WinFrog Device Group:	**ROV**
Device Name/Model:	**Nereus ROV**
Device Manufacturer:	
Device Data String(s) Output to WinFrog:	See Telegram Specification section below.
WinFrog Data String(s) Output to Device:	See Telegram Specification section below.
WinFrog Data Item(s) and their RAW record:	PLOWDATA 490 HEADING 409 ROVDATA 496 ATTITUDE 413 ROV REF VEH NONE

DEVICE DESCRIPTION:

The Nereus ROV is a jetting ROV. This is a driver designed to read various data from the Nereus ROV as well as to output specific data to the Nereus system (refer to the Telegram Specification section below for details on data received/output from/to the Nereus system).

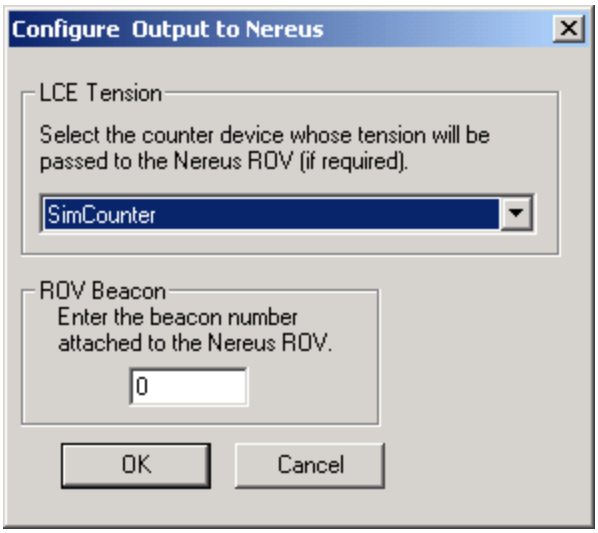
DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

Serial
Configurable Parameters

WINFROG I/O DEVICES > CONFIGURE DEVICE:

This device must be configured at the I/O Device window level. In the I/O Devices window, click the device name to select it, then right-click and select Configure Device. The Configure Output to Nereus dialog box appears, as seen below.



If tension data is to be sent to the Nereus, select the tension data source from the drop down menu. Also in this dialog box, enter the code number of the USBL beacon used to position the Nereus. WinFrog uses this code number to output the X,Y,Z data to the Nereus system.

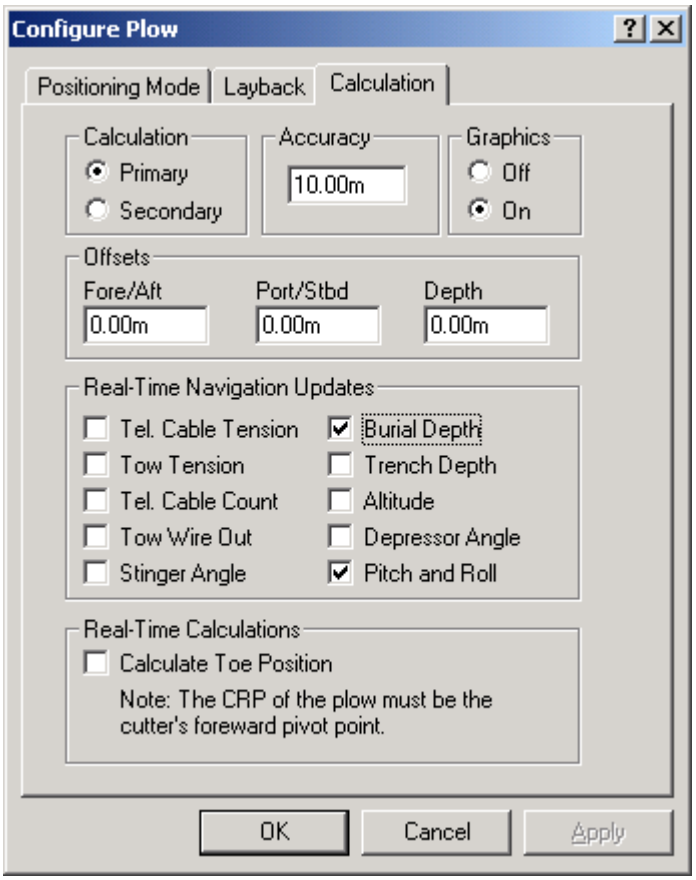
WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:

Adding the Nereus ROV device creates five data items: PLOWDATA, HEADING, ROVDATA, ATTITUDE and ROV REF VEH. Once the data items have been added to the vehicle, they must be edited to suit the application.

