

WinFrog Device Group:	GPS
Device Name/Model:	MHI NAV GPS
Device Manufacturer:	
Device Data String(s) Output to WinFrog:	Navigation Data Distribution Panel Interface
WinFrog Data String(s) Output to Device:	None
WinFrog Data Item(s) and their RAW record:	POSITION 303 HEADING 409 ATTITUDE 413 BOTTOMDEPTH 411/911 WIND 374

DEVICE DESCRIPTION:

This data source provides multiple types of data in a single telegram.

Data Applied to Vehicle

Data Item	Data	Application Criteria
WIND	True wind speed, true wind direction, relative wind speed, relative wind direction	When the update status is 'U' (update) and the data status is not 'I' (invalid).
POSITION	Time, latitude, longitude	When position data status is "G" (GPS) only.
HEADING	Time, heading	When compass data status is "C" (compass) and the number of the gyro selected is '1' or '2'.
ATTITUDE	Pitch, roll	All cases
BOTTOMDEPTH	Water depth	When water depth update status is 'U' (update) and the water depth data status is not 'I' (invalid).

The format description of the data message sent to WinFrog is described in the device's manual, Appendix-4 Navigation Data Distribution Panel interface specification.

DEVICE CONFIGURATION INSTRUCTIONS

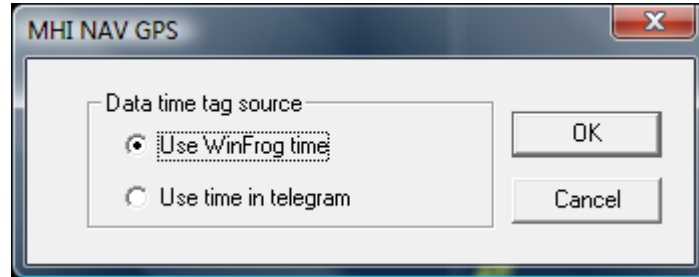
WINFROG I/O DEVICES > EDIT I/O:

Serial

Configurable Parameters

WINFROG I/O DEVICES > CONFIGURE DEVICE:

The MHI NAV GPS device is added to WinFrog from the GPS device group. The device must be configured at the I/O Device window level. The GPS Configuration dialog box appears, as seen below.



This allows the operator to select which time source is to be used as the time of a position and heading that are in a telegram. The default is WinFrog's time. However the time in the telegram may also be used. However for the time in the telegram to be used WinFrog must be synchronized to UTC, the Time Status flag in the telegram must be 'P' for precise clock, and the time setting status flag in the telegram must be 'G' for GPS.

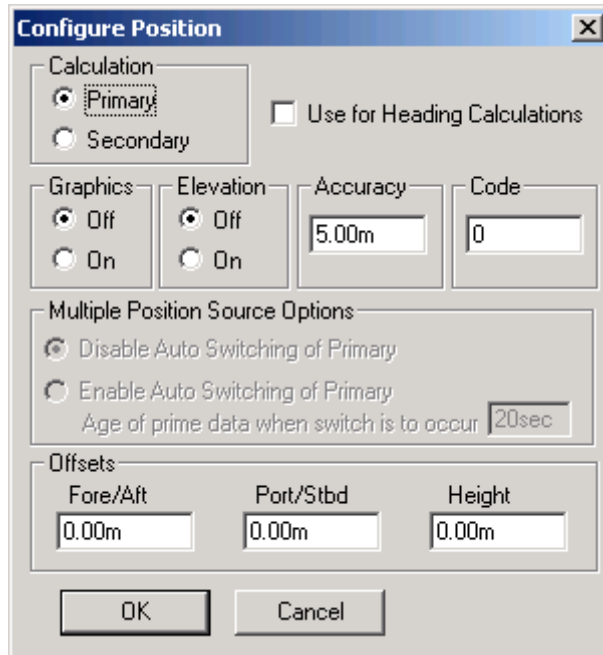
If using the Symmerticom time source to synchronize WinFrog, it must be sending UTC to WinFrog.

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

Adding the MHI NAV GPS device creates five data items: POSITION, HEADING, ATTITUDE, BOTTOMDEPTH and WIND. Once the data items have been added to the vehicle, they must be edited to suit the application, with the exception of the WIND data item which has no configuration options.

Data item: GPS, MHI NAV GPS, POSITION

Highlight the data item in the vehicle's device list and click the Edit button. The Configure Position dialog box appears as seen below.



