

WinFrog Device Group:	GYRO
Device Name/Model:	OCTANS FOG Gyro
Device Manufacturer:	IXSEA 30 Avenue Amiral Lemonnier 78160 Marly Le Roi, France Tel: +33 1 30 08 98 88 Fax: +33 1 30 08 88 01 Website: www.ixsea.com
Device Data String(s) Output to WinFrog:	OCTANS STD 1 includes: <ul style="list-style-type: none"> • \$HEHDT • \$PHTRO • \$PHLIN* • \$PHSPD • \$PHCMP* • \$PHINF *Part of the message set, but not detected, decoded or used Or an operator selected combination of the following: <ul style="list-style-type: none"> • \$HEHDT • \$PHTRO • \$PHSPD • \$PHINF
WinFrog Data String(s) Output to Device:	None
WinFrog Data Item(s) and their RAW record:	HEADING 408, 409 ATTITUDE 413 INERTIAL 401

DEVICE DESCRIPTION:

The FOG gyro provides heading, attitude and speed (inertial) data to WinFrog for use as HEADING, ATTITUDE and INERTIAL data items respectively.

In addition to the standard application of the heading and attitude data, WinFrog is able to apply the inertial data in the position Kalman Filter to enhance results, generally for augmenting USBL positioning for ROV operations. The inertial data can also be used in a non-Kalman Filter application. In this case, the inertial data is used to update the vehicle's speed vectors and generate a new position.

For details on the application of the inertial data and the respective configuration of WinFrog, refer to the Speed Log and Inertial Devices section in the Special Applications chapter.

Note: For the correct application of the inertial data, the heading data is also required to be associated with the same vehicle.

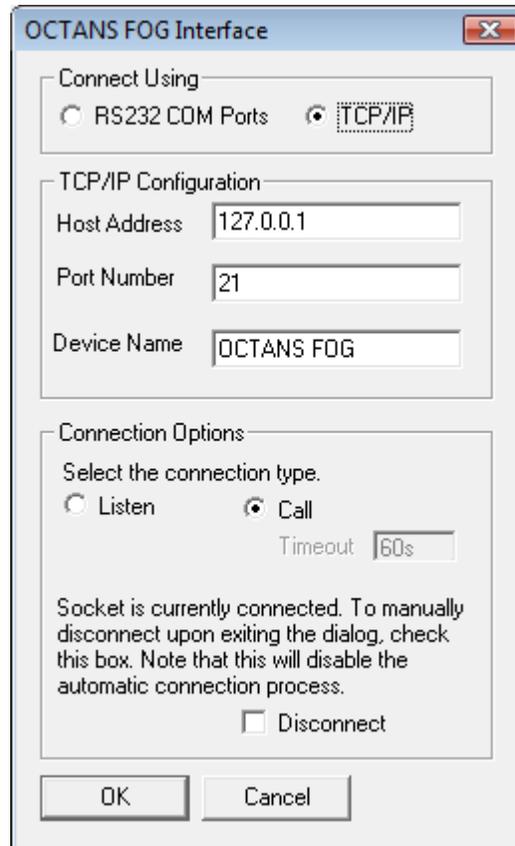
Note: All messages must include a NMEA type checksum or they are not decoded.

DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

The OCTANS FOG gyro device supports both serial and socket communications. If using a serial interface, it is recommended that the highest baud rate supported be used.

When adding the OCTANS FOG gyro device or selecting Edit I/O for the device, the following dialog appears in which you can select either RS232 or TCP/IP as the data communications protocol.



Connect Using:

Select either RS232 or TCP/IP as the data connection device. When you select RS232 and click OK, the standard Device I/O Parameters dialog opens in which you can select the Com port, baud rate, etc. Selecting TCP/IP enables the controls within this dialog pertaining to the connection settings.

TCP/IP Configuration:

If TCP/IP is selected, enter the IP address and port number of the OCTANS FOG gyro and the name that WinFrog is to display for this device. Select whether WinFrog is to **Listen** (default) for a connection or initiate the connection with a **Call**. If Listen is selected, upon exiting this dialog with OK, WinFrog immediately starts listening for a call from the respective device. If Call is selected, upon exiting this dialog with OK, WinFrog

immediately attempts to make the connection. In either case, WinFrog monitors the status of the connection or lack thereof, and automatically listens or calls as required. The socket connection status is displayed in the I/O Device Window.

