WinFrog Device Group:	PLOW
Device Name/Model:	Etisalat Plow
Device Manufacturer:	Soil Machine Dynamics Wincomblee Road Newcastle upon Tyne, UK NE63QS Tel: + 44 191 234 2222 Fax: + 44 191 234 0444 Email: smd@smd-uk.com
Device Data String(s) Output to WinFrog:	See Telegram Specification below.
WinFrog Data String(s) Output to Device:	See Telegram Specification below.
WinFrog Data Item(s) and their RAW record:	PLOWDATA 490 COUNT 492 ROV REF VEH NONE HEADING 410 or 409

DEVICE DESCRIPTION:

This driver is designed to read plow related data from Etisalat's plow. It can also be used to position the plow if a tow wire count is available.

The device supports the following data and respective data items:

Direct Input by this device:
- Product cable tension at the plow (as-laid) (COUNT)
- Tow wire tension at the plow (COUNT)
- Tow wire out (PLOWDATA, COUNT)
- Tow wire tension at the ship (PLOWDATA)
- Plow heading (PLOWDATA, HEADING)
- Plow depth (PLOWDATA)
- Burial depth (PLOWDATA)
- Pitch (PLOWDATA, ATTITUDE)
- Roll(PLOWDATA, ATTITUDE)

Other Device Input (if selected by operator):
- LCE Cable Count
  - Product cable tension at the ship (PLOWDATA)
  - Product cable count (PLOWDATA)
- Tow Cable Count
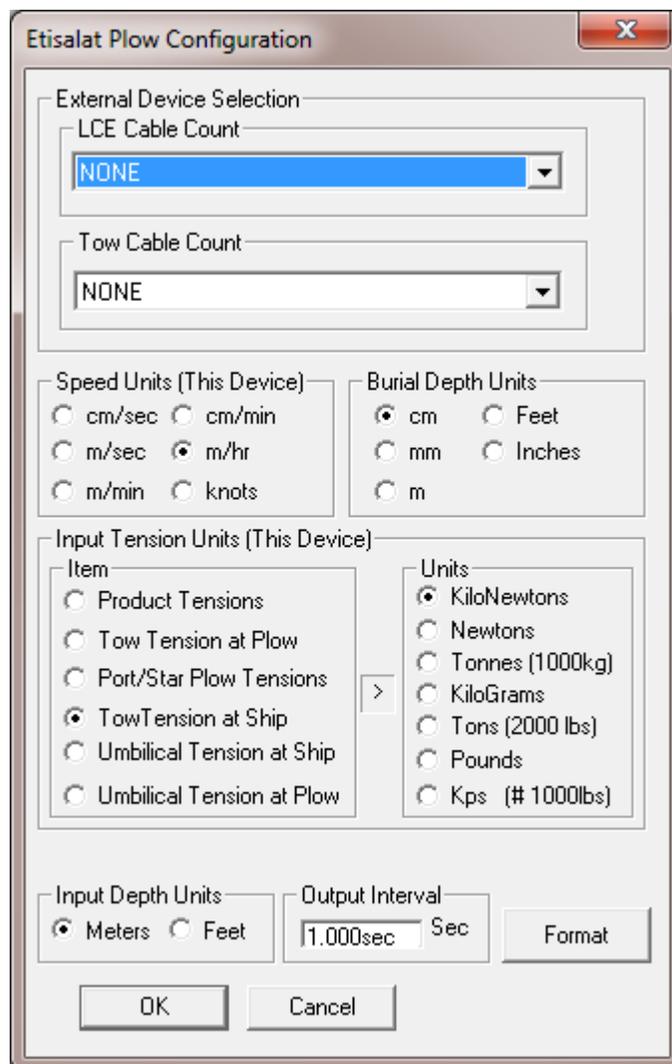 - The tow cable count is obtained from the plow telegram above; do not select an external tow counter.

DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

Serial
Configurable Parameters

WINFROG I/O DEVICES > CONFIGURE DEVICE:

This device must be configured at the I/O Device window level. In the I/O Devices window, click the device name to select it, then right-click and select Configure Device. The Etisalat Plow Configuration dialog box appears, as seen below.

From the dropdown list boxes select the data source for the LCE telephone cable count data if available. Do not select a cable counter for the Tow Cable Count as this data is available from the plow telegram.

In the various Units group boxes, select the input data units for Burial Depth, Water Depth, Product Tensions (As-laid tension), and Tow Tension at Plow. Note that the Speed Units and all other Input Tension Units are not applicable for this device.

Enter the Output interval for the message that WinFrog generates and sends to the plow.

Clicking the Format button launches the following dialog:
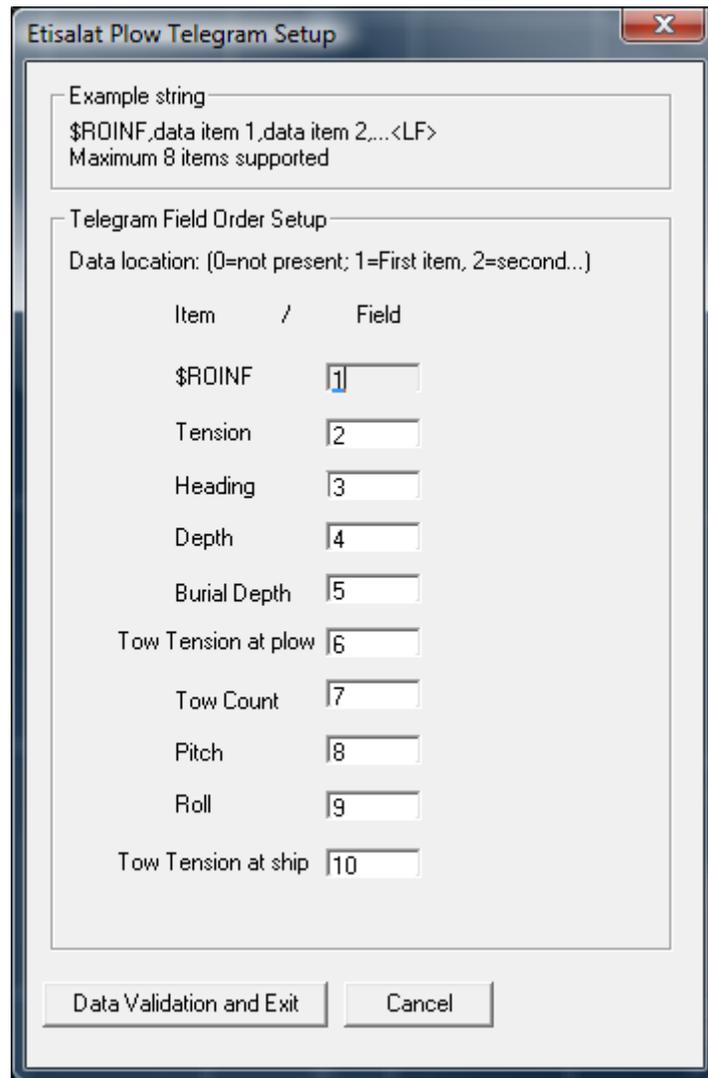
The values in the edit controls (Tension, Heading, Depth, Burial Depth, Tow Tension, Tow Count, Pitch, Roll, and Tow Tension at ship) can be changed to specify the position of a given field in the $ROINF telegram. The $ROINF field is the header and must always be the first field and fixed at '1'. All editable values must be greater than one but less than

16. No entered field number may repeat. The values do not necessarily need to be in sequential order. One or more values may be zero – a zero means that the given item is not present in the telegram or that the user does not want the item to be decoded. But at least one editable value must be non-zero.