Data item: ROV, Nereus ROV, PLOWDATA

This data item is used to read specific data from the Nereus ROV including cable burial depth as well as ROV pitch and roll.

In the vehicle's device list, highlight the PLOWDATA data item and click the Edit button to open the Configure Plow dialog box as seen below. Since acoustic devices such as USBL are used to calculate positions for the Nereus ROV, the options in the Positioning Mode and Layback tabs do not apply to this data item. These options only apply to towed vehicles that rely on layback calculations to derive positions. As mentioned above, this data item is only used to read specific data from the Nereus ROV, therefore, the only options used are found in the Calculation tab as seen below.



Calculation tab

Calculation

Primary – when selected, the layback described above will be used to calculate this vehicle's position, which will be assigned to it. Since this ROV's calculated position is not derived from a Layback calculation, select Secondary.
Secondary – when selected, this device will not determine this vehicle's position. However, this will allow this data item to read and record relevant data as selected from the Real-Time Navigation Updates section as described below.

Accuracy

This device does not use this option.

Graphics

This device does not use this option.

Offsets

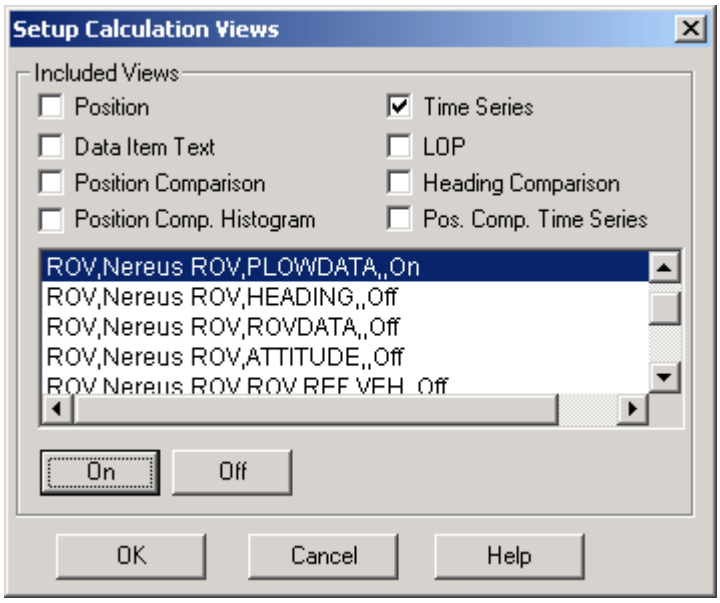
This device does not use these options.

Real-Time Navigation Updates
The Nereus ROV system has the ability to provide real-time data updates via an umbilical. The Decoded data tab in the I/O Devices window will indicate what data is updated in real-time for each device. You should only select the checkboxes for data output by the device, as leaving these checkboxes selected causes data to be assigned to the vehicle. If the device does not output a particular type of data, 0 will be assigned for each item left selected and this may cause values from other devices to be overwritten. For the Nereus ROV device, the only options that should be selected are the Burial Depth and Pitch and Roll options.