If in Call mode and connected when this dialog is opened, an option to manually disconnect is available at the bottom of the dialog. If this is selected, upon exiting with OK, the connection is disconnected and the automatic connection process is suspended. If it is desired to re-connect, this dialog must be re-accessed and the option to re-activate the automatic connection process is available at the bottom of the dialog. Checking this option and exiting with OK causes WinFrog to immediately attempt to automatically connect. It is important to note that if the automatic call process is suspended due to exiting WinFrog, the suspended state is not saved and WinFrog will immediately start automatically attempting to connect when initialized.

RS-232 Serial Configuration:

If the RS-232 option is selected, click OK and the configuration proceeds with the standard serial communications configuration. The following are the default settings.

Baud Rate 19200
Data Bits: 8
Stop Bits: 1
Parity: None

WINFROG I/O DEVICES > CONFIGURE DEVICE:

The configuration of the OCTANS FOG device involves setting the messages to detect, decode and use.



Selected Messages

Selecting this option allows you to select which messages to look for and use from the following options:

\$HEHDT	provides heading data
\$PHTRO	provides attitude data
\$PHSPD	provides inertial data
\$PHINF	provides status information for heading, attitude and inertial data

If using the **Selected Messages** option, at least one of the first three messages must be selected or a warning will appear when trying to exit the dialog by clicking OK since only the first three messages provide navigation and positioning specific data that WinFrog can apply.

It is important to note that if the \$PHINF message is one of those selected, as is the case in the OCTANS STD 1 message set, once the \$PHINF message is received, the respective status flags are set and the data that has been received is made available to the vehicle. If the \$PHINF message is not detected and successfully decoded, no data is available to a vehicle.

If the \$PHINF message is not one of those selected, data is made available to the vehicles as soon as the respective message is received. However, without the \$PHINF message, WinFrog does not have information regarding the status of the data.

OCTANS STD 1

The OCTANS STD 1 message set is a standard OCTANS output setting. This message set includes the following messages in the order listed:

\$HEHDT	provides heading data
\$PHTRO	provides attitude data
\$PHLIN	provides surge data (not used)
\$PHSPD	provides inertial data
\$PHCMP	provides latitude (not used)
\$PHINF	provides status information for heading, attitude and inertial data

Selecting this option results in WinFrog detecting, decoding and making available for association with a vehicle, the HEADING, ATTITUDE and INERTIAL data items. Once the complete message set is received, i.e. once the \$PHINF message is received, the respective status flags are set and the data is made available to the vehicle. If the \$PHINF message is not detected and successfully decoded, no data is available to a vehicle.

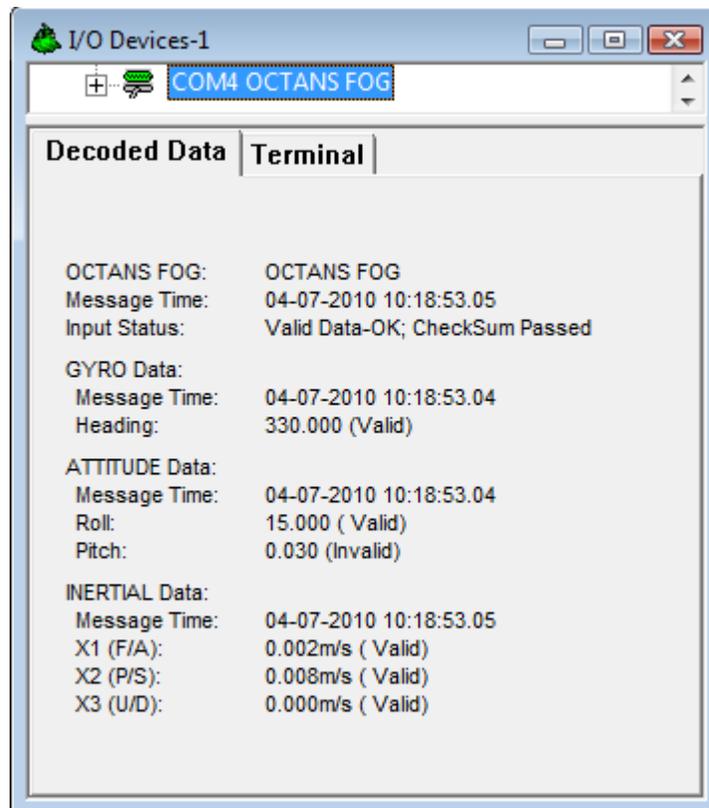
Note: When setting the respective data status:

- If the status of either or both the pitch and roll is not valid, the ATTITUDE status is set to be not valid.
- If the status of any combination or all of the accelerometer X1, X2 or X3 data (fore/aft, port/stbd, up/down axis) is not valid, the INERTIAL status is set to be not valid.