When you have configured the edit controls with the desired values, click the Data Validation and Exit button to verify that the values meet the criteria and to return to the previous dialog. If the values fail the verification, a message will appear saying that there is a problem and WinFrog will not exit to the previous dialog.

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

Adding the Etisalat Plow device creates three data items: PLOWDATA, ROV REF VEH, and HEADING. Once the data items have been added to the vehicle, they must be edited to suit the application.

Data item: ROV, Etisalat Plow, PLOWDATA

This data item is used to assign plow related data to the plow, provide a reference point on the plow for positioning the plow relative to the ship, and to enable logging in the raw file. Add it to the plow vehicle in WinFrog.

Highlight this data item in the vehicle's device list and click the Edit button to open the Configure Plow dialog box as seen below.

Positioning Mode tab
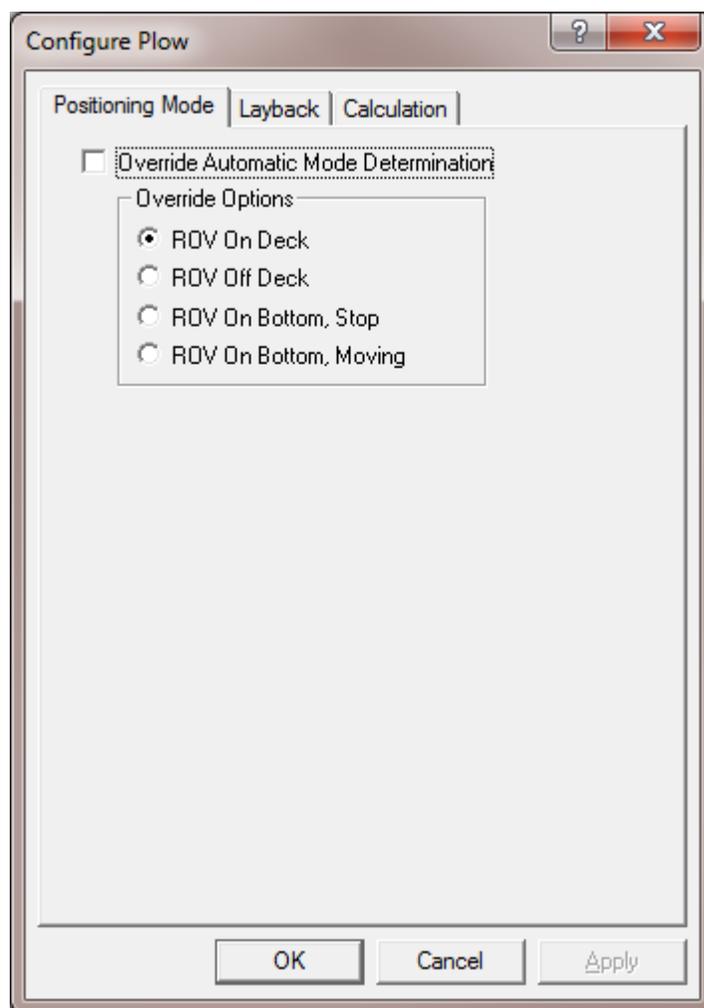
Override Automatic Mode Determination:
This checkbox determines whether WinFrog automatically determines the towed vehicle location and mode or whether the operator determines it.

When in automatic mode, WinFrog uses the following criteria to determine the mode of the towed vehicle:
ROV On Bottom, Moving is assumed if the speed is greater than .2 knots or the Use ROV Speed setting is off and the layback is calculated at more than 1 meter.
ROV Off deck is assumed if the speed is greater than .2 and the layback is calculated at less than 1 meter and the altitude is greater than 4 meters.
ROV On deck is assumed if the speed is 0 and the layback calculated is less than the sum of the depth offset entered on the Calculations tab and the Tow point above water entered on the ROV REF VEH dialog.
ROV On Bottom, Stopped is assumed if none of the others are true.

