Chapter 11: Utilities

WinFrog's main menu includes a **Utilities** category that provides several tools that can be used to perform various frequently required survey operations. Included in the **Utilities** category are the following options:

Geo/Grid Coordinate Conversion	Use this utility to convert geographical (latitude/longitude) coordinates to grid (Northing/Easting) coordinates and vice versa.
KP/Coordinate Conversion	Use this utility to convert KP (Kilometer Post) values to geographical (latitude/longitude) or grid (Northing/Easting) coordinates and vice versa.
Datum Transformation	Use this utility to convert coordinates between datums.
Forward/Inverse Calculation	Use this utility to calculate coordinates of a new point from a fixed point (latitude/longitude or Northing/Easting) by entering range and bearing values. This utility can also be used to calculate true and grid bearing and distance between two coordinates.
File Conversion Wizard	Use this utility to create survey line and waypoint files from text files, and to convert coordinate files from one coordinate system to another.
Export Events To Excel	Use this utility to export event files into an Excel file. Data items and vehicles can be filtered for the export process.
LOP/Position Calculation	Use this utility to calculate a position from either geographic slope ranges or acoustic two-way-travel-times (TWTT) from fixed transponder stations currently in the Working Xponder file. If TWTT data is used, you can select between using the Working Velocity file or entering velocity values for each TWTT entered. The calculation can also be performed in reverse, that is, calculate geographic slope ranges and TWTTs from an entered position to fixed transponder stations currently in the Working Xponder file.
Acoustics	Three utilities are available here: 1) Sound Velocity Enter two depths; velocity is calculated using the current working velocity file. 2) Digiquartz Depth Enter depth and temperature count and observation time. Select parameters from a

	Digiquartz equipped COMPATT or enter manually. Depth is calculated using UNESCO formula or given density. 3) Pressure Depth and Sound Velocity Enter pressure or depth and latitude to calculate the other using the UNECSO formula. Specific ocean corrections can also be applied. As well, enter temperature and salinity and sound velocity is calculated using several different formulae. The pressure entered is to be the absolute pressure minus atmospheric pressure. If the depth is entered, the calculated pressure does not include atmospheric pressure.
Import LBL Cal File	Use this utility to import Sonardyne Fusion LBL calibration data in a Microsoft Access database file and convert it to a WinFrog LBL calibration file.
Map Wizard	Use this utility to create a Blue Marble Map (*.BMM) file for use as a background image in a Graphics window.
Plotter Base Map Wizard	Use this utility for base map configuration when using the Roland DPX-4600 plotter device.
Generate DXF Map	Use this utility to generate a map in the **.DXF** file format.
Generate MGD77 File	Use this utility to generate a file in the **MGD77** format.
Time Conversion	Use this utility to convert PC Time (the number of seconds since 00:00:00.0, Jan. 1, 1970) to ASCII Time (MM:DD:YY HH:MM:SS.S)
Position Averaging	Use this utility to record position information and generate average position and standard deviation values.
Import Bathymetry	Use this utility to convert ASCII x,y,z bathymetry data into a WinFrog formatted soundings database file that can be displayed in the WinFrog Profile window.

The following sections explain each of these utilities in detail, in the order that they are listed above.

Geo/Grid Conversion

Use this WinFrog utility to convert geographical (latitude/longitude) coordinates to grid (Northing/Easting) coordinates and vice versa.

To Convert Geographic Coordinates to Grid Coordinates

1 From the **Utilities** menu, choose **Geo/Grid Conversion**. The **Geo/Grid Conversion** dialog window displays, as seen below.

2 Highlight the latitude value displayed in the **Geographic** field.

3 Press the **Delete** key on the keyboard.

4 Enter the desired latitude by typing the appropriate letter (**N** for North or **S** for South) followed by the value in the format specified in the main menu item **Configure >Units** (i.e. **dd mm.mmmm** or **ddd mm ss.ss)**.

5 Highlight the longitude value displayed in the **Geographic** field.

6 Press the **Delete** key on the keyboard.

7 Enter the desired longitude by typing the appropriate letter (**E** for East or **W** for West) followed by the value in the format specified in the main menu item **Configure >Units** (i.e. **dd mm.mmmm** or **ddd mm ss.ss)**.

8 Click the "**down**" arrow button to perform the conversion to grid coordinates. The grid coordinates (as configured in **Working Geodetics**) are displayed in the **Grid** field.

Note: if the format of the geographical coordinates entered is not correct, the conversion will produce incorrect grid values. To confirm that the coordinates are entered in the correct format, click the "**up**" arrow to re-calculate the geographical coordinates from the grid values. The geographical coordinates will not change if the values were entered correctly.

To Convert from Grid Coordinates to Geographic Coordinates

1 From the **Utilities** menu, choose **Geo/Grid Conversion**.

2 Highlight the Northing value displayed in the **Grid** entry window.

3 Press the **Delete** key on the keyboard.

4 Enter the desired Northing by typing **N** followed by the numerical value (as specified in **Configure > Geodetics)**.

5 Highlight the displayed Easting value displayed in the **Grid** entry window.

6 Enter the desired Easting by typing **E** followed by the numerical value (as specified in **Configure > Geodetics)**.

7 Click the "**up**" arrow button to perform the conversion to geographic coordinates. The geographic coordinates are displayed in the **Geographic** field.

Note: if the format of the grid coordinates entered is not correct, the conversion will produce incorrect geographical values. To confirm that the coordinates are entered in the correct format, click the "**down**" arrow to re-calculate the grid coordinates from the geographical values. The grid coordinates will not change if the values were entered correctly.

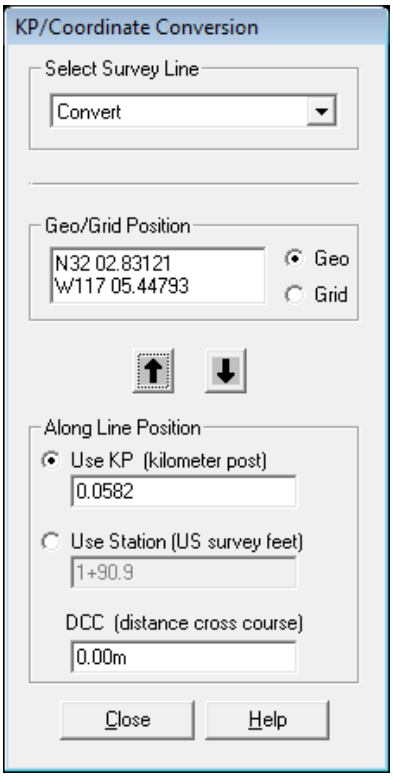
KP/Coordinate Conversion

Use this WinFrog utility to convert KP (kilometer post) or Station values to geographical (latitude/longitude) or grid (Northing/Easting) coordinates and vice versa. This utility is used primarily in cable laying operations, where cable positions are referenced using both of these systems.

Note: The Station value units are the same as the current Map Projection distance units if these are set to either feet, US survey feet or Imperial feet, otherwise they are US survey feet. As a reference, the units are displayed in the respective entry point annotation.

To Convert KP Values to Geographical/Grid Coordinates

1 From the **Utilities** menu, choose **KP/Coordinate Conversion**. The **KP/Coordinate Conversion** dialog window displays, as seen in the next figure.



2 Select the appropriate survey line from the **Select Survey Line** dropdown field**.**

3 Select **Use KP** and enter the desired **KP** (kilometer post) value in the **Along Line Position** panel,

or

4 Select **Use Station** and enter the desired **Station** value in the **Along Line Position** panel.

Note: The KP value is always in kilometers.

Note: While the KP value is read in to the resolution typed, it is displayed to decimeters.

Note: While the Station value is read in to the resolution typed, it is displayed to tenth of a foot.

Note: The STA value can be entered in station format (e.g. 32+80.8) or as a distance (e.g. 3280.8). The default units are as noted in the associated entry point title (e.g. STA (US survey feet)). If a unit tag is entered (e.g. ft, m, yds), the STA value is accepted in these units. Any value entered is automatically re-displayed in the default units.

5 Enter the desired **DCC** value.

Note: The default units for this entry are the Distance Units. Positions that are to the port/left side of the survey line are entered as negative values, while starboard/right positions are entered as positive.

6 Click the "**up**" arrow button to perform the conversion to geographic/grid coordinates.

To Convert Geographical/Grid Coordinates to KP Values

1 From the **Utilities** menu, choose **KP/Coordinate Conversion**. The **KP/Coordinate Conversion** dialog box displays, as seen in the figure above.

2 Select the appropriate survey line from the **Select Survey Line** dropdown menu**.**

3 Select the appropriate **Geo** or **Grid** button to define how the coordinates will be entered.

4 Enter the desired latitude/longitude or Northing/Easting coordinate.

5 Click the down arrow button to perform the conversion from geographic/grid coordinates to KP/STA and DCC values.

Note: The KP value is displayed to decimeters.

Note: The Station value is displayed to tenth of a foot.

Note: It is important to note that when the KP to/from position calculation is performed, the values used are those displayed in the dialog, to the resolution displayed in the dialog. As a result, clicking to calculate from KP/DCC to position and then clicking to calculate from the resulting position back to KP/DCC may result in a different KP or DCC value than originally entered. This is due to the fact that the resolution of the position display may not support the resolution used for the original KP and DCC values, and vice versa. Depending upon the relationship of the KP/DCC to the respective line and the resolutions configured for the position and DCC values, repeatedly clicking KP to position and position to KP may result in the results continually changing. This is not an error in the calculations but a mismatch of the resolutions used.

Datum Transformations

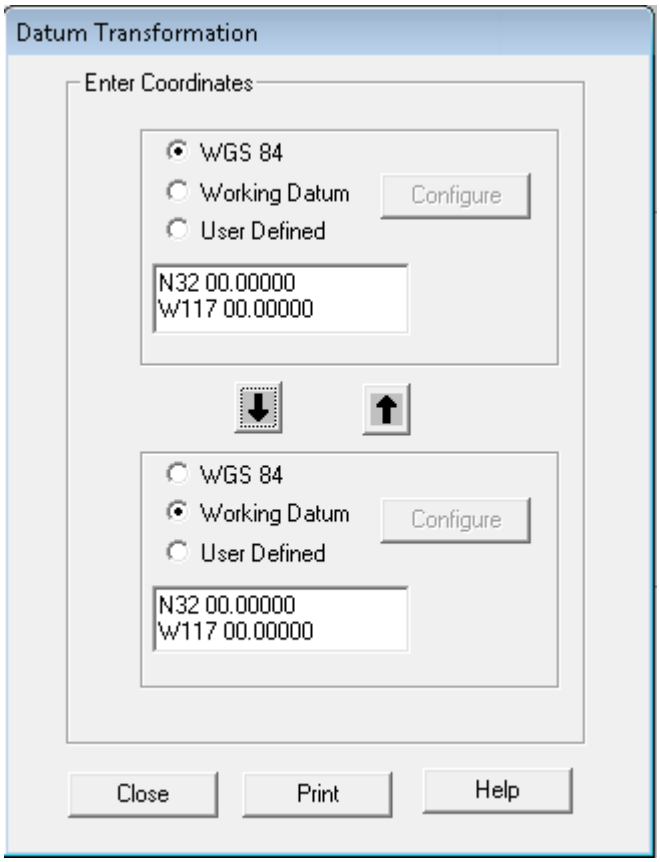
Use this utility to convert coordinates between datums.

Select the main menu item **Configure > Geodetics** to confirm the working geodetics settings. See the **Configuring Geodetics and Units** chapter for more information on **Geodetics**.

Note: If a problem is encountered executing the datum transformation, a pop-up message will appear providing details. For example, if the Geodetics are configured to use NADCON for transformations between the WGS84 and the Working Ellipsoid and the entered coordinate does not lie within the configured area, the transformation will fail and a pop-message appears stating “Datum Shift Error: Input outside NADCON zone”.

To Convert Coordinates between Datums

1 From the **Utilities** menu, choose **Datum Transformation**.



2 There are two sections on the dialog. The down arrow transforms the top section to the bottom section and the up arrow transforms the bottom section to the top section.

3 Use the radio buttons to choose coordinate systems for both top and bottom sections. You can chose between WGS 84 latitude/longitude, current working geodesy, and a user defined geodesy. If the user defined geodesy radio button is selected, the Configure button can be used to define the desired geodesy.

4 Enter the desired coordinate in the top text box and click the down arrow to convert the

coordinate to the bottom section configuration.

5 Enter the desired coordinate in the bottom text box and click the up arrow to convert the coordinate to the top section configuration.

Note:

1) If the format of the geographic/grid coordinate values entered is not correct, the calculated coordinate values produced will be incorrect.

2) If converting between two different datums other than WGS 84, WinFrog first converts to WGS 84 then to the second datum.

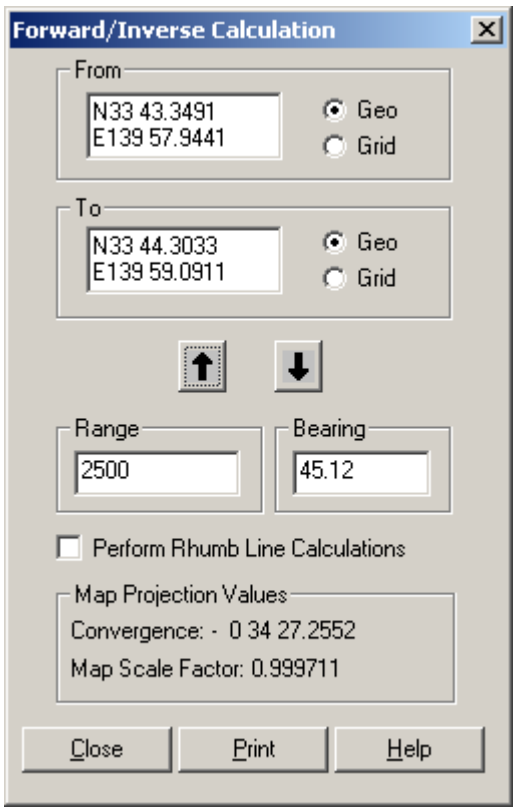
Forward/Inverse Calculations

Use this utility to calculate coordinates of a new point from a known point (latitude/longitude or Northing/Easting) by entering **Range** and **Bearing** values. This is known as a **Forward** calculation. This utility can also calculate the **True** and **Grid Bearing** and **Distance** between two known coordinates. This is known as an **Inverse** calculation.

In both cases, the calculation is performed either on the Map Projection Grid or Working Ellipsoid depending upon which coordinate type is selected, **Grid** or **Geo** respectively. The exception to this is if the **Perform Rhumb Line Calculations** option is selected, in which case the Inverse or Forward calculation is performed using geographic coordinates and Rhumb Line algorithms. Note that these Rhumb Line calculations are independent of the current Working Map Projection but are performed based on the current Working Ellipsoid.

To Calculate the Range and Bearing from One Known Point to Another Known Point

1 From the Utilities menu, choose Forward/Inverse Calculation.



2 In the **From** area of the **Forward/Inverse Calculation** dialog box, select either the **Geo** or **Grid** radio button, depending on which calculation method is to be used.

Note: there can be a significant difference in the calculated **Bearing** and **Distance** depending on which option (**Grid** or **Geo**) is chosen. When you select the **Grid** button, instructs WinFrog to generate **Grid** bearings and distances, which differ from **True** bearings and distances by varying amounts, depending on the location of the points (see below). Alternatively, select the **Perform Rhumb Line Calculations** checkbox to use Rhumb Line inverse algorithms.

Ensure that the correct coordinate option is selected.

3 Enter the coordinates of the first point into the blank fields of the **From** area.

See Steps **2** through **6** in either of the two procedures described in the **Coordinate Conversions** sections earlier in this chapter.

4 In the **To** dialog box, enter the coordinates of the second point.

5 Click the "**down**" arrow button.

The results of the calculation are displayed in the **Range** and **Bearing** fields at the bottom of the **Forward/Inverse** dialog box. The **Range** will be in the same units configured in the Working Datum Projection. The **Bearing** is in decimal degrees format (i.e. **ddd.dddd)**.

Also displayed are the calculated **Convergence** and the **Map Scale Factor.**

Note: Convergence = Geo or True Bearing - Grid Bearing

Map Scale Factor = Map Projection Distance/True Distance.

To Calculate the Coordinates of a Point by Entering a Range and Bearing from a Known Coordinate

1 From the **Utilities** menu, choose **Forward/Inverse Calculation**.

2 In the **From** area of the **Forward/Inverse Calculation** dialog box, select either the **Geo** or **Grid** radio button.

Note: there can be a significant difference in the calculated point position depending on which option (**Grid** or **Geo**) is chosen. Select the **Grid** button to instruct WinFrog to use **Grid Bearings** and **Distances**, which differ from **True Bearings** and **Distances** by varying amounts, depending on the location of the points. Ensure that the correct coordinate option is selected. Alternatively, select the **Perform Rhumb Line Calculations** checkbox to use Rhumb Line direct algorithms.

3 Enter the coordinates of the first point into the blank fields of the **From** area.

See Steps **2** through **6** in either of the two procedures described in the **Coordinate Conversions** sections earlier in this chapter.

4 Type the **Range** value into the **Range** entry window. Ensure that the correct distance units are entered.

5 Type the **Bearing** value into the **Bearing** entry window. The **Bearing** must be in decimal degrees (i.e. **ddd.dddd** format).

6 Click the "**up**" arrow button.

The results of the calculation are displayed in the **To** area as either geo or grid coordinates, depending on the radio button setting.

File Conversion Wizard

Use this utility to do one of the following:

- Convert a listing of line nodes, as well as, optionally, radii or KP values, to a WinFrog survey line (.PTS) file.
- Convert a listing of coordinates to create a WinFrog waypoint (.WPT) file.
- Convert a coordinate list from one geodetic system to another.

Files may be converted one-by-one or in batch mode. The user has the ability to define an input file format, either comma or space delimited, and containing either grid or geodetic coordinates. The input geodetic system is also specified. The output format is chosen as either a pre-determined PTS or WPT file, or a simple user-defined format. The latter is useful when converting a listing from one coordinate system to another.

All of these features are provided through an easy-to-use wizard that can be accessed from the **Utilities** menu.

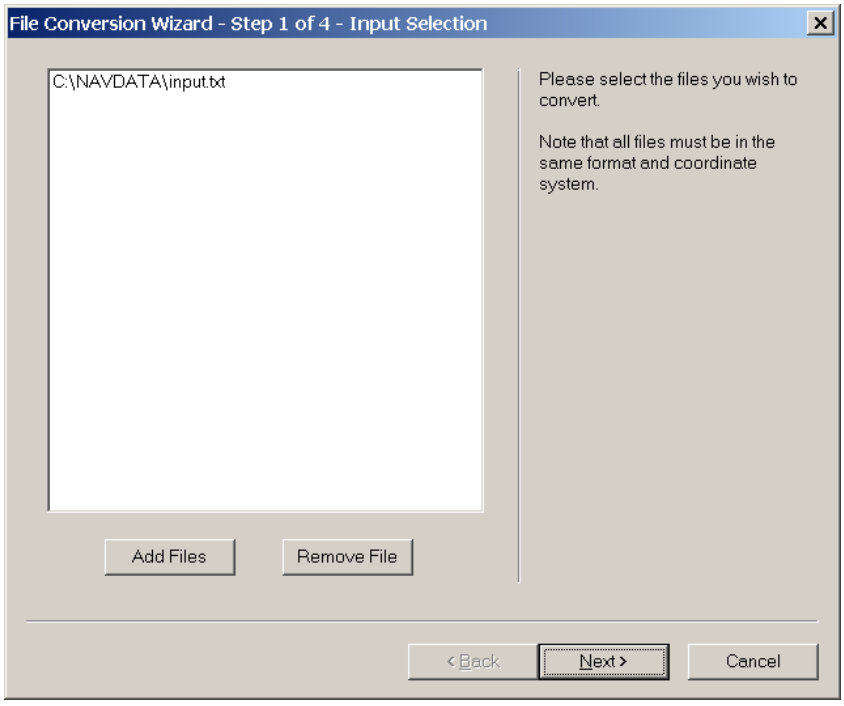
Grid coordinates are assumed to be in the units specified by the coordinate system definition. Heights are not transformed. If selected, they are simply passed through the utility except for a possible sign switch for above/below datum.

Note that once the files have been created you will have to load them manually into WinFrog – this is not done via the wizard.

Note: The File Conversion Wizard executes two datum transformations, one when loading position data from the source file, and one when writing the position data to the target file. If a problem is encountered executing any of the datum transformations, a pop-up message will appear providing details. For example, if the Geodetics are configured to use NADCON for transformations between the WGS84 and the Working Ellipsoid and a position does not lie within the configured area, the transformation will fail and a pop-message appears stating "Datum Shift Error: Input outside NADCON zone". Regardless of how many transformation problems are detected, only one message appears. The offending record(s) are not reported.

