Integrated Positioning Software
Creative Underwater Technologies

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Version 7.7.1.10

March 2019

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General Information

IPS Introduction

The Integrated Positioning System (IPS) software allows for the integration of the EdgeTech Broadband Acoustic Tracking System (BATS), a ship's GPS and a heading sensor (GPS-GYRO, flux gate or gyro compass) to a personal computer (PC) running Windows 7, 8 or 10 operating systems. The system allows for the tracking and navigation of the primary surface support vessel (BATS platform), up to nine submerged targets (e.g., an ROV, AUV, submersible, towfish, diver, etc.) in addition to one remote ship and one Doppler Velocity Log navigation system.

Notes: *A secondary or remote ship can be displayed on the primary support vessel (IPS session) as target 9 provided the data can be transmitted to the primary support vessel. This is typically done using point-to-point RF data modems usually in the UHF bandwidth. Doppler Velocity Log (DVL) units supported included the Teledyne (RDI) Workhorse Navigator and the Link Quest units.*

The position of the submerged targets relative to the ship is determined by the BATS and sent to a PC over a Local Area Network (LAN) or via an RS-232 serial link. The submerged targets' relative bearings are adjusted to a true bearing using the information from the ship's heading sensor. The actual position (latitude/longitude) of the submerged target is then calculated based on the range and true bearing relative to the surface support ship's position as supplied by a GPS receiver. The results are then graphically displayed on the PC's screen. The data may be stored and retrieved for later processing.

Technical Support Contacts

For Technical Support please contact EdgeTech:
ORE Offshore is now EdgeTech

EdgeTech

4 Little Brook Road
West Wareham, MA 02576 USA

Main Phone #: 508-291-0057
Fax #: 508-291-2491
general email: info@edgetech.com
website: http://Edgetech.com

For emergency technical assistance,
please call 508-942-8043

Additional Useful Contacts

NMEA Technical Information:

Marine Electronics - The Official Journal of the NMEA
National Marine Electronics Association

website: http://www.nmea.org
Phone: 410-975-9425
Fax: 410-975-9450
Email: info@nmea.org

Serial Interface Card Technical Information:

Lantronixs

RS-232 to Ethernet Converter
Part #: USD-2100
Website: http://www.lantronix.com
Phone: (949) 453-3990
Fax: (949) 453-3995
Email: sales@lantronix.com

C2G formerly Cables To Go

Website: http://www.cablestogo.com
Phone: 1.800.506.9607

Serial Multiplexer Technical Information:

NoLand Engineering, Inc.

Website: http://nolandeng.com
Phone:321-951-7329
Email: info@nolandeng.com

Horita Serial Control Titler Technical Information:

Website: www.Horita.com
Phone: 949-489-0240
Email Technical Support: techsupport@horita.com

ROV Telemetry

OceanTools Ltd

Website: http://www.oceantools.co.uk
Phone:+ 44 1224 709606
Email: mail@oceantools.co.uk

Gyro Compasses

Subsea Technologies

Website: http://www.subseatechnologies.com
Phone: 281-398-5600
Email: sales@subseatechnologies.com

KVH Industries, Inc.

Website: www.kvh.com
Phone: 401-847-3327
Fax: 401-849-0045

Furuno U.S.

Website: http://www.furunousa.com
West Coast
Phone: 360-834-9300
East Coast
Phone: 410-479-4420

Raytheon Marine Company

Website http://www.raytheon-anschuetz.com
Phone: +49 (0)431 3019 96440
E-Mail: anschuetz.service@raytheon.com

Frequently Asked Questions

1. How do I get a target back on the view screen if it is out of the viewing area?
   Make sure the target of interest is displayed in the Focus Icon Box on the toolbar by clicking on the Focus Icon button until the desired target is showing. Then use the toolbar Home Key to put the target in the center of the viewing area. The Zoom In, Zoom Out and Zoom Area buttons on the toolbar may then be used to further adjust the viewing area.

2. What should I check first if no new tracking data is being processed?
   First make sure that a Hardware Key is being used. If the IPS Message Box displays a "Post processing only!" message that means the IPS did not find a hardware key on start up. Also check the About dialog box and make sure the hardware key number is displayed and not "Post Processing Only". If this is the case the IPS program must be exited, the hardware key put in and the program restarted before new tracking data can be processed. In addition, make sure that Ship's Position input and ORE Data input have been set properly in Inputs->System Inputs. Next make sure that a communications port has been selected using the Communication dialog box. If incoming serial strings are displayed in the Communications View Port Window, this would indicate that the communication port settings are correct, otherwise recheck the communications settings.

3. How do I calculate and display the Range and Bearing between two waypoints?
   First make sure the two waypoints have been set then use the View->Range and Bearing Calculator to calculate and display the range and bearing.

4. How do I set a Waypoint?
   There are several ways to do this. You can set a Waypoint using the Waypoint Icon Box on the toolbar to add a waypoint whose position corresponds to the current position of the focus target. You may also use the View->Waypoint List Window to access the IPS Waypoint Box and enter a Waypoint manually. In addition you can use the View->Cursor Waypoint Activated option to add a waypoint by left mouse clicking the portion of the grid corresponding to the desired waypoint location.

IPS Help

The IPS help manual is available online:

https://gocut.tiwri.com/

Also entering F1 in almost all of the dialog boxes will display the corresponding help file entry.

List of Typical IPS Equipment

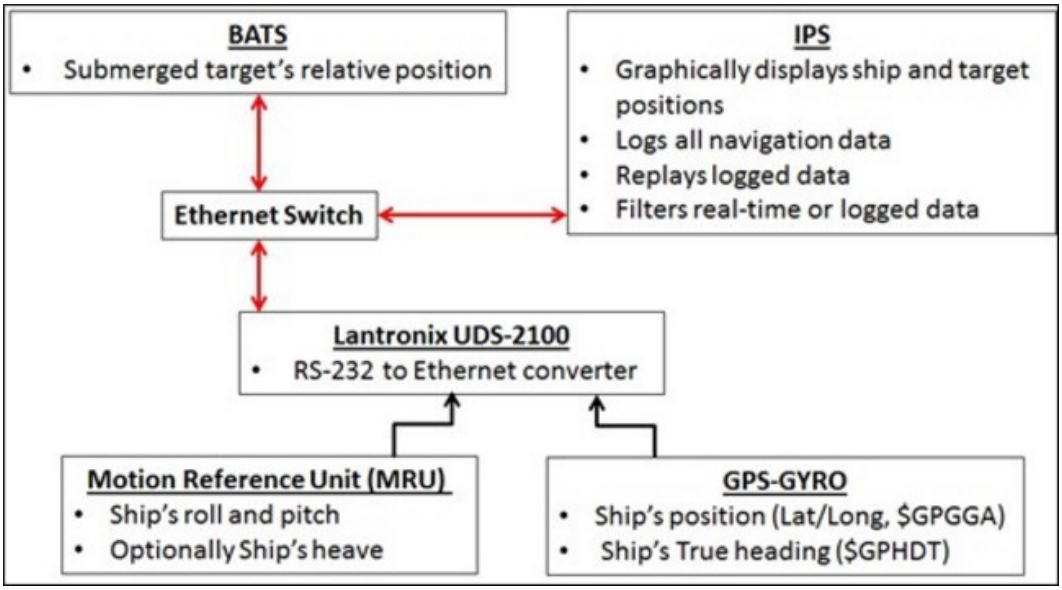
The system has 4 major components:

1. ORE Broadband Acoustic Tracking System (BATS).

2. A GPS receiver that supports the GGA data format, a National Marine Electronics Association (NMEA) data string version 1.5 or higher. For example:
   $GPGGA,154325,2939.551,N,09533.814,W,9,5,002,0018,M,-06,M
   and optionally the following NMEA data strings:
   VTG- Vessel's Course and Speed over ground ($GPVTG,016.7,T,,,08.5,N,,)
   ZDA- Date time
   HDT- True heading (available from GPS positioning and heading systems ("GPS Gyro") or as a pass thru function)
   The first data string (GGA) contains the ship's position in latitude and longitude. Latitude and longitude minutes carried out from 3 to 6 places right of the decimal point are acceptable. A check sum at the end of the $GPGGA data string is acceptable but not necessary. The optional data strings (VTG) contains the ship's course and speed over ground, (ZDA) data time and the (HDT) vessel's true heading.

3. GPS positioning and heading (GPS-GYRO) system, gyrocompass or flux-gate compass to provide vessel heading information. The heading data can be sent to the IPS program through a serial port multiplexer, a USB RS-232 converter or Ethernet RS-232 converter.
   Note: Please contact ORE Technical Support Contacts for additional assistance in compass selection. The following is a list of acceptable compasses:
   A. An EdgeTech ORE Motion Reference Unit (MRU) Model No. ($POREM), NMEA format $PRDID or Maretron SSC200 solid state compass ($PMAROUT).
   B. Any device that outputs an NMEA data string in HDM, HDT, HDG, VHW or TSS HHRP format containing the ship's heading. Examples are compasses produced by EdgeTech, Subsea Technologies, KVH Industries, Inc., Furuno, and Raytheon among others. See the Technical Support Contacts section of this manual for information on contacting these companies. Other formats may be supported, please contact ORE for assistance. Please see the section GPS Receiver in this manual for more information.
   C. Heading sent directly to the PC via Ethernet using UDP (F-180 MCOM format). Please see the section on System Interfacing in this manual for more information.

4. A PC with XP or Vista 32 bit, Windows 7 32 or 64 bit and Windows 10 32 or 64 bit, 600 x 800 graphics or better and one available USB port with a USB-RS232 converter and one Ethernet port.



Suggested BATS-IPS Setup

Summary of Software Features

The IPS software operates on a Windows compatible PC (XP or Vista 32 bit and Windows 7 32 and 64 bit, 600 x 800 graphics) with at least one hundred and twenty eight (128) MB RAM. The PC allows for easy handling of the ship's and target's positional data, and also provides a graphic display of the data as it is collected. The data may then be stored to a disk and reloaded at any time into the IPS program for review or for additional printouts. In addition, the software also allows for the following:

1. Searching through the currently displayed data and/or through any data file loaded into the system WITHOUT the loss of any incoming data. All meaningful mission data is saved in an IPS data file. This data can be filtered using any of the filtering algorithms available in the filtering menu. See MENU BAR-> File Menu for information on saving and loading data from previous missions, and MENU BAR -> for information on filtering data.

2. Shifting the current viewing window to center on any target.

3. Scaling of the current area being displayed. If Latitude/Longitude has been selected for the graphical display the available display units are units of nm, meters, yards or feet. If UTM has been selected for the graphical display the only display units allowed are meters. The text position display can be set to either UTM or Latitude\Longitude regardless of the graphical display setting. See MENU BAR -> Display Settings for information on scaling the area currently displayed.

4. Navigation of the support ship or a submerged target relative to any target, beacon, or a specified location (latitude/longitude).

5. Output of a submerged target position in a variety of NMEA and other formats suitable for interfacing with other data acquisition and plotting systems. In addition the Horita Titler may be used to provide video text overlay in real time. Please see the Serial Out Command and Technical Support Contacts sections in this manual for more information.

6. Export of all ship and ORE target position data currently in memory in many common formats such as National Marine Electronic Association (NMEA) format, IPS format and GIS formats like KML and SHP. Please see the section Text/NMEA Export data and GIS/Image Export for more information.

Demo Replay Mode

The Demo Replay Mode allows the user to open a file and play it back in real time. The file being played back will emulate BATS input in that each point will be plotted using the current draw rate. The draw rate can set by using either Target Settings or Ship Settings menu command. A quality control check will be done before each new point is plotted. If the position in the saved file is not within one foot of the raw data position displayed by the software prior to filtering, a warning will be displayed in the IPS Message window. To use the demo replay feature follow the steps listed below.

Note: Files used in the for demo replay mode must end in the extension .raw. For example a file named demo.raw could probably be used for demo replay, while a file named demo.txt could not be used for demo replay.

1. Select the SYSTEMS INPUT -> Ships Position Data - > Demo/Replay option. Please see the System Inputs section of this manual for more information on the SYSTEM INPUT menu command. If the Demo/Replay option has been selected, the Compass Data will be automatically be set to NMEA.

2. Select FILE -> Open and open the file you wish to use for the demo replay. Please see the File Open Command of this manual for more information on the FILE open command.

3. To close the file currently being used for demo replay, use the FILE -> Close menu option. Please see the Close section of this manual for more information on the FILE close command. At this point a new file may be selected for use as the demo replay file or the replay demo mode may exited.

4. To exit the demo replay mode, select the SYSTEMS INPUT menu command and set Ships Position Data to anything but Demo/Replay.

IPS Installation

IPS Installation Steps

1. Run the IPS setup.exe.
2. Insert the IPS Security Key:

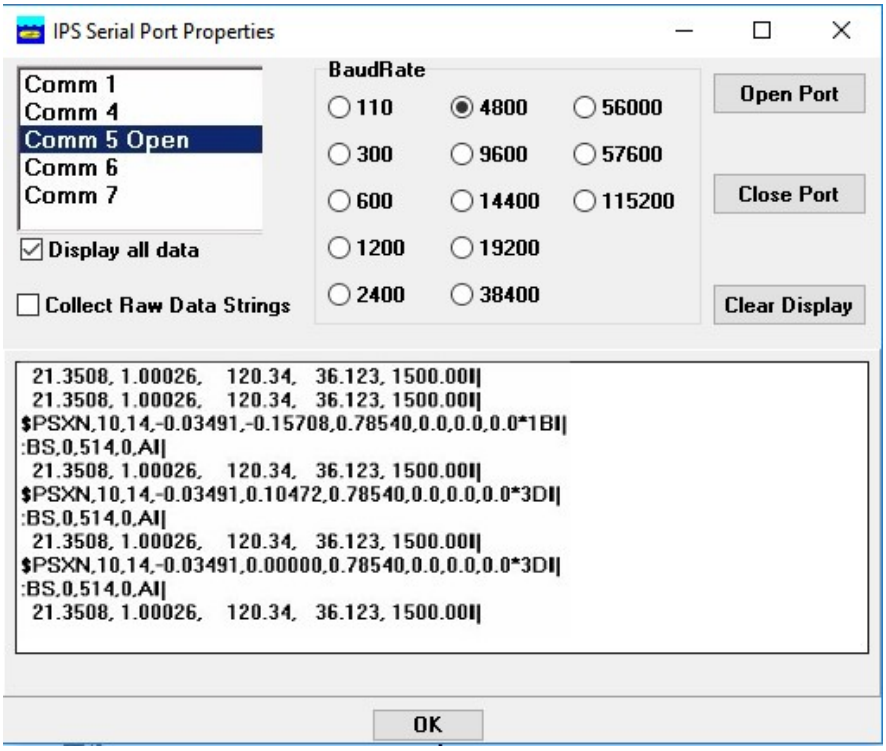
Figure 1. IPS USB Security Key

Setup IPS Communication Port

Serial Ports

1. Run the IPS from desk top Icon 

.
2. Depending on the system setup select serial or ethernet port as required for GPS or VRU data depending on the GPS. From the Main menu select Setup Menu->Communications Command.



1. Select a Serial port from the upper left list box (i.e. Comm 1).
2. Select a Baud Rate (typically NMEA devices default to 4800 baud).

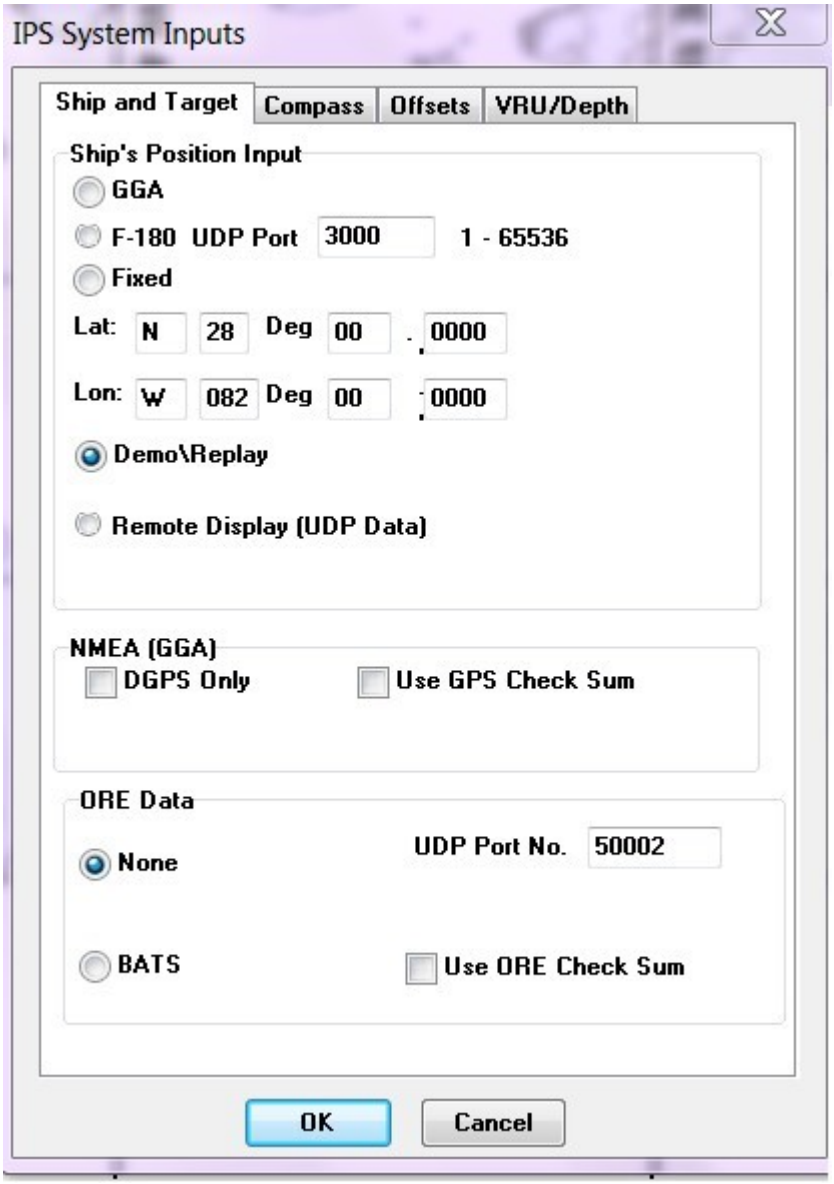
3. Click on the [Open Port] button. Data from that device if available will be displayed in the "in coming data area" below.
4. Continue this process until the necessary devices are on-line and being received by the IPS. This typically includes: GPS (Ship lat/long), ship's heading sensor (Fluxgate compass or gyro) and remote VRU.

Ethernet UDP Ports

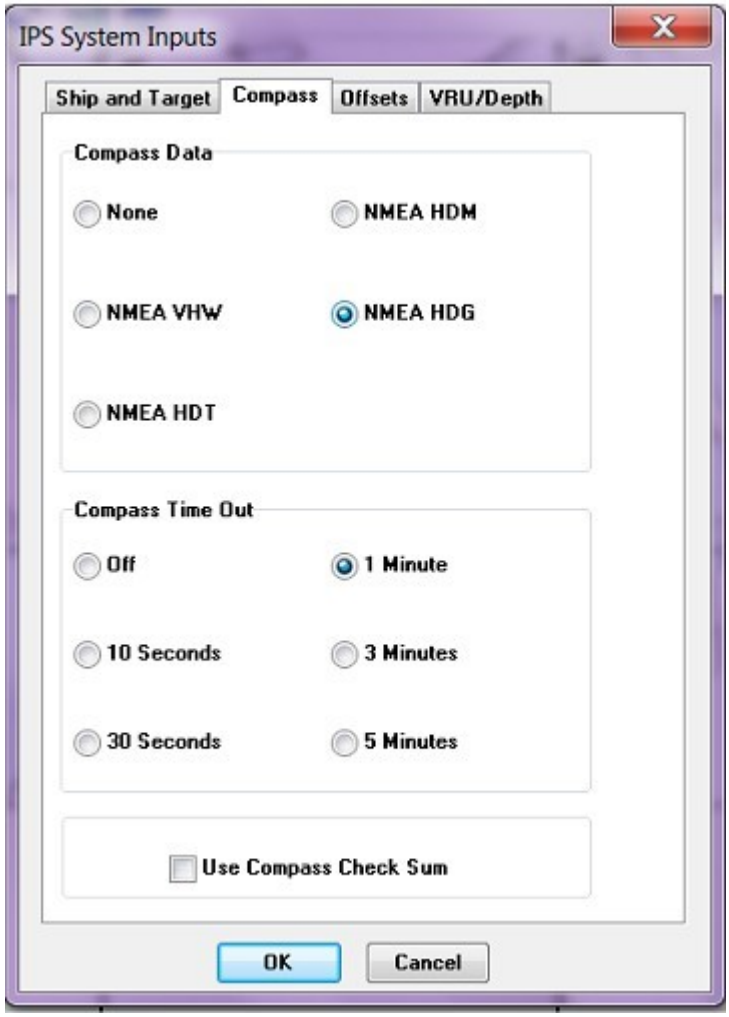
1. From main IPS menu select Setup->Ethernet Settings.
2. Select an unused UDP port.
3. Typically "Header-Special Processing"can be set to **None.**
4. Set **Local Port** number to the UDP port number that the RS-232 converter transmits the data to.
5. Click on the "**Receive Data**"check box.
6. If the IPS is required to transmit data to another device/PC set the **Remote Port** and IP address of the remote device. Note the data format and target number being used are set in the Setup->Serial Out Command menu option.

Setup/configuration of IPS Input Devices

1. From IPS main Menu-> Input Menu->System Inputs Command:



1. If GPS NMEA positions are available select GGA or otherwise:
2. Enter a fixed lat/long position or
3. for CodaOctopus F180 or F190 systems select "F180 UDP".
4. Check DGPS only and Use GPS Check Sum boxes if required for GGA input.
5. Select EdgeTech USBL Tracking System: BATS.
6. Select the System Input "Compass" tab.



1. Select the compass data format style. For NMEA 0183 serial data being received select the corresponding format. Typically the format HDT is provided by North seeking Gyros and HDM or HDG formats are provided by magnetic sensing based heading sensors (Fluxgate compasses etc.) Note if an Attitude Heading Reference System (AHRS) is being used such as TSS MAHRS, IXSA Octans or CDL MiniRLG/MiniPOS set the compass data field to none.
2. Note if the heading sensor provides an NMEA style check sum the user can select the check box "use Compass Check Sum". The check sum field will have the following format '*CS' where the '*' will precede the actual check sum characters that range from 0..9, and A..F (hex encoded ASCII).
3. The remaining two tabs "Offset" and "VRU/Depth" allow for the configuration of an Attitude Heading Reference System (AHRS) as a TSS MAHRS, IXSA Octans or CDL MiniRLG/MiniPOS and allow the user to select the data format for NMEA depth data strings.
4. If valid data from the external devices (ORE USBL, GPS, compass etc.) is being received by the IPS, then the IPS should display the data in text format in the Position Boxes on the right side of the screen and graphically in the center of the screen.

GPS Receiver

Any commercially available GPS receiver should be suitable for use with the IPS, provided it can output the standard NMEA 0183 data strings "GGA" and "VTG". A receiver with differential capability (DGPS) is strongly recommended.

The GPS receiver may be connected to one of the Serial Multiplexer listener ports or to the PC serial port via a shielded RS-232 serial cable. The GPS receiver may also be connected to a RS-232 USB converter which allows you to convert GPS data into USB accessible data that can be input on any windows comport. In addition the RS-232 GPS data may be converted to an Ethernet UDP packet, however an Ethernet port must be opened in the IPS. Please see the Ethernet Configuration section of this manual for more information.

The operations manual for the GPS receiver should be consulted for details of the serial interface, and the procedures for enabling the required data strings. The output protocol should be set to the NMEA standard of no parity, 8 data bits and 1 stop bit.

IPS BATS Setup Procedure

Equipment

1. ORE BATS USBL
   - 1.1. Deck cable (10 m)
   - 1.2. Hydrophone (Model 4213C 22-30 kHz)
   - 1.3. Ethernet switch

2. ORE Trackman software version 1.0.14.0 or later.
3. IPS software version 7 or higher & IPS USB security key.

PC Software Setup

1. Install ORE TrackMan software and update if required.
2. Verify that data output format is set correctly using the text editor Notepad.
   - 2.1. C:\Program Files\ORE Offshore\Trackpoint MMI
   - 2.2. Files: SENT_OUT.INI and SENT_TPI.INI

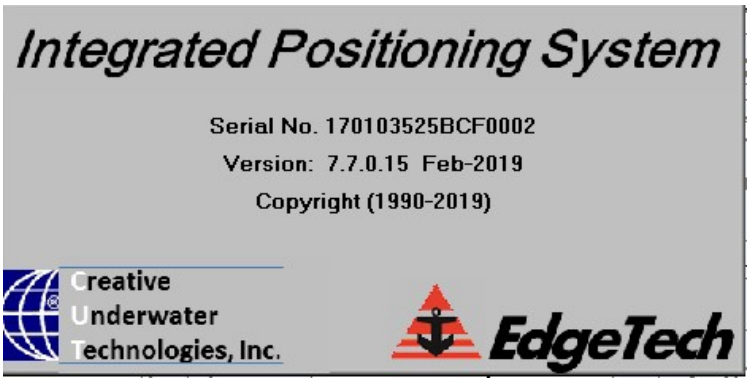
```
[PORE]
FormatMask=3
StartOfMsg=$
Format=PORE
Delimiters=,*
PositionMask1=0
PositionMask2=0
PositionMask3=0
Types=cxtxaxxxxxxxx
NMEA_Format=I02I,U002,c032,i01s,b032,XM62,YM62,DM51,R032,P032,E02I,
Q02I

[POREG]
FormatMask=3
StartOfMsg=$
Format=POREG
Delimiters=,*
PositionMask1=0
PositionMask2=0
PositionMask3=0
Types=cxtxxxxxxxxxxxxx
NMEA_Format=I02I,U002,104I,204I,304I,Q02I,E02I,SM52,A022,B032,XM62,Y
M62,DM52,C032,P032,R032,tC3I,G031
```

3. **Power on BATS (front rocker switch)**

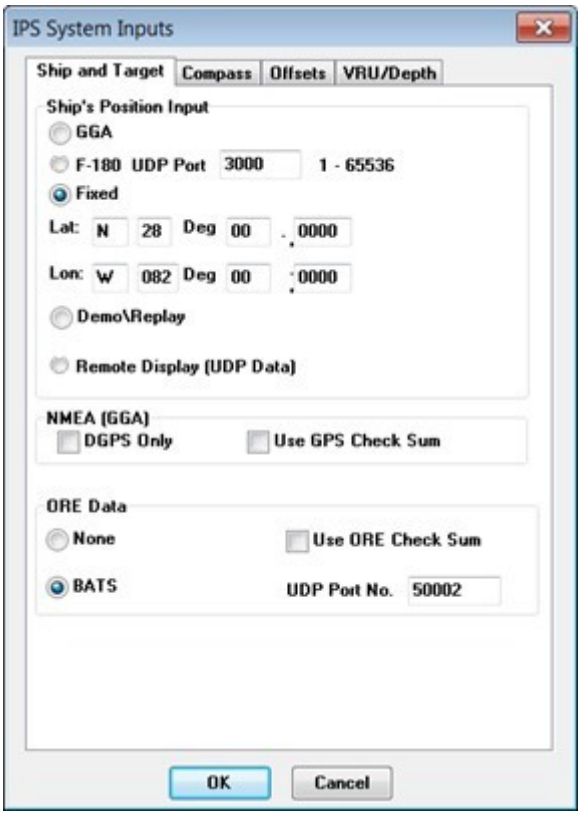
(**The order of the software start-up is important for supporting the TCP Server**)

4. Install IPS Software – See the IPS installation guide.
5. Launch IPS from desktop icon 

6. Verify that an IPS security key was found, there should be a valid serial number on the startup screen or in the about box under the help menu.



7. Open the IPS Inputs Menu->System Input->Ship and Target dialog box and select the BATS radio button in the ORE data group box. The IPS software will automatically start receiving data via UDP broadcast from TM (port 50002) and also start using the ORE time tag. Then select the required GGA input from the Ship's Position Input group box.



8. Select the IPS Setup Menu->Time Options dialog box and check Auto GPS Time Sync.

9. If only receiving GGA NMEA formatted strings, check "Time Sync From GGA String" and be sure that the PC date and time zone are set correctly.

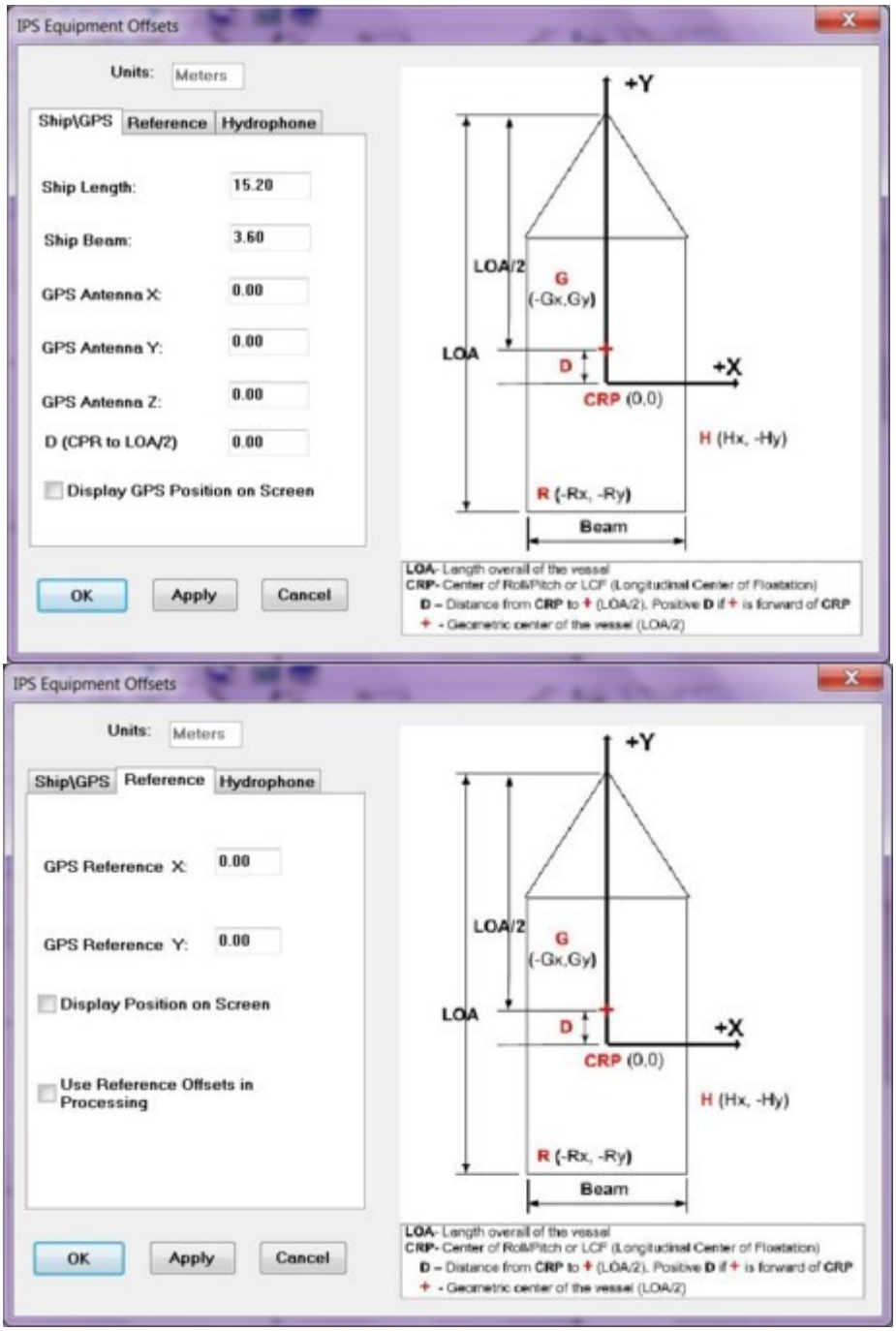
10. Select the IPS Ship and USBL offsets in Setup->Equipment Offsets->Ship Offsets.

Note: Click [Apply] for each section

Note: If using $POREG output from Trackman all offsets must be set in the IPS (Appendix A).

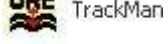
Support Vessel (CRP = Center of Roll/Pitch of the support vessel)

- **Ship**: LOA and Beam
- **GPS**: GPS X,Y,Z location with respect to CRP
- **Reference**: Ref X (+ to Stbd of CRP), Ref Y (+ fwd of CRP, towards the Bowl)
- **Hydrophone (*Warning Only set the Hydrophone offsets in one location, either in IPS or in Trackman but not in both*)**:
  - Hx (+to Stbd of CRP), Hy (+ Fwd of CRP), Hz = (+below CRP)
  - Hydrophone heading, roll, pitch bias = 0 (before calibration)
- **Ctr Roll Pitch**: Center of Roll/Pitch X,Y,Z



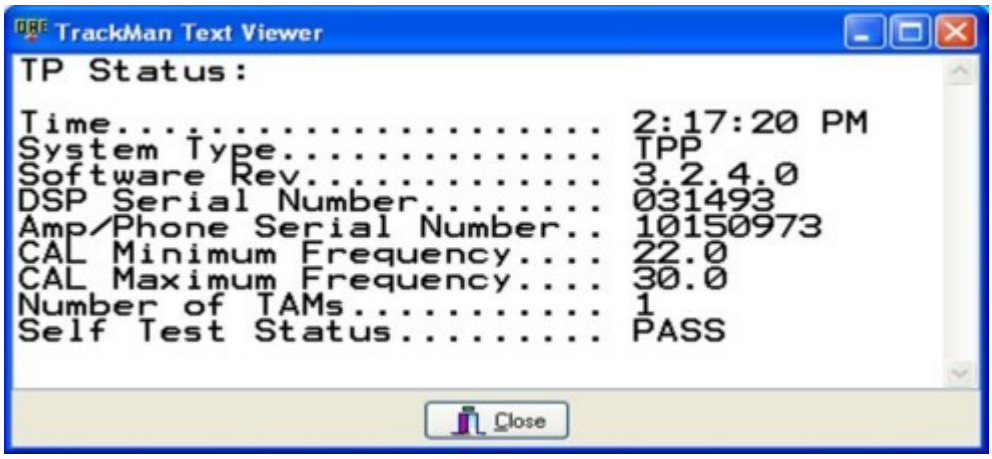
Example of the GPS and Reference Offsets Pages

11. Verify that valid ship (GPS) data is being collected and displayed.
12. **<u>Verify that the Firewall is disabled or the PC has access to TrackMan IP/port (50002).</u>**
13. Launch the TrackMan (TM) from the desktop or Windows Start->main menu.

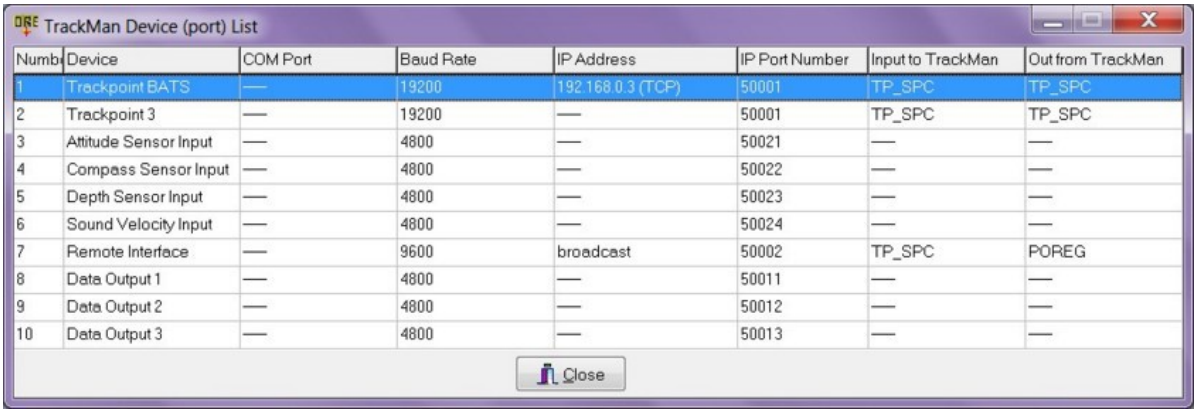


14. The BATS status window should be displayed, indicating that the system boot-up is good, click [close].

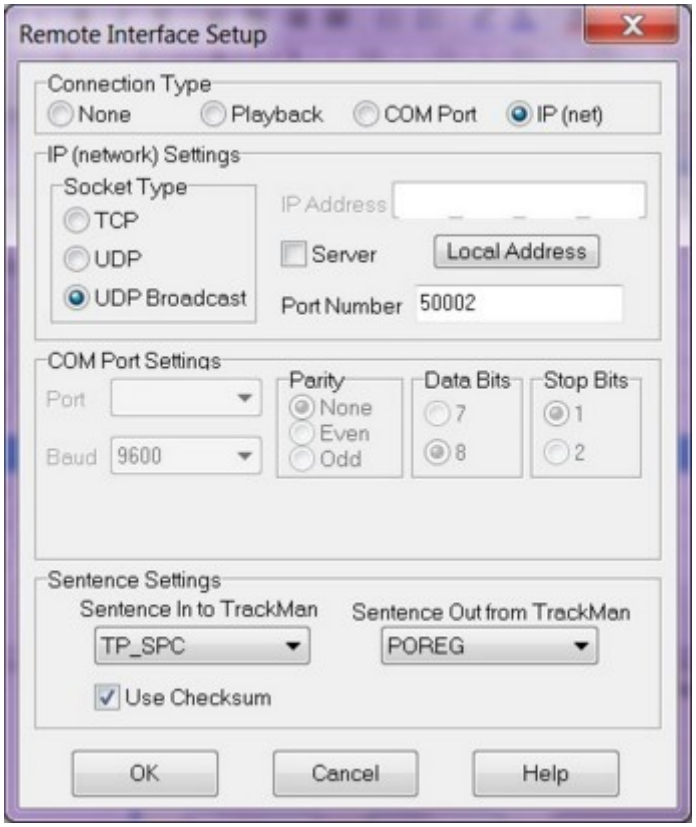
Note: the S/N on the hydrophone and filter board should match the number displayed in the status window.



15. On the TrackMan, Select "Device List" double click on Remote Interface row 7 (figure 2). 50002 for port number broadcast.



16. Toggle the "Use Checksum", this actually enables the port for USBL pass through commands (Output format $PORG). UDP Broadcast



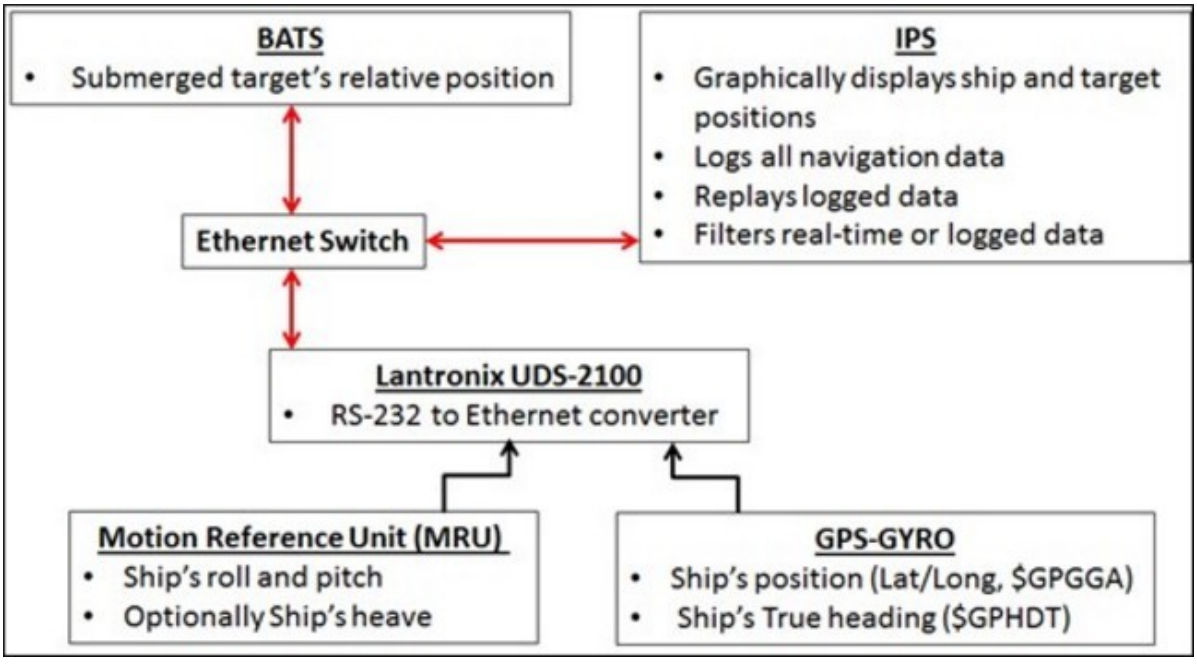
Set Beacons see Trackman software

System Interfacing

To allow the integration of a BATS with GPS, the PC system will require an ethernet connection (local area network) if a Serial Multiplexer is used, otherwise at least two serial ports are required. If only one port is used it could be linked to the Noland Engineering N183-41 Serial Multiplexer. The Serial Multiplexer provides four NMEA standard listener ports (IN1B, INIA, IN2B, IN2A, IN3B, IN3A, IN4B, IN4A). One Serial Multiplexer listener port is linked to the BATS system. The output from the BATS system to the Noland Serial Multiplexer needs to have the serial cable configured for no handshaking.

The second Serial Multiplexer listener port is linked directly to a GPS receiver. Since the Serial Multiplexer provides four listener ports a depth sounder may be connected to one of the remaining listener ports. The Serial Multiplexers RS-232 output (RX, COM and TX) must be connected to the host PC system using a DB-9 cable supplied with the Serial Multiplexer. The Serial Multiplexer will supply the PC with the relative position and current latitude/longitude of the support vessel using information from the EdgeTech USBL and the GPS receiver. Vessel heading information, derived from a flux-gate or gyro compass, can be supplied via the BATS system or the GPS receiver. For further information regarding the interfacing and setup of the Serial Multiplexer, see the Noland Engineering N183-41 manual.

If the IPS is to be used in "ship only" mode with no input from a tracking system or if the tracking system is to be referenced to a fixed lat/long position rather than a GPS derived position, then only one device needs to be connected to the serial multiplexer.



Note: The Lantronix UDS-200 can be replaced with either RS-232 to ethernet or RS-232 MUX (e.g. Noland) or multiport (2-min) RS-232 to USB Hub converters.

Note:RS-232 is the typical cable configuration when a handshake is not required.

Compass

The Ship's heading information can be obtained from either a gyrocompass, flux gate compass, Attitude Heading Reference System (AHRS) or a "GPS Gyro". Three methods are available for the IPS software to receive the compass information:

1. Compass input is through the GPS receiver as an NMEA string and transmitted to the IPS software in the NMEA string VHW. The manufacturer's operations manuals for both the compass and GPS receiver should be consulted to verify the equipment's ability to handle the appropriate NMEA data strings, and also for the required interface cabling.

2. An alternative means of compass input to the IPS program would be to use any of the following NMEA data strings: HDM,HDT,HDG or TSS HHRP2 format into the PC directly via a free PC serial port, USB RS232 hub or a serial multiplexer. See the following sections for more information on serial multiplexers. TECHNICAL SUPPORT CONTACTS and SYSTEM INTERFACING.

3. Ethernet (UDP) when using the CodaOctopus F-180 GPS positioning and referencing system.

A variety of converters are also available to interface the synchro or digital output of a ship's gyro compass with into a PC. For further information regarding these products, please contact ORE International.

Horita SCT-50 Serial Control Titler

Requirements/Configuration:

1. SCT-50 (firmware version SCT330).
2. The IPS will broadcast ID 00, to all available SCT-50 units.
3. The IPS serial port must be set to match the SCT-50 baud rate (default 9600, [4800 or 38400]. See IPS menu SETUP->Communications.
4. IPS configures the text in white over a black background.
5. IPS configures the SCT-50 real time clock to a 24 hour format hh:mm:ss.
6. The user must specify the priority target id, See IPS menu SETUP->Serial Out Command.
7. The target latitude and depth are displayed on the top line (top of video display). The units of the target depth with be meters if the IPS system units are set to meters units otherwise the depth units will be in feet. See VIEW->Display Settings ->System.
8. The target longitude and the SCT-50 real time clock are displayed directly below the target latitude and depth.

