

Target Coordinate Systems

In Target, working with map coordinate systems requires that the map coordinate system information be attached to any database, grid or map. Once you have attached a coordinate system to a set of coordinates, Target will deal with any re-projections that may be required to properly display data from different coordinate systems together on your maps.

When dealing with coordinate systems, it is important to be aware that the geographic location (X,Y) of any objects are either an implied or a known coordinate system. If you do nothing to define coordinate systems in your data, Target will assume that all locations (X,Y) are in the same coordinate system, which is unknown.

You must define coordinate systems if you want to:

- ▶ Annotate maps with longitude, latitude locations
- ▶ Convert the location of information (data or grids) from one map coordinate system to another
- ▶ Display information on a map that is in a different map coordinate system
- ▶ Defined a warped coordinate system to fit data to a desired map coordinate system



If you do not need to do any of these things, you do not have to deal with projections.

Coordinate systems can be defined for any pair of channels in a database, for a grid coordinate system, and for a data view in a map. In most cases, all that is required is to define the coordinate system of the "X" and "Y" channels of an original database. This coordinate system will then be passed on to grids when data from that database is gridded, and maps created from this data will also inherit this coordinate system. Coordinate systems of data channels, grids and map views can also be viewed and modified at any time, although the modification of coordinate systems does require specific and accurate knowledge of the projection information.

Target features "smart projections" that reproject data "on-the-fly" as it is displayed. This functionality enables maps to have several views; each containing a different set of projected coordinates. In addition, dynamic links between maps and data are maintained, even if different coordinate systems are used.

Coordinate Systems in Target

In Target a coordinate system is always attached or applied to something. This can be a coordinate pair on a database, a grid, or a map view. Before you can apply a coordinate system, you will need to know the following information about your data:

The type of projection coordinates that contain the location information for your data.

- ▶ **Projected (x,y)** - the coordinates are in a known projected coordinate system, such as UTM, or some other map-based coordinate system.

or


- ▶ **Geographic (long,lat)** - the coordinates are longitudes and latitudes in degrees. Only a datum is required.



When importing data that includes an attached Geographic Coordinate system, note that Geosoft only supports decimal degrees (ddd.dd) or full Latitude-Longitude (ddd.mm.ss.ss).

Depending on the type of data, you may also need:

- The coordinate projection subset to use (e.g. UTM, USA State Plane)
- The units of measurement you want to use (e.g. feet, metres)
- The Datum (or ellipsoid) to use (i.e. WGS 84 / UTM zone 44N) and local datum to use

 *When you define (or modify) a coordinate system the coordinates of the data (database, grid or map view) remain unchanged. This process only sets the “coordinate system label”. However, when you reproject data into another coordinate system the numerical representation of the coordinates will change.*

Define X, Y Channels

Once your data has been successfully imported into Target, you can set the coordinate system and projection information for your database.

Defining Channels


One of the first steps in setting a coordinate system is defining your X and Y channels. This can be done during the import process, or will be automatically set if your coordinate channels are called X and Y by default.

 *You cannot create a map until your X and Y channels are defined.*

In Target we have introduced "current" X and Y (and Z) channels. This feature enables users to select the channels that they would like to use as the current X and Y (and Z) channels (for example, East, North, and Relative Level).

Markers have been added to the channel header to indicate which channels are currently defined to be the "current" X, Y (and Z) channels. The markers are little rectangles on the right side of the header cell, and contain "x", "y" (or "z") in reversed display (like the triangle protection symbol on the left).

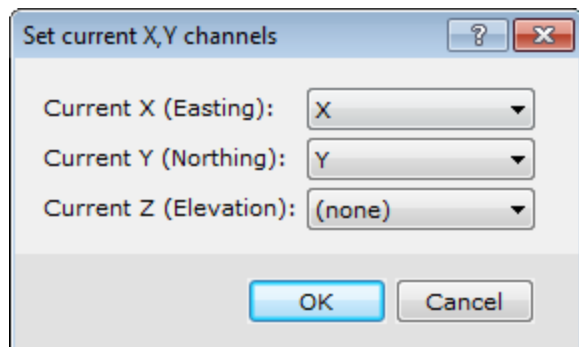
When you alter the current coordinate channels, these markers change too. Normally, you will just get "x" and "y", but if you have a "Z" channel it will get the "z". The "z" will be used in Drillhole databases, where DH_EAST = "x", DH_NORTH = "y" and DH_RL = "z".

 *All grids, maps, and databases derived from a database that has coordinate system information attached to it, will inherit that coordinate system information.*

To Define X and Y channels

When you first import your data, your X and Y coordinate channels may be called East and North (or any other valid naming system).

1. On the *Coordinates* menu, select **Set Current X, Y, Z, Coordinates**. The *Set current X, Y channels* dialog box appears.



2. Select *Current X* and *Y* channels from the drop-down list.
3. Select the *Current Z* channel, if applicable.
4. Click **OK**. Your database now has set X and Y channels which can be seen by the inverse x and y on the right side of the channel header cell.

Projected (X,Y) Coordinate System


The Target *Coordinate System* interface has been designed to make creating, editing or viewing coordinate systems a simple, one-step process. Target uses a single dialog to set and modify coordinate system settings. The *Coordinate System* tool also now supports ESRI projection files (PRJ).

The Coordinate System Dialog

Whenever you work with coordinate systems in Target, the coordinate system information for the current database, grid, or view is displayed in the *Coordinate System* dialog. When the fields in the dialog are shaded grey, you can only view the information. If the dialog box fields are white, you may edit the values.

The dialog also includes a **Copy from** button that displays the **Copy Coordinate System From** dialog. Use this dialog to copy a coordinate system from another file. The file types supported include, Database, Grid, Geosoft Voxel, Geosoft projection (*.prj), ESRI projection (*.prj), Geosoft warp (*.wrp), Geosoft polygon (*.ply) and GMSYS model.

To define a coordinate system, you must know the type of coordinate system that is used for the data. If the wrong coordinate system type is specified, Target may return strange results or take an unusually long time to process the data.

 *If the database contains no coordinate system information, the **Unknown** radio button is automatically selected in the *Coordinate System* dialog box.*

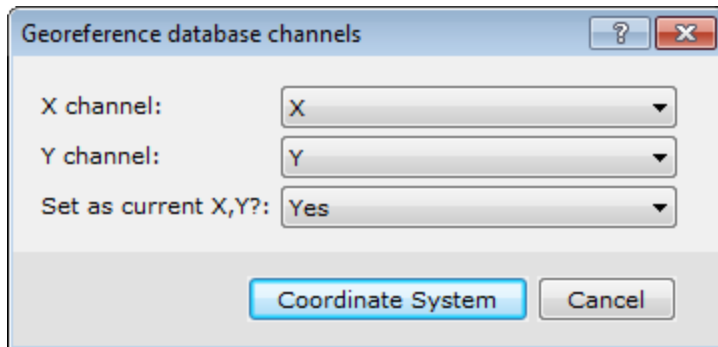
Setting a Projected Coordinate System for a Database

Use the Projected (x,y) coordinate system if your database coordinates are in a known projected coordinate system, such as UTM, or some other map-based coordinate system. A coordinate system can be defined from any pair of channels in a database. These two channels must contain coordinate information. Normally, the X and Y coordinate channels are used.