Calculation:

Set the Calculation selection to Primary or Secondary. Devices set to Primary calculation are used to provide a vessel position. Note that more than one Primary positioning device can be added to a vehicle’s device list; data from these devices will be combined in a weighted mean solution. (See the paragraph on Accuracy below for more on the weighting of Primary calculation device data).

If the Calculation type is set to Secondary, WinFrog will simply monitor the device’s data. WinFrog will not use the data from a secondary device in the final solution of the vehicle’s position.

If auto switching is enabled (see below) a secondary may automatically become a primary should all the primaries fail.

Use For Heading Calculations:

Select this checkbox if the device is to be used in conjunction with another GPS device for determination of the heading of the vessel.

Graphics:

If On is selected, a labeled square will show the raw (offset but unfiltered) location of the GPS antenna in the Graphics and Bird’s Eye windows. This provides a means of comparing raw device and filtered vehicle positions.

Elevation:

This device does not provide an elevation so this should be set to off.

Accuracy:

The Accuracy value entered provides WinFrog with the expected accuracy of the position from this device. This value is used in the weighting of this device compared to other positioning devices that may be added to the vehicle's device list. The smaller the value entered, the more accurate it is considered to be, and hence the more weight that will be applied to the device's data.

The Accuracy parameter can be changed from the suggested values. Changes should be made with caution, however, as they will affect the final filtered position of the vehicle.

Code:

This entry window is used when the telegram contains multiple positions for multiple vehicles. For this driver there is only one position for one vehicle so this should be left blank.

Multiple Position Source Options:

This group box allows you to enable automatic switching of a secondary to primary should the data from all POSITION and PSEUDORANGE data items set to primary timeout. The **Age** entered is the length of time that the secondary will wait in the absence of data from all primaries, before taking over as primary. This age is only entered for the secondary.

For example, if the POSITION or PSEUDORANGE data items associated with two GPS receivers were set to primary and the POSITION or PSEUDORANGE data item of a third GPS receiver was set to secondary, both primary GPS receivers must time out before the secondary will become the primary. Upon the recovery of either of the original primary data items, the original primary will be reset to primary and the original secondary will be reset to secondary.

Note for the auto switching feature to work, there must be at least one primary and one secondary enabled. For example, given two data items, one set to primary with the auto switching disabled and the other set to secondary with the auto switching enabled, if the primary fails the secondary is not set to primary and the vehicle positioning stops until the primary data item recovers.

Disable Auto Switching of Primary:

If this data item is not to be involved in the auto switching process, check this box. As stated above, this data item is then not involved in the auto switching process in any way.

Enable Auto Switching of Primary:

If this data item is to be involved in the auto switching process, either as a primary or a secondary, check this box. If set to secondary, enter the Age of data the primary data items must reach before this secondary is switched to act as the primary.

In order for this option to be effective you must have at least one primary and one secondary. If there are multiple secondary data items that are enabled for switching, the first one to receive data will become primary.

Note: This option is not enabled unless WinFrog determines that there is more than one POSITION and/or PSEUDORANGE data item associated with the respective vehicle. The exception to this is the case of a WinFrog with the Remote module operating as a Controlled Remote being configured remotely from the Controller. In this case, the option is always enabled even though it may not be applicable. The operator must be aware of what is available on the Remote and configure the data item accordingly.

Note: This option is not available in the WinFrog Remote package.

Note: This option is not available for USBL based POSITION data items.

Offsets:

Offsets are required to associate the GPS antenna position with the vessel's Common Reference Point (CRP). The offsets are applied *from* CRP (of the vehicle) *to* the GPS antenna location.

Forward Offsets are entered as positive values.

Aft Offsets are entered as negative values.

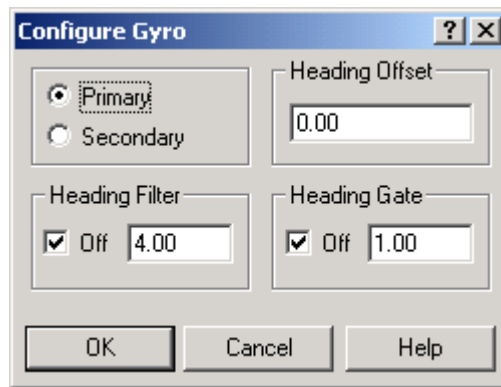
Starboard Offsets are entered as positive values.

Port Offsets are entered as negative values.