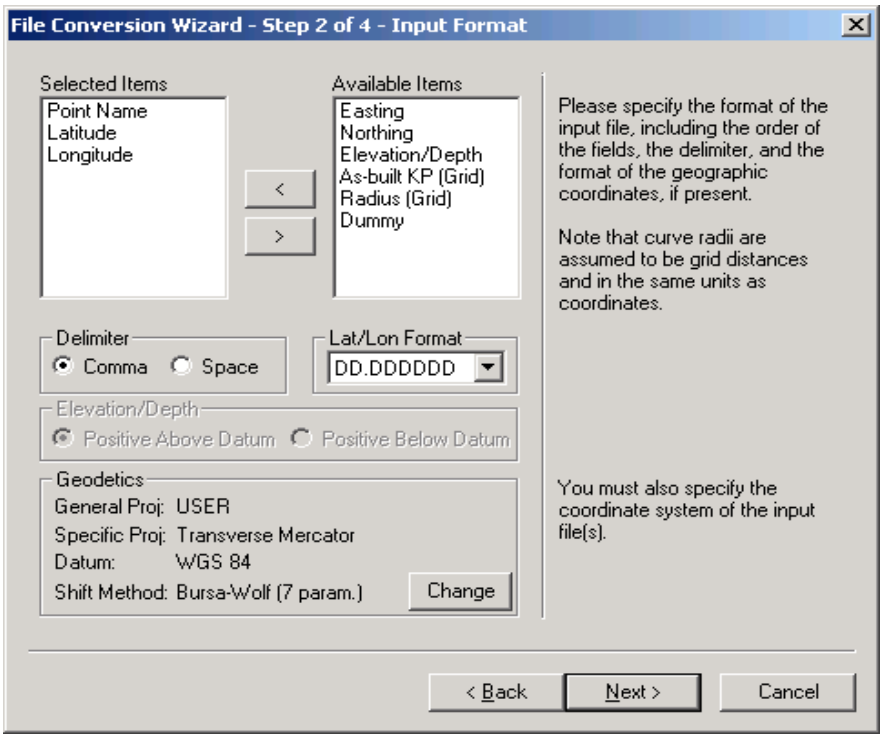
To Create a WinFrog Waypoint File

1 From the **Utilities** menu, select **File Conversion Wizard**. The **Input Selection** dialog box of the wizard is displayed.



2 Use the **Add Files** button to open a browse dialog to add one or more files to the list to be converted. Multiple files may be selected by pressing the **Ctrl** key as you click on the files. You may also remove files from the list by selecting an item in the list box and clicking the **Remove File** button. Note that all selected files must be in the same format and coordinate system. When finished, click the **Next** button.

3 Using the next page of the wizard you will be able to define the input format. Move items between the **Available Items** list and the **Selected Items** list by highlighting them and clicking the arrow buttons, or double-clicking the items. The order that they appear in should be the order they are in the file.



You must also select the delimiter and coordinate system, whether any input elevations/depths are positive above or below datum, and if geodetic coordinates are in the file, you must select the format.

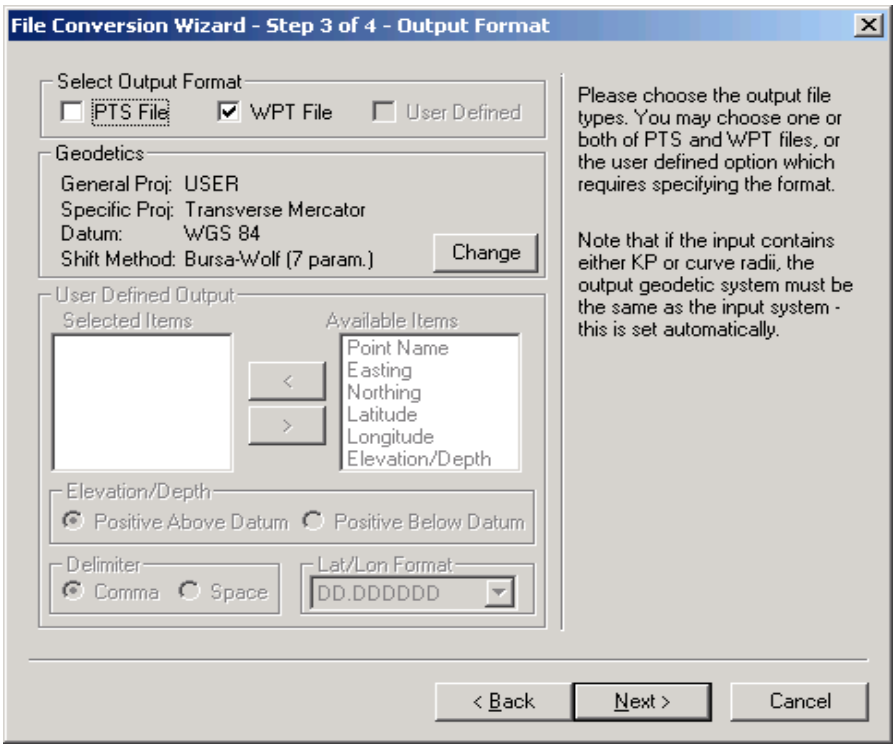
Note that in order to continue you must select either both Easting and Northing, or Latitude and Longitude items. If Easting and Northing are selected, the values in the file must be in the same units as specified in the selected coordinate system. This is also true for any curve radii.

For the geodetic coordinate formats, S or W should be indicated by a negative (-) immediately before the degree value.

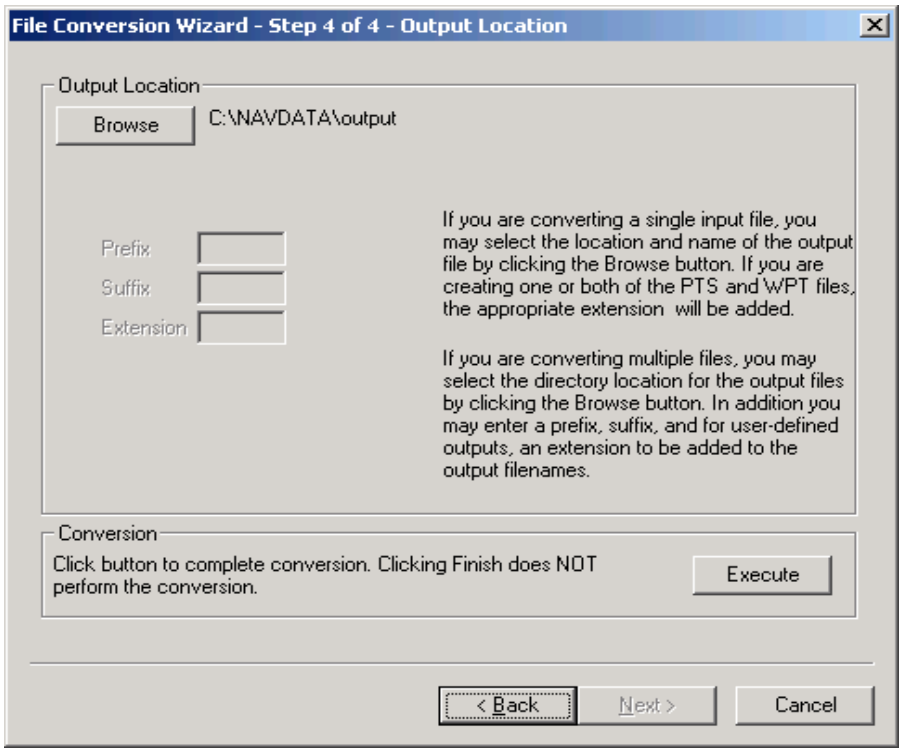
Curve radii and KP values are considered to be grid distances, and if selected you will not be able to choose a coordinate system (see next page in the wizard) that differs from the input system.

When finished, click the **Next** button.

4 In the next page of the wizard you will be able to specify the output format. Since we are outputting a waypoint file, check the **WPT File** box. Don't forget to specify the coordinate system in which to output the points. Note that only horizontal coordinates are transformed – the heights are unchanged except for possible switching of the sign. When finished, click the **Next** button.



5 You will now be able to specify where to output the files.



If you have selected a single input file, you will be able to specify the output path and filename using the **Browse** button. The .wpt extension will automatically be appended.

If you have selected multiple input files, one output file will be created for each input file.

In this case, you may select the output directory using the **Browse** button. The output filenames are created by adding the user-entered prefix and suffix values (if any) to the input name and then appending the .wpt extension.

6 To perform the conversion, click the **Execute** button.

To Create a WinFrog Survey Line File

The steps for converting input files to survey line (.PTS) files are similar to those for waypoint files. You may follow those steps with the following additional notes:

- In step 2, you may select either As-built KP, or curve radius, but not both. Note that both values are grid distances. If you select Radius, each node in the input file must have a value, even if it is zero, denoting no curve. The radius is associated with the node at the intersection point. As noted previously, if either of these values is selected, then the output coordinate system will be automatically set to the input system.
- In step 3, check the **PTS File** box (both WPT and PTS can be checked concurrently, and both types of file will be created).
- In step 4, the same rules apply for file naming. The name of the survey line itself is taken from the input filename, excluding the extension.

To Create a User-Defined File

This feature is useful for converting a file of geodetic coordinates to grid coordinates (or vice versa), and converting files of coordinates from one system to another.

Once again, many of the steps are as before, and the procedure for creating a waypoint file may be followed with the additional notes:

- In step 2, since it is not possible to output KP and radius values to a user-defined file, these will be ignored in any input file.
- In step 3, check the **User Defined** box (both the WPT and PTS must be unchecked to enable this box). You may then move the items between the **Selected** and **Available** lists as needed. If the output included geodetic coordinates, then you must specify the format of the degrees. Note that either both Easting/Northing or Latitude/Longitude must be selected in order to continue. For all Lat/Lon output formats, no spaces are inserted between the degrees, minutes and seconds fields.
- In step 4, the same rules apply for file naming. For multiple files, as well as a prefix and suffix entry, you may enter a custom extension which will be appended to each output filename.

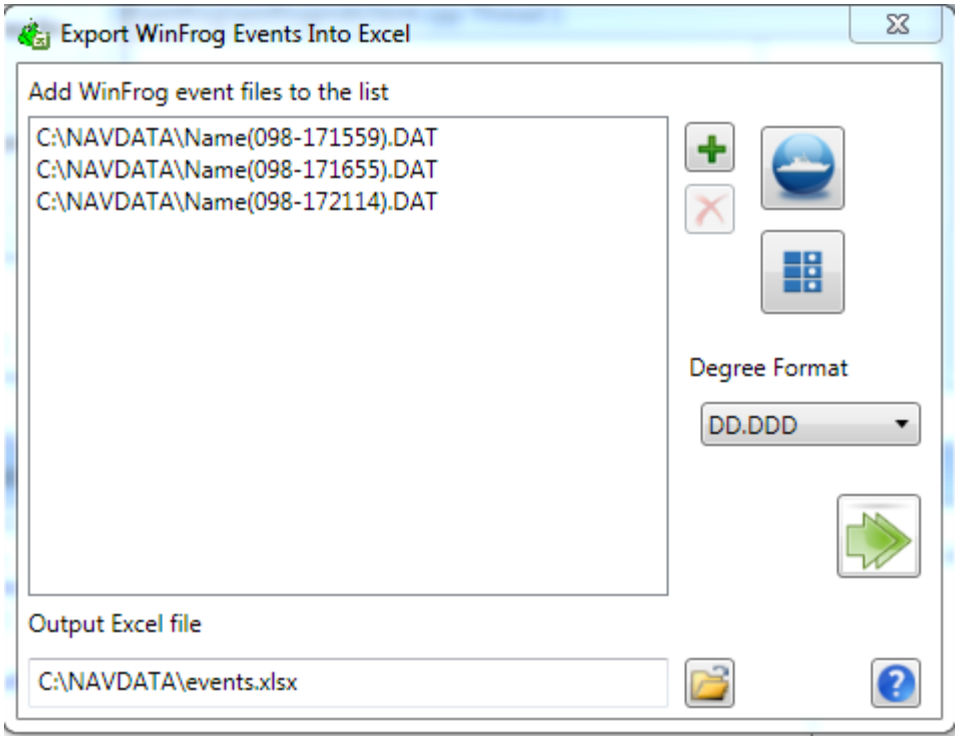
Export Events to Excel

Use this utility to export event files (*.DAT and *.LOG files) into an Excel file. Microsoft Excel 2007 or higher must be present on the computer for this utility to work.

Note: This utility also requires Microsoft .Net Framework to be installed which may not be present on Windows XP. A dialog will notify you during installation if it is not detected on your operating system. In order to use the utility, you may need to download and install .Net Framework 3.5 or later from Microsoft.

To Export Events to Excel

1 From the **Utilities** menu, select **Export Events to Excel**. The **Export WinFrog Events Into Excel** dialog box is displayed.



2 Build a list of event files to be exported. Use the Add and Remove buttons to add and remove event files from the list. Note that mixing file types (.dat, .log) and file versions is not permitted.

3 Select the vehicles for which events will be exported. The vehicles presented are all that were found in the event files.

4 Select the data items to be exported. The items presented are all that were found in the event files.

5 Enter a file name and path for the output Excel file. Each event file will be written in a separate spreadsheet in the Excel file. The spreadsheets will be given the name of the input event files.

6 Select the format for latitude and longitude from the drop down list. Latitude and longitude can be in decimal degrees; degrees and decimal minutes; or degrees, minutes, and decimal seconds.

7 Click the Start Process button to initiate the export process.

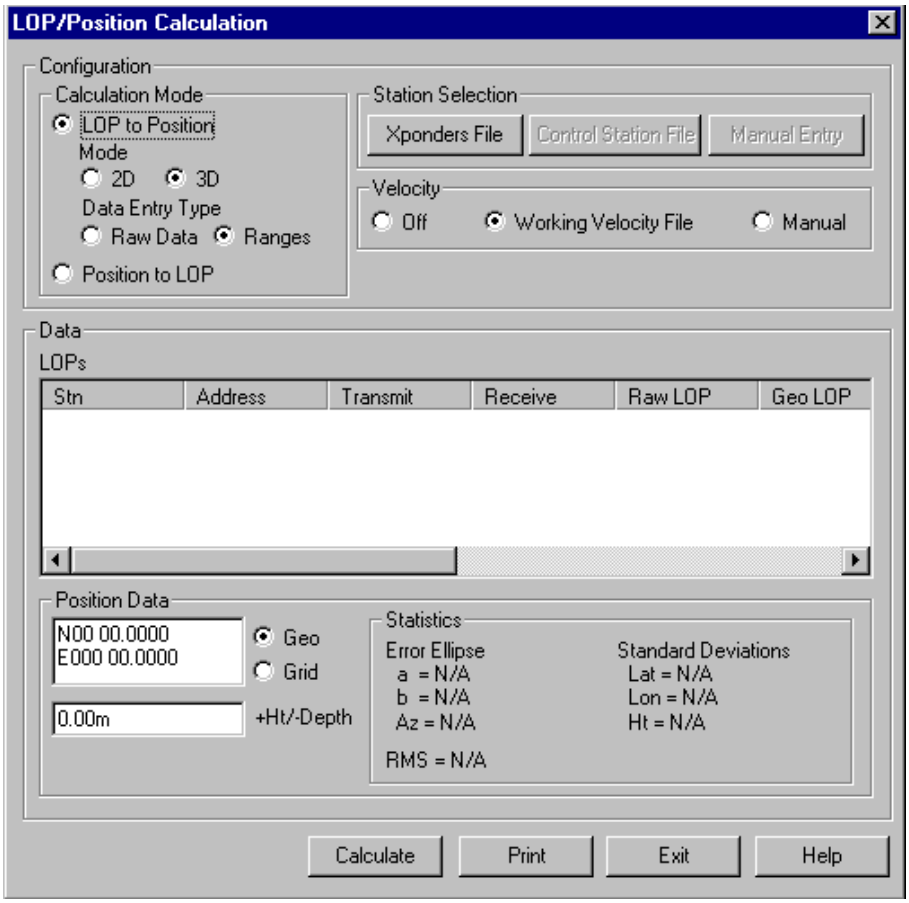
LOP/Position Calculation

Use this utility to calculate a position from either geographic slope ranges or acoustic two-way-travel-times (TWTT) from fixed transponder stations currently in the Working Xponder file. If

TWTT data is used, you can select between using the Working Velocity file or entering velocity values for each TWTT entered. The calculation can also be performed in reverse, that is, calculate geographic slope ranges and TWTTs from an entered position to fixed transponder stations currently in the Working Xponder file.

To Access LOP/Position Calculation

1 From the **Utilities** menu, select **LOP/Position Calculation**. The **LOP/Position Calculation** dialog box displays.



You are able to select what calculation to perform and how to perform it. The options are as follows:

Calculation Mode

LOP to Position — Enter the LOP data and the position is calculated using least squares.

2D or 3D — If you select **2D**, you must enter a height/depth. This value is held fixed and the position is solved for. If you select **3D**, the height/depth and position is solved for.

Raw Data or Ranges — Enter either raw data or geographical slope ranges. In the case of LBL acoustics, the raw

data is the TWTT in milliseconds (ms) for a given transponder, including any turn-around-time (TAT) value that has been entered in the Working Xponder file for that transponder. If you select **Ranges**, enter the true slope range for each transponder. If you enter ranges, no velocity information is required to obtain a solution. However, if none is provided, the respective TWTTs are not computed and displayed or printed.

Position to LOP — Enter a position and height/depth, and the geographic slope ranges between this position and each of the selected LOP stations are calculated. If velocity information is available, the respective LOPs are also presented in their associated raw data format.

Station Selection

Xponder File — This provides access to a dialog box (see **Selecting Stations**) where you can select which stations in the Working Xponder file to use for the calculation.

Velocity

This controls the use of velocity data for the calculations. If **Raw Data** is used for an **LOP to Position** calculation, this must be set to either **Working Velocity File** or **Manual** or the calculation will fail. If **Ranges** are used for an **LOP to Position** calculation, this setting is not critical. For a **Position to LOP** calculation, this setting is not critical.

Off — No velocity information is to be used. As a result, no TWTT data can be used for a calculation or calculated from entered or calculated range data.

Working Velocity File — Velocities for each LOP are calculated using the current Working Velocity file.

Manual — Velocity data is entered for each LOP (see **Entering LOPs**)

Data

LOPs — This list view provides two functions. For **LOP to Position** calculations, it provides you access to each LOP for data entry. For **Position to LOP** calculations, it presents the results.

Stn — This lists the name of the station selected for the LOP. This column includes a status indicator in the form of a red or green LED. If the LED is red, the associated LOP has had a problem in the solution, for example, an invalid velocity. The cause of the problem should be investigated. A green LED indicates that the LOP is OK in the

calculation.

Address This lists the address of the transponder associated with the LOP station.

Transmit This lists the transmit code of the transponder associated with the LOP Station.

Receive This lists the receive code of the transponder associated with the LOP Station.

Raw LOP This lists the raw data for the LOP (TWTT in the case of LBL acoustics). If the TWTT is not available, for example, if range data is used for a **Position to LOP** calculation and there is no velocity information, the term **N/A** is given.

Geo LOP This lists the true (geographic) slope range.

Grid LOP This lists the reduced grid slope range. Note that though this value is listed, it is not available for entry as a range. Only true (geographic) ranges are entered.

Residual This lists the residual for the associated LOP for an **LOP to Position** calculation. In the case of a **Position to LOP** calculation, the term **N/A** is given since the solution provides the exact range/TWTT between the entered position and the LOP stations.

Accuracy This lists the entered accuracy (standard deviation) for the LOP. This is only valid for an **LOP to Position** calculation, and therefore the term **N/A** is given for **Position to LOP** calculation.

Velocity This lists the velocity used (whether calculated or entered) for the associated LOP plus a status. If the LOP has a red LED, this column should be investigated for the probable cause.

Position Data

Position The position to use for a **Position to LOP** calculation is entered here. For an **LOP to Position** calculation, the resulting position is presented here. Note that the data entry and display can be toggled between geographic (**Geo** option) and map grid (**Grid** option). Note that this affects only the position data entry and display. The entry of range data is geographic regardless of the setting here.

Height/Depth The height/depth to use for a **Position to LOP** calculation is entered here. For an **LOP to Position** calculation, the resulting height/depth is presented here. Note that depths are negative and heights are positive.

Statistics

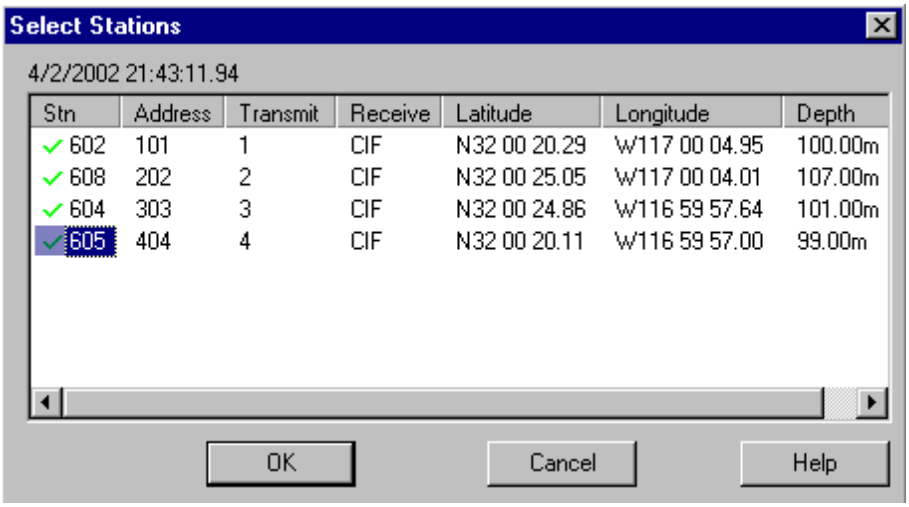
Statistics is a presentation of the accuracy indicators for an **LOP to Position** calculation only. If a **Position to LOP** calculation is performed, these values will all show **N/A**.

Buttons

Calculate	Performs the selected calculation as configured.
Print	Prints the results to the printer in a report format. (See **Printing**).
Exit	Leaves the utility.
Help	Future development. Will provide online help for this utility.

Selecting Stations

Click the **Xponder File** button to present the following dialog box. In it, all the transponders set to LBL Fixed are listed along with the address of the associated transponder and their position data. The name of the Working Xponder file displayed is given on top of the list view.



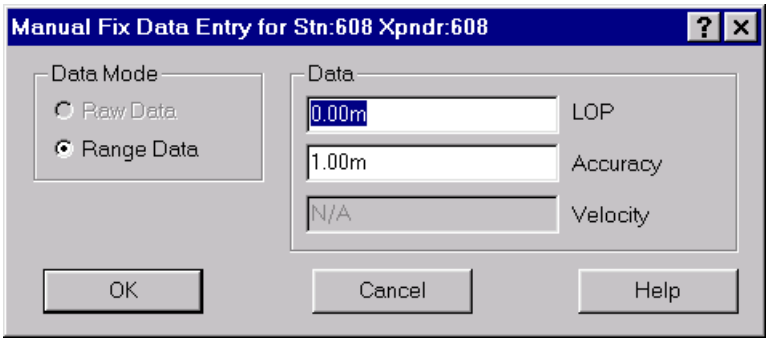
The stations are selected and deselected by double clicking on the name. If the station is selected, a green checkmark is shown next to the name. If the station is not selected, a red X is shown next to the name.