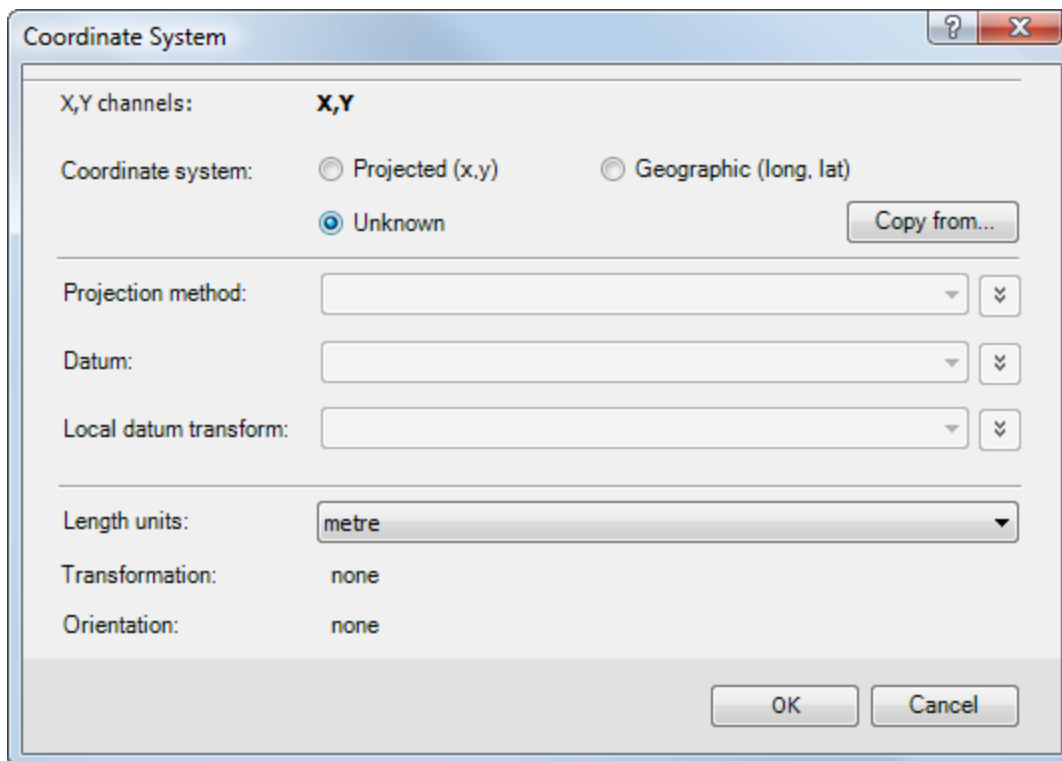
To Set a Projected (X, Y) Coordinate System for Database Channels

This procedure assumes you have an open a database which contains at least two channels with coordinate information (X, Y).

1. On the *Coordinates* menu, click **Coordinate System**. The *Georeference database channels* dialog appears.



2. Select the **X** and **Y** coordinate channels that you will use to set the coordinate system
3. From the **Set as current X,Y?** drop-down list, select **Yes**.
4. Click **Coordinate System**. The *Coordinate System* dialog appears. This dialog displays the current coordinate system information for the database.



5. Select the **Projected (x,y)** radio button. The appropriate dialog parameters are enabled.
6. Verify the **Length units** are correct.
7. Select the **Datum** and **Local datum transform** from the drop-down lists. The Local datum transform drop-down list provides all the local datum transforms, which apply to the selected *Datum*.
8. Select the **Projection method**. Choose one of the available pre-defined projections from the list. The list contains all

projections currently defined by EPSG (v4.2). In cases where the coordinate system can only be viewed, and not modified, this control is replaced with a label containing the name of the local datum transform.



*If the coordinate system method you want to use does not exist, but you know the parameters for it, you can click the **Projection method** drop-down menu, which activates a **New** button to access the *New Projection Method* dialog. Use this dialog to create a new (custom) coordinate system method.*

9. When all the Coordinate System settings are correct, click **OK**.

Set Projected Coordinate System of a Grid

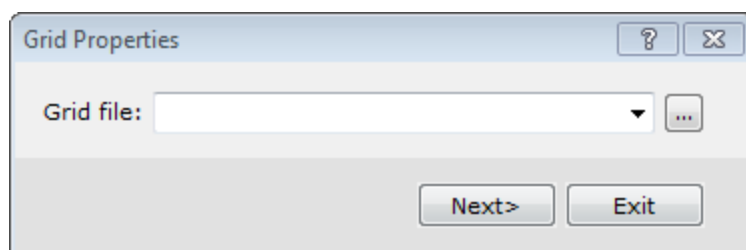
Normally, when you create a grid from a database that already has location (coordinate) channels with a defined coordinate system, the coordinate system information in the database is automatically applied to the grid. You can modify the current coordinate system or define a new one from the *Grid and Image* menu.

To ensure consistency between your databases and grids it is good practice to define a coordinate system for your database before creating grids from it.

