

<b>WinFrog Device Group:</b>	<b>GPS</b>
<b>Device Name/Model:</b>	<b>SEAPATH</b>
<b>Device Manufacturer:</b>	Kongsberg Seatex AS Pirsenteret N-7462 Trondheim Norway  Tel: +47 73 54 55 00 Fax: +47 73 51 50 20 E-mail: <a href="mailto:firmapost@kongsberg-seatex.no">firmapost@kongsberg-seatex.no</a>
<b>Device Data String(s) Output to WinFrog:</b>	Binary input message
<b>WinFrog Data String(s) Output to Device:</b>	
<b>WinFrog Data Item(s) and their RAW record:</b>	POSITION            303 VELOCITY            900 HEADING             910 ATTITUDE            413 HEAVE                888

**DEVICE DESCRIPTION:**

The Seapath device is an integrated heading, attitude, and positioning sensor. It provides a real time heading, altitude and position solution. Seapath utilizes a Seatex MRU-5 inertial sensor and two fixed baseline GPS carrier-phase receivers as raw data providers. The raw sensor data is integrated in a Kalman filter in the Seapath Processing Unit. The Processing Unit contains a processor with Seapath software, the two GPS receivers, RS232/422 user interfaces, and power supply. Feedback of GPS data into the MRU-5 results in absolute and dynamic heading. Seapath provides roll and pitch by utilizing the GPS velocity to compensate for horizontal accelerations. Position and velocity are determined by using GPS phase-smoothed pseudo-range and doppler observations. The data is transformed to the ship's center of gravity, and, if required, to a user defined location by lever arm compensation settings in the setup configuration. In addition, heave and vertical velocity are measured by the MRU-5.

To configure the sensor during installation, the Windows-based Seapath Control Center software is used on a separate installation computer.

Note for this device driver WinFrog will only decode the Binary Format 11 format.

***DEVICE CONFIGURATION INSTRUCTIONS***

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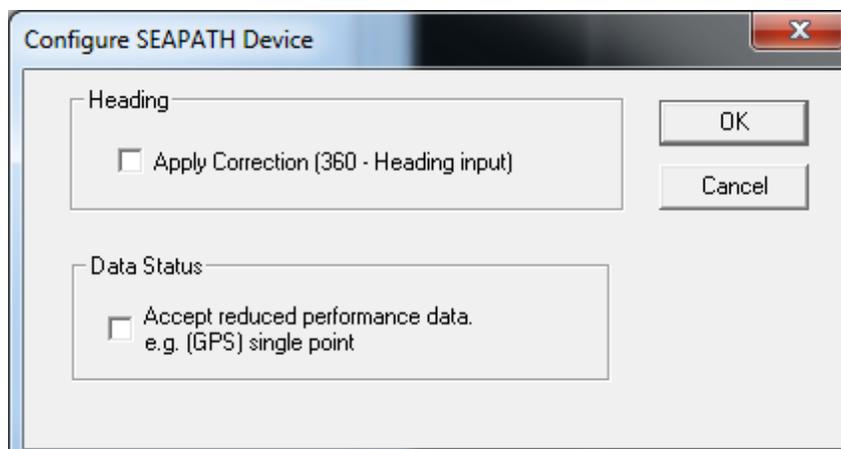
**WINFROG I/O DEVICES > EDIT I/O:**

- Serial
- Configurable Parameters

### **WINFROG I/O DEVICES > CONFIGURE DEVICE:**

This device has a device configuration dialog as seen below. It appears that the Seapath can be installed in such a way that the heading it outputs is the reciprocal of the actual heading, in this case you can correct for this by checking the Apply Correction (360-Heading input) box. If checked, WinFrog will subtract the observed heading (from the Seapath) from 360.

The Seapath reports three status levels of data: OK, Reduced Performance, and Invalid. If you wish to apply the data that has the Reduced Performance status level, check the box. If the box is left unchecked then only data that is OK will be used. Note, single point GPS is always Reduced Performance.