The operation of the device can be monitored from the I/O Device window.

- If configured for TCP/IP, the status of the connection is displayed.
- The date and time of the last message received, regardless of whether or not it is an expected message is displayed.
- The input status is displayed, e.g. if the data is valid (note, this is the message status, not the data status as provided by the \$PHINF message) and if the check sum was detected and correctly checked.
- If a message is expected, the time it is received and the decoded data is displayed. If the \$PHINF message is expected, the display includes the respective status, if it is not then no status information is available for display. If a message is not expected, it is listed as “N/A”.

Note: The sign convention of the port/starboard inertial data is opposite of that used in WinFrog. It is displayed as received in the I/O Device window and changed accordingly when passed to the vehicle. As a result, the sign convention for this data as displayed in the I/O Device and Calculation (Data Item Text) window are opposite.



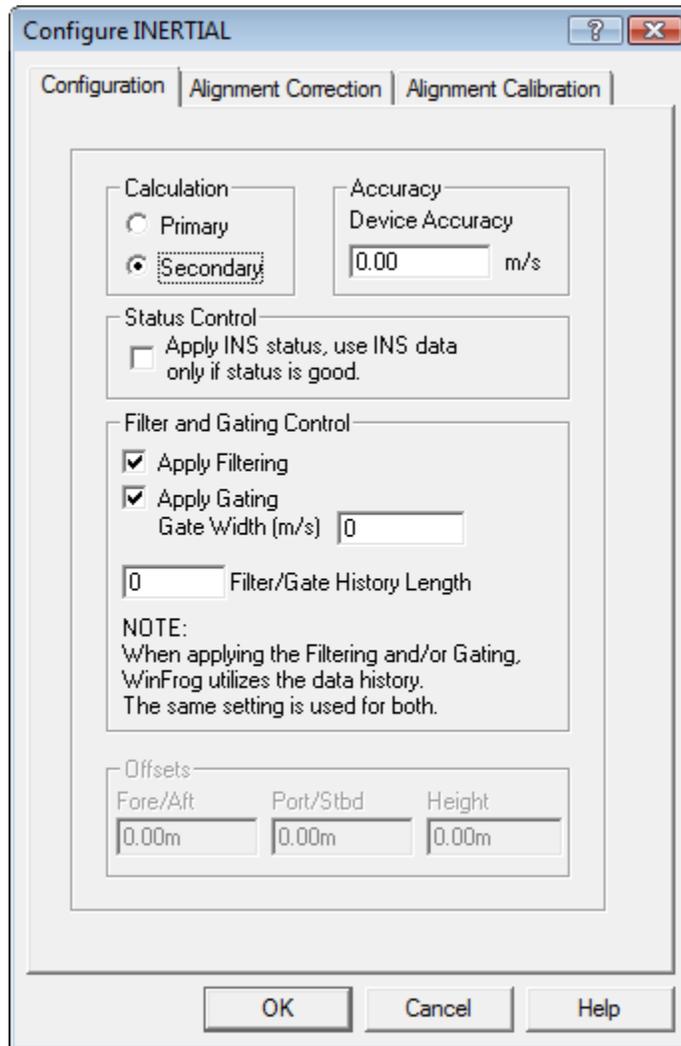
WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:

The OCTANS FOG Gyro device supports three data items: HEADING, ATTITUDE, and INERTIAL. Once the data items have been added to the vehicle, they must be edited to suit the application.

Data item: GYRO,OCTANS FOG,INERTIAL

The INERTIAL data item must also be edited once it is added to a vehicle's device list. Highlight the INERTIAL data item in the vehicle's device list and click the Edit button. The Configure INERTIAL dialog box appears as seen below.

Configuration Tab



Calculation

Set to Primary if you wish the inertial data to be used to assist the position of the vehicle.