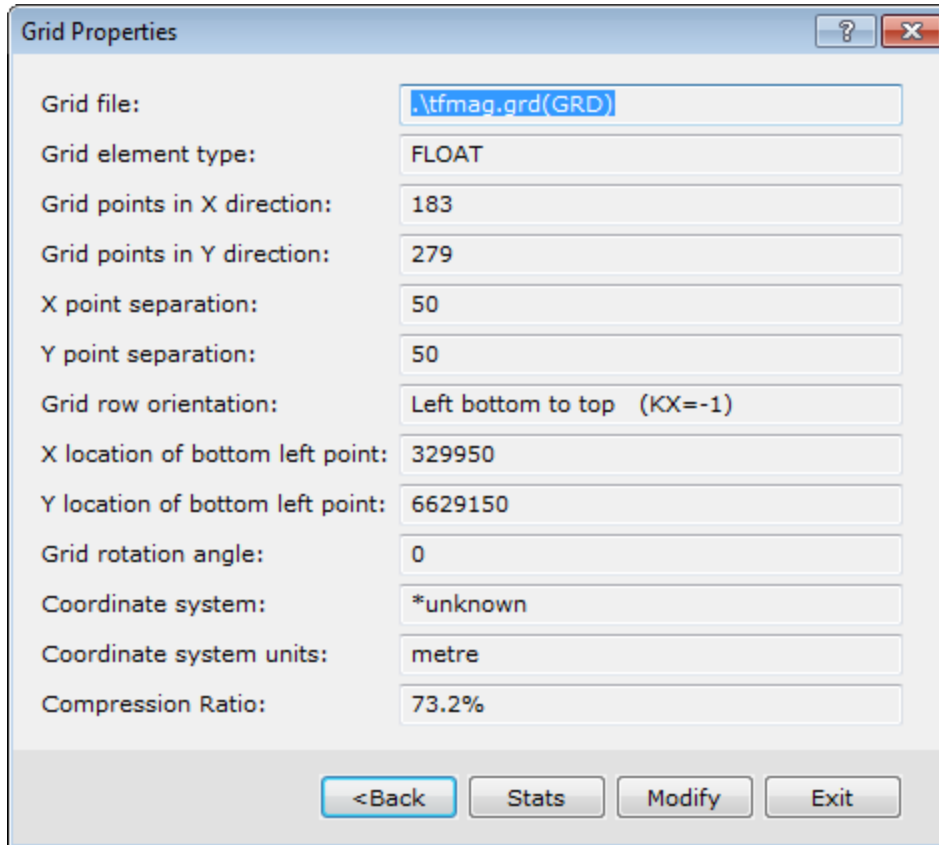
To Modify or Define a Projected Coordinate System of a Grid

When the fields in any dialog box are shaded grey, you can only view the information. If the dialog box fields are white, you may edit the values.

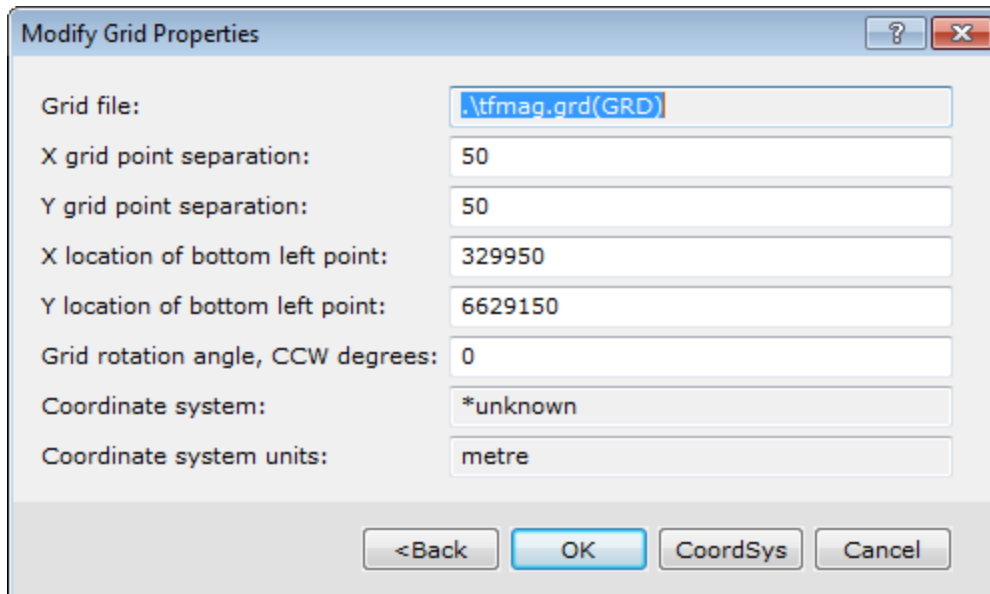
1. On the *Grid and Image* menu, select **Properties**. The *Grid Properties* dialog appears.



2. **Browse** to the grid you want to modify.
3. Click **Next**. The *Grid Properties* dialog appears. This dialog reports all of the basic information about the selected grid.



- Click **Modify** to display the *Modify Grid Properties* dialog. This dialog displays the information that is used to locate the grid in a real coordinate system.





Changing anything in this dialog will have the effect of moving or changing the apparent size of the grid when displayed on a map.

- Click **CoordSys** to modify (or define) the map coordinate system of the grid file. The *Coordinate System* dialog appears. This dialog displays the current coordinate system information for the grid.

- Select the **Projected (x,y)** Coordinate system radio button.
- Verify the **Length units** are correct.
- Select the **Datum** and **Local datum transform** from the drop-down lists. The Local datum transform drop-down list provides all the local datum transforms, which apply to the selected *Datum*.
- Select the **Projection method**. Choose one of the available pre-defined projections from the list. The list contains all projections currently defined by EPSG (v4.2). In cases where the coordinate system can only be viewed, and not modified, this control is replaced with a label containing the name of the local datum transform.



If the coordinate system method you want to use does not exist, but you know the parameters for it, you can click the **Projection method** drop-down menu, which activates a **New** button to access the *New Projection Method* dialog. Use this dialog to create a new (custom) coordinate system method.

- When all the Coordinate System settings are correct, click **OK**. The *Modify Grid Properties* dialog appears.
- Click **OK** to apply the changes to the grid file and the *Grid Properties* dialog will be displayed.
- Click **Exit** to close the dialog.

Create New Map from Projected (X, Y) Coordinates

In Target maps have several Views that contain information about the map. Coordinate system information for a map is contained in the Data View. Base map information is contained in the Base View.

When you create a new map, the system either reads the manually entered coordinates or scans a user-specified database or grid file and attaches their coordinate system and coordinate attributes to the specified map view.

Use the *New map from x,y* menu item to create a new blank map to fit the data range specified. The data range can be entered manually, or it can be determined from the range of selected data in a database or from a grid range. The first step is to create a new map using the coordinate system from an existing database or grid.

To Define a Map Coordinate System for a New Map from Projected (X,Y) Data

1. On the *Map Tools* menu, select *New Map* and then select **New Map from X,Y**.
The *Data range to map* dialog appears. This dialog shows the data range (coordinate), units and coordinate system information from the last coordinate system that was used.

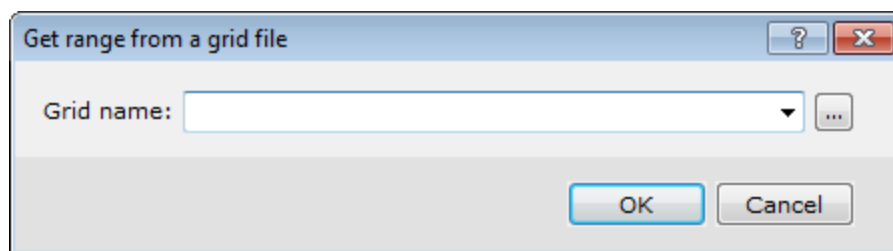
2. To change the coordinate system information you can scan an existing database or grid. Follow the procedures below depending on where the coordinate system information resides.

