WinFrog Device Group:	PLOW
Device Name/Model:	Valeport IPS
Device Manufacturer:	Valeport Ltd St, Peter's Quay Totnes Devon TQ9 5EW United Kingdom +44 (0) 1803 869 292 sales@valeport.co.uk
Device Data String(s) Output to WinFrog:	See Telegram Specification section below
WinFrog Data String(s) Output to Device:	See Telegram Specification section below
WinFrog Data Item(s) and their RAW record:	INJECTOR 377 INJECTOR REF 376

DEVICE DESCRIPTION:

The Valeport IPS device enables the input from up to 3 depth sensors to support the calculation of multiple data types. It can be summarized as follows:

1. 3 depth sensor inputs:
    a. Input of $PSSV, $PIPS or simple depth messages.
    b. Machine based depth sensor attached to a subsurface vehicle, e.g. injector
    c. Mobile based depth sensor, e.g. diver held.
    d. Reference depth sensor attached to the hull of a reference surface vessel that is equipped with devices capable of providing accurate realtime elevation data (e.g. RTK GPS),
2. 1 data output
    a. Select output of Depth of Burial (DOB), Elevation of Cable (EOC) or Elevation of Trench Bottom (EOT).
    b. Specify format.
        i. NMEA $-- DBT telegram
        ii. plain depth telegram
        iii. plain depth telegram with header.
3. Using the Machine and/or Mobile input and combining the data with a water depth obtained from a specified vehicle, calculate DOB.
    a. This can be passed to the vehicle as the depth of burial and be available for display in the Vehicle Text window
    b. This is logged to the raw record 377 and is available for processing with Ribbit
4. Using the Machine and/or Mobile depth sensor inputs and the Reference input, calculating Elevation of Cable EOC or EOT.

a. This can be passed to the vehicle as its elevation/depth and be available for display in the Vehicle Text window and logged to automatic and manual events.
b. This is logged to the raw record 377 and is available for processing with Ribbit
5. When configured to determine EOC or EOT, and used with a suitable DTM (requires the MBES Logging module), calculate the DOB or Depth of Trench Bottom (DOT).
a. The DOB can be passed to the vehicle as the depth of burial and be available for display in the Vehicle Text window
b. The DOB is logged to the raw record 377 and is available for processing with Ribbit
c. The seafloor elevation can be passed to the vehicle as the water depth and be available for display in the Vehicle Text window and logged to automatic and manual events.
d. The seafloor elevation is logged to the raw record 377 and is available for processing with Ribbit

Calculations

The calculations are done at the device level using data received from the respective sensors and retrieved from the respective vehicles.

Burial Depth Calculation Using Water Depth

$DOB = D_M + H - WD$

where:

DOB is the calculated Depth of Burial
D_M is the observed Machine or Mobile sensor depth
H is the vertical offset from the Machine or Mobile sensor to the expected burial point
WD is the water depth from a specified vehicle

Elevation of Cable and/or Trench Bottom

$EOC = E_R + D_R - D_M - H$

where:

EOC is the calculated Elevation of Cable or Trench Bottom
E_R is the elevation of the reference depth sensor (determined from the offsets and data of the realtime elevation device and the offsets of the reference sensor, with attitude applied if available)
D_R is the observed Reference sensor depth
D_M is the observed Machine or Mobile sensor depth
H is the vertical offset from the Machine or Mobile sensor to the elevation point (note that for a Mobile sensor this is usually 0).

Burial Depth Calculation Using DTM
DOB = E_D - EOC

where:

DOB   is the calculated Depth of Burial or Cable
E_D is the seafloor elevation determined form the DTM
EOC   is the calculated Elevation of Cable or Trench Bottom
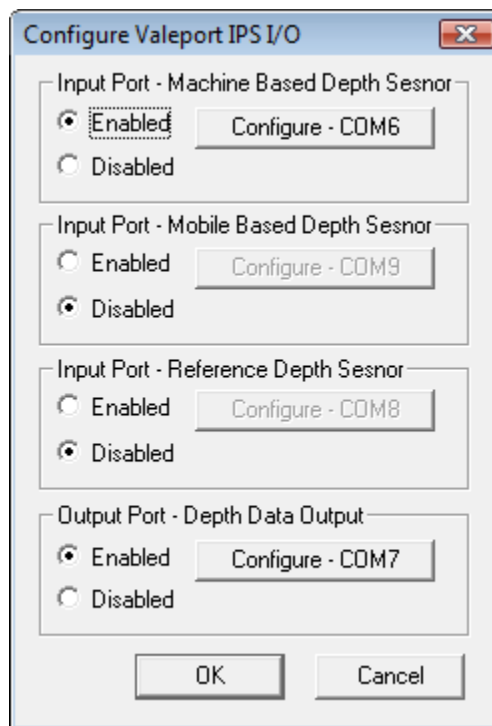
DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

Serial
Configurable Parameters, default is 9600 8-N-1.
Minimum of 1COM ports is required, device supports up to 4.

