DISCOVER 4200

USER SOFTWARE MANUAL

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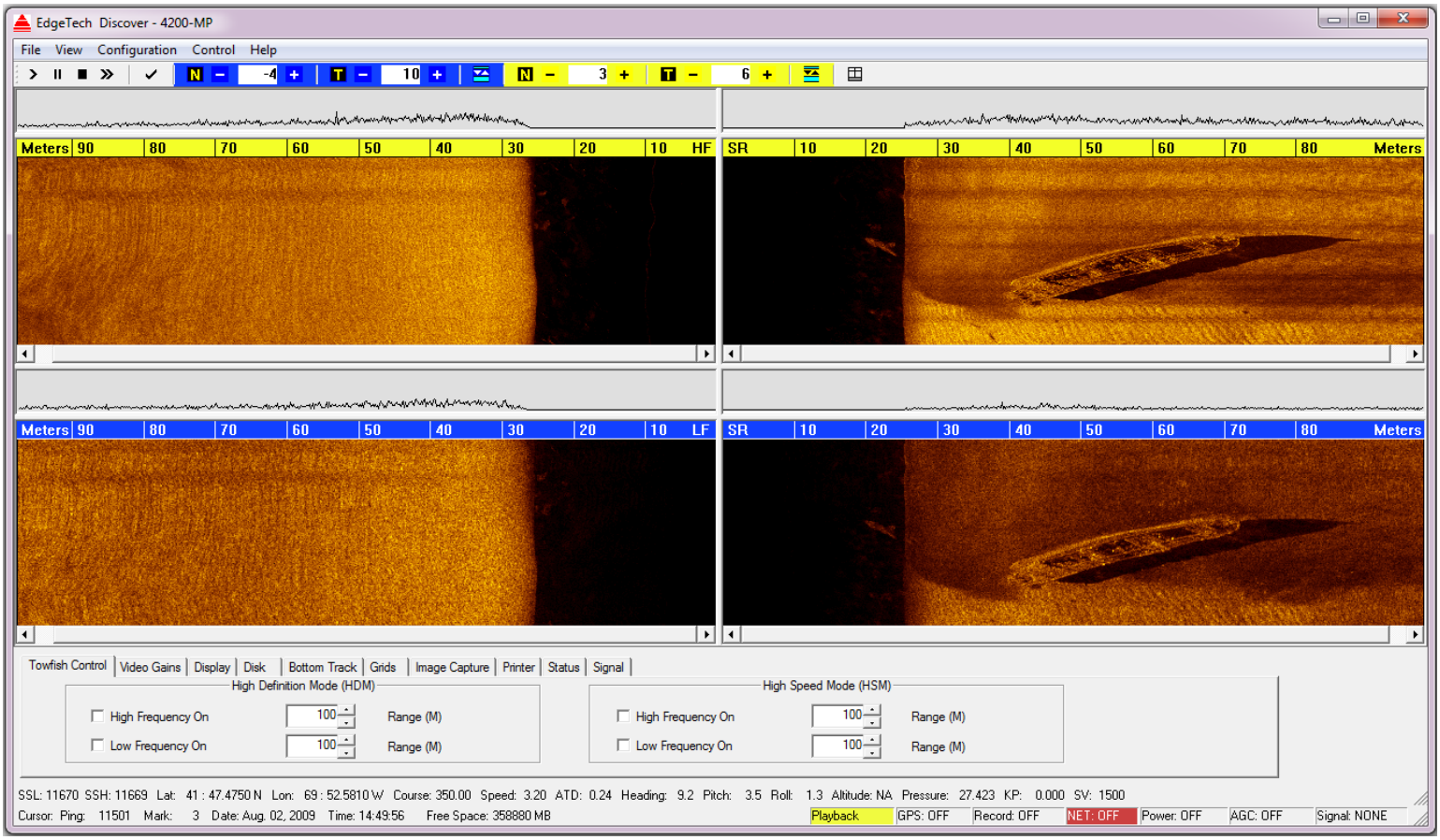
10/13/2017



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ABOUT THIS DOCUMENT

Thank you for purchasing our DISCOVER 4200 survey software. At EdgeTech, it is our policy to provide high-quality, cost-effective products and support services that meet or exceed your requirements. We also strive to deliver them on-time, and to continuously look for ways to improve them. We take pride in the products we manufacture, and want you to be entirely satisfied with your software.