To Scan a Database for Data Range and Coordinate System Information

1. Click **Scan Data**. The system scans the current database open in your project. The new data range and coordinate system information obtained from the database appears in the *Data Range to Map* dialog box.

To Scan a Grid for Data Range and Coordinate System Information

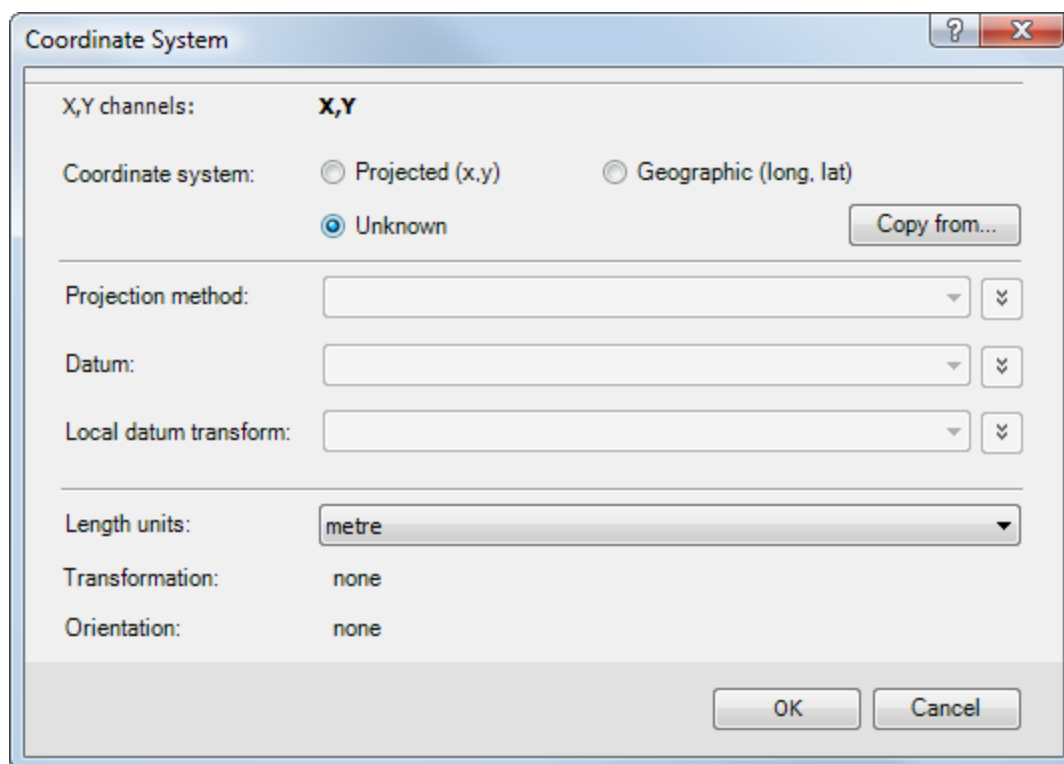
1. Click **Scan Grid**. The *Get range from a grid file* dialog box appears.



2. **Browse** to the grid file.
3. Click **OK**. The new data range and coordinate system information, obtained from the grid, appears in the *Data Range to Map* dialog box.

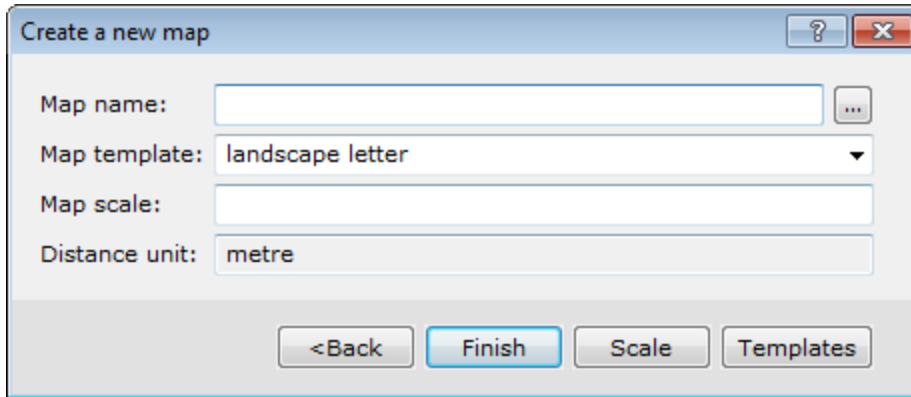
To Define the Coordinate System

1. Click **Coordinate System** to view the coordinate system information. The *Coordinate System* dialog box appears. This dialog will display the known coordinate system information as defined in the scanned database or grid file.



When the fields in any dialog box are shaded grey, you can only view the information. If the dialog box fields are white, you may edit the values.

- If all the coordinate system settings are correct, click **OK** to apply the coordinate system and the *Data range to map* dialog will again be displayed.
- Click **Next** to continue. The *Create a New Map* dialog box will be displayed.



- Specify a *Map name* for the new map.



You can also select a **Template** to use for your map layout.

- To automatically calculate the map scale, click **Scale**. The default scale that will fit the defined data range to the specified template will be displayed. You can modify this value to a more appropriate scale.
- Click **Finish** when you are done. The system will create a new (blank) map with coordinate system information in the Data View.

Geographic (long, lat) Coordinate System

The Target *Coordinate System* interface has been designed to make creating, editing or viewing coordinate systems a simple, one-step process. Target uses a single dialog to set and modify coordinate system settings. The *Coordinate System* tool also now supports ESRI projection files (PRJ).

The Coordinate System Dialog

Whenever you work with coordinate systems in Target, the coordinate system information for the current database, grid, or view is displayed in the *Coordinate System* dialog. When the fields in the dialog are shaded grey, you can only view the information. If the dialog box fields are white, you may edit the values.

The dialog also includes a **Copy from** button that displays the *Copy Coordinate System From* dialog. Use this dialog to copy a coordinate system from another file. The file types supported include, Database, Grid, Geosoft Voxel, Geosoft projection (*.prj), ESRI projection (*.prj), Geosoft warp (*.wrp), Geosoft polygon (*.ply) and GMSYS model.

To define a coordinate system, you must know the type of coordinate system that is used for the data. If the wrong coordinate system type is specified, Target may return strange results or take an unusually long time to process the data.