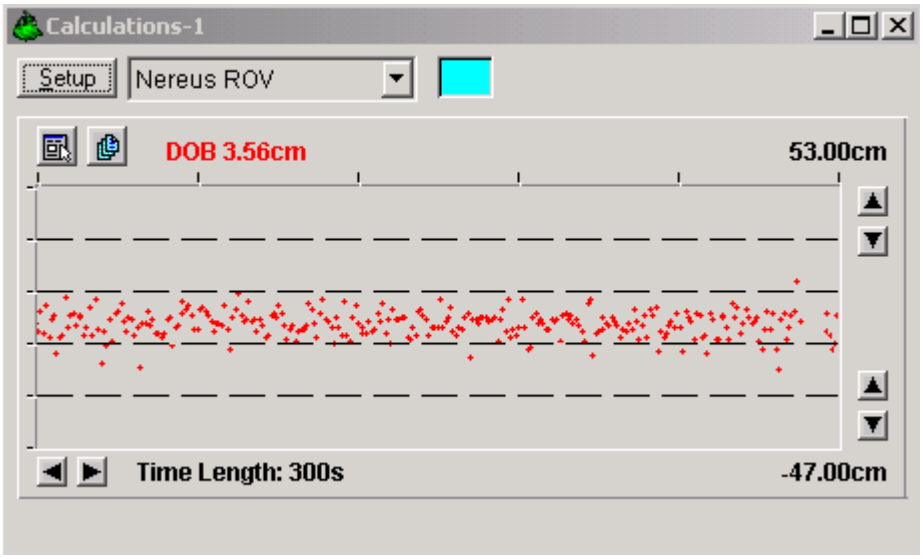
Real-Time Calculations
This device does not use this option.

The results of the some of the above configurations can be viewed in a Calculations window. If, for example, you wish to graphically display the burial depth in real time, the following steps would be performed.

To display the Calculations window, select View > Calculations from the main menu. Select the appropriate vehicle from the dropdown list and click the Setup button, which opens the Setup Calculation Views dialog as seen below.

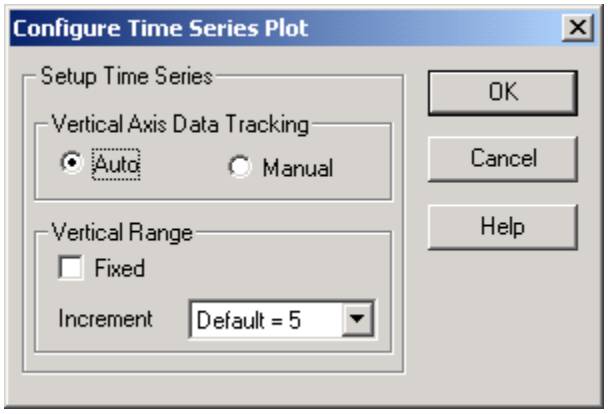


Select **Time Series** and turn on the data item **ROV, Nereus ROV, PLOWDATA** by highlighting it and clicking the **ON** button as seen above. Exiting with OK will display the Calculations window as seen below.



The length of the plot (in seconds) can be increased or decreased by using the left/right arrow buttons in the bottom left hand corner of the window. Using the up/down arrows found on the right hand side of the Time Series can change the vertical scale of the burial depth.

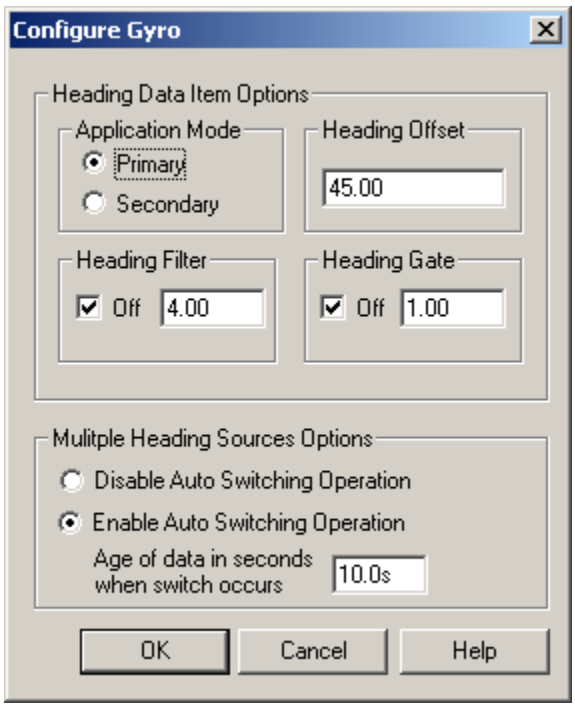
Clicking on the  button opens the Configure Time Series Plot dialog box as seen below.



From this dialog you can configure the presentation of the Time Series window.