Accuracy

Accuracy of the inertial data in m/s. The default is 0.2. For details, refer to the Speed Log and Inertial Devices section in the Special Applications chapter.

Status Control

If the respective device is providing data status (valid or not valid) for the INERTIAL data, selecting this option will result in WinFrog monitoring the data status and if it is set to not valid, the data will not be used. This includes not inputting it to the filter and thus potentially skewing the filter performance.

If this option is not selected, the data is used regardless of the data status.

Apply Filtering

Controls the filtering of the raw inertial data prior to its use. If selected, a central tendency filter (which seeks the median of the input values) is applied to the data using the number of samples defined in the *Filter/Gate History Length*, the result of which is used for input to the Kalman Filter.

Apply Gating

Controls the gating of the raw inertial data prior to its use in the Kalman Filter. If selected, the new data is tested against the data history based upon the number of samples defined in the *Filter/Gate History Length*. If it exceeds the gate limits, the data is rejected.

Gate Width

Defines the gating limits in m/s, the value must be determined by monitoring the data.

Filter/Gate History Length

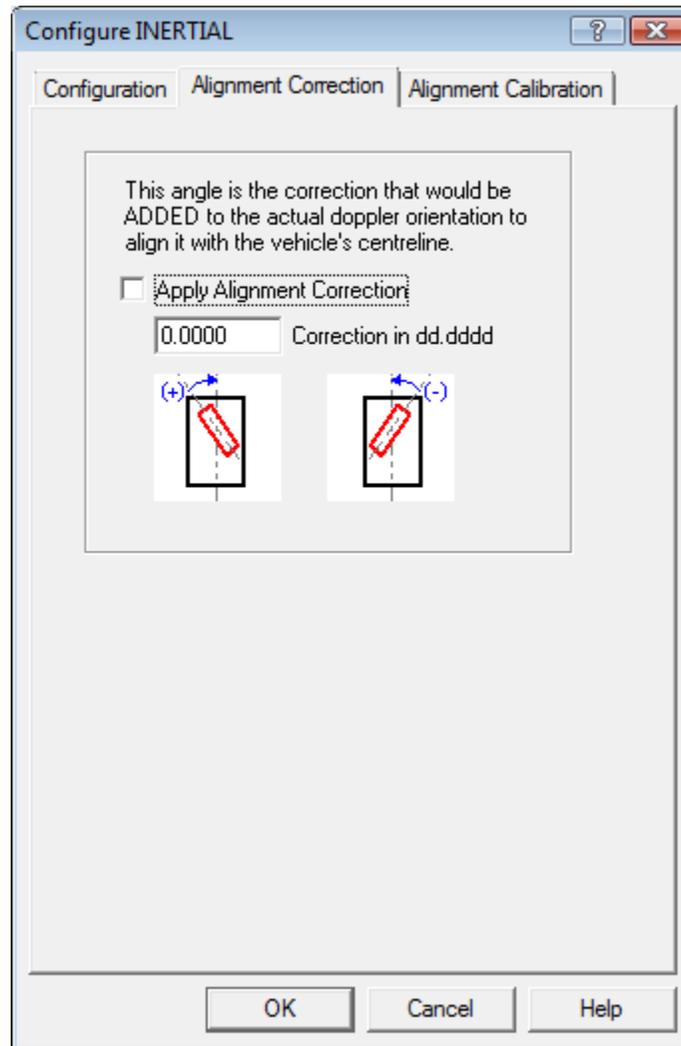
Defines the number of samples (minimum 3, maximum 30) to be used for both the central tendency filtering and the gating. This setting must reflect the application, environment and the inertial unit's performance. It depends upon balancing the need to smooth the data and the required responsiveness to real changes in the data. The longer the filter, the smoother the result, however, the result will be less responsive to the actual dynamics of the vehicle. The shorter the filter, the less smooth the results, and the more responsive to the actual dynamics of the vehicle.

It should be noted that if the *Apply Filtering* option is selected, but not the *Apply Gating* option, a default gating value of 10m/s is used for the purpose of utilizing the filtering function.

Offsets

Not applicable for this device.