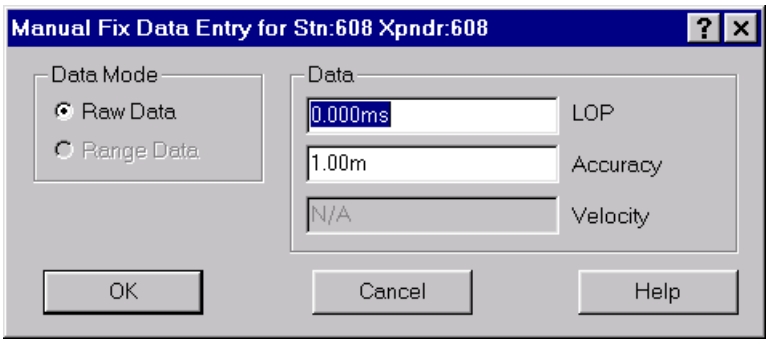
Note: No editing of the station transponder address or position data is possible from this dialog.

Selected stations are listed in the LOP list view in the main dialog.

Entering LOPs

To enter LOP data for an **LOP to Position** calculation, double-click the station name of the associated LOP in the LOP list view in the main dialog. One of the two dialog boxes shown below is then presented, depending upon the data type selected. Note that if **Position to LOP** is selected, nothing happens when you double-click the station name.



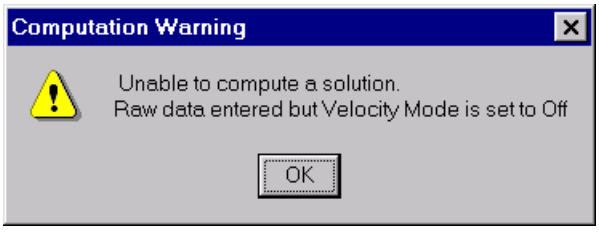


You enter the respective data, either TWTT or a geographic slope range and the accuracy to be associated with the LOP. The data entry type is controlled by the **Data Entry Type: Raw Data or Ranges** setting in the main dialog. This setting is indicated in the **Data Mode** panel. Note that the accuracy entered is a distance unit regardless of data type setting.

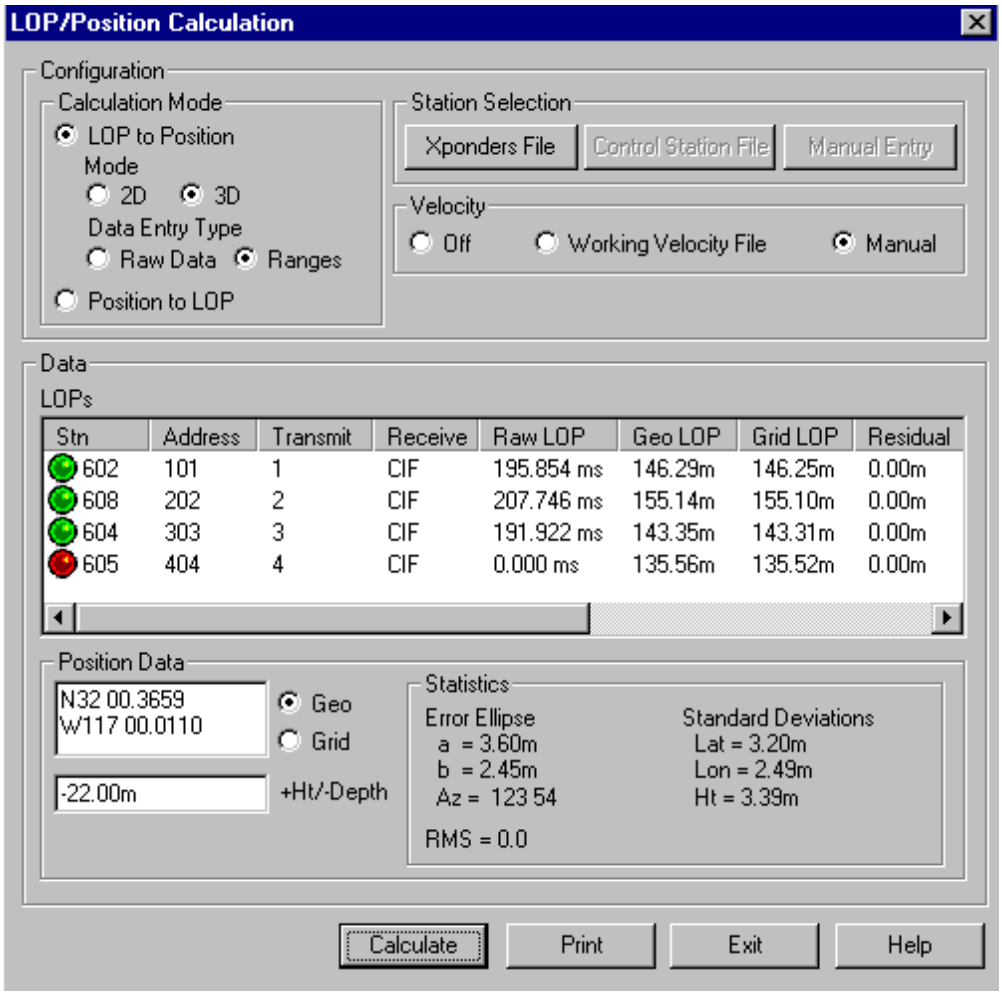
If the velocity option is set to **Manual**, the velocity to be used for the calculation can also be entered, otherwise this entry box displays **N/A** and is disabled.

Performing the Calculation

Once the calculation is configured, click the **Calculation** button to execute the calculation. If a problem is encountered that prevents a solution, a warning is presented as shown below.

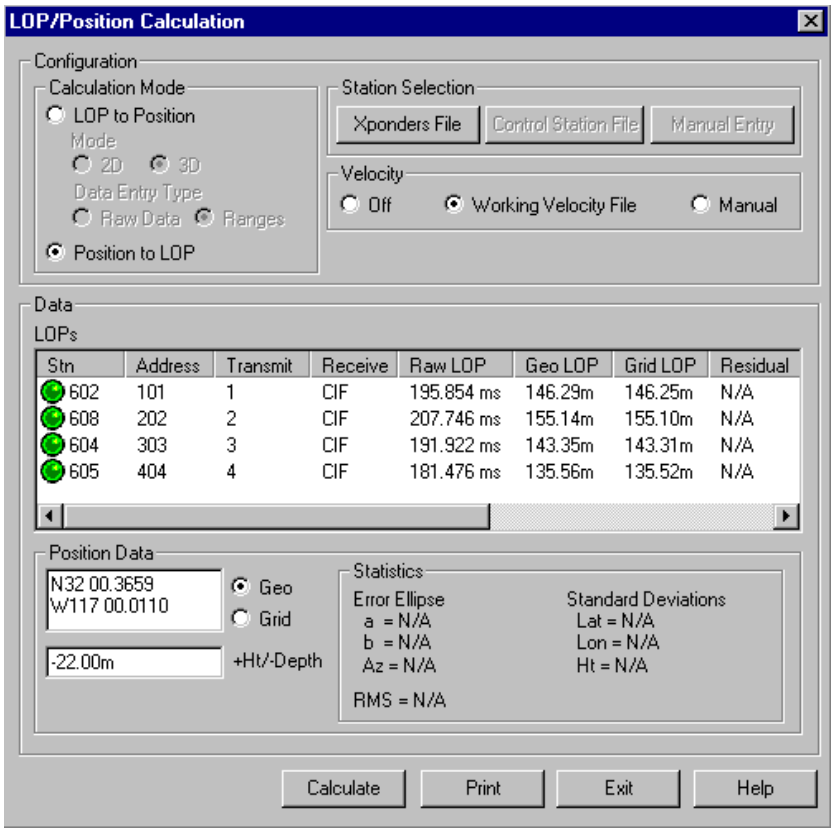


If the solution is successful, the results are presented in the main dialog. An example of a successful **LOP to Position** calculation is shown below.



The results shown above also illustrate the warning given by the red LED for station 605 due to an invalid velocity entered with the velocity mode set to **Manual**.

The following dialog box shows the results of a successful **Position to LOP** calculation.



Printing

Clicking the **Print** button will provide a report formatted printout. A sample report is shown below.

LOP to Position Calculation

Calculation Type: LOP to Position
Calculation: Mode: 3 Dimensional
Data Input Type: Raw Data

Velocity Mode: File (Vel_01.vel)

Position: N44 51.2514 N4966899.66m
(Solved) W063 32.9530 E456603.67m
H -35.70m

Statistics: Error Ellipse Standard Deviations RMS: 0.000
Semi-major a: 2.03m Lat Std Dev: 1.59m
Semi-minor b: 1.60m Lon Std Dev: 1.32m
Orientation: 66 56 Ht Std Dev: 6.92m

Data:

Stn Name	Address	Raw Data	Geo Slope Range	Grid Slope Range	Residual	Accuracy	Velocity
C101	101	405.609 ms	302.33m	302.22m	0.00m	1.00m	1490.74m/s
C202	202	367.285 ms	273.76m	273.66m	0.00m	1.00m	1490.73m/s
C303	303	405.637 ms	302.35m	302.24m	0.00m	1.00m	1490.73m/s
C404	404	484.590 ms	361.19m	361.06m	0.00m	1.00m	1490.72m/s

Saving of the Configuration

The configuration for the LOP to/from Position utility is read from the **winfrog.ini** file when the utility is accessed. Upon exiting the utility, the current configuration is saved to the **winfrog.ini** file. This facilitates repeated calculations with similar setups.

Acoustic Utilities

Use this utility to compute sound velocity from the working velocity profile or given depth or pressure, temperature and salinity. Also convert between depth and pressure.

Velocity Tab

Enter the depths between which you want to calculate the velocity. The calculation uses the data in the working velocity file. If a working velocity file is not selected, a message indicating this will be displayed. The formula used to compute the velocity is the same as used to compute the velocity for all LBL work. This is the harmonic mean as described by Christian de Moustier, Lecture Notes 16, Sound Refraction in the Water Column in Clarke, de Moustier, Mayer, and Wells, Lecture Notes for Multibeam Training Course, No 26, 2001. Scripps Institute of Oceanography, pp. 2 - 4.

Depth tab

Enter the pressure and temperature count and the observation time in seconds, usually 1 or 9 seconds. The Digiquartz coefficients may be manually entered or obtained from a Digiquartz equipped COMPATT found in the working transponder file. Manually entered coefficients are retained after the utility is closed, but not if WinFrog is shut down. You cannot change a COMPATT's coefficients or any other values assigned to a COMPATT from this dialog. The atmospheric pressure entered is subtracted from the calculated pressure before the depth is calculated. If the Average Density method is selected for depth calculation the following formula is used:

D = (pressure – atmospheric pressure)/water density.

The UNESCO selection uses the international equation of state for seawater (EOS-80). This is described by Fofonoff, N.P. and Millard, R.C., Algorithms for computation of fundamental properties of seawater, UNESCO technical papers in marine science No. 44 (1983)

Sound Velocity, Pressure, and Density tab

This dialog will convert depth to pressure or pressure to depth depending on which one you enter. The formula used to convert pressure to depth is the UNESCO formula as described above. The formula used to convert depth to pressure is from Leroy, C.C. and Parthiot, F., Depth-pressure relationships in oceans and seas, Journal of Acoustical Society of America 103(3), (March 1998). The corrections to either of the calculated values are also from the Leroy and Parthiot paper. The pressure entered is to be the absolute pressure minus atmospheric pressure, i.e., pressure just due to the water. If the depth is entered, the calculated pressure does not include atmospheric pressure.

Two sound velocity formulae (Del Grosso and Chen-Millero) have been included with recalculated coefficients by Wong and Zhu 1995 following the adoption of the International

Temperature Scale 1990. Technical Guides – Speed of Sound in Seawater, National Physics laboratory. For those formulae requiring pressure in kg/m^3 (Wilson and both Del Grosso), this value is obtained by applying the calculated gravity at the given latitude regardless if the pressure is entered or calculated.

Density is calculated using the formula found in the UNESCO paper mentioned above.

Import LBL Cal File (*.MDB)

Use this utility to import Sonardyne Fusion LBL calibration data contained in Microsoft Access database files into WinFrog and create a WinFrog acoustic calibration file. This WinFrog calibration file can then be manipulated and processed with WinFrog.

The Fusion calibration types supported are referred to in the files as Baseline, Extend Array, Array Box-in, and Box-in. The following sections detail the tables and data searched for and loaded. The time for any given record is decoded from the columns *Date Time* (provides the date and time with the seconds term rounded) and *Value Time* (time in milliseconds from an undocumented reference, used to *un-round* the seconds value).

The destination file chosen may be a new or existing WinFrog *.CAL file. In the case of the latter, you will be asked whether to overwrite or append to the file. If append is chosen and there are transponder stations in the source file that match existing transponder stations in the destination *.CAL file, the existing stations will be overwritten by the data in the source file. Determination of duplicate transponder stations is determined solely by the station **name** found in the CAL file.

Note: WinFrog performs the LBL calibration adjustment on the map projection, and the position data in the MDB file are in map projection coordinates. Therefore, it is critical that WinFrog is configured to match the geodetics used to collect the calibration data before importing the file.

Fusion Data

The following details the data that is loaded from the Fusion mdb files and which columns it is loaded from. The sequence this information is presented is also the sequence that the data is loaded in. This is intended as a reference to assist investigation should problems be experienced importing the mdb file.

Note: While every effort has been made to ensure that this utility is able to recognize and load the calibration data from the respective mdb files, it is dependent upon the Sonardyne Fusion database file conforming to the expected format. Variations and changes in this format may result in this utility failing to load the data and since such variations are not within the control of Fugro Pelagos this is not considered an error in WinFrog. If a problem is encountered with this conversion utility, follow the instructions given on the technical support form and submit it along with the mdb file to Fugro Pelagos.

Transponder Information

The transponder information is loaded from the *CalibrationLog* table. The *Property* column provides details of the information provided in the *Value* column. The following columns are searched for to create the transponder Base Station data based on the following respective

contents. Note that the transponder information is loaded for all types of calibration files.

Property Column	Value Column
Calibrate:References:*s*:Position:Initial[1]	Transponder *s* coordinates
Calibrate:References:*s*:Instrument:Address	Transponder address
Calibrate:References:*s*:Instrument:Turnaround Time	Transponder TAT (ms) [2]
Calibrate:References:*s*:Instrument:Common Reply Frequency	Transponder CRF
Calibrate:References:*s*:Instrument:Individual Reply Frequency	Transponder IIF

[1] The transponder station name *s* is retrieved from this record

[2] This is retrieved from the table but it is not passed to WinFrog because the raw TWTT time logged by WinFrog in the calibration file already has the TAT as entered into the acoustic system applied by the acoustic system before outputting to WinFrog.

Note: The adjustment state of the transponders is not retrieved from the Fusion file, i.e. whether the transponder is known or to be solved for. These settings must be made in WinFrog when processing.

Note: If the transponder address and/or CRF information is missing from the *CalibrationLog* table, the loading of the source file is aborted. This information is required to correctly identify the associated acoustic data.

Calibration Type and Vessel

The calibration type and the vessel used for the data collection are retrieved from the *CalibrationLog* table.

Property Column	Value Data
Calibrate:Method	Calibration type: Baseline Extend Array Array Box-in Box-in
Calibrate:Vehicles:Selected	Name of the vessel

Baseline and Depth Observations

The baseline and depth observations are loaded from the *ObsLog* table. The following details the columns searched for and the data retrieved from each. Note the baseline and depth observations are loaded for Baseline and Extend Array calibration files.

Column	Data
Obs Type	Observation type contained in record: Position Z: depth (m) TwoWayRange: acoustic TWTT (ms) TwoWayTravelTime: acoustic TWTT (ms)
For Obs Type Position Z	
Corrected Obs	Elevation of transponder transducer (m), -ve is depth
Source	Name of respective transponder station
For TwoWayRange and	

TwoWayTraveltime	
Status	Status of observation Measured: observed measurement (weighted) Fail: measurement failed (de-weighted) Abort: measurement cycle aborted (not loaded Complete: measurement cycle completed (not loaded)
Corrected Obs	TWTT c/w TAT (ms)[3]
Turnaround Time	Applicable TAT (ms)
Sound Velocity	Applicable sound velocity (m/s)
Source	From transponder station name
Dest	To transponder station name
Default Error	Observation error, used for observation weight (m)

[3] Note that despite the column name, the TWTT observation (assumed to be in milliseconds) requires that the TAT value (assumed to be in milliseconds) be subtracted. This value is considered to be the RawLop and is reduced to distance (ScaledLop) by multiplying by the Sound Veclocity value.

Surface based Acoustic and GPS Observations

The loading Array Box-in and Box-in calibration files involves loading sensor information from the *CalibrationLog* table, acoustic and GPS observations from the *ObsLog* table, and ship CRP position data from the *PositionLog* table.

WinFrog inspects the records from the *ObsLog* table in sequence. When an acoustic observation is found it is loaded as the WinFrog acoustic LOP. The next GPS observation following this acoustic record is then loaded as the associated GPS LOP. Note that the GPS data provides two LOPs, a Northing and an Easting. Once the acoustic and GPS LOPs have been loaded, WinFrog interpolates the CRP position and vessel heading for the acoustic data epoch using data loaded from the *PositionLog* table. To complete the information required by WinFrog, the vessel's speed and advance (CMG) are calculated.

Note: The weight applied to the acoustic and GPS LOP is that used as the default for POSITION and XPONDER data items, i.e. 5m and 3m respectively. If the observation status is *Accepted*, this weight is applied. If the observation status is *Rejected*, a weight of 0 is applied.

Note: According to Sonardyne, when Fusion obtains an acoustic observation, it retrieves the associated GPS (and other) sensor observation from its filter for that epoch. Therefore, unlike in WinFrog, the GPS sensor LOPs may not be the raw GPS data.

Note: The Sequence Numbers assigned to the sensor observation records are not necessarily sequential with respect to time. WinFrog inspects the *ObsLog* table records in sequence based on this Sequence Number. As a result, when WinFrog loads the GPS observation that follows an acoustic observation record, it may actually be for a time preceding the acoustic data epoch.

The following details the columns searched for and the data retrieved from each. The vessel name is denoted with *v* in these tables.

Note: WinFrog only imports the sensor information and associated data for the respective acoustic sensor and primary GPS sensor.

CalibrationLog Table: Retrieve Sensor/Device Information

Property Column	Value Column
Calibrate:Vehicles:*v*:Offsets:Interrogator	Name of USBL/LBL sensor
Calibrate:Vehicles: *v*:Offsets:GPS	Name of primary GPS sensor
Calibrate:Vehicles: *v*:*s*:Position:Offset	Sensor *s* offsets from the COG (m)
Calibrate:Vehicles: *v*:*s*:Instrument	Sensor *s* type[4]

[4] WinFrog identifies acoustic sensors as either USBL or LBL. However, because the USBL data loaded from the file and used in the subsequent WinFrog acoustic calibration file is the TWTT, for simplification of the import process it is assigned as an LBL type in the WinFrog calibration file.

ObsLog Table: Retrieve Sensor Observations

Column	Data
Source	Name of vessel
Source Offset	Name of sensor
Obs Type	Type of observation TWTT PosX PosY
If TWTT	
Corrected Obs	TWTT c/w TAT (ms)[5]
Turnaround Time	Applicable TAT (ms)
Sound Velocity	Applicable sound velocity (m/s)
Dest	Transponder station name
Status	Status of observation Accepted: observation is weighted Rejected: observation is de-weighted
If PosX or PosY	
Corrected Obs	Map projection coordinate PosX: Easting PosY: Northing
Status	Status of observation Accepted: observation is weighted Rejected: observation is de-weighted

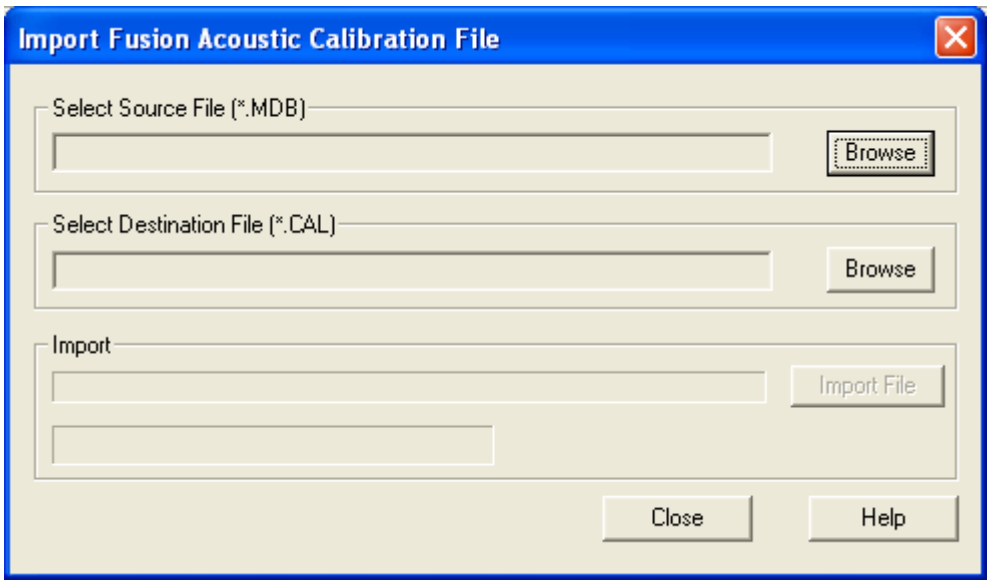
[5] Note that despite the column name, the TWTT observation (assumed to be in milliseconds) requires that the TAT value (assumed to be in milliseconds) be subtracted. This value is considered to be the RawLop and is reduced to distance (ScaledLop) by multiplying by the Sound Veclocity value.

