

WinFrog Device Group:	INS						
Device Name/Model:	LN-211G						
Device Manufacturer:	LITTON Guidance and Control Systems 5500 Canoga Ave. Woodland Hills, CA 91367-6698 Tel: 1 (818) 715-4040 Email: ellms@littongcs.com						
Device Data String(s) Output to WinFrog:	Binary message						
WinFrog Data String(s) Output to Device:	WinFrog polls the device for data						
WinFrog Data Item(s) and their RAW record:	<table> <tr> <td>POSITION</td><td>303</td></tr> <tr> <td>HEADING</td><td>910</td></tr> <tr> <td>ATTITUDE DATA</td><td>413</td></tr> </table>	POSITION	303	HEADING	910	ATTITUDE DATA	413
POSITION	303						
HEADING	910						
ATTITUDE DATA	413						

DEVICE DESCRIPTION:

The Litton LN-211G uses the Fiber Optic Gyro Inertial Measurement Unit and a six-channel C/A-code DGPS receiver. The navigation inputs are integrated in an Intel 80960 processor running a 23-state Kalman filter. This device also has an Attitude data Module for calculation and output of pitch and roll data.

DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

Serial
Configurable Parameters

WINFROG I/O DEVICES > CONFIGURE DEVICE:

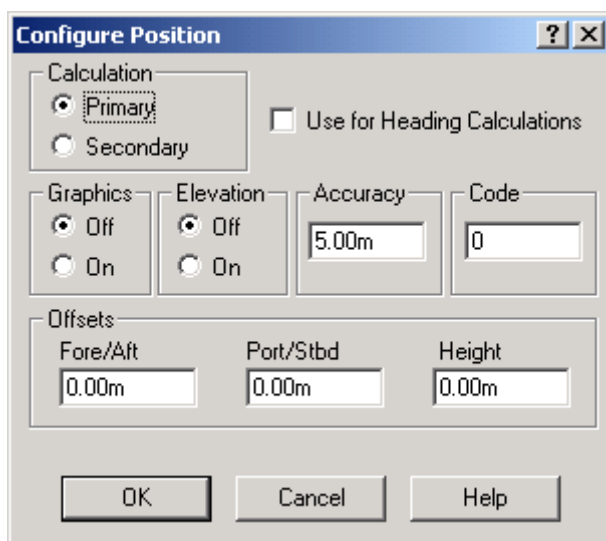
No configuration is required at the I/O Device window level.

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

Adding the LN-211G device creates three data items: POSITON, HEADING and ATTITUDE. Once the data items have been added to the vehicle, they must be edited to suit the application.

Data item: INS, LN-211G, POSITION

The Position data item must be edited once it is added to a vehicle's device list. Highlight the **POSITION** data item in the vehicle's device list, then 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 position data from the device in the final solution of the vehicles' position.

Note: In the case of Primary device failure, WinFrog will not automatically use the Secondary devices for the vessel's position computation. Instead, the vehicle's positioning will go to dead reckoning (if dead reckoning is turned on). You must manually change a Secondary device to Primary in order for the data to be utilized.

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. The vessel's heading will be derived by the inverse of the GPS antenna coordinates.

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:

Setting the Elevation option to On will result in the elevation determined by GPS to be used as the elevation of the vessel referencing the GPS (WGS84) Ellipsoid. The sounder data recorded in WinFrog's .RAW data files will not be affected.

This option is meant only for those applications where there is no fixed vertical reference (i.e. mean sea level), such as on a river. For acceptable results, this option requires the use of high accuracy "RTK" GPS data.

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 GPS data is being received by a remote GPS receiver connected via telemetry link. If this is the case, set the Code to coincide with the code parameters associated with the GPS unit being used.

For all other applications, the Code entry must be set to 0.

Offsets:

Offsets are required to associate the GPS antenna position with the vessel's Common Reference Point (i.e. 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.

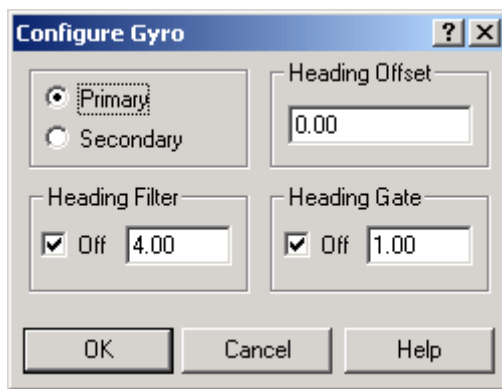
Starboard Offsets are entered as positive values.

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: INS, LN-211G, 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, then 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: INS, LN-211G, 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, then click the **Edit** button. The **Attitude** dialog box appears as seen below.

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

- Attitude:** ☐ On, ☒ Off
- Pitch Correction (d.dd):** 0.000000
- Roll Correction (d.dd):** 0.000000
- ☒ Do not use data if error flag is set
- Pitch = (+) Bow Up; Roll = (+) Starboard Down**
- Primary Attitude Device Selection:** A list box containing 'TSS HRP,ATTITUDE,2,0' (selected), 'TSS HRP,ATTITUDE,2,0', and 'TSS DMS,ATTITUDE,3,0'.
- Primary Device Auto Switch:** ☐ On, ☒ Off
- Age of data when switch occurs:** 20.00
- Acoustic Options:** A text box with the message: '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.' Below the text is an empty list box.
- Offsets:** Three input fields for 'Fore/Aft', 'Port/Stbd', and 'Height', all containing '0.000'.
- Buttons:** OK, Cancel, and Help.

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.

Correction values can also 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 attitude 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.

Error flag testing

This allows you to enable or disable error detection – the default is on. When the instrument sends data with the status flag set to unsettled or the flag contains a blank, WinFrog will not use the data unless the box is unchecked.

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 offsets are used to calculate remote heave (lever arm). It is expected that these values are the offset from the center of gravity of the sensor. Then using the observed pitch, roll, and heave, the heave at the center of gravity will be calculated and assigned to the vehicle, which may then be output using the INSIX output device. However, it is recommended that the sensor be placed at the center of gravity. If this is not possible, it is better to enter the lever arm offsets into the sensor and have the sensor make the correction, then have the sensor output the corrected values with respect to the center of gravity. The INSIX output device expects that the heave assigned to the vehicle is with respect to the center of gravity.

WinFrog records the attitude data to a type 413 raw data record. This record contains observed Heave, Pitch, Roll, status, accuracy, and a time stamp to indicate precisely when the data was observed. See Appendix B: WinFrog File Formats in the WinFrog User's Guide for details on the Type 413 raw data record.

TELGRAM SPECIFICATION:

Binary message