Data item: ROV, Nereus ROV, HEADING

If the heading data from the Nereus ROV is deemed to be accurate, this data item can be used to orient the ROV. Highlight this data item in the vehicle's device list and click the Edit button to open the Configure Gyro dialog box as seen below.



Heading Data Item Options:

Application Mode(Primary/Secondary):

Set the type of calculation to Primary or Secondary by selecting the appropriate radio button. Devices set to Primary are used to provide the vehicle heading information. Devices set to Secondary are simply monitored, and are not used in the vehicle's calculations.

Note that WinFrog supports automatic switching from a designated Primary to a Secondary in the event that data from the Primary fails (see Multiple Heading Sources Options).

Heading Offset:

A correction value (as determined from a gyro calibration) can be input in the Heading Offset box. This value is added to the heading value from the device to provide a corrected heading for the vehicle. Note that positive or negative values can be entered.

Heading Filter/Heading Gate:

The Heading Filter is used to "smooth" heading values used by the vehicle. The value entered in the Heading Filter indicates the number of headings that will be used to predict the next heading value. The larger the value entered, the "heavier" the filter will be – i.e. the slower the vehicle's heading will respond to changes.

The Heading Gate defines a tolerance value to limit the use of anomalies in gyro readings. If the next observed gyro value received falls outside the specified

range of predicted values (i.e. plus or minus the entered value), the value will not be used.

Multiple Heading Sources Options:
WinFrog supports automatic switching from a designated Primary source to an alternate Secondary source in the event that the Primary fails. The first Secondary source to receive data after the Primary has failed becomes the alternate Primary providing the heading for the vehicle. When the designated Primary is detected as active again, the alternate Primary source reverts to Secondary and the designated Primary provides the heading data to the vehicle.

If an alternate Secondary fails and there are additional Secondary sources, it in turn is detected by the first of the remaining operational Secondary sources to receive data after the failure, at which time this Secondary becomes the alternate Primary.

Note that this option is only available if more than one HEADING source is associated with the respective vehicle. Changes made to the Auto Switching options for any one of the HEADING data items are automatically assigned to the others upon exiting this dialog with OK. If the Auto Switching option is enabled and the respective HEADING source has been set to Primary, all others are automatically set to Secondary. The exception to this is when configuring a WinFrog Controlled Remote (WinFrog with a Remote module) from a Controller. In this case, changes made to one HEADING source are not automatically made to other HEADING sources. The operator must explicitly make them for each HEADING source.

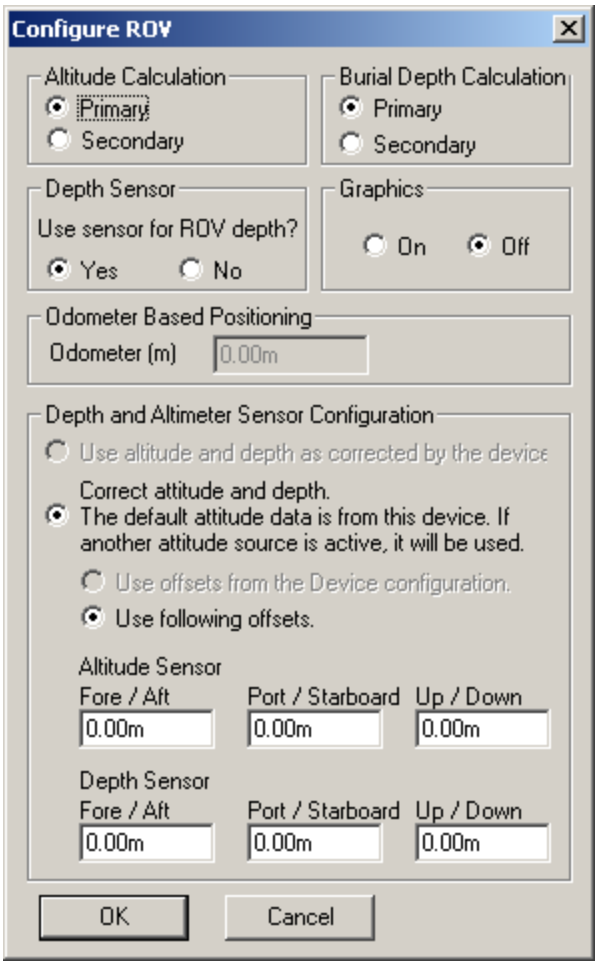
This option is not available in the WinFrog Remote package.