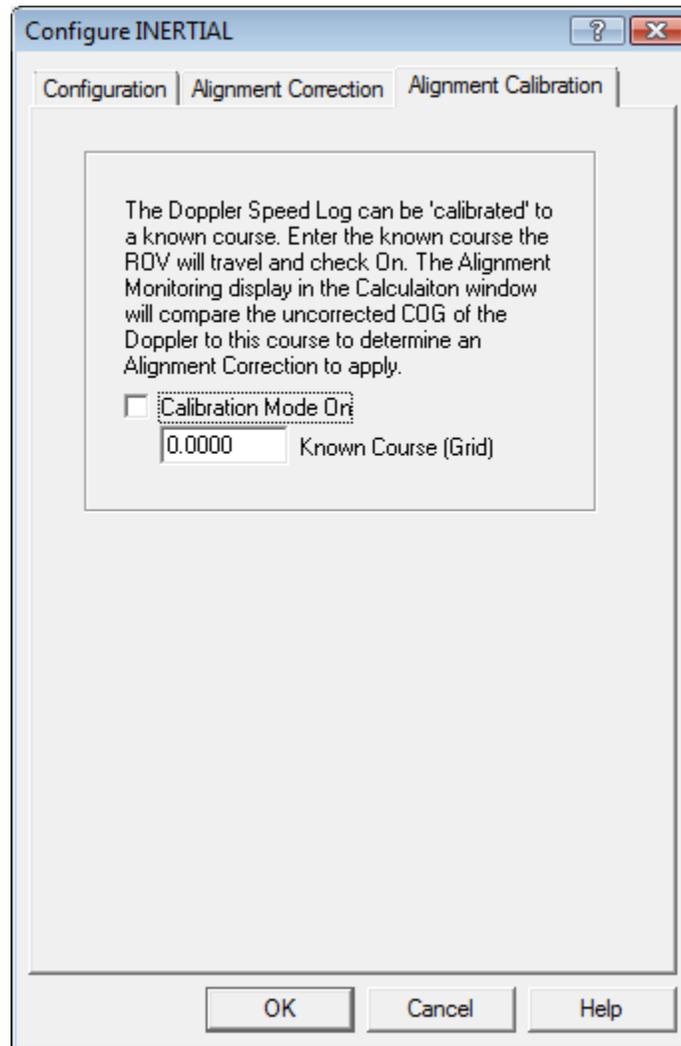
Alignment Correction Tab



Apply Alignment Correction

If the inertial unit has a known misalignment relative to the vehicle, select this option and enter the correction paying close attention to the sign convention as illustrated in the diagrams. The correction is used to translate the respective speed vectors before use.

Alignment Calibration Tab



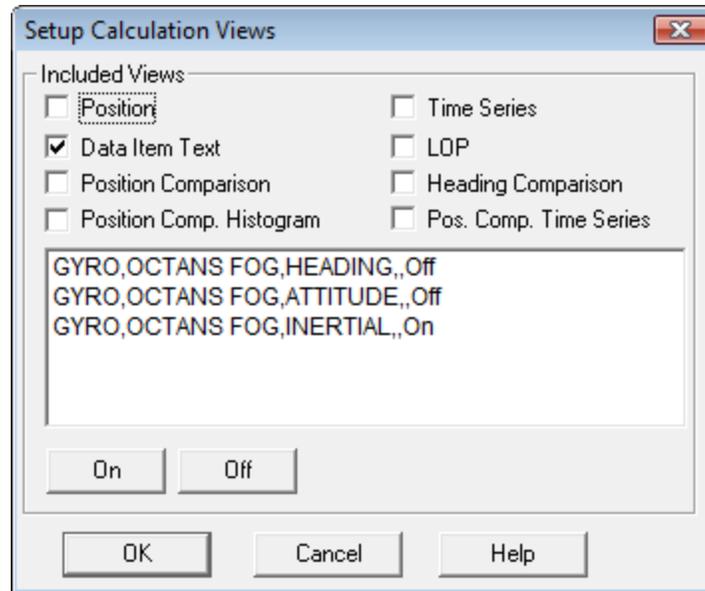
Calibration Mode On

The INERTIAL data item has a very basic alignment calibration option. If the inertial unit alignment is to be calibrated, select this option and enter the grid bearing of the course (e.g. pipeline) that will be followed during the calibration process.