When the device is added or the Edit I/O for the device is accessed, the following dialog is presented.

Input Port – Machine Based Depth Sensor
If a depth sensor attached to a subsurface vehicle, e.g. injector, is to be used, select Enabled and click the Configure button to select the COM port and configure the parameters.

If this input is not required, select Disabled so that a serial port is not unnecessarily assigned and therefore not available for other devices.

Input Port – Mobile Based Depth Sensor
If a depth sensor that is not attached to a subsurface vehicle is to be used as a hand held device by a diver, select Enabled and click the Configure button to select the COM port and configure the parameters.

If this input is not required, select Disabled so that a serial port is not unnecessarily assigned and therefore not available for other devices.

Input Port – Reference Depth Sensor
If a depth sensor that is attached to a surface vehicle as the reference for elevation calculations is to be used, select Enabled and click the Configure button to select the COM port and configure the parameters.

If this input is not required, select Disabled so that a serial port is not unnecessarily assigned and therefore not available for other devices.

Output Port – Depth Data Output
If calculated data is to be output, select Enabled and click the Configure button to select the COM port and configure the parameters.

If this input is not required, select Disabled so that a serial port is not unnecessarily assigned and therefore not available for other devices.

Note: At least 1 port must be enabled. If none are enabled when the dialog is closed with OK, you are warned that at least 1 port must be enabled and are returned to the dialog.

Note: If a conflict between enabled ports is detected, i.e. the same port is assigned to more than one enabled input or output, you are warned and are returned to the dialog.

The operation of the device can be monitored via the I/O Device Window. The input for each sensor is displayed on its own page. To select between these pages, right-click in the data tab and select the desired page: Machine Sensor Port, Mobile Sensor Port or Reference Sensor Port. The output is displayed at the bottom of every page.

WINFROG I/O DEVICES > CONFIGURE DEVICE:

The device requires configuration. In the I/O Devices window, click the device name to select it, then right-click and select Configure Device. The Valeport IPS dialog box appears, as seen below.
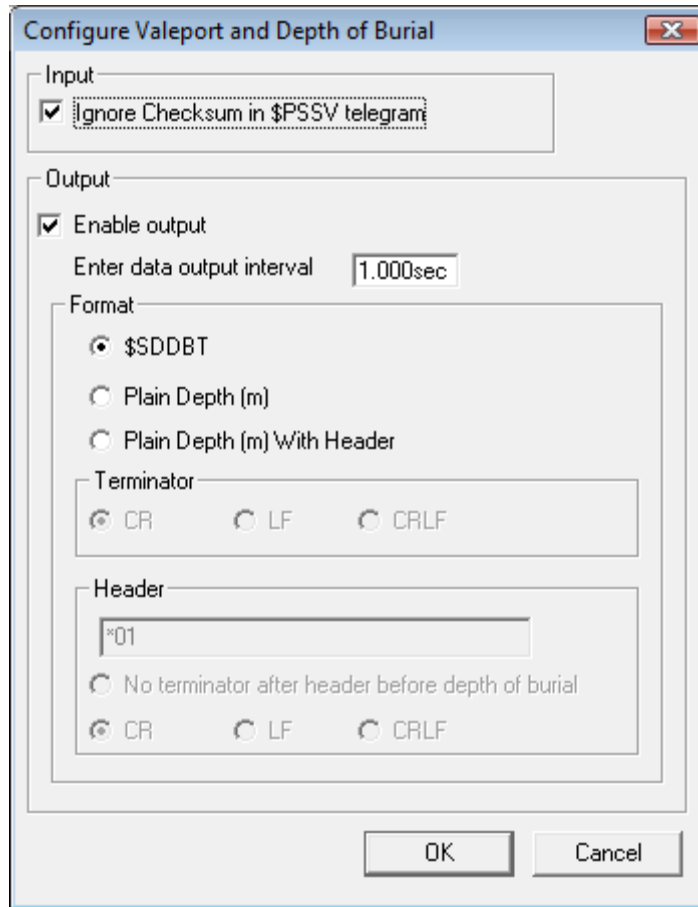
Input

Ignore Checksum
Check this box if you do **not** want WinFrog to calculate a check sum and compare it to the check sum at the end of the telegram. If this box is not checked and the comparison fails the telegram will not be used.

Output

Enable
Check this box if you want the depth of burial output in one of the formats listed below.

Output Interval
Enter the output interval in seconds.

Format
$SDDBT
Select this to output a NMEA 0183 $SDDBT telegram. The value in the telegram is the burial depth.