Hardware Key

A hardware key must be used with the IPS software for the IPS to process new tracking data. The IPS USB hardware key is supported on all USB ports.

Figure 1. IPS USB Security Key

Operation

Ship Position Box

The Ship Position Box displayed in the upper right hand portion of the screen displays the name, latitude, longitude, depth, horizontal range, error codes, bearing and other information for the ship. The entire list of parameters that may be displayed in the position box is given below. The user may set which if any parameters will be displayed in the position box using the INPUT -> Ship Settings menu option. In the Target Settings dialog box click the position box items tab and check the position box items that should be displayed. If the most recent ships position received was an error then a question mark will be displayed instead of the number of satellites used to determine the ships position.

The ship position box may be moved to a more convenient location by dragging the box with the mouse. The position box can be expanded by dragging the borders of the box.

The following table lists the text displayed in the ship position box and their descriptions:

Time: Current system time To synchronize the IPS time with the GPS use the SETUP->Time Sync menu command. Uses NMEA data from ZDA format.

Latitude: Latitude of current fix in N or S in ##:##.#### format. from GPS (data string GGA).

Longitude: Longitude of current fix in E or W in ###:##.#### format. from GPS (data string GGA).

UTM: UTM Eastings and Northings.

Compass Depth: Ship's heading and Depth if available. Heading data from NMEA strings HDT, HDG, HDM, VHW. Depth from NMEA data DBT.

Roll Pitch: Ship's roll and pitch if available. From TSS-1 format.

COG\SOG: Current Course and Speed over ground (COG/SOG). Data from GPS NMEA data string VTG.

Status: 1. The number of satellites used to determine the GPS position (From GPS data string GGA).

2. The GPS tracking status:
   - ?- Fix not available or invalid
   - ' '- C/A Standard GPS SPS mode fix valid
   - D- DGPS, SPS mode fix valid
   - P- PPS mode fix valid
   - R- RTK Fixed
   - F- RTK float
   - I- Free inertial

3. V or H DOP 0-99.9 (H- Horizontal dilution of precision).

4. DGPS beacon correction age [sec]. Time in seconds since last SC104 type 1 or 9 update.

5. DGPS beacon reference station id.

Target Position Box

The Target Position Box is initially displayed in the center of the viewing screen when target data is first received for the corresponding target. The target box displays parameters such as the name, latitude, longitude, depth, horizontal range, error codes and bearing of the target. The entire list of parameters that may be displayed in the position box is given below. One target box will be displayed for each target for which data is received. The target position box may be moved to a more convenient location by dragging the box with the mouse. The target position box can be expanded by dragging the borders of the box. The user may set which if any parameters will be displayed in the position box using the INPUT -> Target Settings menu option. In the Target Settings dialog box click the position box items tab and check the position box items that should be displayed. If the most recent ORE System position was an error, then the time elapsed since the last valid fix will be displayed instead of the target name.

The type of filter used for a target will be displayed after the target name in the target position box in the lower right hand corner of the screen. For example if raw data is being used for target number one Fish, then only Fish will be displayed as the target name in the target position box. If the velocity filter and on-site filter are set to on then Fish FVO will be displayed as the target name. If the target name exceeds 16 characters then the last 4 characters of the target name will be truncated to make room for the filter information if necessary. The Max-Range, Min-Depth and Max-Depth settings will not appear after the target name as they are not specific for each target. For more information see the Filter Command section of this manual.

The entire list of parameters that may be displayed in the position box is given below:

Time:	Current DOS time.
Latitude:	Latitude of current fix in N or S in ##:##.#### format.
Longitude:	Longitude of current fix in E or W in ###:##.#### format.
UTM:	Eastings and Northings.
Compass Depth:	Targets's Depth
Roll Pitch:	Compass heading roll and pitch.
COG\SOG:	Current COG\SOG of the current fix.
Status:	The number of satellites used to determine the GPS position.

Waypoint Icon Box

The Waypoint Icon Box is the small square with the red W in it that is always displayed in the bottom right of the screen. Clicking this window adds a waypoint at the end of the waypoint list whose position corresponds to current position of the focus target. After the waypoint has been added to the waypoint list, the Waypoint List window will be activated and the position information corresponding to the new waypoint will be displayed in the Waypoint List windows edit boxes.

The Waypoint Icon Box also works when the IPS is in search mode. Use the VIEW -> Search Mode menu command to activate the search mode. Once Search mode is activated, use the right mouse button to select a data point. The up and down arrow keys may also be used to step through the data points one at a time when in search mode. The data point that is selected when the Waypoint Icon Box is clicked will be added to the waypoint list.

Waypoints may also be added in the Waypoint list window and using the right mouse button in the chart/map portion of the screen if the VIEW -> Cursor Waypoint Activated menu command has been selected.

Also See:

Display Search Mode

Display Waypoint Box Command

Waypoint List Window

Cursor WayPoint Activated

Waypoint List Window

The waypoint dialog box allows the user to enter, edit and delete waypoint positions. Up to forty-five waypoints may be used when running a sailplan. The Waypoint List window may be used to navigate to a single waypoint, center on a selected waypoint, skip a selected waypoint and stop the current sailplan. To display the waypoint box click the red W on the right side of the toolbar or use the VIEW drop down menu to select the Show Waypoint Box Command. The waypoint dialog box has a waypoint entry page and a display settings page. Each page is represented by a tab. To move from page to page click the appropriate tab. The two pages are as follows:

Waypoint Entry:

If a sailplan is currently active then existing waypoints may not be altered or deleted. If the user attempts to delete, replace or edit a waypoint while a sailplan is running, an IPS error message will be displayed.

The Waypoint box is composed of edit boxes for entering the latitude, longitude, memo, depth and time for each waypoint, a list of existing waypoints and twelve push buttons. To select options in the Waypoint List window use the mouse or the tab key. To scroll through the list of existing waypoints use the mouse or the arrow keys. The highlighted waypoint is considered the selected waypoint. The information corresponding to this waypoint appears in the latitude, longitude, memo depth and time edit boxes. To add, delete or edit waypoints use the appropriate push buttons.

The user may manually enter the time and depth for each waypoint if desired. However, the IPS program will automatically set the waypoint time to the current time. If a time is entered manually, the following message 'Use Edit Box Time Instead of Current Computer Time?' will be displayed. Click the enter key or press enter to use the manually entered time. The depth entered must be between 0 and 16404 feet (0 to 5000 meters). To view the time and depth of a waypoint that was just entered, use the arrow keys or mouse to select the waypoint, and the time and depth of the waypoint will be displayed in the Time and depth edit box.

Waypoints may also be added by using the Target Waypoint (T w) toolbar button, which is next to the Waypoint toolbar button. Clicking the Target Waypoint icon box adds a new waypoint whose position corresponds to the current position of the focus target.

Entering New Waypoints:

When entering a new waypoint manually as opposed to using the Target Waypoint Icon or the Cursor Waypoint Activated function, the waypoint must be in a specific format to be accepted. The acceptable formats are given below:

Latitude:	N or S	Degrees: 0 to 90	Minutes:	0 to 60	Fractional Minutes: 0 to 9999
Longitude:	E or W	Degrees: 0 to 180	Minutes:	0 to 60	Fractional Minutes: 0 to 9999

If a waypoint field is not entered correctly an error message will be displayed and an acceptable entry must be made in the field before the user can edit another field. However, the cancel button may be used to exit the dialog box at any time.

The maximum memo length is thirty. The arrow, home, end and delete keys may be used when editing and viewing entries in the memo box. You may use the Ctrl Ins key combination to copy a memo, and use the Shift Ins key combination to paste a memo.

Push Button Functions:

Load Wpt File:

Pops up a file open dialog box that allows the user to loads a previously saved *_WPT.DB file into the current IPS session. The waypoints may then be used in a sailplan or edited. If waypoints already exit, the file waypoints may be appended to the existing waypoints or the existing waypoints may be cleared and over written. If a sailplan is running it must be exited before the waypoint file is loaded.

GOTO:

The Goto push button starts a sailplan and navigates to a selected waypoint. The ship or target in the focus box will be used for the sailplan. To select a waypoint scroll through the list of existing waypoints using the mouse or the arrow keys. The waypoint that is currently highlighted is considered to be selected.

Insert:

Puts a new waypoint above the selected waypoint. Highlight the way point you want to appear directly below the new waypoint. Enter the new waypoints latitude, longitude and memo (optional) and click the Insert push button. When the new waypoint is added to the list a number representing the waypoints position in the waypoint list will be displayed in the viewing grid (if the waypoint coordinates are in the viewing grid).

Delete:

To delete a waypoint select it using the mouse or arrow keys, then click the Delete push button.

Copy:

Copies an existing waypoint. First select the waypoint to be copied then click the Copy push button. Then use the Paste push button to fill the waypoint edit boxes with the information from the waypoint that was just copied. The waypoint may then be added to the waypoint list using the Add, Insert or Replace push buttons. The waypoint will also be copied to the windows clipboard. Therefore if you use the Copy push button to copy a waypoint, you may paste it into most other windows applications (i.e. Word, Excel or Notepad) provided the waypoint was the last item copied.

Paste:

Pastes the most recently copied waypoint into the edit boxes above the waypoint list. The waypoint may then be added to the waypoint list using the Add, Insert or Replace push buttons.

Rep:

Replaces the selected waypoint with information entered in the latitude, longitude, memo, time and depth edit boxes. The IPS program will automatically set the waypoint time to the current time if If a time is not entered manually. This is useful when editing existing waypoints. To edit an existing waypoint select the waypoint using the mouse or arrow key. The waypoints latitude, longitude, memo**,** time and depth will appear in the edit boxes. Edit the waypoint information as required and click the Replace push button to replace the old waypoint with the edited waypoint.

New:
The New button adds a new waypoint to the end of the waypoint list. To add a new waypoint enter the latitude and longitude of the waypoint in the edit boxes provided. An optional memo may be entered in the memo edit box. The user may manually enter the time and depth of the waypoint if desired. However, the IPS program will automatically set the waypoint time to the current time. If a time is entered manually, the following message 'Use Edit Box Time Instead of Current Computer Time?' will be displayed. Click the enter key or press enter to use the manually entered time. The depth entered must be between 0 and 16404 feet (0 to 5000 meters). Click the New push button to add the waypoint to the end of the waypoint list. When the new waypoint is added to the list a number representing the waypoints position in the waypoint list will be displayed in the viewing grid (if the waypoint coordinates are in the viewing grid).
Mark:
Converts the selected waypoint to a marker. To make a waypoint a Marker select the waypoint then click the Mark push button. The waypoint will no longer be used for plotting routes but will still be displayed on the screen and will remain in the waypoint list.
Skip:
To Skip the waypoint displayed in the sailplan window, click the Skip button. This feature is only allowed if a sailplan is running.
RXTE:
Redraws and resets the cross track error lines based on the current ship or target position. This feature may only be used if a sailplan is running.
Ctr:
Centers the viewing grid on the selected waypoint. If the grid does not remained centered on the selected waypoint make sure that the neither the ship or targets are set to auto center. Please see INPUT -> Target Settings Command and INPUT -> Ship Settings Command
for more information on centering the ship or targets. Not currently operational.
Stop:
The Stop push button will disable the currently running sailplan, if one is running. A sailplan may also be disabled by closing the Sailplan Window or un checking the run check box in the SETUP -> WAYPOINT MENU dialog box. The existing waypoints may not be altered or deleted if a sail plan is currently active. New waypoints may be added to the end of the waypoint list if a sailplan is currently active, but the sailplan must be restarted in the WAYPOINT dialog box for the new waypoint to be included in the sailplan.

Display Settings:

To access this section of the dialog box, at least one waypoint must already be entered. Waypoints may be entered manually using the Wpt Entry page of this dialog box or the Target Fix toolbar button. The waypoint that is selected (highlighted) in the Wpt Entry page is the waypoint the following parameters will be applied to. The apply button must be used to apply the settings listed below to the selected waypoint.

Label Alignment:
Sets the position of the waypoint screen label in relation to the waypoint. The options are Lower Right, Middle Right, Upper Right, Lower Left, Middle Left and Upper Left. The IPS default is Middle Right. To select a different label alignment click the arrow button on the right side of the combo box. A drop down box displaying the label alignment options will appear. Make a selection using the mouse or the arrow keys.

Label Font Size:
Sets the font size of the waypoint screen label in relation to the waypoint. The options are 12, 14, 16, 18, 20, 24, 28, 32 and 36. The IPS default is 12. To select a different font size click the arrow button on the right side of the combo box. A drop down box displaying the font size options will appear. Make a selection using the mouse or the arrow keys.
Range Ring Size:
Sets the radius of the waypoint range ring in system units. This feature is not currently operational.
Range Ring Color:
Sets the color of the waypoint range ring. When the Range Ring Color button is pressed, the IPS Color Set dialog box will appear. Select the color you want using the mouse, tab or arrow keys and press the OK button to set the waypoint Range Ring color. This feature is not currently operational.
Label Color:
Sets the color of the waypoint label. When the Label Color button is pressed, the IPS Color Set dialog box will appear. Select the color you want using the mouse, tab or arrow keys and press the OK button to set the waypoint label color.
Include in Sailplan:
This feature is not yet operational.
Send Wpt as RPDA:
Sends the Waypoint data out as an RPDA message. This feature is not yet operational.
Display Txt on Screen:
Toggles the display of the waypoint label. If the box is checked the waypoint label will be displayed. The IPS default is checked, display the waypoint label.
WPT Screen Label:
Allows the user to enter a waypoint label of up to 29 characters that will be associated with the waypoint selected in the Wpt entry page. The position, font size, color and whether the waypoint label will be displayed can be set using the parameters described above.
Apply:
Applies the waypoint parameters set above to the waypoint selected in the Wpt Entry page.

Also See:

Display Waypoint Box Command

Waypoint Icon Box

Focus Icon Box

The Focus Icon Button is the toolbar button that displays either a ship or target icon. Clicking the focus icon button allows the user to switch the focus from one target or ship to another. Only targets which are being tracked have their icons displayed on the focus button. The target currently displayed in the focus button is the target that will be used in search, by the Waypoint Icon Box and when the home key is used to center a target.

Also See:

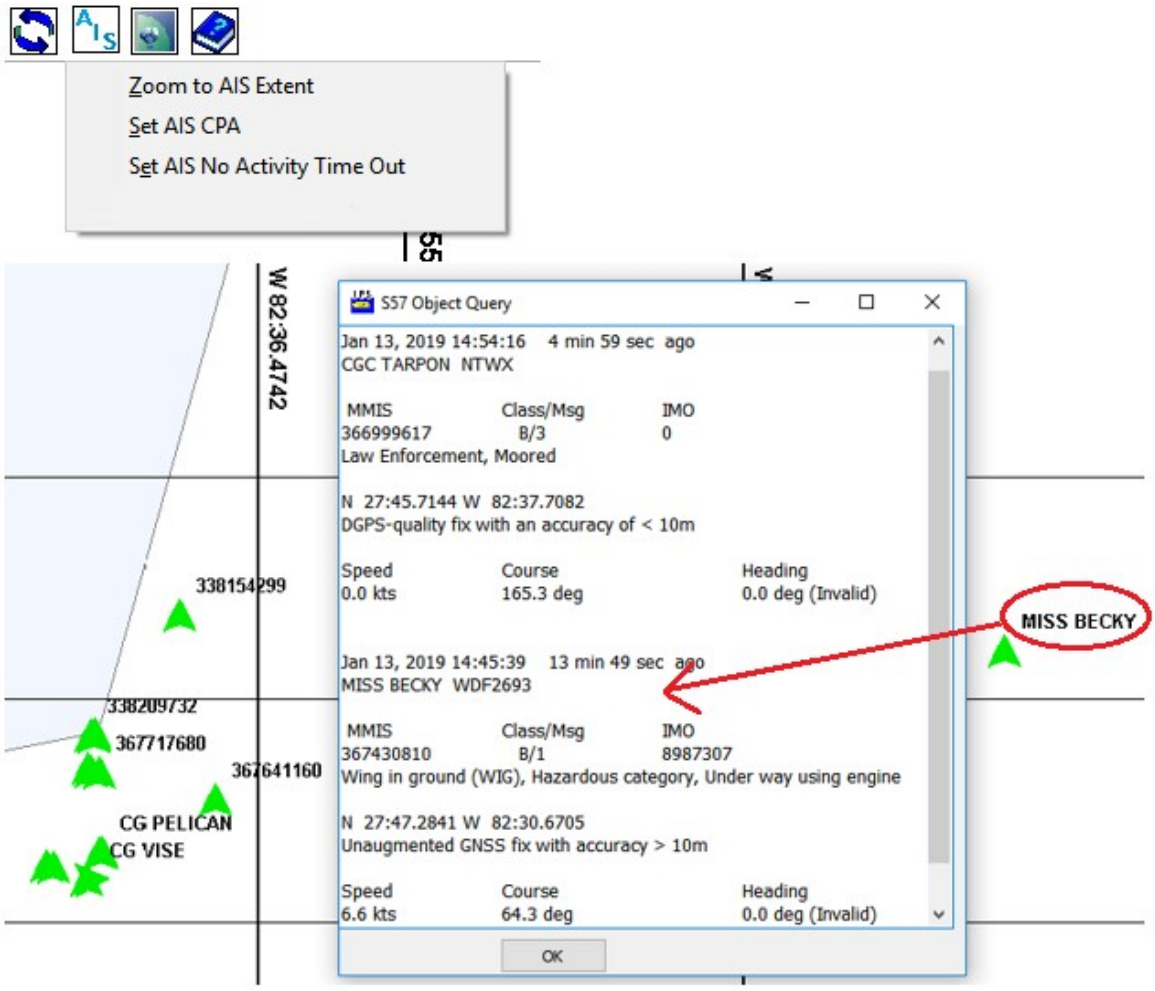
Waypoint Icon Box

Search

Home Key

Pressing the home key places the target currently displayed in the Focus Icon Box in the center the viewing area.

Automatic Identification System (AIS)



Example of AIS Display Information and Tracking for a Ship

The IPS will display Automatic Identification System (AIS) data when AIS(!AIVDM string) input is detected as serial or UDP data through an Ethernet packet. Double click on the green triangular shape to display information about a specific vessel in a text box. The information includes name, classification, call sign, course and speed, registration number, MMSI, and additional data if available. To stop AIS display click the AIS toolbar button to display the AIS dialog box and uncheck the AIS Displayed Enabled check box.

The IPS will also automatically display Aids To Navigation data (AToN) data when valid AToN data is received through an !AIVDM string. To stop AToN display click the AIS toolbar button to display the AIS dialog box and uncheck the Process AToN check box.

If valid AIS or AToN data is received it will automatically be displayed and the AIS toolbar icon will change from grey to light blue.

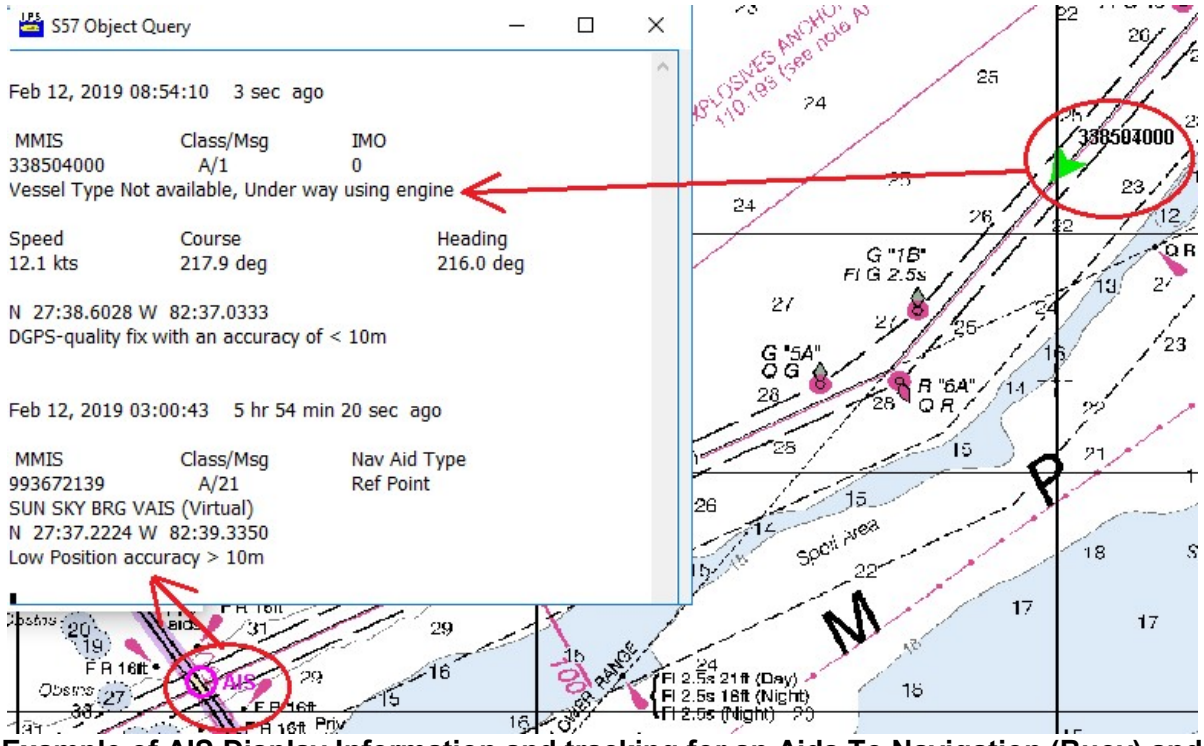
***Note:** The AIS and AToN features should be used in combination with a navigation chart. Please see the Menu->Chart-> Chart Open section of the IPS manual.*

The following AIS settings are available in the AIS dialog which is displayed when he AIS toolbar icon is clicked:

Set AIS CPA:
Sets AIS closest point of approach. When another vessel's path would lead to a CPA that is less than the CPA set by the user, the triangular shape representing that vessel turns red. The minimum AIS CPA is 0.25 nm and the maximum AIS CPA is 20.00 nm. The default is 2.00 nm.

Set AIS No Activity Time Out:
Sets the time required for a vessel to be removed from the display due to no data updates concerning that vessel. The minimum AIS No Activity Time Out is 5 minutes and the maximum No Activity Time Out is 20.00 minutes. The default is 15 minutes.

Zoom to AIS Extent:
Will zoom to display all current AIS targets. To zoom back in click the zoom in button on the toolbar. This feature does not work with the AToN data.



Example of AIS Display Information and tracking for an Aids To Navigation (Buoy) and Ship. The IPS marks the Aid To Navigation with a magenta circle and the initials AIS. The AtoN and the unnamed vessel are circled in red.

AIS

IPS AToN Marker

AToN Display Enabled:
Aids To Navigation data (AToN) will be displayed automatically when valid AToN data is received through an !AIVDM string. Double click on a buoy shape to display a text box with information about that buoy including the MMSI number, name, type, position, position accuracy and update time. The default is on.

AIS Displayed Enabled:
AIS data will be displayed automatically when valid AIS data is received. Double click on a the green triangular shape to display a text box with information about that ship including the MMSI number, classification, call sign, course and speed, registration number, name, type, position, position accuracy and update time. The default is on.

Search

The search mode allows the user to search through the currently displayed or any loaded data file. The search mode can also be used to save selected data points to a file. See the section below for more information. The data points that are displayed in Search mode can be used whether the currently active mode is SHIP or TARGET. The Search Position window will initially be displayed in the center of the screen. The information displayed is set in the Search Data Settings Dialog Box. The information that can be displayed about the selected data point includes: ship name or targets name, the targets latitude, the targets latitude, the targets depth or compass position and the time the data point was acquired.

To activate the search mode follow the steps listed below:

1. Use the focus button in the Tool Bar at the top of the screen the screen to select the target or ship whose data will be searched (the focus button will display a picture of either the ship or a target.). If you change the focus during a search session, the change will not be reflected in the current search session.

   Note: The Display Mode must be Chart or Grid for the Search Mode menu item to be enabled. Please see the VIEW -> Display Settings sections of this manual for more information.

2. Open the VIEW drop down menu and select SEARCH MODE. If Search Mode is activated a check mark will be displayed to the left of the menu item. Please see the VIEW-> Display Search Mode section of this manual for more information on this menu item.

3. Once Search mode is activated, use the right mouse button to select a data point. If the right mouse button is clicked and a valid data point is within 48 miles, the data points position information will be displayed in the Search Position information window.

4. The Search Position Box tool bar allows the user to navigate the selected ship or target position data. The Search Position Box tool bar buttons are as follows:

 Start, moves to the start of the data base, with respect to time.

 Previous, steps backward through the data base (time history), one data point at a time.

 Jumps backward in time through the data base ten points at a time.

 Next, steps forward through the data base one point at a time.

 Fast forward through the data base ten points at a time.

 End, moves to the end of the data base, with respect to time.

 Start Marker, marks the selected data point as the start of a group of data points. The selected data point will be marked with a letter 'A'. The group of data points may then be used for operations such as USBL calibration. To select a data point use the Start, Previous, Next or End buttons described above.

 End Marker, marks the selected data point as the end of a group of data points. The selected data point will be marked with a letter 'B'.

 Save As, a Save As Dialog Box will appear allowing the user to save the selected data points (A to B) to a specified disk file in IPS format. Please see the FILE -> File Save As Command section of this manual for more information. Use the Start Marker and End Marker push buttons described above to select the group of data points to be saved.

 Deletes the selected data point. To select a data point use the Start, Previous, Next or End buttons described above.

 Adds a waypoint using the latitude and longitude of the selected point. The number of the new waypoint will be displayed in red on the grid. If the Waypoint Box is currently being displayed, the new waypoint's latitude and longitude will be displayed in the latitude and longitude edit boxes in the waypoint box. The latitude and longitude may be edited at this time and a memo may be added if desired.

 A system calibration is completed using search data from Start Marker A to End Marker B. There must be at least 10 data points between the start and stop markers. Please see the VIEW -> System Calibration section of this manual for more information.

 Allows the user to search for a data point by data and time. Enter the date and time in the edit boxes provided and the corresponding data point information will be displayed in Search box.

 Displays the Search Track Details box.

In addition, the following keys are available for searching the data

points. The Search Position Window must have focus for these keys to be used in a search session.

[Down Arrow]	Down arrow, will step backward through the data base (time history), one data point at a time.
[Up Arrow]	Up arrow, will step forward through the data base one point at a time.
[PgDn]	Move to the start of the data base, with respect to time.
[PgUp]	Move to the end of the data base, with respect to time.

5. To exit the search session, open the VIEW drop down menu and select SEARCH MODE. If SEARCH MODE is disabled, the check will not be displayed to the left of the menu item. Another way to end the search session is to close the Search Position window.

Data Subset

Load the *.tdbt file.

1. To see what targets are available use View->Mission Statistics. Expand the Mission Statistics window to view all of the targets (Ship ID = 10). Note times 07:59 to 11:31 and number of samples (Target-1 2232 pts, Target-2 2209)

2. To see all of the display data points use the Focus toolbar icon to cycle through the targets (including the ship). Right click in the plot area and select INPUTS->Target settings to adjust the number of pts being displayed.

3. Activate search mode (View-> Search Mode) for the target of interest.

4. Use the Search Mode Flashlight icon to set the START time for a sub-set of the data to be saved (e.g. 09:00-10:00). The triangle search icon will jump to the nearest target point corresponding to that time (e.g. Target-1 8:59:56.750). Then click on the Search tool bar START icon to mark the beginning of the data subset you want.

5. Use the Search Mode Flashlight icon to set the END time for a sub-set of the data to be saved (e.g. 09:00-10:00). The triangle search icon will jump to the nearest target point corresponding to that time (e.g. Traget-1 8:59:56.750). Then click on the Search tool bar END icon to mark the end of the data subset you want.

6. To save out the selected sub-section of the data click on the Search tool bar "File-Disk" icon and choose the folder of interest. Name you sub-set of data (e.g. "SubSet 0900-1000_trk").

7. Upon completing export of all required sub data sets exit the IPS.

8. To Export the subsets of data into text or GIS data formats Launch the IPS and open the subset file you just created.

9. Use File->Export Data->Text to create a new file from the subset file.

10. For example to Export Target Position and Depth in TPD format:
    Click the TPD radio button.
    For raw data select "Raw Data".
    Select desired time format (e.g. HH:MM:SS.ss).
    For JUST Target data (to exclude ship data) click "Target Data Only".
    Click [Ok].
    Enter a file name- and save.

11. The text file will be saved in folder the IPS data was load in from.

    Example of exported data:
    $IPTPD,01,4134.3697,N,07054.4133,W,001.0,M, 9:00:27.11,T,R
    $IPTPD,02,4134.3924,N,07055.3026,W,001.0,M, 9:00:37.69,T,R
    $IPTPD,01,4134.8754,N,07054.6082,W,001.0,M, 9:00:57.94,T,R
    $IPTPD,01,4134.4916,N,07054.3268,W,001.0,M, 9:01:02.85,T,R
    $IPTPD,02,4134.9296,N,07054.5675,W,001.0,M, 9:01:13.00,T,R

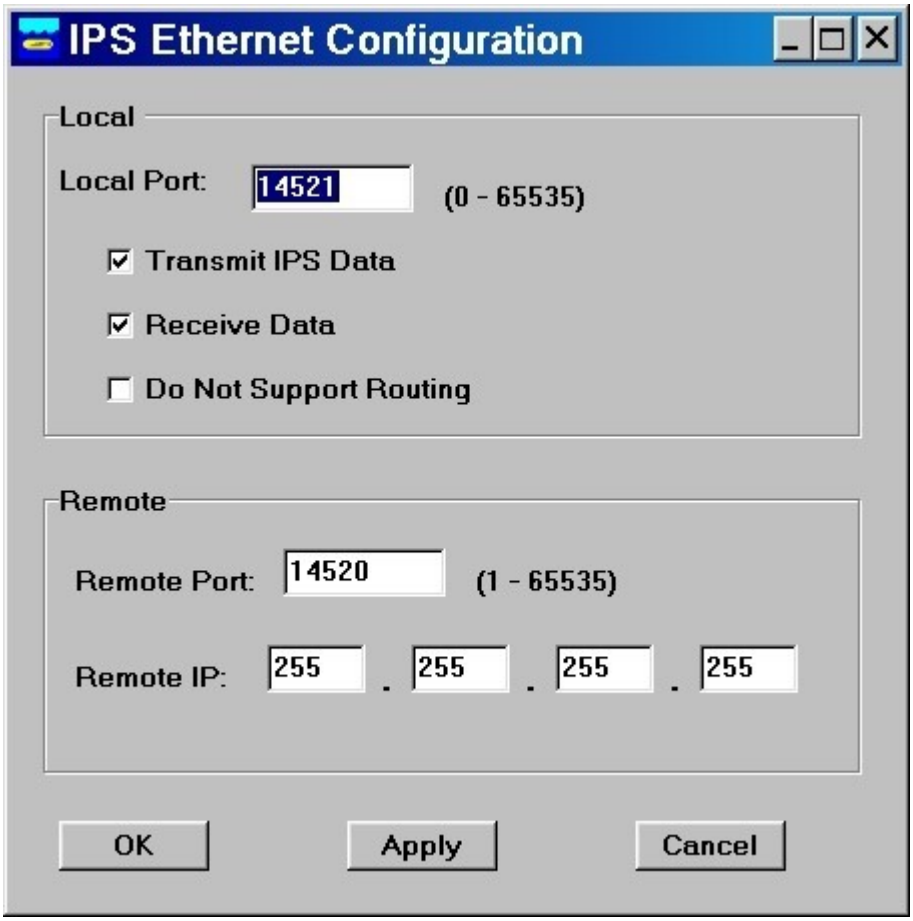
Remote IPS Display

The remote display feature of the IPS requires one IPS session (PC) to act as a master or server providing the raw tracking data that may be displayed by any number of PCs (remote hosts) running the IPS in Remote Display mode. The remote display data is transmitted via standard Ethernet using UDP (datagram) communications.

- ***Note***: **An IPS hardware Security key is required on the Master Station side only!**

Master Station Configuration:

1. IPS Main Menu -> Settings -> Ethernet Configuration



2. Enter a **Local Port number** of zero '0'. Setting it to 0 enables the TCP/IP stack to choose a port at random. Otherwise, a port number above 2000 is suggested as port numbers 1 to approximately 2000 are reserved.
3. Click (select) the **Transmit IPS Data** option.
4. Enter a Remote Port number. The **Remote *Port*** is the UDP port on the **Remote *Host*** where UDP datagrams will be sent. A valid port number (a value between 1 and 65535) is required.

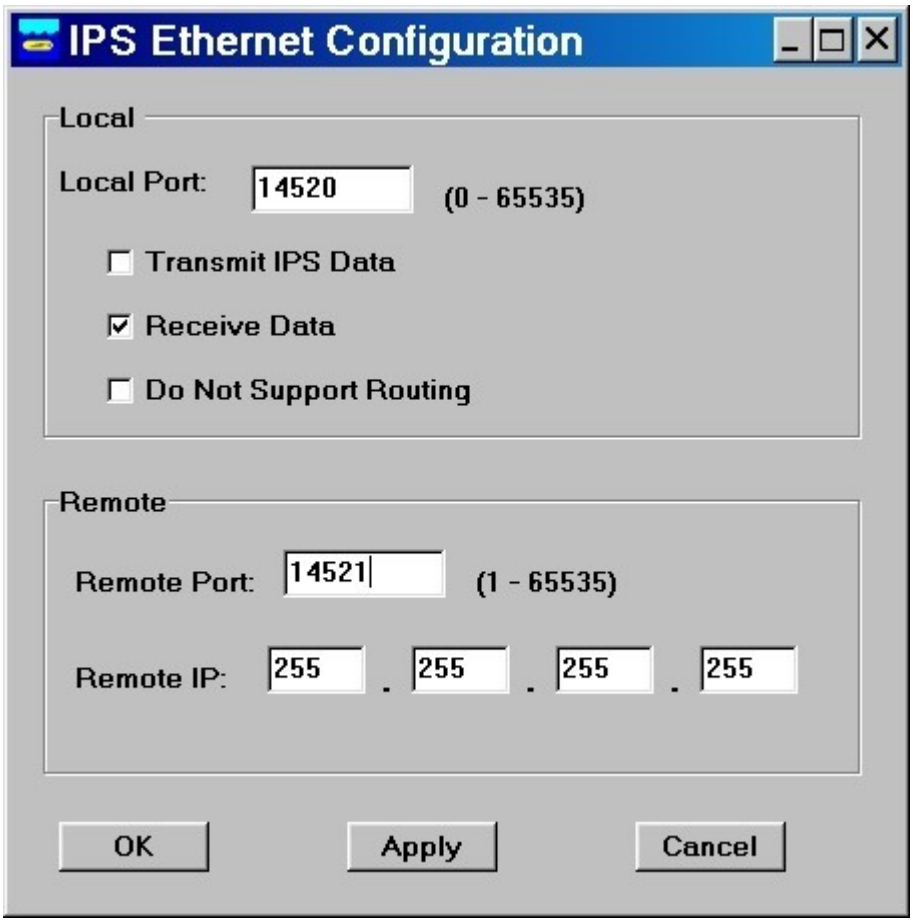
Note: *This is the Remote Port number that will be entered in the **"Remote Display" PC's IPS Ethernet Configuration** dialog box Local Port field**.***

5. Enter the IP address of the Remote Host. The Remote Host property specifies the IP address (IP number in dotted internet format) of the remote host. If **Remote Host** is set to **255.255.255.255**, the IPS will broadcast the data on the local subnet.
6. **Testing Ethernet Configuration**. In order to test the communications link without the availability of real time tracking data (GPS / ORE USBL inputs) the Master station may be configured to "Demo/Replay" mode using the **Input**-> System Inputs dialog box and selecting "**Demo/Reply**" mode as Ships's Position Input. Then under the **File menu** select "Open" and choose any previously generated IPS tracking file *_Raw.DB to simulate the availability of real time data.

***Note**: An IPS hardware Security key is required on the Master Station side even if the master station is running in Demo/Replay mode.*

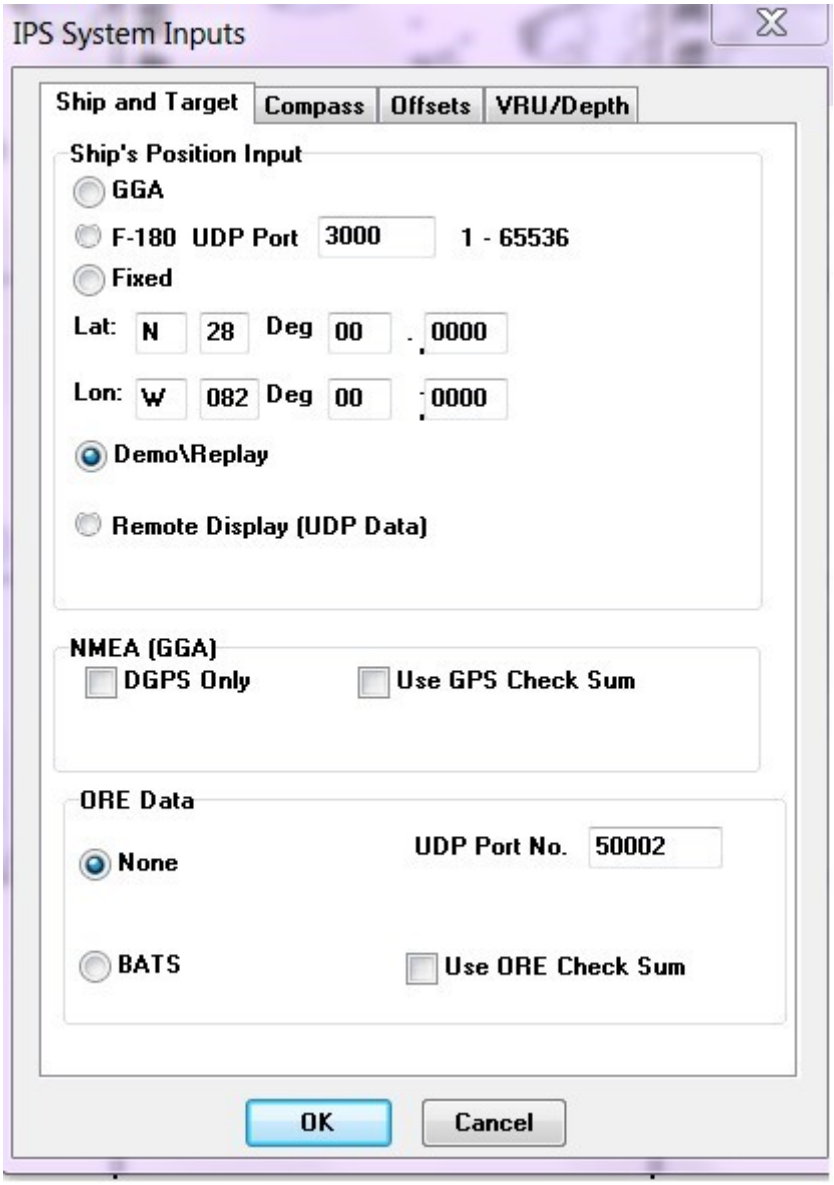
Remote Display (Host) Configuration:

1. IPS Main Menu -> Settings-> Ethernet Configuration:



2. Enter the number that was used as the Master "Remote Port" in the Local Port field. **In this example a "Local Port" number of 14520 is required** because that number was used as the master remote port number.
3. Check the option "Receive Data".
4. The settings for the "Remote" section are optional and are only required to support bi directional communications back to the Master station.

5. To display the data use the IPS Main Menu -> Inputs-> System Inputs -> Ship and Target tab. Select the following options: "**Remote Display (UDP Data)**" under the Ship's Position Input section.



IPS 3D Sensor Processing

The IPS 3D sensor processing supports three basic functions:

- Display of 3D data sets from ASCII (.dat) files in UTM (Northing, Easting and depth format) or in latitude, longitude and depth (.txt). An example of a UTM text file is:

Date (yyyy-mm-dd) HHMMSS.zzz, X-Northing, Y-Easting, Depth [m]

2006-03-28 102721.607,10.602,-4.944,4.944
2006-03-28 102721.707,10.631,-4.869,4.950
2006-03-28 102721.807,10.659,-4.793,4.970
2006-03-28 102721.907,10.687,-4.718,4.983

Note: Date-time data is used for 3D calibration and 3D data times may be shifted if required to match the appropriate navigation time tags using the time bias option.

- Conversion of 3D sensor data from local (sensor) coordinates to geodetic coordinates.

- 3D sensor calibration using established Multibeam calibration Patch test methods.

IPS 3D Data Display

The IPS 3D data display allows a user to load ASCII X,Y,Z text files into a 3D display environment. A concise pop up menu that is activated by right clicking on the 3D display window has the following options: Home, Center, Rotate, Zoom, Pan, Info, Make Wpt, Load File, Add Data File, Make VRML File, Save as BMP and Clear Plot.

IPS 3D Calibration

The IPS supports the calibration of 3D sensor data (x,y,z) using the standard Multibeam patch test method. That is the IPS solves for the three mounting angles of the 3D sensor with respect to the navigation coordinate system (Heading, Roll and Pitch). The patch test method starts with the user collecting the calibration data in three separate runs. Each of the three calibration runs are designed to minimize the effect of the other two variables and maximize the error effect on the angular variable in question. For example, to collect calibration data for determining the 3D sensor roll mounting angle (with respect to the navigation coordinate system) one would collect 3D sensor data over a flat bottom either by running a down and back pattern over the same patch of flat bottom or by spinning the 3D sensor over a flat section of the sea floor (i.e. ROV). The 3D data is then imported into the IPS as an ASCII text file in the following format in either UTM Northing, Easting, depth or Latitude, Longitude and depth.

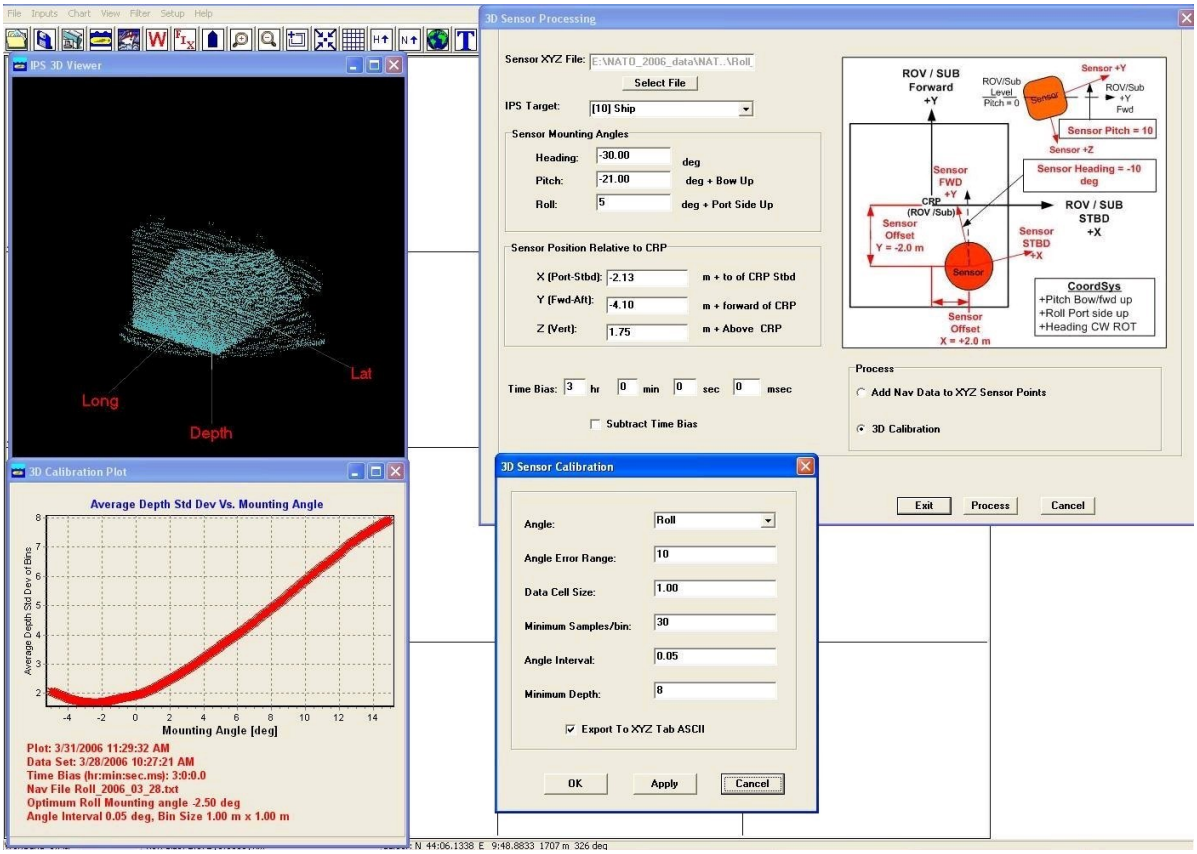
File Format:

Date (yyyy-mm-dd) HHMMSS.zzz, X-Northing, Y-Easting, Depth [m]

2006-03-28 102721.607,10.602,-4.944,4.944
2006-03-28 102721.707,10.631,-4.869,4.950
2006-03-28 102721.807,10.659,-4.793,4.970

The user then enters the initial estimate of the mounting angles and the sensor x,y,z offsets with respect to the platforms center of roll & pitch (CRP). Next, if required, the user should enter a time bias to map or modify the 3D sensor data point time tag to match sync to the IPS navigation time (figure 1). The user then clicks on the "3D calibration" option that pops-up another dialog box that allows the user to select the angle of interest, the maximum range that the mounting angle should be in and several other values as described below. The IPS will then process the data file in the following manner:

1. Open and read in the ASCII 3D sensor text file.
2. Assign the navigation data to the individual 3D data points using time tags and user specified time bias.
3. Step through the range of mounting angles for the variable in question (heading, roll or pitch) based upon the users initial mounting angle guess, angle error range and angle interval. The results of this process are displayed in the IPS calibration plot that shows the optimum mounting angle at the minimum of the plot.
4. The 3D data can then be displayed in the IPS 3D Viewer to visually verify that the new mounting angle improved the overall data quality. Figures 2 and 3 show the before and after 3D plots from a roll test.