PositionLog Table: Retrieve Vessel CRP Observations

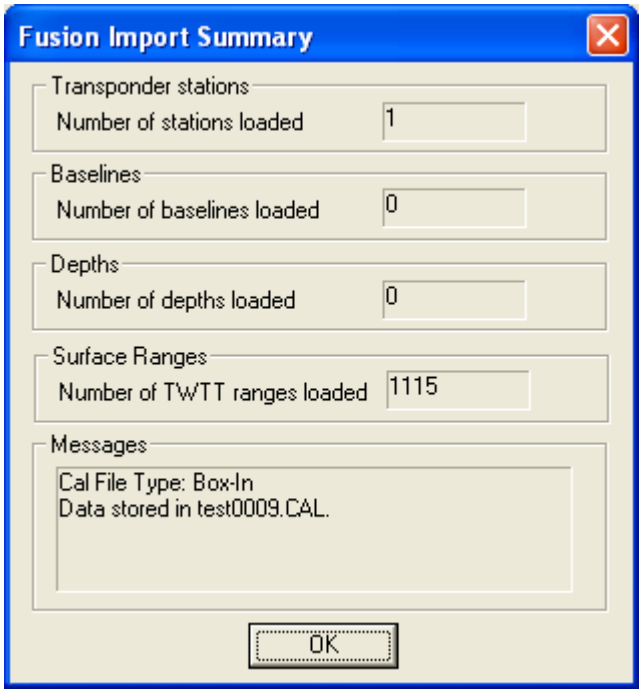
Column	Data
Name	Name of vessel
Type	Data type, only use data of type '1'
X Position	CRP Map projection coordinate: Easting
Y Position	CRP Map projection coordinate: Northing
Z Position	CRP Vertical coordinate (draft)
Heading	Vessel's heading

Using the Utility

1. From the main menu, go to **Utilities > Import LBL Cal File (*.MDB)**.

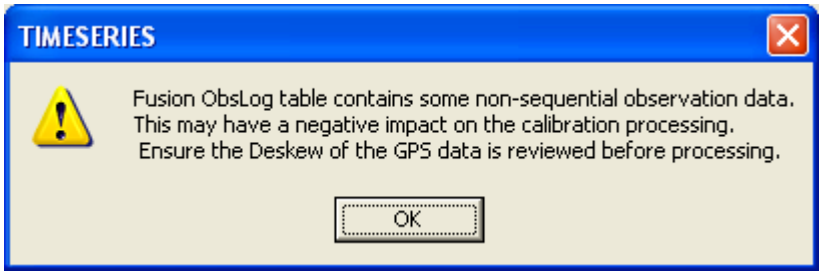


2. Click the Browse button in the Select Source File (*.MDB) group box and navigate to and select the Fusion calibration file to import.
3. Click the Browse button in the Select Destination File (*.CAL) group box and navigate to the target folder for the WinFrog calibration file. Select an existing file to overwrite or append to, or enter the name for a new Calibration file. Note if creating a new calibration file and for some reason the import is aborted, the calibration file is not created. The status of the calibration file (Overwritten, Appended or Created) is displayed in the text box in this group box.
4. Click the Import File button to initiate the import. The status of the import is indicated with the progress bar.
5. When the import is completed, a summary dialog is presented. Click OK to complete the process.



a. If a problem is detected with the import, e.g. transponder station information is missing, an appropriate message box will appear and the import will be aborted.

b. If the GPS LOP data is determined to preceed the acoustic LOP by more than 2 seconds, a message box appears to alert the operator to this. The import does not abort.



6. Load the resulting WinFrog calibration file as a standard WinFrog calibration file. See WFUG EM3b - LBL Calibration for details.

Processing a Converted File

The resulting WinFrog calibration file can be processed as a file recorded by WinFrog. However, there are a few points to be aware of. See the Working Files and LBL Calibration chapters for details.

Calculate

The use of the transponders in the calibration adjustment, i.e. which are considered known and which are to be solved for, is not loaded from the MDB file. Therefore, the adjustment must be setup before processing.

ResetLBL

Before using this feature you must ensure the following:

- The WinFrog geodetic and map projection parameters match those used when the calibration data was logged
- A valid Working Velocity file is loaded into WinFrog.
- A valid Working Xponder file is loaded into WinFrog. The transponder name, address and transmit channel of the respective transponder stations must match that loaded from the MDB file.

When the MDB file was imported, the turnaround time found in the file was applied to the observation to obtain what WinFrog considers the raw observation. Therefore, it shouldn't be necessary to enter a turnaround time in the transponder file. However, if you wish to change the turnaround time, enter the difference in the transponder file.

When the MDB file was imported, no transducer/depth sensor offsets were applied; the raw and reduced depths are considered the same. Therefore to retain this relationship, no depth sensor offset should be in the transponder file (note, when a known transponder type is selected a default offset will be applied). However, to apply a depth sensor offset or a depth sensor calibration correction they may be entered in the transponder file.

Map Wizard

Use this utility to create a Blue Marble Map (*.BMM) file for use as a background image in a graphics window.

The BMM map can be composed of many different layers each of a different map type. Currently, the BMM file supports the following vector and raster file types. The supported vector file types are DXF, DWG, SHP, MIF, DGN, and BML. The supported raster file types are JPG, BMP, TIF and GEOTIFF. Note that all layers added to a BMM file must have been created in the same coordinate system and using the same units. When importing a BMM file into WinFrog, the geodetic and unit settings of WinFrog must agree with the system the layer files were created in.

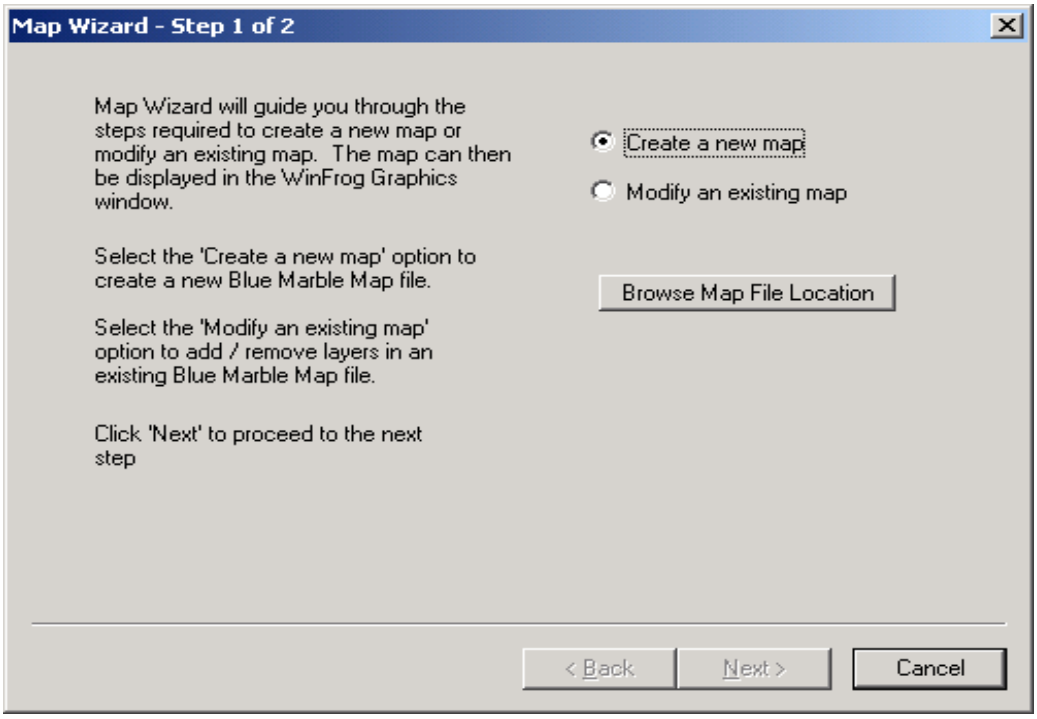
Depending on the file format used, some layers and feature types may not be fully supported by the Blue Marble library. It is important to verify the integrity and completeness of the imported file when displayed in the Graphics window. If features are the same color as the background color, they will be masked and will not be visible.

To Create a BMM map file

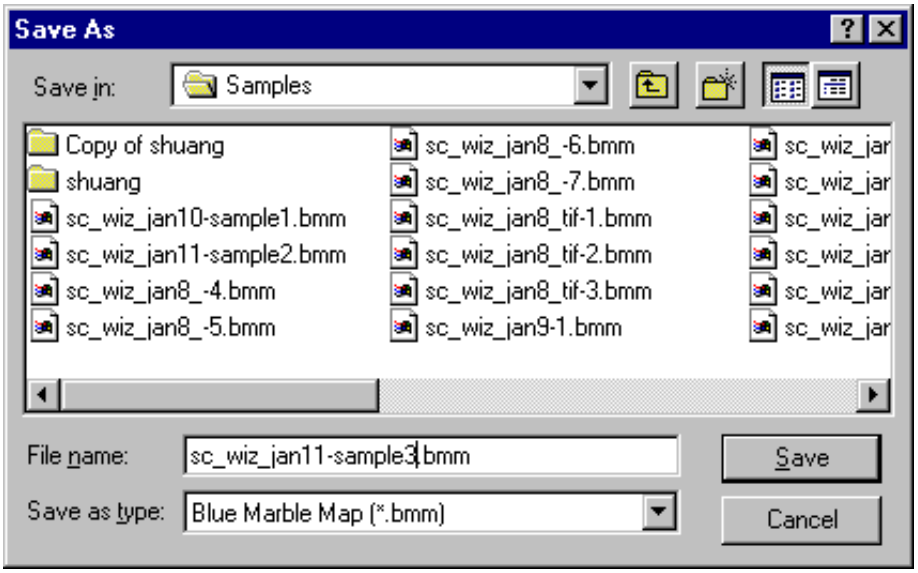
From the **Utilities** menu, choose Map Wizard. A map wizard will be launched that will take you through the process of creating a new map or adding to an existing map.

Create a new map:

1 Select the **Create a new map** radio button.

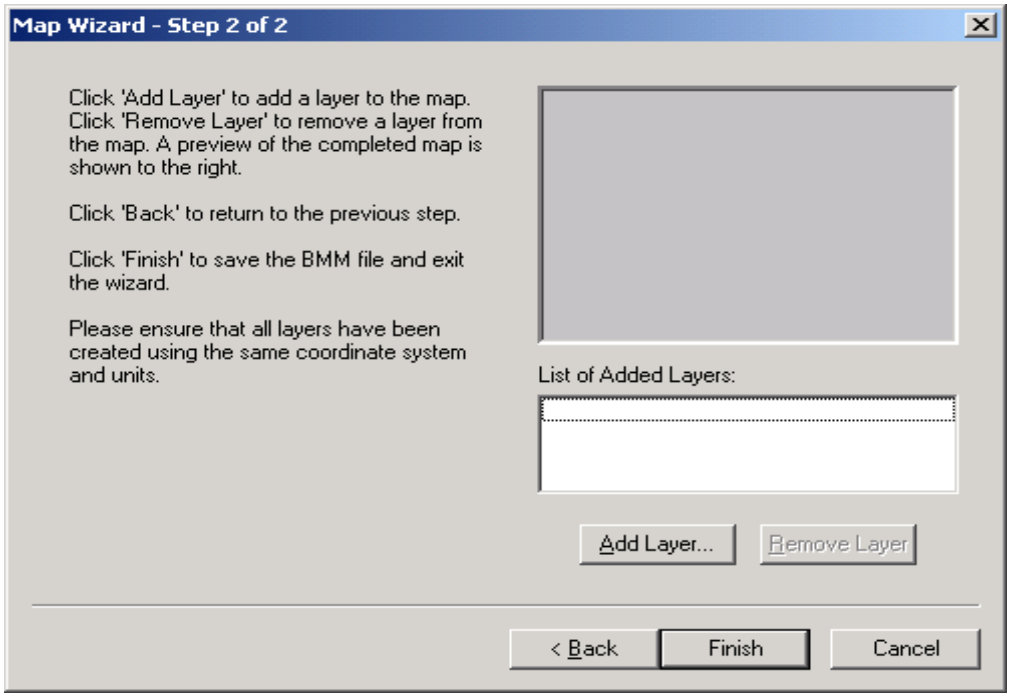


2 Click the **Browse Map File Location** button to launch a file create dialog.

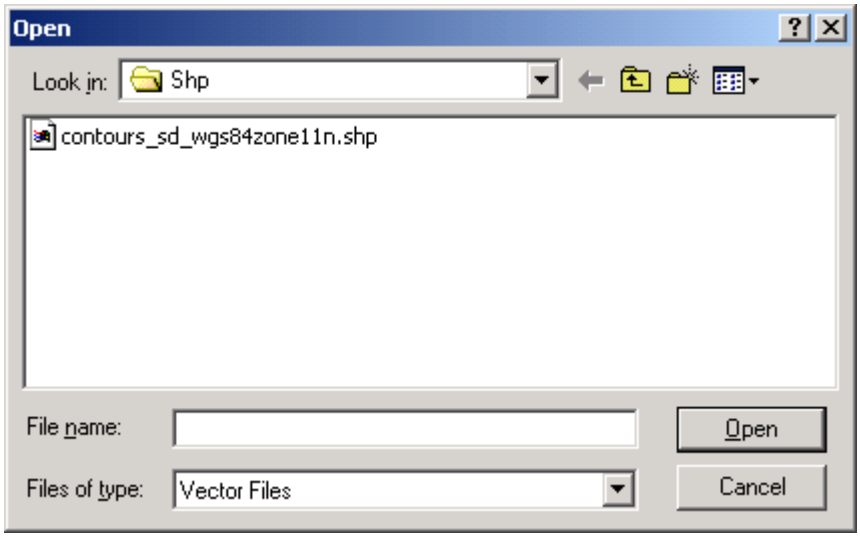


3 Once your file has been created, the name and path of the file is displayed below the button in the wizard.

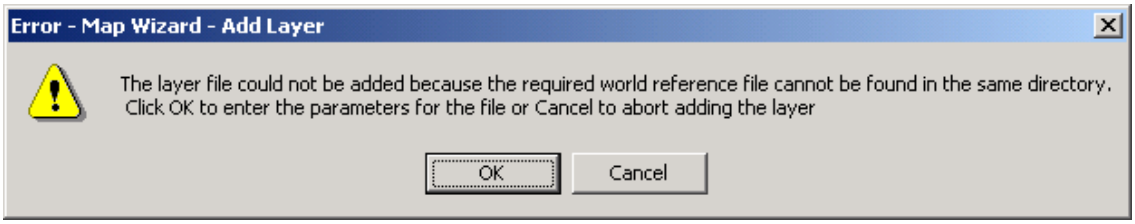
4 Click **Next** on **Map Wizard - Step 1 of 2** to proceed to step 2 of the wizard where the layers of the BMM file are added and removed.



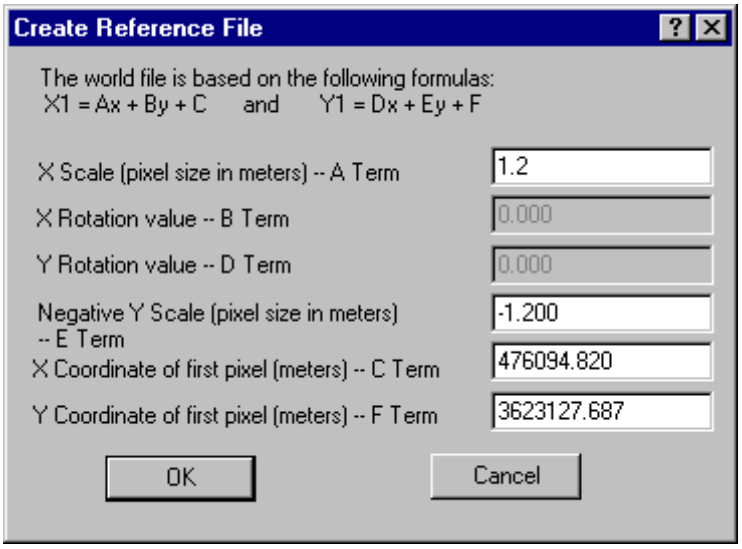
5 To add a layer, click **Add Layer**. This will open a standard **File Open** dialog in which to select the layer to add to the BMM map file. Click OK when the file has been chosen.



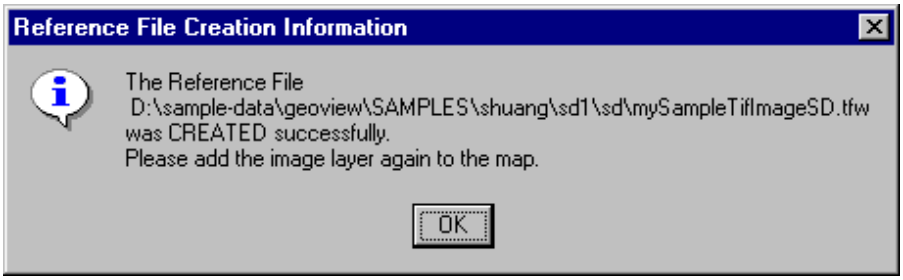
If the layer that is being added is an image such as a .TIF file and there is no .TIF reference file, then an error message, as shown below, is displayed to inform you of the corrective action to take. Otherwise, skip to step 6.



a) Clicking **OK** will launch the **Create Reference File** dialog in which you can enter the reference parameters for the image file. Enter the pixel size in meters for the X (Easting) and Y (Northing) dimensions of the image as well as the X and Y coordinates of the first pixel (topmost left) of the image. Click **OK** to complete the operation. Click **Cancel** to cancel adding the layer.



You will be informed of the result of the Reference File creation process as displayed below.



b) Click **OK** to return to the **Map Wizard** dialog box where you must select the layer again – return to the start of step 5.

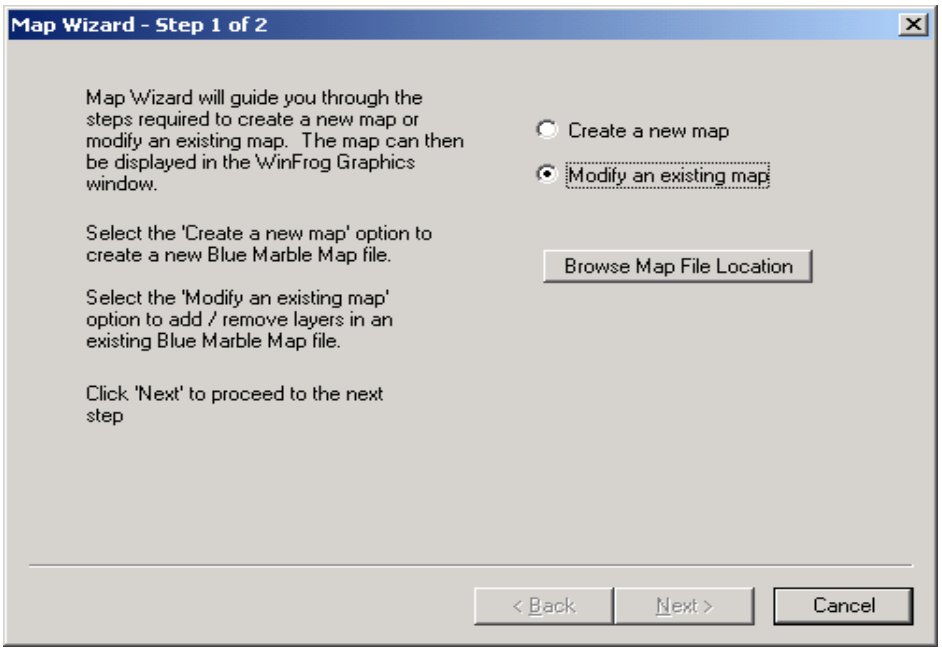
6 You will be presented with a preview of the composite map showing all added layers in the top right of the dialog. To add another layer repeat step 5.

7 To remove a layer, select any layer in the list on the right of the dialog and click **Remove Layer.** The preview window will be updated accordingly.

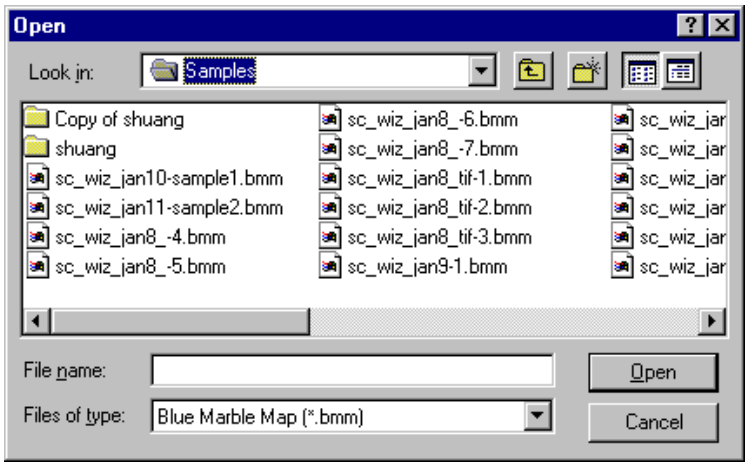
8 Once all the layers have been added and removed, click **Finish** to save the BMM file and exit the wizard.

Modify an existing map:

1 Select the **Modify an existing map** radio button.



2 Select the **Browse Map File Location** button to launch a file open dialog and select the file.



3 Click **Next** on **Map Wizard - Step 1 of 2** to proceed to step 2 of the wizard.

4 At **Map Wizard - Step 2 of 2,** the layers of the BMM file are added and removed. See steps 5 – 7 in the Create a new map section above to complete these procedures.