Purpose of this Manual

The purpose of this manual is to provide the user with information on the setup and use of EdgeTech's DISCOVER 4200 survey software. Although this manual encompasses the latest operational features of the product, some may be periodically upgraded. Therefore, the information in this manual is subject to change and should be used for reference only.

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Revision History

REV	DESCRIPTION	DATE	APPROVAL
2	Release to production	01/2011	HS
A	Update formatting and content	09/2016	HS
B	Removed Target Logger & Coverage Mapper Sections	12/2016	CC
C	New Discover features	10/2017	HS

Cautions and Notes

Where applicable, cautions and notes are provided in this manual as follows:

CAUTION! Identifies a potential hazard that could damage equipment or data.

NOTE: Recommendations or general information that is particular to the material being presented.

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EdgeTech provides software services free of charge. This software agreement does not address customer-specified modifications or enhancements. These services may be ordered separately. Furthermore, EdgeTech software upgrades are meant for the sole use of EdgeTech customers. Any reproduction of EdgeTech-supplied software or file sharing is strictly prohibited.

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- Software enhancements that are not on the price list
- Software fixes and changes
- Product integration
- Documentation updates to on-line help
- Tests for compatibility with other modules

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- Minor software enhancements
- Software fixes and changes

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- Respond within 24 hours via Telephone, Facsimile, and E-mail Support
- Immediately attend to serious problems affecting operations
- Attempt to find an immediate work-around

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Customer service personnel at EdgeTech are always eager to hear from users of our products. Your feedback is welcome, and is a valuable source of information which we use to continually improve these products. Therefore we encourage you to contact EdgeTech Customer Service to offer any suggestions or to request technical support:

> **NOTE:** Please have your system Serial Number available when contacting Customer Service.

E-mail:	service@edgetech.com
Mail:	4 Little Brook Road West Wareham, MA 02576
Telephone:	(508) 291-0057
Facsimile:	(508) 291-2491
24-Hour Emergency Technical Support Line:	(508) 942-8043

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COMPANY BACKGROUND

EdgeTech traces its history in underwater data acquisition and processing back to 1966 when it was then called EG&G Marine Instruments. EdgeTech has designed, developed, and manufactured products, instruments, and systems—for the acquisition of underwater data, including marine, estuarine, and coastal applications—for over 50 years.

The company has responded to the needs of the scientific, Naval, and offshore communities by providing equipment—such as sub-bottom profilers, side scan sonar, acoustic releases, USBL positioning systems, and bathymetric systems—that have become standards in the industry.

EdgeTech has also consistently anticipated and responded to future needs through an active research and development program. Current efforts are focused on the application of cutting-edge CHIRP and acoustic technology.

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1.0 OVERVIEW

DISCOVER is EdgeTech's proprietary survey software that is provided with each Side Scan and Sub-Bottom system. This manual documents the version designed specifically for both the portable and rackmount versions of the 4200 Side Scan Sonar System.

DISCOVER works by signaling the hardware to send out a linear CHIRP pulse, and then interpreting the echoes that are received. The echo signals are amplified and band-limited to encompass useable array bandwidth, and then digitized. The pulse compression and echo separation is achieved through CHIRP Matched Filtering (MF). For each transmitted pulse, MF is implemented in digital signal processing (DSP), where the echo data is digitally correlated with a replica of the transmit signal. The CHIRP waveform processing provides both signal gain during the pulse compression, and out-of-band noise rejection.

The end result is high-quality images of the seafloor that can be both viewed in real-time in the program's "waterfall" display, and recorded as a JSF file or XTF file for later playback.