5.

Figure 1. IPS 3D sensor calibration dialog boxes, graphical QC plot and 3D plot.

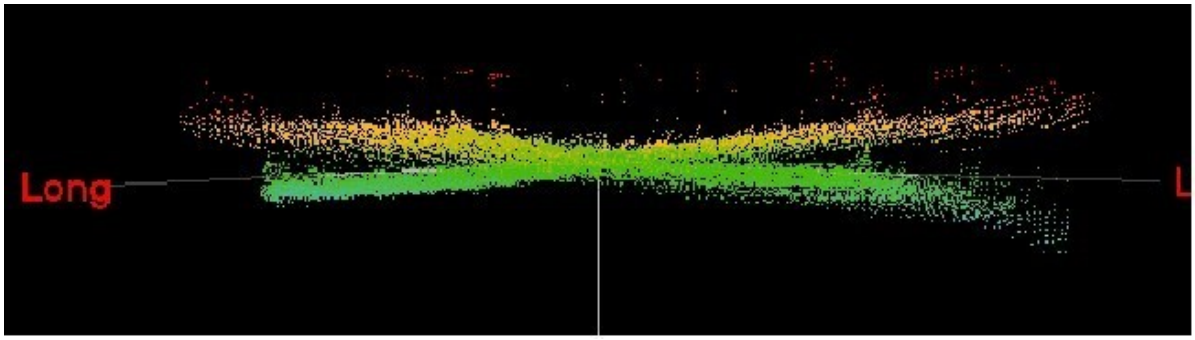


Figure 2. Side view of raw georeferenced roll calibration data displaying the effects of a roll bias between the navigation coordinate system and the 3D sensor.

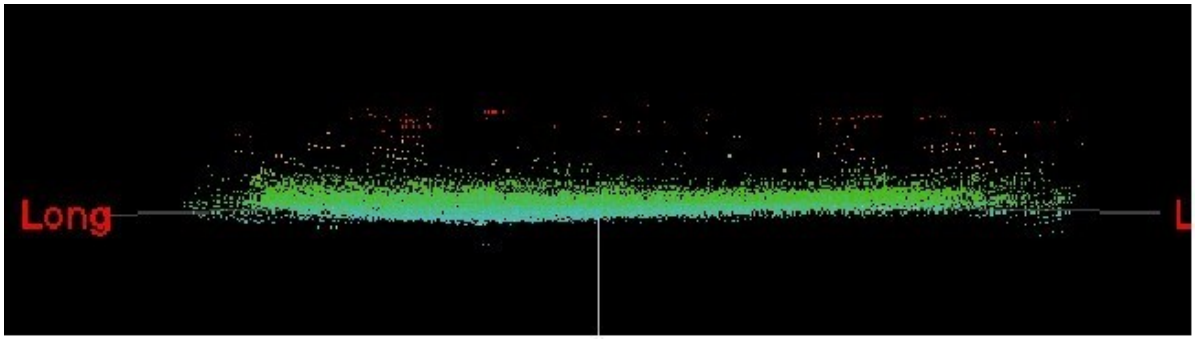
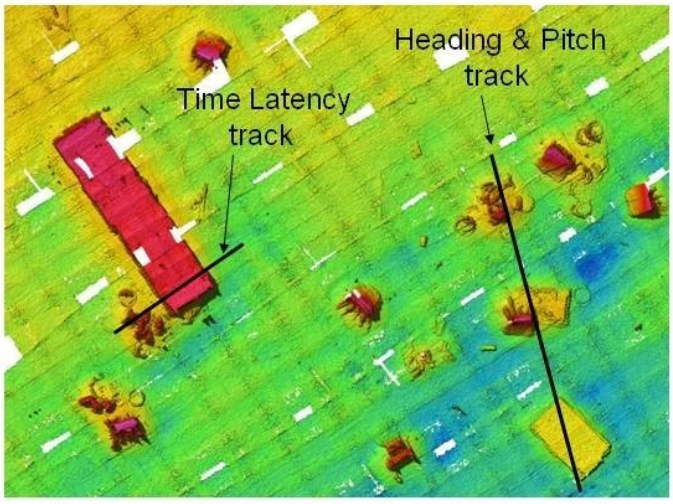


Figure 3. Side view of the corrected georeferenced roll calibration data after the new roll mounting angle as determined by the IPS has been applied.

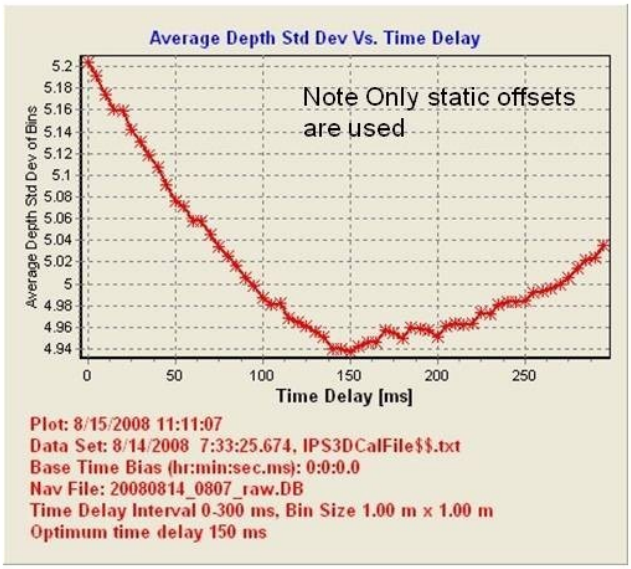
3D SONAR Calibration (Patch Test) Example

3D SONAR Calibration Steps

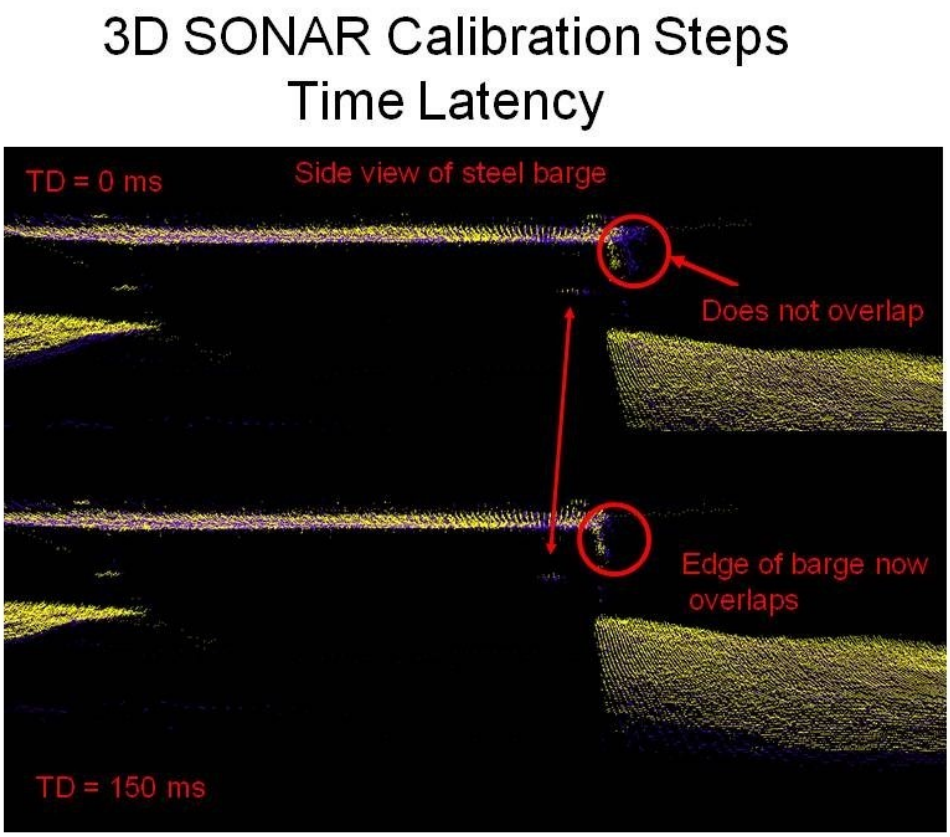
Patch Test calibration is performed in order to determine the angular biases between the SONAR and the navigation system



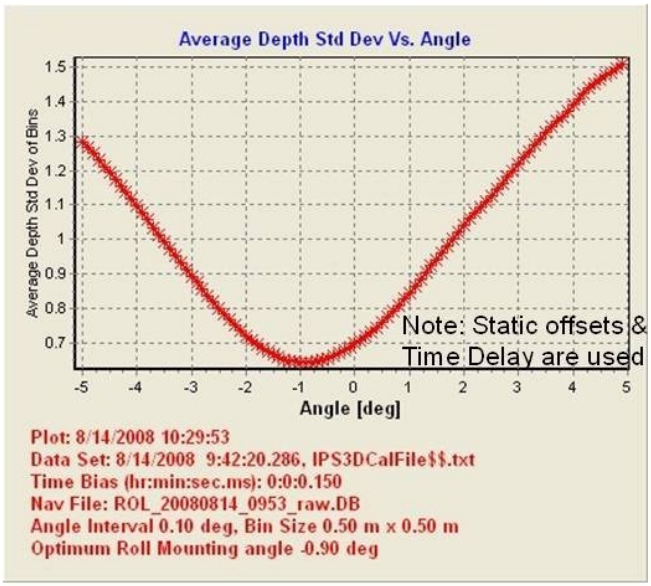
3D SONAR Calibration Steps
Time Latency



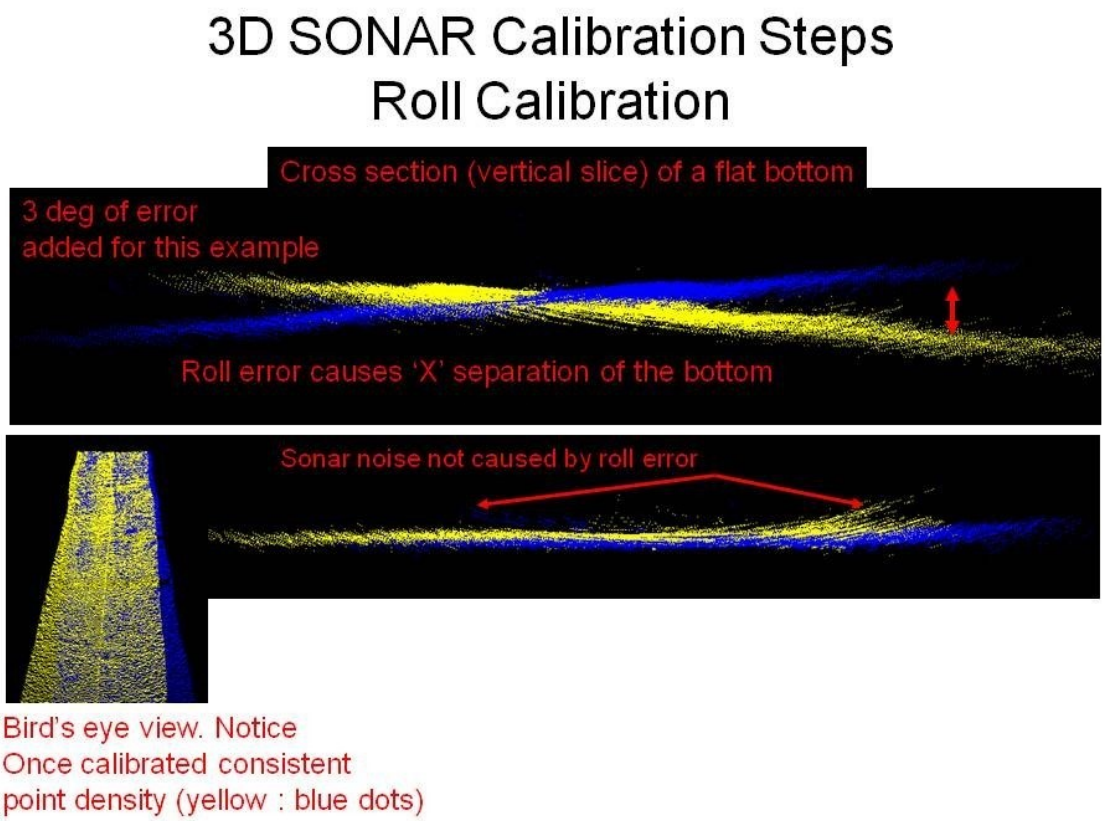
Time delay or latency is determined by making two runs both on the same heading but a two different speeds. In this example at ~ 2 and 7 knots



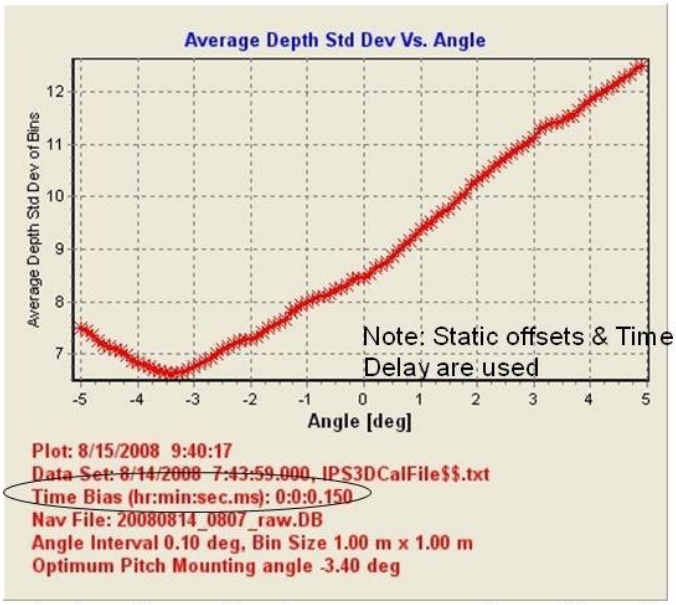
3D SONAR Calibration Steps
Roll Calibration



Roll calibration is done by making two runs on reciprocal headings over a flat bottom at the same speed



3D SONAR Calibration Steps
Pitch

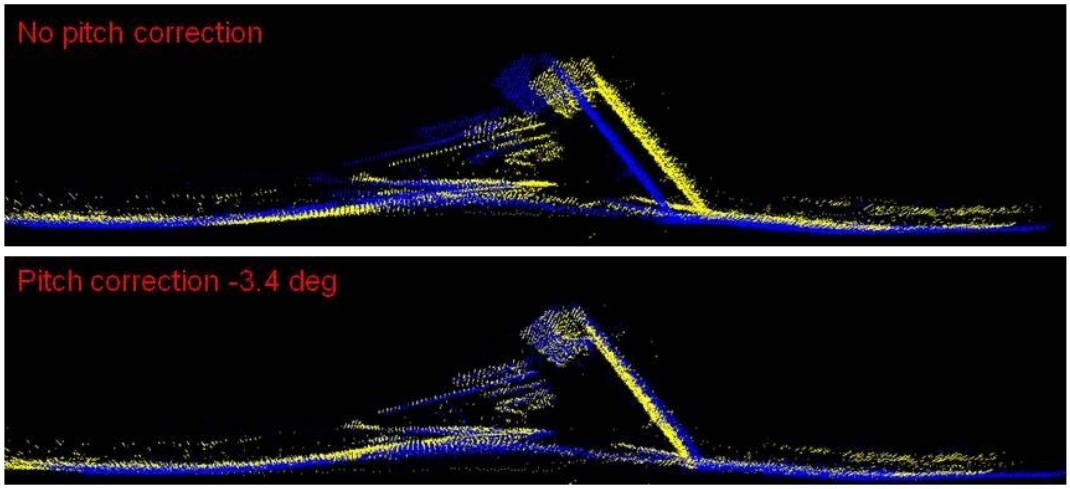


Pitch calibration is done by making two runs on reciprocal headings at the same speed over a slope (bottom or object)

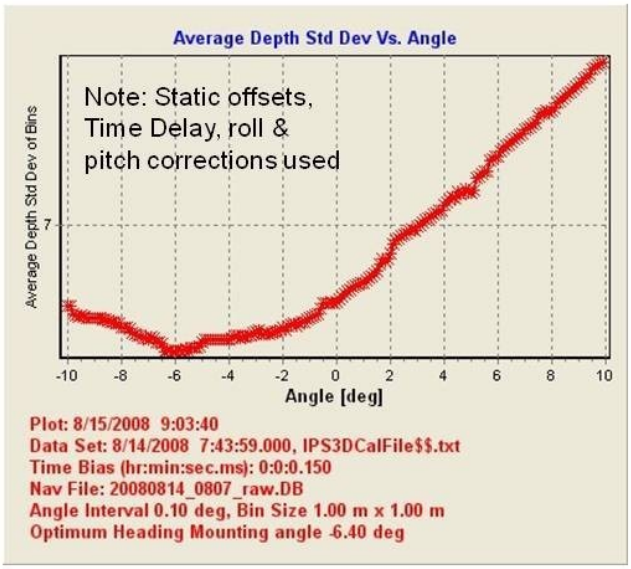
3D SONAR Calibration Steps
Pitch Calibration

Side view of construction debris (slope surface)

Pitch error causes separation of the object between the scans

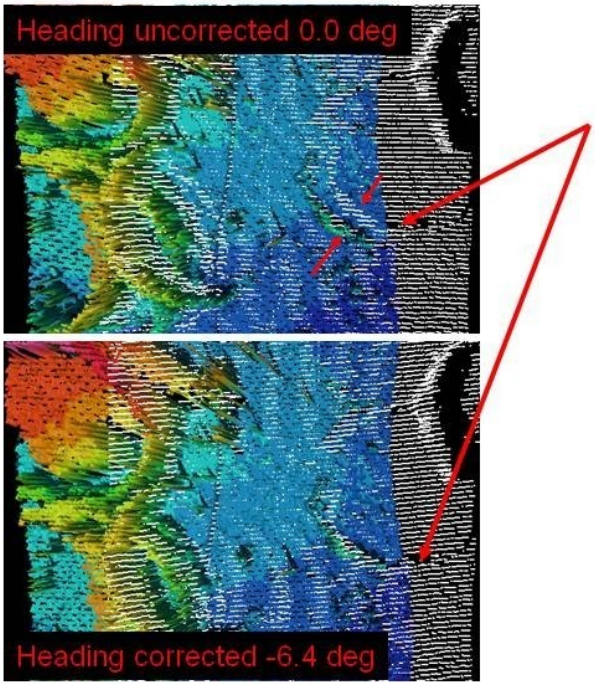


3D SONAR Calibration Steps
Heading Calibration



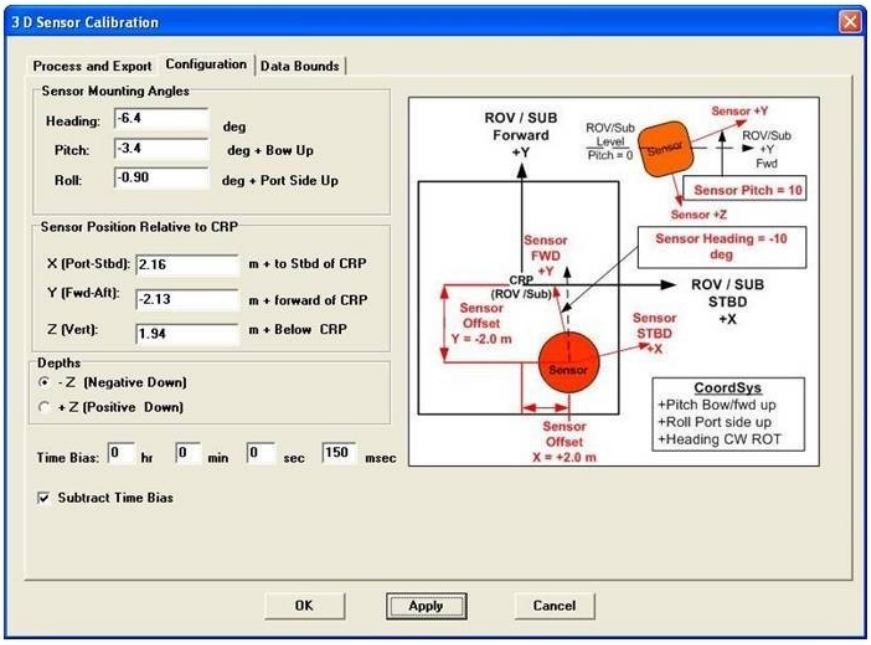
Heading calibration is done by making two runs on reciprocal headings over an object at the same speed

3D SONAR Calibration Steps
Heading Calibration



Bird's eye view of Northern debris. Notice the gap between the solid model and the white dots as well the offset of shadow from the reciprocal heading run

3D SONAR Calibration Steps
Final Calibration



Calibration Procedures

Equipment Offset Measurements

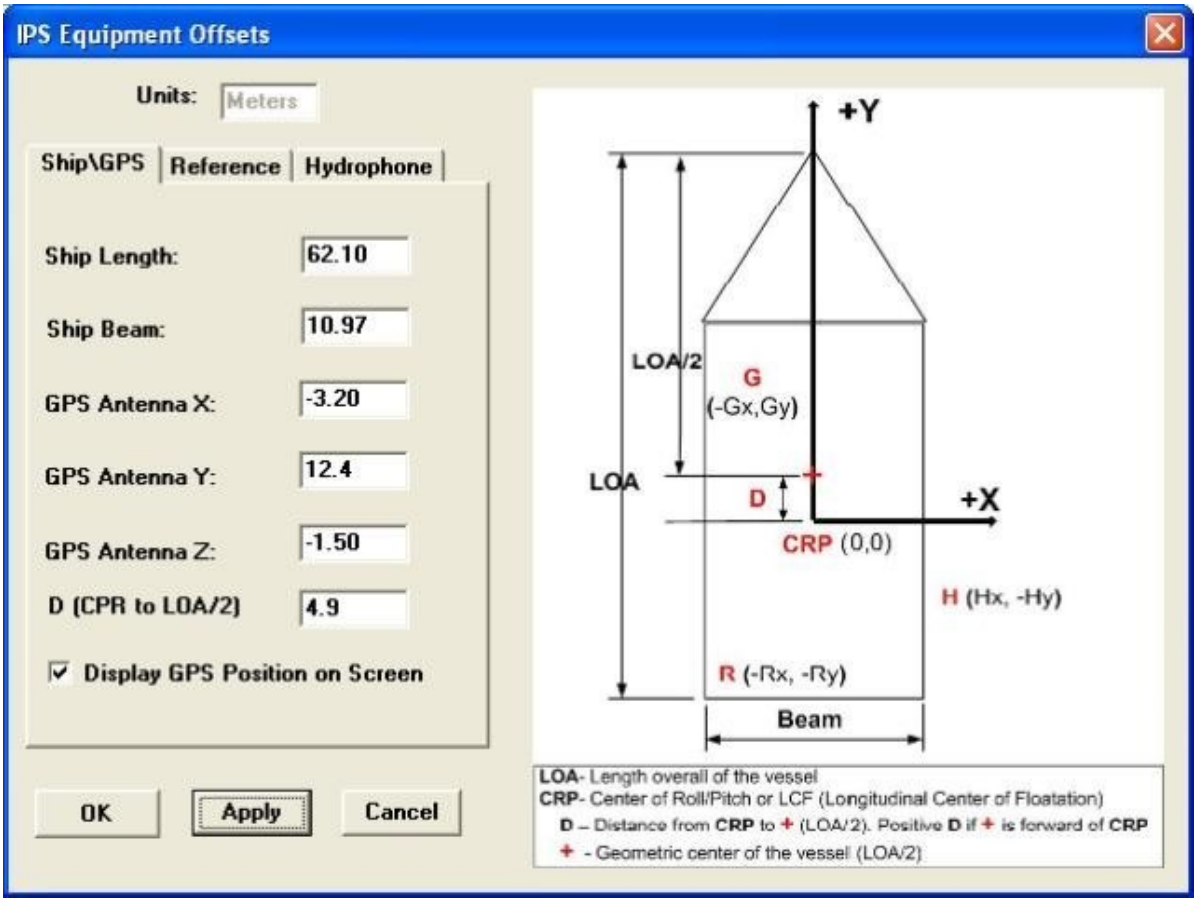
Recommended Setup:

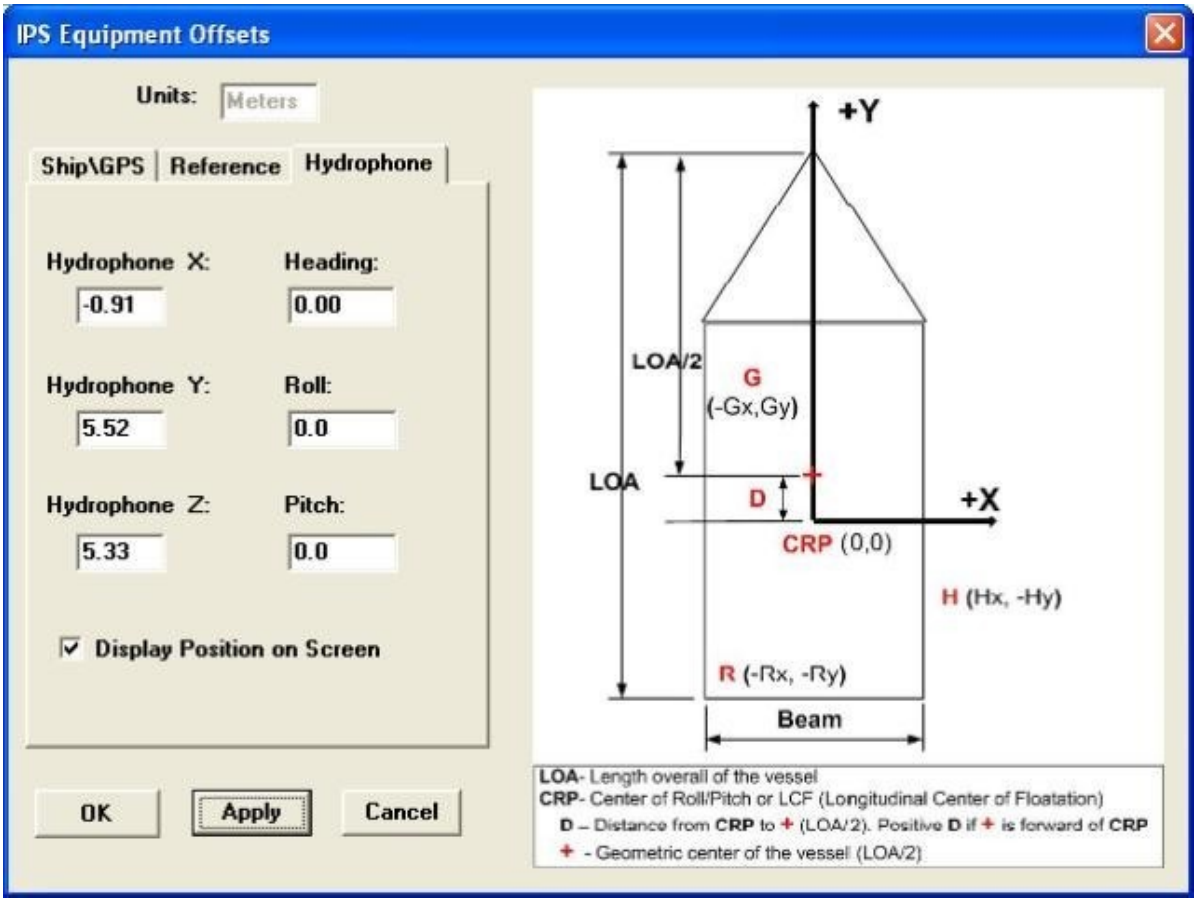
- USBL setup with GPS timing input string (reference: BATS manual 4450MA0250 RV A, section 3.3.4 "USBL GPS/Time Sync").
- Omni directional transponder ready for shallow water calibrations.
- Transponder float collar with anchor and surface float or transponder stand (tripod) with surface float to maintain the transponder in roughly vertical position.

Verify the Following Parameters:

1. Equipment offsets are relative to the vessel's center of roll/pitch (CRP) and still waterline as the origin (0,0,0).
   Enter the required ship offsets into IPS (Setup->Equipment Offsets->Ship Offsets->*Hydrophone*):
   1.1. Hydrophone X_____m (+ to Stbd, w.r.t CRP)
   1.2. Hydrophone Y_____m (+ Fwd, w.r.t CRP)
   1.3. Hydrophone Z_____m (+Down, below still waterline)
   1.4. Set the Hydrophone heading, roll & pitch mounting angles to 0.0 deg
   Note: The hydrophone tip should be at least one meter below the keel.

   Enter the required GPS offsets into IPS (Setup->Equipment Offsets->Ship Offsets->*Ship/GPS*):
   1.5. GPS X _____m (+ to Stbd)
   1.6. GPS Y_____m (+ Fwd)
   1.7. GPS Z _____m (+Down, below still waterline)
   1.8. D _____m (Distance from CRP To Geometric center)
   1.9. The Reference position can be set to X,Y = 0 in Setup->Equipment Offsets->Ship Offsets->Hydrophone).





IPS Equipment Offsets Ship\GPS Dialog Box

2. Verify the forward hydrophone alignment mark is positioned forward (within +/- 20 deg).
   2.1 Manual beacon depth _____ m (see item 2.2 in the Sheltered Water Calibration section below).

Set the Following TrackMan Software Parameters:

5. Data Output format $POREG
6. Filtering
   - 6.1. Filter Level **4 or 5**
   - 6.2. Detector Threshold **MED-LOW to High**
   - 6.3. Averaging **0** points (ç**Critical**)
   - 6.4. [**X**] Quality Factor Filter (**enable)**

Sheltered Water Calibration

IPS Requirements

- Hydrophone X,Y,Z offsets w.r.t CRP/still water line
- Correct sound velocity
- GPS input
- True ship's heading
- Time sync'ed enabled in IPS
- USBL time sync'ed
- TM filtering set to average 0 points
- Hydrophone heading, roll & pitch mounting angles set to zero in TM
- Beacon deployed at a known depth with TM depth set to manual and "input" or the use of a depth telemetry beacon
- Collection of sufficient number of data samples (typically once every two seconds)
- Data is collected with good geometry, by following the suggested calibration pattern (figure X) at a maximum range of 3-5 time the beacon depth

Sheltered Water Calibration

1. Select site
   - 1.1. On-site Sound Velocity Cast SV _____m/s {-for shallow water, SV at hydrophone will be suffice).
     - 1.1.1. Enter SV into Trackman & into IPS (Inputs->System Inputs->Offsets->ORE Sound Velocity).
     - 1.1.2. If available enter in vessel's depth sounder _____m/sec.
   - 1.2. Determine depth of beacon site using calibrated depth sounder.
     - 1.2.1. Actual site Depth _____m.
2. Ready transponder with surface float and weight for deployment at site of depth. Set the actual line length for 10-20 ft more than the actual depth.
   - 2.1. Set the beacon up to float or be positioned 1.0 meter above the bottom using beacon float collar or stand.
   - 2.2. Beacon Depth _____m.
3. **Power on Beacon**
4. Deploy the beacon at site and log actual deployment position (take a fix).
   Lat_____ Long_____
5. Enter into the Navigation plot the waypoint for the calibration pattern (figure 1).
6. Center on beacon waypoint and zoom in to a grid scale such that the individual squares are about 3-5X the depth of the beacon. For example, if the beacon is deployed at a depth of 50 meters zoom in so an individual squares are about 200 meters. The vertical size of a grid square is enclosed in brackets [ ] in the status bar at the bottom of IPS, as shown below:

7. Have the vessel slowly (2-3 knots) follow the calibration pattern (figure1) and collect two sets of data (into one file).
8. Run the USBL calibration routine (See procedure below).
9. Calibration Hydrophone Mounting angle Offsets:
   - 9.1. Heading _____ deg (+ CW – alignment mark rotated " to Stbd")

9.2. Roll_____ deg (+ Port side Up – Top of Hyd port side is Up)
9.3. Pitch_____ deg (+Bow up – Hyd Fwd Top edge Up)
10. Enter Calibration Hydrophone Mounting angle Offsets into IPS as reported.
11. At main corners of calibration pattern verify tracking quality.

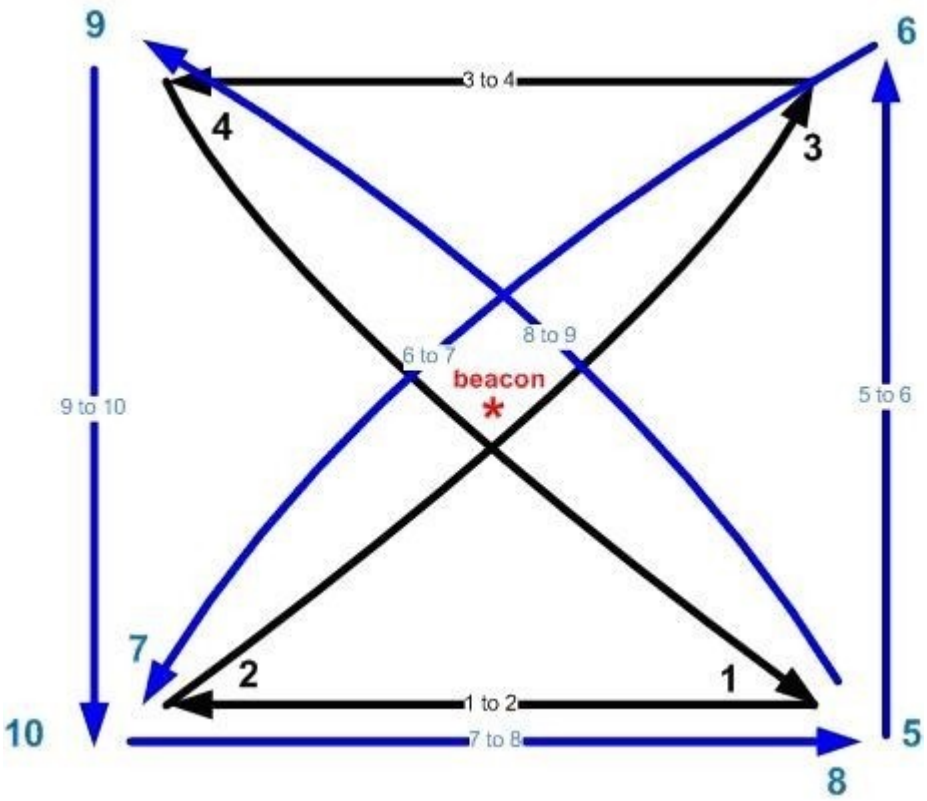
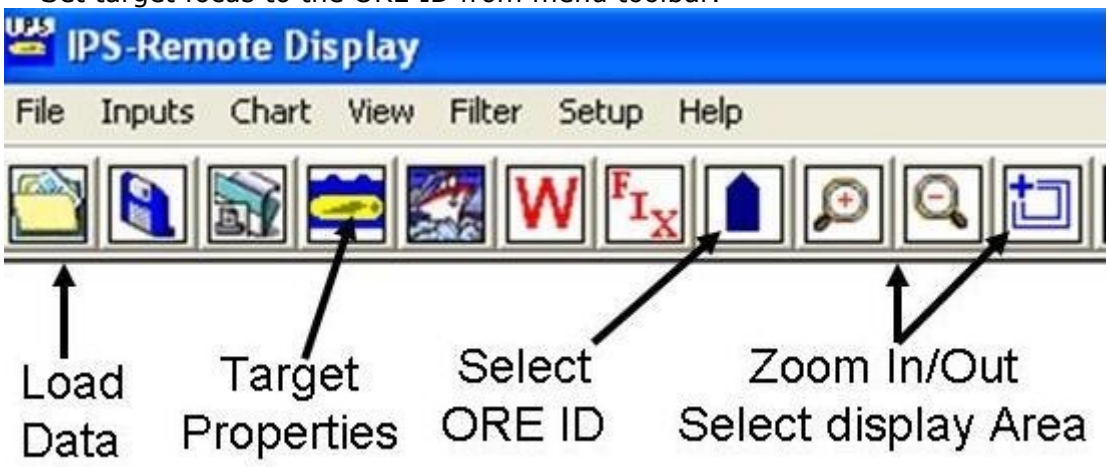


Figure 1. Suggested USBL calibration pattern. If possible, the vessel should not operate at a horizontal range greater than 5 times the depth of the beacon.

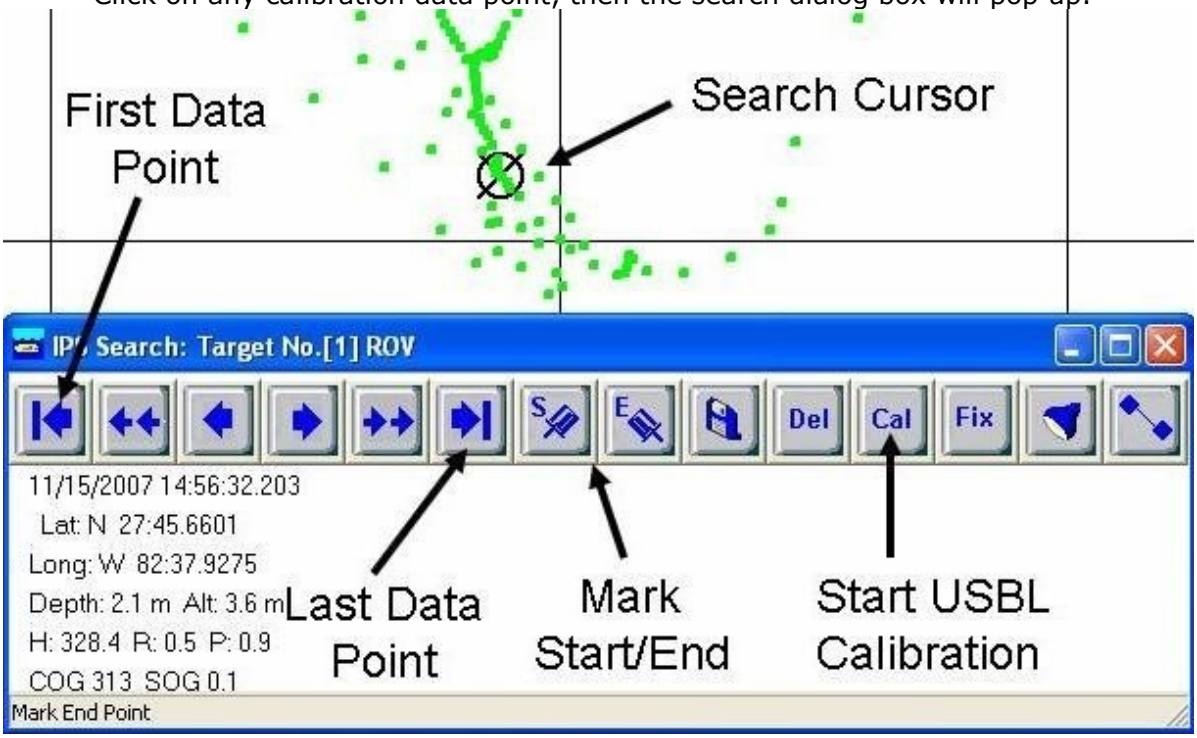
After or in tandem with the sheltered water calibration the IPS Off-Line USBL Calibration Procedure should be run.

IPS Off-Line USBL Calibration Procedure

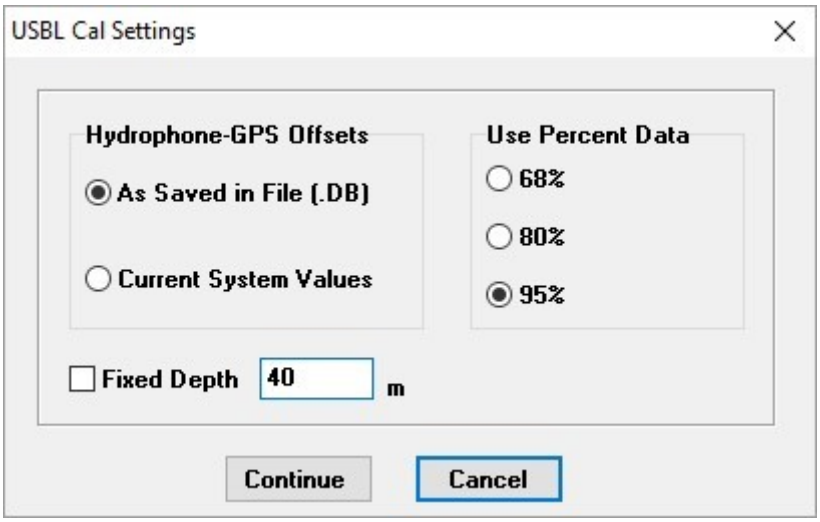
1. Verify IPS USB security key is installed.
2. Launch IPS.
3. Load collected calibration data using the (File->Open) menu command.
4. Set target focus to the ORE ID from menu toolbar.



5. From the Target Properties toolbar icon set the number of display points to 500-1000.
6. Enable search mode (View-> Search mode). **Note**: the cursor will change from an arrow pointer to a Gun sight ¤.
7. Click on any calibration data point, then the search dialog box will pop up.

