WinFrog Device Group:	**SPEED LOG**
Device Name/Model:	**SIMLOG**
Device Manufacturer:	
Device Data String(s) Output to WinFrog:	NONE
WinFrog Data String(s) Output to Device:	NONE
WinFrog Data Item(s) and their RAW record:	VELOCITY 998 SPEED LOG 402

DEVICE DESCRIPTION:

This is a device designed to provide simulated data similar to real time Speed Log devices. This device is used for simulation and training purposes and as such many of the options are not typically used. However, since this device is used for training purposes, information has been included for all of the options regardless of whether or not they are used in the simulation/training. In addition, there is a General Information section at the end of this document which provides some information on the effects of the filtering routines and gyro input.

DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

No I/O parameters - Simulated Device

WINFROG I/O DEVICES > CONFIGURE DEVICE:

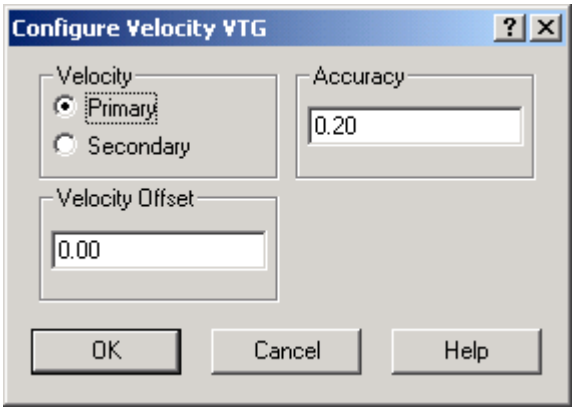
No configuration is required at the I/O Device window level.

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

Adding the SIMLOG device creates two data items: VELOCITY and SPEED LOG. Once the data items have been added to the vehicle, they must be edited to suit the application.

Data item: SPEED LOG, SIMLOG, VELOCITY

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



Velocity
Select Primary if this Velocity device is to be used to calculate the vessel's velocity. The default setting is Secondary.

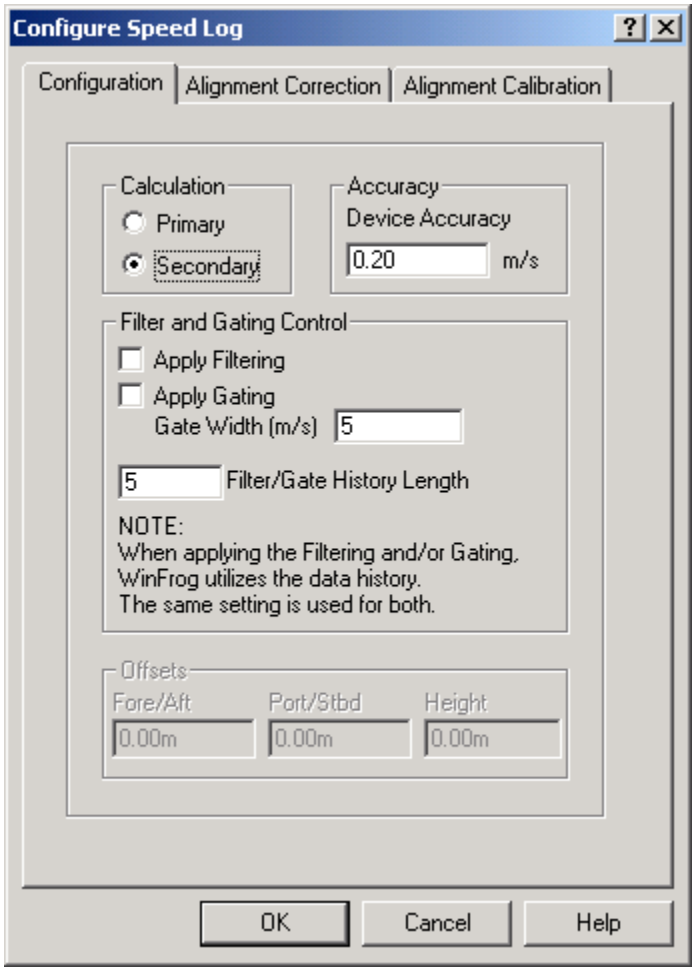
Accuracy
The Accuracy field is where you can specify the expected accuracy, expressed in m/s, of the velocity component from this device.