1.1 Key Features

Along with the crisp images that EdgeTech's DISCOVER software helps to obtain and display, its ease-of-use both during and post-survey sets it apart from other survey programs. A few of these aspects are highlighted below:

- High/Low Frequency Waterfall Displays
- A-Scan Pane
- Data recording and playback
- NMEA GPS Navigation input
- Sonar commands and controls
- Sonar diagnostics
- Ping (return) number
- Manual Marks
- Event/Fix Marks (sent to DISCOVER from a Custom GPS string or a switch Closure from Topside back panel)
- Thermal printer support for waterfall data output

1.1.1 Side Scan Sonar

Side scan sonar module is the main screen users will see during a survey or when viewing data. It contains the controls for manipulating the tow vehicle's output, such as power level, range settings, and trigger settings, along with a waterfall display of sonar echoes themselves for both high and low frequency.

> **NOTE:** Most images in this manual are taken from the DISCOVER 4200-MP version, which is almost identical to DISCOVER 4200-SP, with the few exceptions. The exceptions are called out within this text.

1.1.2 Dual-Simultaneous Sonar Display

Because the 4200 system is dual-frequency (100/400 kHz, 100/600, 300/600, or 300/900 kHz), the software displays and records both high and low frequencies simultaneously. This feature makes target identification easier during a survey.

1.1.3 Data Sources

All data and command interfaces with the sonar sub-system are implemented using TCP/IP (Transport Control Protocol/Internet Protocol). The source for Navigation (and other auxiliary data) is via Serial port on the processor. A USB-to-serial adaptor may be necessary if the third-party navigation system does not offer direct USB-to-USB interfacing. EdgeTech also allows for direct serial input to a serial port adaptor.

1.1.4 Flexibility of the JSF Format

DISCOVER records data using EdgeTech's native JSF file format, which has the advantage of not reflecting run-time display settings, such as screen gain, software TVG settings, etc. This allows these settings to be fine-tuned post-survey. JSF files do reflect any settings that directly affect the Sonar System's Operation, such as transmitted Pulse, Range and Transmit Level.

DISCOVER allows the user to record in XTF format, but cannot playback XTF files. XTF lack some of the flexibility offered by JSF format. Data recorded directly to XTF loses valuable system setting information that may prove useful for later error diagnosis.

> **NOTE:** Newer versions of XTF (V.34) do not record gain, lack valuable system setting information, and cannot be played back in DISCOVER.

For these reasons, EdgeTech recommends acquiring and archiving data in the native JSF format. JSF files can then be converted to XTF later if needed, but the reverse is not possible. DISCOVER automatically records in the JSF format.

1.1.5 Record during Playback

DISCOVER's playback and record options work independently, allowing useful options, such as:

- During playback – Record module may be started and stopped at any time
- During recording – Playback may be started, paused, and stopped at any time
- Playback – Data file source can be changed

The features above allow the user to concatenate several input files into one output file, and to "snip" a section out of an input file to make shorter output file.

> **NOTE:** During real-time data acquisition, only record is available and can log data in JSF and XTF simultaneously. Record can be started or stopped at any time during acquisition.

1.1.6 Third-Party Interfacing

The system may be optionally controlled in a limited manner (set recording path, ON/OFF pinging, range selection, etc.), and have its data recorded by a third party program. This is accomplished using a second dedicated Ethernet port on the 4200 topside processor, an Ethernet switch that networks both topside processors, or by running the third-party program on the 4200 topside processor. For more information, contact **EDGETECH CUSTOMER SERVICE**.

1.2 NMEA-type Message Annotation Input (via Serial Port)

The NMEA-type message annotation input allows the user to adjust settings between DISCOVER and a user-provided Navigation System via a Serial Port. See **NAVIGATION-ANNOTATION** for more detail.

1.3 Modules

DISCOVER 4200 has 2 external modules: Target Logger and Coverage Mapper.

1.3.1 Target Logger

The purpose of the Target Logger is to review and call out items of interest in the data. The enhanced Target Logger will install on machines with 4 GB RAM (or greater) and 64-bits OS, whereas the older Target Logger will install on machine with less than 4 GB RAM or 32-bit OS.