Disable/Enable Auto Switching Operation:
Select the mode you wish to operate WinFrog.

Age of data in seconds when switch occurs:
Enter the age of data that is permitted before the source is considered to have failed.

Data item: ROV, Nereus ROV, ROVDATA

This data item is designed to read specific ROV type data from this device. Highlight this data item in the ROV's device list and click the Edit button to open the Configure ROV dialog box as seen below.



Altitude Calculation:
Primary will result in this vehicle's altitude being determined from the observed altitude value found in the string from this device minus the altitude offset also found on this dialog. This value can be displayed in the Vehicle Text window as ROV Alt.

Secondary will result in no calculation or assignment of the vehicle's altitude from this device. The raw data is still always recorded.

Burial Depth Calculation:
Primary will result in the burial depth (if applicable) being determined from the observed burial depth value found in the string from this device. This value will be assigned to the vehicle.

Secondary will result in no calculation or assignment of the burial depth from this device. The raw data is still always recorded.

Graphics:
Select the On radio button to display the device name and a square at the location of the hydrophone, within the Graphics and Bird's Eye windows.

Use sensor for ROV depth:
Selecting the Yes radio button will cause the depth of this vehicle's CRP to be determined from the observed depth value found in the string from this device plus the depth offset below. This vehicle's elevation will be the negative of this value. This value will be used to calculate the bottom depth.

The bottom depth will be determined as:
Observed depth + Depth Offset + observed altimeter - altitude Offset
The offsets (see below) are not corrected for pitch and roll when determining the water depth.

Selecting the No radio button will result in this device obtaining the depth of the CRP from the vehicle itself, as opposed to assigning it to the vehicle as above. You must assign another device to determine the depth of the vehicle (e.g. USBL and assigning it as the source for depth).

Note: The observed altimeter value is always used for depth determination regardless of the prime/secondary altimeter setting.

Odometer Based Positioning:
This is only used by the ROV device Sonsub Innovator3.

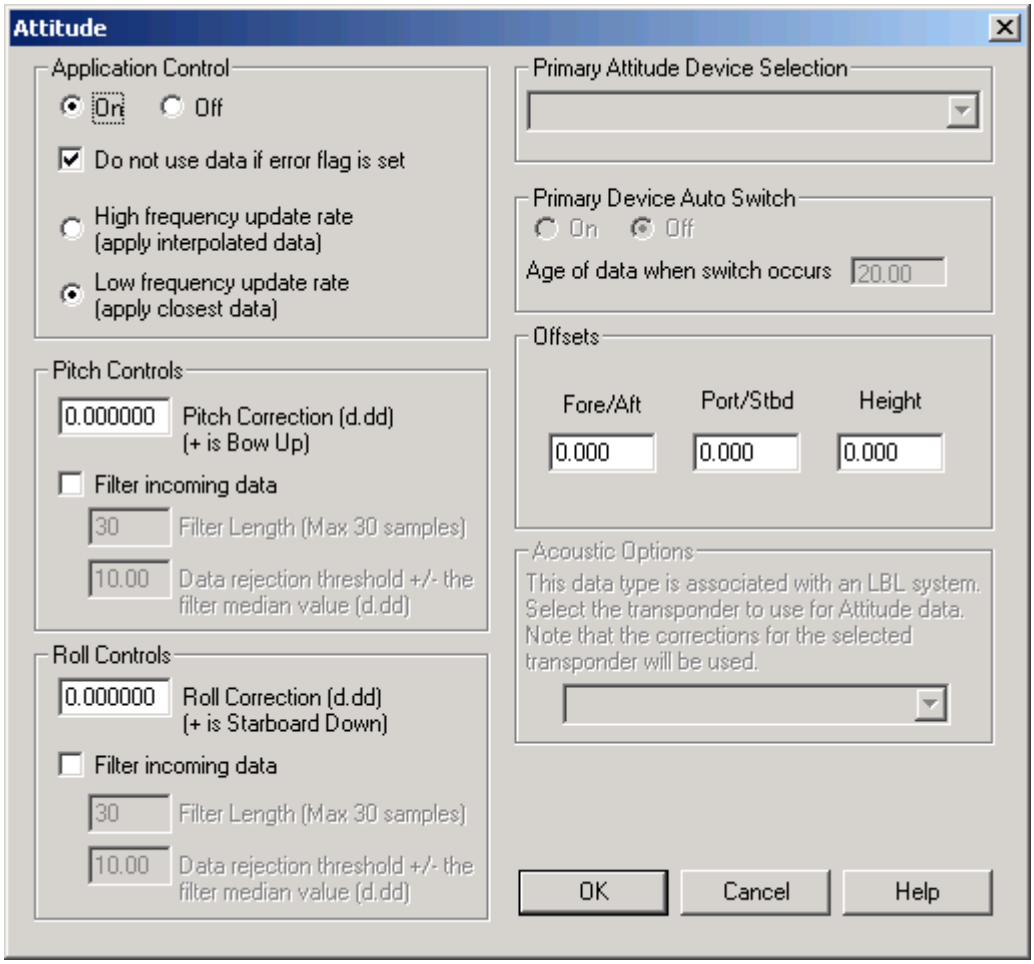
Depth and Altimeter Sensor Configuration:
For all ROV devices except Deep Blue ROV, the radio button settings cannot be changed. See the Deep Blue ROV device documentation for information on setting these radio buttons.

