

WinFrog Device Group:	USBL
Device Name/Model:	SONAR 2059
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Device Data String(s) Output to WinFrog:	
WinFrog Data String(s) Output to Device:	
WinFrog Data Item(s) and their RAW record:	USBL HYDROPHONE NONE BEACON 309

DEVICE DESCRIPTION:

The SONAR 2059 is an acoustic tracking system developed for Naval purposes.

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 SONAR 2059 device creates two data items: USBL HYDROPHONE and BEACON. Once the data items have been added to the vehicle, they must be edited to suit the application.

Data item: USBL, SONAR 2059, USBL HYDROPHONE

As mentioned above, adding the SONAR 2059 device to WinFrog creates two separate data items: the USBL, SONAR 2059, USBL HYDROPHONE and the USBL, SONAR 2059, BEACON.

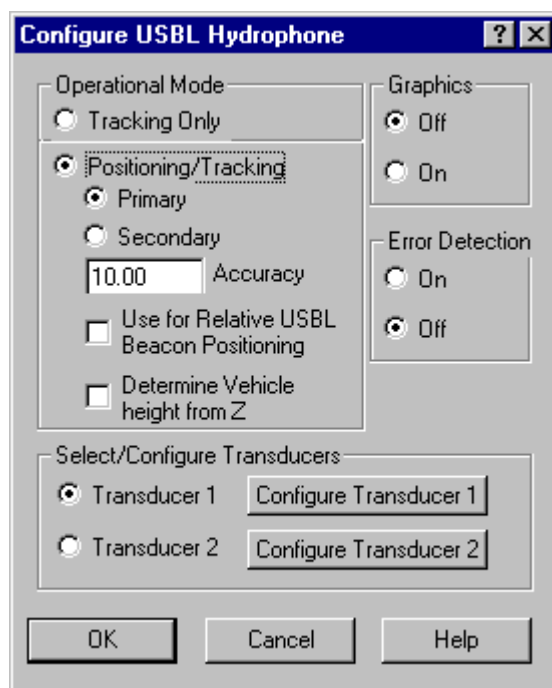
For remote vehicle tracking, the USBL SONAR 2059 Hydrophone data item must be added to the device list of the vehicle to which the hydrophone has been physically attached (i.e. the main ship).

The Beacon data item must be added to the vehicle to which the beacon has been physically attached (i.e. the ROV or towed vehicle).

USBL systems can also be used for positioning of the main vessel. In this type of operation the USBL Beacon must be physically attached to some fixed point on the seabed or subsurface structure. In this type of operation, the Hydrophone position (i.e. vehicle position) is derived from measurements made to the fixed beacon. For this type of positioning, you must define a working Xponder File (*.XPT) in WinFrog, and enter the fixed coordinates of the Beacon into that file. The Hydrophone must be added to the ship's device list and configured for positioning as opposed to tracking mode. See chapter 5 of the WinFrog User's Guide for more information on setting up *.XPT files.

Configuration of the USBL Hydrophone

Once the SONAR 2059 Hydrophone has been added to the appropriate vehicle's device list it must be edited to suit the application. In the vehicle's devices list, highlight the USBL, SONAR 2059, USBL HYDROPHONE data item and click Edit to open the Configure USBL Hydrophone dialog box as seen below.



Operational Mode:

As mentioned above, USBL systems can be used for tracking of subsurface vehicles or for positioning of the main vehicle to which the hydrophone is attached.

Select Tracking Only if relative tracking of a structure/vessel is desired.

Select Positioning/Tracking and Primary if you want to position the Master Vessel relative to a stationary (fixed) beacon. The beacon must be fixed at a stationary (fixed) location, as defined in a working XPONDER (.XPT) file. Select the Secondary radio button if this is not the primary positioning source (i.e. if this is a comparison position), or if you are setting up for a USBL Calibration. Note as well that if you are setting up for a USBL Calibration, the Hydrophone should also be specified as a Secondary positioning device. See chapter 20 of the WinFrog User's Guide for more information on USBL Calibrations.

If Positioning/Tracking is selected, you can also specify Use for Relative USBL Beacon Positioning. This feature controls the use of the USBL positioning of the hydrophone from a fixed beacon for application to relative USBL Beacon positioning. In this mode, the difference between the hydrophone position, as determined directly from observation, to fixed beacon is compared to the hydrophone position determined from other positioning sources (e.g. DGPS). This difference is then applied to the position determined for any tracked beacon. The concept is that any inherent errors due to local conditions, both environmental and mechanical, are cancelled out. This is independent of the Primary/Secondary setting.

Determine Vehicle height from Z

Select this checkbox if the USBL system is to be used to determine the height of the vehicle. This is independent of the Primary/Secondary setting.

Graphics:

Select On to have WinFrog display the device name and a square at the location of the hydrophone within the Graphics and Bird's Eye windows.

Error Detection:

Select On to have WinFrog analyze the error codes included in the SONAR 2059's output data strings and to have WinFrog include error detection codes in the Raw Files for post project QC analysis. If an error code is recognized, WinFrog will not utilize that particular data string in its calculations of the beacon position.

Select/Configure Transducers:

Some USBL systems can be configured with two hydrophones. Before configuring a transducer ensure that it is the correct one, and that the values entered refer to that device. Click Configure Transducer 1 or Configure Transducer 2 as required. The Configure USBL Transducer dialog box appears as seen below.

Configure USBL Transducer ? X

Calibration Corrections

Range Scale Factor	Head Rotation Correction
1.00000	0.00000
Pitch Correction	Roll Correction
0.00000	0.00000

NOTE: Corrections sign conventions are
Roll=(+)Stbd down; Pitch=(+)Stern down

USBL System Internal Offsets

Offsets from the point the data is related to, to the transducer. These values will be subtracted from the USBL output data to get data related to the transducer.