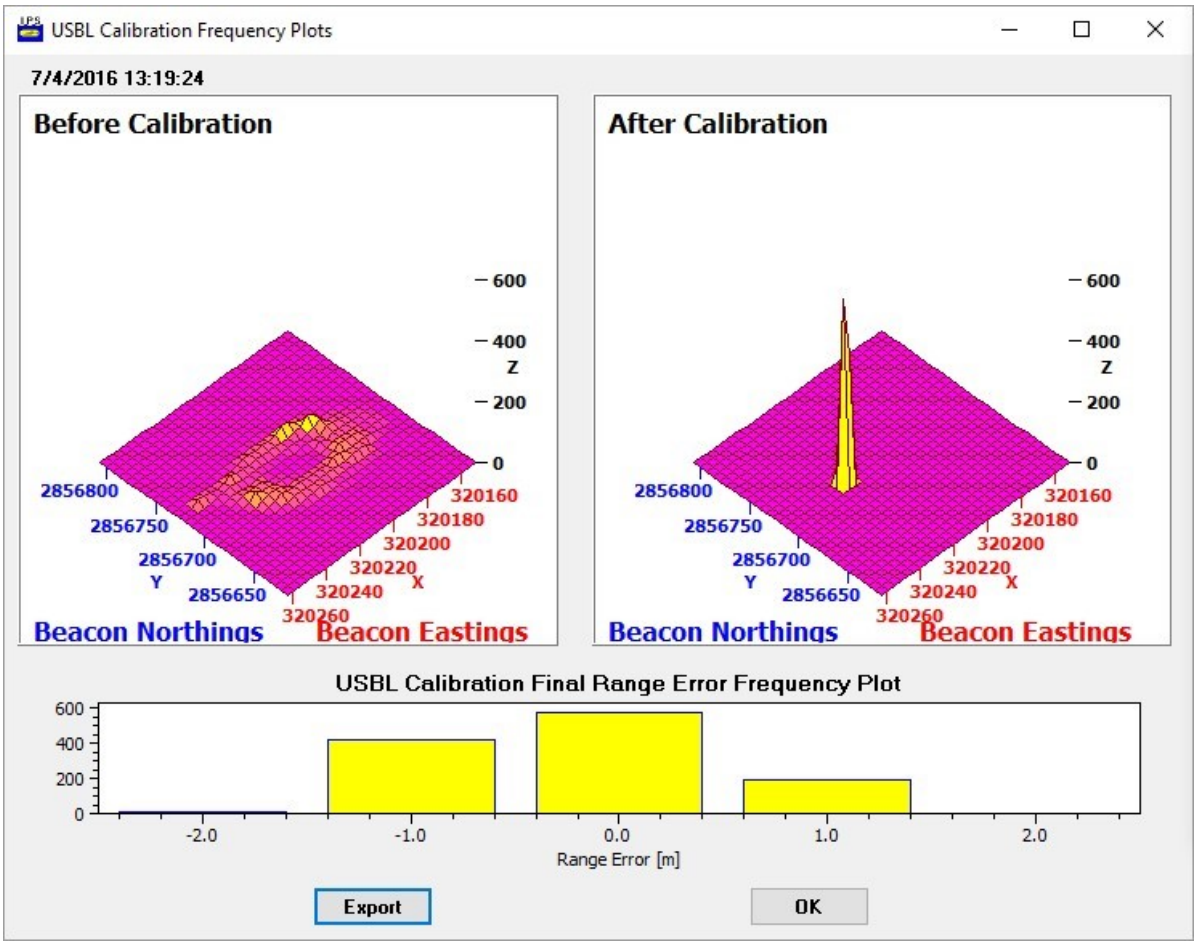


8. Jump to first data point and click to "Mark" the Start point.
9. Jump to the last data point and click to "Mark" the End point.
10. Start the USBL calibration which will generate the following:
    10.1. The USBL Calibration dialog box, enter the required settings.

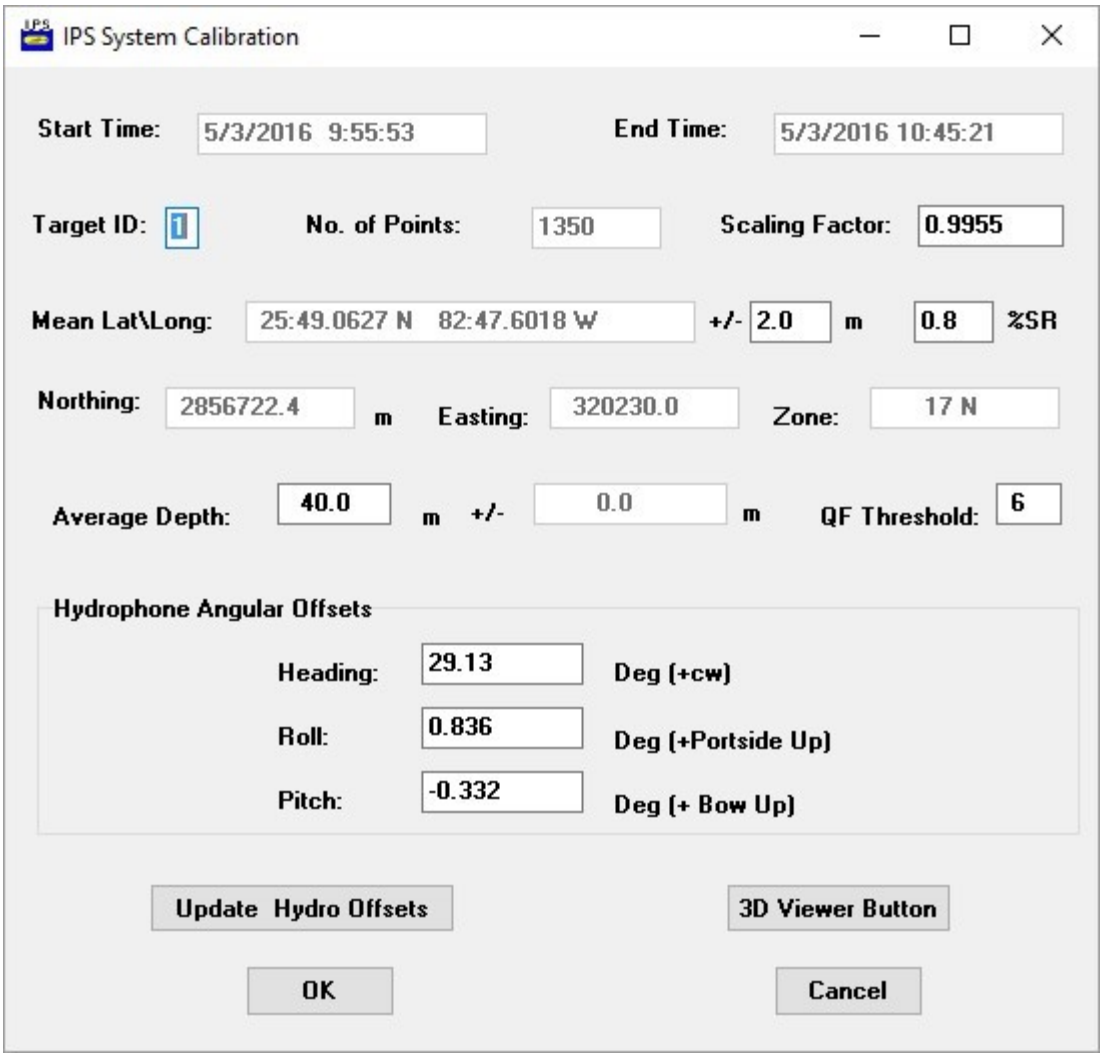


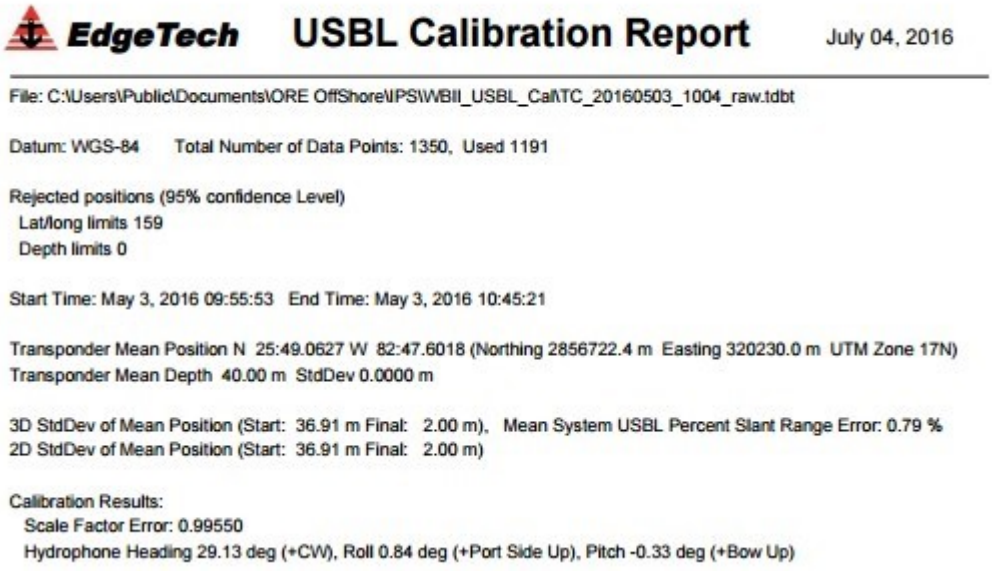
10.2. Before and After Frequency plots.
10.3. A text file of the calibration results.
10.4. Display the IPS System Calibration dialog box.
10.5. Update the IPS nav plot with the corrected positions.

11. If the calibration was meaningful the Before and After frequency plots should show that the position of the beacon goes from broadly distributed positions to a very tight cluster as seen in the figures below:



1. The IPS System Calibration dialog box with the results of the calibration will also be displayed and a PDF format report is also generated in the directory where the data for the calibration is locates.





EdgeTech **USBL Calibration Report** July 04, 2016

File: C:\Users\Public\Documents\ORE OffShore\IPS\WBII_USBL_Cal\TC_20160503_1004_raw.tdbt

Datum: WGS-84 Total Number of Data Points: 1350, Used 1191

Rejected positions (95% confidence Level)
Lat/long limits 159
Depth limits 0

Start Time: May 3, 2016 09:55:53 End Time: May 3, 2016 10:45:21

Transponder Mean Position N 25:49.0627 W 82:47.6018 (Northing 2856722.4 m Easting 320230.0 m UTM Zone 17N)
Transponder Mean Depth 40.00 m StdDev 0.0000 m

3D StdDev of Mean Position (Start: 36.91 m Final: 2.00 m), Mean System USBL Percent Slant Range Error: 0.79 %
2D StdDev of Mean Position (Start: 36.91 m Final: 2.00 m)

Calibration Results:
Scale Factor Error: 0.99550
Hydrophone Heading 29.13 deg (+CW), Roll 0.84 deg (+Port Side Up), Pitch -0.33 deg (+Bow Up)

Three Axis Magnetometer Calibration

Creating a Magnetometer Calibration

1. Launch the IPS with the USB security key.
2. If you know the location of the magnetometer calibration create an IPS waypoint now for later use, see section 7.2 below.
3. Select File->Export Sensor XYZ from the main menu.
4. If required, and you are using the $PIMAG or SLD data format., you can specify the region of data to be processed. Set the "Time Bounds", under the Data Bounds tab. See below for examples of the data formats used.
    1. Check (enable) the "Use Time Bounds" and [Apply].
5. Under the "Process and Export" tab set the "Sensor File" to mag calibration data file in either the raw Honeywell HMR2300, HMR3000 (XDR) ASCII data formats, the $PIMAG formatted text or SLD *.csv file.
6. Click on the [3-Axis Mag Cal] button.
7. Enter in the total earth field Nanotesla [nT] for the specific Mag calibration site.
    1. Use your latitude and longitude or zip code to find the total earth field at the following website http://www.ngdc.noaa.gov/geomag-web/#igrfwmm.
    2. Or select an IPS waypoint near the calibration area, you may use the waypoint entered earlier. The IPS will automatically calculate the earth's magnetic field using the Enhanced Magnetic Model (EMM) based on the waypoint latitude and longitude and the first data point's UTC date-time at sea level.
    3. Or enter the default value of 50,000, however this may cause a small bias relative to Earth's actual magnetic field.
8. The processed magnetometer calibration data should be represented as a single green line that overlaps the blue Earth field line. If this is the case, click on the [Save calibration] button to generate a PDF calibration report including a calibration plot and a Mag calibration text file with the calibration coefficients. If you do not get a desirable result, try one of the following suggestions. If the points are scattered collecting more data may improve the calibration. If the line has a slope, this is usually caused by the temperature not being at a steady state, the magnetometer's temperature must equilibrate to the temperature that you are calibrating in. This applies only to non-temperature compensated magnetometers.

Magnetometer Output (Machine Readable) Text File Format:

[TotalField]51508
[Threshold]184
[a11]0.915631199985504
[a12]0.00729029969385857
[a13]0.0137476726049316
[a21]0.00729029969385852
[a22]0.930359671865496
[a23]-0.00217196119162317
[a31]0.0137476726049316
[a32]-0.0021719611916232
[a33]0.930237010025602
[b1]0.132084211077783
[b2]0.046174601186279
[b3]0.235802094970093
[StdDev]0.000922

3-Axis Magnetometer Calibration Plot

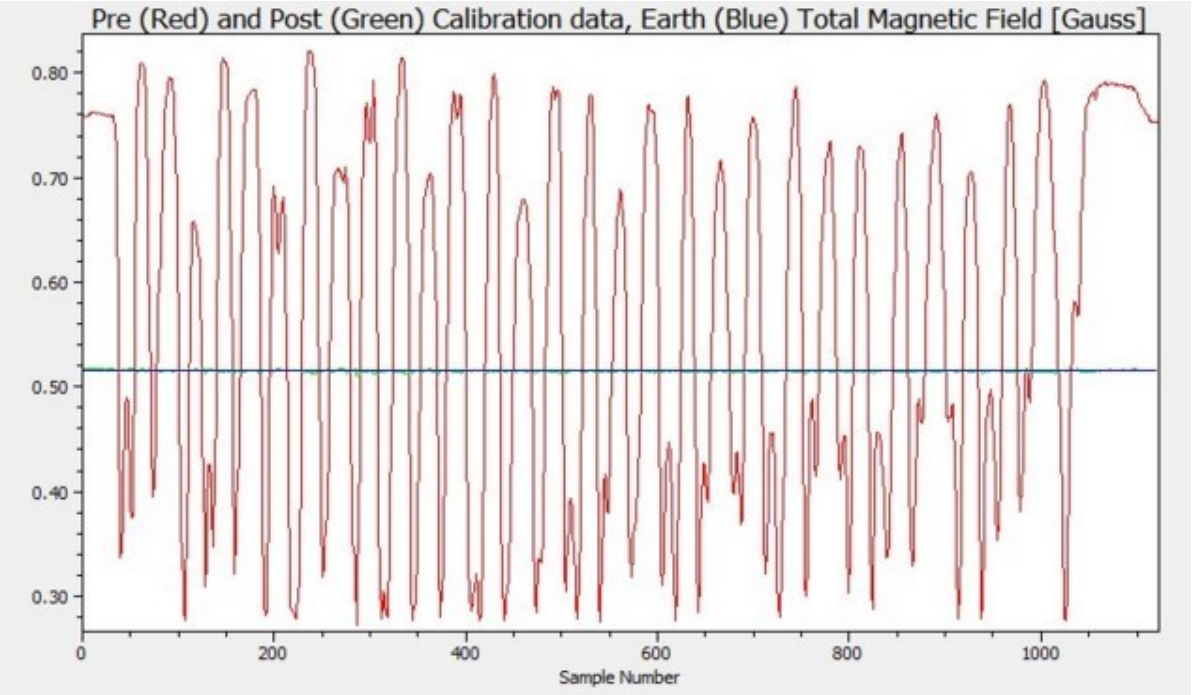
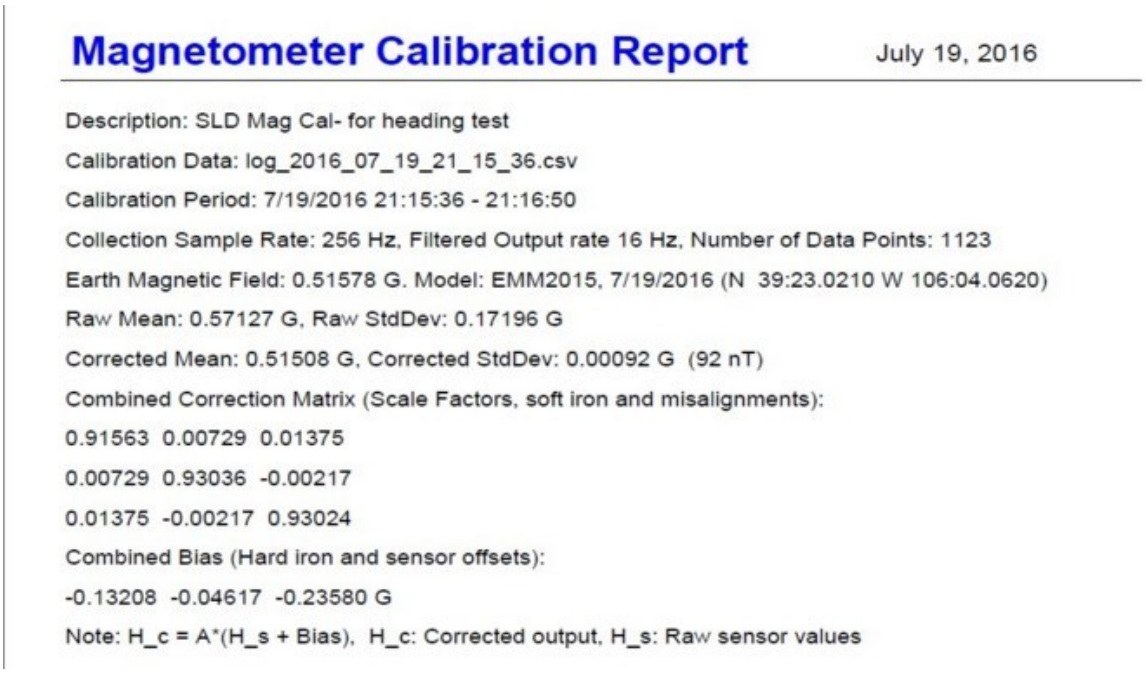


Figure 1. Example of a 3-axis magnetometer calibration plot showing the raw magnetometer data in red and the same magnetometer data processed using the magnetometer calibration coefficients in green. If the calibration is valid the green line should overlap the blue line that is the Earth's total magnetic field at the calibration site in Gauss [G].

The calibration of the three axis magnetometer requires it to be moved in three dimensions, if possible through a variety of heading, roll and pitch positions in an area that is free of magnetic clutter (away from steel ships, commercial docks etc.)

Example Magnetometer PDF report (Cal plot image not show below, see figure 1).



Magnetometer Calibration Report July 19, 2016

Description: SLD Mag Cal- for heading test

Calibration Data: log_2016_07_19_21_15_36.csv

Calibration Period: 7/19/2016 21:15:36 - 21:16:50

Collection Sample Rate: 256 Hz, Filtered Output rate 16 Hz, Number of Data Points: 1123

Earth Magnetic Field: 0.51578 G. Model: EMM2015, 7/19/2016 (N 39:23.0210 W 106:04.0620)

Raw Mean: 0.57127 G, Raw StdDev: 0.17196 G

Corrected Mean: 0.51508 G, Corrected StdDev: 0.00092 G (92 nT)

Combined Correction Matrix (Scale Factors, soft iron and misalignments):

0.91563 0.00729 0.01375

0.00729 0.93036 -0.00217

0.01375 -0.00217 0.93024

Combined Bias (Hard iron and sensor offsets):

-0.13208 -0.04617 -0.23580 G

Note: H_c = A*(H_s + Bias), H_c: Corrected output, H_s: Raw sensor values

Georeferencing of Magnetometer data (IPS $PIMAG)

1. With either valid real time data being collected or an IPS file loaded into IPS.
2. Click on File->Export Data -> Sensor XYZ.
3. Select the "Process Export" tab.
4. Click on the Sensor File" of IPS Magnetometer file ($PIMAG or SLD).
5. Click on "Support File" to set the corresponding magnetometer calibration file generated by the IPS (*.txt).
6. Set the IPS target number.
7. Click on button Georeferenced Local Sensor Data.

Note: HMR3000 or HMR2300 data files can be converted from raw (uncompensated) to total field compensated using the same procedure as Georeferencing IPS $PIMAG or SLD data files. In this case no valid navigation data needs to be loaded into IPS.

IPS File Formats Supported (using UTC time):

If you are using a format currently not supported, contact EdgeTech and we will add the required format.

$PIMAG,HHMMSS.sss,MM-dd-yyyy,x,y,z<CR><LF> where X,Y,Z are in Gauss. For

Example:

$PIMAG,180023.803,05-08-2014,0.209067,-0.189467,-0.373400

Or

Honeywell HMR-2300 ASCII format 28 bytes (fixed field)
SN | X1 | X2 | CM | X3 | X4 | X5 | SP | SP | SN | Y1 | Y2 | CM | Y3 | Y4 | Y5 | SP | SP | SN | Z1 | Z2 | CM | Z3 | Z4 | Z5 | SP | SP |<cr><lf>

Where, SN= negative sign or a space, CM-comma, SP-Space. For example:
  4,079 - 1,250 - 5,539
-     47   485 - 6,921

Honeywell HMR-3000 ASCII format

$HCXDR,A,37.8,D,PITCH,A,-45.0,D,ROLL,G,2696,,MAGX,G,8681,,MAGY,G,-3536,,MAGZ,G,9754,,MAGT*1C

Or
wwww.RIEmbedded.com, SLD AHR 9Axis Orientation Logger (inexpensive MEMS device)
Default ASCII format:

SLD-AHR Default format settings (using UTC time):

www.SimpleMEMS.com
Battery Voltage 4.152 Volts
Sample Rate (SR) (256) Hz
Timestamp Format (TSF) (0) Absolute
Accelerometer Status (AS) (1) On
Acceleration Format (AF) (0) G's
Accelerometer Full Scale (AFS) (2) +/- 2 G's
Magnetometer Status (MS) (1) On
Magnetic Field Format (MFF) (0) Gauss
Magnetic Field Gain (MFG) (1300) milli-gauss
Gyroscope Status (GS) (1) On
Angular Rate Format (ARF) (0) DPS: Degrees per second
Angular Rate Full Scale (ARFS) (250000) milli-degrees per second/250 DPS

Example SLD *.csv log file header and data

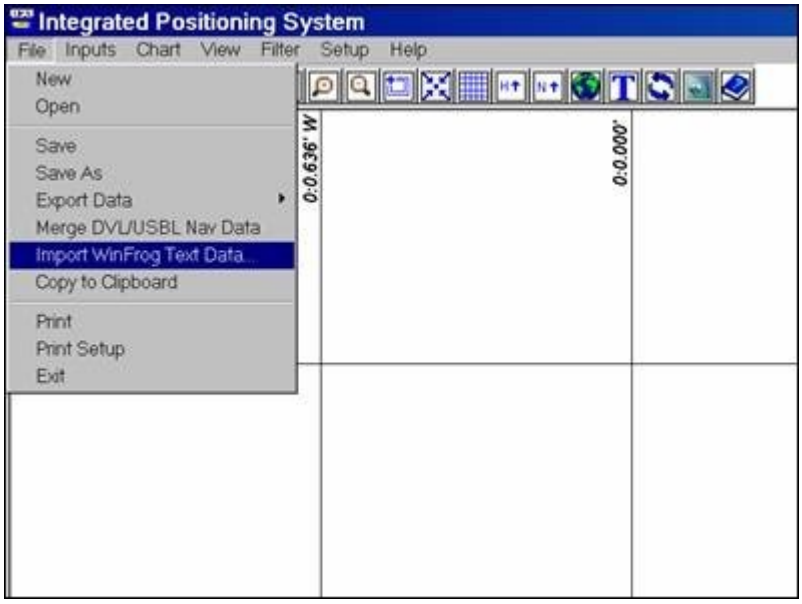
Year	Month	Day	Hour	Minute	Second	Sub-Second	Acceleration-X (G's)	Acceleration-Y (G's)	Acceleration-Z (G's)	MagneticField-X (Gauss)	MagneticField-Y (Gauss)	MagneticField-Z (Gauss)	AngularRate-X (dps)	AngularRate-Y (dps)	AngularRate-Z (dps)
2016	7	19	21	15	36	0	-0.987	0.067	0.003	-0.6536	-0.2364	-0.3051	2.7	2.4167	-7.8
2016	7	19	21	15	36	0.0039	-0.99	0.064	0.004	-0.6491	-0.2373	-0.3061	2.2	2.8333	-8.275
2016	7	19	21	15	36	0.0078	-0.986	0.064	0	-0.6491	-0.2373	-0.3061	1.6667	3.175	-8.5833
2016	7	19	21	15	36	0.0117	-0.984	0.062	-0.005	-0.65	-0.2373	-0.3071	1.3583	3.1583	-8.7
2016	7	19	21	15	36	0.0156	-0.975	0.057	-0.01	-0.65	-0.2373	-0.3071	1.525	2.975	-8.2917

3 Beam Operation

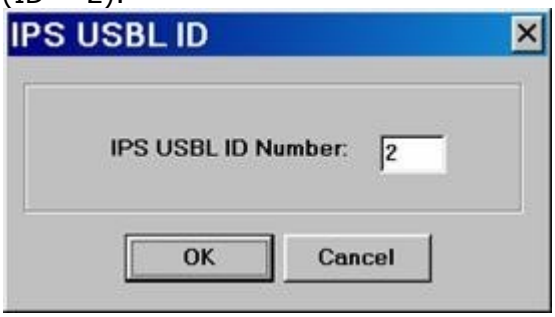
Conversion of WinFrog USBL Text Files to IPS File Format

Conversion of WinFrog USBL Text Files to IPS File Format (*_raw.db & *_trk.db)
The WinFrog .dat text file should be in the following format:
3,10-04-03 07:32:11.8,N33 58.3701,W119 36.7739,-60,3762221.14,
258596.00,0.00,0.00,0.00,55.04,56.50,0.71,0.00,NONE,0.000,0.00,0.00,0.00,0.00,0.00,De
lta<CR><LF>
Note: Only the date, time, latitude, longitude and depth data fields are imported (used);
10-04-03 07:32:11.8,N33 58.3701,W119 36.7739,-60
Conversion/Import Steps:

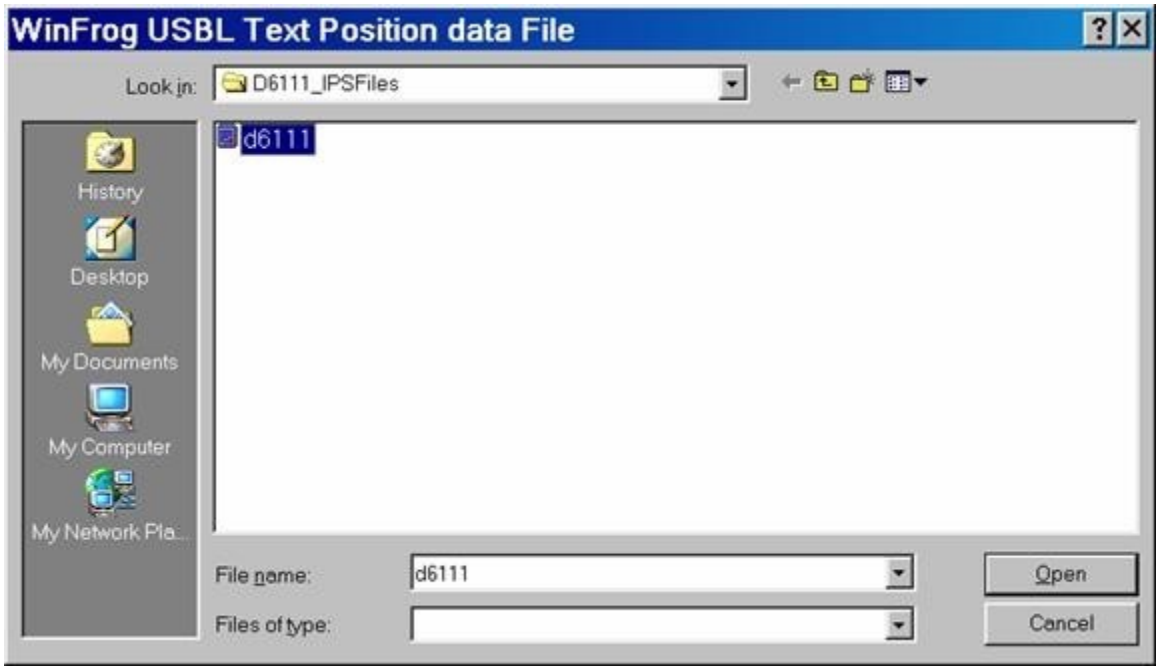
1.File->Import WinFrog Text File.



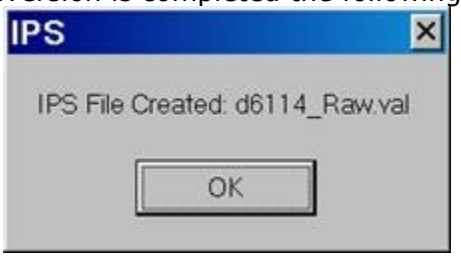
2. Then choose a tracking ID not equal to the ID assigned or used for the DVL navigation. Typically the DVL target is set to an ID or 1 or 9, therefore the USBL ID could be set to 2 (ID = 2).



3. Select the WinFrog .dat (text file) to be converted.



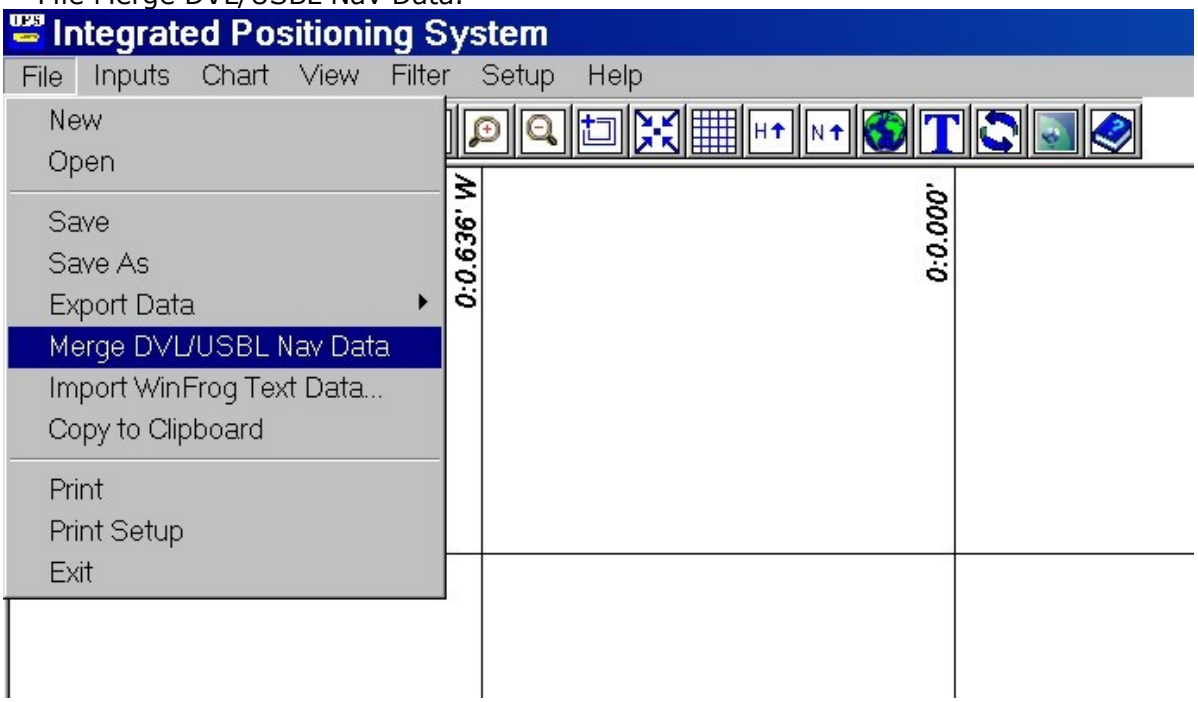
4. Click [open]. When the conversion is completed the following message box will pop up.



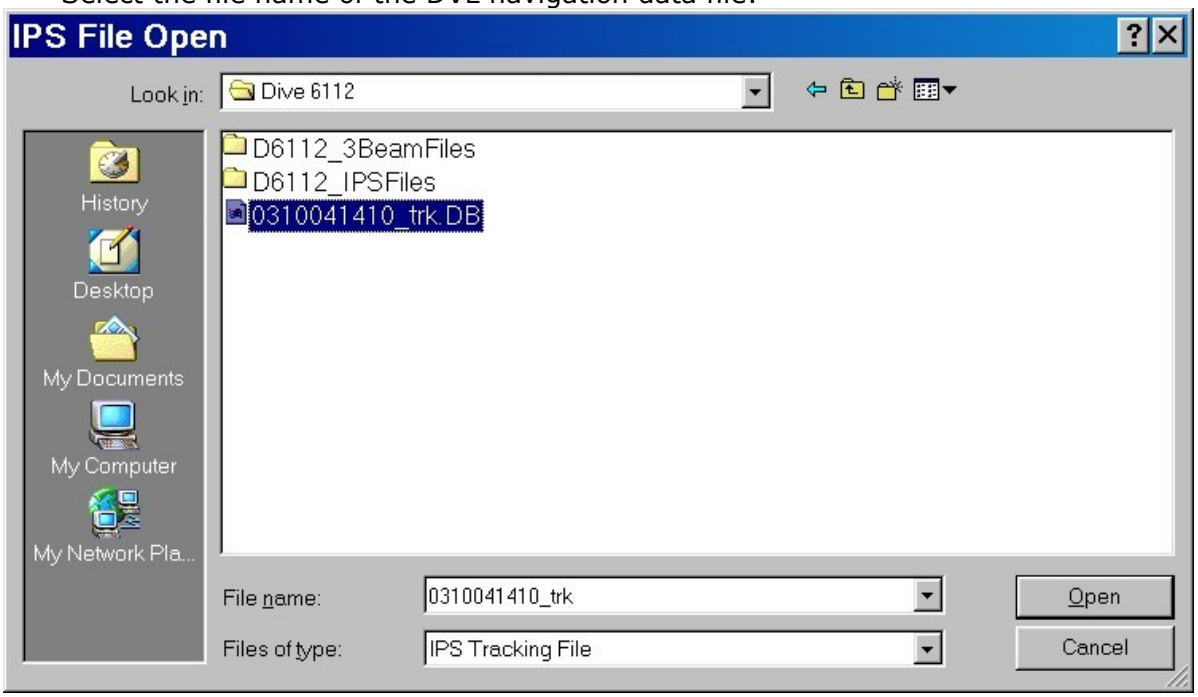
Merging DVL and USBL IPS Files

Processing Steps:

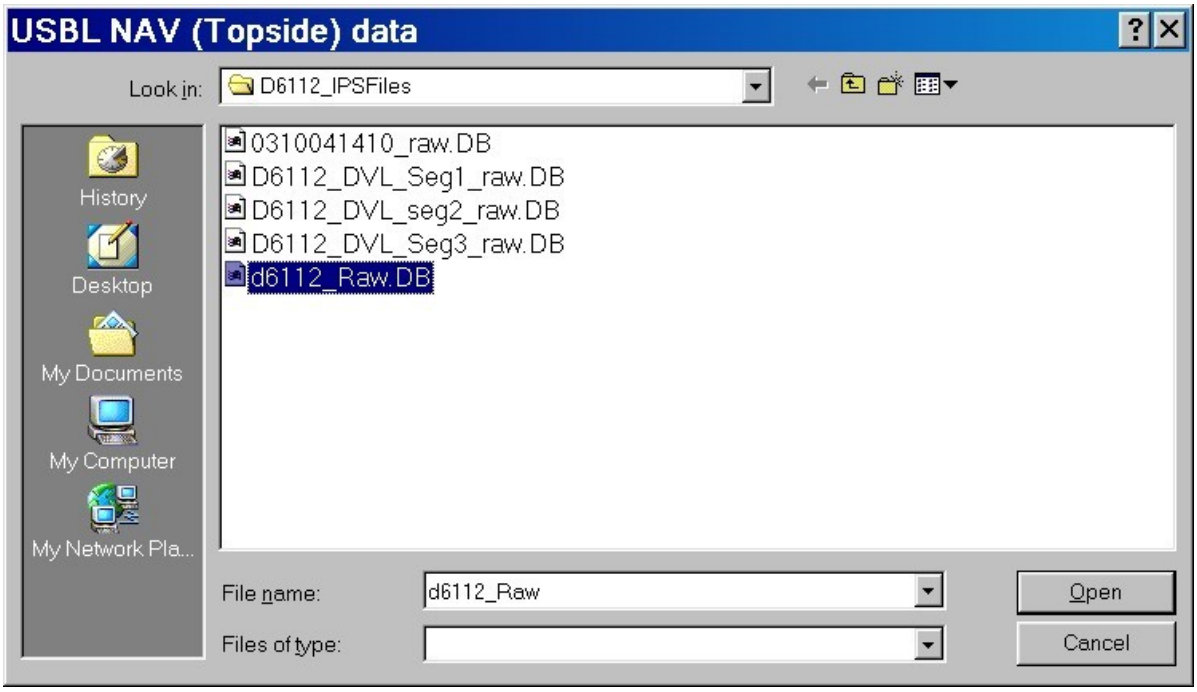
1. File Merge DVL/USBL Nav Data.



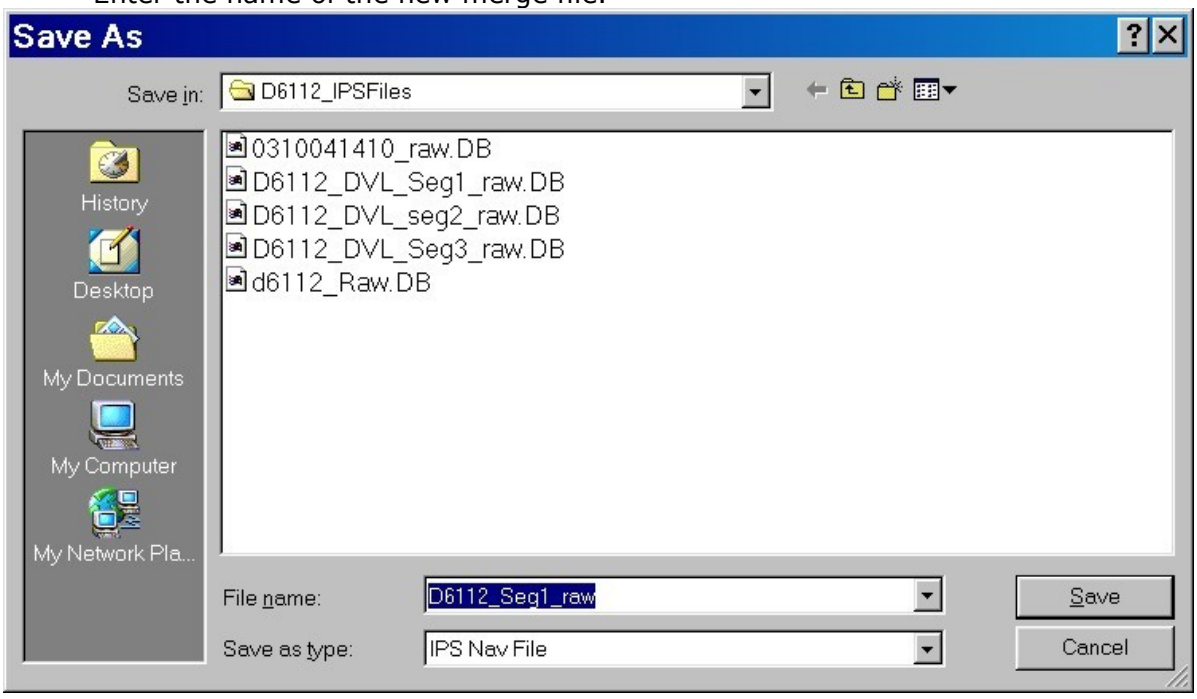
2. Select the file name of the DVL navigation data file:



3. Select the IPS USBL navigation file. This could be data that was converted from a WinFrog .dat nav file that was converted to an IPS file, see Conversion of WinFrog USBL Text Files to IPS File Format.

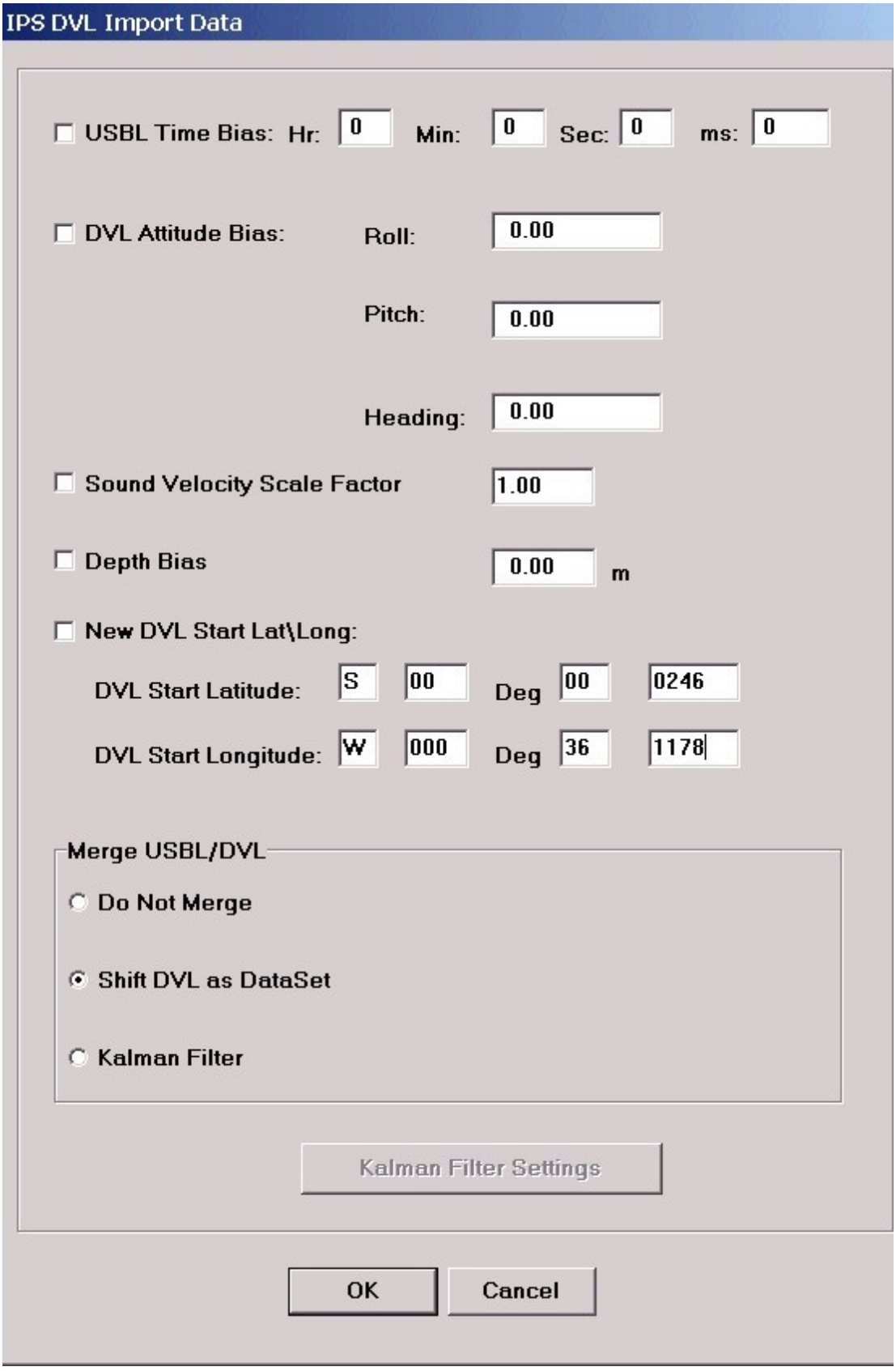


4. Enter the name of the new merge file.

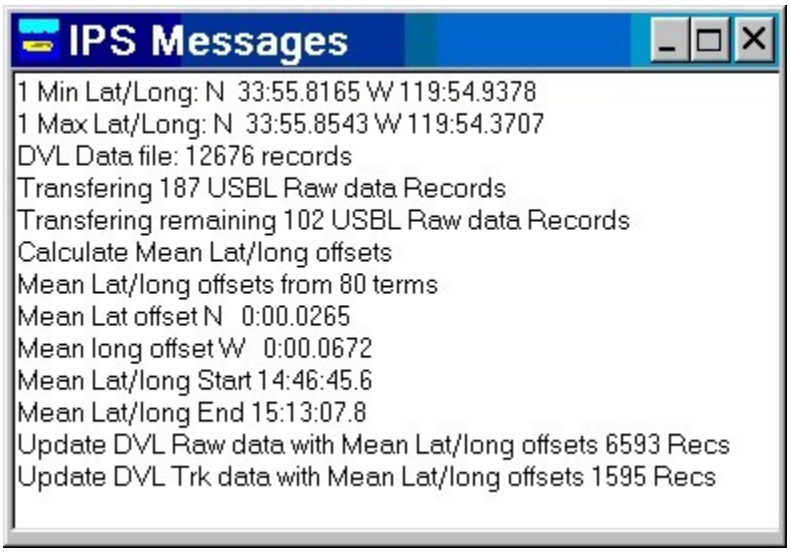


5. When the settings dialog box pops up you can alter the raw DVL data and select how to fuse the DVL and USBL data. A quick method to fuse the DVL and USBL navigation data is to select the "Shift DVL as Data Set" radio button in the "Merge USBL/DVL" group box. This routine will calculate the mean lat/long error between the DVL data set and the USBL data set and then apply the delta lat/long error terms to the DVL data set. (Note a USBL /DVL time bias could cause the data to not match correctly). Therefore, if the USBL time bias is know

it should be applied in order to ensure that the USBL position times accurately match the DVL position times. Using the Kalman Filter method would solve drift over time method, but longer + complex.
Note: The USBL time bias will be added to the USBL times.