5 Click **Finish** to save and update the BMM file and complete the map wizard.

Plotter Base Map Wizard

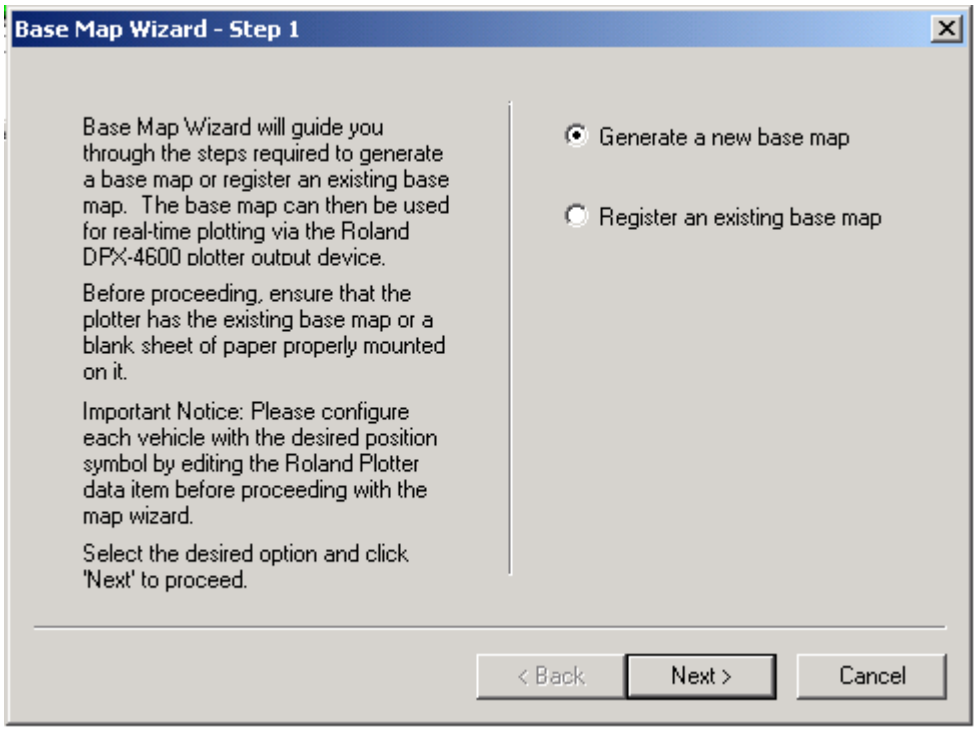
Use this utility for base map configuration when using the Roland DPX-4600 plotter device. Once the device has been connected to the computer and has been configured as described below, you can either register an existing map for real time data plotting or define scale, orientation and offsets for plotting on a blank sheet of paper. Both of these activities are supported through the use of this setup wizard tool.

To Add The Plotter to WinFrog

The plotter device is added in the same way as any other device – through the I/O Devices window. Right-click in the upper pane and select Add Device. The Roland DPX-4600 plotter can be found in the OUTPUT category. Select the device and click OK. Refer to the Roland DPX-4600 device document for details on installation and configuration.

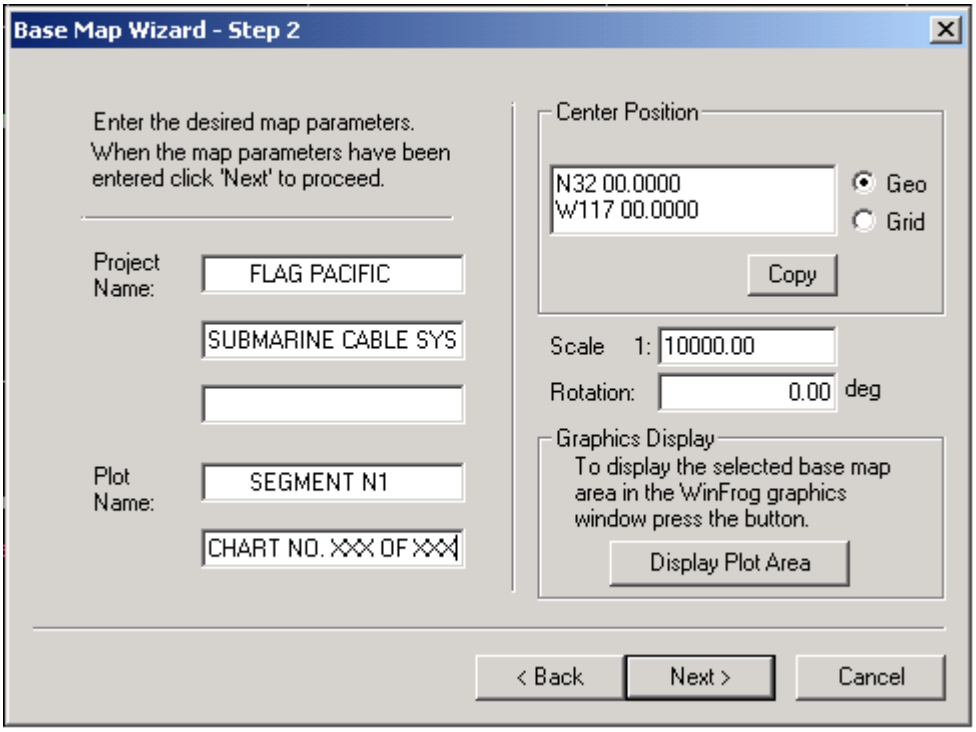
To Generate a New Base Map

1 From the **Utilities** menu, choose **Plotter Base Map Wizard**.



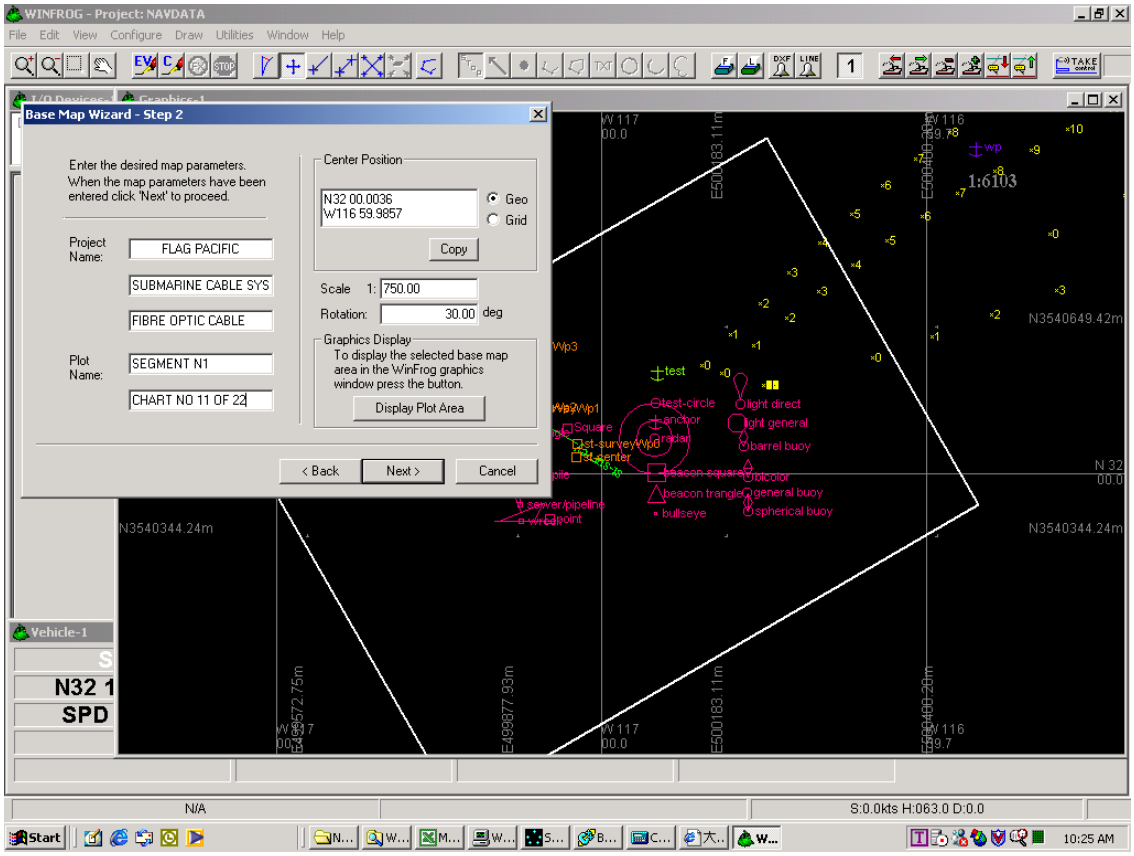
Note the advisory notice stating that the base map or blank sheet should already be properly mounted on the plotter. It is also important to note that, when generating a new map with a standard legend, the desired position symbols for each vehicle have to be configured before proceeding with the map wizard. This is because the position symbols will be plotted on the standard legend as the vehicle track symbol. The position symbol is configured by editing the ROLAND PLOTTER data item for each vehicle. Refer to the Roland DPX-4600 device document for details.

2 Select the **Generate a new base map** radio button and click **Next**.

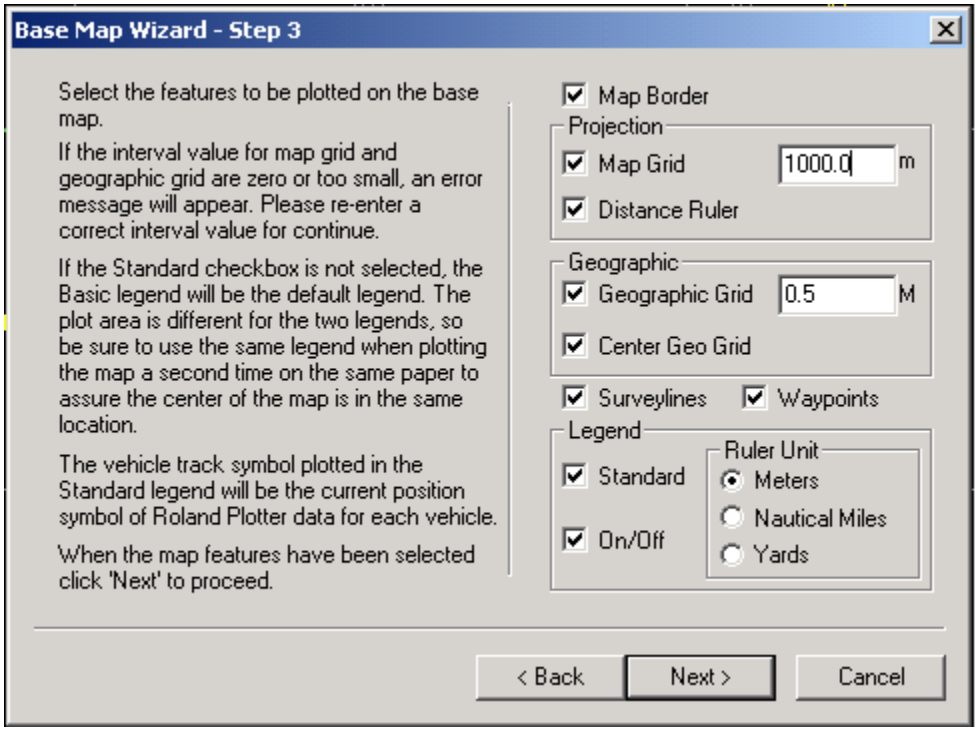


3 Enter the desired map/chart parameters in Step 2.

Project Name	This will be plotted as the title of the map/chart in the legend.
Plot Name	This will be plotted as the name of the map/chart in the legend.
Center Position	the world coordinates of the center of the plot
Scale	the scale of the plot
Rotation	any rotation angle between the world coordinate system and the plotter coordinate system
Display Plot Area	The selected base map/chart area can be displayed in the Graphics window to check the plot area. Click this button to display the outline of the plot area in the Graphics window. The outline is a frame of white lines. Adjust the entered map parameters for plotting the desired map/chart. The following screen shot is a sample.



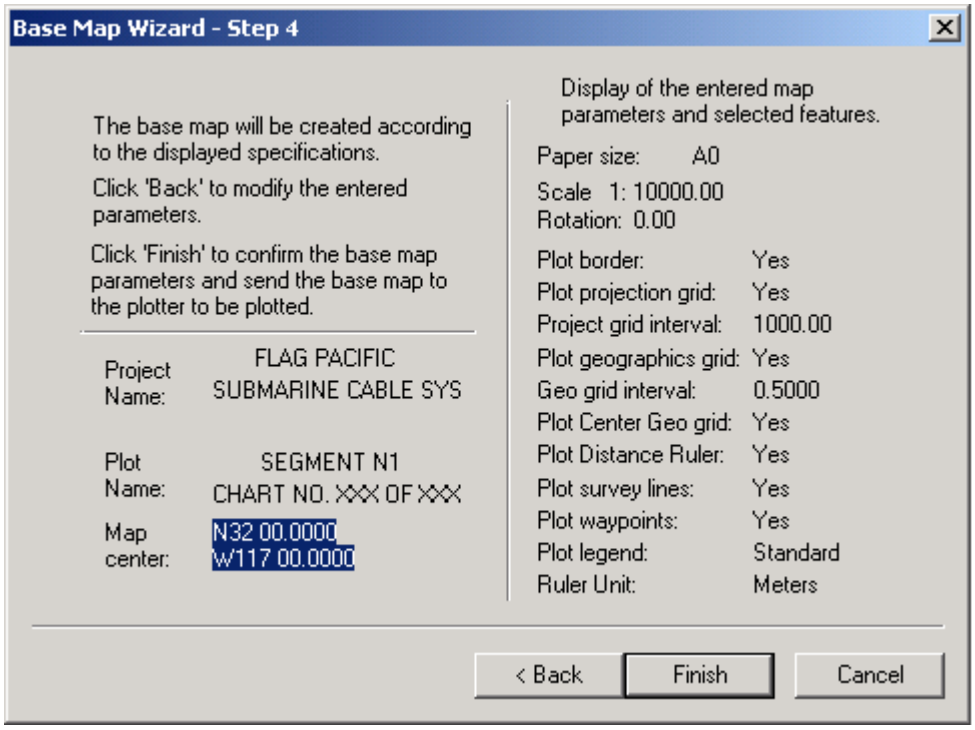
4 Once the map parameters have been entered, click **Next** to proceed to Step 3 of the wizard.



5 Select various additional items to be plotted along with the vessel position.

Map Border	Plots a map/chart border with a thin frame.
Map Grid	Plots projection grid at the given interval with the unit of meters.
Distance Ruler	Plots a scale drawn on the chart in the plot area along the left side of the map/chart reading distances in meters.
Geographic Grid	Plots graticule grid at the given interval with the unit of minutes.
Center Geo Grid	Plots a graticule drawn at the centermost Latitude line and Longitude line. Plots 9 tics between each Latitude/Longitude line for 10 spaces.
Survey Lines	Plots survey lines that are in the chosen working file.
Waypoints	Plots waypoints that are in the chosen working file.
Legend Group	
Standard	Plots a standard legend on the right side of map/chart. If the Standard checkbox is not selected, the Basic legend will be the default legend. The Standard Legend contains the Project Name, Plot Name, Vehicle Name, Geodetic System, Scale, Rotation, Vehicle Track and Corner Data for register. The Basic Legend contains the Custom Input Lines, Geodetic System, Scale, Rotation, Created time stamp and Corner Data for registration. **Note**: The plot area is different for the two legends, so be sure to use the same legend when plotting the map a second time on the same paper to ensure the center of the map is in the same location. **Note**: When you click the Standard checkbox to select this legend, or deselect it for the Basic legend, the display of the base map area in the Graphics window (white frame) will resize to show the different plot areas.
On/Off	Plots the legend if the checkbox is checked, otherwise does not plot a legend.
Ruler Units	The scale in the standard legend of the map/chart can be selected in meters, nautical miles and yards.

6 Once the features to be plotted have been chosen, click **Next** to proceed to Step 4 of the wizard.



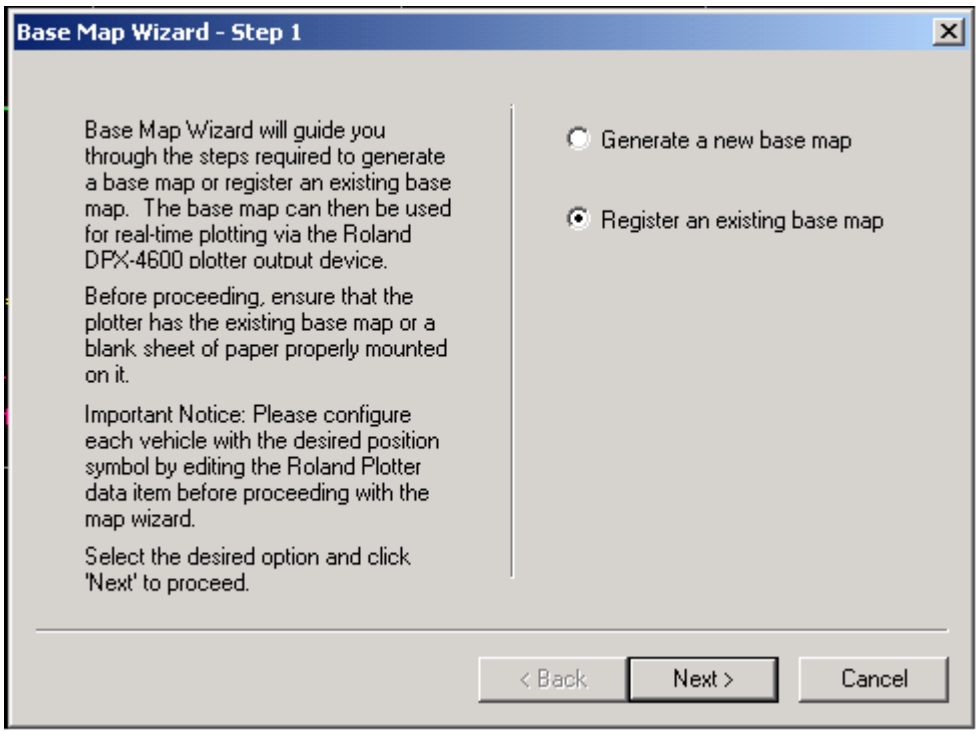
7 Review the summary of the entered transformation parameters. If any changes are needed at this point, click the **Back** button to access the appropriate page and edit the values. When satisfactory, click **Finish** and the new data will be sent to the plotter.

Once the plotter has been set up in this manner, a base map/chart will be plotted out. The options for the background will be plotted on the blank sheet of paper as the new map. For example, if the Border, Map Grid, Survey Lines and Waypoints are selected, those items will be plotted on the paper after the Finish button is clicked.

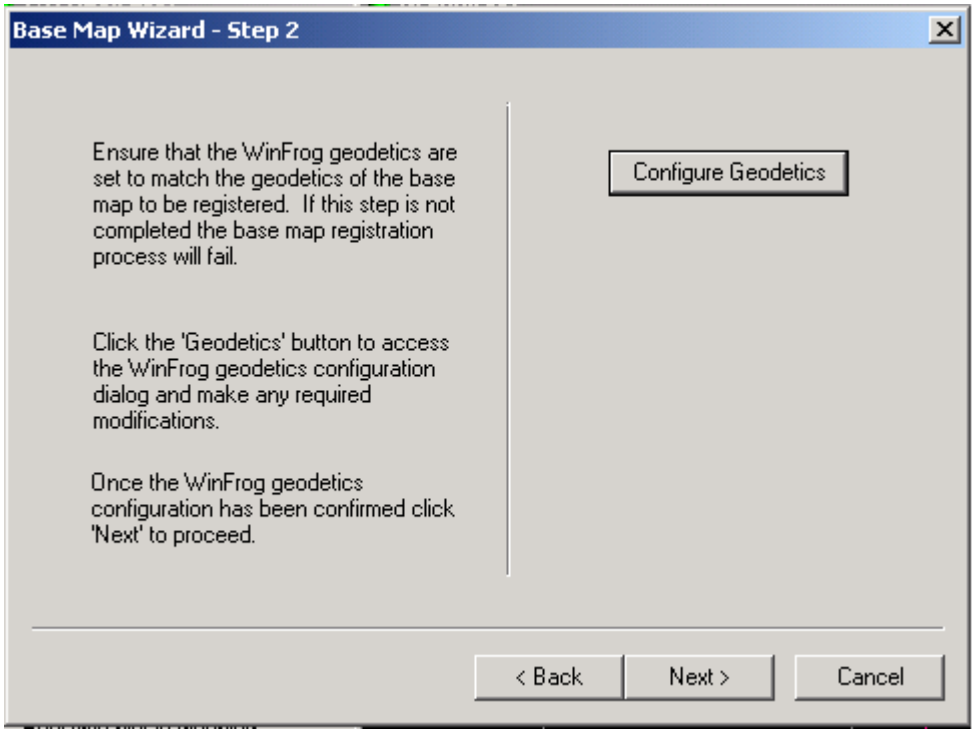
After the map/chart is plotted, and the Real Time plotting mode is enabled, the positions for selected vehicles will be sent to the plotter at the interval defined by the trigger event and other real time plotting options. Refer to the Roland DPX-4600 device document for details.