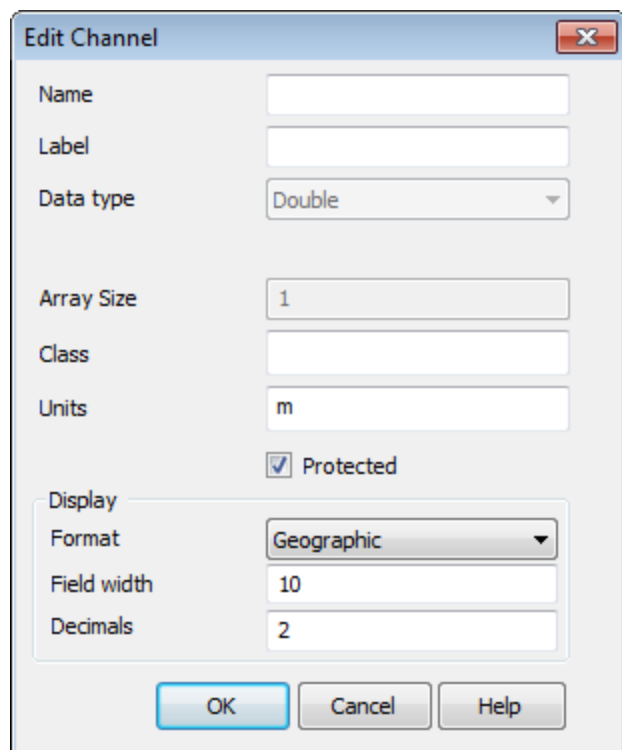
If the database contains no coordinate system information, the **Unknown** radio button is automatically selected in the *Coordinate System* dialog box.

Setting a Geographic Coordinate System for a Database

Use a *Geographic (long, lat)* coordinate system if your database coordinates are in longitudes and latitudes degrees and only a datum is required. A coordinate system can be defined from any pair of channels in a database. These two channels must contain coordinate information. Normally, the X and Y coordinate channels are used.


Before you begin, use the *Edit Channel* dialog to confirm the *Format* type is Geographic as shown below:

 When importing data that includes an attached Geographic Coordinate system Geosoft only supports decimal degrees (ddd.dd) or full Latitude-Longitude (ddd.mm.ss.ss).

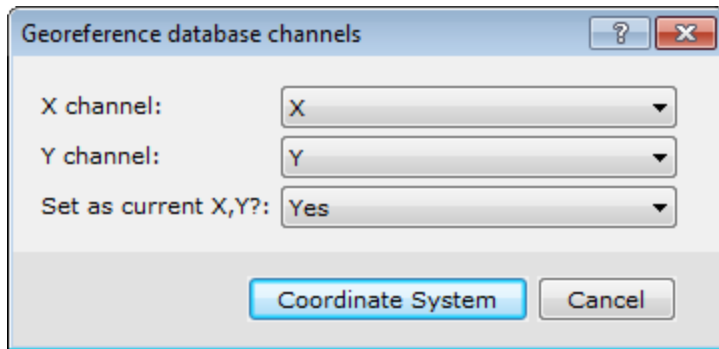


To set a Geographic (Long, Lat) Coordinate System for a Database

This procedure assumes you have an open a database which contains at least two channels with longitude and latitude information.

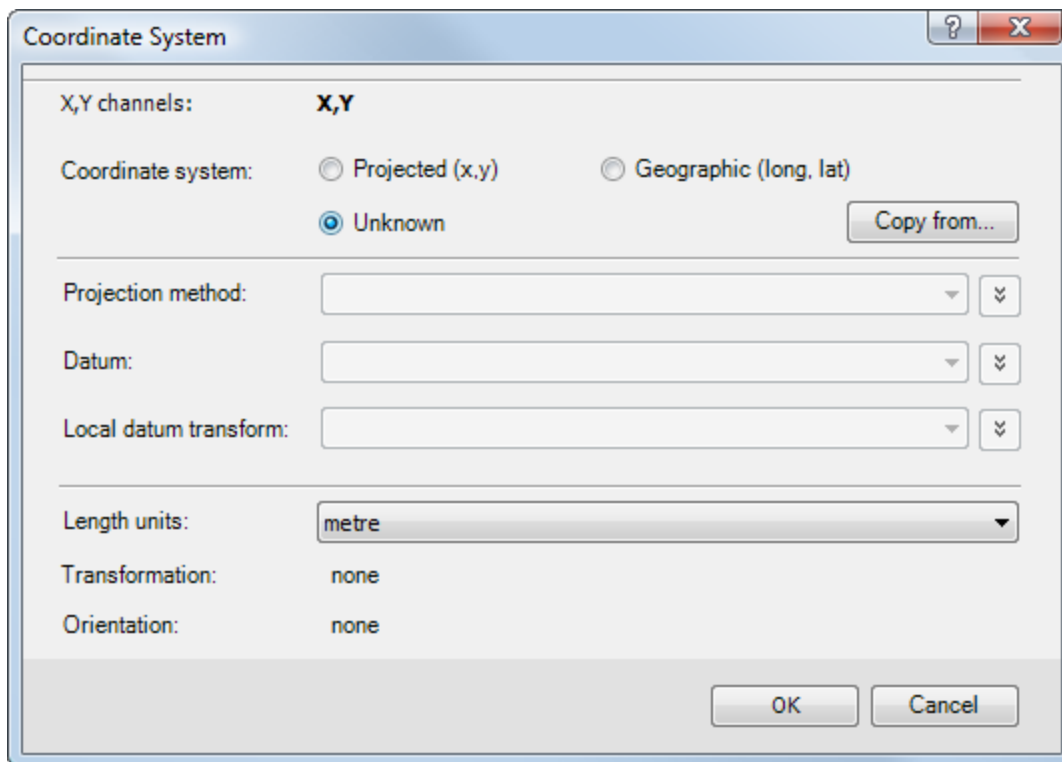
 When you select a *Geographic (long,lat)* coordinate system the geographic coordinates will be displayed as a Cartesian system with units of degrees. This means that you will not be able to display latitude and longitude annotations in the base map because the X, Y coordinate system of the map will be represented by the long, lat coordinates.

1. On the *Coordinates* menu, click **Coordinate System**.
The *Georeference database channels* dialog box appears.



2. Select the X and Y coordinate channels that you will use to set the coordinate system and then click the **Coordinate System** button.

The *Coordinate System* dialog box appears.



3. Select the **Geographic (long,lat)** radio button. The appropriate dialog parameters are enabled.



You will note that the Length units have been set to match the units used by the coordinate system and can not be changed.

4. Select the *Datum* and *Local datum transform* from the dropdown lists. The *Local datum transform* drop-down list provides all the local datum transforms, which apply to the selected *Datum*.
5. When all the *Coordinate System* settings are correct, click **OK** to apply the coordinate system.