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

Data item: SPEED LOG, SIMLOG, SPEED LOG

Speed Log devices are typically used in the Kalman filter to enhance ROV positioning results from other devices such as USBL.

Highlight the SPEED LOG, SIMLOG, SPEED LOG data item in the vehicle's device list and click the Edit button to open the Configure Speed Log dialog box. The Configure Speed Log dialog consists of three tabs as can be seen below.



Configuration tab:

Calculation
Select the Primary option if the SimLog device is to be used to assist in the positioning of the vehicle.

Accuracy
The default accuracy should be a sufficient starting point, but the optimal performance can only be determined by observation and manual adjustments to these settings.

Filter and Gating Control
The Apply Filtering option controls the filtering of the raw Doppler data prior to its' use in the Kalman Filter. If selected, a central tendency filter 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.

The Apply Gating option controls the gating of the raw 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.

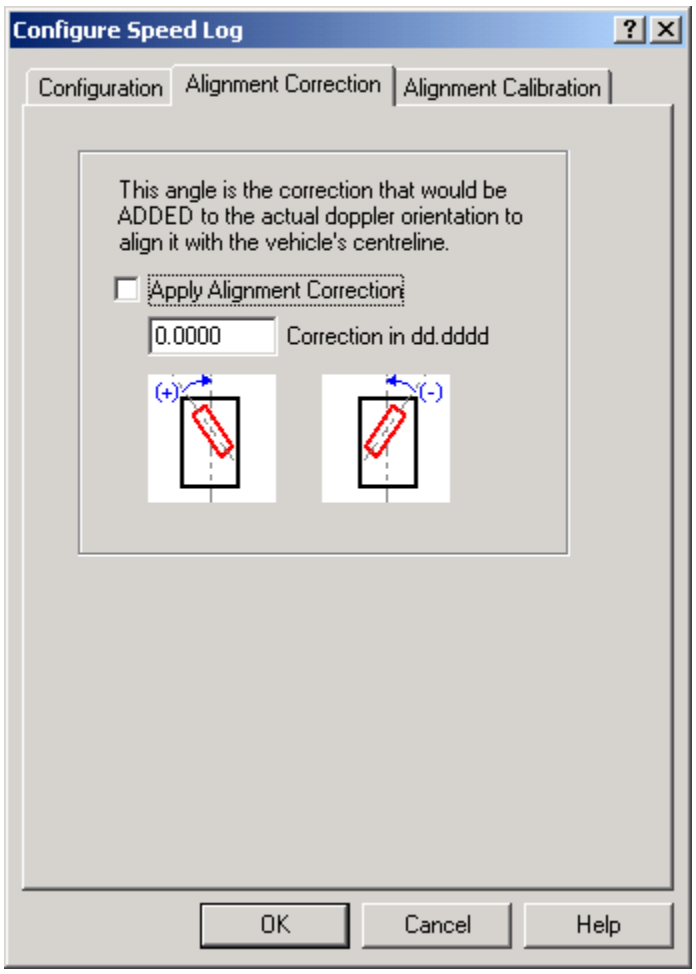
The Gate Width option defines the gating limits in m/s; the value must be determined by monitoring the data.

The Gate and Filter/Gate History settings define 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 Doppler performance (in a real time device). 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.

This device does not use Offsets.