Vertical offsets of the altitude and depth sensors, relative to the CRP, can be entered here. The Altitude Offset is the vertical distance (positive up) from the ROV's CRP to the acoustic beacon tracking the seafloor. The Depth Offset is the vertical distance (positive up) from the ROV's CRP to the sensor that provides depth information of the ROV.

The offset position will be corrected for pitch and roll then the vertical offsets will be applied to determine the depth of the ROV and height of the ROV above the bottom.

Data item: ROV, Nereus ROV, ATTITUDE

If the pitch and roll data is to be used then this data item can be added to the ROV's device list. Highlight this data item in the vehicle's device list and click the Edit button to open the Configure Gyro dialog box as seen below.



Attitude
By default, the sensor mode is off, meaning that data from the device will not be used in the vehicle's calculations. To turn the sensor on, and begin using the inclination corrections in the position output, click the 'On' radio button.

Error flag testing
The error flag check box is applicable to those devices that output a code indicating the data is either good or bad. If checked and the device supports such a code in its telegram, WinFrog will look at the code and if the data is indicated as bad, WinFrog will not use the data.

Sensor Update Frequency Rate
If the associated attitude sensor has a high frequency update rate (e.g. 10Hz and higher) it is appropriate to extract attitude data for application by either interpolating or extrapolating for a given epoch. In this case, the *High frequency update* option should be selected. Some attitude sensors have slow update rates, in particular those installed in acoustic transponders that require interrogation. For these sensors interpolation/extrapolation can produce a bad value as there is insufficient information to determine the correct shape of the curve (aliasing). Thus the most

current attitude needs to be used. In this case, select the *Low Frequency update* option. This option applies to the use of the attitude data by the following data items:

- POSITION
- ELEVATION
- ALTITUDE
- XPONDER
- LBL TRANSCEIVER
- PROFILE

Pitch and Roll
There are two control groups, one for each of pitch and roll. Correction values can be added in this section of the window. The correction values (entered in units of degrees-decimal degrees) are added to the raw pitch and roll values received from the device before the data is applied to the vehicle's calculations. Ensure that entered values adhere to the sign convention used by WinFrog. You can verify that the corrections are entered properly by viewing the pitch and roll values in the I/O Device window and the Vehicle Text window.

Filtering
Additionally you may filter the incoming values to remove extraneous noise or spikes – check boxes are provided to switch this feature on or off. A filter length (up to 30 samples) and a threshold value (applied to the median of the samples in the filter to obtain lower and upper bounds) can be entered. Any pitch or roll values outside of the bounds are rejected and not used in the vehicle calculations, but will be recorded in the RAW files. If either one of pitch or roll is rejected, both values are ignored, although you may set up the filtering parameters for them separately. The status of the filters, including the current valid range for each of pitch and roll, and the percentage of values rejected, can be viewed in the calculations window, selecting the appropriate ATTITUDE data item.

