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| WinFrog Device Group: | USBL |
| Device Name/Model: | TRACKPOINT |
| Device Manufacturer: | ORE Offshore Division 10450 Stancliff, Suite 115 Houston, Texas 77099 Tel (281) 879-7277 Fax (281) 879-9213 |
| Device Data String(s) Output to WinFrog: | WinFrog accepts 4 Trackpoint data formats: Standard, Standard-EC, Rev 4 or Rev 4-EC The data must be in meters. The data may be North referenced, however it is recommended that it be ship relative. |
| WinFrog Data String(s) Output to Device: | Nil |
| WinFrog .raw Data Record Type(s): | Type 309: Beacon data |

DEVICE DESCRIPTION:

Trackpoint (II Plus) an ultra short baseline (USBL) underwater acoustic tracking system, is used to determine the position of Remotely Operated Vehicles (ROV's), towed equipment, etc. An acoustic beacon (responder or transponder), operating at a set frequency, is attached to the equipment that is to be tracked. By interrogating the beacon and subsequently receiving an acoustic response, the Trackpoint accurately determines the position of the beacon relative to the hydrophone. This data is then output to external equipment for final determination of the beacon's real world coordinates.



TRACKPOINT II Plus

The system consists of the following components:

Command / Display Module

Hydrophone

Deck Cable (4740A Amplifier optional)

Beacon and/or Transponder/Responder

DEVICE CONFIGURATION INSTRUCTIONS:

Baud Rate: Configurable

Data Bits: 8

Stop Bits: 1

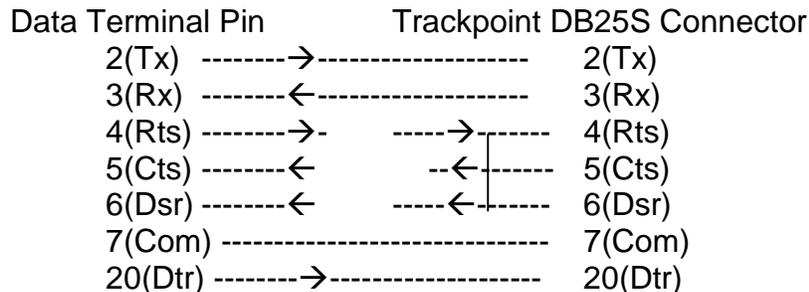
Parity : N

Protocol: XON/XOFF

Standard RS-232C serial communication is used to output data to external devices. This is configurable from the instrument menu. With firmware version 8.0 or greater the Trackpoint has the capability of changing most tracking functions via the RS-232 port.

Data is sent over the RS-232C lines until an XOFF character is encountered from the external device. Data is output once every 2 seconds in Pinger Mode (1200+baud rate).

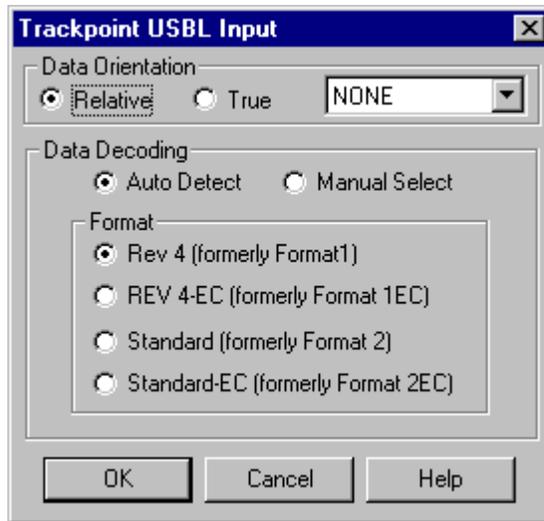
Cable Configuration (when no handshaking required):



WINFROG I/O DEVICES > CONFIG OPTIONS:

The Trackpoint is added to WinFrog from the USBL device category. Adding a Trackpoint to WinFrog creates two data items: a Hydrophone and a Beacon.

The Trackpoint must be configured at the “generic” I/O Device window level. In the I/O Devices window, highlight the Trackpoint device then right-click and select Configure Device from the presented menu. The Trackpoint USBL Input dialog box appears as seen below.



Trackpoint USBL Input:

Raw USBL data measurements are made relative to the hydrophone. Data output options, however, include referencing the data simply to the hydrophone's axis (i.e. the ship's axis) or, if interfaced to a gyro device, relative to North. If the data coming from the Trackpoint is referenced to the vessel's centerline axis (i.e. to the bow), select "Relative". (This is the recommended operating mode).

If the data is referenced to North then select True. There are four data formats that can be configured from within the Trackpoint console for output. You must determine which format is being output from the Trackpoint and select the appropriate option. If the format of the data is "Standard" or "Standard-EC" it is not necessary to select a compass. The data will be reprocessed using the "Compass Heading" found in the data telegram. If the format of the data is "REV 4" or "REV 4-EC" it is necessary to select a compass. The data will be reprocessed using the selected compass heading to relate the data back to ship relative values.