Height Offsets are positive upwards. (It is suggested that the vessel's Height origin should be at the water line.)

Data item: GPS, MHI NAV GPS, HEADING

Highlight the data item in the vehicle's device list and click the Edit button. The Configure Gyro dialog box appears as seen below.



Calculation (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 with heading information. However, unlike the Position data items, WinFrog does not calculate a weighted mean solution for multiple Heading data items. If more than one Heading data item is set to primary, the vessels heading, in WinFrog, will jump back and forth between the two. Devices set to Secondary are simply monitored, and are not used in the vehicle's calculations.

In the case of Primary device failure, WinFrog will not automatically use the Secondary device(s). You must manually change a Secondary device to Primary status in order for it to be used in the vehicle's calculations.

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.

Data item: GPS, MHI NAV GPS, ATTITUDE

Highlight the data item in the vehicle's device list and click the Edit button. The Attitude dialog box appears as seen below.

The screenshot shows the 'Attitude' dialog box with the following settings:

- Application Control:** On, Off; Do not use data if error flag is set; High frequency update rate (apply interpolated data); Low frequency update rate (apply closest data).
- Pitch Controls:** Pitch Correction (d.dd) (+ is Bow Up) = 0.000000; Filter incoming data; Filter Length (Max 30 samples) = 30; Data rejection threshold +/- the filter median value (d.dd) = 10.00.
- Roll Controls:** Roll Correction (d.dd) (+ is Starboard Down) = 0.000000; Filter incoming data; Filter Length (Max 30 samples) = 30; Data rejection threshold +/- the filter median value (d.dd) = 10.00.
- Primary Attitude Device Selection:** (Empty dropdown)
- Primary Device Auto Switch:** On, Off; Age of data when switch occurs = 20.00.
- Offsets:** Fore/Aft = 0.000, Port/Stbd = 0.000, Height = 0.000.
- Acoustic Options:** This data type is associated with an LBL system. Select the transponder to use for Attitude data. Note that the corrections for the selected transponder will be used. (Empty dropdown)

Attitude

By default, the sensor mode is off, meaning that data from the attitude 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

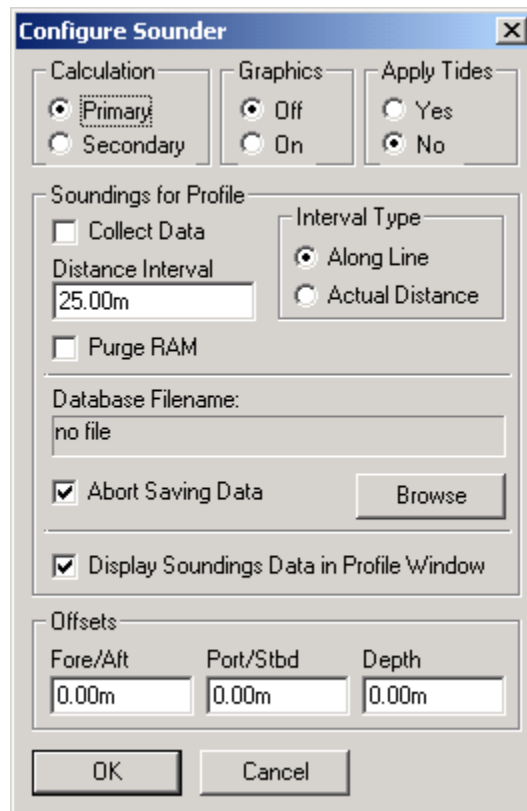
To use this feature first turn the sensor on as described in the Attitude section above. Next, select the attitude device that you wish to be primary from the drop down list box. Then turn the primary device auto switch on and enter the time out time. Then edit all the other attitude data items and enable 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.

Data item: GPS, MHI NAV GPS, BOTTOMDEPTH

Highlight the data item in the vehicle's device list and click the Edit button. The Configure Sounder dialog box appears as seen below.



Calculation:

Set the type of calculation to Primary or Secondary using the appropriate radio button. WinFrog will only utilize (i.e. display and record) data from a Primary sounder device. If there is more than one Primary sounder attached to a vehicle's device list, WinFrog will not mean the data (as is done with positional devices), but rather alternate between the devices. Data from a Secondary status sounder will simply be monitored.

Graphics:

Select the On radio button to display a labeled square representing the location of the sounder in the Graphics and/or Bird's Eye windows.