*If your Longitude, Latitude channels display double asterisks (**), that only indicates that the channels are too narrow to display the data. Widen the channels and the data will be properly displayed.*

New Map from Geographic Coordinates

In Target maps have several views that contain information about the map. Coordinate system information for a map is contained in a data view. Base map information is contained in the base map view.

When you create a new map, the system either reads the manually entered coordinates or scans a user-specified database or grid file and attaches their coordinate system and coordinate attributes to the specified map view.



The projected base map created from a latitude-longitude range will be windowed based on lines of latitude and longitude, not X and Y, and the data window will be oriented so that North is up at the centre of the map.

To create a new map from Latitude-Longitude requires a database that has a Projected (x,y) coordinate system.

When using latitude-longitude degrees as the coordinates of your data and/or a geographic coordinate system you need to use *New map from x,y* menu item. The resulting map will have latitude and longitude displayed in a right angled Cartesian coordinate system.



With a Projected (x,y) coordinate system, you can display Latitude and Longitude annotations on the basemap of a new map created from x,y coordinates.

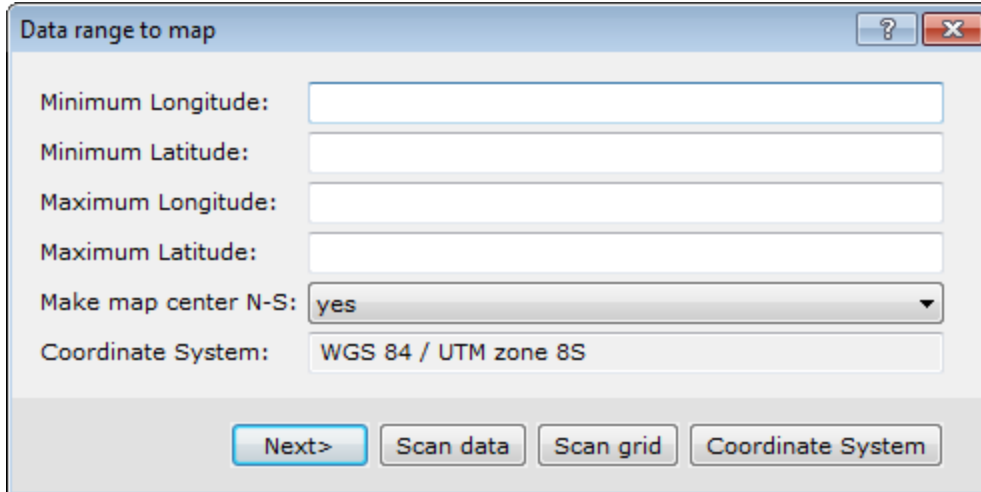
To Define a Map Coordinate System for a New Map from Geographic Coordinates

The first step is to create a new map using the coordinate system from an existing database or grid. After creating a map from Longitude/Latitude the data view of the new map will have a warp attached to it. This is because when we create a Longitude/Latitude map we warp the view so that North is at the top and centred.



If you remove the warp on your map, new elements may not be positioned correctly.

1. On the *Map Tools* menu, select **New Map**.
2. Select **New map from Lat,Long**. The *Data range to map* dialog appears. This dialog shows the data range (coordinates), units, and coordinate system information from the current (selected) database in your project.



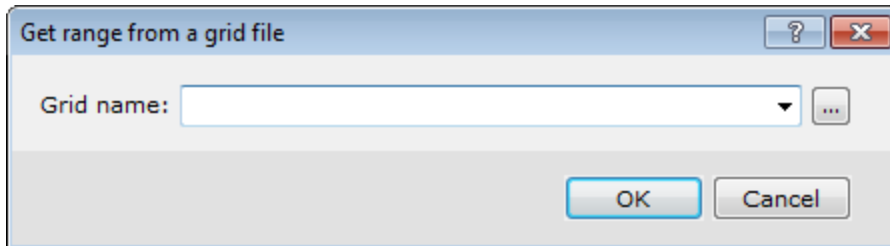
3. To change the coordinate system information, you will need to either scan an existing database or grid for the coordinate system information. Follow the procedures below depending on where the coordinate system information resides.

To Scan a Database for the Data Range and Coordinate System Information

1. Click **Scan Data**. The system scans the current database open in your project. The new data range, and coordinate system information obtained from the database appear in the *Data Range to Map* dialog box.

To scan a grid for the data range and coordinate system information

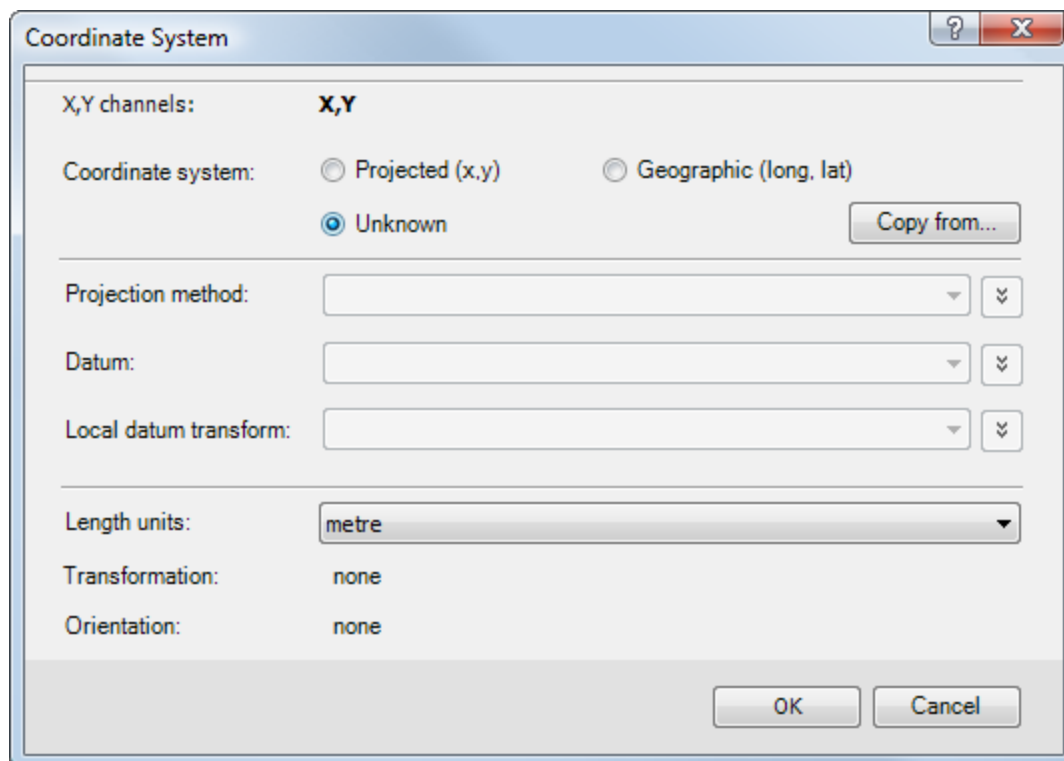
1. Click **Scan Grid**. The *Get range from a grid file* dialog box appears.