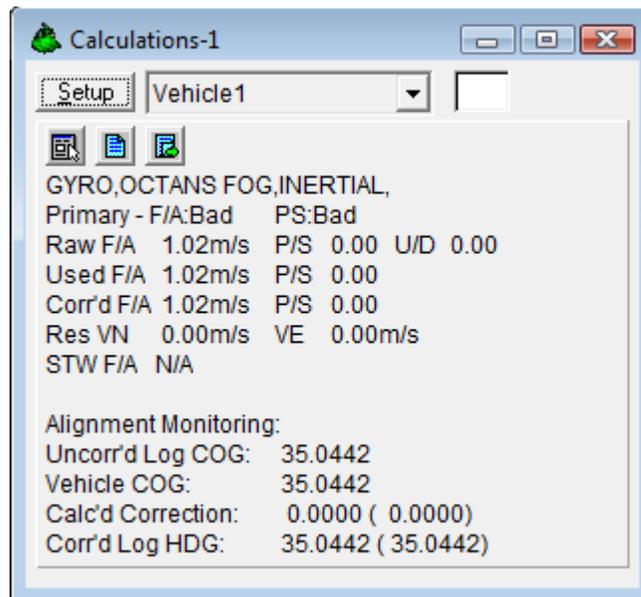
For details on this operation, refer to the Speed Log and Inertial Devices section in the Special Applications chapter.

Monitoring the Filtering and Gating of the INERTIAL Data Item

To monitor the actual use of the inertial data as attached to the vehicle, a Calculation window should be opened. In this window, select the appropriate vehicle from the dropdown list. Then use the Setup button to the left of the vehicle dropdown list to access the configuration dialog box shown below.



Select the *Data Item Text* checkbox, highlight the INERTIAL item and then click the *On* button. Exit with *OK*. The inertial data can then be monitored in this Calculation window, as shown below.



The information provided in this window is as follows:

- Data item and device name
- Calculation setting (Primary/Secondary) and the status of the F/A and P/S velocity data. The status can be *OK*, *Gate* or *Bad*. *OK* indicates that the data is valid and used. *Gate* indicates that the data has been gated and is not used. *Bad* indicates that the data as received from the device was not valid.
- The raw F/A, P/S and Up/Down Over Ground velocities in m/s.

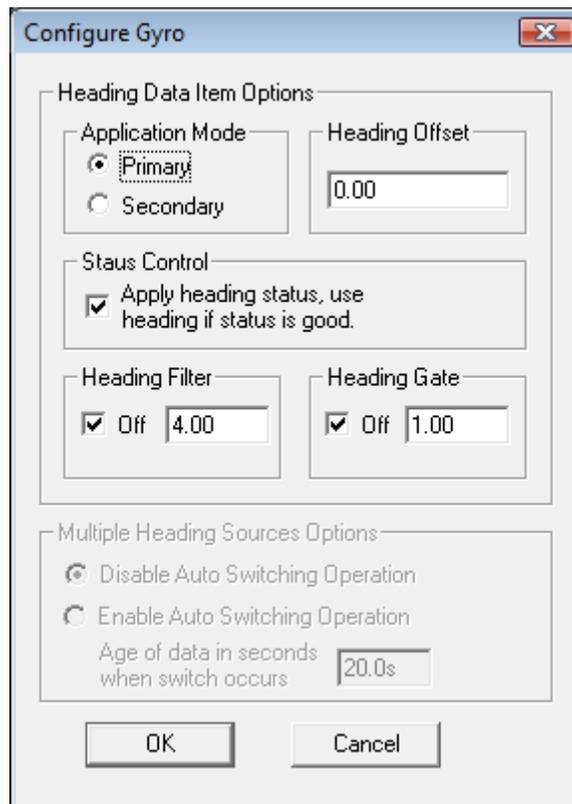
- The F/A and P/S velocities used in the Kalman Filter. If the inertial data filtering is turned on, these will be the results of the filter. If not, these will be the raw data repeated.
- The Northing and Easting velocity vector residuals in m/s. The residuals are the Kalman Filter results minus the used data.
- The *Speed Through Water* is not applicable.
- The Alignment Monitoring is also displayed here. For details on this, refer to the Speed Log and Inertial Devices section in the Special Applications chapter.

This window provides you with the means to observe the results of the gating and filtering. Changes to the INERTIAL data item configuration are required if excessive gating occurs or the filtered data does not reasonably represent the raw data.

It should also be noted that a time series plot of the *used* fore/aft, port/stbd, up/down velocities and the resulting combined velocity can be displayed by selecting the *Time Series* checkbox in the Calculation window configuration dialog box.