For more information on the enhanced Target Logger, see the provided addendum in the Manuals Folder: Target Logger Software Module Addendum [0018974].

For DISCOVER Target Logger features, see **EXTERNAL FEATURES**.

1.3.2 Coverage Mapper

The Coverage Mapper module provides a visualization of the area covered in a survey. This allows user to ensure that they have covered the entirety of a particular location. The enhanced Coverage Mapper will install on machines with 4GB RAM(or greater) and 64-bits OS, whereas the older Coverage Mapper will install on machines with less than 4 GB RAM or 32-bits OS.

For more information on the enhanced Coverage Mapper, see the provided addendum in the Manual Folder: Coverage Mapper Software Module Addendum [0018975].

For DISCOVER Coverage Mapper features, see **EXTERNAL FEATURES.**

2.0 DISCOVER 4200 USER INTERFACE

DISCOVER's Side Scan Sonar Module contains two waterfall displays for viewing the high and low frequency data in real-time or during playback. The interface, as shown **FIGURE 2-1**, also displays many display control and transmitter options. These features will be discussed in more detail below.

This section explains the features and controls of the side scan sonar module. An image of the overall DISCOVER window, without data is shown in **FIGURE 2-1**. As shown in **FIGURE 2-1**, the Main Display Window is split into four sections. The top two quadrants display the high frequency data, while the low frequency data is shown in the bottom two quadrants. Similarly, the right quadrants correspond to data coming in from the starboard transducers, while the quadrants on the left display data from the port side transducers. When only one subsystem is active (i.e., high or low frequency), the two quadrants for that system expand to take up the whole area, maximixing the available screen area. Each of the four data panes, (starboard/port and high/low frequency) have their own scale and **A-SCAN PANE**, which presents a crosssectional repesentation of the returning echoes. **FIGURE 2-2** shows DISCOVER 4200 with Data.