WINFROG VEHICLE TEXT WINDOW > CONFIGURE VEHICLE DEVICES > DEVICE > EDIT OPTIONS:

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

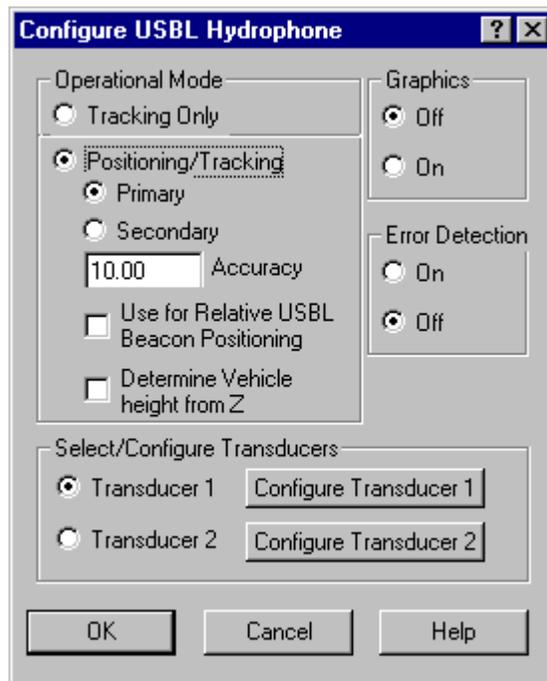
For remote vehicle tracking, the USBL TRACKPOINT HYDROPHONE data item must be added to the device list of the vehicle to which the hydrophone has been physically attached (i.e. the main ship). The Beacon data item must be added to the vehicle to which the beacon has been physically attached (i.e. the 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 Users Guide for more information on setting up *.XPT files.

Configuration of the USBL Hydrophone

Once the TRACKPOINT Hydrophone has been added to the appropriate vehicle's device list it must be edited to suit the application. In the vehicle's Device list, highlight the USBL, TRACKPOINT, 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 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:

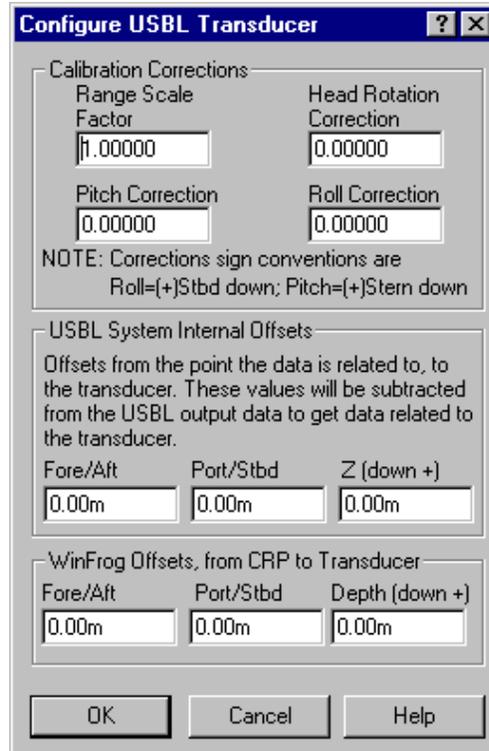
Select On to have WinFrog display the device name and a square at the location of the hydrophone within the Graphics and Bird's Eye windows.

Error Detection:

Select On to have WinFrog analyze the error codes included in the Trackpoint'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.



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

Configuration of the USBL 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, TRACKPOINT, BEACON device brings up the Configure USBL Beacon dialog box, as seen below.

The screenshot shows the 'Configure USBL Beacon' dialog box. The 'Calculation' section has 'Primary' selected. The 'Accuracy' is set to '10.00m'. 'Error Detection' is set to 'Off'. Under 'Deskewing Options', both 'Deskew Beacon Timestamp' and 'Deskew Hydrophone Position' are checked. The 'Code' is '1'. 'ROV Depth from USBL' is set to 'Yes'. 'LBL Calibration' is 'Use For Calibration' is unchecked. 'Graphics' is set to 'Off'. The 'Offset, from the CRP' section has 'Fore/Aft', 'Port/Stbd', and 'Height (+ above CRP)' all set to '0.00m'. Buttons for 'OK', 'Cancel', and 'Help' are at the bottom.

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.

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 section 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.

CONFIGURATION DETAILS:

It is preferable to configure the Trackpoint to output ship relative data in one of the above mentioned formats (in meters). In configuring the Trackpoint, ensure that a target number of 0 is not used. WinFrog requires beacon numbers be greater than 0. WinFrog is not restricted to a maximum target number of 9.