To Register an Existing Map and Plot to it in Real Time

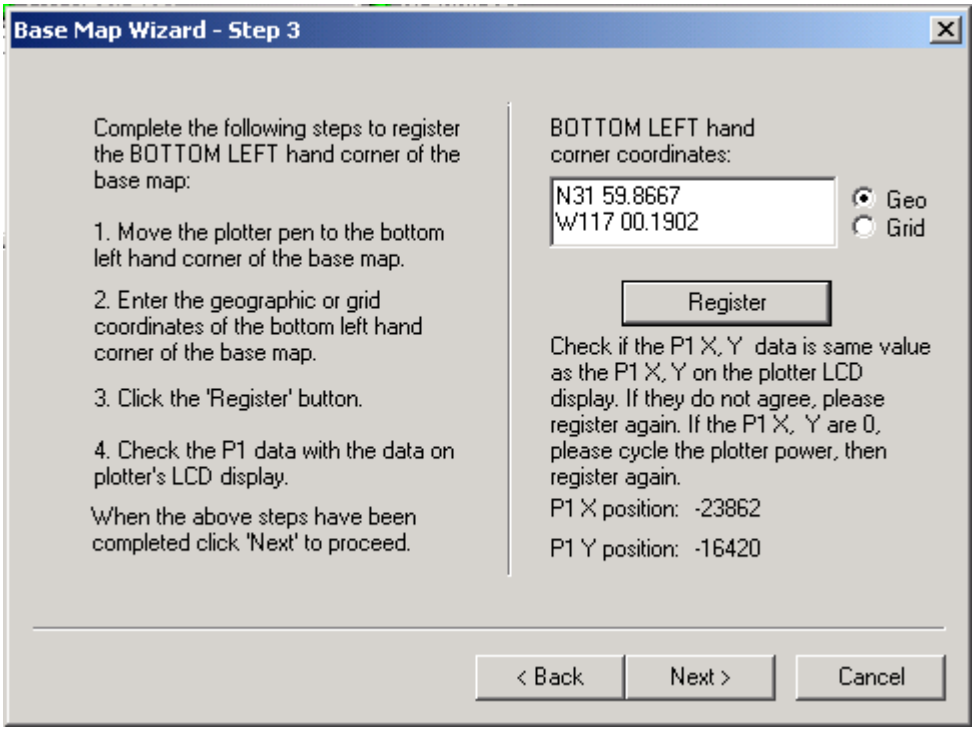
If it is desired to plot the multiple vessel positions and other data on an existing base map or chart, then the map must be registered first in order to define the transformation parameters between the plotter coordinate system and the world coordinate system.



1 Select the **Register an existing base map** radio button at Step 1 of the wizard. Click **Next** to proceed.



2 Choose the geodetic system that the base map is in. It is vital that the base map geodetics match those in WinFrog – this dialog allows you to change the WinFrog settings if required. Click **Next** to proceed.



3 At Step 3 you need to define two known positions in order to perform the registration. For a drawn base map/chart, the left bottom and right top corner data is on the legend. By following the instructions on the left of the wizard page, the real world and plotter coordinates of the bottom left corner of the plot are recorded.

Follow the following steps to operate the plotter for registration:

a) Press the FAST button on the plotter LCD display. The plotter will grab the pen No. 1.

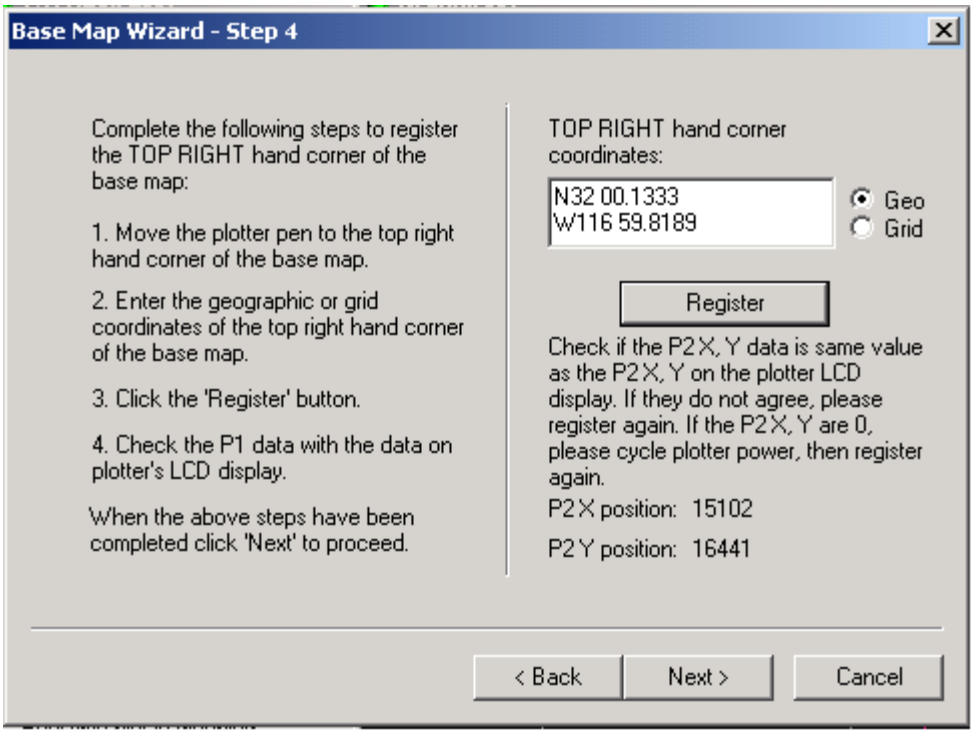
b) Press FAST and => or <= keys to move the plotter pen to the Left Bottom hand corner.

c) Press the Pen Down menu on the LCD display to check that the pen is on the top of the point, and then press Pen Up.

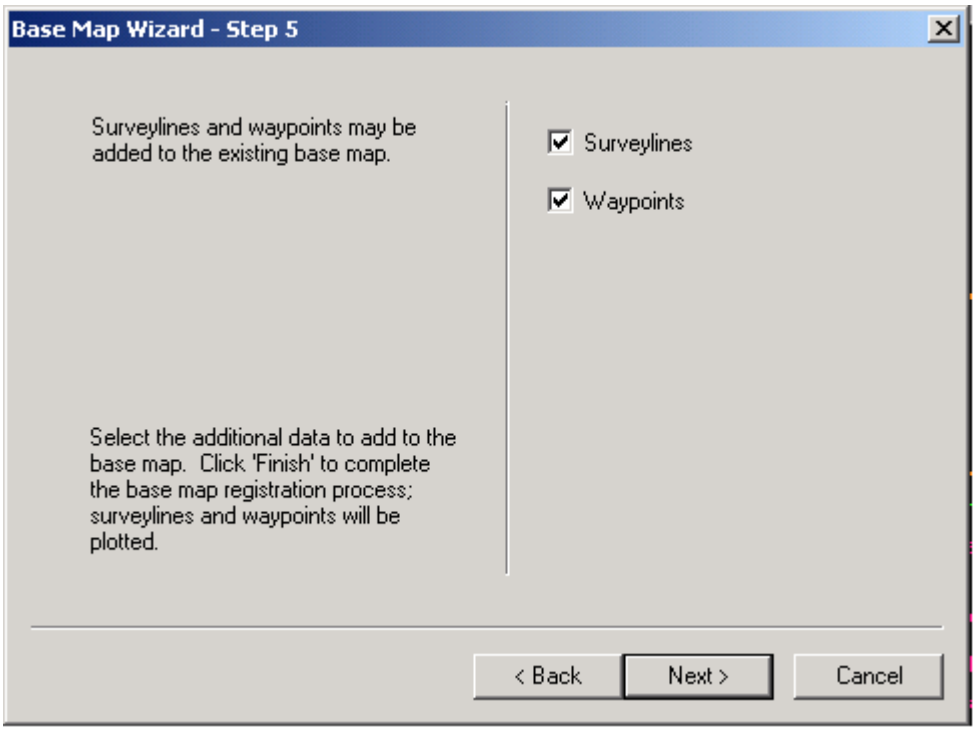
d) Click the Register button on the Base Map Wizard.

e) Check that the P1X and P1Y position agrees with the data on the plotter LCD display.

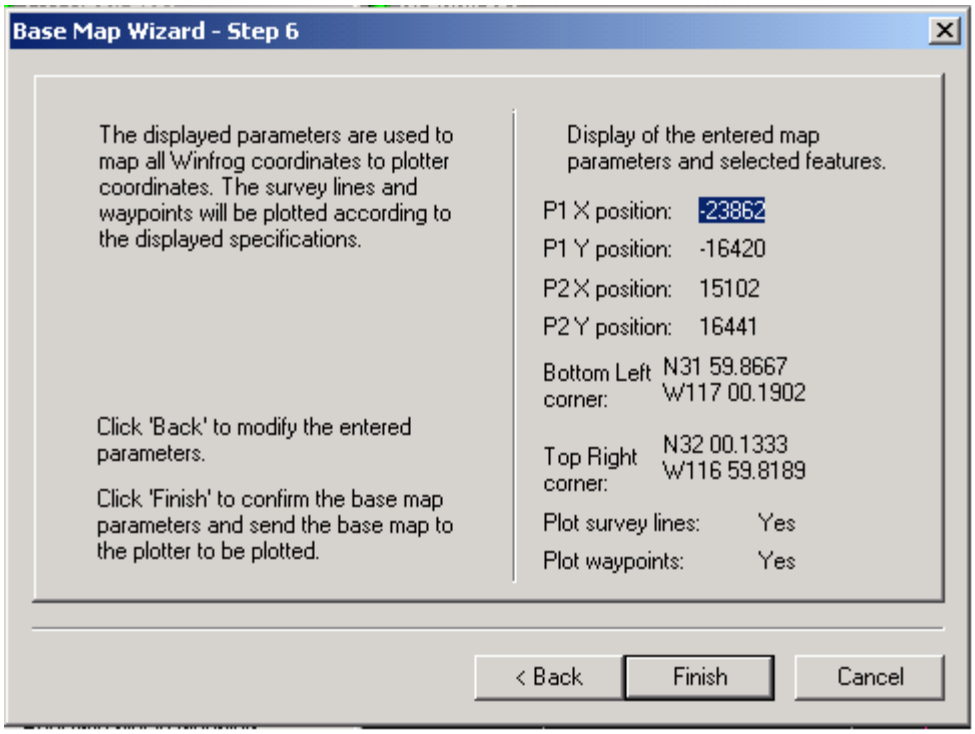
4 Click Next to proceed to Step 4 where you need to follow the same steps for the upper right corner of the map/chart – the only difference is to check that the P2X and P2Y positions agree with the data on the plotter LCD display. In this way, a two-dimensional similarity transformation is computed between the plotter and real world coordinates.



5 Click **Next** to continue to Step 5.



6 In addition to the vessel position, it is possible to plot survey lines and waypoints at Step 5. If these are desired, select the appropriate checkboxes and click **Next** to continue.



7 Review the summary of the entered data. Corrections can be made by using the **Back** button. If the P1 and P2 data is zero, an error message will appear and you will need to go back and register again before continuing. When satisfactory, click **Finish** and survey lines and/or waypoints will be sent to the plotter, if you made those selections.

After the map/chart is registered, enable the Real Time plotting mode and the positions for selected vehicles will be sent to the plotter at the interval defined by the trigger event and other real time plotting options. Refer to the Roland DPX-4600 device document for details.

Generate DXF Map

Use this utility to generate a map in the form of a **.DXF (Drawing Exchange Format)** file.

This map can include the contents of the **Working Picture**, **Survey Line**, **Waypoint**, and **Data** files, all of which are referenced using the current WinFrog geodetic configuration. Other options include **Borders**, a **Bar Scale**, and **Grid Lines**. You can also control the **Size**, **Scale**, and **Rotation** of the final product.

The **.DXF** file can then be imported into programs, such as AutoCAD, MicroStation, or other CAD or mapping packages.

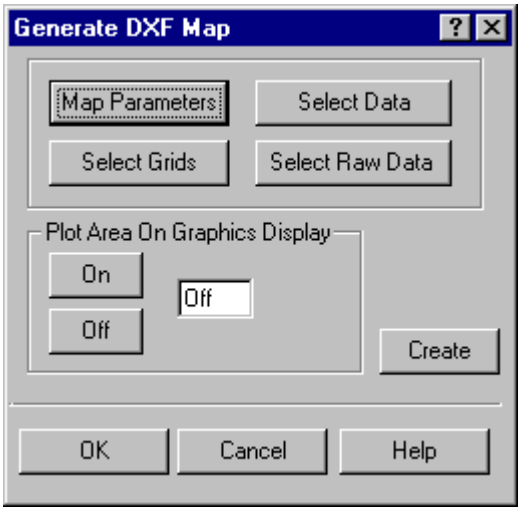
This section discusses all steps required to create a .**DXF** file using WinFrog, starting with a brief overview of the procedures required.

To Create a .DXF Format Map

1 Open a **Graphics** window if one is not already open.

2 Center and zoom the **Graphics** window so that it displays the area to be exported.

3 From the **Utilities** menu, choose **Generate DXF Map**. The **Generate DXF Map** dialog box is the main dialog box for configuring and creating a **.DXF** map in WinFrog. This dialog box provides access to four other dialog boxes that provide the actual configuration tools.



4 In the **Plot Area On Graphics Display** area of the **DXF Output** dialog box, click the **On** button.

5 Click the **Map Parameters** button to open the **Map Parameters** dialog box.

6 Configure the parameters in the **Map Parameters** dialog box.

See the **Map Parameters Dialog Box** section later in this chapter for details concerning configuring these parameters.

7 Click the **Select Grids** button to open the **Select Grids** dialog box.

8 Configure the parameters in the **Select Grids** dialog box.

See the **Select Grids Dialog Box** section later in this chapter for details concerning configuring these parameters.

9 Click the **Select Data** button to open the **Select Data** dialog box.

10 Configure the parameters in the **Select Data** dialog box.

See the **Select Data Dialog Box** section later in this chapter for details concerning configuring these parameters.

11 Click the **Select Raw Data** button to open the **Select Raw Data** dialog box.

12 Configure the parameters in the **Select Raw Data** dialog box.

See the **Select Raw Data** section below for details concerning configuring these parameters.

13 Click the **Create** button to build the .**DXF** file.

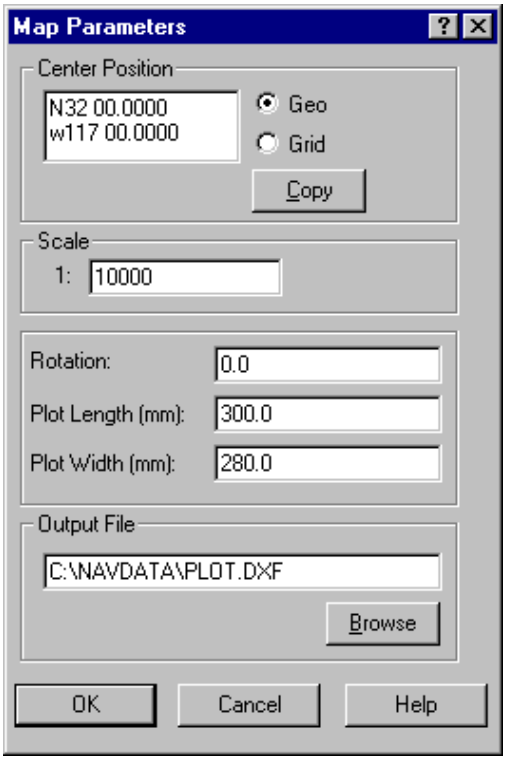
If the file already exists, WinFrog asks if the file is to be overwritten.

OK	overwrites the existing file
Cancel	returns to the **Generate DXF Map** dialog box

The following sections detail each of the above mentioned dialog boxes.

Map Parameters Dialog Box

Click the **Map Parameters** button in the **Generate DXF Map** dialog box to open the **Map Parameters** dialog box.



The following parameters are set within the **Map Parameters** dialog box:

Center Position

entry field	the **Center Position** coordinates of the map display in this field
Geo radio button	indicates that values in entry field are in latitude and longitude
Grid radio button	indicates that values in entry field are in Northing and Easting
Copy button	copies the coordinates displayed in the WinFrog Position Display toolbar into the entry field.

Scale

entry field	Enter the **Scale Factor** for the map (representing the scale of **Drawing Units** to **Ground Units**).

Rotation

Rotation field	Enter the rotation angle of the plot in degrees (**dd.dddd**), as measured clockwise from North.
Plot Length (mm)	Enter the length of the plot in millimeters.
Plot Width (mm)	Enter the width of the plot in millimeters.

Output File

entry field	Enter a name for the new .DXF file along with a directory path.
Browse button	use this typical Windows™ navigation dialog box to select a file name and directory.

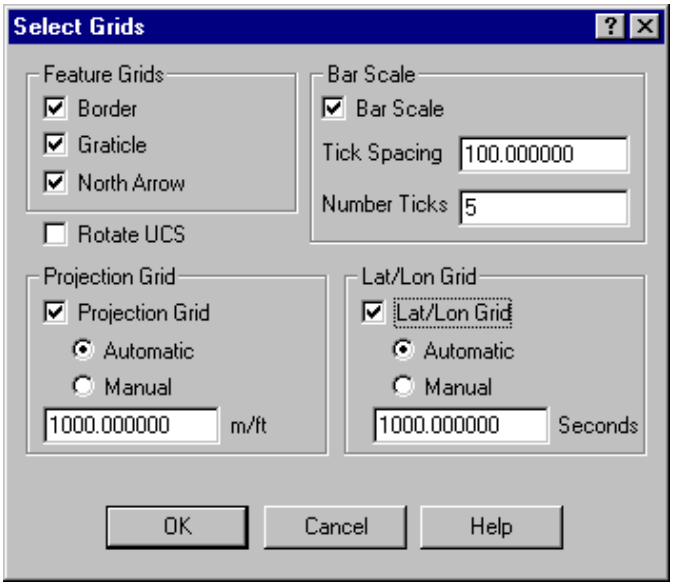
Click **OK** to return to the **Generate DXF Map** dialog box.

A blue box outlining the area to be exported appears in the **Graphics** window.

Select Grids Dialog Box

WinFrog can be configured to generate three types of grid lines in a .**DXF** map. These parameters (as well as some other line options) are configured using the **Select Grids** dialog box.

Click the **Select Grids** button in the **Generate DXF Map** dialog box to open the **Select Grids** dialog box.



The following parameters are set using the **Select Grids** dialog box:

Feature Grids

Border checkbox	Check this to enable the plotting of a border outlining the plot area.
Graticle checkbox	Check this to enable the plotting of a grid "cross" in the center of the map.
North Arrow checkbox	Check this to enable the plotting of a North arrow.

Bar Scale

Bar Scale box	Check this to enable the plotting of a bar scale.
Tick Spacing field	Enter the distance between adjacent ticks. Units used are as per the **Working Geodetic** units.
Number Ticks field	Enter the number of ticks to be displayed.
Rotate UCS box	Enable this option to create a map with a rotated UCS (User Coordinate System) so that the **X** direction corresponds to North and the **Y** direction corresponds to East. This option is used to compensate for those CAD systems that utilize this mathematical coordinate system as opposed to the survey convention.

Projection Grid

Projection Grid box	Check this option to generate small "crosses" on the map that mark the intersection of projection grid lines.
Automatic radio button	Select this option to have WinFrog define the projection grid line spacing.
Manual radio button	Select this option to have WinFrog use the value entered in the **m/ft** field immediately below to define the projection grid spacing.
m/ft field	Enter a value to define the ground distance in meters or feet between projection grid ticks.

Lat/Lon Grid

Lat/Lon Grid check box	Check this option to generate a set of lines on the map with marked latitude and longitude values.
Automatic radio button	Select this option to have WinFrog define the spacing of the lines of latitude and longitude.
Manual radio button	Select this option to have WinFrog use the latitude and longitude spacing value immediately below.
Seconds field	Enter a value (in seconds) to define the number of **seconds** of latitude or longitude between lat/long grid lines.

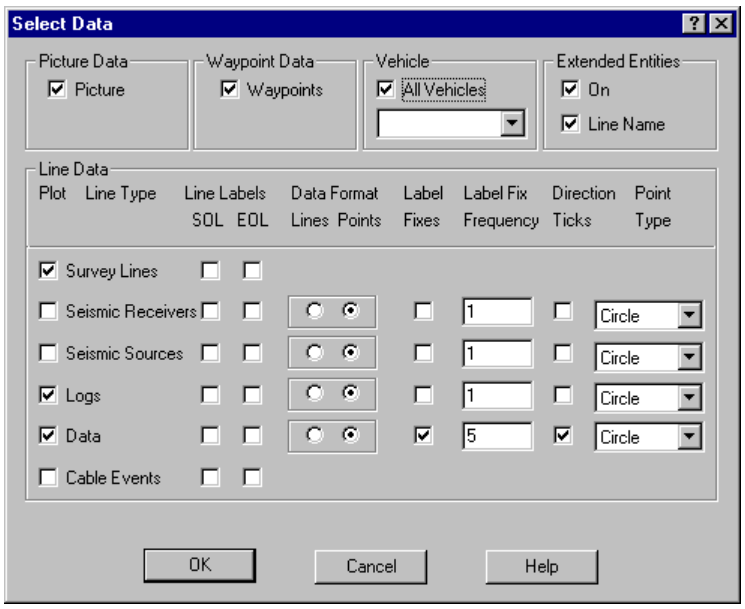
Click **OK** to save the changes and return to the **Generate DXF Map** dialog box.

Select Data Dialog Box

WinFrog can be configured to include the contents of several different types of WinFrog working files in the DXF map. These parameters are configured using the **Select Data** dialog box.

You can choose from the following list of **Working File** types: **Picture**, **Waypoint**, **Survey Lines**, **Seismic Receivers**, **Seismic Sources**, **Logs**, **Data**, and **Cable Events**. You also have various options that determine how the information is displayed in the DXF map.

Click the **Select Data** button in the **Generate DXF Map** dialog box to open the **Select Data** dialog box.



The following parameters are set in the **Select Data** dialog box:

Picture Data

Picture box	Check this option include the contents of the **Working Picture** (**.pic**) file on the .DXF map.

Waypoint Data

Waypoints box	Check this option include the contents of the **Working Waypoints** (**.wpt**) file on the .DXF map.

Vehicle

All Vehicles box	Check this option to have all vehicles included.
dropdown menu	Use this option to enable the plotting of one, individual vehicle.

Extended Entities

On box	Check this option to have the DXF map include "**Extended Entities**." Currently, **Line Name** is the only extended entity available.
Line Name box	Check this option to include the line name on the DXF map.

