WinFrog Device Group:	USBL
Device Name/Model:	SIMRAD300P
Device Manufacturer:	**Kongsberg Simrad AS** P.O. Box 483 3601 Kongsberg Norway E-mail: WebOffice@kongsberg.simrad.com Phone: 47 32 28 50 00 Fax : 47 32 73 59 87
Device Data String(s) Output to WinFrog:	Code, X, Y, Z, and error check. "Code\tAge\tX\tY\tZ\tErr\t " See Configuration Details below for complete string data contents.
WinFrog Data String(s) Output to Device:	Nil
WinFrog .raw Data Record Type(s):	Type 309: USBL Transceiver, Beacon

DEVICE DESCRIPTION:
The Simrad HPR 300P is a compact and portable hydroacoustic position reference system based on the ultrashort baseline (USBL) principle. The unit is used for tracking subsurface towfish, ROVs, and the positioning of vessels and structures. The acoustic transmit/receive elements and the VRU (vertical reference unit) are housed in a single compact transducer unit. The calculation of position is based on range and bearing measurement giving three dimensional transponder positions relative to the system's transducer. It can operate with up to 14 reference sensors, such as transponders and responders.

Simrad HPR 300P

Simrad states the following specifications for the HPR 300P:

- **System Accuracy** Better than 2% of slant range
- **Frequencies** Transmit 20-26 KHz Receive 26-32 KHz
- **Power Output** 1.7-100w variable
- **Pulse Duration** 2-43 mSec variable, Hemispherical beam
- **Pulse Repetition** Max. 3 Hz, range dependant
- **Inputs** Gyro compass synchro signal, 26v RMS, 400Hz reference 11.8v signal
- **Outputs** RS232 ASCII format - 1 start, 7 data, 2 stop bits, odd parity, 4800 baud
  Analogue RGB 0.7v p-p with composite sync TTL Monitor
  Composite B/W Responder trigger - 24v, 2mS pulse
- **Power** 220v AC.
- **Operating Temperature** -10 to +55 DEG C

DEVICE CONFIGURATION INSTRUCTIONS:
Baud Rate: 4800
Data Bits: 7
Stop Bits: 2
Parity :   Odd

The HPR 300 uses standard RS-232C serial communication protocol to output data to external devices. After each line a Carriage Return <CR>and Line Feed <LF> are transmitted. For numbers over 999.9m, the decimal is left out and the numbers are rounded to the nearest meter. Spaces are used between the individual data values.

WINFROG I/O DEVICES > CONFIG OPTIONS:
The Simrad 300P is added to WinFrog from the USBL device category. No device configuration is required at the "generic" I/O Devices window level.

WINFROG VEHICLE TEXT WINDOW > CONFIGURE VEHICLE DEVICES > DEVICE > EDIT OPTIONS
As mentioned above, adding the Simrad device to WinFrog creates two separate data items: the USBL, SIMRAD300P, USBL HYDROPHONE and the USBL, SIMRAD300P, BEACON.
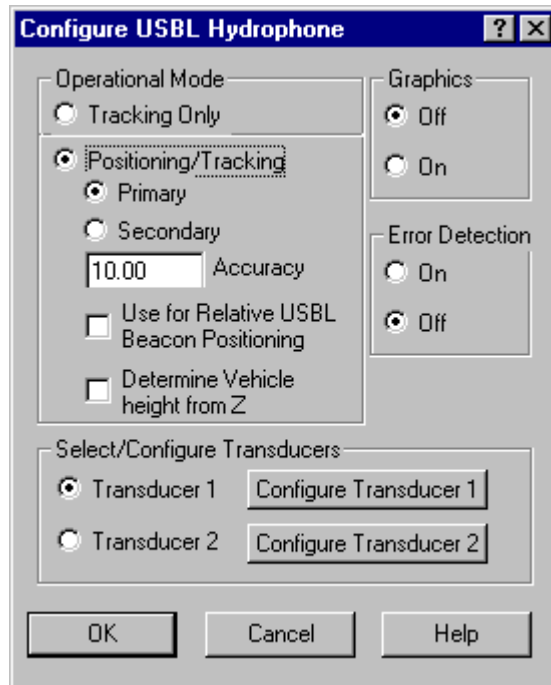
For remote vehicle tracking, the Hydrophone data item must be added to the device list of the vehicle to which the hydrophone has been physically attached (i.e. the main ship). The Beacon data item must be added to the vehicle to which the beacon has been physically attached (i.e. the ROV or towed vehicle).

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 position 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 Users Guide for more information on setting up *.XPT files.

1. Configuration of the USBL Hydrophone

Once the SIMRAD 300P 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, SIMRAD300P, USBL HYDROPHONE then click the Edit button. The Configure USBL Hydrophone dialog box appears as seen below.

Operational Mode:
As mentioned above, USBL systems can be used for tracking of remote 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 located on the stationary (fixed) object, 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 Users 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 utilize error codes detected in the data string received from the SIMRAD. If WinFrog detects a significant error code, the data will not be utilized in the vessel's calculations.