Override Options:
ROV On deck places the towed vehicle on the tow vessel 5 meters forward of the offset point entered in the ROV REF VEH dialog.
ROV Off deck places the towed vehicle on the tow vessel at the tow point, which is the offset point entered in the ROV REF VEH dialog.
ROV On Bottom, Stop leaves the vehicle where it was when this option was selected and makes no further calculations as to its position.
ROV On Bottom, Moving calculates the towed vehicle's position using the data available and updates all displays with this data.

Layback tab
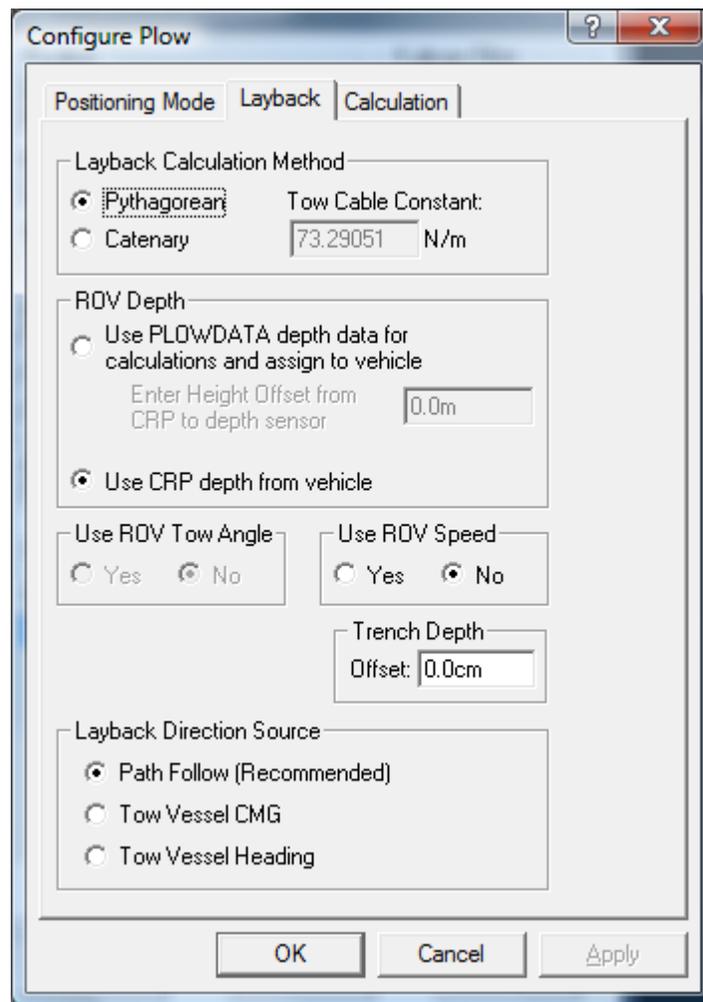
Layback Calculation Method
Pythagorean uses the depth and cable count to form a right triangle. The layback is then calculated and applied to the tow vehicle's offset position along with an azimuth based upon the previous towed vehicle's raw position. WinFrog will use this position to calculate an azimuth but use the calculated layback for the distance between the towed vehicle and the tow vehicle.

The right triangle is formed thus: the hypotenuse is the cable count and the vertical value is the sum of the depth, Tow Point Above Water and the z offset found on the Calculations tab below.

Catenary requires the weight of the cable in newtons/meter, (1lbs/ft = 14.63nt/m). This calculation uses the cable count, depth of the towed vehicle and the tow tension to calculate the layback using a static catenary model. The azimuth used is the same as described above.

Use ROV Depth
Use PLOWDATA depth for calculations and assign to vehicle causes two actions:
1) The depth obtained from this device will be added to the depth offset and assigned to this vehicle. The depth offset is entered in the Calculation tab.
2) The value used to calculate the layback is the above value plus the depth offset entered on the Calculations tab plus the value *Tow Point above the Water*, entered in the ROV REF VEH configuration dialog (attached to the tow vehicle).