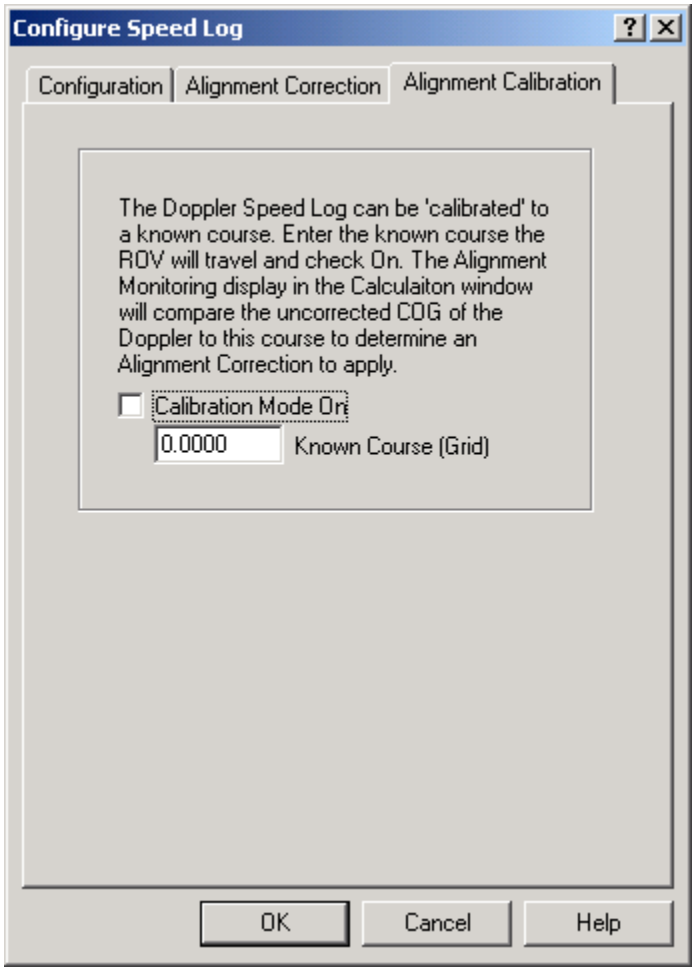
Note that if the *Apply Filtering* option is selected, but not the *Apply Gating* option, a default gating value of 10m/s is used for the purpose of utilizing the filtering function.

Refer to the General Information section below for more details on the effects of this device as well as some general information on filtering routines.



Alignment Correction tab:

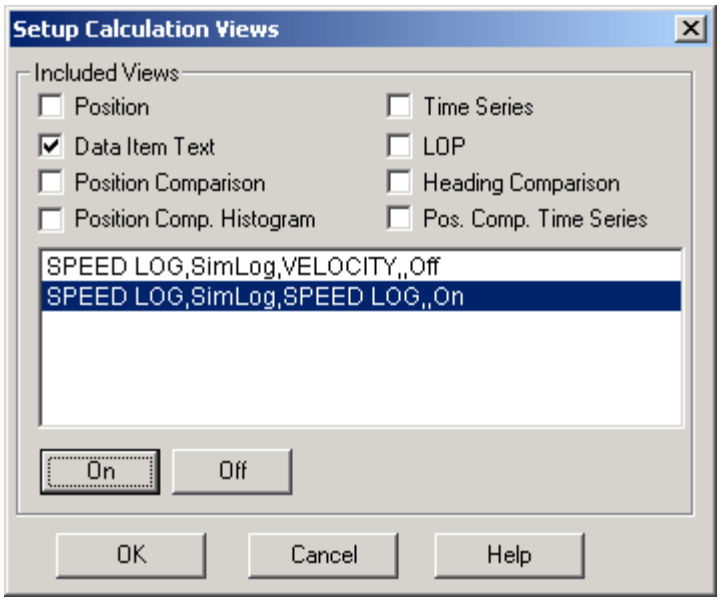
If an alignment correction has to be added to orient the speed log device with the centreline of the vehicle, select the Apply Alignment Correction checkbox and enter the correction value in decimal degrees. See the Alignment Calibration tab for details on determining the correction value to be used.