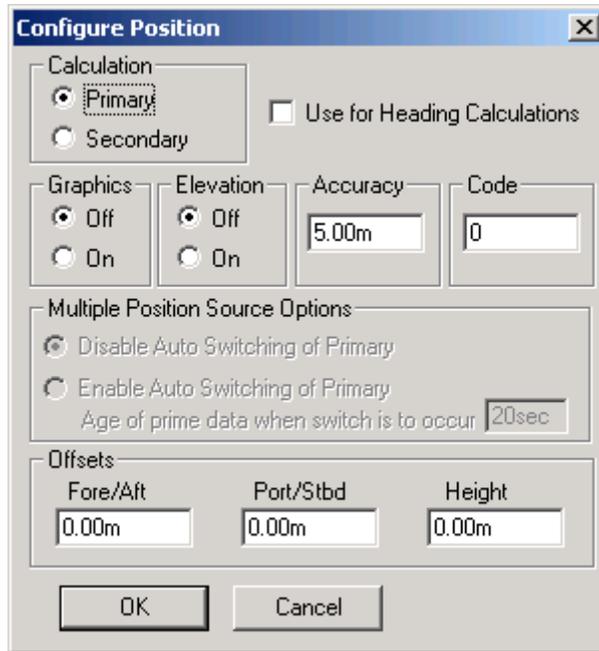


### **WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:**

Adding the SEAPATH device creates five data items: POSITION, VELOCITY, HEADING, ATTITUDE and HEAVE. Once the data items have been added to the vehicle, they must be edited to suit the application.

#### **Data item: GPS, SEAPATH, POSITION**

The POSITION data item must be edited once it is added to a vehicle's device list. 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:**

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.

**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.

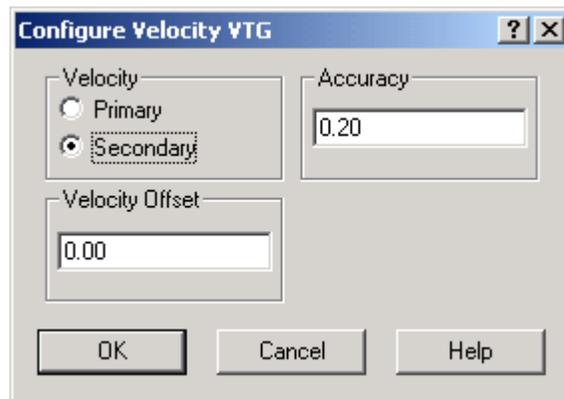
Aft Offsets are entered as negative values.

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, SEAPATH, VELOCITY**



## Velocity

You can select Primary if the Seapath device is to be used to calculate the vessel's velocity. The default setting is Secondary.

## Accuracy

The Accuracy dialog box is where you can specify the expected accuracy, expressed in m/s, of the velocity component from this device.

## Velocity Offset

The Velocity Offset is entered in m/s and is added to the velocity input from the Device.

## Data item: GPS, SEAPATH, 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.

The screenshot shows the 'Configure Gyro' dialog box with the following settings:

- Heading Data Item Options:**
  - Application Mode:  Primary,  Secondary
  - Heading Offset: 45.00
  - Heading Filter:  Off, 4.00
  - Heading Gate:  Off, 1.00
- Multiple Heading Sources Options:**
  - Disable Auto Switching Operation
  - Enable Auto Switching Operation
  - Age of data in seconds when switch occurs: 10.0s

Buttons: OK, Cancel, Help

## 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 NMEA Gyro 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:**