Plain Depth (m)
Select this one to output the depth in metres as the only field. Select the terminator for the telegram: carriage return (CR), line feed (LF), or CRLF.

Plain Depth (m) With Header
Select this one to output a header followed by the depth. Select the terminator for the telegram: CR, LF, or CRLF. The header may also be terminated with a CR, LF, CRLF, or no termination. The header may be used to address an RS485 device.

Note: The output can be enabled even if the Output Port is disabled and not assigned. Both must be enabled for the output to occur.
Note: The selection of the data to be output is configured at the data item level (see below).

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

The Valeport IPS device supports two data items: INJECTOR and INJECTOR REF.

INJECTOR REF
This data item enables the passing of water depth and reference sensor elevation to the device and must be added to the surface vehicle that is to provide this data. If this data is to be provided by different surface vehicles, this data item must be added to both vehicles. It also enables the logging of the raw reference depth sensor data.

This data item requires configuration.
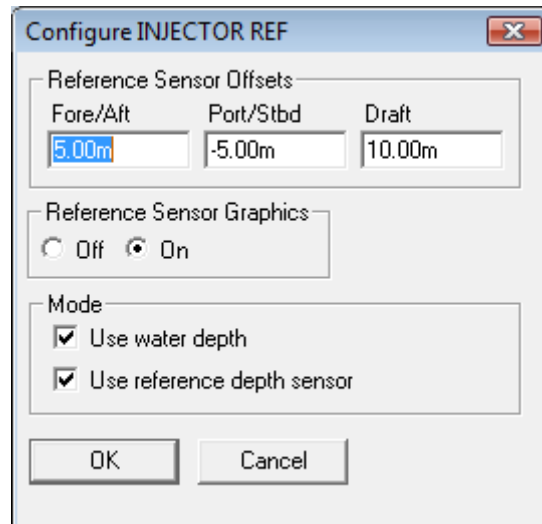
Reference Sensor Offsets
Enter the offsets from the CRP to the reference depth sensor. Note that the third is defined as Depth and therefore is positive down. These are used to translate the elevation of the CRP to the sensor. If an attitude sensor is available and enabled, the translation from the CRP to the sensor applies the pitch and roll to eliminate the affect of long lever arms.

Reference Sensor Graphics
Select On to have the location of the depth sensor displayed in the Graphics windows. Turning this On can assist confirming that the offsets have been entered correctly. This is generally set to off to reduce the clutter in the graphics once this has been done.

Mode

> **Use water depth**
> If this vehicle is to provide the water depth (obtained from an echo sounder) to the device for DOB calculations, check this box. Otherwise leave this unchecked.
>
> **Use reference depth sensor**
> If this vehicle is to provide a reference depth sensor elevation for EOC or EOT calculations, check this box. Otherwise leave it unchecked.

The data passed to the vehicle and the status of the application of the attitude can be monitored in a Calculation Window configured to display Data Item Text and or Time Series.
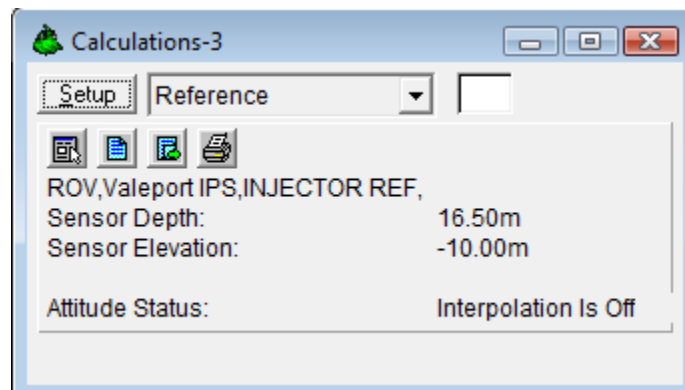
INJECTOR
This data item enables the passing of two items to the device: 1) the vertical offset between the depth sensor and the point of interest, e.g. offset to bottom of injector and 2) the vehicle position to interrogate the DTM for a seafloor elevation. It also enables the passing of the raw Machine or Mobile depth sensor data, calculated DOB, EOC/EOT and DTM based seafloor elevation to the vehicle. These are logged to raw data files and assignment as appropriate.

This data item is to be added to the subsurface vehicle for which the respective device's Machine or Mobile input pertains to. If both the Machine input and the Mobile input are enabled for the device and are required, this data item must be added to each of the respective vehicles and configured accordingly (see Application Mode below).

This data item requires configuration.

Depth Sensor Offsets
Enter the offsets from the respective depth sensor to the point of interest, e.g. cable or expected bottom of trench. Note that the third term is defined as Height and is therefore positive up.

Note: It is recommended that the CRP of the vehicle that the INJECTOR data item is associated with be the point of interest, e.g. bottom of injector, since if the Elevation Mode (see below) is set to EOC or EOT, the calculated elevation corrected for the Height offset is assigned to the vehicle as the CRP elevation.