Line Data

Check the box to the left of the appropriate option to plot data from the following list of **Working Files**: **Survey Lines (.PTS)**, **Seismic Receivers (.ALL)**, **Seismic Sources (.ASC)**, **Logs (.LOG)**, **Data (.ALG)**, and **Cable Events(.CET)**.

The following options can be included for any of the mentioned **Working Files**:

Line Labels - SOL box	If checked, WinFrog creates a label with the survey line name at the start of each data set.
Line Labels -EOL box	If selected, WinFrog creates a label with the survey line name at the end of each data set.

The following options can be included for **Working Seismic Receivers**, **Seismic Sources**, **Logs**, and **Data** files:

Data Format - Lines	Select this radio button to connect adjacent data points to create a line.
Data Format - Points	Select this radio button to not connect adjacent data points into a line, instead plotting each point individually.
Label Fixes box	Check this box to enable the plotting of labels for each of the fixes (events) within the data files. The value of the label is equal to the event number as shown within WinFrog.
Label Fix Frequency field	This parameter sets how often event labels are plotted. If the **Label Fix Frequency** is set to 1, every event is labeled. If it is greater than one, WinFrog only labels every $\mathbf{n}^{th}$ fix, where **n** is the value entered.
Direction Ticks box	This option is dependent upon the **Data Format** radio buttons. If you select the **Data Format Points** radio button, check this option to plot "ticks" that point in the direction of travel along a line. The ticks are not created if the **Data Format - Lines** radio button is selected.
Point Type menu	If the **Data Format - Points** radio button is selected, there are four different types of point markers that can be chosen from this dropdown menu: **Circle**, **Square**, **Triangle**, or **Point**.

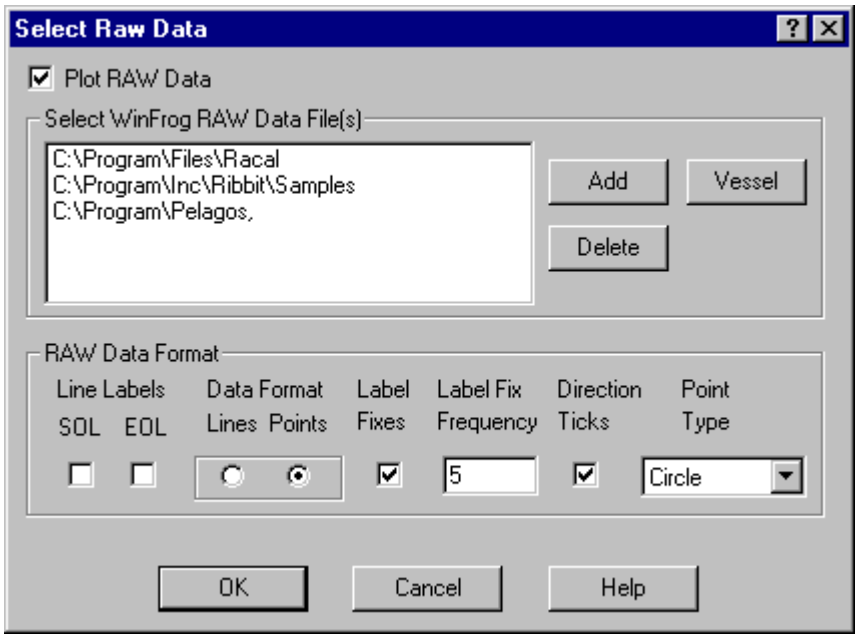
Click **OK** to return to the **Generate DXF Map** dialog box.

Select RAW Data Dialog Box

WinFrog can also be configured to include positional data from WinFrog **Raw** (**.raw**) files in the .DXF map. These parameters are configured in the **Select RAW Data** dialog box.

To Plot Raw Positional Data in the DXF Map

1 In the **Generate DXF Map** dialog box, click the **Select Raw Data** button.



2 Select the **Plot RAW Data** option at the top of the **Select RAW Data** dialog box.

3 Click the **Add** button.

4 Navigate to the desired directory.

5 Select the desired file(s) from the list of **.RAW** files.

6 Click **Open**.

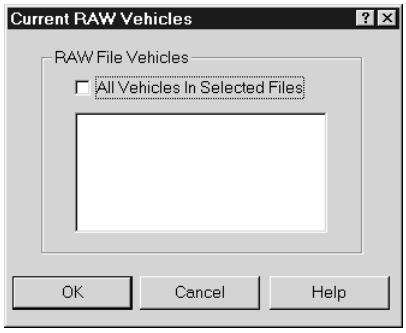
7 Click **OK.**

The file is displayed in the **Select WinFrog RAW Data File(s)** list in the **Select RAW Files to Plot** dialog box.

8 Repeat steps **3** through **7** to add more raw files.

Note: to remove a raw file from this list, select it and click the **Delete** button.

9 When all desired files are listed in the **Select WinFrog RAW Data File(s)** list, click the **Vessel** button.



From the **Current RAW Vehicles** dialog box, WinFrog can be configured to export raw data from all vehicles or individual vehicles:

10 To select all vehicles, check the **All Vehicles In Selected Files** box.

11 To select individual vehicles, select the desired vehicles from the list in the white field.

Note: make sure that the **All Vehicles In Selected Files** box is not checked or all vehicles will be used.

12 Click **OK** to return to the **Select RAW Data** dialog box.

13 Configure the parameters in the **RAW Data Format** area:

Line Labels SOL box	Check this option to have WinFrog plot the line name at the start of each line.
Line Labels EOL box	Check this option to have WinFrog plot the line name at the end of each line.
Data Format - Lines	Select this radio button to connect adjacent points into a line.
Data Format - Points	Select this radio button to not connect adjacent points into a line, instead plotting them individually.
Label Fixes box	Check this option to label the fixes (events) within the raw file. The value of the label is equal to the event number as saved in the raw file.
Label Fix Frequency field	Sets this to determine how often event labels are plotted. If the **Label Fix Frequency** is set to 1, every event is labeled. If it is greater than one, WinFrog only labels every $\mathbf{n}^{th}$ fix, where **n** is the value entered.
Direction Ticks box	If you select the **Data Format - Points** radio button, WinFrog can create ticks that point in the direction of travel along a line. If you select the **Data Format Lines** radio button, the direction ticks are overwritten by the line.
Point Type menu	If the **Data Format - Points** radio button is selected, there are four different types of point markers that can be chosen from this dropdown menu: **Circle**, **Square**, **Triangle**, or **Point**.

Click **OK** to return to the **Generate DXF Map** dialog box.

Generate MGD77 File

The **Generate MGD77 File** utility allows you to combine client created and supplied magnetometer and bathymetry data files with raw format WinFrog data into a single ASCII file. This utility can then convert that merged file into a file in **MGD77** format.

The three types of data that can be merged are magnetics (**.CSV**), bathymetry (**.DEP**), and raw WinFrog (**.RAW**) files. These three files are merged into a **.ROD** file that is then converted to an **.MGD** file. WinFrog generates the **MGD77** format as defined by **The Marine Geophysical Data Exchange Format - MGD77**. This document can be found on the internet at the following site: **ftp://ftp.ngdc.noaa.gov/MGG/geodas/docs/mgd77.txt**

File Formats

The **Magnetics** file contains **Julian Day**, **Time (hhmmss)**, **Magnetic Value**, and **Event Number** data in a single, comma-separated string (i.e. **343,100834,32,12**).

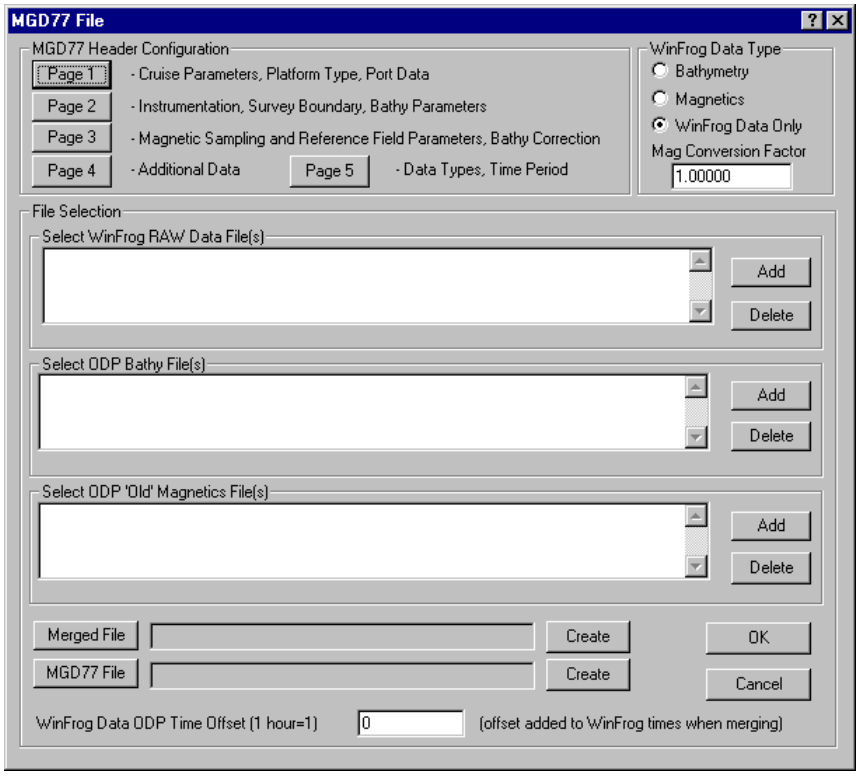
The **Bathymetry** file contains **Year**, **Julian Day**, **Hours (hh)**, **minutes (mm)**, **seconds (ss)**, and **Depth** (i.e. **1994,343,10,08,34,10.1**).

The WinFrog **.raw** file must contain **Type 351** records. See the **WinFrog File Formats** appendix of this manual for details.

The MGD77 format consists of two parts: a header section and a data section. The header section contains information about the content and structure of the geophysical data as well as other general information. WinFrog allows you to enter the header information using five dialog boxes.

To Create an MGD77 Format File

1 From the **Utilities** menu, choose **Generate MGD77 File**.



2 Configure the **Header Information** using the **Page 1** through **Page 5** buttons at the top of the **MGD77 File** dialog box.

See the **Header Page Buttons** section below.

3 In the **WinFrog Data Type** area of the **MGD77 File Utility** dialog box, select one of the three radio buttons to define the type of data recorded in a WinFrog **.raw** file:

Bathymetry	these are files created offline by user
Magnetics	these are files created offline by user
WinFrog Data Only	no data other than WinFrog data

If navigation data is the only data type in the WinFrog **.raw** data file, you can include bathymetry data files (*.**dep**) and magnetics data files (*.**csv**) from other sources.

4 Enter the **Mag Conversion Factor**.

This is a scale factor that is multiplied by bathymetry and depths during the file creation.

5 In the **File Selection** area of the **MGD77 File Utility** dialog box, click the **Add** button next to the type of file you wish to add.

6 Navigate to the desired directory.

7 Select the desired files from the available **Raw WinFrog Data Files**, **ODP Bathy Files**, or **ODP Magnetics Files**.

8 Click **Open**.

9 Click **OK**.

Note: if WinFrog does not show the file in the respective list , this indicates that the file has no usable data.

10 Repeat steps **5** through **9** to add more files.

Note: to remove files from any of the three lists, select them and click the relevant **Delete** button.

11 Enter a value in the **WinFrog ODP Time Offset (1 hour=1)** field.

This is a time bias that is added to WinFrog times so that they correspond with **ODP** times. More information about this parameter can be found in the **WinFrog Data ODP Time Offset** section below.

12 Enter the path and file name in the **Merged File** field.

Or alternatively, click the **Merged File** button, navigate to the desired directory, select the desired file, click **Open** and then click **OK**.

13 Click the **Create** button (immediately to the right of the **Merged File** field) to perform the merge and create a new file.

14 Enter the path and file name in the **MGD77 File** field.

Or alternatively, click the **MGD77 File** button, navigate to the desired directory, select the merged file, click **Open**, and then click **OK**.

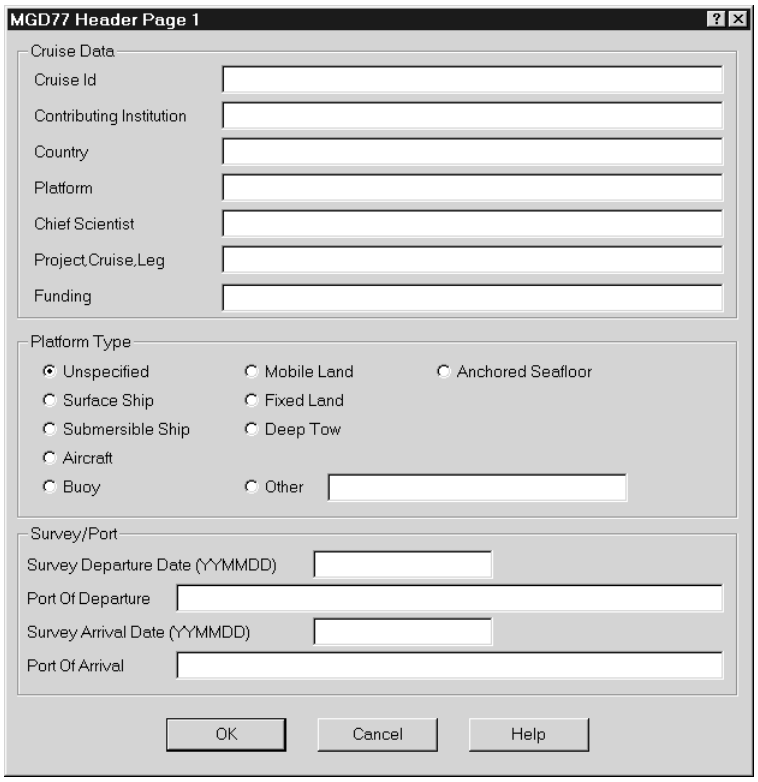
15 Click the **Create** button (immediately to the right of the **MGD77 File** field) to perform the export.

Header Page Buttons

Each of the **Page 1** through **5** buttons at the top of the **MGD77 File Utility** dialog box leads to a unique dialog box. The information in each of these dialog boxes needs to be entered in order to configure the header in the proper **MGD77** format.

Page 1

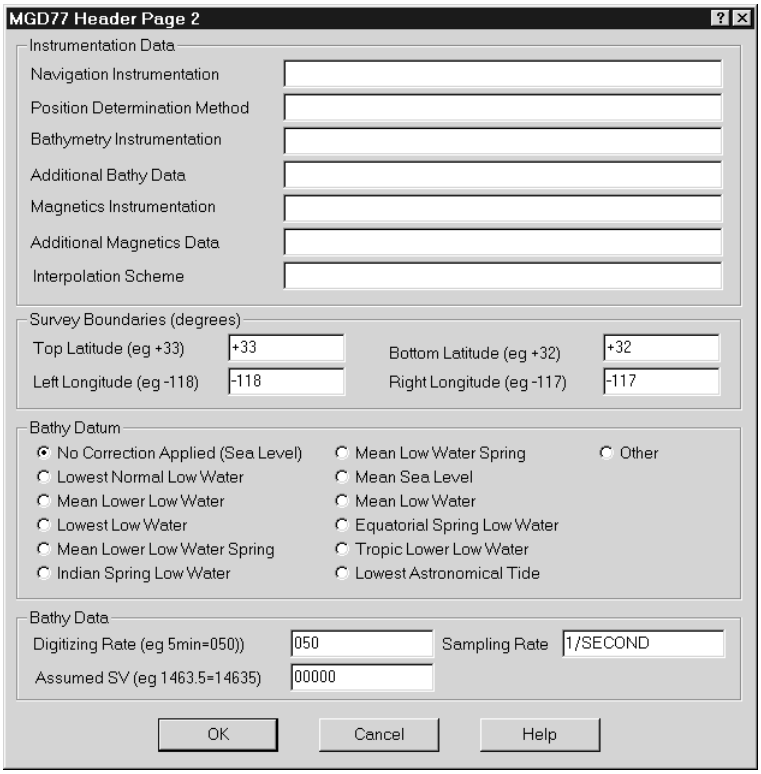
The **Header Page 1** dialog box includes **Cruise Parameters**, **Platform Type**, and **Survey/Port Data**. Highlight the appropriate fields and enter the necessary data.



Page 2

The **Header Page 2** dialog box includes with **Instrumentation**, **Survey Boundary**, and **Bathy Parameters**.

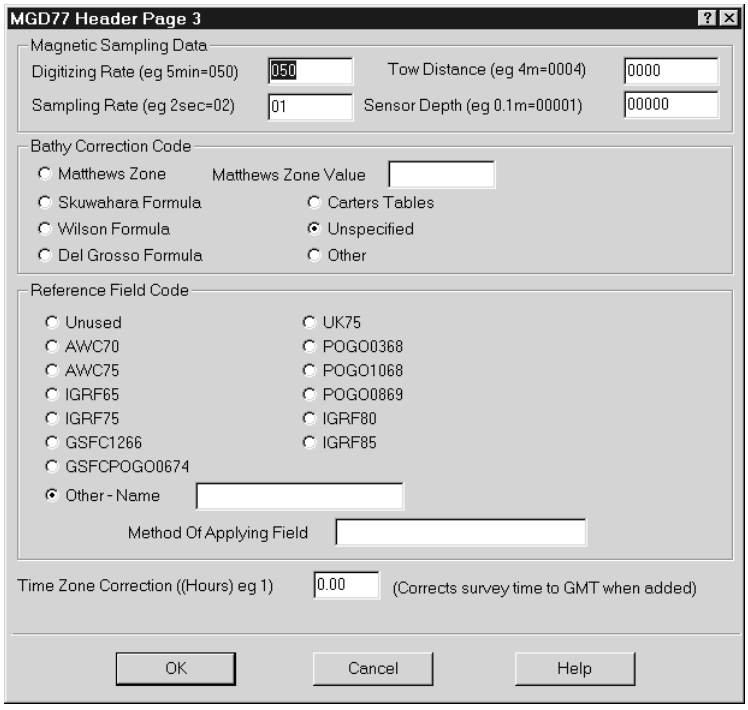
Highlight the appropriate field and enter the necessary data.



Page 3

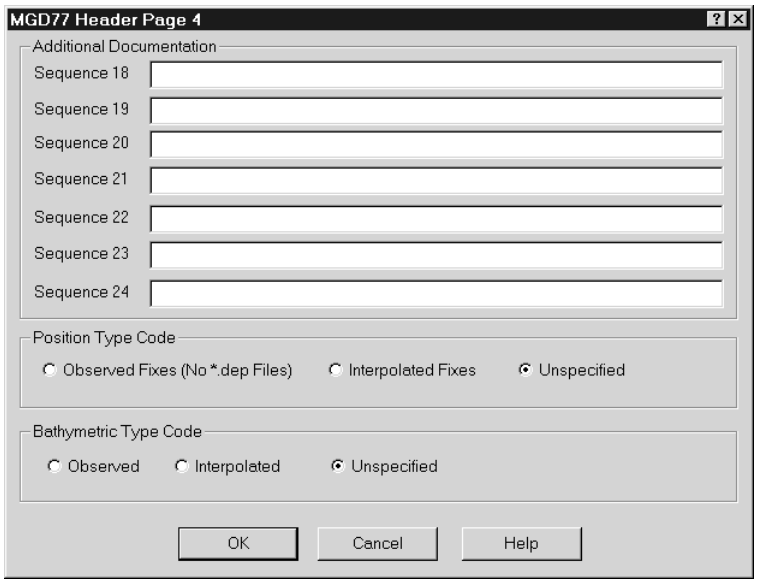
The **Header Page 3** dialog box is concerned with **Magnetic Sampling and Reference Field Parameters**, and **Bathy Correction**.

Highlight the appropriate field and enter the necessary data.



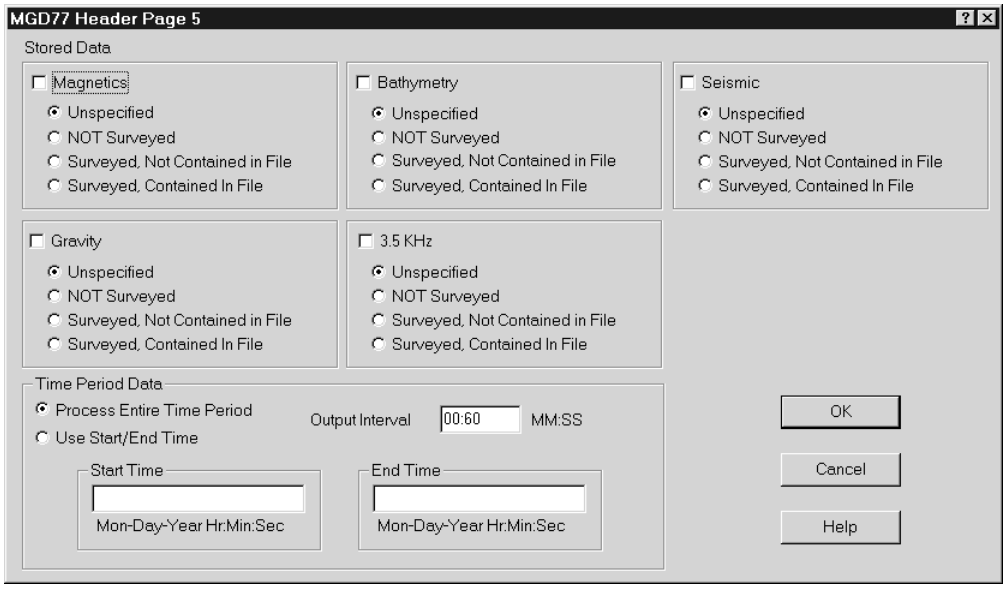
Page 4

The **Header Page 4** dialog box is concerned with any additional data. Highlight the appropriate field and enter the necessary data.



Page 5

The **Header Page 5** dialog box is concerned with **Data Types** and **Time Period**. Highlight the appropriate field and enter the necessary data. For more information refer to the **Time Period Data** section below.