Fore/Aft	Port/Stbd	Z (down +)
0.00m	0.00m	0.00m

WinFrog Offsets, from CRP to Transducer

Fore/Aft	Port/Stbd	Depth (down +)
0.00m	0.00m	0.00m

OK Cancel Help

Calibration Corrections:

WinFrog allows you to enter Range Scale, Heading, Pitch and Roll correction values to correct raw USBL measurements. Note that the Heading, Pitch and Roll values are entered in degrees and decimal degrees. These values can be determined by using WinFrog's USBL calibration utility. See chapter 20 of the WinFrog User's Guide for detailed information on calibration of USBL systems.

USBL System Internal Offsets:

This section of the Configure USBL Transducer dialog box is for the entry of X,Y and Z offsets that will be applied to the raw observations received from the SONAR 2059 console.

The upper fields are used to remove any offsets that have been entered into the SONAR 2059 console. This may come into use particularly when USBL systems are used for vessel positioning, where the ship's DP system needs positional information to relate to the vessel's center of gravity as opposed to just at the USBL hydrophone. WinFrog, however, requires all XYZ offsets to relate to the USBL hydrophone.

Use these fields to enter the same offsets as are entered in the SONAR 2059 console, nullifying the offsets in the SONAR 2059. As these values are subtracted from the received data, ensure that values are entered using the same sign as internal SONAR 2059 offsets.

The lower fields, WinFrog Offsets, from CRP to Transducer, are similar to all other positional device offsets entered in WinFrog. These offsets must be entered to relate the hydrophone's position to the vessel's Common Reference Point (CRP). All offsets are entered with signage referring to the distance *from* the CRP *to* the hydrophone.

Data item: USBL, SONAR 2059, BEACON

As mentioned above, for subsurface vehicle positioning, the USBL beacon must be added to the appropriate subsurface vehicle's device list. Once added to the device list, it must be edited to suit the application. Editing the USBL, SONAR 2059, Beacon data item brings up the Configure USBL Beacon dialog box, as seen below.



The image shows a Windows-style dialog box titled "Configure USBL Beacon". It contains several sections for configuring beacon parameters:

- Calculation:** Radio buttons for "Primary" (selected) and "Secondary".
- Accuracy:** A text box containing "10.00m".
- Error Detection:** Radio buttons for "On" and "Off" (selected).
- Deskewing Options:** Two checked checkboxes:
 - Deskew Beacon Timestamp:** The data signal reception time is corrected to the signal transmission time based on sound velocity and slant range.
 - Deskew Hydrophone Position:** The hydrophone position is deskewed to the appropriate beacon epoch based on the hydrophone vehicle's speed and CMG. If not on, the last updated position for the hydrophone is used regardless of age.
- Code:** A text box containing "1".
- ROV Depth from USBL:** Radio buttons for "Yes" (selected) and "No".
- LBL Calibration:** A checkbox for "Use For Calibration" (unchecked).
- Graphics:** Radio buttons for "Off" (selected) and "On".
- Offset, from the CRP:** Three text boxes for "Fore/Aft", "Port/Stbd", and "Height (+ above CRP)", all containing "0.00m".

At the bottom are "OK", "Cancel", and "Help" buttons.

Calculation

Set Calculation to Primary if the beacon is to be used for positioning the vehicle to which it is attached. Multiple beacons can be added to the same vehicle's device list,

each configured as Primary. WinFrog will calculate a weighted mean position using the Accuracy value entered as the basis for the relative weighting.

Setting the calculation to Secondary will result in the Beacon's position being monitored but not used in the vehicle's position calculation. Note that in case of Primary data item failure, WinFrog will not automatically use the data item(s) designated as Secondary. You must change the calculation to Primary in order for the data item to be used in position calculations.

Accuracy

This value is used by WinFrog to weight the use of different positioning devices in solving a single vehicle's position. The lower the accuracy value entered, the more accurate it is deemed to be, and hence the more weight that will be applied to it in comparison to the other devices.

Error Detection:

Setting Error Detection to 'On' instructs WinFrog to identify error codes received in the USBL data string and disable the use of bad data. USBL systems include various error codes in the data string when the beacon is not within the optimum "cone of operation" or other operational parameters have been exceeded.

Deskewing Options

Deskew Beacon Timestamp

This option is for future development.

Deskew Hydrophone Position

When positioning the beacon, WinFrog uses the last calculated position for the associated USBL Hydrophone to determine the tracked beacon's position. Depending on the vehicle's Kalman filter and Dead Reckoning settings, the position of the hydrophone may be up to 1 second old. It is recommended that this deskewing option be enabled to remove positional inaccuracies associated with this latency.

Code:

Enter a value matching the code of the beacon attached to the vehicle.

ROV Depth from USBL:

If Yes is selected, the ROV's depth will be set to the calculated USBL beacon depth.

LBL Calibration:

Select the Use for Calibration checkbox if the beacon is to be used in an LBL Calibration.

Graphics:

Select On to have WinFrog plot a square and label to represent the beacon location in the Graphics and Bird's Eye displays.

Offsets:

This portion of the dialog box is used to enter Offsets that relate the beacon's location to the subsurface vehicle's Common Reference Point (CRP). These values are set similar to values that would be applied to any device offset within WinFrog, with values entered as measured *from* the CRP *to* the device. A heading (i.e. gyro) device must also be added to the vehicle's device list to ensure that the offsets are applied in the correct direction.