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.
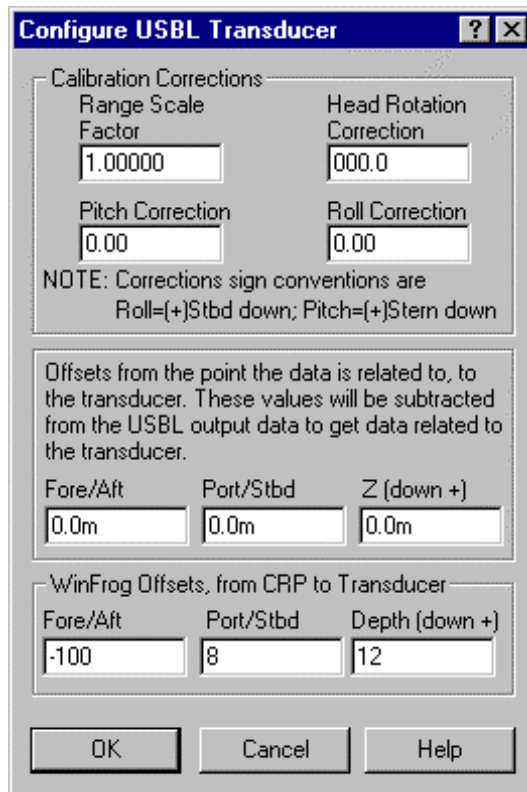
Calibration Corrections:
WinFrog allows you to enter Range Scale, Heading, Pitch and Roll correction values to correct raw USBL measurements. Note that the Heading, Pitch and Roll values are entered in degrees and decimal degrees. These values can be determined by using WinFrog's USBL calibration utility. 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 SIMRAD console.

The upper fields are used to remove any offsets that have been entered into the SIMRAD console. This may come into use specifically 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. These upper fields are then used to enter the same offsets as are entered in the SIMRAD Console, nullifying the offsets in the SIMRAD. As these values are subtracted from the received data, ensure that values are entered using the same sign as internal SIMRAD offsets.

The lower fields, **WinFrog Offsets, from CRP to Transducer**, is 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.

2. **Configuration of the USBL Beacon**
As mentioned above, for subsurface vehicle positioning, the USBL beacon must be added to the appropriate vehicle's device list. Once added to the device list, it must be edited to suit the application. Editing the USB, SIMRAD, Beacon device brings up the Configure USBL Beacon dialog box, as seen below.
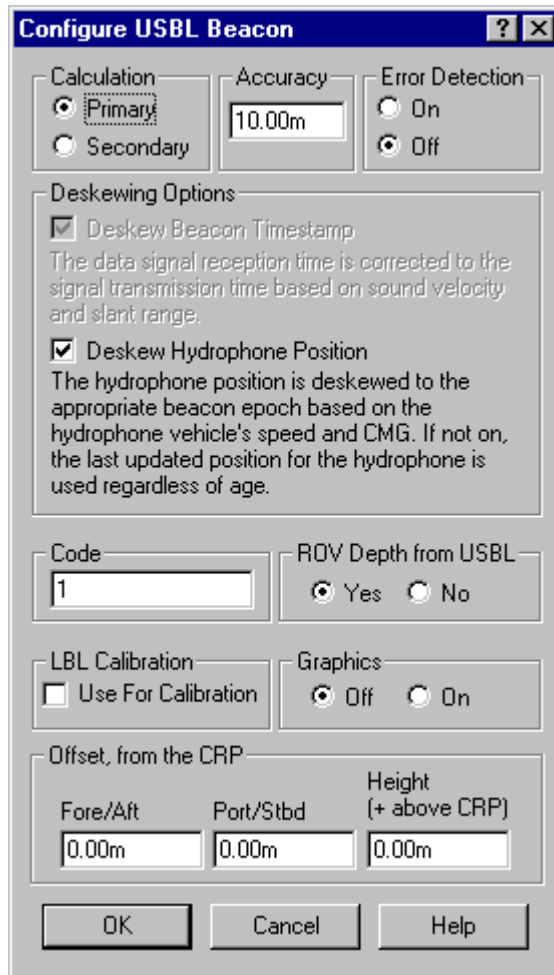
Calculation

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.

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 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 device must also be added to the vehicle's device list to ensure the correct application of the offsets.

CONFIGURATION DETAILS:

The Simrad 300P is a menu driven device that allows you to easily configure ROV tracking, vessel positioning and subsea relocation configuration parameters as required. Multiple targets, system status, function and parameter information can be monitored via the 300P's Display Unit. Please refer to the 300P operator's manual for complete information on the configuration of this device.

The HPR 300P outputs the following ASCII string for each measured position:

```
XX  X  N  NNN  XXX.X  XXX.X  XXX.X  XXX.X  XX.X  NNN  XX.X  XXX.X
(1)  (2)(3)  (4)    (5)      (6)     (7)     (8)     (9)    (10)  (11)    (12)
```

Where:
1:      Transponder Number, 1 to 9 / 11 to 55
2:      Transducer Used: 1=TD1
3:      Beam Used: W=Wide, M=Medium, N=Narrow
4:      Reply Status: OK=Reply OK, NRY=No reply, MRY=Missing reply,
                            REJ= Reply rejected
5:      Course, Vessel Course
6:      X coordinate of Range
7:      Y coordinate of Range
8:      Z coordinate of Range
9:      QUA=position quality based on the 4 last positions. If NRY or REJ occurs, the Qua=QUA*3. The value is in metres.
10:     SA, status angle measuring, (if any), same as in 4.
11:     Riser Angle Tilt
12:     Riser Angle Azimuth.