Data item: GYRO,OCTANS FOG,HEADING

The HEADING data item must also be edited once it is added to a vehicle’s device list. Highlight the HEADING data item in the vehicle’s device list and click the Edit button. The Configure Gyro dialog box appears 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 gyro to provide a corrected heading for the vehicle. Note that positive or negative values can be entered.

Status Control

If the respective device is providing data status (valid or not valid) for the HEADING data, selecting this option will result in WinFrog monitoring the data status and if it is set to not valid, the data will not be used.

If this option is not selected, the data is used regardless of the data status.

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. You must explicitly make them for each HEADING source.

This option is not available in the WinFrog Remote package.

Disable/Enable Auto Switching Operation:

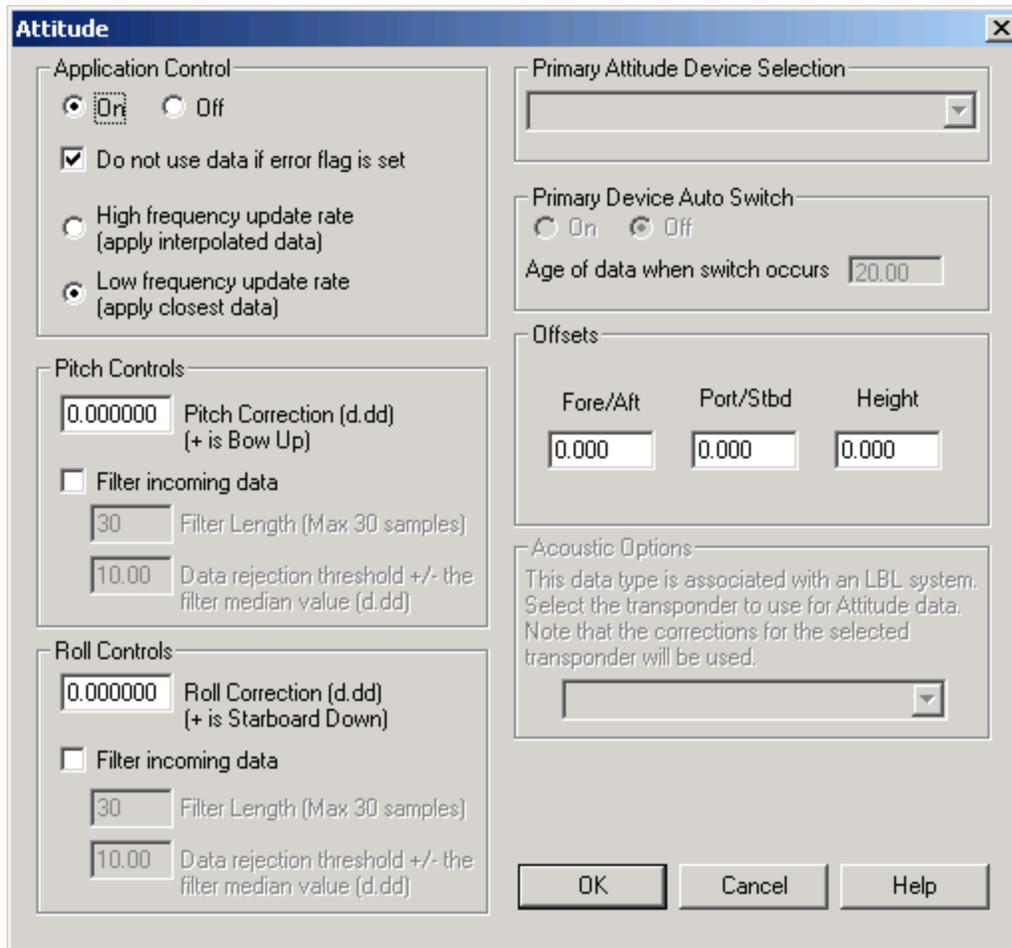
Select the mode you wish to operate WinFrog.

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: GYRO,OCTANS FOG,ATTITUDE

The ATTITUDE data item must also be edited once it is added to a vehicle's device list. Highlight the Attitude data item in the vehicle's device list and click the Edit button. The Attitude dialog box appears 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 checkbox 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 – checkboxes 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

Not applicable for this device.

Acoustic Options

Not applicable for this device.