To finish preparing WinFrog for data merging and file export in the MGD77 format, continue with step **3** of the **To Create a Merged Export File in MGD77 Format** section earlier in this chapter.

Time Period Data

The time period data are configured in the **MGD77 Header Page 5** dialog box. This parameter allows you to select an interval within which the data records will be merged and the MGD77 file created. If the **Process Entire Time Period** radio button is selected in the **Time Period Data** area, data are output for the entire time period covered by the WinFrog files. If a time period is entered in the **Output Interval** field in the **Time Period Data** area and the **Use Start Time/End Time** radio button is selected in the **Time Period Data** area, only data within this time period are output.

WinFrog Data ODP Time Offset

The **Data ODP Time Offset** is the time (in hours) that is added during the file merge to the WinFrog time to match the time to the ODP file time. For example, if the ODP files were recorded in GMT and the WinFrog files were recorded in PST (which is 8 hours behind), the value **8** would be entered here. The value entered in the **Time Zone Correction ((Hours) eg 1)** field at the bottom of the **MGD77 Header Page 3** dialog box is therefore the offset from the ODP file time to GMT.

Time Conversion

Use this utility to convert between **DOS** time and **ASCII** time**. DOS** time is defined as the number of seconds since midnight, January 1, 1970. **ASCII** time is in the form **mm-dd-yy hh:mm:ss.s**.

WinFrog **.raw** files contain **DOS** time in each record, whereas **Automatic** and **Manual Event** data files contain **ASCII** time. This utility is often used to relate **.raw** data records to **Automatic Events** for data processing efforts.

To Convert DOS Time to ASCII Time

1 From the **Utilities** menu, choose **Time Conversion**.

2 Enter the **DOS** time into the **DOS Time** field. This must be entered in seconds.

3 Click the "**down**" arrow button.

The result of the conversion is displayed in the **ASCII Time** field.

To Convert ASCII Time to DOS Time:

1 From the **Utilities** menu, choose **Time Conversion**.

2 Enter the **ASCII** time into the **ASCII Time** field. It must be in the form **mm-dd-yy hh:mm:ss.s**.

3 Click the "**up**" arrow button.

The result of the conversion is displayed in the **DOS Time** field.

Note: if an invalid ASCII time is entered, WinFrog displays **0.0** in the **DOS Time** field. To confirm that the correct ASCII time format was entered, click the "**down**" arrow button. The ASCII time value will not change if the conversion is correct.

Position Averaging

This WinFrog utility provides the ability to save up the position of a selected vehicle over a selected period, compute the mean position, allow data editing and save the data into an **.aep** file. The data is displayed in a dialog box that provides you with the following information:

- Mean Position
- Mean Height
- Mean Depth
- Mean Heading (True and Grid)
- Standard Deviations of the above Means
- Mean Line Tracking data (KP, EOL, Offline)
- Mean Waypoint Tracking data (Range, Bearing)

Also displayed is a scatter plot of the collected data, a spreadsheet of all recorded **Observations** including the **Residuals** of each observation and a **Used/Not Used** status indicator. Using the spreadsheet, you can manually look through all data and residuals, then remove an observation(s) and recalculate the mean position. The final **Mean Position** can then be saved to the **Working Log** (.**log**) file. The .**aep** file can also be saved with all edits intact.

Additionally, you can load fixes from a *.DAT event file or from a *.LOG manual event file.

The following sections detail all features and functions of the **Position Averaging and Editing Utility**.

Recording

As mentioned above, you can configure the **Position Averaging** utility to record real-time positions of any WinFrog vehicle. It is important to remember that the positions recorded are the chosen vehicle's **Tracked Offset** map position and these are filtered positions using the current **Working Geodetic Datum and map projection**. You should confirm all configuration settings before any data recording is initiated.

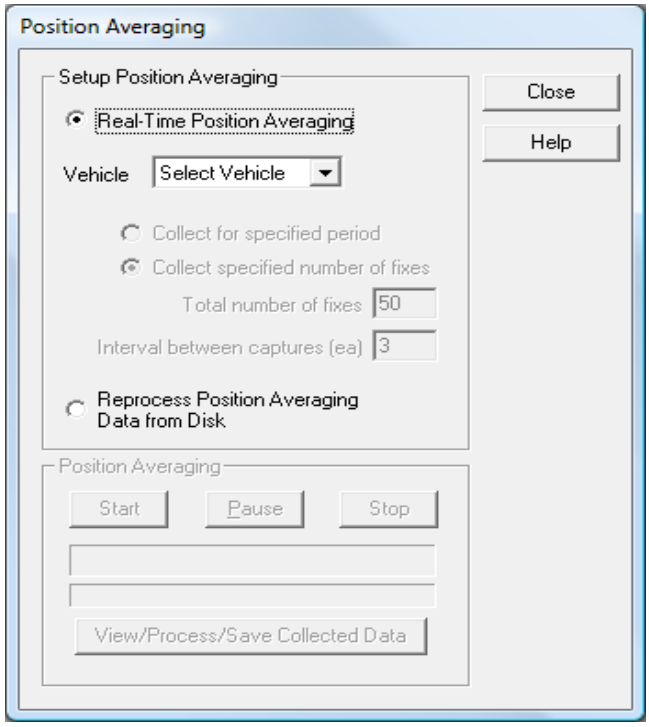
Also, because the **Position Averaging** utility can calculate a survey line and waypoint tracking

information, ensure that the correct survey line and waypoint are being tracked. It is not necessary to actually have a line or waypoint assigned.

If you want to load data from a file (AEP, LOG, or DAT) skip ahead to the section titled **To Load Data from Files.**

To Record Fixes and Compute a Mean Position

1 From the **Utilities** menu, select **Position Averaging**. The **Position Averaging** dialog box is displayed. This is a modeless dialog and therefore it is not necessary to close it in order to access other WinFrog windows and options. As a result, the data collection can be configured and executed without impeding normal WinFrog operation. It is important to note that the sampled data will be deleted when the dialog is closed. You can save the data from the view dialog accessed by clicking the **View/Process/Save Collected Data** button. You will be warned accordingly if you close the Position Averaging dialog without first viewing the data.



2 In the **Setup Position Averaging** portion of this window, ensure that the **Real-Time Position Averaging** radio button is selected.

3 Select the appropriate vehicle from the dropdown menu. This will enable the appropriate controls.

4 Select which of the two methods you want to collect the data by, either over a period of time or a given number of fixes. The text associated with the edit boxes will change depending upon your selection.

Enter either the **Total time** (in minutes) over which to record the data or the **Total number of fixes** to record, in the provided entry window.

5 Enter an **Interval** (in seconds or fixes), to elapse between actual position fixes before the

next sample is captured, in the provided entry window. This defines the interval between positions that will be captured.

6 Select the **Start** button at the bottom of the window. The recessed text section below the **Start** button will display the current number of samples captured. Below this, a progress bar will fill with blue sections as the data recording progresses.

7 If you wish to pause the data collection you can click the **Pause** button. This button then changes to **Resume,** which can be clicked to continue collection. Pausing does not affect the total sample time nor total number of fixes. Alternatively, you may click the **Stop** button**,** which will cause data collection to finish prematurely and the **View/Process/Save Collected Data** button to become enabled.

8 Once the specified time has elapsed or the number of fixes have been captured, the progress bar will clear and the **View/Process/Save Collected Data** button will be enabled**.**

9 Click the **View/Process/Save Collected Data** button and skip to the section below **To Calculate and View the Position Data**. Note: When the Position Averaging dialog is closed the data is deleted, thus you must view and save the data if desired. If you close the dialog and WinFrog detects that you did not view data collected you will be warned that the data will be lost.

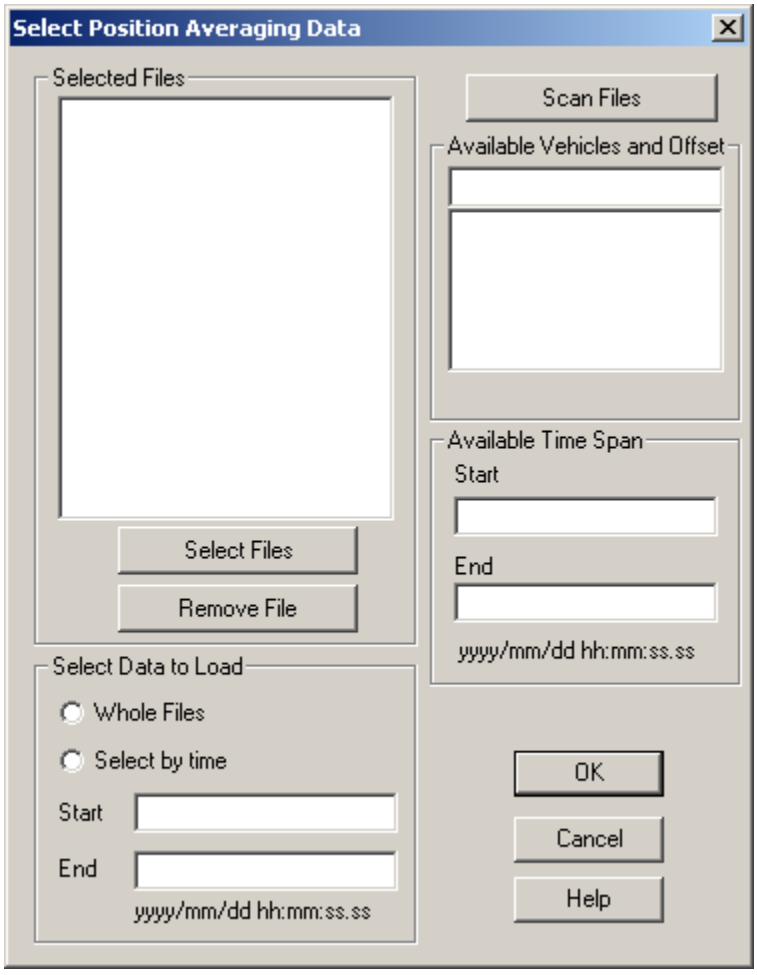
Note: Data is collected with respect to a vehicle. Once the data collection has stopped you cannot add to the set. You can however save the multiple sets in separate files then load them into one set; see the following section.

To Load Data from Files

This feature allows you to load data from a DAT event file, LOG manual event files, or a Position Averaging AEP file. Several of these files can be loaded at once.

1 From the **Position Averaging** dialog box, select the **Reprocess Position Averaging Data from Disk** radio button.

2 Click the **Load** button.(Note: this is the same button that was previously labeled **Start**). The following dialog will open.



3 Select all the files that you want included in the mean position calculation. You can also remove a file.

> ***NOTE:*** The purpose of this feature is for long-term stationary operations (such as drilling). It allows the use of event (DAT file) that may be recorded at, for instance, one-minute intervals over a day or two. These events may be recorded in several files. However, this dialog allows you to select any DAT, LOG, or AEP file thus you must keep track of the files with respect to where and when the data was recorded, which vehicles were present and their reference offset used. The scan button will scan the files for the vehicles and their offset and you can select which of these you want the data for, but if the same vehicle was recorded in two different files in two different locations the results will be biased. Also, once the mean position is computed the results can be saved to the working LOG file. So when loading a LOG file be sure that it contains the expected data. You can flag individual records so they are not used in the calculation; see below.

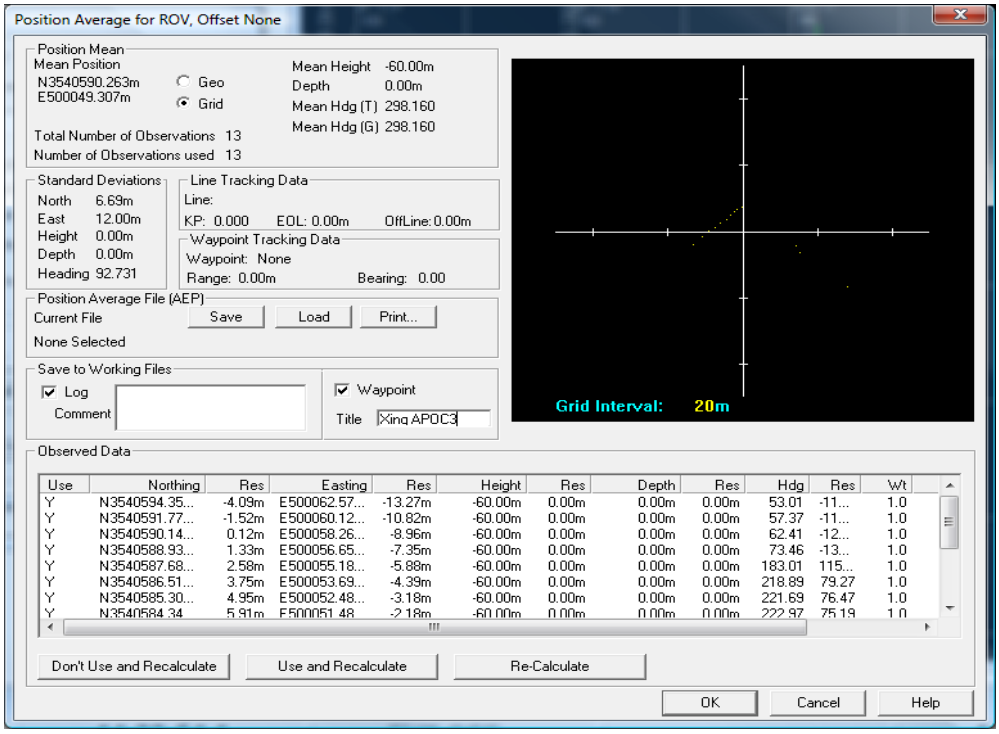
4 Scan the files for the vehicles and their offset. After which select a vehicle and offset. The time span of all the data will be reported.

5 Select how you want the data loaded. Either all the data for the selected vehicle and offset or load by time. Note the time and date format.

6 Once completed click OK and the dialog in the next section will open.

To Calculate and View the Position Data

1 The **Position Averaging and Editing** dialog box now appears, as seen below.



2 The **Position Mean** portion of this window displays the **Mean Position**, as well as **Mean Height, Mean Depth,** and **Mean Heading (True and Grid)** information.

3 The **Standard Deviations** portion of this window displays the calculated **Standard Deviations** for the **Mean Position**, **Mean Height**, **Mean Depth,** and **Mean Heading** information.

4 The **Line Tracking Data** portion of this window displays the **Name** of the **Tracked Survey Line** and the calculated **Average KP (Kilometer Post)**, **EOL (End of Line)**, and **Offline** distances.

5 The **Waypoint Tracking Data** portion of this window displays the **Name** of the **Tracked Waypoint** and the calculated **Average Range** and **Bearing** to the **Tracked Waypoint**.

6 The **scatter plot** is a graphical display of the distribution of the used positions centered on the mean position. The axes are automatically scaled to encompass all used data**.**

7 The **Observed Data** portion of this window displays the following information, as found from left to right.

Use	**Y** - indicates that this observation is used in the mean calculations **N** - indicates that this observation is **not** used in the mean calculations **Note:** see the section immediately below for more information on the **Used** status.
Northing	the **Grid Northing** of this observation

res	the residual of this **Northing observation** (i.e. the difference between this observation and the calculated **Mean Northing**)
Easting	the **Grid Easting** of this observation
res	the residual of this **Easting observation**. (i.e. the difference between this observation and the calculated **Mean Easting**)
Height	the **Height** of this observation
res	the residual of this **Height observation** (i.e. the difference between this observation and the calculated **Mean Height**)
Depth	the **Depth** of this observation
res	the residual of this **Depth observation**. (i.e. the difference between this observation and the calculated **Mean Depth**)
Hdg	the **Heading** of this observation
res	the residual of this **Heading observation**. (i.e. the difference between this observation and the calculated **Mean Heading**)
Wt	the **relative weighting** accuracy value of this observation
Time	the date and time of this observation (mm-dd-yy hh:mm:ss.ss)

8 The **Save to Working Files** portion allows you to save the mean position to the log and/or waypoint working file. The data is saved if the box is checked when the dialog is closed, which can result in multiple records of the same point in these files. If a waypoint title is not entered, the resulting waypoint in the file will be titled (No Name).

To Edit and Re-Calculate Average Position Data

This section details the steps required to edit the data used to determine the mean position. The editing of data should only be undertaken by qualified personnel who understand the repercussions of their actions. By default, WinFrog uses **all** observations in its calculation of **Mean** values. If the **data** has been questionably altered (i.e. records have been disabled that perhaps should be included), simply re-enable all the observations.

1 The **only** way to modify the results in the **Position Averaging** window is to disable points from the **mean calculations**. This is typically based on the residual value for that observation. A high residual value suggests that this observation does not agree with the other observations used to calculate the mean value.

To disable an observation (all of the data in the record), select the desired row under the Use column and click the **Don't Use and Recalculate** button; the status displayed under the **Used** column changes to **N** and the mean position and other values are automatically recalculated. (You can also use the **Shift** [contiguous] or **Ctrl** [discrete] keys to select multiple rows).

Note: You cannot remove part of an observation record such as a **Depth** or **Easting** that has a high residual.

2 Observations can be re-instated into the data set for the calculation by simply highlighting the desired row and clicking the **Use and Recalculate** button; the mean position and other values are then automatically recalculated. (You can also use the **Shift** [contiguous] or **Ctrl** [discrete] keys to select multiple rows).

3 Clicking the **Re-Calculate** button will recompute the mean position and other values using the current points whose **Used** status is **Y** (yes). This is now largely redundant given the recalculate functionality of the Use and Don't Use buttons.

To Print and Save Average Position Data

Once the **Mean** and **Standard Deviation** values have been obtained, you can print the results and also save the information to file.

1 To **Print** the **.aep** file (including both **Observations** and **Results**) in its current state, click the **Print...** button in the middle right section of the dialog box.

2 To save the **Mean Position** to the **Working Logs (.log)** file, check the **log** box and enter a **comment**. When **OK** is clicked to close the **Position Averaging and Editing** window, this **Comment** and **Position** are written to the **Working Log (.log)** file.

3 To save the data to an .aep file, click the **Save** button to bring up the **Select Position File** dialog box. Enter the **name** and browse to specify the location where the new .aep file will be created. Click **Save** to create this file and return to the **Position Averaging and Editing** dialog box.

Note: Details regarding the format of the records logged to the .aep file are given in Appendix B, File Formats. Please refer to records 1001, 1002, 1510, 511, and 1010. Records 1001, 1002, 1510, and 511 contain summary, waypoint, line tracking, and line information respectively. The 1010 records contain the position data. Please note that records 1510 and 511 are only included in the .aep file if line tracking is enabled for the respective vehicle at the time of data collection.

Loading Single AEP Files

1 The load button on this dialog only allows you to load a single AEP file. Doing this will delete all the current data so be sure to save it first.

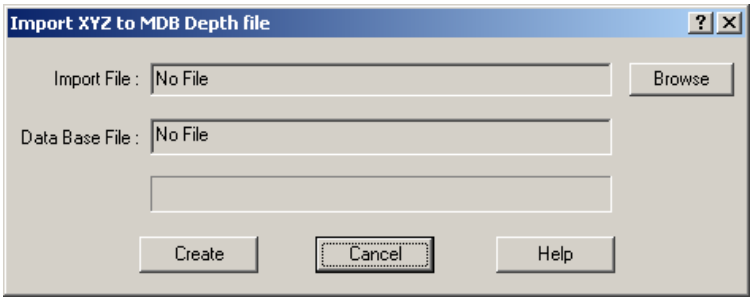
2 If you wish to load multiple files you need to close this dialog and use the **Positioning Averaging** dialog. See the section **To Load Data from Files** above.

Import Bathymetry

This WinFrog utility provides the ability to convert bathymetry in an ASCII x,y,z formatted file into a WinFrog soundings database file that can be displayed in the WinFrog Profile window.

The ASCII file to be imported is a simple format consisting of a header block and comma-delimited data records. It is important that the header block is completed with relevant survey information, and in particular, care should be taken to enter the correct information for Datum Name, Ellipsoid Name, General and Specific Projection Names, and Units. The ASCII file format is described below.

To import bathymetry data from an ASCII file, select **Utilities > Import Bathymetry**. This will open the Import File dialog shown below.



Browse for the ASCII import file. When this file is selected, the Data Base File will be set to the same name and directory as the ASCII import file with an .mdb extension. Click **Create** to build the database file. If the database file already exists, a warning is displayed with the option to overwrite the existing file or not. If no is selected, a new name for the database can be entered.

The file header is checked to ensure that the geodesy is compatible with that configured for the current project. The ASCII data bathymetry file header format is specified below. A message displays with information on the status of the import operation when the MDB file import is completed. Upon successful importation, the MDB file can then be loaded for display in the Profile window.

ASCII Bathymetry Header Format (with example data)

```
* Winfrog uses the header to check the geodesy and units
* Recognized units
* meters (m)
* feet (ft)         = .3048 m;
* US survey feet (ft) = (12./39.37)m
* fathoms (fm)       = (.3048*6)m
* Imperial Feet      = .3047994718 m
H,Date,              10/10/00,
H,Company Name,      Racal NCS,
H,Project Number,    2236,
H,Project Description, TLP Installation - Phase 1,
H,Survey Area,       Green Canyon 237,
H,Client,            McDermott,
H,Party Chief,       Travis John,
H,Vessel,            Seaway Rover,
H,Line Name,         1,
H,Ellipse Name,      Clarke 1866,
H,Datum Name,        NAD 27,
H,Projection General,  U.S. State Plane 1927 (SPCS 27),
H,Projection Specific, Texas South Central,
H,Grid  Units,       US survey feet,
H,Depth Units,       meters,
H,DAL   Units,       meters,
```

ASCII Bathymetry Record Format

Field	Data	Format	Comment
1	Easting	f.d	Grid units defined in Header
2	Northing	f.d	Grid units defined in Header
3	Depth	f.d	Depth units defined in Header
4	KP	f.d	DAL units defined in Header