Use CRP depth from Vehicle causes the depth for the layback calculation to be obtained from the vehicle. Essentially, this means the depth must be obtained by another device and assigned to the vehicle by that device.

Use ROV Speed
Yes causes the speed of the vehicle to be obtained from this device. Since this device does not provide a speed select **No**.

Use ROV Tow Angle
This option is not applicable to this device.

Trench Depth
Offset – This device does not provide trench depth so this offset is not applicable; it should be set to 0.

Layback Direction Source
   Path Follow (Recommended) This is the recommended selection. It uses its own previous position and the tow vehicle location to determine the direction to the new position.

   Tow Vessel CMG This selection uses the tow vehicle's course made good (plus 180 degrees) to determine the direction to the new position. As the course made good changes the towed vehicle will swing back and forth.

   Tow Vessel Heading This selection uses the tow vehicle's heading (plus 180 degrees) to determine the direction to the new position. As the vessel's heading

changes the towed vehicle will swing back and forth. This is usually more pronounced than the Tow Vessel CMG selection.

Calculation tab
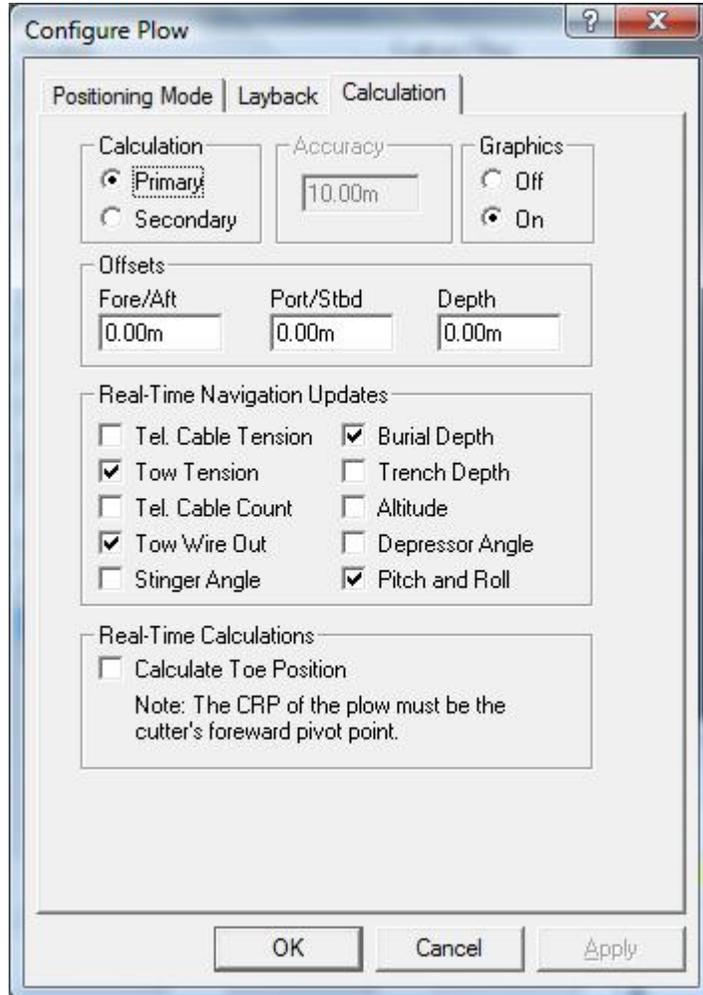
Calculation
Primary – when selected, the layback described above will be used to calculate this vehicle's position, which will be assigned to it.
Secondary – when selected, this device will not determine this vehicle's position.

Accuracy
The Kalman filter uses this value as a weight factor. The operator cannot adjust it.

Graphics
Select the On radio button to display a square in the Graphics and Bird's Eye windows at the offset position below.