Apply Tides:

If the Yes radio button is selected, WinFrog will apply tidal corrections to the observed water depths. Depths displayed in the Vehicle Text window and recorded in automatic event (i.e. .DAT, .SRC, and .RCV) and type 351 raw files will refer to the datum corrected depths. Note that type 411 raw data records will remain truly raw and will not reflect the tide correction.

The tide information can be supplied by a real time telemetry system or by predicted tide files. Either way, the tide “device” must also be attached to the same vehicle’s device list. For more information, refer to documentation on Tide devices.

Soundings for Profile:

This section of the Configure Sounder dialog permits the collection of sounding data to an .mdb database file for display in WinFrog’s Profile window. This collection is completely separate from automatic event or raw data collection.

Collect Data

Select this checkbox to enable the collection of data to an .mdb database file.

Interval Type

Select to utilize either Along Line or Actual Distance (i.e. between successive position updates) calculations for data collection intervals. Selecting Along Line requires that you also enable survey line tracking.

Distance Interval

Specify the distance interval at which the data will be collected.

Purge RAM

Sounding data is stored in the RAM memory of the computer. Any data collected which will not be required at a later time can be deleted by selecting the Purge RAM checkbox, then clicking the **OK** button to exit the dialog box.

Database filename

Click the Browse button to define where and to what filename the .mdb file will be written. The file name and location is displayed in this dialog.

Abort Saving Data

Select this checkbox to abort saving data to the .mdb file. In other words, to save data to the .mdb file ensure that this box is NOT checked.

Display Soundings Data in Profile Window

Select this checkbox to enable the display of this data in WinFrog’s Profile window.

Offsets

This section of the dialog allows for entry of Offset values as measured from the vessel’s common reference point (CRP). Note that the Fore/Aft and Port/Stbd offsets are used for “cosmetic” visual purposes only: An echo sounder is not a positioning device, and hence its horizontal offsets have no application. If the echo sounder’s position is to be recorded correctly, you must create and enable a vehicle Tracking Offset for that specific location. The offsets entered here can simply be used as a means of graphically confirming that the Tracking Offset values have been entered correctly.

The Depth Offset is applied; the entered value will be added to the received sounder data.

Depths displayed in the Vehicle Text window and recorded in automatic event (i.e. .DAT, .SRC, and .RCV) and type 351 raw files will refer to the corrected depths. Note that type 411 raw data records will remain truly raw and will not reflect the depth offset correction.

Data item: GPS, MHI NAV GPS, WIND

There is no configuration for the WIND data item.

TELEGRAM SPECIFICATION:

Sent from the device to WinFrog. See [Appendix-4 Navigation Data Distribution Panel interface specification.pdf](#).

Field	Data
Time status	'P' for "precise clock, 'L' for CPU clock
Time Setting Status	'G' for "GPS Base", 'C' CPU base, 'M' manual setting base.
UTC	Y:m:d:h:m:s:ms
Position Data Status	'G' (GPS), 'E' (estimated), 'I' (invalid), 'S' (gyro) or 'R' (dead reckoning)
Latitude	Degrees
Longitude	Degrees
Number of Gyro Selected	'1' (#1 gyro), '2' (#2 gyro), '0' (manual or invalid)
Compass Data Status	'C' (compass), 'M' (manual), 'I' (invalid)
Heading	Degrees
Pitch	0 is bow down, 1 is bow up
Roll	1 is starboard down, 0 is starboard up
Water Depth Data Status	'C' (continuous), 'S' (single) or 'I' (invalid)
Water Depth Update Status	'U' (update) or 'H' (hold)
Water Depth	Meters
Ownship Speed Data Status	'B' (bottom), 'M' (manual), 'D' (dummy) or 'I' (invalid)
Ownship Speed Update Status	'U' (update) or 'H' (hold)
Ownship Speed	Knots (0 = ahead, 1 = backwards)
True Wind Data Status	'R' (right), 'L' (left), 'D' (dummy) or 'I' (invalid)
True Wind Update Status	'U' (update) or 'H' (hold)
Apparent Wind Data Status	'R' (right), 'L' (left), 'D' (dummy) or 'I' (invalid)
Apparent Wind Update Status	'U' (update) or 'H' (hold)
Wind True Direction	Degrees (0 ~ 359.9)
Wind True Speed	m/s (0 ~ 99.9)
Wind Apparent Direction	degrees (0 ~ 359.9)
Wind Apparent Speed	m/s (0 ~ 99.9)