2. **Browse** to the grid file.
3. Click **OK**. The new data range, and coordinate system information obtained from the grid appear in the *Data Range to Map* dialog box.

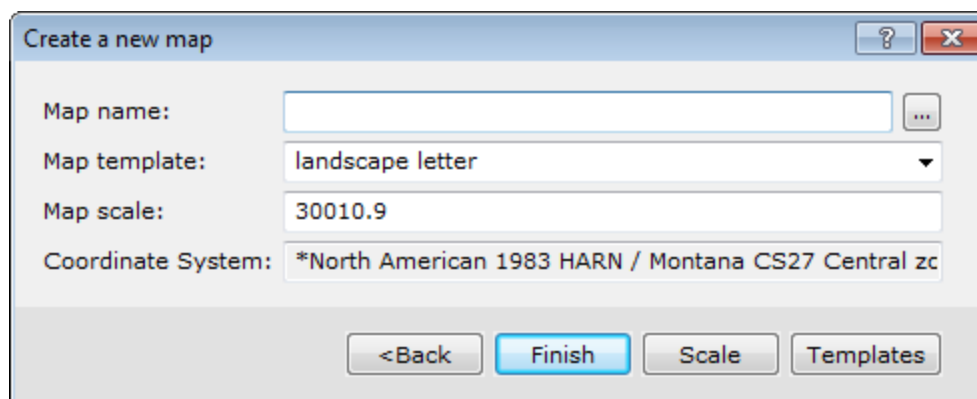
To Define the Coordinate System

1. Click **Coordinate System** to view the coordinate system information. The *Coordinate System* dialog box appears. This dialog will display the known coordinate system information as defined in the scanned database or grid file.



When the fields in any dialog box are shaded grey, you can only view the information. If the dialog box fields are white, you may edit the values.

2. If all the coordinate system settings are correct, click **OK** to apply the coordinate system and the *Data range to map* dialog will again be displayed.
3. Click **Next** to continue. The *Create a New Map* dialog box will be displayed.



4. Specify a *Map name* for the new map.



You can also select **Templates** to use for your map layout.

5. To automatically calculate the map scale, click **Scale**. The default scale that will fit the defined data range to the specified template will be displayed. You can modify this value to a more appropriate scale.
6. Click **Finish** when you are done. The system will create a new (blank) map with coordinate system information in the Data View.

Displaying Data with Different Coordinate Systems on a Map

Since grids, images, data and maps can have different coordinate system information, you may want to display one or more types of coordinate systems on a map. The following is a list of data types that you can attach coordinate system information to and place on a map:

- Grid or image
- Located data
- ArcGIS Lyr
- ArcView SHP
- MapInfo data
- Vector files such as DXFs, etc

To Display Different Coordinate Systems on a Map

1. Identify the coordinate system for each data type (i.e. grids, images, maps, or located data).



Data types with different coordinate systems can be placed on the same map. However, make sure the data cover the same geographical area.

2. Data that is imported into a map is re-projected into the map coordinate system when it is displayed. For example, if you place a grid with latitude/longitude coordinate system coordinates on a map defined in UTM coordinates, the system will display the grid on the map in the map's coordinate system while preserving the grid's coordinate system information. In this example, the lat/long meridians on the grid would appear curved, while the UTM meridians would appear straight.

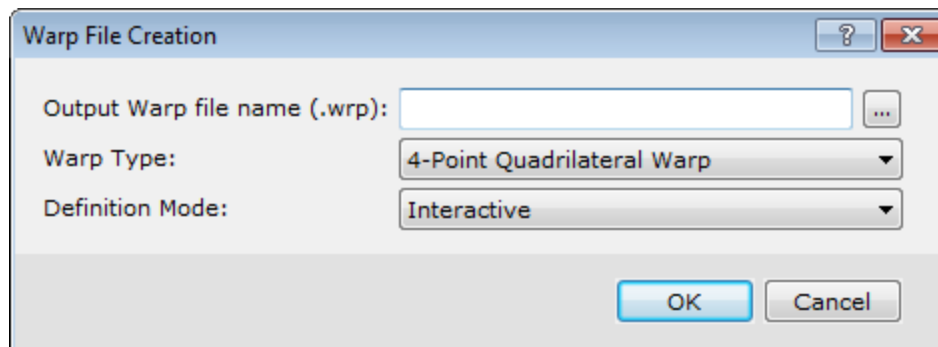
Create and Apply Warps on a Grid

Warping is useful when you have an un-referenced grid file in an unknown coordinate system or an un-referenced image.

- Relocate data, define one control point
- Scale and rotate data, define two points
- Scale in X and Y and rotate, define 3 control points
- Perform a quadrilateral warp, define 4 control points

To Define a Warp

1. On the *Coordinates* menu, select **Georeferencing** and then select **Define a Warp**. The *Warp file Creation* dialog appears.



2. Specify an *Output Warp file name (.wrp)* .
3. Select the **Warp Type** from the drop-down list.

You will be prompted to enter a number of control points, depending on the warp type. If *4-point Quadrilateral Warp* is chosen then the points must be specified in a clockwise or anti-clockwise direction to avoid a mid-point twist of the output data. Each control point will have an old coordinate and a new coordinate. The *Multipoint* warp (more than 4 points) is best for small translations relative to the units of distance on the map.

4. Select the **Definition Mode**.

In *Interactive* mode, both the old and new coordinates are defined using the mouse on the current map. In *Semi-interactive* mode the old coordinate is defined on the current map, but the new coordinate is entered in a dialog, using the old positions as default values. In *Manual* mode, both the old and new positions are entered in a dialog window.



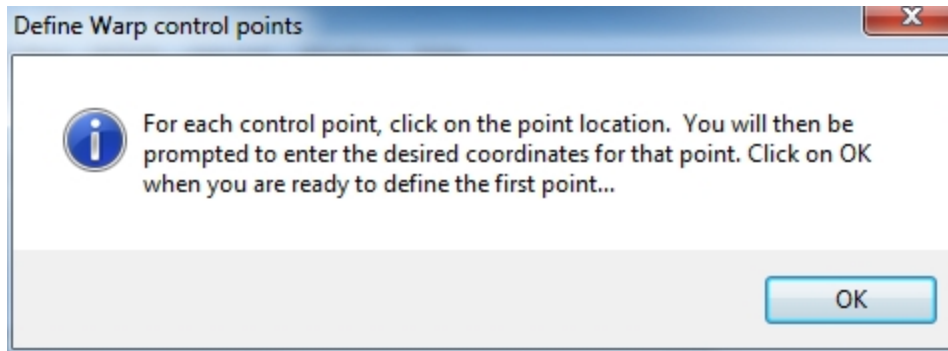
Semi-interactive mode enables you to select the points on the map that you are warping from (for example, the corners of a bitmap) and then manually input the points (in UTM) that you are translating to. If you find that you cannot accurately select these points, try the other modes (interactive and manual) to enter the four points. Remember, that you can use the right mouse menu to zoom, shrink, and pan around the map while you are selecting the points.