Offsets
The **Fore/Aft** and **Port/Stbd** offset point is the reference point for the layback distance. Essentially, the lay back distance is the distance between this point and the offset point of the tow vehicle described in the **ROV, Etisalat Plow, ROV REF VEH** section. This can also be viewed as the beginning or 0 point of the tow cable. This offset point is from the towed vehicle's CRP to the tow point.

Depth is an offset from the CRP. It is applied in several different ways:
1) If **Use ROV Depth** is set to **Yes** (on the Layback tab) this value is added to the depth from this towed vehicle device and assigned to the vehicle's depth. See Use ROV Depth on the Layback tab above.
2) If the Pythagorean solution is selected, this value is added to the vehicle depth and the Tow Point Above Water value to get the vertical portion of the right triangle when computing the layback.
3) If the catenary solution is selected, this value is not used in the model.

Real-Time Navigation Updates
If you have selected an external cable counter for the telephone cable then check the Tel. Cable Tension box. This will assign the tension from that device to the vehicle. Checking the Tow Tension and Tow Wire Out will assign the tow tension at the ship and the tow cable count to the vehicle. If you wish to assign the As Laid Tension to the vehicle use the COUNT data item below; check the Pitch and Roll and Burial Depth boxes to assign these values to the vehicle. All others should be unchecked so this driver does not interfere with another driver providing this data. The heading that this driver provides is handled by the HEADING data item, see below. The plow depth is handled on the layback tab, see above.

Real-Time Calculations
Calculate Toe Position – is not applicable to this driver.

Data item: ROV, Etisalat Plow, ROV REF VEH

This data item is attached to the vehicle in WinFrog that has a real-time positioning source (DGPS etc.) typically the tow ship. This vehicle with its known position serves as the reference point for determining the Plow's position. Highlight this data item and click the Edit button to open the Configure ROV Reference dialog box seen below.
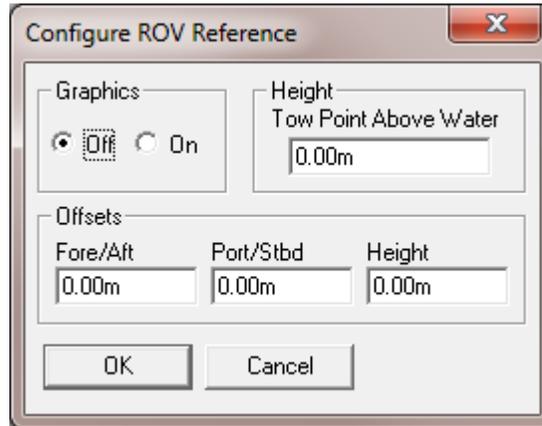
Graphics:
Select the On radio button to display the device name and a square at the location of the ROV, within the Graphics and Bird's Eye windows.

Tow Point Height:
The height of the tow point above water is added for layback calculations.

Offsets:
The X,Y,Z Offsets are applied from the CRP to the tow point (usually the winch) on the ship. Note that the Height Offset is not used for operations involving plough vehicles.