Sensor Graphics
Select On to have the location of the depth sensor displayed in the Graphics windows. Turning this On can assist confirming that the offsets have been entered correctly. This is generally set to off to reduce the clutter in the graphics once this has been done.

Burial Depth Mode
Burial Depth off
Burial depth calculations are not performed for this data item.

Burial depth using water depth
Burial depth calculations are performed using a reference water depth. This requires the INJECTOR REF data item be assigned to a reference vehicle and configured for *Use water depth*.

Burial Depth using DTM
Burial depth calculations are performed using a seafloor elevation value retrieved from a DTM and a calculated EOC or EOT. This requires the INJECTOR REF data item be assigned to a reference vehicle and configured for *Use reference depth sensor* and this data item be configured for either *Elevation of cable (EOC)* or *Elevation of trench bottom (EOT)*.

Note: The Burial Depth using DTM option is only available if the MBES Logging module is present.

Note: If the Burial Depth Mode is set to either *using water depth* or *using DTM*, the DOB is passed to the vehicle and therefore available for display in the Vehicle Text Window.

Note: If the Burial Depth Mode is set to *using DTM*, the seafloor elevation is assigned to the vehicle as the water depth and is therefore available for display in the Vehicle Text Window and logging to automatic and manual event files.

Elevation Mode
Elevation off
Elevation calculations are not performed for this data item.

Elevation of cable (EOC)
Elevation calculations are performed for this data item and are flagged as EOC when logged to the raw file.

Elevation of trench bottom (EOT)
Elevation calculations are performed for this data item and are flagged as EOT when logged to the raw file.

Note: If the Elevation mode is set to either *EOC* or *EOT*, the elevation is passed to the vehicle as its CRP elevation and therefore available for display in the Vehicle Text Window and logging to automatic and manual event files.

Application Mode
Depth sensor attached to machine (injector)
Select this option if the depth data input to be used is that on the Machine port.

Depth sensor used manually
Select this option if the depth data input to be used is that on the Mobile port.

Output Control
Disabled
Output is not generated by this data item

Burial depth
Output is the DOB generated by this data item.

Elevation of cable/trench
Output is the EOC or EOT generated by this data item.

Note: If the INJECTOR data item for the same device is added to more than one vehicle, it is important that output is only enabled for one of the vehicles. If it is enabled for more than one, the output will be generated for both but not in a controlled manner, i.e. it is not possible to determine which data is used in any given output message.

Raw Data Logging
Enabled
Select this if data is to be logged to the raw files when raw data logging is active.

Disabled

Select this if data is not to be logged to the raw files when raw data logging is active.

Note: It is recommended that if the data item is associated with the Machine depth sensor, that this option be set to *Enabled* as all data will be relevant.
However, if the data item is associated with the Mobile depth sensor, it is recommended that this option be set to *Disabled* until a desired reading is obtained at which time this option be set to *Enabled* for several readings in order that the raw data and DOB is logged to the raw files while it is relevant, then set back to *Disabled*.

TELGRAM SPECIFICATIONS:

WinFrog will decode three different telegrams from the Valeport IPS:

1) $PIPS message

Field   Data

1       $PIPS   (header)
2   Sensor Depth   (metres)
3   M   (indicates metres)
4   *ddd   (delimiter followed by decimal checksum)
<CR><LF>

Note: The decimal checksum is non-standard for NMEA 0183 telegrams.

e.g.

$PIPS,0000.03,M*122

2) $PSSV message

Field   Data

1       $PSSV   (header)
2   Sound velocity   (metres/second)
3   Sensor Depth   (metres)
4   M   (indicates metres)
5   *hh   (delimiter followed by hex checksum)
<CR><LF>

e.g.

$PSSV,1503.0,1.5,M*54

3) Data only message, no header

Field   Data
1   Depth (metres)
<CR><LF> or just <LF>

This telegram may be followed by a second carriage return and line feed or just a line feed.

OUTPUT TELEGRAM

Three different telegrams may be output by WinFrog.

The first is a standard NMEA 0183 $--DBT telegram, however, the values are the burial depth.

Field	Data	
1	$SDDBT	(header)
2	Burial depth	(feet)
3	f	(indicates feet)
4	Burial depth	(metres)
5	M	(indicates metres)
6	Burial depth	(fathoms)
7	F	(indicates fathoms)
8	*hh	(delimiter followed by hex checksum)

e.g.
$SDDBT,2.806,f,0.855,M,0.468,F*08

The second is just the depth in metres followed by a terminator selected by the operator (CR, LF or CRLF).

Field	Data	
1	Burial depth	(metres)

The third is

Field	Data	
1	Header	
2	Burial depth	(metres)