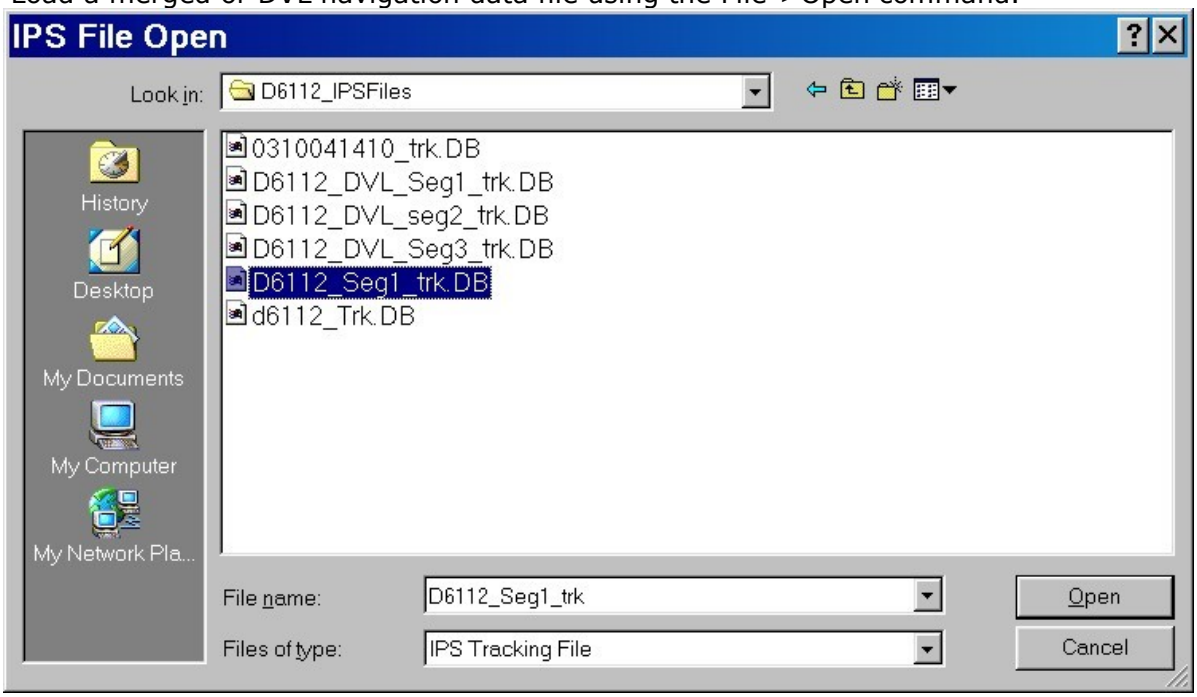
6. Select [OK] to start the process. As the processing is taking place the status may be monitored by viewing the IPS Message box.

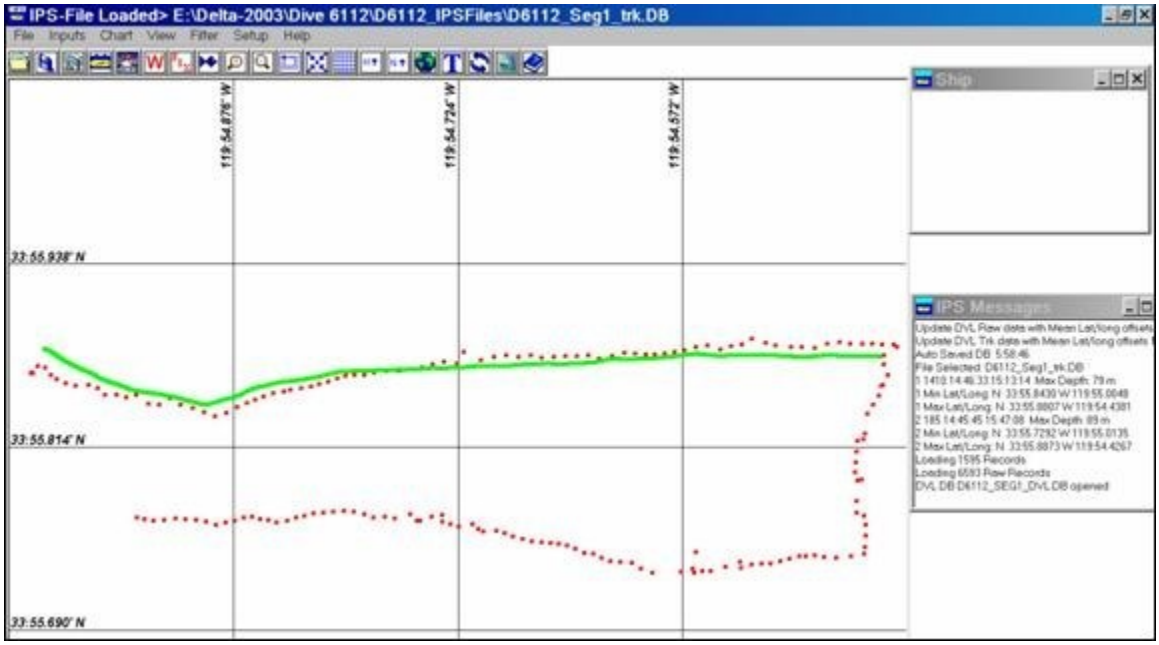


Creating a 3Beam Data File

Suggestion: right click on the Windows menu bar and activate then shrink the Task Manger dialog box (now the icon should be on your menu tool bar).

1. Load a merged or DVL navigation data file using the File->Open command.





2. Click on the focus button to select the DVL target. DVL Targets are typically ID 1 (fish shape) or 9 (Sub shape).

Focus Button _____/\

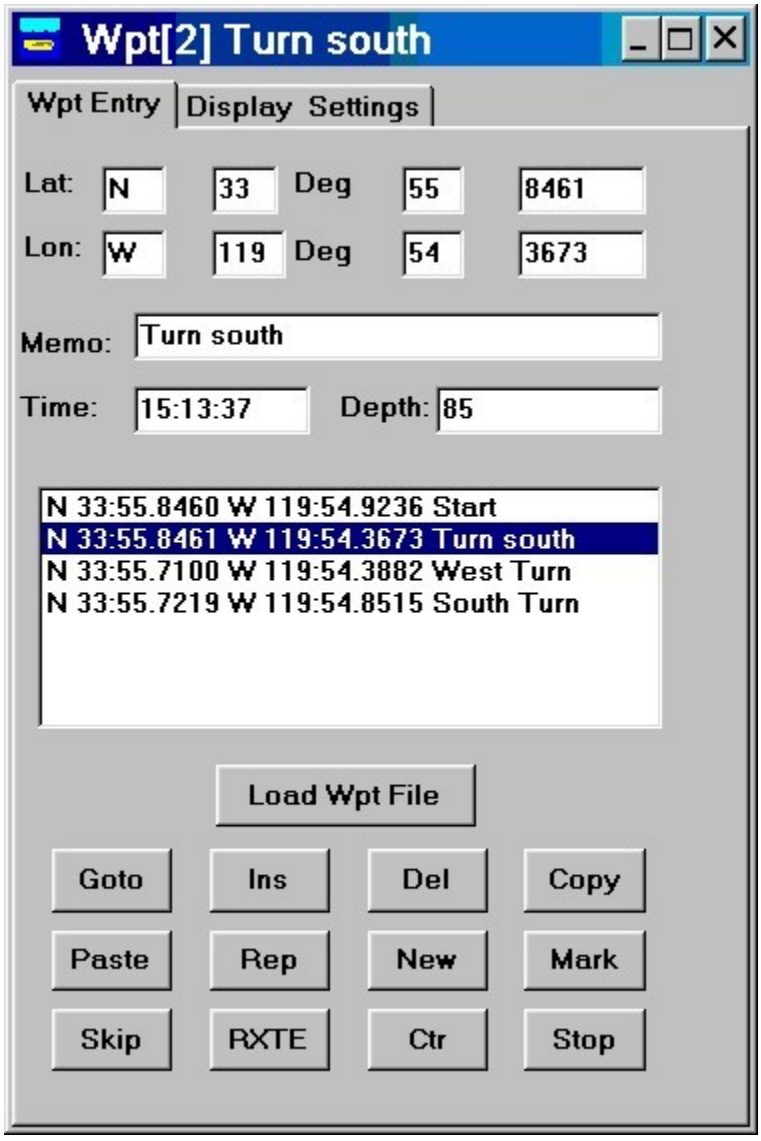
3. Click on the sub icon and select an appropriate target (e.g. target ID 1, Fish) set point color to a highly visible color like a light green and the track size to 2500 with a skip point of 1.

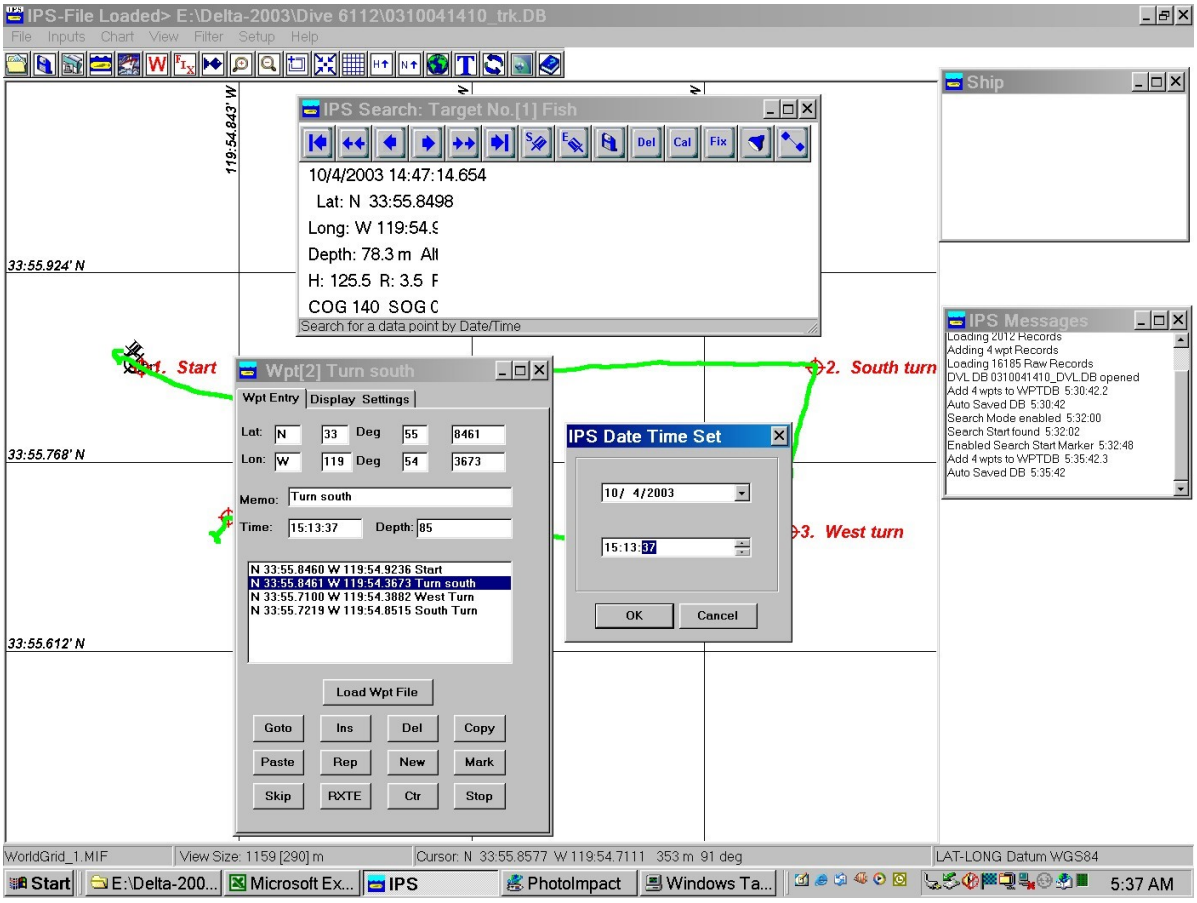
4. Enter search mode IPS Menu bar View -> Display Search Mode

5. Move cursor over any fish data point and click on it. The search dialog box will pop up.

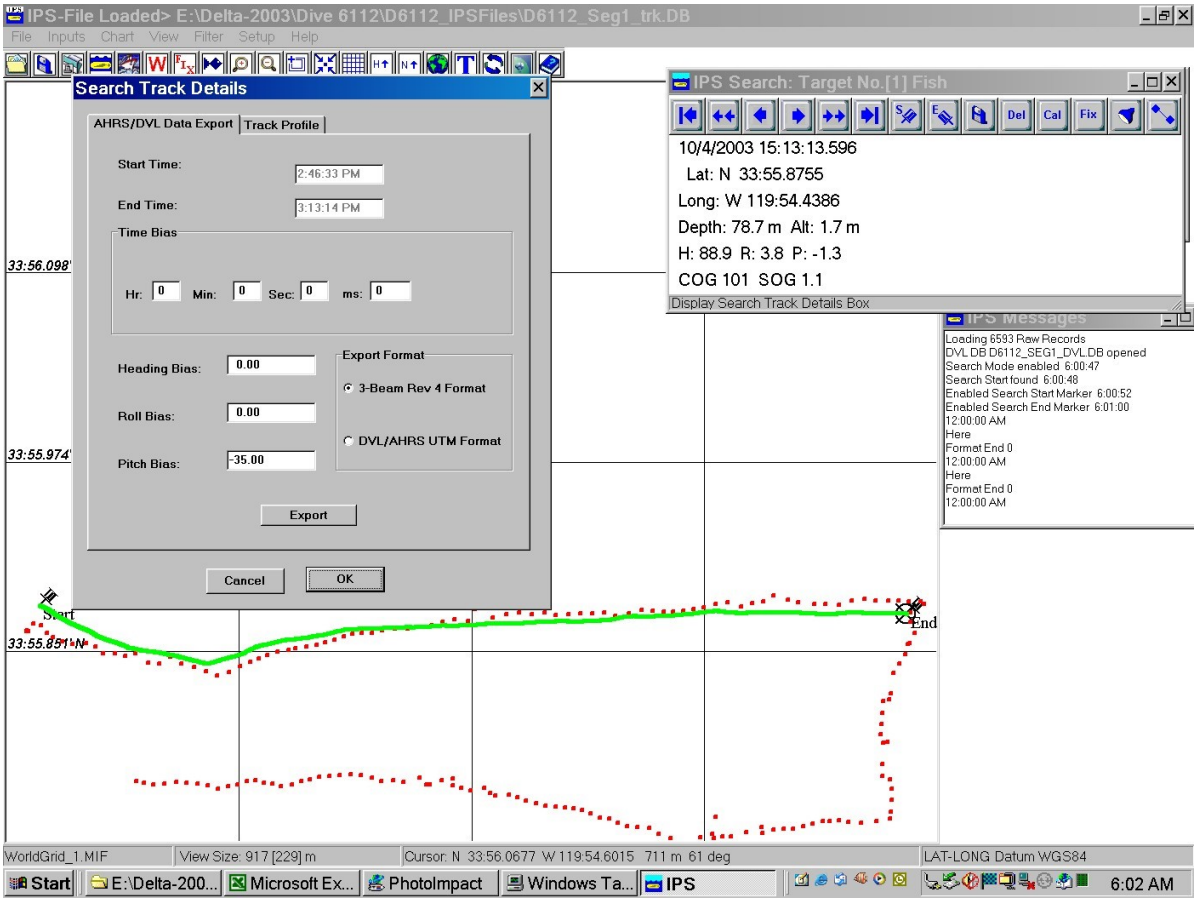
6. Use Search dialog box tool bar icons to move to a start of a transect and click the start icon.

7. Then move to the end of the transect and click on the End icon. If IPS waypoints were taken during a dive or the Start/End times are known the IPS Waypoint dialog box may be used to determine the time of a given waypoint. The time can then be used to jump to a given location:



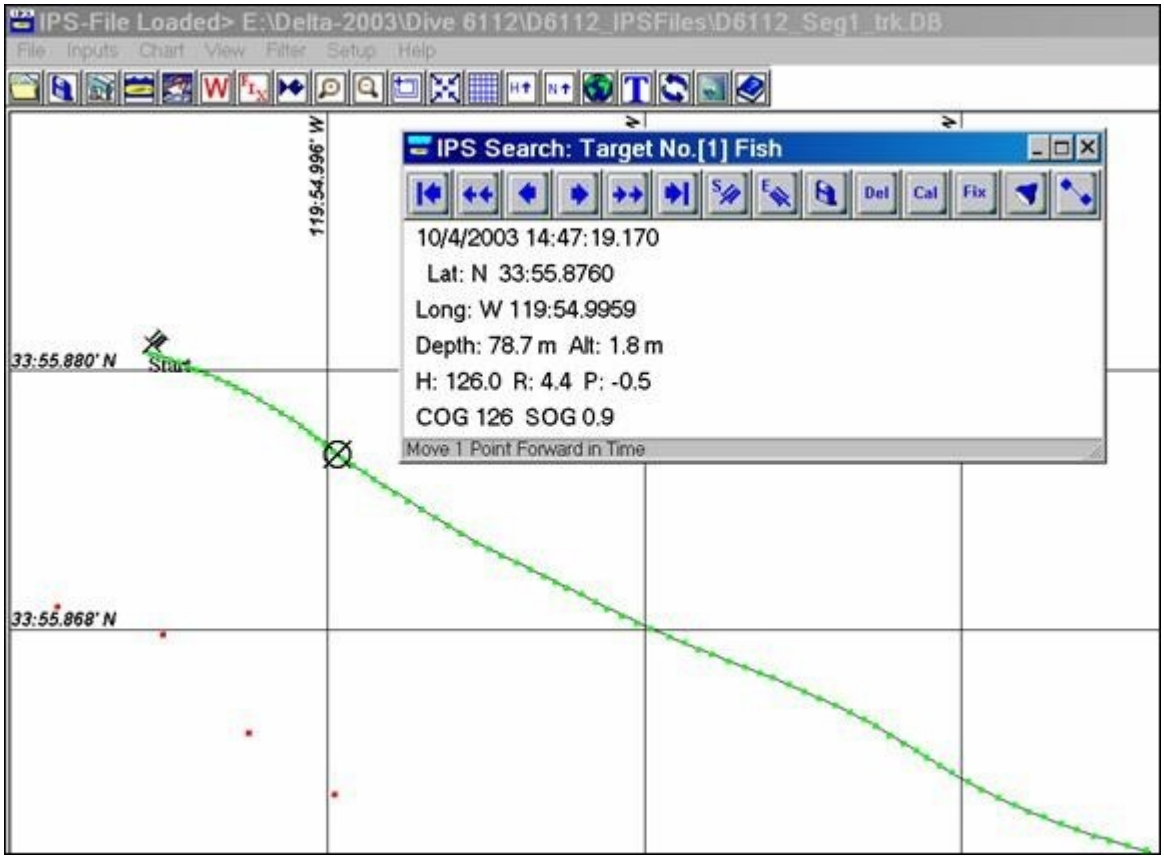


8. Click the track icon. 
9 Add the 3Beam pitch (mounting) bias (e.g. -35.00 deg., Down is negative).
10. Click Export. It takes approximately 3.5 min to complete a 500 meter transect on a 800 MHz PC. The progress of the process may be monitored in the IPS Message box. Two 3beam data files are created. (E.g "0310030812.txt" and (0310030812_Stat.txt).



11. When the process is completed the following message box will pop up.

12. To view the quality of the IPS Path fit to the actual data zoom in. A thin black line representing the statically best fit path is shown.



13. The 3beam file *_Stat.txt contains the following processing data:

	Start Time	End Time	nr	Lat r	Long r	DMean	DStdDev	nD
a)								
b)	8:12:22.439	8:14:11.305	425	0.7929	0.9981	0.1951	0.107699	421

c) The nr is the number of data points used for the curve fit, where the nD is the number of data points used to calculate the mean and StdDev for the individual distances from each data point to the predicted data point.

14. The 3-Beam data format (rev 4) is:
3-Beam file format to support Doppler Velocity Log (DVL) Navigation and Attitude Heading Reference System (AHRS) data.

Time MMDDYYHHmmsszzz	Roll [deg] + Port side up	Pitch [deg] + Bow up	True Heading [deg] 0-359.99	Alt [m]	DVL North Vel [m/s] + North NEU	DVL East Vel [m/s] +East NEU	DVL Distance along Mean path [m]	Depth [m]	X Long [deg] (WGS-84)	Y Lat [deg] (WGS-84)
022802130443281	R -0.68	P 38.20	H 358.48	A 1.25	N 0.124	E .025	M 229.512	D 60.02	X -119.61276953	Y 33.97318973

Notes:
1. time format zzz is ms not hsec.
2. DVL X & Y velocities have been corrected for roll and pitch and are with respect to North.
3. Each data string is followed by a <cr><lf>.

Menu Bar

Menu Bar Overview

Operator control of the IPS program is via the PCs mouse, a series of drop-down menus arranged across the top of the viewing window and the IPS toolbar under the menu bar. The individual menu selections and toolbar options are described in the following sections.

The IPS menu system is divided into seven logical paths, each originating from the basic menu bar. These selections may be accessed in three ways. The first is by using the mouse and clicking the desired menu option. The second is using the F10 key to get to the Menu Bar and then using the left or right arrow keys to select a menu. The third method is entering the appropriate hot key. The hot key is ALT and the highlighted letter of the selection. For example, the hot key for the FILE drop down menu is Alt F. To exit the Menu Bar click any other area on the screen or use the Escape key. When a selection has been made a drop down menu displaying all of the options for that selection appears. To access any of the options listed for that selection use the mouse, up or down arrow keys or the highlighted hot key. For example, the hot key for Save in the File selection is S.

In addition, individual dialog boxes may be accessed by using the Ctrl key and the letter on the left of the menu item. For example, pressing Ctrl T will display the Target Setting dialog box.

Menu items that have an ellipsis (…) after the menu item have corresponding dialog boxes. Clicking on the menu item causes the dialog box to appear. There are two ways to access dialog box options. The first is clicking on the appropriate radio button, checkbox or edit box. The second method is using the tab key to cycle through the dialog box options. A text box indicates that you need to enter the information being requested. Click on or tab to the text box and enter the necessary information. To exit the dialog box and save changes click the ok button. To exit a dialog box without saving changes click the cancel button. Pressing an apply button sets the dialog box parameters, and pressing the cancel button after pressing the apply button will not reverse these settings.

Menu items that toggle an IPS setting or set whether or not an IPS feature is displayed (i.e. the IPS Message Box) are checked when the setting is on. When the parameter is set to off the check mark disappears. Examples of this are MENU BAR-> SETUP -> Auto Save and MENU BAR->VIEW -> Show Toolbar.

The seven Menu Bar selections are described in detail in the Menu Bar section:

File Menu

File New Command

The New command clears the current display buffer WITH THE LOSS OF ALL COLLECTED DATA for the current mission (unless the data has been previously saved to a file).

File Open Command

The Open command loads a previously saved mission into a buffer. A window displaying the current directory and all subdirectories and IPS data files in that directory will appear.

File Close

The Close command returns the display from a previously saved data file to current mission data.

File Save Command

The File Save command saves the current mission (data) to a specified disk file in IPS format. Position data saved using this command may be loaded back to the IPS program for post processing. The File Save As dialog box displaying the current directory and all corresponding sub-directories will be displayed if the data for the current mission has not been saved yet.

File Save As Command

Displays a dialog box allowing the user to enter the name of the file to be saved. If the file name entered in the dialog box matches the name of an existing file the File Exists message box will be displayed. The message box gives the user three options:

Yes: The file that already exists will be over written and all data in the old file will be lost.

No: The user will be given another opportunity to save the current data file under a different name. This is the default option.

Cancel: The save dialog box will be exited and no new data will be saved.

If the name entered as the file to be saved matches the name of the file last used to save real time mission data File Name Unavailable will be displayed. The user will then be allowed to enter a new name to be used for saving the current data.

Export Data Command

Text/NMEA Sub Menu

This option displays a dialog box that allows the user to generate a text file composed of all ship and ORE target position data currently in memory. When you click on the Text/NMEA File sub menu command the Text/NMEA Settings dialog box will appear. After setting the parameters listed below, click the Ok push button. The SaveAs dialog box will appear. Enter the name of the text file in the space provided and click the Ok push button. The default name is Run1.txt. The user may change the name, however it is a good idea to not use *.trk or *.raw as the file extension as this may cause the text file to be confused with an IPS format file.

Position data IPS files with *.trk and *.raw extensions that are loaded into memory using the FILE -> Open command may also be output as a text file. However a text file generated using the Save as Text File command may not be loaded back into the IPS for post processing. To save position data in a file for post processing use the -> FILE -> Save command.

A dialog box allowing the user to set the following Text/NMEA parameters will appear when the Text/NMEA sub menu is selected:

Text\NMEA Format:
allows the operator to select a National Marine Electronic Association (NMEA) format or IPS format for the serial output. Check the appropriate radio button to select one of the nine formats. The nine options for NMEA serial output are GGA2, DTF, DTF NOAA, TLL, TPD, Waypoints Only, Waypoints w/ ArcView, UTM(x,y,z) and $PIUDP data. If a GGA output format is selected, the priority target must be set to a target that is being tracked or no data will be sent to the output file.
Note: When the TPD format is selected as NMEA serial output the target's depth will be given in the current IPS system units. This means the target's depth will be expressed in meters if meters are the current system units and feet in all other cases.

Priority Target:
allows the user to select which of multiple targets will be sent out as a text string if GGA version 2.0 has been selected for serial output. This is necessary because neither GGA format includes a target ID or name. If the Text\NMEA Format is GGA, the priority target must be set to a target number that is being tracked, or no data will be sent to the output text file. All other serial output options include a target name or ID. Therefore text strings will be output for all targets for which valid data is being received if any other serial output format is selected. This is the only effect Priority Target has on any of the target's parameters. Enter the appropriate target number in the edit box provided.

Display/Raw:
allows the user to choose to save either the data displayed to the screen or all data collected by the IPS software. If Display is selected data eliminated using the Filter Command and data not displayed due to the INPUTS->Target Settings Command-> Draw Rate setting will not be included in the text file.

Time Format (Seconds):
allows the user to select the format used for the time format field of the data file.

Check Sum:
allows the user to enable or disable the check sum field. A check sum is a field at the end of the data string that can be used by the receiving software to verify that the text string has not been corrupted during transmission. If the check sum is enabled an asterisk will be displayed after the text string format selected.

Target Data Only:
allows the user to eliminate ship position data from the text file. Only position data pertaining to ORE targets will be added to the text file. However, not all of the output formats have ship's data. For example, the GGA format does not have a target ID field so it will only contain the info for the "Priority Target." Whereas, TPD, DTF, TLL all have a target ID fields and can be created with or without the ship data depending on if the "[ ] Target Data Only" check box is enabled.

GIS/Image Sub Menu

This option displays a dialog box that allows the user to generate an image file using the current screen display. When you click on the GIS/Image File menu sub command the GIS/Image Settings dialog box will appear. After setting the parameters listed below, click the Ok push button. The SaveAs dialog box will appear. Enter the name of the text file in the space provided and click the Ok push button. The default name is Run1.*. The user may change the name, however it is a good idea to not use *.trk or *.raw as the file extension as this may cause the text file to be confused with an IPS format file.

GIS Image Format:
allows the operator to select the image format used for the saving the current IPS screen. Check the appropriate radio button to select one of the six formats. The six options are MIF(Map Info), DXF(Auto Cad), GPX(GPS eXchange Format), SHP(ESRI Shape), KML(Google) and JPG Bitmap Image ESRI Reference File.

View Area:
allows the user to select the entire screen to be saved as an image instead of just the chart. If Bitmap Image Reference has been selected as the GIS image format this option is automatically set to on.

Didson Sub Menu

This dialog box allows the user to embed IPS latitude and longitude data in the Didson binary file and/or to mark the location a Didson image was recorded at by setting that location as an IPS Waypoint.

Didson File:
displays the name of the Didson file selected. This edit box is for display purposes only and may not be edited by the user.

Select File:
this option displays a dialog box that allows the user to select the Didson file to be used. The selected file will be displayed in the Didson file edit box above.

IPS Target:
allows the user to select the target who's track will be used to generate the latitude and longitude data that will be embedded in the Didson file. Only the ship and targets that are being tracked will be displayed in the list box.

Heading:
allows the user to enter the Didson heading bias. The maximum roll bias that may be entered is 359.90 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

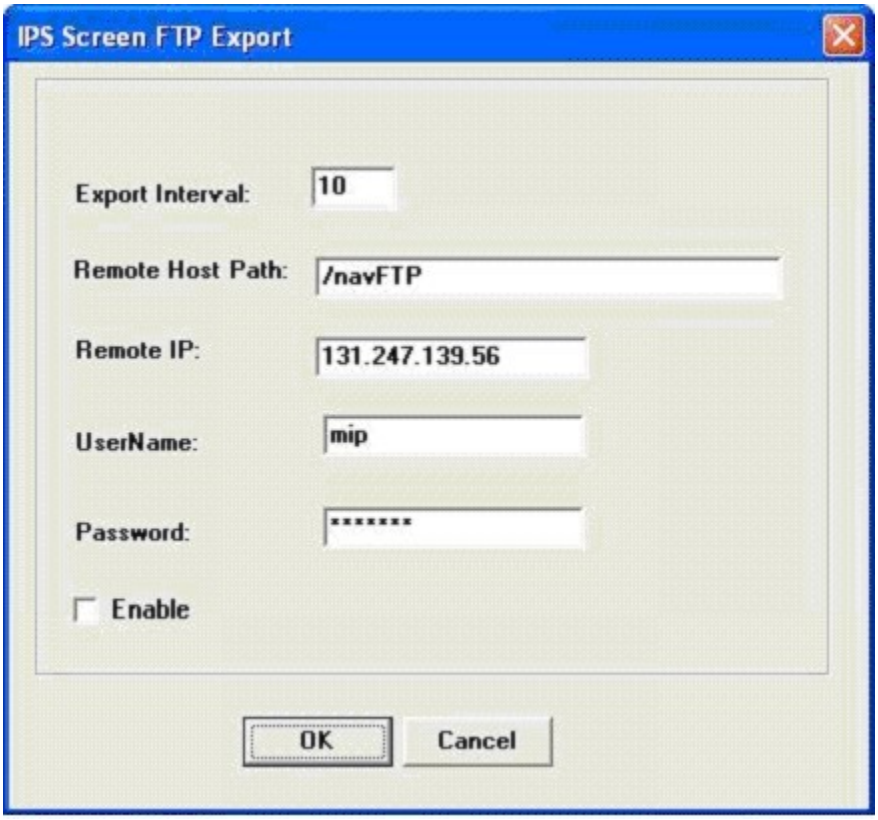
Pitch:
allows the user to enter the Didson pitch bias. The maximum pitch bias that may be entered is 180.0 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

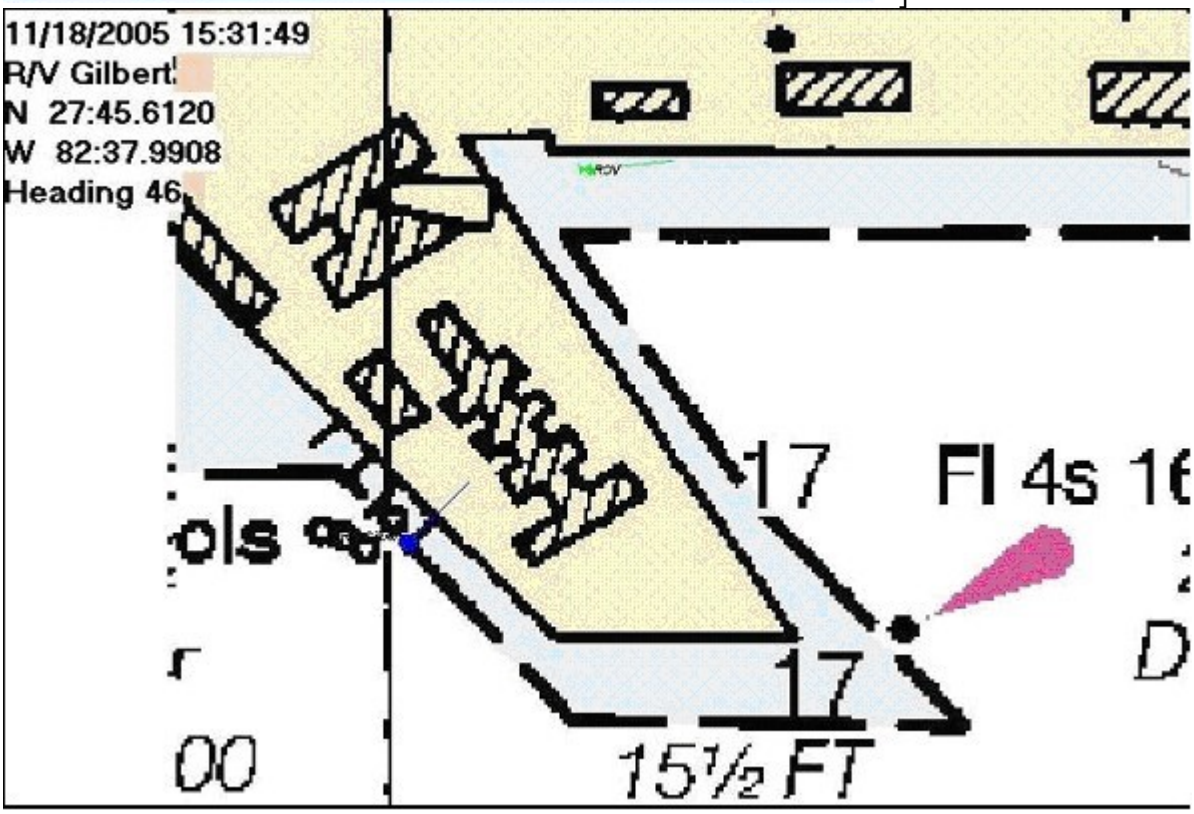
Roll:
allows the user to enter the Didson roll bias. The maximum roll bias that may be entered is 180.0 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

Time Bias:
allows user to enter a time bias that will be applied to the Didson data. The maximum time bias that may be entered is 3600.00 seconds. The offset may be positive or negative. The IPS default is 0.0 degrees.

Add as Waypoint:
allows the user to mark the latitude and longitude where the Didson image was recorded by setting it as an IPS Waypoint.

IPS Screen FTP Export Sub Menu





The IPS Screen FTP Export allows a user to host on a web site in near real time the navigation plot area as seen by the IPS operator. This utility simply copies the IPS plotting area into a jpg and transfers it to a web server or other host using ftp at a rate set by the "Export Interval". The basic vessel ("ship") and target information will be displayed on the left hand side of the jpg image as shown in the figure above. The IPS software always creates a jpg image named: *nav_plot.jpg* in a sub folder "ftp". This folder is created by IPS in the startup directory (typically C:\Program Files\ORE). This image is overwritten upon the creation of a new jpg image (screen grab) at an interval set by "Export Interval". For information on running a remote instance of the IPS on a host computer please see the Remote IPS Display and Ethernet Configuration sections of this manual.

Export Interval:
sets the time period in seconds between updates of the IPS plotting area jpg and its transfers by FTP to the host site. The maximum interval is 60 seconds and the minimum is 0. The default value is 10.

Remote Host Path:
allows the user to enter the path of the remote host (i.e. web server) that the jpg will be transferred to.

Remote IP Address:
allows the user to enter the IP address of the remote host (web server).

User Name:
allows the user to enter the FTP account on the remote host (web server) for the IPS screen export. The maximum length for the user name is 20 characters.

Password:
allows the user to enter the password for the IPS screen export This may not be required depending on how the ftp site account has been configured on the host (web server).

Enable:
allows the user to select whether or not the IPS export data function is active. If this feature is not enabled the other settings are saved but the jpg images will not be created or ftp'ed to the host system. If the box is checked the function is enabled.

3D Sensor Processing Sub Menu

This dialog box allows the user to process 3D sensor data. Please see the IPS 3D Sensor Processing and the 3D SONAR Calibration (Patch Test) Example sections for more information. The dialog box is composed of five pages each represented by a tab. To move from page to page click the appropriate tab. The pages are as follows:

Process and Export Tab

Sensor XYZ File:
Displays the sensor XYZ file that is being processed.

Select File:
Allows the user to select the sensor XYZ file to be processed. The file open dialog box will appear when the Select File button is pressed.

Support File:
Displays the support file that is being processed.

Select Support File:
Allows the user to select the support file to be processed. The file open dialog box will appear when the Select Support File button is pressed.

IPS Target:
Allows the user to select which of the currently tracked (real time) or previously tracked (old data) targets will be associated with the 3D sensor data for processing. The ship, which is target 10 may also be used. The default is the current target in focus.

3D Plot:
Displays the 3D plot created using the 3D sensor data. If you right click on the image displayed in the 3D Plot Viewer a sub menu with the following features will appear. The features are Home, Center, Rotate, Zoom, Pan, Info, Make Wpt, Load File, Add Data Set, Make VRML File, Save As BMP Clear Plot and View Axis. If 3D data is currently loaded into the 3D viewer then the Create VRML option will generate a .wrl (v 1.0 VRML) web viewable file and two pop-up dialog boxes will appear. The first to allow a sensor ID to be assigned and the second is for a title/description. Both of these inputs will be added to the VRML file header.

QC Cal Plot:
If a valid 3D calibration (patch test) was performed the QC Cal plot button will pop up the most recent plot.

2D Alignment
Aligns the two sonar images selected in Sensor File and Support based on the parameters set in the 2D alignment dialog box.

Auto Area Select
this feature will use PCA (Principle Component Analysis) to select the optimal area to use for 2D alignment between files.

Georeference Local Sensor Data Button:
Opens a dialog box that allows the user to enter a geo reference file containing raw 3D data (in sensor coordinates) based upon the values set in the IPS offset dialog box and currently loaded in IPS navigation file. The process also allows for a Z offset to be applied in units of meters.

3D Sensor Cal Button:
Opens the 3D Sensor Calibration Dialog Box. From here the user can select which processing step of the "Patch Test" 3D calibration process to use, see the 3D SONAR Calibration (Patch Test) Example section above. Also see the section below titled "3D Sensor Calibration Dialog Box"**.**

Start 3D Cal Button:
Will process the data file(s) specified in the file selection fields using the method specified in the "3D Sensor Calibration Dialog Box".

3D Alignment
Aligns the two sonar images selected in Sensor File and Support based on the parameters set in the 3D alignment dialog box.

Target Detect Button:
Will make an automated comparison between two geo referenced files in UTM coordinate systems. The output is a text file that specifies the geodetic location of the points (bins) that are statistically different.

Use Tide File:
Adds offsets to multi beam data to account for tides.

3D Sensor Calibration Dialog Box

Variable:
allows the user to choose either the heading, roll or pitch angle to apply to the parameters listed below.

Angle Error Range:
allows the user to enter the angle error range. The maximum angle error range allowed is 20, the minimum is 0 and the default is 5. However 20 is a good number Calculates the mounting relative to the navigation coordinate system.

Data Cell Size:
allows the user to enter the data cell size used in the 3D calibration. The maximum data cell size allowed is 10.0, the minimum is 0.10, and the default is 1.00.

Minimum Samples/Bin:
allows the user to enter the minimum number of samples per bin that can be used to calculate the 3D calibration. The maximum data cell size allowed is 100.0, the minimum is 10.0, and the default is 30.00.

Angle Interval:
allows the user to enter the angle interval that will be used when calculating the 3D calibration. The maximum angle interval allowed is 1.00, the minimum is 0.02 and the default is 0.5.

Minimum Depth:
allows the user to enter the minimum depth that will be used to calculate the 3D calibration. The largest minimum depth allowed is 4000.00, the smallest is 0.0 and the default is 5.0.

Time Range:
allows the user to enter the maximum time delay range that will be used to calculate the 3D calibration. The largest maximum time delay range allowed is 2000.00, the smallest is 100.00 and the default is 1000.

Export to XYZ Tab ASCII:
if enabled (checked) this feature will export the sensor data to an ASCII file. The default setting is off.

Auto Area Select:
if enabled (checked) this feature will set the Auto Area Select to on. The default setting is off.

Depth:
allows the user to select - Z (Negative Down) or + Z (Positive Down) as depth setting.

Time Delay Interval:
allows the user to enter a time delay interval of 5,10,20,50 or 100.

Configuration Tab:

Sensor Mounting Angles:
allows the user to enter the following sensor mounting angles.

Heading:
allows the user to enter the heading mounting angle. The maximum heading mounting angle allowed is 359.99 degrees and the minimum is -359.99. The default is 0.

Pitch:
allows the user to enter the pitch mounting angle. The maximum pitch mounting angle allowed is 180.00 degrees (bow up) and the minimum is -180.00. The default is 0.

Roll:
allows the user to enter the roll angle. The maximum roll angle allowed is 90.00 degrees (port side up) and the minimum is -90 degrees. The default is 0.

Sensor Position Relative to Center of Roll Pitch:

X (Port-Starboard):
allows the user to enter the X sensor position. The maximum sensor X position allowed is 180.00 degrees and the minimum is -180.00. The default is 0. A positive value indicates an X position on the starboard side of the CPR.

Y (Forward Aft):
allows the user to enter the Y sensor position. The maximum sensor Y position allowed is 180.00 degrees and the minimum is -180.00. The default is 0. A positive value indicates a Y position forward of the CPR.

Z (Vertical):
allows the user to enter the Z sensor position. The maximum sensor Z position allowed is 180.00 degrees and the minimum is -180.00. The default is 0. A positive value indicates a Z position above the CPR.

Depth:
allows the user to select - Z (Negative Down) or + Z (Positive Down) as depth setting.

Time Bias:
allows the user to enter the time bias that will be applied to the sensor data.

Subtract Time Bias:
if enabled (checked) subtracts the time bias instead of adding it when processing the 3D data. The time bias is added or subtracted from the sensor time, not the IPS Navigation time.

Data Bounds Tab:
When running a 3D calibration the user may want to select only a specific segment of the data for use in the calibration. This segment may be defined either by area or by time. To use either method enable the appropriate check box and enter the desired area or time bounds in the corresponding edit boxes. If neither the Use Area Bounds check box or the Use Time Bounds check box is checked all the data will be used for the 3D calibration.

Area Bounds

Use Area Bounds:
if this check box is enabled the segment of the data defined using the 3D area values entered below will be processed in the 3D calibration. The IPS default is disabled.

Median Filter 3D Cal File:
applies a median filter for each sonar/laser line being processed. This is done by scanning the data a line at a time to get rid outliers caused by fish, floating debris or sonar noise.

XMin/Easting/Long:
allows the user to enter the minimum bounding area X value (UTM Easting or longitudinal value) that will be used during the 3D sensor calibration process

YMin/Northing/Lat:
allows the user to enter the minimum bounding area Y value (UTM Northing or Latitude value) that will be used during the 3D sensor calibration process.

XMax/Easting/Long:
allows the user to enter the maximum bounding area X value (UTM Easting or longitudinal value) that will be used during the 3D sensor calibration process.

YMax/Northing/Lat:
allows the user to enter the maximum bounding area Y value (UTM Northing or Latitude value) that will be used during the 3D sensor calibration process.

Min Depth:
all data points above the value entered will be excluded from calibration processing. The minimum depth allowed and the default value are both 0 meters. The maximum Minimum Depth allowed is 3048 m (10000 feet). Enter the Minimum Depth in meters in the edit box provided.

Max Depth:
all data points below the value entered will be excluded from calibration processing. The maximum depth that may be entered and the default value are both 3048 m (10000 feet). The minimum depth is 0 feet. Enter the Maximum Depth in meters in the edit box provided.