5. Click **OK**. The *Map projection* box appears asking you to *Define the output coordinate system?*
6. Click **Yes** if you wish to define the coordinate system of the map or click **No** to continue applying the warp.

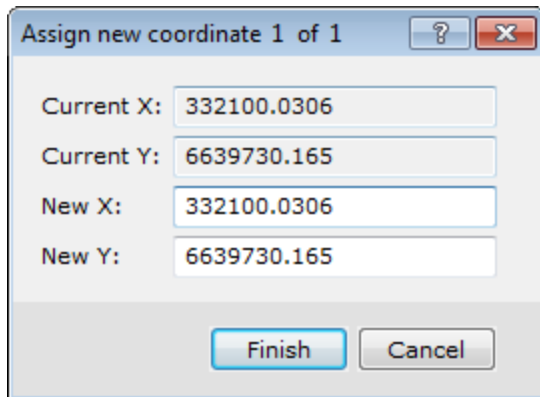


*If you clicked **Yes** above, the *Coordinate System* dialog will appear. Refer to the *Application Help* files for details on defining the *Coordinate System*.*

7. If you clicked **No** above or have defined the coordinate system, the *Define Warp control points* dialog appears.
8. This dialog tells you to click on the point location for each point in your warp file, you will then be prompted to specify the new “warped” location in the following dialog. Click **OK** to when you are ready continue. The cursor changes to a cross-hair enabling you to locate the first point.



9. **Left-click** to assign the first point. Once you have located the first point, the *Assign new coordinate* dialog appears.



10. Specify the *New X and Y* coordinates. Temporary circles will be placed on the locations that you select with the cross-hair cursor. These circles will be removed once all of the control points have been set and the warp control file has been created.

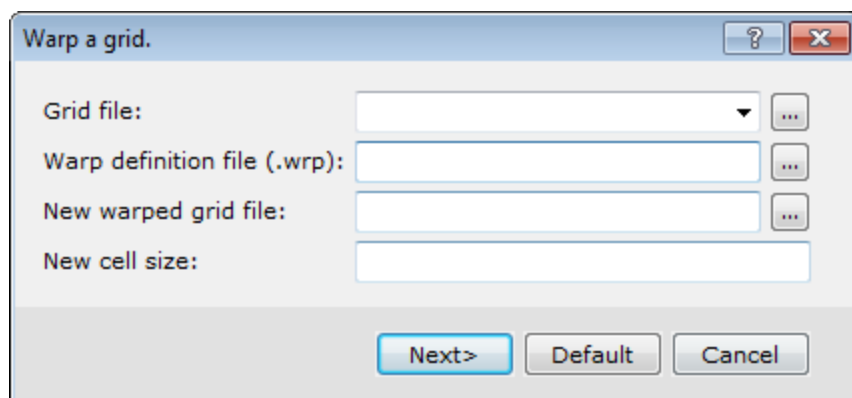


*If you have multiple coordinates to define, click **Next** to specify the next coordinate point location. Continue this until you have specified all coordinates.*

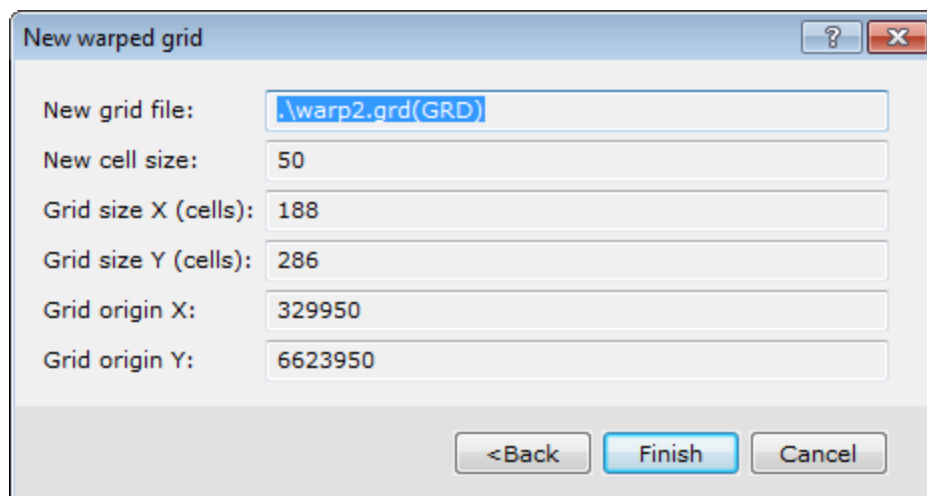
11. Click **Finish**. The warp is created.

To Apply A Warp to a Grid

1. On the *Coordinates* menu, select **Georeferencing** and then select **Warp a Grid**. The *Warp a grid* dialog appears.



2. From the drop-down list, select the **Grid file** to warp.
3. *Browse* to the *Warp definition file (.wrp)* from your project directory.
4. Specify the *New warped grid file* name and a *New cell size* (optional), if required.
5. Click **Next** to continue. The *New warped grid* dialog appears.



6. When all parameters are correct, click **Finish** to warp the specified grid file.

Warping Image Files

If you want to warp an image file (i.e. tiff, bmp) and the file is large, you may only want to attach the warp to the file. "Attaching" the warp is suitable if you have a very large file that is stored on a CD, for instance. The warp process is repeated every time you display the file to a projected map but the original file remains unchanged.

When you warp an image, the warped output image **must** be a Geosoft COLOUR grid (*.grd) *File type* in order to keep the colours of the original image.

If the image of the new warped grid appears twisted or is an incorrect size, check the warp points are in a circular order and the points are correctly located within the defined map area.

Converting Elevations

The *Geoid height* menu option enables you to convert GPS elevations to elevations relative to the geoid. Geoid height (GEOID GX) will create a channel of the geoid height relative to the GRS 80 spheroid for a given pair of coordinate channels. This GX requires a grid of the geoid model, which is the elevation of the geoid in metres relative to the GRS 80 spheroid, which is found in the *Target/etc* directory. For more information, please refer to the GEOID GX help topic.

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