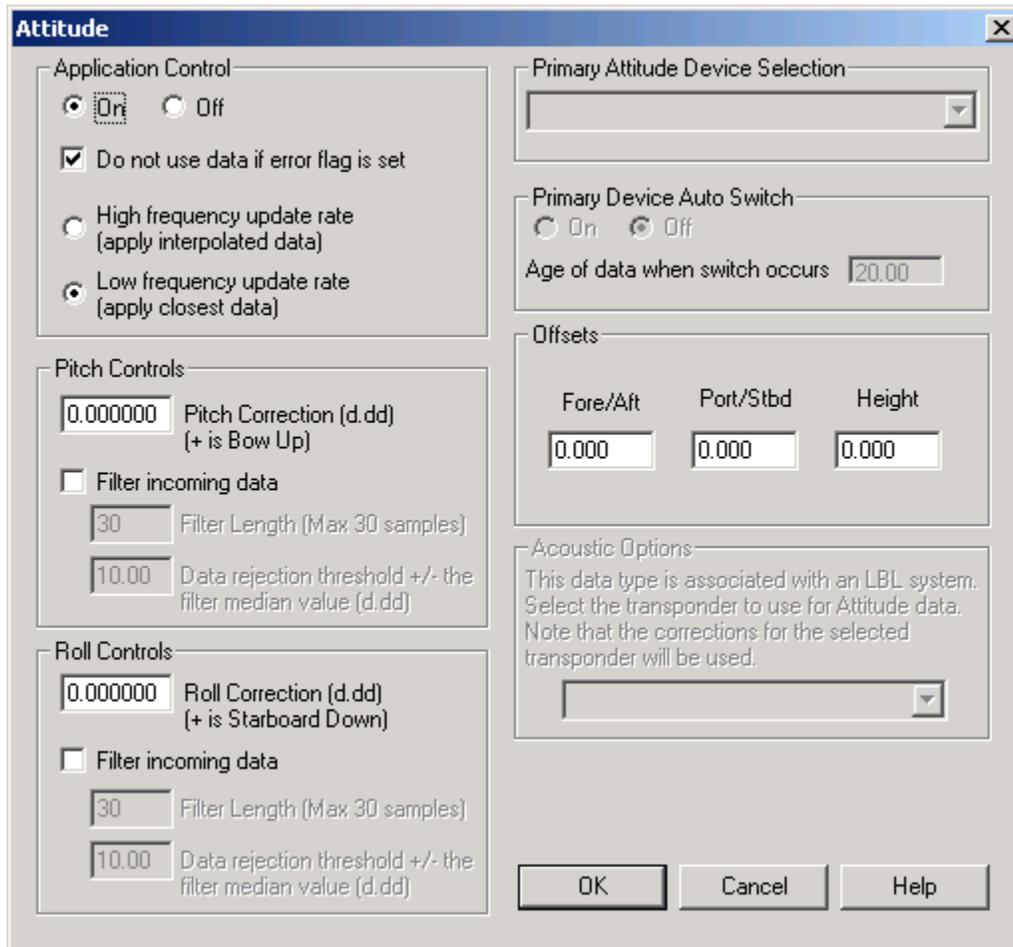
Select the mode you wish to operate WinFrog.

**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: GPS, SEAPATH, 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.



**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.

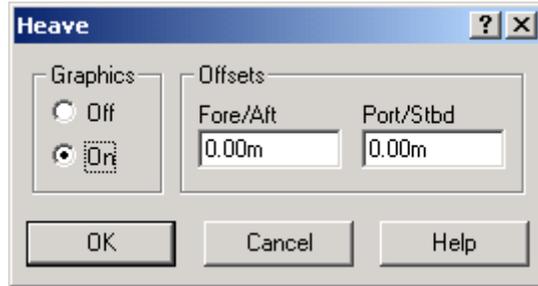
### **Offsets**

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: GPS, SEAPATH, HEAVE



### Graphics:

The Graphics Off/On radio buttons have no application at this time. This is to say that when the graphics is turned on, no display of the unit's position will appear.

### Offsets:

The Fore/Aft and Port /Stbd fields allow you to enter Offsets from the vessel's Common Reference Point (CRP) to the heave sensor. These offsets are used to reduce heave measurement errors that occur when the heave sensor is located at any position other than the vessel's center of gravity (COG).

WinFrog will apply pitch and roll data to the entered offsets to calculate the heave at the vessel's COG. In order to minimize potential erroneous offset entries, it is advised to place the vehicle's common reference point (CRP) at the vessel's COG.

Pitch and roll are not affected in the same manner as heave when the unit is installed at a location other than the COG. For this reason, offsets are not applied to the Pitch and Roll values.

The heave data is only recorded for use in post processing, i.e. if an echo sounder is added to WinFrog, recorded depths are not corrected for heave. If real time heave corrected depth data is required, you must use an echo sounder that is capable of interfacing to the heave sensor and applying the heave data internally.