> ***Important:***
> Do not enable filtering unless there is a high enough data rate (say 10hz) to correctly determine the shape of the curve. Essentially, if the low frequency update rate is selected above, do not enable filtering.

Primary Attitude Device Selection
If more than one attitude device is present, you may select one of them to be primary and the others to be secondary and allow WinFrog to automatically switch between them should the primary system stop sending data or has bad data. There must be at least two attitude data items added to the vehicle to use this feature. (Note: The attitude and offset data displayed in this dialog is for the attitude device corresponding to the data item that is being edited. Selecting a Primary Attitude Device from the drop down list does not affect these values for any attitude device in the list. Every attitude device needs to be set up for its own corrections and offsets.)

Primary Device Auto Switch
Select the On radio button to turn on this feature. Then enter the time out time in the edit box. If WinFrog does not receive data from the primary attitude device, or if it receives bad data for this length of time, it will switch to the next secondary that is enabled and has good data.

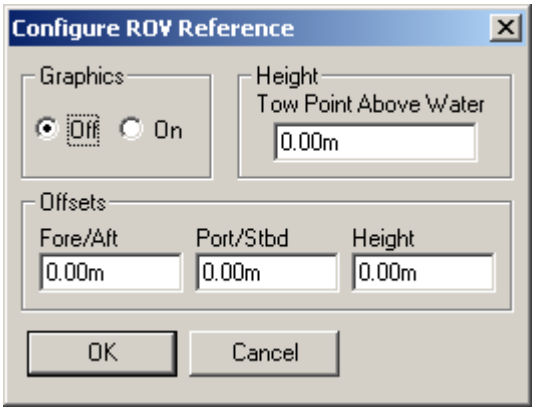
Auto Switch Feature Usage
To use this feature first turn the sensor on as described in the Attitude section above. Next, select the attitude device that you wish to be primary from the drop down list box. Then turn the primary device auto switch on and enter the time out time. Then edit all the other attitude data items and enable them in the Attitude group box. Note that the same selected primary will be displayed for all attitude data items; similarly, the automatic feature will be turned on and the time out time will be the same. However, you must individually enable each attitude device in the Attitude group box.

Offsets
These are not applicable in this case.

Acoustic Options
This applies to long base line acoustic transponders that have inclinometers. See chapter 17 for more information.

Data item: ROV, Nereus ROV, ROV REF VEH

This data item is added to the ship's device list to allow the ship's positional data to be included in the data telegram output to the ROV control system. Highlight the ROV REF VEH data item in the ship's device list and click the Edit button to open the Configure ROV Reference dialog box as seen below.



Graphics:
Select the On radio button to display the device name and a square at the location of the ROV, within the Graphics and Bird's Eye windows.

Tow Point Height:
The height of the tow point above water is added for layback calculations only if a towed vehicle model is used and is therefore not used by this device.

Offsets:
The X,Y,Z Offsets are applied from CRP to the Scanning Head Location. These values are set similar to values that would be applied to any device offset within WinFrog.

Note: It is advised to use the waterline as the vertical CRP reference when sub-sea positioning devices are employed

TELGRAM SPECIFICATION:

The Input data telegram (from the Nereus ROV) is in comma-delimited format and contains the following data;

Field	Data
1	unknown
2	unknown
3	umbilicalOut //m
4	umbilicalTension //T
5	speed //m/hr
6	new travel //m
7	total travel //total travel
8	burialDepth //mm
9	roll //deg
10	pitch //deg
11	unknown
12	subDepth // m
13	heading //deg

The Output data telegram (to the Nereus ROV) is in comma-delimited format and contains the following data;

shipLatDeg,shipLatMin,shipLatDecimalMin, shipLatDir, shipLonDeg, shipLonMin, shipLonDecimalMin,shipLonDir, vehSpeed, rovRefVehHeading, depth, toolLatDeg, toolLatMin, toolLatDecimalMin,toolLatDir, toolLonDeg, toolLonMin, toolLonDecimalMin, toolLonDir, toolDepth,vehRef-rovRefVehHeading, usblX,usblY, usblZ, lceTension, toolKP