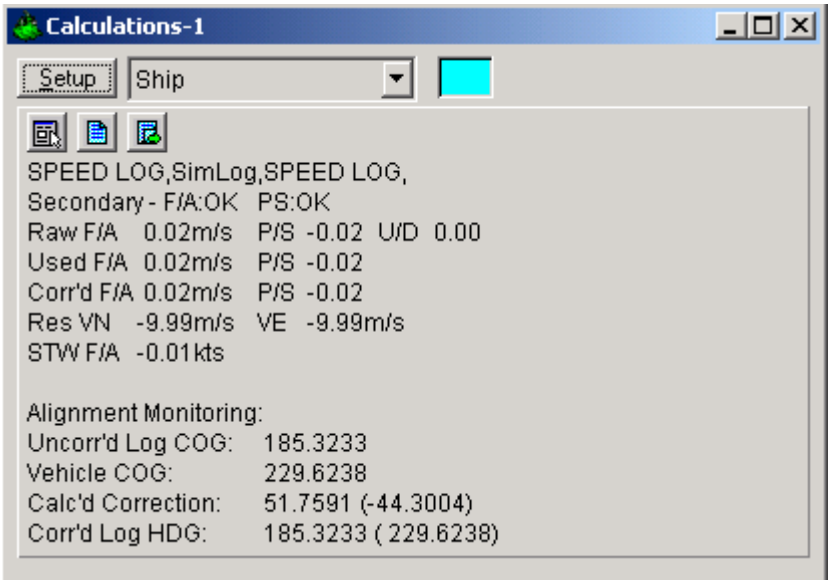
Alignment Calibration tab:

The description in the Alignment Calibration is fairly self-explanatory. It is used in conjunction with a Calculations window to determine the correction value that can be entered in the Alignment Correction tab as discussed above.

To open a Calculations window, select View > Calculations from the main menu. In the Calculations window, click the Setup button which will open the Setup Calculation Views dialog box as seen below.



Select (check) the Data Item Text option. Next, highlight the Speed Log data item and click the On button. Exit this window with OK and the speed log data, as well as the Alignment Monitoring data can be viewed in the Calculations window as seen below.



The calculated correction (Calc'd Correction) can be viewed in this window. This correction value can be entered in the Alignment Correction tab.

General Information:

The application and monitoring of a Doppler speed log is detailed in the following section. **It is important to note that the values and limits stated here for any of the configurations discussed are guidelines. The operator must evaluate the actual performance and make adjustments accordingly.**

Background on Filtering and Gyro Input

General Kalman Filtering:

The Kalman Filtering performed by WinFrog allows the direct input (to the filter) of position and velocity data. The application of this data within the filter is a balance between:

- The accuracy attributed to each individual data type, and,
- The Kalman Filter setting itself.

The former is the accuracy entered by the operator for each data type when configuring its use as attached to a vehicle. The latter is the Kalman Filter setting controlled with the slider bar in the Configure Vehicle Calculations dialog box.

It is important to realize that the correct application of the Kalman Filter requires careful consideration of the actual accuracy of each data type, and, the relative accuracy between data types utilized. If the accuracy relationship is unbalanced, the Kalman Filter will be biased towards the data type with the overly optimistic accuracy setting.

The Kalman Filter setting itself controls how reactive to new data the filter will be. The default setting of 0.1 is applicable for many situations. The impact that the new data has in the filter is also affected by the accuracy setting for that data type. Note that the lower the value, the more smoothing that is applied.

If the Kalman Filter is set to OFF, the Velocity Filter kicks in. The Velocity Filter is a central tendency filter, which seeks the median of the input values. The Velocity Filter does not affect position (i.e., the position of the vehicle will be the resultant of the raw data from the positioning sensors). The velocity filter will ‘smooth’ the velocity only. This is good for use when minor changes in velocity need to be monitored (e.g., Cable Lay Vessels and Vessel Tows where estimated time of arrival is important).

Gyro Requirements:

A Doppler speed log unit provides WinFrog with fore/aft and port/starboard (and in some cases, up/down) velocities. For use in the Kalman Filter, these are converted to Northing and Easting velocity vectors. Therefore, it is necessary to have a reasonably accurate and calibrated vehicle heading source to enable the

transformation of the velocities from a vehicle based X/Y reference frame to an absolute North/East reference. The heading data used is that which is configured for the vehicle, including any offsets applied in the associated HEADING data type configuration.

At present, the vertical velocities are not utilized within WinFrog.