Data item: ROV, Etisalat Plow, COUNT
The **Etisalat Counter COUNT** data item must be edited once it is added to a vehicle's device list. Highlight the **COUNTER, Etisalat Counter, COUNT** data item in the vehicle's device list and click the **Edit** button. The **Configure Counter** dialog box appears as seen below.
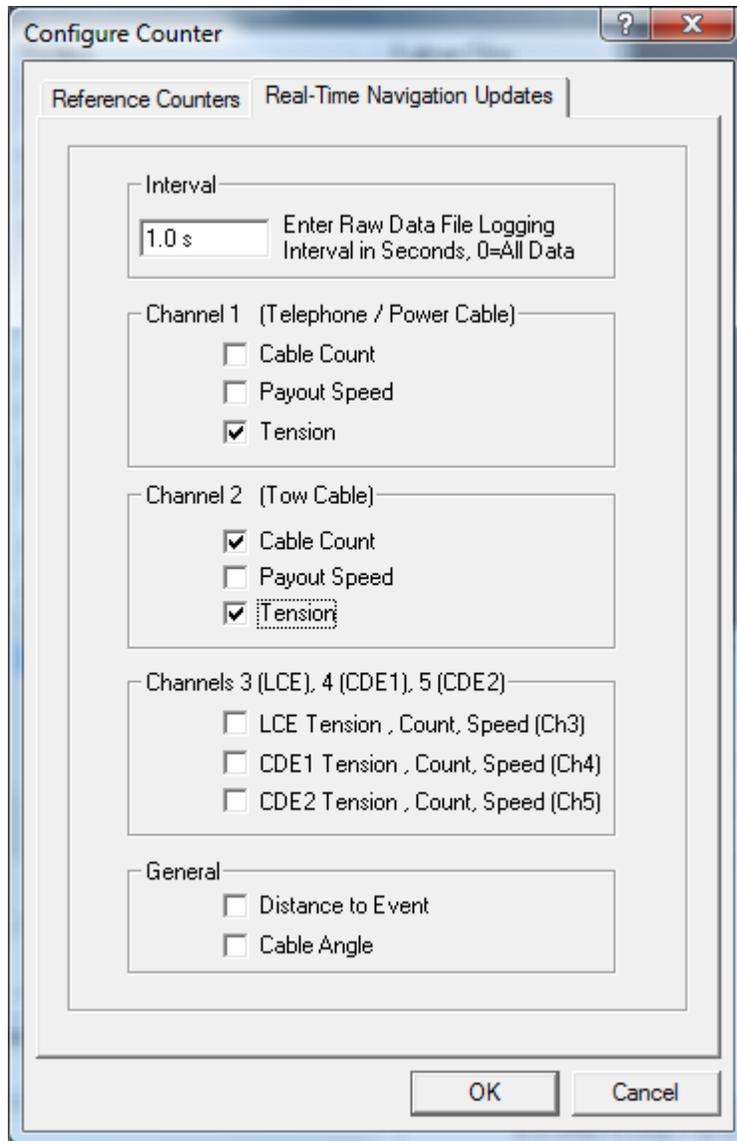
This dialog has two tabs. The first, **Reference Counters**, does not apply to this counter and should be left at the defaults. The second, **Real-Time Navigation Updates**, enables or disables this device's data from being passed to the vehicle. Checking the Channel 1 Tension will assign the As laid Tension to the vehicle. The tow count and tension can also be passed to the vehicle by checking these two boxes.

You can control the amount of data written to the raw file by changing the value in the interval box.

If another counter is attached to this vehicle you must uncheck the boxes on that data item that you have checked here, as it will overwrite the values from this device and vice versa.

TELGRAM SPECIFICATIONS:

Output string
$ROGEO,LCE Tension, Plow latitude, Plow Longitude, Plow KP<CR><LF>

Where:
       LCE Tension in tonnes. Obtained from the selected LCE cable count device.
       Latitude/Longitude in decimal degrees
       KP in kilometers

Input String
$ROINF,cable tension,heading,plow depth,burial depth,tow tension at plow,tow wire out<CR><LF>

Where:
       Cable tension at the plow (selectable units)
       Heading (degrees)
       Water depth (selectable units, recommend m)
       Burial depth (selectable units, recommend cm)
       Tow tension at plow (selectable units)
       Tow wire out (m)

Notes
       If the tow wire out field is not present the message will be still decoded and used.
       All other fields must be present.
       The tow wire out data is only used and made available in the PLOWDATA and
       COUNT data items if no Tow Cable device is selected.

Devices
If an LCE Cable Count device is selected, the product cable count and tension at the ship are obtained from the selected device and passed to the vehicle via the PLOWDATA data item.

If a Tow Cable Count device is selected, the tow wire length and tension at the ship are obtained from the selected device and passed to the vehicle via the PLOWDATA data item.