Center Box

XMin/Easting/Long:
allows the user to enter the minimum bounding area X value (UTM Easting or longitudinal value) that will be used during the 3D sensor calibration process

YMin/Northing/Lat:
allows the user to enter the minimum bounding area Y value (UTM Northing or Latitude value) that will be used during the 3D sensor calibration process.

File Area Bounds:
When the scan button is pressed the IPS will determine the minimum and maximum extents of the file and display them in the appropriate edit boxes as a guideline.

Time Bounds:
Will process 3D calibration data only within specified time boundary if the "Use Time Bounds" check box is checked.

Use Time Bounds:
If enabled (checked) the time bounds entered below will be used during the 3D sensor calibration.

Min Time:
Allows the user to enter the minimum time bounds used during the 3D sensor calibration.

Max Time:
Allows the user to enter the maximum time bounds used during the 3D sensor calibration.

Modem File

The Modem File menu command allows the user to process a saved micro modem file. The micro modem file will be converted from hex encoded data strings to readable text.

Merge DVL/USBL Nav Data

Please see the Merging DVL and USBL IPS Files section of this manual for more information. The following biases and parameters may be applied to DVL data. If the corresponding check box is checked then the bias will be applied or the parameter will be used. If the check box is not checked any value entered in the corresponding edit box will be disregarded.

USBL Time Bias:
Allows user to enter a time bias that will be applied to USB data.

DVL Altitude Bias:	**Roll:**	Enter the roll bias. The roll bias must be between 90.00 and -90.00.
	Pitch:	Enter the roll bias. The roll bias must be between 90.00 and -90.00.
	Heading:	Enter the heading bias. The roll bias must be between 360.00 and -360.00.

Sound Velocity Scale Factor:
Allows user to enter the sound velocity scale factor. The roll bias must be between 1.15 and 0.05.

Depth Bias:
Allows user to enter the sound depth bias. The roll bias must be between 1.15 and 0.05.

New DVL Start Lat/Lon:
Resets the DVL position to the latitude and longitude entered below. The IPS default is off.

DVL Start Lat/Lon:
Allows the user to enter a new latitude and longitude that can be used to reset the DVL tracking. New DVL Start Lat/Lon above must be on (checked) for the these parameters to be used.

Merge USBL/DVL:
Allows the user to choose to not to merge the USBL/DVL data with ORE data, to shift the DVL data as a Data Set or to use a Kalman Filter to merge the data. If the Kalman Filter radio button is selected the Kalman Filter Settings button will be enabled allowing the Kalman Filter Settings dialog box to be displayed. See the Kalman Filter Settings section below for more information. The value and selection of the Kalman filtering parameters entered depends on which data and which type of correction the user feels is less noisy. Merging the USBL data with the DVL data is useful because while the DVL data is more precise (less error between data points) it tends to drift over time while the USBL data is noisier but is more accurate with regard to geodetic position. These values can be determined by an offline equipment calibration such as a USBL calibration. Please see the System Calibration Section of this manual for more information. The IPS Default is Kalman Filter.

Kalman Filter Settings:
Opens the Kalman Filter Settings dialog box. This button is only enabled if the Kalman Filter option is selected in the group box above.

USBL		
	USBL ID:	Allows the user to enter the ID of the USBL target that is being tracked. The ID must between 1 and 9. The default value is 1. Note: this cannot be the same as the DVL ID.
	Positioning STDEV:	Allows the user to choice to apply a positioning Standard deviation correction when the merging USBL/DVL data. The default is on. Either the Positioning STDEV or the % SR correction may be used but not both.
	Positioning STDEV Value:	Allows the user to enter the positioning standard deviation that will be applied when the merging USBL/DVL data. The positioning standard deviation is determined by offline analysis and equipment calibration. The standard deviation must be between 0 and 200.000 meters and the default value is 10 meters.
	% SR Correction:	Allows the user to apply a percent slant range correction when merging USBL/DVL data instead of using the positioning standard deviation. The default is off.
	% SR Correction Value:	Allows the user to enter the slant range correction percent. The slant range correction is determined through equipment calibration. The SR percentage must be between 0.05 and 5.00 meters and the default value is 1.0 meters.
DVL	**Velocity STDV Value:**	Allows user to enter the velocity standard deviation that will be applied when merging USBL/DVL data. The velocity STDV must be between 0 and 2.000 milli seconds and the default value is 0.115 meters per second.
	Apply Altitude Correction:	Allows the user to apply an altitude correction when merging the USBL/DVL data. The default value is off.
	Generate Unfiltered DVL Path:	Allows the user to generate an unfiltered DVL path using the target number entered below in Unfiltered DVL Path Target ID. The default value is on.
	Unfiltered DVL Path Target ID:	Allows the user to enter the target number used to generate an unfiltered DVL path. The target must be between 1 and 9 and the IPS default is target 4.
Filter Process	**Position Noise:**	Allows the user to enter the position noise. The position noise must be between 0 and 200.000 meters and the default value is 0.100 meters.
	Depth Noise:	Allows the user to enter the depth noise. The depth noise must be between 0 and 20.000 meters and the default value is 0.010 meters.
	Manual Velocity Noise:	Allows the user to enter the manual velocity noise. The manual velocity noise must be between 0 and 20.000 milli seconds and the default value is 0.03 meters per second.
	Calculate:	Allows the user to have the IPS calculate the processed velocity noise based on a calculation that provides optimal filtering. The IPS default is on.
	HZ Process Rate:	Allows the user to enter the HZ process rate. The HZ process rate must be between 2 and 30 and the default value is 0.03 meters.
Depth:	**Depth STDV:**	Allows the user to enter the depth standard deviation. The

		depth standard deviation must be between 0 and 20.000 meters and the default value is 0.010 meters.
	Vertical Velocity STDV:	Allows the user to enter the vertical velocity standard deviation. The vertical velocity standard deviation must be between 0 and 2.00 meters and the default value is 0.00 meters.
	Use DVL/SVP/CTD Depth:	Allows the user to use the DVL,SVP and CTD depths when merging the USBL/DVL data. The default value is on.
Graph Depth Profile:		Opens a dialog box that displays the raw input and the Kalman filtered data. The difference between the predicted value (the position the filter calculates the target should be) and the actual raw position is also displayed. The IPS default is on.

Import WinFrog Text Data

A dialog box allowing the user to enter the USB ID of the device the WinFrog data will be imported from will be displayed. The ID number must be between 1 and 9. The default is 2. After the ID number is entered, a save as dialog box allowing the user to enter the name of the file the data will be saved to is displayed.

Copy to Clipboard

Copies selected data to the clipboard. The data in the clipboard can then be used to create bitmaps or JPGs.

File Print Command

The Print command allows the user print the current view of the display screen and/or other associated IPS statistics. If You do not want to print press Cancel.

Printer Options:
Allows the user to select what data will be printed. The options are Display Plot, Waypoint List, Calibration Results, Equipment Offsets and Mission Tracking Statistics.

Title:
Allows the user to enter a title of up to sixty characters which will be printed across the top of each page except the display plot page.

Font Size:
Allows the user to select a font size from 8 to 18 that will be used to print all text in the IPS printout.

Orientation:
Allows the user to select a whether the printout will be printed as a portrait(vertically) or landscape (horizontally).

Print Setup Command

The Print Setup command allows the user to select the printer type, paper size to be used and print properties such as color and margin size.

File Exit Command

Exits the IPS program. To save data before exiting the program use the FILE ->Save menu option. If data was previously saved, the name of the file the data was saved to and the time of the last save are displayed in the IPS caption. One of three message boxes will be displayed depending on whether or not data has been collected and saved. They are as follows:

If no data has been saved yet (a file has not yet been assigned for saving current mission data) the 'Session (data) has not been saved! Exiting will result in the lost of all data!' message box will be displayed. The message box gives the user the following three options:

Yes: The program will be exited and no data will be saved. This is the default option.
No: The program will not be exited and no data will be saved. The user must use the FILE -> Save command to save the data to a file.
Help: Displays this section of the IPS help file.

If data has already been saved to a file but more data has been collected since the last save, the 'Exiting will result in loss of data collected in the last [time elapsed since last save]' message box will be displayed if the IPS program is exited. The message box gives the user the following three options:

Yes: The program will be exited and no additional data will be saved. Previously saved data will remain. This is the default option.
No: The program will not be exited and no additional data will be saved. The user must use the FILE -> Save command to save the additional data to a file.
Help: Displays this section of the IPS help file.

If no data has been collected, the 'No Data Collected- Safe to Exit' message box will be displayed.

Yes: The program will be exited immediately. This is the default option.
No: The program will not be exited.
Help: Displays this section of the IPS help file.

Also See:

File Save As Command

Input Menu

Target Settings Command

The Target Setting command allows the user to set certain parameters for a chosen target. Immediately after the Target Settings Command is selected the Target Selection dialog box with ten radio buttons and corresponding bitmaps is displayed. To select a target click the radio button to the right of the bitmap representing that target, then click the Ok push button. To escape without changing any targets, click the cancel push button. If You clicked Ok then a dialog box composed of five pages each represented by a tab will appear. To move from page to page click the appropriate tab. The pages are as follows:

Position Box Tab:

Target Number:
Displays the target number selected in the target selection dialog box. All changes made in the dialog box will be applied to this target number. This field is for display purposes only and cannot be edited by the user.

Font Settings:
Clicking on this button displays a dialog box that allows the user to select the font color and font size of the text displayed in Target Position Box.

Target Name:
Allows user to edit the name of the submerged target ID selected in the previous dialog box. The name may be up to eighteen characters long.

Target Name Position:
Allows the user to select automatic or manual positioning of the target name. If the user selects manual then the user can select the orientation of the target name using the Target Name Alignment combo box.

Target Name Alignment:
Allows the user to set the alignment of the target name with respect to the bitmap representing that target. The options are Lower Right, Middle Right, Upper Right, Lower Left, Middle Left and Upper Left. The default setting is Upper Left.

Position Box Display Items:
Allows the user to select the values that will be displayed in the Target Position Box by toggling the corresponding check box. If the box is checked, the value will be displayed in the target position box. The following are the possible values that may be displayed:

Time of fix.
Target Latitude and Longitude.
UTM: Eastings and Northings.
Depth
Heading Roll and Pitch: Compass heading roll and pitch.
COGSOG: CTD salinity and sound velocity.
Horizontal Range: Range, Relative Bearing and True Bearing.

XYZ: ORE x,y,z values.
Error code and message.
Pinger: Pinger bearing information.

Range and Bearing to Selected Target:
If enabled (checked) displays the range and bearing to from one target to another. Select the targets using the **Select Target for Range Bearing** push button below. The bearing from target to target will be displayed in the **Target Position Box**. At least two targets must be being tracked for this feature to be enabled.

Relative and True Bearing Displays:
If enabled displays the compass rosettes showing the relative and true bearing on the bottom of the **Target Position Box**. At least two targets must be being tracked for this feature to be enabled.

Select Target for Range Bearing:
Allows the user to select the targets that will be used in displaying the range and bearing and relative and true bearing discussed above.

Raw Display Tab:

Unavailable at this time.

Filtered Display Tab:

Target Number:
Displays the target number selected in the target selection dialog box. All changes made in the dialog box will be applied to this target number. This field is for display purposes only and cannot be edited by the user.
Track By:
Allows the user to select whether the number of data positions on the screen will be set by points or time.

If No. Points is selected, the value in the edit box opposite the No. Points radio button sets the number of currently collected data point positions that will be displayed. The number of points displayed may range from 0 to 16000. The display begins with the currently active data point and moves back through the data points with respect to time. The "snail trail" is displayed in the color selected below using the Point Color button. The trail length is independent for each target. For normal use, select approximately 10 to 40 points. To display all points enter 16000. In both Relative mode and North Up mode no data points are displayed.
If Time is selected all the data points between the time entered the time edit box and the current time will be displayed.
Note: If skip decimation is set to anything besides 0, points will be skipped. Please see the help file item directly below.

Skip Decimation:
Allows the user to set the number of points in the snail trail to be skipped. For example, if the number 1 is entered, only every other point will be displayed. If 10 is entered only every 10th point will be displayed. This setting allows the user to view an extensive history of the mission without displaying every point. Each point is still saved in the mission database, regardless of what number is entered in the skip edit box. A number between 0 and 99 may be entered. The default is 0.

Point Color:
Clicking this button displays a dialog box that allows the user to set the color of the points displayed in the view screen snail trail for the corresponding target.

Tracking:
Allows the user to specify whether or not data from the target ID just selected in the previous dialog box will be tracked and updated by the IPS software. The default mode for Targets is auto. The position information for all targets will be displayed in the target position boxes. When data is initially received for a target a position box for that target will be displayed in the center of the viewing area. The target position box can then be moved to another location.

Auto Center:
Places the target ID just selected in the previous dialog box at the center of the display screen if the current position goes out of the current viewing area. To center the viewing area about a target that may be currently out of the viewing display press the Home key. Only one target or the ship may be centered at a time.

Display Label:
Displays the target name in the viewing area.

DVL Navigation Only:
Enables or disables navigation by DVL allowing the capability of processing subsea DVL data from a RDI in the PD6 format or the IPS NMEA style string $PUVN.

Display Range Ring:
Enables or disables the display of a range ring centered about the target. The radius of the range ring is determined by the Display Range Size.

Range Ring Size:
Sets the radius of the range ring in system units. The Range Ring is always centered about the vessel.

Display Range Color:
Sets the color of the range ring.

System Units:
Displays the system units set in the VIEW->Display Settings dialog box. This field is for display purposes only and cannot be edited by the user.

Draw Rate:
Sets the rate at which the positions for the target will be displayed in the viewing area. The maximum amount of time allowed between display updates is 3600 seconds (60 minutes). The minimum amount of time allowed between display updates is 2 seconds. If a draw rate has not been set, the default time of 20 seconds between each screen update will be used.

Waypoint Settings Tab:

Text Display:
Allows the user to select the values that will be displayed in the Target Position Box by toggling the corresponding check box. If the box is checked, the value will be displayed in the target position box. The following are the possible values that may be displayed:

Range and Bearing
ETA
TTG
XTE

Apply:
displays the values selected above in text display in Target Position Box immediately.

DVL TAb:
This feature acts as a shortcut to begin DLV navigation if the apply button is pressed and resets the current position to the for latitude and longitude entered in the edit boxes if the DVL Reset button is pressed. The DVL navigation will be based on the values entered in Equipment->Target Offset DVL Tab.

Ship Settings Command

The Ship Setting command allows the user to set certain parameters for the ship. When this menu command is selected a dialog box composed of four pages each represented by a tab will appear. To move from page to page click the appropriate tab. The pages are as follows:

Position Box Tab:

Font Settings:
Clicking on this button displays a dialog box that allows the user to select the font color and font size of the text displayed in Ship Position Box.

Ship Name:
Allows user to edit the name of the ship, the ship name will be displayed in the caption of the ship position box and in the viewing area, adjacent to the ship. The name may be up to eighteen characters long.
Note: The ship name will only be displayed in the view area when the Display Label check box is checked and the ship heading marker is visible (the ball and line.)

Ship Name Position:
Allows the user to select automatic or manual positioning of the ship name. If the user selects manual then the user can select the orientation of the ship name using the Ship Name Alignment combo box.

Ship Name Alignment:
Allows the user to set the alignment of the ship name with respect to the ship shape. The options are Lower Right, Middle Right, Upper Right, Lower Left, Middle Left and Upper Left. The default setting is Upper Left.

Position Box Display Items:
Allows the user to select the values that will be displayed in the Ship Position Box by toggling the corresponding check box. If the box is checked, the value will be displayed in the ship position box. The following are the possible values that may be displayed:

Time of fix.
Ship Latitude and Longitude.
UTM: Eastings and Northings.
Compass Depth
Heading Roll and Pitch: Compass heading roll and pitch.
COG\SOG: CTD salinity and sound velocity.
Status, # of satellites

Raw Display Tab:

Unavailable at this time.

Filtered Display Tab:

Ship Shape Fill Style:
Allows the user to enter the style that will be used to fill in the ship shape displayed in the

IPS viewing grid. The available fill styles are as follows: Fill Hollow, Fill Solid, Fill Horizontal, Fill Vertical, Fill F Diagonal, Fill B Diagonal, Fill Cross, and Fill Diagonal Cross. The IPS default is Fill Hollow (no fill inside ship shape). Setting the fill style to something besides Fill Hollow is useful when the ship and target shapes are being displayed over a chart. Filling in the ship shape makes the ship shape stand out and be easier to see.

Ship Shape Line Size:
Allows the user to enter the line size that will be used to draw the ship shape displayed in the IPS viewing grid. The available line sizes range from 1 to 20. The IPS default is 1.

Track By:
Allows the user to select whether the number of data positions on the screen will be set by number of points or time.

If No. Points is selected, the value in the edit box opposite the No. Points radio button sets the number of currently collected data point positions that will be displayed. The number of points displayed may range from 0 to 16000. The display begins with the currently active data point and moves back through the data points with respect to time. The "snail trail" is displayed in the color selected below using the Point Color button. The trail length is independent for each target. For normal use, select approximately 10 to 40 points. To display all points enter 16000. In both Relative mode and North Up mode no data points are displayed.

If Time is selected all the data points between the time entered the time edit box and the current time will be displayed.
Note: If skip decimation is set to anything besides 0, some points will be skipped. Please see the help file item directly below.

Skip Decimation:
Allows the user to set the number of points in the snail trail to be skipped. For example if the number 1 is entered, only every other point will be displayed. If 10 is entered only every 10th point will be displayed. This setting allows the user to view an extensive history of the mission without displaying every point. Each point is still saved in the mission database, regardless of what number is entered in the skip edit box. A number between 0 and 99 may be entered. The default is 0.

Point Color:
Clicking this button displays a dialog box that allows the user to set the color of the points displayed in the view screen snail trail for the ship.

Tracking:
Allows the user to specify whether or not data from the ship will be tracked and updated by the IPS software. The default mode for the ship is auto. The position information for the ship will be displayed in the Ship Position Box.

Auto Center:
Places the ship in the center of the display screen if the current position goes out of the current viewing area. To center the viewing area about the ship if it is currently out of the viewing display press the Home key. This is a good selection to have activated for the general navigating of a surface ship that will be underway for long periods of time. To center the viewing area about a target being tracked use the Auto Setting option setting under the Input Menu Target Settings. Only one target or the ship may be centered at a

time.

Display Label:
If this option is checked the ship name will be displayed in the viewing area.
Note: The ship name will only be displayed in the view area when the ship heading marker is visible (the ball and line).

Display Range Ring:
Enables or disables the display of a range ring centered about the ship. The radius of the range ring is determined by the Display Range Size.

Display Range Ring Size:
Sets the radius of the range ring in system units. The Range Ring is always centered about the vessel.

Display Range Ring Color:
Clicking this button displays a dialog box that allows the user to set the color of the ship range ring displayed in the view screen.

System Units:
Displays the system units set in the VIEW->Display Settings dialog box. This field is for display purposes only and cannot be edited by the user.

Draw Rate:
Sets the rate at which the positions for the ship will be displayed in the viewing area. The maximum amount of time allowed between display updates is 3600 seconds (60 minutes). The minimum amount of time allowed between display updates is 2 seconds. If a draw rate has not been set, the default time of 20 seconds between each screen update will be used.

Waypoint Settings Tab:

Text Display:
Allows the user to select the values that will be displayed in the Ship Position Box by toggling the corresponding check box. If the box is checked, the value will be displayed in the target position box. The following are the possible values that may be displayed:

Range and Bearing
ETA
TTG
XTE

Apply:
Displays the values selected above in text display in Ship Position Box immediately.

System Inputs Command

The System Input command allows the user to set input parameters such as the type of equipment sending the input data and what error checking will be used when processing the data. The dialog box composed of four pages each represented by a tab will appear. To move from page to page click the appropriate tab. The pages are as follows:

Ship and Target Tab:

Ships Position Input:
allows the user to specify the source of the surface support vessel's position. Five selections are available, GGA, F-180 UDP Port, Fixed, Demo\Replay or IPS Remote Display UDP Input. If GGA is selected the user may select the Use DGPS Only option, see below. If the Fixed selection is chosen the user must enter the constant latitude and longitude of the surface support vessel in the edit box provided. Select the desired setting by clicking the corresponding radio button.
Note: See the section above listing Typical IPS Equipment.

Entering New Waypoints:

When entering the fixed position the latitude and longitude must be in a specific format to be accepted. This format is degrees, minutes and seconds. Acceptable formats are given below:

Latitude
N or S ## ## ####

Longitude
E or W ### ## ####
Note: The # symbol represents a number between 0 and 9. However the minutes of latitude or longitude may not be greater than 60. Degrees of latitude may not be greater than 90 and degrees of longitude may not be greater than 180.

The following are examples of unacceptable latitude and longitude entries.

N 95:04.3643 Degrees of latitude > then 90.
W 140:70:2891 Minutes Greater than 60.
- 080:58.0010 Region is entered as - not W.

If the entered latitude or longitude is invalid (i.e. a latitude of more than 90) the latitude or longitude will be corrected automatically, and Fixed Position Invalid, Adjusted will be displayed in the IPS message box.

Use DGPS Only:
If GGA is selected the user may select the Use DGPS Only option. If Use DGPS Only is selected and differential GPS input with at least 4 satellites reporting is not detected then the GPS data will not be used. If this is the case, DGPS Off Line and the time since the last valid DGPS input will be displayed in the ships position box instead of the ships name. Some older GPS units do not output the status of the differential GPS in the NMEA output string, therefore if DGPS only is selected no GPS data will be accepted at all. The IPS default is to disable Use DGPS Only.

Use GPS Check Sum:
allows the IPS software to use the check sum field of the GPS data string to verify that incoming data has not been corrupted. If Use GPS Check Sum is checked, the check sum field of the incoming data will be used to authenticate GPS data. The check sum is a field at the end of the data string that can be used by the receiving software to verify that a data string has not been corrupted during transmission. If the IPS determines that the incoming GPS data string has been corrupted a message will be displayed in the IPS message box and the data string will not be used. The IPS default is to disable Use GPS Check Sum.

ORE Data:
selects the type of acoustic tracking system being used. The current selections available are None or the BATS system. If BATS is selected a UDP port 5002 is automatically opened. However Broadcast UDP should be selected as Output Device in the Trackman software. See the IPS BATS Setup Procedure for more information.

Use ORE Check Sum:
allows the IPS software to use the check sum field of the ORE data string to verify that incoming data has not been corrupted. If Use ORE Check Sum is checked, the check sum field of the incoming data will be used to authenticate ORE data. The check sum is a field at the end of the data string that can be used by the receiving software to verify that a data string has not been corrupted during transmission. If the IPS determines that the incoming ORE data string has been corrupted a message will be displayed in the IPS message box and the data string will not be used.

Compass Tab:

Compass Data:
selects the method of compass input to the IPS program. The possible selections are none, NMEA VHW, NMEA HDM, NMEA HDT and NMEA HDG. If the method of compass input is HDM or HDG the user should input the local compass variance. See the section on INPUTS ->SYSTEM INPUTS COMMAND - > Variance below for more information.

Compass Time Out:
the user may select the time that must elapse without valid compass input before the program considers the compass to be non functional. The options are 10 seconds, 30 seconds, 1 minute, 2 minutes and 5 minutes. If the user does not select a time, the default time of 1 minute will be used. When the IPS software determines that compass input is non functional a dotted line will be used for the vessel outline instead of a solid line. In addition, the error message "Error in compass input?" will be displayed at the bottom of the screen and COG will be displayed on the lower right of the screen next to the target's heading until valid compass input is received.

Use Compass Check Sum:
allows the IPS software to use the check sum field of GPS data to verify that incoming data has not been corrupted. If Use Compass Check Sum is checked, the check sum field of the incoming data will be used to authenticate GPS data. The check sum is a field at the end of the data string that can be used by the receiving software to verify that the text string has not been corrupted during transmission. If the IPS determines that the incoming GPS data string has been corrupted a message will be displayed in the IPS message box and the data string will not be used.

Offsets:

Variance:
allows the user to enter the compass variance. The maximum value for variance that may be entered is 45 degrees. If the value entered is greater than 45, the variance will be changed to 45 degrees and an error message will be displayed. Only 'E' for east and 'W' for west may be displayed in the second Variance edit box.

ORE Sound Velocity:
allows the user to enter the ORE sound velocity. This value must be between 1000.00 ms and 2000.00 ms. The default value is 1500.00

User Sound Velocity Profile:
if the box is checked, the user sound velocity profile will be used. The default is off.

Ship Sound Velocity:
allows the user to enter the ship sound velocity. This value must be between 1000.00 ms and 2000.00 ms. The default value is 1500.00.

VRU/Depth:

Remote VRU/AHRS:
the user may select one of the following: VRU none, ORE MRU (R/P) TSS1 Maretron $PMAROUT, ORE MRU (R/P/H) TSS HHRP $PRDID, KVH GyroTrk, CDL RLG MinRLG1 (Subsea DVL Nav) or Octans FOG $PSXN (Subsea DVL Nav). The ORE MRU (R/P) TSS1 reports roll, pitch and heave and should be used with the standard ORE MRU system. The ORE MRU (R/P/H) TSS option reports roll, pitch, heave and heading and should be used only if you have the ORE MRU package with the heading feature and want to get your heading from the MRU. The default is VRU none. The heading, pitch, roll and heave will be reported in the Ship Position Box.

Use VRU Check Sum:
allows the IPS software to use the check sum field of VRU data to verify that incoming data has not been corrupted. If Use VRU Check Sum is checked, the check sum field of the incoming data will be used to authenticate VRU data. The check sum is a field at the end of the data string that can be used by the receiving software to verify that the text string has not been corrupted during transmission. If the IPS determines that the incoming VRU data string has been corrupted a message will be displayed in the IPS message box and the data string will not be used.

Depth:
allows the user to select the depth string used to input the target depth. The choices are None, DBT (Depth Below Transducer) or DPT (Depth Below Transducer + Offset). The IPS default is none.

DBT Offset:
allows the user to enter the DBT Offset. This offset is the distance between the surface of the water and the transducer. The number entered in the edit box will be added to the DBT depth. This value must be between 0 meters and 30 meters (98.4 ft). The default value is 3 meters (9.8 ft). The DBT Offset will be displayed in feet if the system units are feet, yards or nautical miles. If the system units are meters then the DBT Offset will be displayed in meters. The system units may be changed using the VIEW->Display->Display Units menu option. Please note the units displayed next to the DBT Offset edit box when entering the depth.

Use Depth Check Sum:
allows the IPS software to use the check sum field of Depth data to verify that incoming data has not been corrupted. If Use Depth Check Sum is checked, the check sum field of the incoming data will be used to authenticate VRU data. The check sum is a field at the end of the data string that can be used by the receiving software to verify that the text string has not been corrupted during transmission. If the IPS determines that the incoming VRU data string has been corrupted a message will be displayed in the IPS message box and the data string will not be used.

Chart

Chart Open

The Chart Open menu option allows the user to open a graphic chart (i.e. ESRA, Raster) that the IPS can display on and navigate over. A dialog box displaying the current directory and all subdirectories containing chart files in that directory will appear.

Map Properties

Description: a tag that describes the layer data or nature (data type) of the map.

Map Layers: allows user to select the layer that the following actions will be applied to.

Disconnect: disconnects or closes the layer so that layer is no longer part of the map. To see that layer again you must reopen it.

Properties: the Layer Properties dialog box will be displayed allowing the user to view and/or edit the following properties of the selected layer:

Visible:	toggles the layer from visible to hidden.
Query:	gives permission to search for individual objects (points of interest) in the selected layer. This feature will be implemented in the future.
Paged:	this feature will be implemented in the future.
Memory Based:	allows the user to choose to retrieve layer information from RAM or peripheral device (i.e. CD Rom).
Minimum View Scale:	allows the user to set the minimum scale used to draw the selected layer.
Maximum View Scale:	allows the user to set the maximum scale used to draw the selected layer.
Area:	displays the coordinates in degrees of latitude and longitude of the north west (top) and southeast (bottom) of the selected layer.

Center On: allows user to select a portion of the layer to center on in the viewing area.

To Top: returns the view to the top of the map.

Area: displays the coordinates in degrees of latitude and longitude of the northwest (top) and southeast (bottom) of the entire map.

Center X: allows user to set an x coordinate used to center the entire map.

Center Y: allows user to set a y coordinate used to center the entire map.

Scale: allows user to set the scale for the entire map. Entering a larger number will cause more of the map to appear in the viewing area. Therefore each individual object will appear smaller.

Rotation: rotates the map in a clockwise direction relative to the north of the map in decimal degrees. The view angle affects the view of the map only. Image layers are not rotated. Use of this feature is not advised.

Scroll Bars: toggles scroll bars on and off.

Color Raster: toggles between gray tones and color. This feature will be implemented in the future

Convert Layer Coordinate System

Opens a dialog box that allows the user to select a vector data file to convert (i.e. state plane coordinate systems, UTM, U.S. state plane) to the IPS data format. The vector data file that is not in the IPS format (WGS-84 latitude longitude) will be converted into a file that can used by the IPS. A copy of the file will which has been modified to fit WGS-84 will be saved in the same directory as oldfilename_IPS. The file may then be opened using the Chart -> Chart Open menu command.

Import Layer Properties

The Layer Display Properties dialog box allows the user to set the viewing attributes of points, shapes and lines in a layer. The Layer Display Properties must be set prior to opening the layer, or they will have no effect on the layer.

Point Symbol:
sets the symbol that will be displayed representing each point in the layer. The available symbols are as follows:

Solid Circle

Solid Square

Solid Diamond

X

Circle

Circle - Dot

Circle - Cross

Circle - X

Filled Cross

Thumb Tack

Triangle - Dot

Triangle

Solid Triangle

Square - Dot

Cross

Airplane

The IPS default is a solid diamond. To see the symbol clearly use a larger point size.

Point Color:
sets the color of the points in the layer. The available colors are as follows:

Black

Light Gray

Gray

Dark Gray

White

Red

Yellow

Green

Cyan

Blue

Magenta

Dark Red

Dark Green

Dark Yellow

Dark Blue

Dark Magenta

Dark Cyan

Money Green

Sky Blue

Cream

The IPS default is a sky blue.

Point Size:
sets the size of the points in the layer. The size range is 1 to 20 and the default is 7.

Fill Style:
sets the fill type that will be used to fill in certain shapes (i.e. polygons) in the layer. The available fill styles are as follows:

Fill Hollow

Fill Solid

Fill Horizontal

Fill Vertical

Fill F Diagonal

Fill B Diagonal

Fill Cross

Fill Diagonal Cross

The default is Fill Hollow.

Fill Color:
sets the color that will be used for certain shapes (i.e. polygons) in the layer. The available fill colors are as follows:

Black

Light Gray

Gray

Dark Gray

White

Red

Yellow

Green

Cyan

Blue

Magenta

Dark Red

Dark Green

Dark Yellow

Dark Blue

Dark Magenta

Dark Cyan

Money Green

Sky Blue

Cream

The default is yellow.

Line Style:
sets the style that will be used for lines in the layer. The available line styles are as follows:

Solid

Dash

Dot

Dash Dot

Dash Dot Dot

The default line style is dash.

Line Color:
sets the color of the lines displayed in the layer. The available colors as follows:

Black

Light Gray

Gray

Dark Gray

White

Red

Yellow

Green

Cyan

Blue

Magenta

Dark Red

Dark Green

Dark Yellow

Dark Blue

Dark Magenta

Dark Cyan

Money Green

Sky Blue

Cream

The default is light gray.

View

Display Settings

A dialog box allowing the user to set the following display parameters will appear when this option is selected:

Grid Style:
selects one of four available styles of viewing display. The chart mode should be used when an outside vender raster or vector chart has been loaded in using the CHART->Chart Settings menu command. The grid mode shows both the ship and target in terms of their geodetic latitude and longitude positions. The grid mode is scaled in latitude and longitude with true north at the top of the screen. Two of the displays have the ship centered at all times and display the target either relative to the ship's bow (heading up) or relative to the compass's north (north-up). When a target(s) is displayed relative to the ship's bow both filtering capabilities and the track plot line are disabled. When a target(s) is displayed relative to the compass's north the maximum number of data points displayed is 15.

Grid Format:
allows the user to select the way the latitudes and longitudes will be displayed on the edge of the view screen. The options are as follows: None, the latitudes and longitudes will not be displayed. Degrees, the latitude and longitude will be displayed as degrees and fractional degrees in the following format: ##.####. Degrees minutes seconds, the latitude and longitude will be displayed in the following format: ## ## ##. Degrees minutes fractional minutes the latitude and longitude, minutes and fractional minutes will be displayed in the following format ###.##.###.

Display Units:
sets the display units to feet, yards, meters or nautical miles. If the units selected are feet, yards or nautical miles the depth will be displayed in feet. If the units selected are meters the depth will also be displayed in meters. The full scale edit box will be changed to reflect any change in display units. In addition, if the units selected are meters, the display units will automatically change to kilometers when the display scale is increased beyond 1000 to 1500 meters.

Heading Up\North Up Scale:
sets the maximum size for the graphical display area when in north-up or heading-up. Use the dropdown list box to select the maximum display size. The minimum size available is 200 feet and the maximum size available is 12,000 feet. The selections in the dropdown box are in the units set in DISPLAY SETTINGS-> Display Units.

Show Toolbar Command

The IPS ToolBar is a row of icons that represent IPS menu commands. Selecting this option will display the IPS ToolBar if it is hidden and hide the IPS ToolBar if it is visible. Clicking one of the icons is a faster alternative to choosing a command from the menu. If the IPS ToolBar is currently being displayed check mark will appear next to the Display ToolBar Menu option.

Night View Command

Sets the screen, Ship Position box, Target Position box, IPS Message Box and Search Box backgrounds to black so the IPS screen is easier to view in dim light. The text inside the text boxes mentioned previously, gridlines and grid label will be set to white. The user will be given the option of setting the waypoints to white, otherwise they will remain their current color. When switching back to regular view the waypoints will all be displayed in red if the user set them to white in night view. If the IPS is currently in Night View mode a check mark will appear next to the Night View Menu option. To access night view use the VIEW->Night View menu option.

Show Waypoint Box Command

The IPS Waypoint Box allows you to enter the latitude and longitude and a memo for up to 200 Waypoints. Selecting this option will display the Waypoint Box if it is hidden and hide the Waypoint Box if it is visible. The default placement of the Waypoint Box is in the middle right portion of the screen just outside the plot area. The Waypoint Box can be dragged to different position on the screen if desired. If the Waypoint Box is currently being displayed check mark will appear next to the Show Waypoint Box Menu option.

Also See:

Waypoint List Window

Cursor Waypoint Activated

If the Cursor Waypoint Activated option is on the user will be allowed to add waypoints by left mouse clicking the portion of the grid corresponding to the desired waypoint location. The number of the new waypoint will be displayed in red on the grid. If the Waypoint Box is currently being displayed, the new waypoints latitude and longitude will be shown in the Waypoint Box. The new waypoints latitude and longitude will be displayed in the latitude and longitude edit boxes in the waypoint box. The latitude and longitude may be edited at this time and a memo may be added if desired. If the Cursor Waypoint Activated option is on a check mark will appear next to the Cursor Waypoint Activated Menu option.

Range and Bearing Calculator

The Range and Bearing Calculator menu command displays a window that calculates and displays the Range, Bearing and Speed Made Good between two waypoints. The Range is the distance between the two waypoints. Speed Made Good is the Range in nautical miles divided by the time difference between the two waypoints. The Bearing is the direction or heading with respect to true north.

To select the two waypoints to be used in the calculations, use the combo boxes labeled **Waypoint 1** and **Waypoint 2**. Click the arrow on the right of the combo box and a list box with all the waypoints will be displayed. The waypoint number will be displayed at the far left of the list box entry, followed by the waypoint latitude and longitude. When scrolling through the list of waypoints the memo corresponding to the waypoint will be displayed in the static box directly above the combo box. To select a waypoint use the mouse or the arrow key to scroll through the list of waypoints. Then either mouse click on the waypoint or hit the enter key to choose a waypoint. To calculate and display the Range, Bearing and Speed Made Good click the **Cal** push button. To clear the display, click the **Clear** push button.

As two unique waypoints must be selected for Range and Bearing calculation, this menu command will be disabled until at least two waypoints have been entered. Waypoints may be entered using the Cursor Waypoint Activated menu option or the Waypoint List Window.

Survey Lines

Allows the user to create survey lines for navigational use. The user must enter a valid start and end waypoint. Please see the Waypoint List Window or Cursor Waypoint Activated section of this manual for more information.

Two unique waypoints must be selected for the survey lines feature to be used and the selected waypoints must be at least 1.0 meters apart.

Start Waypoint:
selects the beginning waypoint used to create the survey lines. Click the arrow on the right of the combo box and a list box with all the waypoints will be displayed. The waypoint number will be displayed at the far left of the list box entry, followed by the waypoint latitude, longitude and memo. To select a waypoint use the mouse or the arrow key to scroll through the list of waypoints. Then either mouse click on the waypoint or hit the enter key to choose a waypoint.

End Waypoint:
selects the end waypoint used to create the survey lines.

Spacing:
sets the space in meters between each line. The maximum allowed space between the survey lines is 5000.00, the minimum is 1.00 and the IPS default is 25.0 meters.

Number of Lines:
sets the number of survey lines. The maximum number of lines allowed is 100, the minimum is 1 and the IPS default is 10.

Directions:
allows the user to select whether the survey lines will be to the left or right of the waypoints. The IPS default is left.

System Calibration

The System Calibration feature calculates and displays the overall azimuth error in the system and gives the scaling factor to correct the raw slant ranges. These system calibration parameters can be saved in the configuration file. The last set of System Calibration parameters that have been saved in the configuration file will be displayed in the System Calibration dialog box when it is initially activated. If no System Calibration parameters have been saved to configuration file, the System calibration parameters will all be zero.

The QC Threshold edit box may be used to determine the quality of the data used in the calibration. The higher QC factor entered, the stricter the criteria is for selecting the data used for calculating the calibration. The options are 1 through 10 and the default setting is 8.
After a successful calibration the Calibration Dialog box will be displayed showing the new Calibration parameters. If $POREG data is being used as ORE data enter the Hydrophone Mounting Angle Offsets into the Calibration Dialog box. To apply these offsets click the Update Hydro Offsets push button. To view the before and after Calibration Frequency Plots click the 3D Viewer Button.

Please see the following sections of the IPS Manual for more information on the system calibration:

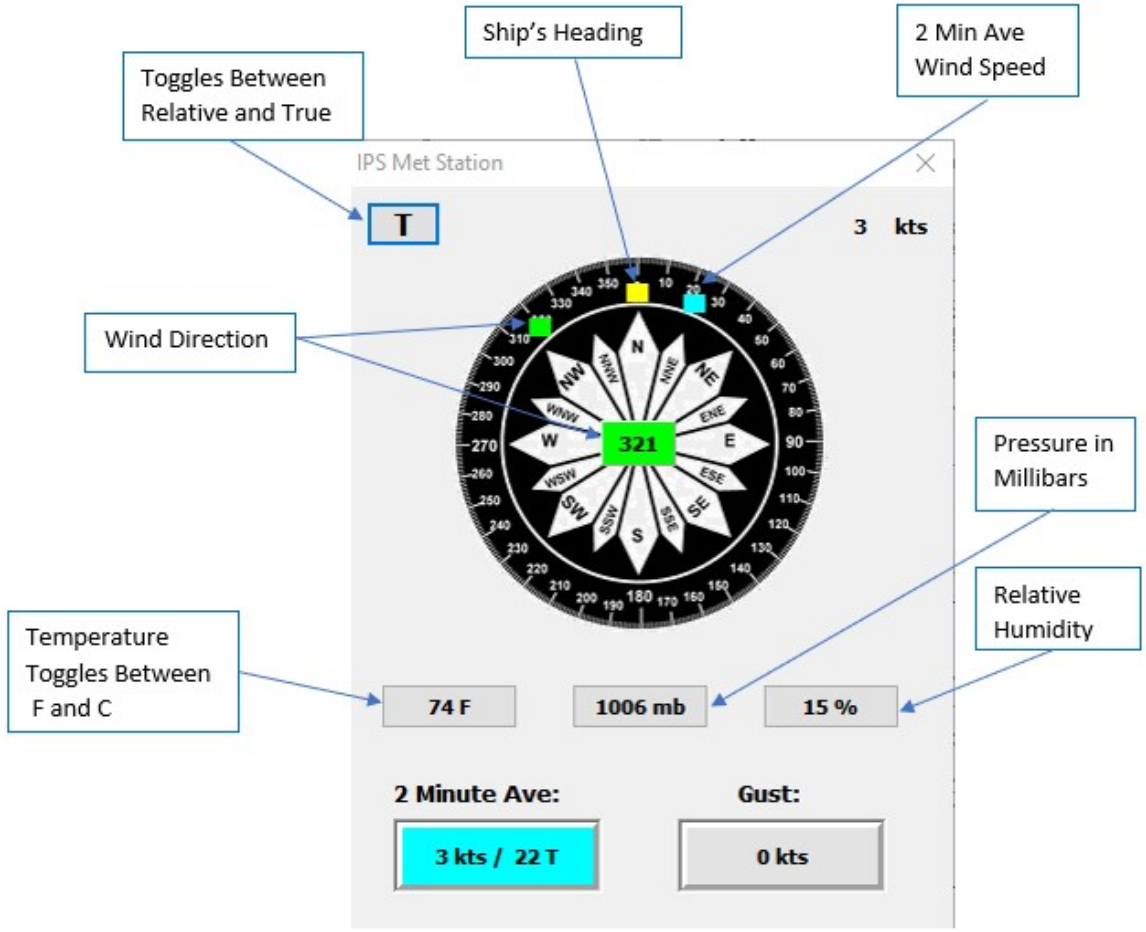
Equipment Offset Measurement

Sheltered Water Calibration

IPS Off-Line USBL Calibration Procedure

Weather Station

The Met Station dialog box displays true or relative direction and wind speed as well as the current temperature, pressure and percent relative humidity. It uses weather data from an Airmar Weather Station 200WX (or comparable device that outputs NMEA $IIMDA and $IIMWV files) aided by the ship's navigation data.



Relative or True Indicator Button:

The user can toggle between true and relative wind speed by clicking on the indicator button, **T** means true
R means relative this selection will be reflected in the wind speed indicated by the red button, the wind speed displayed in the green rectangle and the wind speed displayed in knots.

Wind Speed Display:
Displays the wind speed in knots in the upper right hand corner of the display.

Compass Rosette:

Current wind direction is indicated by small red square on compass, it can be displayed in either relative or true depending on the Relative or True Indicator button setting.

The 2 minute average wind speed is indicated by small cyan square on compass. This is always displayed as True.

The ship's heading is indicated by the yellow square on the compass.

The current wind direction is displayed in the green rectangle in the center of the compass.

Temperature Button:
Displays the temperature in either Fahrenheit or Celsius. Click the temperature button to toggle between Fahrenheit or Celsius.

Pressure Button:
Displays pressure in millibars.

Relative Humidity Button:
Displays relative humidity.

Two Minute Ave Button:
The 2 minute average wind speed is displayed. This is always displayed as True.

10 Minute Gust:
Will display the 10 minute wind average. Not operational yet.

Recorded Data Format
The IPS automatically outputs MET data in the following format:

- Comma separated text file with header
- Data is saved with other IPS files see File Save Command (the default directory is usually ORE Offshore\IPS). The file is named METlog YEAR-MO-DY_HR-MN-SEC.txt.
- Collected and time stamped at one second intervals.
- Ship position, heading, course and speed.
- Relative wind speed and direction.
- True wind speed and direction are 2 minute averages for both.
- Gusts at 14 kts and above.
- Temperature (Celsius), Relative Humidity and Pressure (millibars).

Header and Example Data:

Type,DateTime,Lat,Long,ShipHead,COG,SOG,RelWndSp,RelWndDr,TrWindSp,2minAVG,TrWindDr,AVGWindir,GUST,TempC,RH,MB
$PIMET,2013-03-04
16:18:00,27.7620778,-82.6293364,274.62,0.00,0.03,7,143,6,5,57,55,0,11,30,1023
$PIMET,2013-03-04
16:18:01,27.7620778,-82.6293364,274.62,0.00,0.08,6,145,6,5,59,55,0,11,30,1023

3D Plot

The IPS 3D data display allows a user to load ASCII X,Y,Z text files into a 3D display environment. A concise pop up menu that is activated by right clicking on the 3D display window has the following options: Home, Center, Rotate, Zoom, Pan, Info, Make Wpt, Load File, Add Data File, Make VRML File, Save as BMP and Clear Plot.

Show IPS Messages Command

If the Show IPS Messages option is activated any messages generated by the IPS software or the ORE system will be displayed in the IPS Message Box. These messages include messages from the ORE system such as target tracking errors, telemetry errors and warning messages. The IPS messages include the latitude and longitude of new waypoints and filtering errors. The IPS message window can hold twenty messages, however the scroll bar must be used to view messages beyond the latest five. If the scroll bar is not visible and more five messages have been displayed, expand the window by dragging the right border of the window further right.

Selecting the Show IPS Messages option will display the IPS Message Box if it is hidden and hide the IPS Message Box if it is visible. The default placement of the IPS Message Box is in the middle right portion of the screen just outside the plot area. The IPS Message Box can be dragged to different position on the screen if desired. If the IPS Message Box is currently being displayed check mark will appear next to the Show IPS Messages Menu option.

Show Ship Position Box

If the Ship Position Box is not showing clicking this menu option will display the Ship Position Box. If it is showing, clicking this option will hide the Ship Position Box. If a check mark is visible on the left of this menu option the Ship Position Box is being displayed.

Search Data Settings

The Search Data Settings Dialog Box allows the user to select the information that will be displayed in the Search Position Box. The information that can be displayed about the selected data point includes: the targets or ships latitude, the targets latitude, the targets depth or compass position and the time the data point was acquired. To set the data to be displayed in the Search Position Box toggle the corresponding check box. If the box is checked, the value will be displayed in the Search Position Box. Time, Lat\Long and Depth and Altitude are defaulted to on. The following are the possible values that may be displayed:

Time:
Data point time tag.

Latitude:
Latitude of current fix in N or S in ##:##.#### format.
Longitude:
Longitude of current fix in E or W in ###:##.#### format.

UTM:
UTM Northings and Eastings.

Depth and Altitude:
The ship's depth sounder value and heading sensor (Gyro) data if valid. For a target the depth below the surface and altitude the above the bottom as reported by the altimeter (if available).

Heading, Roll Pitch:
Compass heading roll and pitch.

COG\SOG:
Current COG\SOG of the data point.

Horz Range, Relative & True Bearing:
For the targets only: Horz Range- The range from the ship to the target along the surface of the water (Horizontal plane). Relative bearing- The bearing of the target with respect to the ships bow (center line, Off the Bow 000 deg, Starboard beam 090 etc.). True Bearing- The bearing to the target with respect to true north.

X,Y,Z:
The individual components that define the vector to the target from the ship. Horz Range = (x^2 + y^2)^1/2, Z = depth.

Error Code and Message:
Ship-The number of satellites used to determine the GPS position. Target-ORE Error code and message.

CTD Time, Depth and Temp:

CTD Salinity and Sound Velocity:

DVL COG/SOG:

DVL Water Speed and Direction:

DVL Altitude and Speed of Sound:

For more information please see:

Search

Search Mode

If the Search Mode option is enabled the user can search through the currently displayed or any loaded data file. A search position window will also be displayed in the center of the screen with position information about the selected data point.

To activate the search mode use the VIEW drop down menu and select SEARCH MODE. If the Search Mode is enabled a check mark will be displayed to the left of the menu item. Once Search mode is activated, use the right mouse button to select a data point. If the right mouse button is clicked and a valid data point is within 48 miles, the data point's position information will be displayed in the Search position information window. Please see the OPERATIONS SEARCH section of this manual for more information about searching data points. Use the focus button in the Tool Bar to select the target or ship whose data will be searched.

This menu option is disabled (grayed out) if the Display Mode is either North - Up or Heading - Up. To enable the SEARCH MODE menu option use the DISPLAY menu option in the VIEW pull down menu, and select either Chart or Grid as Grid Style. Please see section on the VIEW -> Display Settings menu option in this manual for more information.

Mission Statistics

The Mission statistics box provides general information about the ship and each target currently being tracked or loaded into the system. Id 10 represents the tracking vessel and the IDs 1-9 correspond to the ORE targets. The mission information dialog box may be accessed using the VIEW -> MISSION STATICS menu command. When the Mission Statics dialog box is enabled a check mark appears next to the Mission Statistics menu item. The information format is as follows:

Target No.	No. Points	Start Time	Stop Time	Max Depth in Meters
Target No:		Min Latitude	Max Longitude	
Target No:		Max Latitude	Max Longitude	

Filter Menu

Filter Command

A window allowing the user to set various filtering parameters will appear when this option is selected. To edit a targets filter parameters select the target number from the target number list box using the mouse or the arrow keys. The current filter parameters for that target will be displayed in the filter window controls. Change the filter parameters to the desired settings. To set the new filter parameters click the Apply button or the Ok button. The Ok button will save the filter settings for that parameter and exit the program. The Apply button will save the filter settings for that parameter but not exit the program. To set the filter parameters for more than one target at once, you must select the target number using the list box, change the desired settings and click Apply for each target.

Note: The Max Range, Min Depth and Max Depth settings are the same for each target. For example, changing the Max Range, Min Depth and Max Depth filter parameters for target number 1 will change the Max Range, Min Depth and Max Depth to the new settings for all targets.

Please note the Alpha Beta and On Site filters may not be used at the same time. However either Alpha Beta or On Site may be used with the Velocity filter. In addition Alpha Beta, On Site and Velocity may not be set to on (checked) when Raw is selected. If the Raw check box is clicked, the Alpha Beta, On Site and Velocity filters will be automatically set to off. If the Alpha Beta filter is selected, both the On Site filter and Raw or will automatically set to off. If the On Site filter is selected, both the Alpha Beta filter and Raw or will automatically set to off. However the Max Depth, Min Depth and Max Range filters may be used when Raw or any of the other filters are selected.

IPS Target:
allows the user to select which of nine possible targets the filter data will be applied to. The type of filter used for a target will be displayed after the target name in the target position box in the lower right hand corner of the screen. For example if raw data is being used for target number one Fish, then only Fish will be displayed as the target name in the target position box. If the velocity filter and on-site filter are set to on then Fish FVO will be displayed as the target name. If the target name exceeds 16 characters then the last 4 characters of the target name will be truncated to make room for the filter information if necessary. The Max-Range, Min-Depth and Max-Depth settings will not appear after the target name as they are not specific for each target. For more information see the Target Position Box section of this manual.

System Units:
displays the current system units. This setting cannot be changed from this dialog box. To set system units select Display Settings from the View Menu and select the appropriate units under the Display Units option.

Raw Data:
all useful BATS data is saved without any IPS software filtering at a rate determined by the output rate of the instrument used to track the target(s) or ship. See the section File Save Command in the FILE MENU portion of the IPS help for further information. The data is displayed in the target information box in the lower right portion of the screen. If the most recently acquired data point is fully acceptable the highlighted portion in the box reads "OK". Otherwise the most recently acquired data point has been rejected or is questionable. In this case an error or warning message corresponding to a BATS error code or warning message will be displayed in the highlighted portion of the target information box. Only the Max Range, Min Depth and Max Depth are available if Raw Data has been selected.

Velocity:
the total linear distance between the last accepted data position and the newly acquired data point is calculated. If the current position is unreasonable based on the maximum target velocity entered and time between acquiring of the data points the new data point will be discarded. The error message "Geo Vel" will also be displayed in the target information box. Use of this filter is appropriate at all times. Allowing the IPS software to control velocity filtering instead of the BATS is advantageous because the IPS calculates the total linear distance between the data points using the geodetic positions of the target. The BATS calculates the velocity between two points based on the relative heading of the ship. Therefore a rapid change in the heading of the ship could cause a valid data point to be rejected. If a data point is rejected by the BATS system error code 5 "excessive target velocity" will be displayed in the dialog box. The IPS software also allows adjustment of the maximum velocity of the target used in velocity filtering. Select Velocity and enter the maximum velocity in the edit box provided next to the Velocity option. The minimum maximum target velocity allowed is 0.25 knots. The largest maximum target velocity allowable and the default maximum velocity are both 10 knots. When using the BATS for velocity filtering the maximum target velocity used is nominally 4.5m/sec (8.7 knots).

Alpha-Beta:
filter is equivalent to a first order Kalman filter. The range and bearing values from the BATS system are processed for an improved estimate of the range, bearing and velocity of the target relative to the surface support ship. This filter is best used to track an active target moving in a predictably. For example for a target moving in a preprogrammed manner at a relatively slow speed such as an side scan sonar the Alpha Beta filter could be set at 80% or higher. For a target moving in a less predictable manner and a higher rate of speed such as ROV the Alpha Beta filter should be set to less than 80%. Enter the desired Alpha Beta percent in the edit box provided next to the Alpha Beta option. The minimum percentage that may be entered is 0 the maximum number of seconds is 99. The default value is 50.

On-Site:
the filtering of the positional data acquired for a submerged target is done in order to improve the displayed positions. By rejecting any data point(s) that are statistically different from the majority of the data points collected in the user selected period, based upon a Chi square distribution with two degrees of freedom (df=2). On Site filtering should be used if the target is known to be at one location ==> "on-site". Enter the number of seconds for the selected period in the edit box provided next to the On Site option. The minimum number of seconds that may be entered is 2 the maximum number of seconds is 60. The default value is 20.

The filtering model utilized, for the improvement of a submerged target's display is based upon the following conditions: 1) The latitudes and longitudes are normally distributed about the mean latitude and mean longitude. 2) The existence of independence; the squares of distances are Chi Square distributed. Once the data has be filtered the individual data points are then reduced using a "Maximum-Likelihood" estimation. This process calculates weighting factors for each data point to give more influence to data points that are closer to the mean latitude and longitude.

DVL Aided:
if enabled (checked) and if real time DVL data is coming in the DVL course and speed over ground data will be used to remove scatter in the USBL data. Not implemented at this time.

Depth Offset:
allows the user to enter the Depth Offset used in filtering. The Depth Offset must be between 32.81 feet and -32.81 feet (10.00 to -10.00) meters. The default is 0.00.

Depth Scale Factor:
allows the user to enter the Depth Scale Factor used in filtering. The Depth Scale Factor must be between 10.00 to -10.00. The default is 0.0000.

Max Range:
the maximum range the target can be from the surface support vessel. Any BATS data received that has the x, y, or Horizontal range greater than Max Range is rejected. The minimum range allowed is 0 feet. The maximum range allowed and the default value are both 13120 feet (4000 m). Enter the maximum range in the edit box provided.

Min Depth:
the minimum depth that will be accepted from the BATS system. If the depth from the current reading is less than the Min Depth setting in the IPS software the reading is rejected. The minimum depth allowed and the default value are both 0 feet. The maximum Minimum Depth allowed is 10000 feet (3048 m). Enter the Minimum Depth in the edit box provided.

Max Depth:
the maximum depth that will be accepted from either the BATS system. The maximum depth that may be entered and the default value are both 10000 feet (3048 m). The minimum depth is 0 feet. Enter the Maximum Depth in the edit box provided.

Setup Menu

Sailplan Settings Command

A dialog box allowing the user to set the following waypoint parameters will appear when this option is selected:

Run\Start:
enables or disables the current sailplan. When Run is checked and either the Apply or OK sailplan configuration buttons are pressed, a message box asking the user if they want to begin a sailplan for that target is displayed. To start the sailplan click the OK button in the message box. If a sailplan is running, the sailplan will be displayed in the bottom portion of either the ship or target position box. The range, bearing, XTE (cross track error, see below) TTG (time to go) and ETA of the waypoint currently being navigated to will be displayed.

When Run is checked and a sailplan is already running for that target, a message box asking the user if they want to reset the sailplan for that target is displayed. To reset the sailplan click the OK button in the message box. Resetting the sailplan will allow any changes made to the sailplan configuration (i.e. Display Cross Track Error Lines, Line Style) to be applied. The cross track error will also be reset.

If a sailplan is running and the run check box is toggled to off, a message box will appear warning the user that the current sailplan will be terminated. To terminate the current sailplan click yes. To continue running the current sailplan click no or press the enter key. **Note:** If the sailplan direction is single, the sailplan will be terminated. To restart navigation to a single waypoint, open the Waypoint List window, select a waypoint and click the Goto push button.

Direction:
the direction setting tells the router how the waypoints should be used, which waypoints should be used and what order they should be used in. The options that may be selected are as follows:

Forward -
the router will go through the waypoint list from top to bottom of the list using any waypoint that is not a marker. The router will store the waypoints in a separate list and run the sailplan using this list. This direction is the IPS system default.

Reverse -
the router will go through the waypoint list from the end of the list to the beginning of the list using any waypoint that is not a marker.

Track:
allows the user to choose to display the ship's intended course between all waypoints or not to display the course at all. None is the IPS system default.

XTE Lines:
the cross track error or XTE lines will be displayed only if XTE lines is enabled (on).

Course Line:
enables or disable the line displaying the ships current course.

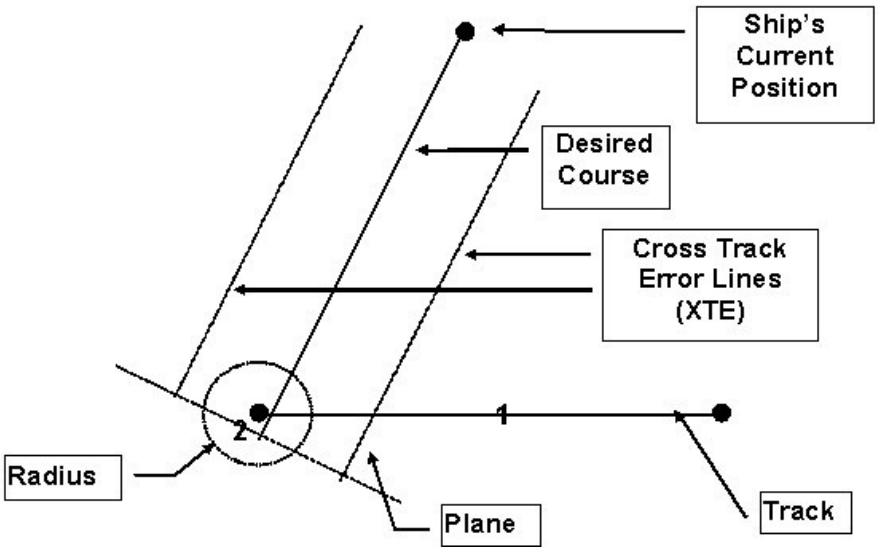
Include Markers:
enables or disables the marker display.

Criteria:
tells the sailplan manager how to determine if a given waypoint has been reached. The following options are available:

Radius - the sailplan manager will compare a targets (ship's) current position to that of the waypoint position. If the range between the two is less than or equal to the value specified by the menu selection Radius then the waypoint has been reached.
Note: With this selection it is very possible to "miss" a waypoint by passing it to one side or the other. This often occurs when the vessel must maneuver to avoid other traffic.

Plane- the sailplan manager will consider a waypoint reached if the vessel breaks a plane that is perpendicular to the desired course.

Radius and Plane - the sailplan manager will consider a waypoint reached if either the vessel breaks a plane that is perpendicular to the desired course or the vessel gets within the radius of the waypoint. as specified by the menu selection Radius.



Cross Track Error:
the XTE or cross track error is the perpendicular great circle distance from the vessel's present position to the desired course. The menu selection XTE allows the user to specify how far from the desired course to display the cross track error lines. The minimum cross track error that may be entered is 0.00 nautical miles. The maximum cross track error that may be entered is 9.999 nautical miles. The XTE lines and value are used only for display purposes. The default value is 0.100 nm.
Note: The XTE lines will only be displayed if the Waypoint dialog box menu selection XTE lines: on is enabled (on). The default value is 0.100 nm. The desired course can be reset at any time

Radius:
allows the user to specify the size of the radius around each waypoint. The vessel must pass within the distance of the radius around the waypoint for the sailplan manager to consider the vessel has reached that waypoint. The minimum radius that may be entered is 0.00 nautical miles. The maximum radius that may be entered is 9.999 nautical miles. The default radius is 0.050 nautical miles. Enter the appropriate radius size in the edit box provided.

Line Color:
clicking this button displays a dialog box that allows the user to set the color of the Waypoint and Cross Track Error lines.

Line Style:
allows the user to select which line style will be used for the Waypoint lines. The options are Solid, Dash, Dot, Dash Dot and Dash Dot Dot. The default is solid.

Line Size:
allows the user to select which line size will be used for the Waypoint lines. The options are 1-20 and the default is 1.

See Also:
Waypoint List Window

Serial Out Command

A dialog box allowing the user to set the Serial Out parameters will appear when this option is selected. The dialog box is composed of three pages each represented by a tab. The tabs are standard, Acoustic Modem and TC-100 Settings. To move from page to page click the appropriate tab.

Standard:

Port Selection:
allows the user to select any currently open port as an output port. If the upper portion of the combo box displays a 'No Ports Open' message use the SETUP-> Communications menu command to open at least one serial port or use SETUP->Ethernet Configuration menu command to open at least one UDP port. The port number currently selected is displayed in the upper portion of the combo box. To select a different port number click the arrow button on the right side of the combo box. A dropdown box displaying all open ports will appear. Select a port using the mouse or the arrow keys. The settings listed below are applied to the port number selected in this combo box. The apply button may be used to set serial out parameters without exiting the Serial Out dialog box.

Priority Target ID:
allows the user to select which of multiple targets will be associated with the selected port. The selections are 1 through 10, with 1 to 9 being targets and 10 being the ship. Verify that the correct target ID is set or inappropriate data or no data may be sent. The following data strings: GGA2, TTMT, WHOI AM, RMC, Fledermaus, GGA\VTG\HDT, SCT Video, HDT, DBS, GGA\TLL\VTG, TC-100, Platform (Echo Scope) Nav Data and GGA\ZDA\VTG require a priority target to be selected because they do not have a target ID field. Any target ID is valid with the majority of the NMEA options, but TTMT and SCT Video require a subsea (non ship) target. In addition the ship (ID 10) is the only ID allowed with the WHOI AM option. It is not necessary to set the target ID if the Remote IPS option is selected as the Remote IPS Display sends out all valid target data. Please see Serial Out ID Selection for more information. Enter the appropriate target number in the edit box provided.

Check Sum:
allows the user to enable or disable the check sum field. A check sum is a field at the end of the data string that can be used by the receiving software to verify that the text string has not been corrupted during transmission. If the check sum is enabled an asterisk will be displayed after the text string format selected. The check sum may not be used if SCT Video is selected for NMEA output, therefore the check sum will be disabled (grayed out) if SCT Video is selected. The check sum is required for the RMC string according to the NMEA manual.

GPS Echo:
enables the output of GGA, VTG and ZDA strings through the port selected as the output port. A port must be open for a GPS Echo to be output. Please see the Communications section of this manual for more information.

Data Rate:
allows the operator to select the IPS data output speed. The options are Fastest (when available), Moderate (5Hz or less), Slow (1 Hz or less). The default is Fastest. The age of the receiving piece of equipment should be considered when making the data rate selection. For example an older side scan may need to receive data at a low rate (> 5). The data rate selection doesn't increase the data output speed, it just limits it when one of the two slower options is selected. The data rate will be automatically set to slow (1 Hz or less) for the RMC string.

Output Data Format:
allows the operator to select a National Marine Electronic Association (NMEA) or NMEA like format for the serial output or to disable serial output. Click the appropriate radio button to select one of the 20 formats or to disable serial output. The 19 options for NMEA serial output are None, GGA 2.x, TTMT, WHOI AM, TPD (Target Position & Depth), RMC, TP 2EC, TLL, Fledermaus (Platform Positions), GGA/VTG/HDT, SCT 50 Video, HDT (True Heading), DBS (Depth Below the Surface), GGA/TLL/VTG, TC-100 Video Time Code Sync, Link Quest DVL (Enable Tx), Platform (EchoScope) Nav data and Remote IPS Display ($PIUDP), GGA/VTG/VTG, Ext Trigger USBL (UDP). Please see the NMEA Summary section of this manual for more detailed information on serial output formats.

- **Note:** The following serial output strings: GGA, TPD, TLL and Remote IPS Display ($PIUDP) have target location data values that are also independent of the reference location. However the locations of the serial output string TTMT is with respect to the reference location if it is enabled. If the reference location is enabled the word 'ref' will be displayed in the target position box.
- **Note:** When the TPD format is selected as NMEA serial output the target's depth will be given in the current IPS system units. This means the target's depth will be expressed in meters if meters are the current system units and feet in all other cases.

Using the SCT Video Feature:

The SCT Video selection will display text onto a video image in real time. To use the IPS SCT Video feature follow the instructions listed below.

1. Open the appropriate port with a baud rate of 9600 using the SETUP -> Communications menu. Please see the Communications section of this manual for more information.

2. Select SCT Video as the SERIAL OUT ->Output Data Format.

3. Set SERIAL OUT -> Priority Target to number of the target that is being tracked. This must be done, or no data will be sent out to the video image.

4. Set the hardware ID on the SCT-50 to 01.

5. Remember that if SCT Video is selected SERIAL OUT -> Check Sum and SERIAL -OUT -> GPS Echo cannot be used. (grayed out).

The text displayed when using the SCT Video includes the latitude, longitude, PC time, depth reported by the depth sounder and depth of the priority target. The targets latitude and longitude are displayed on the upper left of the screen. The targets depth is displayed in the upper right of the screen. The PC time is displayed in the lower left of the screen and the depth below the ship in the lower right. The depth below the ship is supplied by its depth sounder via the NMEA string DBT in units of feet. The current PC time is adjusted by the Zone Description.

The Horita Serial Control Titler model number SCT-50 may be used as an interface device to send the IPS output string to video device. From more information on the SCT-50 contact Horita at the following address:

Horita

P.O. Box 3993
Mission Viejo, CA 92690
(714) 489-0240
www.Horita.com

PAL Format:
allows the user to set PAL format to on or off. If the check box is checked PAL format will be used when sending out SCT Video data. This setting has no effect if SCT Video has not been selected as the Output Data Format. The default setting is off.

Output Display:
Opens a window that displays all serial out data. The window will remain open when the Serial Out dialog box is closed.

Acoustic Modem:

Acoustic Modem Tracking:
this check box must be on (checked) to allow acoustic modem tracking to occur.

Range:
when the Range push button is clicked the slant range is calculated by interrogating the micro modem. The transponder is not used in the calculation and the bearing information is not provided. The answer is displayed in the edit box to the right of the range push button.

Bluefin AUV Commands:
The following three AUV commands are only enabled if Acoustic Modem Tracking check box has been selected.
Return-Transit to End:
The AUV will return to the last mission waypoint.

Stop Kill Tailcone:
Disables power to the AUV tailcone(thruster) and the AUV will float to the surface if it is positively buoyant.
Drop Weight:
Starts the dropweight process for the AUV.

End Mission:
not available at this time.

USBL Track Time/Cycle:
determines how long the USBL tracking continues before an acoustic modem command is sent out. You would only get on possible ping once the target if the track time is set to the minimum (2 seconds).

Target USBL ID:
allows the user to select which of the USBL targets will be used to send a type 28 message to the acoustic modem. The type 28 message consists of the ships position data and the USBL's geodetic position and a position error estimate.

Vehicle Status:
query to send back vehicle status.

Sub INS ID:
allows the user to assign an unused ORE target number to a target position coming from an acoustic modem.

Modem Configuration:
opens the Modem Configuration dialog box.

Target Ship Configuration:
opens the Target Ship Configuration dialog box.

TC-100 Settings:
This tab allows the user to set the variables that effect the TC-100 video overlay appearance.

TC-100 Font Size:
Allows the user to set the font size on the TC-100 video overlay.

TC-100 Screen Position:
Allows the user to set position of the TC-100 video overlay to the top or bottom of the screen.

TC-100 on Screen Display:
If enabled (checked) the TC-100 information will be displayed on the screen.

Sync TC-100 Time to PC Clock:
If this check box is enabled the TC-100 time is synchronized with the PC clock.

Apply TC-100 Settings:
Applies and saves the setting shown above. This does the same thing as clicking the apply button on the bottom of the dialog box, but only the TC-100 settings are changed.

AM Configuration:

Modem NVRAM Configuration Parameters:
Allows the user to select which of 33 NVARM parameters such as BR1 [0-7] Baud rate for serial port 1 or PTO Int Packet timeout (sec) can be set in the **Parameter Settings** see edit box below.

Parameter Settings:
Allows the user to enter the parameter setting that corresponds with the configuration parameter selected in **Modem NVRAM Configuration Parameters**. For example if BR1 [0-7] Baud rate is selected the **Modem NVRAM Configuration Parameters** list box then the valid entries for **Parameter Settings** are

Check Settings:
If this check box is enabled the check sum will be added at the end of the AM modem configuration string.
Also See:

Target Settings

Ship Settings

Communication

Ethernet Configuration

Communications Command

A dialog box allowing the user to select a serial port and set the corresponding parameters will be displayed. Communication ports one through sixteen may be selected, provided they are available. Select the serial port you want to use from the port selection list box using the arrow keys or mouse. Then set the parameters listed below and click the Open button to open the port for serial input or output.

Port Selection:
allows the user to select a port number. If a port is already open, the word open will be displayed in the list box after the port number. The port number currently selected is highlighted. To select a different port number use the arrow keys or mouse to highlight a different port. The settings listed below are applied to the port number selected in this list box.

Port Status:
if the port selected in the port selection combo box is open, the active radio button will be highlighted. If the selected port is closed, the inactive radio button will be highlighted. This group box is for display purposes only and cannot be changed by the user.

Baud Rate:
allows the user to select the appropriate baud rate from the group of radio buttons. The available baud rates range from 110 to 115200. The IPS system default is 4800.

Collect Data Strings:
allows the user to enable or disable the collect data strings option. If the box is checked, all serial data will be stored in a file. The IPS default value is false, no data strings will be collected.

Open Port:
Opens the port selected in the port selection list box. A message will be displayed in the view window with the port number, the baud rate, number of data bits, stop bits and parity. If there is an error in opening the port an IPS error message will be displayed.

Close Port:
closes the port selected in the port selection list box.

Clr Display:
clears the view port window.

Display all Data:
If the check box is true (checked) data from all of the open ports will be displayed. Otherwise only data from the port selected in the Port Selection box will be displayed.

View Port Window:
This window displays incoming and outgoing communications data (i.e. BATS data, GPS data Compass data). This window can be used to determine if target or ship information is not being displayed due to incorrect communication port settings or incorrect IPS parameter settings. For example if SETUP -> System Inputs Command -> Ore System is set to none and the target position input is from a BATS, no target position information will be displayed even if all the communication port settings are correct. If incoming serial strings are displayed in the view window, this would indicate that the communication port settings are correct.

Ethernet Configuration

The Ethernet Configuration dialog box allows the user to set the parameters used for remote display of IPS data. Please see the Remote IPS Display section of this manual for more information.

Local Port:
Allows the user to enter a local port number between 0 and 65535. Setting the local port number to 0 enables the TCP/IP stack to choose a port at random. Otherwise, a port number above 2000 is suggested as port numbers 1 to approximately 2000 are reserved.
Transmit IPS Data:
If true (checked) allows the transmission of IPS data. This allows the computer to be the master station.
Receive Data:
If true (checked) allows the IPS to receive data. This allows the computer to be the remote host.
Do Not Support Routing:
If set to true (checked) the socket is forced to send data directly to the interface (no routing).
Remote Port:
Allows the user to enter a Remote Port number. The **Remote *Port*** is the UDP port on the **Remote *Host*** where UDP datagrams will be sent. A valid port number (a value between 1 and 65535) is required.
Note: *This is the Remote Port number that will be entered in the **"Remote Display" PC's IPS Ethernet Configuration** dialog box Local Port field**.***
Remote IP:
Allows the user to enter the IP address of the Remote Host. The Remote Host property specifies the IP address (IP number in dotted internet format) of the remote host. If **Remote Host** is set to **255.255.255.255**, the IPS will broadcast the data on the local subnet.

Equipment Offset Commands

Ship Offset

Note: All offsets are now entered with respect to the center of roll pitch.

System Units:
This edit box displays the system units. If the system units are meters the edit box will display meters. If the system units are feet, yards or nautical miles feet will be displayed in the edit box. This edit box is applies to each page of the dialog box but may not be edited by the user.
Ship Offsets Sub Menu:

Ship\GPS:

Ship Length:
allows the user to enter the ships overall length in feet or meters. The maximum offset that may be entered is 300 meters/ 984.25 feet, the minimum amount that may be enters is 1 meter /3 feet. The default value which will be used if the user has not entered the ships length is 62.18 meters/204 feet.

Ship Beam:
allows the user to enter the ships beam in feet or meters. The maximum offset that may be entered is 100 meters/ 328 feet, the minimum amount that may be enters is 1 meter/3 feet. The default value which will be used if the user has not entered the ships beam is 11.58 meters/ 37.99 feet.

GPS Antenna X:
allows the user to enter the GPS antenna X position, which is the distance the GPS antenna is horizontally (along the X axis) from the center of the ship. If the GPS antenna is starboard of the center of the ship the position must be a positive number. If the GPS antenna to port of the center of the ship the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for ships beam, the minimum amount is the negative of 1/2 the amount entered for ships beam.
Note: The default GPS position is 0, 0 the center of the ship.

GPS Antenna Y:
allows the user to enter the GPS antenna Y position, which is the distance the GPS antenna is ahead of or behind (along the Y axis) the center of the ship. If the GPS antenna is forward of the center of the ship the position must be a positive number. If the GPS antenna is aft of the center of the ship the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for ships length, the minimum amount is the negative of 1/2 the amount entered for ships length.

If a number that does not fall in the range given above is entered, a warning message will be displayed and a number equal to 1/2 the ships length will be filled in the edit box. To accept the number that is now displayed in the edit box the user must click Ok or Apply. The user may also enter another value in the correct range and click Ok or Apply.

GPS Antenna Z:
allows the user to enter the GPS antenna Z position, which is the distance the GPS antenna is ahead of or behind (along the Z axis) the center of the ship. If the GPS antenna is forward of the center of the ship the position must be a positive number. If the GPS antenna is aft of the center of the ship the position must be a negative number. The maximum offset that may be entered is 98.42 feet or 30.0 meters. The Hydrophone Z offset may be positive or negative.

D (CPR to LOA/2):
allows the user to enter a center of roll pitch reference offset to be used only for displaying the ship shape on the main grid. The ship shape is now displayed as a Mercator projection.

Display on Screen Position:
allows the user to enable or disable the display of the GPS offset position on the equipment offset ship bitmap. If the box is checked, the on GPS position will be displayed on the ship bitmap. The IPS default is false, the GPS position will not be displayed.

Reference:

Reference X:
allows the user to position the GPS antenna over the hydrophone by setting the reference position to the hydrophones actual position. This frees the user from having to enter hydrophone offsets into the BATS systems.
The reference position is the position displayed (lat/long) as ships position in the display box in the upper right hand corner of the screen. If the reference X position is starboard of the center of the ship the position must be a positive number. If the reference X position is port of the center of the ship the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for ships beam, the minimum amount is the negative of 1/2 the amount entered for ships beam.
Note: To use the reference position a valid compass input must be supplied.

Reference Y:
If the reference Y position is forward of the center of the ship the position must be a positive number. If the reference Y position is aft of the center of the ship the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for ships length the minimum amount is the negative of 1/2 the amount entered for ships length.
Note: The default reference position is 0,0 the center of the ship. The reference position is defined to allow the user the flexibility of selecting a position onboard the vessel other than the locations of the actual GPS antenna and hydrophone. For example the reference position may be set to the stern of the vessel where launch and recovery of an ROV or other equipment takes place. To use the Reference position valid compass input must be supplied.

Display on Screen Position:
allows the user to enable or disable the display of the reference offset position on the equipment offset ship bitmap. If the box is checked, the reference offset position will be displayed on the ship bitmap. The IPS default is false, the on screen position will not be displayed.

Use Reference Offset in Processing:
allows the user to enable or disable the use of the reference offsets when calculating position statistics. The IPS default is false, the reference offsets will not be used in calculations.

Hydrophone:

Hydrophone X:
hydrophone X, Y, and Z allow offsets to be entered that cause the hydrophone's apparent position to be directly under the GPS antenna. This is important because the target's latitude and longitude are based on the ship's latitude and longitude. The X offset adjusts the distance the hydrophone is ahead of or behind the GPS antenna. The maximum offset that may be entered is 1/2 half the amount entered for ships beam the minimum amount is the negative of 1/2 the amount entered for ships beam.

Hydrophone Y:
the Y offset adjusts the distance the hydrophone is laterally from the GPS antenna. The maximum offset that may be entered is 1/2 half the amount entered for ships length the minimum amount is the negative of 1/2 the amount entered for ships length.

Hydrophone Z:
the Z offset adjusts the distance the hydrophone is below the water surface. The maximum offset that may be entered is 98.42 feet or 30.0 meters. The Hydrophone Z offset may be positive or negative.

Heading:
allows the user to enter the heading bias. The maximum heading bias that may be entered is 360 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

Roll:
allows the user to enter the roll bias. The maximum roll bias that may be entered is 10.0 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

Pitch:
allows the user to enter the pitch bias. The maximum pitch bias that may be entered is 10.0 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees

Display on Screen Position:
allows the user to enable or disable the display of the reference offset position on the equipment offset ship bitmap. If the box is checked, the reference offset position will be displayed on the ship bitmap. The IPS default is false, the on screen position will not be displayed.

Target Offset

Target Offsets Sub Menu:

Immediately after the Target Equipment Offsets Command is selected the Target Selection dialog box with nine radio buttons and corresponding bitmaps is displayed. To select a target click the radio button to the right of the bitmap representing that target, then click the Ok push button. To escape without changing any targets, click the cancel push button. The Target Offset dialog box allowing the user to enter the General, DVL, Reference and Depth Sensor Offsets will appear.

Target Number:
Displays the target number selected in the target selection dialog box. All changes made in the dialog box will be applied to this target number. This field is for display purposes only and cannot be edited by the user.

System Units:
This edit box displays the system units. If the system units are meters the edit box will display meters. If the system units are feet, yards or nautical miles feet will be displayed in the edit box. This edit box may not be edited by the user.

General:

UWV LOA:
lows the user to enter the targets overall length in feet or meters. The maximum offset that may be entered is 100 meters/ 328 feet, the minimum amount that may be enters is 1 meter /3.28 feet. The default value which will be used if the user has not entered the targets length is 7.2 meters / 23.62 feet.

UWV Beam:
allows the user to enter the targets overall beam in feet or meters. The maximum offset that may be entered is 50 meters/ 164 feet, the minimum amount that may be enters is 1 meter /3.28 feet. The default value which will be used if the user has not entered the ships length is 2.5 meters/8.2 feet.

Latitude:
allows the user to enter the targets latitude. This is the latitude that would be used for calculating the DVL start position if manual has been selected for the DVL start position. This latitude would also be used to reset the DVL position if manual has been selected for reset position.

Longitude:
allows the user to enter the targets longitude. This is the longitude that would be used for calculating the DVL start position if manual has been selected for the DVL start position. This longitude would also be used to reset the DVL position if manual has been selected for reset position.

DVL Sound Velocity:
allows the user to have the IPS DVL sound velocity calculated from the DVL temperature and depth or calculated using the manual sound velocity.

Manual Sound Velocity:

allows the user to enter a manual sound velocity that may be used to calculate the DVL sound velocity. The maximum sound velocity that may be entered is 2000.00 m/s, the minimum is 1000.0 m/s. The IPS default is 1500.0 m/s.

Salinity:
allows the user to enter a salinity that may be used to calculate the DVL sound velocity. The maximum salinity that may be entered is 45.0 practical salinity units, the minimum is 1.0 PSU. The IPS default is 35.0 PSU. This value is only used if calculate from DVL temperature depth is selected in the DVL Sound Velocity group box. This parameter is important because the salinity of the water effects the DVL sound velocity.

DVL Start Position:
allows the user to select either manual or ship reference position as the DVL start position. The IPS default is manual.

Reset Position:
allows the user to select either the Manual, Ship Reference Position, ORE Target, Fuse DVL/USBL or Reset DVL Waypoint data position to use to reset the DVL position. The IPS default is manual.

Reset ORE Target:
allows the user to enter the ORE Target whose position will be used when resetting the DVL position. The maximum target number that may be entered is 9, the minimum is 0. The IPS default is 0. This value is only used if ORE Target is selected in the reset position group box.

Reset Lat/Lon Position:
allows the user to reset the DVL position based on the values entered above. The DVL position will be reinitialized and the data accumulators will be set to zero. This means that the new DVL latitude and longitude will be based on data collected after the DVL position was reset.

DVL Navigation:
begins DLV navigation based on the values entered above. The positions calculated for the DVL will be shown in the display grid. If the DVL Navigation check box is not checked nothing will be done with the DVL data that is collected. The IPS default is DVL navigation off.

DVL:

DVL X:
allows the user to enter the DVL X value. The maximum offset that may be entered is 1/2 half the amount entered for target's UWV Beam the minimum amount is the negative of 1/2 the amount entered for UWV Beam. The IPS default is 0.0.

DVL Y:
allows the user to enter the DVL Y value. The maximum offset that may be entered is 1/2 half the amount entered for UWV LOA the minimum amount is the negative of 1/2 the amount entered for UWV LOA. The IPS default is 0.0.

DVL Z:
allows the user to enter the DVL Z value. The maximum offset that may be entered is

16.4 feet or 5.0 meters. The Hydrophone Z offset may be positive or negative. The IPS default is 0.0.

Mounting Angles:
this refers to the angle the DVL is mounted at relative to the navigation frame. If the DVL unit is correctly aligned with the vessel's navigation frame the mounting angle heading, roll and pitch biases would be zero. Please note the example in the DVL dialog box. In this example the DVL unit is tilted 10 degrees off the ROV/Sub level, therefore the pitch bias is 10.

Heading:
allows the user to enter the heading bias. The maximum roll bias that may be entered is 359.90 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

Roll:
allows the user to enter the roll bias. The maximum roll bias that may be entered is 180.0 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees.

Pitch:
allows the user to enter the pitch bias. The maximum pitch bias that may be entered is 180.0 degrees. The offset may be positive or negative. The IPS default is 0.0 degrees

Manual DVL Depth:
allows the user to enter a manual DVL depth that may be used in DVL calculations. The maximum DVL depth that may be entered is 4999.99 meters or 16,4004.00 feet the minimum is 0.0. The IPS default is 0.0.

Vehicle Depth:
allows the user to select either Manual DVL Depth, DVL Sensor Depth or SVP or CTD Depth to be used in DVL calculations. If Manual DVL Depth is selected, the value entered in the Manual DVL Depth edit box above will be used. The IPS default is Manual DVL Depth.

Filter DVL Data: allows the user to set the DVL Filter on or off.

Filter Plot: displays a popup window with a graph of the filtered DVL data.

Reference:

USBL Beacon X:
allows the user to enter the USBL Beacon X value. The maximum offset that may be entered is 1/2 half the amount entered for ships UWV Beam the minimum amount is the negative of 1/2 the amount entered for UWV Beam. The IPS default is 0.0.

USBL Beacon Y:
allows the user to enter the USBL Beacon Y value. The maximum offset that may be entered is 1/2 half the amount entered for UWV LOA the minimum amount is the negative of 1/2 the amount entered for UWV LOA. The IPS default is 0.0.

USBL Beacon Z:
allows the user to enter the USBL Beacon Z value. The maximum offset that may be entered is 16.4 feet or 5.0 meters. The Hydrophone Z offset may be positive or negative. The IPS default is 0.0.

Reference X:
allows the user to position the GPS antenna over the hydrophone by setting the reference position to the hydrophones actual position. This frees the user from having to enter hydrophone offsets into the BATS systems.
The reference position is the position displayed (lat/long) as target position in the display box in the lower right hand corner of the screen. If the reference X position is starboard of the center of the target the position must be a positive number. If the reference X position is port of the center of the target the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for UWV Beam, the minimum amount is the negative of 1/2 the amount entered for UWV Beam.
Note: To use the reference position a valid compass input must be supplied.

Reference Y:
If the reference Y position is forward of the center of the target the position must be a positive number. If the reference Y position is aft of the center of the target the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for UWV LOA the minimum amount is the negative of 1/2 the amount entered for UWV LOA.
Note: The default reference position is 0,0 the center of the target. The reference position is defined to allow the user the flexibility of selecting a position onboard the target other than the locations of the actual GPS antenna and hydrophone. For example the reference position may be set to the stern of the vessel where launch and recovery of an ROV or other equipment takes place. To use the reference position valid compass input must be supplied.

Reference Z:
If the reference Z position is below the target's data center the Z the position must be a positive number. If the reference Z position is above target's data center the Z position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for UWV LOA the minimum amount is the negative of 1/2 the amount entered for UWV LOA.
Note: The default reference position is 0,0 the center of the target. The reference position is defined to allow the user the flexibility of selecting a position onboard the target other than the locations of the actual GPS antenna and hydrophone. For example the reference position may be set to the stern of the vessel where launch and recovery of an ROV or other equipment takes place. To use the Reference position valid compass input must be supplied.

Use Ref Offsets in Processing:
allows the user to have the reference offsets entered above used in processing. The IPS default is off.

Depth Sensor:

Depth Sensor X:
allows the user to enter the Depth Sensor X value. The maximum offset that may be entered is 1/2 half the amount entered for target's UWV Beam the minimum amount is the negative of 1/2 the amount entered for UWV Beam. The IPS default is 0.0.

Depth Sensor Y:
allows the user to enter the Depth Sensor Y value. The maximum offset that may be entered is 1/2 half the amount entered for UWV LOA the minimum amount is the negative of 1/2 the amount entered for UWV LOA. The IPS default is 0.0.

Depth Sensor Z:
allows the user to enter the Depth Sensor Z value. The maximum offset that may be entered is 16.4 feet or 5.0 meters. The Hydrophone Z offset may be positive or negative. The IPS default is 0.0.

Fixed Target

Fixed Target Offsets Sub Menu:

Allows the user to enter the fixed target's length, beam, shape and line properties. The reference and heading offsets and the fixed target's latitude and longitude may also be set.

Display Properties:

Vessel Length:
allows the user to enter the fixed target's overall length in feet or meters. The maximum offset that may be entered is 100 meters, the minimum amount that may be enters is 0.1 meters. The default value which will be used if the user has not entered the ships length is 50.0 meters.

Vessel Beam:
allows the user to enter the fixed target's beam in feet or meters. The maximum offset that may be entered is 50.0 meters, the minimum amount that may be enters is 0.1 meter. The default value which will be used if the user has not entered the ships beam is 7.0 meters.

Line Size:
allows the user to select the size (width) of the line used in drawing the fixed target in the viewing area. The allowable line sizes range from 1 to 10 and the default line size is 3.

Line Color:
allows the user to select the color of the line used in drawing the fixed target in the viewing area. The available colors are: black, light gray, dark gray, gray, white, red, yellow, green, cyan, blue, magenta, dark red, dark green, dark yellow, dark blue, dark magenta, dark cyan, money green, sky blue and cream. The default line color is light gray.

Shape:
allows the user to choose a ship shape or barge shape to represent the fixed target on the IPS viewing area. The default shape is ship.

Display:
allows the user to display the fixed target in the IPS viewing area. If display is not checked none of the values selected above will have any effect. The default is display off.

Reference:
Reference X:
allows the user to position the GPS antenna over the hydrophone by setting the reference position to the hydrophones actual position. This frees the user from having to enter hydrophone offsets into the BATS systems.
If the reference X position is starboard of the center of the fixed target the position must be a positive number. If the reference X position is port of the center of the target the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for Vessel's Beam, the minimum amount is the negative of 1/2 the amount entered for Vessel Beam.
Note: To use the reference position a valid compass input must be supplied.

Reference Y:
if the reference Y position is forward of the center of the fixed target the position must be a positive number. If the reference Y position is aft of the center of the fixed target the position must be a negative number. The maximum offset that may be entered is 1/2 half the amount entered for Vessel Length the minimum amount is the negative of 1/2 the amount entered for Vessel Length.
Note: The default reference position is 0,0 the center of the fixed target. The reference position is defined to allow the user the flexibility of selecting a position onboard the target other than the locations of the actual GPS antenna and hydrophone. For example the reference position may be set to the stern of the vessel where launch and recovery of an ROV or other equipment takes place. To use the Reference position valid compass input must be supplied.

Heading:
allows the user to enter the fixed target heading. The maximum heading allowed is 359.0 degrees and the minimum heading is 0.0 degrees. The IPS default heading is 0.0.

Latitude:
allows the user to enter the fixed target latitude.

Longitude:
allows the user to enter the fixed target longitude.

Mission Information

Allows the user to enter information about the mission such as the Cruise ID and the Pilot's names. This information will be displayed at the start the IPS program if the Show on Start Up box is enabled. The information entered below is stored in the file IMinfo.txt in the IPS start directory.

Cruise ID:
allows the user to enter the cruise ID. The cruise ID must be alphanumeric and can be up to 30 characters.

Dive ID:
allows the user to enter the dive ID. The dive ID must be numerical and can be up to 8 characters. The dive ID is incremented each time the IPS is run. However, all of the other parameters will remain unchanged.

Main Vehicle ID:
allows the user to enter the main vehicle ID. The main vehicle ID must be alphanumeric and can be up to 30 characters.

Pilot 1:
allows the user to enter the first pilot ID. The first pilot ID must be alphanumeric and can be up to 30 characters.

Pilot 2:
allows the user to enter the second pilot ID. The second pilot ID must be alphanumeric and can be up to 30 characters.

Observer 1:
allows the user to enter the first observer. The first observer must be alphanumeric and can be up to 30 characters.

Observer 2:
allows the user to enter the second observer. The second observer must be alphanumeric and can be up to 30 characters.

Show on Start Up:
if the show on start up check box is enabled (checked) the mission information dialog box will be shown automatically each time the IPS program is run.

Time Options

Zone Description:
allows the user to enter a zone description of -12.0 to 12.0 hours to adjust the IPS time used for serial or text/NMEA output data to match UTC (Universal Coordinated Time) or GMT (Greenwich Mean Time). The default is 0.0. For more information on text/NMEA or GIS output data see FILE -> Export Data Command. For more information on serial output data see SETUP -> Serial Out Command.

GPS Time Sync on Start Up:
allows the user to synchronize the PC system time with the GPS time as reported by the NMEA ZDA string. The PC time is synchronized when the system is started and every five minutes when the IPS data is automatically backed up. The default is off (unchecked).

Time Sync Command

Allows the user to synchronize the PC system time with the GPS time as reported by the NMEA ZDA string on a one time basis. The PC time is can also be synchronized when the system is started and every five minutes when the IPS data is automatically backed up using the SETUP -> Time Options -> GPS Time Sync on Start Up.

NMEA Strings

DBT Depth Below Transducer

Water depth referenced to the transducer.

```
            1        2          3
$--DBT,2500.0,f,752.0,M,416.7,F*hh
```

1. Water depth in feet.
2. Water depth in meters.
3. Water depth in fathoms.

Note: For DBT, the IPS will only use the first field (feet).

DPT Depth Position Target

MO Resolution A.224(VII). Water depth relative to the transducer and offset of the measuring transducer. Positive offset numbers provide the distance from the transducer to the waterline. Negative offset numbers provide the distance from the transducer to the part of the keel of interest.

```
          1      2
$--DPT,300.0,175.0,*hh
```

1. Water depth relative to the transducer in meters.
2. Offset relative to the transducer in meters.

Note:

- For DPT, the IPS will only use a positive transducer offset (the distance from the water line to the transducer) in order to calculate the total water depth with respect to the surface.

- If the second field contains a negative value this would indicate the distance from the transducer to the keel. The IPS will ignore this value and return the depth with respect to the transducer.

DTF IPS Data Base Format

IPS Database Format.

```
   1          2        3          4                        5       6       7     8
 9
10/4/2001,10:09:16,2,35.00204523,-75.40662995,61.7,m,-1.0,m,278.4,1.2,kt,10.
8,

      10      11       12           13    14     15          16    17    18   19
-3.82 1.40 ,0.00,m, 127,244.00,0.00,0.00,7,1500.0,m/s,-12.6,-28.9,61.7,9
```

1. Date
2. Time
3. Target id
4. Lat long degrees. For example 20 degrees 30 minutes = 20.5000.
5. Depth and altitude in system units. If the IPS system units are meters, then the units are in meters, otherwise they are in feet.
6. Altitude in system units. If the IPS system units are meters, then the units are in meters, otherwise they are in feet. If either the depth or altitude are invalid a -1 will be displayed in that field.
7. Course over ground (COG) [deg].
8. Speed over ground [knots].
9. Platform heading. Note the platform is the target ID. These values will not equal the USBL heading, roll pitch unless it is ship data. For example the platform could be an AUV, ROV Manned sub etc.
10. Platform roll.
11. Platform pitch.
12. Platform heave. If system units = meters => meters else feet.

13. Platform attitude quality flag:

```
{- bit #: 8    7    6    5    4    3    2    1  }

{-       0   PR   PP   PH   PZ   UR   UP   UH  }
      USBL HeadingValid = 1;  {- 00000001 }
      USBL PitchValid = 2;    {- 00000010 }
      USBL RollValid = 4;     {- 00000100 }
      Platform HeaveValid = 8;    {- 00001000 }
      Platform HeadingValid = 16; {- 00010000 }
      Platform PitchValid = 32;   {- 00100000 }
      Platform RollValid = 64;    {- 01000000 }
```

14. USBL Heading,

15. USBL Roll

16. USBL Pitch

17. USBL quality flag (see above)

18. Sound velocity in m/s or feet/s

19. Position quality flag: ORE raw x,y,z [m] quality factor. If Ship (GPS) Number of satellites, GPS quality indicator (0 '?'none, 1' '-GPS, 2 'D'-DGPS, 3'P'-PPP mode fix valid, 4'R'-RTK Fixed, 5'F'-RTK float, 6'I'-Free inertial, DOP (dilution of precision), Age of differential GPS data [sec], Differential reference station ID 0000-1023.

DTF NOAA With ARCView Data

This format includes all of the information in the DTF IPS Data Base Format described above, but also includes a tab deliminated header and the mission information. The mission information is the Cruise_ID, Dive_ID, Vehicle_ID, Pilot_1, Pilot_2, Obs_1 and Obs_2. The mission information may be entered in Setup->Mission Information. A separate directory is also created for the text file using the dive name and number.

```
     1          2         3              4                    5                6
  7
ROV_2006        728       SeaMax         Steven Smith         Mike
Thomas      Charlie Davis       John Wilson

    8           9      10           11                  12        13        14     15     16

10/4/2001,10:09:16,2,35.00204523,-75.40662995,61.7,m,-1.0,m,278.4,1.2,kt,10.
8,


  17      18   19      20     21      22     23  24    25              26
-3.82 1.40 ,0.00,m, 127,244.00,0.00,0.00,7,1500.0,m/s,-12.6,-28.9,61.7,9
```

1. Cruise_ID
2. Dive_ID
3. Vehicle_ID
4. Pilot_1
5. Pilot_2
6. Obs_1
7. Obs_2
8. Date
9. Time
10. Target id
11. Lat long degrees. For example 20 degrees 30 minutes = 20.5000
12. Depth and altitude in system units. If the IPS system units are meters, then the units are in meters, otherwise they are in feet.
13. Altitude in system units. If the IPS system units are meters, then the units are in meters, otherwise they are in feet. If either the depth or altitude are invalid a -1 will be displayed in that field.
14. Course over ground (COG) [deg].
15. Speed over ground [knots].
16. Platform heading. Note the platform is the target ID. These values will not equal the USBL heading, roll pitch unless it is ship data. For example the platform could be an AUV, ROV Manned sub etc.

17. Platform roll.

18. Platform pitch.

19. Platform heave. If system units = meters => meters else feet.

20. Platform Attitude quality flag:

```
{- bit #: 8    7    6    5    4    3    2    1  }

{-       0   PR   PP   PH   PZ   UR   UP   UH  }
       USBL HeadingValid = 1;  {- 00000001 }
       USBL PitchValid = 2;    {- 00000010 }
       USBL RollValid = 4;     {- 00000100 }
       Platform HeaveValid = 8;    {- 00001000 }
       Platform HeadingValid = 16; {- 00010000 }
       Platform PitchValid = 32;   {- 00100000 }
       Platform RollValid = 64;    {- 01000000 }
```

21. USBL Heading,

22. USBL Roll

23. USBL Pitch

24. USBL quality flag (see above)

25. Sound velocity in m/s or feet/s

26. Position quality flag: EdgeTech raw x,y,z [m] quality factor. If Ship (GPS) Number of satellites, GPS quality indicator (0 '?'none, 1' '-GPS, 2 'D'-DGPS, 3'P'-PPP mode fix valid, 4'R'-RTK Fixed, 5'F'-RTK float, 6'I'-Free inertial, DOP (dilution of precision), Age of differential GPS data [sec], Differential reference station ID 0000-1023.

GGA 2.x Global Positioning System Fix Data

NMEA format version 2.x GGA contains the latitude and longitude of the target and is the most commonly used format for shipboard navigation. The drawback of this format is that it does not give a target number or depth. The main difference between format 2.x and format 1.x is that format 2.x gives the UTC of position in hours minutes and seconds format. The GGA 2.x text string is appropriate to use as serial output when the IPS software is being used primarily for ship navigation. If a GGA text string has been selected for serial output the only the GGA data received from the target selected as a priority target will be used as serial output. See the field definitions section in the NMEA version 2.x manual for more detailed information.

Note:

- The IPS software disregards the last two fields in the NMEA format 2.x GGA version for both serial input and output.
- The serial output of target location data in the 2.x GGA strings created by IPS will always be with regard to the hydrophone location independent of the reference (R) location.

```
                1          2         3     4        5  6 7  8     9        10    11     12
GPGGA, 221024.15 ,2619.307,N,08005.280,W,1,6,01.0,000027.5,M,00027.5,M*76
```

1. UTC of position.
2. GPS of Latitude.
3. Latitude N. or S.
4. GPS Longitude.
5. Longitude E or W.
6. GPS quality indicator.
7. Number of GPS satellites being used.
8. Horizontal dilution of precision (HDOP).
9. Antenna height.
10. Antenna height units.
11. Geoidal Height
12. Geoidal Height Units.

TLL Target Latitude and Longitude

A TLL text string in the format displayed below that contains data associated with the tracked target in. NMEA format version 2.x TLL. The TTL text strings is appropriate to use as serial output when the IPS software is being used primarily for target navigation as The TTL text string has a target ID number.

NOTE: The serial output of target location data in the TLL strings created by IPS will always be with regard to the hydrophone location independent of the reference (R) location.

```
          1     2         3     4         5    6      7         8
$IPTLL,05,2409.251,N,09120.214,W,Lxt-1,214619.44T,,*53
```

1. Target Number From 0 To 9.
2. Target Latitude.
3. Latitude N. or S.

4 Target Longitude.

5. Longitude E. or W.
6. Target name display only first 8 characters.
7. UTC of data.
8. Target status.

TPD Target Position and Depth

A TPD text string in the format displayed below that contains data associated with the tracked target in a format similar to TLL string with the target's depth replacing the target name. When the TPD format is selected as the NMEA serial output the target's depth will be given in the current IPS system units. This means the target's depth will be expressed in meters if meters are the current system units and feet in all other cases.

NOTE: The serial output of target location data in the TPD strings created by IPS will always be with regard to the hydrophone location independent of the reference (R) location.

```
          1      2         3      4         5      6         7         8
$IPTPD,05,2606.102,N,08003.984,W,,0010,f,210918.09,T,*3F
```

1. Target Number From 0 to 9.
2. Target Latitude.
3. Latitude N. or S.

4 Target Longitude.

5. Longitude E. or W.
6. Target depth in feet [f] or meters [m].
7. UTC of data.
8. Target status.

RMC Recommended minimum specific GPS/Transit data

RMC is the recommended minimum data to be provided by a GPS or Transit receiver. Time, date position, course and speed data are provided by a GPS or TRANSIT navigation receiver. A check sum is mandatory. This data string should be transmitted at speeds of 1 hertz when used with the IPS. All data fields must be provided, null fields should be used only when the data is temporarily unavailable.

```
       1      2    3      4     5       6     7     8      9      10    11  12
RMC,220516,A,5133.82,N,00042.24,W,173.8,231.8,130694,004.2,W*70
```

1. Time Stamp 220516 22:05:16 UTC
2. A validity - A-ok, V-invalid
3. 5133.82 current Latitude
4. N North/South
5. 00042.24 current Longitude
6. W East/West
7. 173.8 Speed in knots
8. 231.8 True course
9. 130694 Date Stamp
10. 004.2 Variation
11. W East/West
12. *70 checksum

TTMT Tracked Message Target

A TTMT text string in the format displayed below that contains data associated with the tracked target relative to the true north in NMEA format version 2.x TTM. At this time the IPS software only sends out valid information in the target number, distance, bearing, time, target name and target status fields. The time stored in the time field is the current DOS time of the computer being used to run the IPS software unless the operator used Time Zone to adjust local time to GMT. The usable fields are in bold type in the example below. All other fields will be either zero or null. See the field definition section in the NMEA 0183 version 2.x manual for more detailed information.

Note: The location of the serial output strings TTMT is with respect to the reference location if it is enabled. If the reference location is enabled the word 'ref' will be displayed in the target position box.

```
         1     2     3       4   5       6     7     8    9   10 11  12      13
$IPTTM,01,0.031,104.4,T,0.0,0.0,T,0.752,123.3,N,BATS-1,T,,132424.12,A*5E
```

1. Target number from 0 to 9.
2. Targets distance from own ship. [NM]
3. Bearing from own ship,(T true). [deg]
4. Target speed. SOG [knots]
5. Target course degrees. COG [deg]
6. Range CPA
7. Time to CPA '-' = increasing
8. Speed distance Units K/N/S
9. Target Name, displays only 1st 8 characters.
10. Target status ,L ,Q or T.
11. Reference target = R, null otherwise.
12. UTC of data. just time
13. Type of acquisition, A = Auto, M = manual.

PORE ORE Proprietary Format

The format "PORE" or NMEA ORE is a NMEA 0183 string length of 70 characters not including <CR><LF>. It follows the sentence structure for a NMEA 0183 version 2.1 proprietary sentence.
Example of the NMEA ORE Format:
$ P O R E , # # , HHMMSS, , , B R G , X (m) , Y (m) , Z (m) , R O L L , PT C H , WC, QF* CS
$PORE,01,072450,,,300.8,-00001.0,000000.6,00505.4,000.00,000.00,00,10*18
Example of the NMEA ORE Format with compass heading enabled:
$PORE,##,HHMMSS,HDG,ID, BRG, X (m), Y (m) , Z (m), ROLL, PTCH,WC,QF*CS
$PORE,01,072537,125.8,M,125.5,000000.2,-00000.2,00505.4,-00.03,-00.02,00,10*16

For more information please see the Operation and Maintenance Manual for the Track Point 3 section 3.7.6.1.

UDP EchoScope Format

UDP EchoScope nav string format:

$PIES,Lat,R,Long,R,depth,heave,heading,roll,pitch,SV<cr><lf>

$PIES - Header for EchoScope Lat/Long format "I-IPS, ES- EchoScpoe

Lat - [DDmm.mmmm] Lat WGS-84 - NMEA 0183 format
Region - 'N' or 'S'
Long - [DDDmm.mmmm] Long WGS-84 - NMEA 0183 format
Region - 'W' or 'E'

Depth - [m] + down min depth 0.00 (surface)
Heave - [m] +vert up

Heading - [deg] 0-359.99
Roll - [deg] +Port side up (TSS CoordSys)
Pitch - [deg] +Bow up

SV - [m/s]

<CR> - ASCII 13 Dec
<LF> - ASCII 10 Dec

To be used for the Code EchoScope MK II.

PIUDP Data Format

UDP data nav string format:

NOTE: The serial output of target location data in the $PIUPD strings created by IPS will always be with regard to the hydrophone location independent of the reference (R) location.

$PIUDP,HHMMSS.sss,mm-dd-yyyy,id,dddd.dd,hhh.h,rr.rr,pp.pp,yyy.yy,RR.RR,PP.PP,
aaa.a,ccc.c,s.ss,vvvvv.v,S,AF,DD.ddddd,LL.llll,nnn,QFSt*CS<cr><lf>

$PIUDP,143755.000,02-25-2003,9,4.37,83.59,-3.75,-2.24,1.77,85.15,0.49,1507.74,1,27
.1234567,-83.1234567,1,2,3*A6

1 $PIUDP header
2 HHMMSS.sss Hours 24 hr clock, LMT hours minutes seconds and milliseconds
3 mm-dd-yyyy local data
4 id = target is ship_ID, 1-9 ORE, SHIP_ID Just set a default of 10
5 ddd.dd subsea depth [m] or ship heave + down
6 hhhh.h True heading [deg]
7 rr.rr roll (+Port side up) [deg]
8 pp.pp pitch (+Bow up) [deg]
9 yyy.yy Yaw rate (+CCW) [deg/sec]
10 RR.RR Roll rate [deg/sec]
11 PP.PP Pitch rate [deg/sec]
12 aaa.a altitude [m] and ship depth sounder
13 ccc.c course over ground from processed DVL+AHRS+CTD [deg] wrt true north or GPS ship
14 ss.ss speed over ground in knots from processed DVL+AHRS+CTD [deg] or GPS ship
15 vvvv.v sound velocity [m/s]
16 S DVL status 0-no bottom lock, 1-bottom lock
17 AFlag : word; status of all attitude values

```
-- Constants for Attitude quality factor --------
 P= Platform, U= USBLL
 Can assembly multi valid angles by OR-ing.
 flag := PHeadingValid or UPitchValid or URollValid
 To check for example USBL roll
  if ( URollValid = (flag and URollValid) ) then
 bit #: 8    7    6    5    4    3    2    1
       0   PR   PP   PH   PZ   UR   UP   UH
UHeadingValid = 1;  // 00000001
UPitchValid = 2;    // 00000010
URollValid = 4;     // 00000100

PHeaveValid = 8;    // 00001000
PHeadingValid = 16; // 00010000
PPitchValid = 32;   // 00100000
PRollValid = 64;    // 01000000

// Note need to be 16 bit since Aflag : 2 byte Uint
PHeaveError =   $FFF7;  // 11110111
PHeadingError = $FFEF;  // 11101111
PPitchError =   $FFDF;  // 11011111
```

```
    PRollError =    $FFBF;  // 10111111

    PDVLAHRSValid = 112;      // 01110000
    PDVLAHRSHeaveValid = 120; // 01111000

  18  Lat deg.1234567,  7 places to Rt . for 0.00001 min of resoulation + North
  19  Long deg.1234567  +East
  20  nnn   PosFrom // typically 0 from actual tracking station else for remote display IPS 3
dig key number
  21  QFst [30]  //  quality factor string is a function of target type {-ID field is 4; Ship ID
= 10, USBL or DVL targets id = 1-9}
             // Subsea targets:
             // ORE USBL- raw SR [m], relative bearing [deg], dpeth [m] (w.r.t still water),
USBL QF (0-9), Hx,Hy,Hz, [m]
             //          Hydrophone yaw, hydrophone roll, hydphone pitch mounting biases
[deg], USBL processing method
             // DVL Nav-  Bottom Vel X,y,z, [m/s] Alt [m],Fixed QF =10,Gyro yaw rate
             // Ship - Num Sats, GPS quality,DOP,Age of DGP corrections sec,DGPS Station
ID  (ex. 8,D,1,4,0)
             // GPS quality = {- 0 = '?' fix not available or invalid
                              1 = ' ' C/A Standard GPS fix valid
                              2 = 'D' DGPS mode fix valid
                              3 = 'P' PPP mode fix valid
                              4 = 'R' RTK Fixed
                              5 = 'F' RTK float
                              6 = 'I' Free inertial
                              7 = 'W' WAAS
                              8 = 'S' OmniStar normal VBS
                              9 = 'H' OmniStar HP
                            }
  22  *
  23  NMEA checksum (XOR)
  24 <cr>
  25 <lf>
```

Examples:

$PIUDP,082949.690,01-29-2005,10,0.00,316.74,1.30,-0.61,0.00,0.00,0.00,0.00,317.32,6.80,1500.0,0,120,30.3878394,-81.5628697,304,8,D,1,4,0*25

$PIUDP,082952.271,01-29-2005,10,0.00,316.66,1.38,-0.61,0.00,0.00,0.00,0.00,317.24,6.79,1500.0,0,120,30.3878742,-81.5629067,304,8,D,1,4,0*29

Serial Out ID

Serial Out ID Selection

	Description	Valid id range Subsea- 1..9	Remarks
GGAv2	NMEA GGA version 2 string	**Any id**	It advisable to enable *Echo GPS* if ship id is selected
TTMT	NMEA Tracked Target Message True	**Subsea**	The target bearing with respect to True North from the GPS position or Ship Ref '**R**' position if enabled
WHOI AM	WHOI acoustic micro modem	**Ship only**	USBL/modem ORE TP3
TPD	Target Position Depth	**Any id**	Subsea targets id/lat/long/depth/time
RMC	minimum data to be provided by a GPS or Transit receiver	**0-10**	Must set priority target, A check sum is mandatory, data string should be transmitted at speeds of 1 hertz when used with the IPS.
TLL	NMEA Target id/Latitude/Longitude string	**Any id**	
DTF	IPS Database Format with ID	**Any id**	Contains all the tracking information
GGA/HDT/VTG	NMEA strings typically used for side scan sonar and sub-bottom profilers	**Any id**	Sends out three NMEA strings: GGA / HDT
STC 50 video	Horita Serial Control Titler	**Any id**	Adds Lat/Long and depth on top of video
TSS1	TSS1 format: heave, roll and pitch data string	**Any id**	
RDI DVL Depth/Zero	IPS command to RDI workhorse DVL to zero its depth sensor	**Subsea**	
TLD (Target Location Depth Tx)	Upon a query to IPS with the IPS $PITLR = Target Location Request will return the Targets position and depth	**Any id**	Typically used for imaging sonars to get a target's geodetic position
TC-100 Video Time Code Sync	To set this time code generator and video text overlay	**Any id**	Used with older 3-Beam systems
Horita Video	Horita PG-2100 time. IPS sets PG-2100 to PC clock	**Subsea**	Used with older 3-Beam systems

Platform UTM Nav	Provides a compact position (UTM), heading, roll, pitch, SV data string	**Any id**	Specific id required
Remote IPS Display ($PIUDP)	Remote display of all IPS data on another (or many) PCs	**None required all targets are supported**	

Error Messages

Target Tracking Error Messages

The following is a list of possible target tracking error messages that can occur when running the IPS program:

Target Tracking Errors:

0. No errors detected.

1. Error: Unusable signal received.

2. Error: Signal timing error.

3. Error: Range cannot be determined.

4. Error: Low quality factor.

5. Warning: Target velocity excessive.

6. Error: No recent replies.

7. Error: Minimum range error.

8. Error: Simultaneous reply error.

9. Error: Transmitter inoperative.

10. Error: Travel Time < Turn Around Time.

Telemetry Errors and Warnings:

22. Warning: Telemetry signal timing error.

23. Warning: Telemetry timing out of range.

24. Error: Telemetry depth greater then slant range.

26. Warning: No recent telemetry replies.

Warnings:

50. Warning: Target input depth not within normal limits of calculated depth.

51. Error: Pinger D.A. < 20 , with hydrophone offsets.

52. Error: Pinger D.A. < 20 .

53. Warning: Pinger D.A. < 20 - 45 . Position ».

54. Warning: Target centered mode canceled.

55. Warning: Compass not active.

56. Warning: Transponder or responder D.A. > 45 .

57. Error: Depth > Slant range.

59. Warning: No external key received.

60. Warning: System ignores the phase count depression angle.

61. Error: Horizontal range calculation > slant range

62. Warning: Auto offset enabled.

64 Warning: Low quality factor lower, quality factor lower than average previous 5 replies.

Lateral Positional Offset Errors

Table 1.

Lateral positional offset errors caused by small inaccuracy in the data from the support vessels compass about the actual or true headings. Ranges in the table are listed in meters. The underlined areas in the table highlight lateral positional errors of approximately 5 meters or less. See notes below for assumed conditions.

Horz. Range [meters]	0.5 Deg	1.0 Deg	2.0 Deg	3.0 Deg	5.0 Deg
150	1.3	2.6	5.2	7.9	13.1
300	2.6	5.2	10.5	15.7	26.1
500	4.4	8.7	17.4	26.2	43.6
750	6.5	3.1	26.2	39.3	65.4
1000	8.7	17.5	34.9	52.3	87.2
1500	13.1	26.2	52.3	78.5	130.7
2000	17.5	34.9	69.8	104.7	174.3

Notes:
Correct speed of sound is used.

Correct hydrophone offsets are used.

Hydrophone motion is corrected in the IPS with data from a vertical referencing unit (VRU), as done with a BATS system.

The above omitted any DGPS induced errors.

Support vessels compass headings contains no bias and is with respect to true North

Table 2.

Maximum tracking range in meters for beacons with and without depth telemetry. Note that the listed values have be rounded down to the closes hundreds of meters for clarity. The values in the table below are based upon a beacons turn-around-time (TAT) of 15 ms, a speed of sound of 1500 m/s and if used a depth telemetry Full Scale period of 1000 ms.

Interrogation Rate [sec]	Max Range [meters]	
	W/O Telemetry	**With Telemetry**
2.0	1400	700
3.0	2200	1400
4.0	2900	2200
5.0	3700	22900

Equipment Setup

RDI DVL Configuration

Objective: To configure the RDI Workhorse DVL to support the use of an external Attitude Heading Reference System (AHRS).

Figure 1. RDI Workhorse heading Alignment

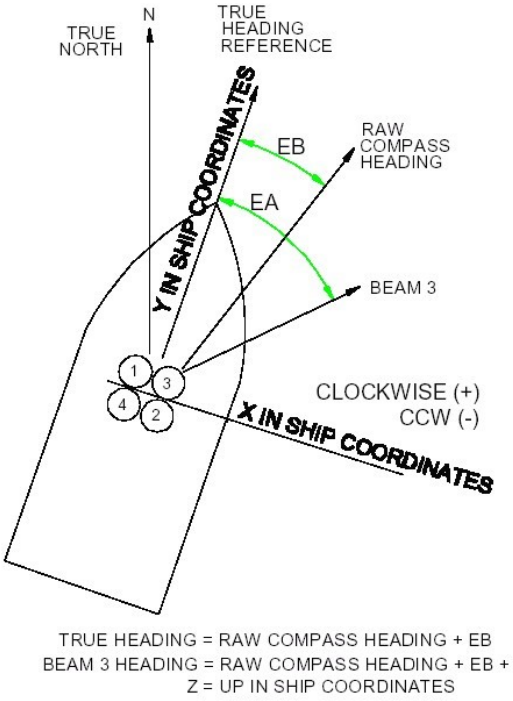


Table 1. Required DVL Configuration:

Item	Name	Description	Default	Setting
1	**CR**-Settings	Resets the DVL command set to factory/user settings. CR keeps the present baud rate and does not change it to ROM setting	*CR0*	CR1
2	**EA**-Heading Alignment	To reference beam 3 to vehicle centerline or Y-Axis, in 100th of degrees. Clockwise(+) see fig 1	EA00000	EA+04500
3	**EB**-Heading Bias	To convert compass heading to true magnetic reference (NOT USED) for JSL [100th of degrees]	EB00000	EB00000

4	**EC**-Speed of sound	Sets the DVL speed of sound value that is used to scale the velocity values by [m/s]. Note the actual speed of sound is determined by the onboard CTD and all velocities are scaled by the ratio of the CTD speed of sound to 1500 m/s	EC1500	EC1500
5	**EH**-Heading	Sets the DVL heading angle [100th of degrees]. Note **EZ** heading field = 0, the DVL uses the **EH** value instead of the DVL internal heading sensor.	EH00000	EH00000
6	**EP**-Pitch	Sets the DVL pitch angle [deg]. Note **EZ** Pitch field = 0, The DVL uses the EP value instead of the DVL internal pitch sensor.	EP0000	EP0000
7	**ER**-Roll	Sets the DVL Roll angle [deg]. Note **EZ** Roll field = 0, The DVL uses the ER value instead of the DVL internal roll sensor.	ER0000	ER0000
8	**ES**-Salinity	Sets the water's salinity value [PSU]	ES35	ES35
9	**ET**-Temperature	Sets the water's temperature [100th of deg C]. Note EZ temp field = 0, The DVL uses the ET value. This must be a constant otherwise the DVL will adjust the speed of sound and velocity values based upon a value of other then 1500 m/s. See **EC** above	ET2500	ET2500
10	**EX**-Coordinate Transformation	Sets the coordinate transformation processing flags. For JSL set so DVL provides the velocity components X,Y,Z wrt ship coordinates (see Fig 1). The **EA** command value is used, internal heading is not used and Roll/pitch will not be used since bit 3 of EZ =0. Bit fields: EX10…= Ship coord, EX..0.. = do not use DVL Roll/Pitch, EX…11 allow 3-beam solution and bin mapping	EX11111	EX10011
11	**EZ**-Sensor Source	Selects the source of the environmental sensor data. Format Ez*cdhprst* *c*- Speed of sound = 0 = manual **EC** 1500 *d* – Depth = 1 = DVL depth sensor *h* – heading = 0 = manual **EH** 0.00 *p* – pitch = 0 Manual **EP** 0.0 *r* – roll = 0 = Manual **ER** 0.0 *s* – Salinity = 0 = Manual **ES** 35 ppt *t* – temp = 1, (Manual **ET** 25.0 C)	EZ111111 1	EZ0**1**00001 Note: Depth and Temp required for Sound Velocity
12	**CF-**Flow ctrl	Flow Ctrl (EnsCyc;PngCyc;Binry;Ser;Rec) Auto ensemble, auto ping, bin, serial, no recording		CF11110
13	**CB-**Baud rate	DVL Serial port settings, defaults to 9600,8,1,n (CB411) Set to 19200,8,1,n (CB511)	CB411	CB511

14	**PD-**Data select	Selects the type of ensemble output data structure. Set to PD6 “Send a special DVL ASCII data stream”	PD0	PD6
15	**TE-**Time Per Ensemble	Sets the minimum interval between data collection cycles, default TE01:00:00.00	TE01:00:00.00	TE00:00:00.00
16	**TF-**First ping	TF- Time to First Ping. Sets the time to wake up DVL and start data collection	**/**/**,**:**:**	**/**/**,**:**:**
17	**TP-**Time Between Pings	Time Between Pings. Set the minimum time between pings.. Format TPmm:ss.ff (mm-Min, ss-sec, ff-hsec)	TP01:20.00	TP00:00.00
18	**BP-**Bottom Pings	Bottom Track pings per ensemble. Sets the number of bottom pings to average together in each data ensemble	BP001	BP001
19	**CK**	Save settings (Verify settings)		
20	**CS**	Start pinging		

Configuration settings

```
>B?
BA = 030 ----------------- Evaluation Amplitude Min (1-255)
BB = f934 ---------------- High Bandwidth Maximum Depth (dm)
BC = 220 ----------------- Correlation Magnitude Min (0-255)
BD = 000 ----------------- Delay Re-Acquire (# Ensembles)
BE = 1000 ---------------- Max Error Velocity (mm/s)
BF = 00000 --------------- Depth Guess (0=Auto, 1-65535 = dm)
BG = 0,30,000 ------------ Restricted Xmit: Enable; MaxXmit[%]; MaxXmit[ms]
BH = 3,0,0000 ------------ BM6 Configuration BW; Code; Velocity(cm/s)
BI = 020 ----------------- Gain Switch Depth (0-999 meters)
BK = 0 ------------------- Layer Mode (0-Off, 1-On, 2-Lost, 3-No BT)
BL = 160,0320,0480 ------- Layer:  Min Size (dm), Near (dm), Far (dm)
BM = 5 ------------------- Mode (4 = Def, 5 = Coherent, 6 = No Amb. Res.)
BN = 0,999 --------------- Speed Log Hold/Drop Control (hold=1,timeout)
BO = 025 ----------------- Distance Measure Filter Constant (1/100ths)
BP = 001 ----------------- Pings per Ensemble
BR = 0 ------------------- Resolution (0 = 4%, 1 = 2%, 2 = 1%)
BS ----------------------- Clear Distance Traveled
BW = 00001 --------------- Water Reference Interval (0-65535 pings)
BX = 02500 --------------- Maximum Depth (10-65535 dm)
BZ = 004 ----------------- Coherent Ambiguity Velocity (cm/s radial)

>C?
CA = 000 ----------------- Periodic Output 1/10 sec. (0-Off, [10-600])
CB = 511 ----------------- Serial Port Control (Baud [5=19200]; Par; Stop)
CF = 11110 --------------- Flow Ctrl (EnsCyc;PngCyc;Binry;Ser;Rec)
CK ----------------------- Keep Parameters as USER Defaults
CL = 1 ------------------- No Sleep Between Pings (0 = ON, 1 = OFF)
CN = 1 ------------------- Save NVRAM to recorder (0 = ON, 1 = OFF)
CR # --------------------- Retrieve Parameters (0 = USER, 1 = FACTORY)
CS ----------------------- Go (Start Pinging)
CT = 1 ------------------- Turnkey (0 = OFF, 1 = ON)
CX = 0 ------------------- Trigger Enable (0 = OFF, 1 = ON)
CY = 8800C000 ------------ Clear Error Status Word
```

CZ ---------- Power Down Instrument
>CK
[Parameters saved as USER defaults]

>E?
EA = +04500 ---------- Heading Alignment (1/100 deg)
EB = +00000 ---------- Heading Bias (1/100 deg)
EC = 1500 ---------- Speed Of Sound (m/s)
ED = 00000 ---------- Transducer Depth (0 - 65535 dm)
EF = 100 ---------- Pressure Smoothing Constant (1-100,100=off)
EH = 00000 ---------- Heading (1/100 deg)
EP = +0000 ---------- Tilt 1 Sensor (1/100 deg)
ER = +0000 ---------- Tilt 2 Sensor (1/100 deg)
ES = 35 ---------- Salinity (0-40 pp thousand)
ET = +2500 ---------- Temperature (1/100 deg Celsius)
EX = 10011 ---------- Coord Transform (Xform:Type; Tilts; 3Bm; Map)
EZ = 0000000 ---------- Sensor Source (C;D;H;P;R;S;T)

Ocatns AHRS Configuration

1. Verify Octans interface wiring (Subcon 16 pin connector):

Config RS232 (DB9)
GND-16 (5)
Tx-15 (2)
Rx-14 (3)

Port A (to IPS)
RS232 GND-10 (5)
RS232 Tx-3 (2)

Power (12 w)
19-35 vdc-1
GND-2

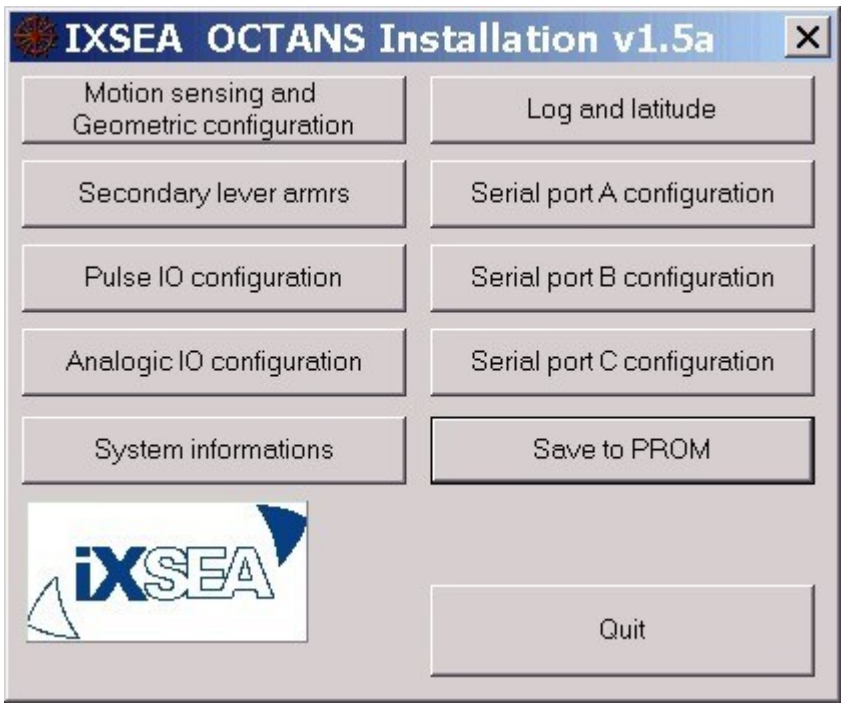
2. If not already installed, install the IXSEA programs "OCTANS Installation Software" (setup.exe).

3. Connect Octans configuration port to PC (typically com 1).

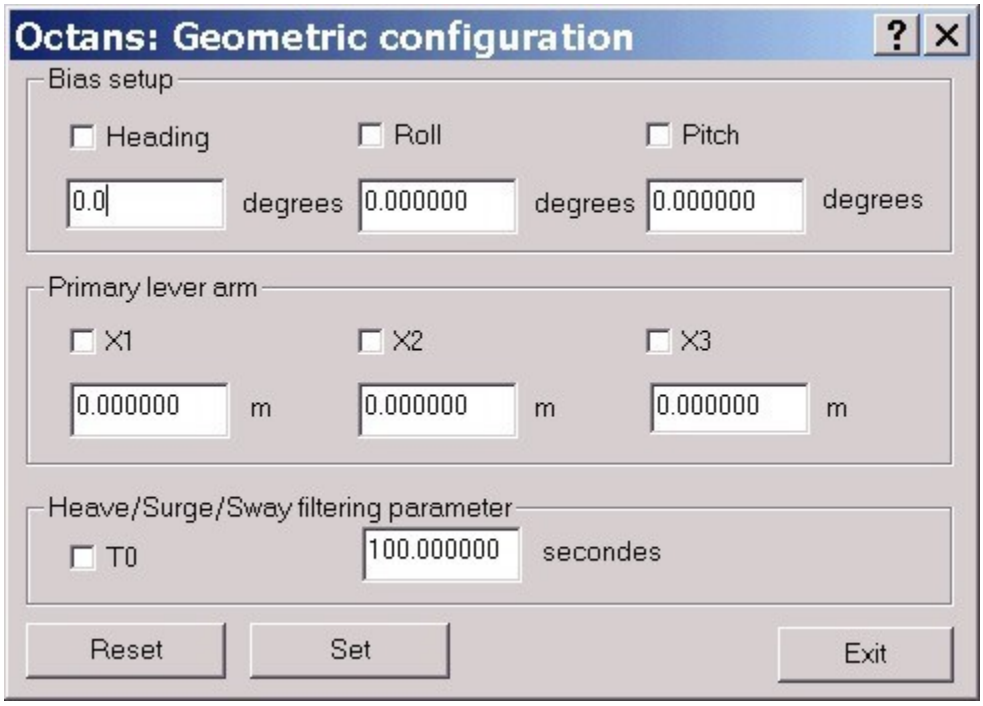
4. Launch the "OCTANS Installation Software.

5. Select the appropriate PC serial port.

6. If powered and the PC is interfaced correctly the following dialog box should be visible.

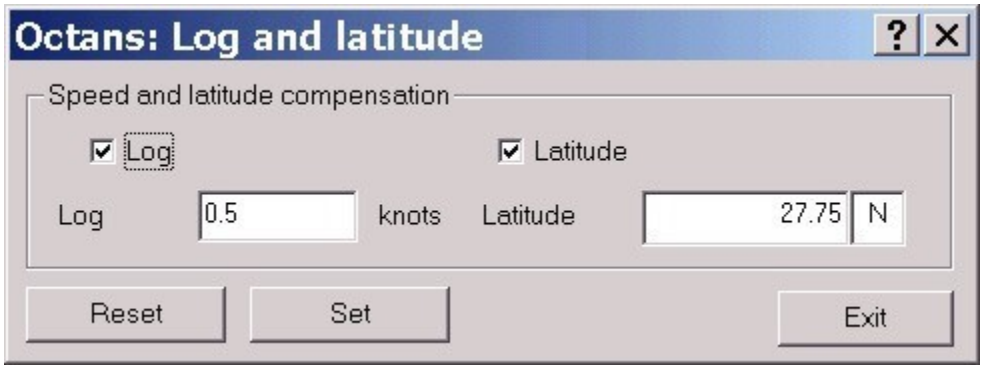


7. Set and verify the Octans heading, Roll and Pitch biases.



After any required value changes check the appropriate check boxes and select the Set button before exiting the dialog box.

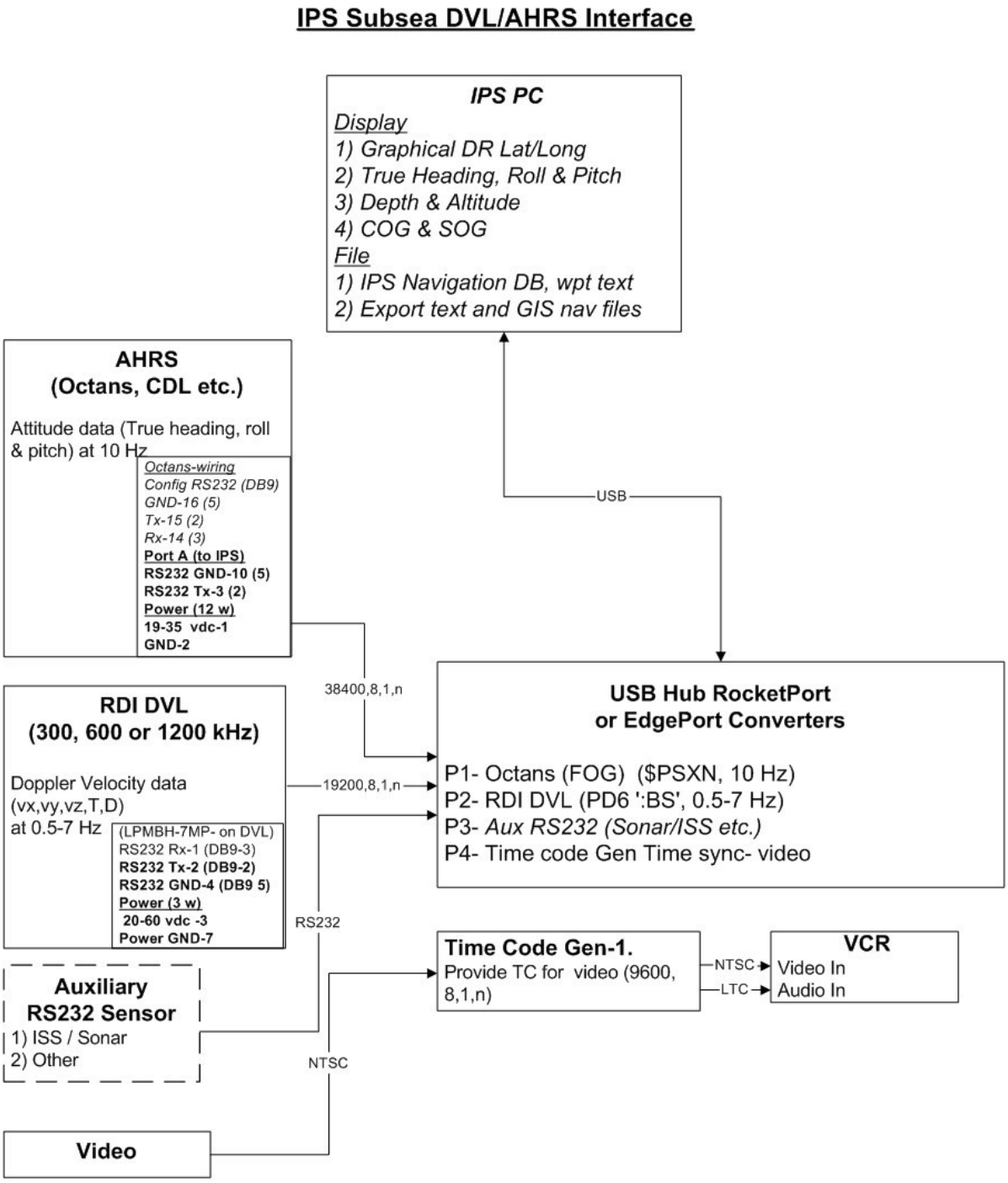
8. Set and verify the Speed log and latitude information.



After any required value changes select the "Set" button before exiting the dialog box.

11. Save the configuration to the Octans PROM by selecting the Save To Prom button from the main menu.
12. If changes were made verify that the Octans stored the changes correctly by accessing the above configuration dialog boxes.

DVL/AHRS Interface



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