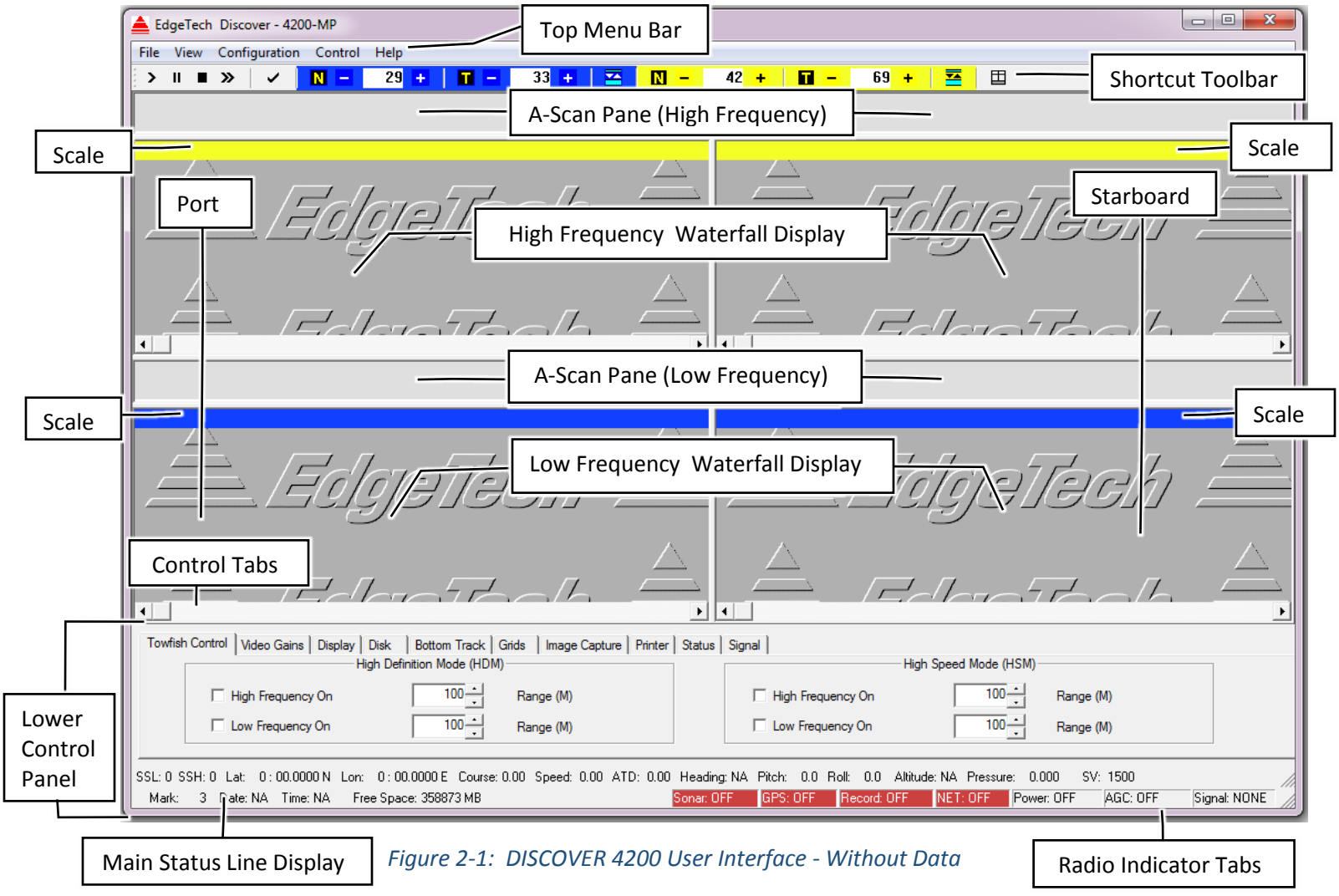

Figure 2-1: DISCOVER 4200 User Interface - Without Data

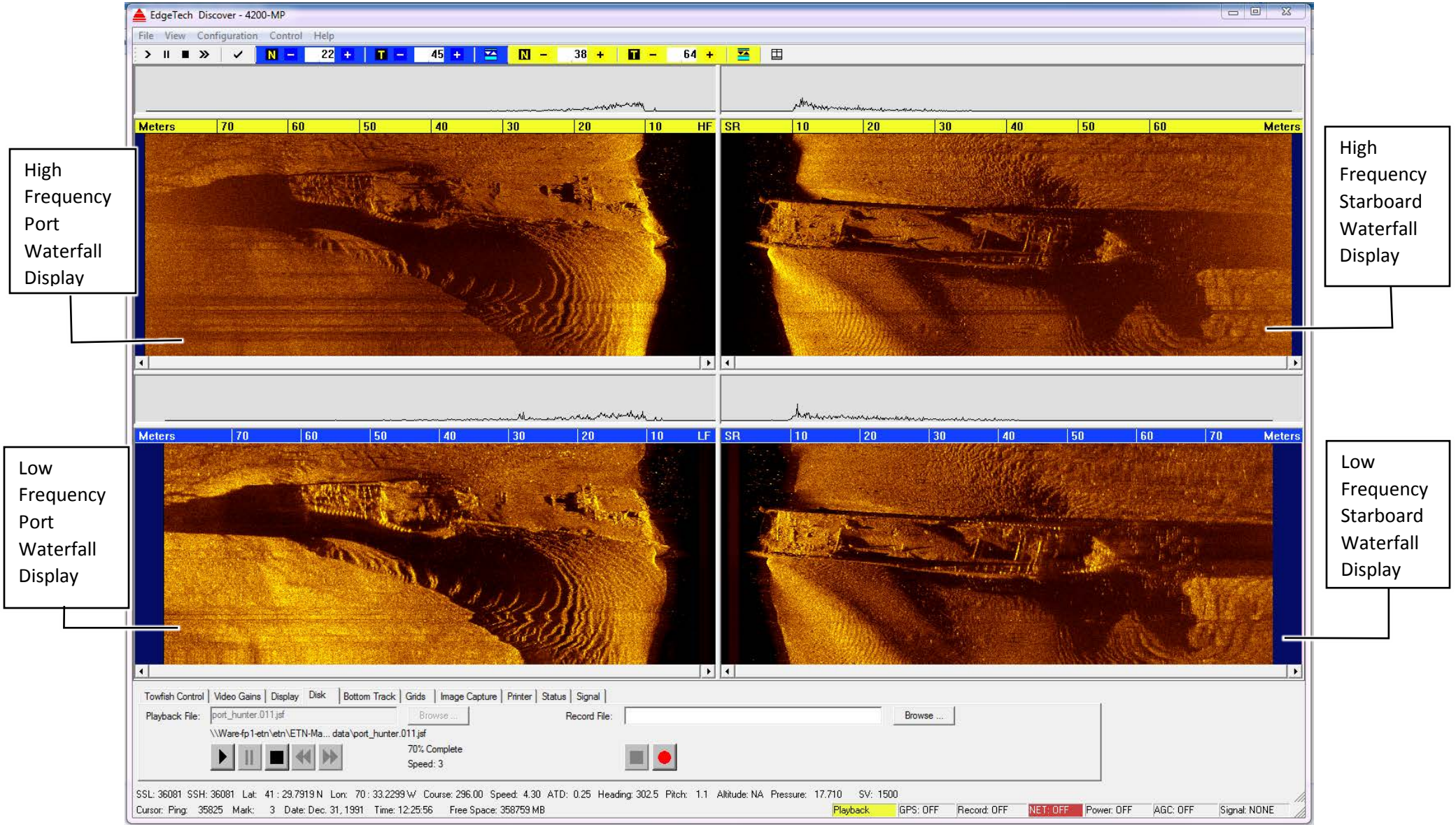

Figure 2-2: DISCOVER 4200 User Interface - With Data

The Discover 4200 Interface consists of the following:

Waterfall Display

Displays the Sonar records during real-time data acquisition or playback

A-Scan Pane

Displays the Low/High Frequency signal amplitude

Shortcut Toolbar

| Play, Pause Stop, Record | Normalize Low Frequency Gain, - / + Low Frequency Gain | Speed Correction |

| Normalize High Frequency Gain, - / + High Frequency Gain | Speed Correction | Reset Display |

Top Menu Bar

Provides control options

File

View

Configuration

| DISPLAY | RECORD | PRINTER | IMAGE CAPTURE | NAVIGATION | EXTERNAL FEATURES |

| SONAR PORT SETTINGS | SYSTEM TIME SET | TRIGGER | NETWORK | SERIAL PORTS |

| MULTIPULSE CALIBRATION | ALERTS | LAYBACK

|NAVIGATION - NMEA NAVIGATION CONFIGURATION | NAVIGATION OFFSETS | NAVIGATION OUTPUTS|

Control

| ADVANCED SONAR CONTROLS | EXTERNAL DEVICE CONTROLS | CONNECTION INFORMATION |

| DIAGNOSTIC INFORMATION | XTF OUTPUT CONTROL |

Help

Lower Control Panel [consists of 3 parts]

Sonar Controls

| TOWFISH CONTROL - DISCOVER 4200-MP | DISCOVER 4200-SP | VIDEO GAINS | DISPLAY | DISK |

| BOTTOM TRACKING | GRIDS | IMAGE CAPTURE | PRINTER | STATUS | SIGNAL (4200-MP ONLY) |

Main Status Line Display

Radio Indicator Tabs

There is more information on each display in the following sections.

2.1 Waterfall Display

The main display window area is split into four sections. The top two quadrants display the High Frequency Data, while the bottom two quadrants display Low Frequency Data. Similarly, the right quadrants correspond to data coming in from the starboard transducers, while the quadrants on the left display data from the port side transducers. When only one subsystem is active (i.e., high or low frequency), the two quadrants for that subsystem expand to take up the whole area, maximixing the available screen area.

The High and Low Frequency quarants of the Waterfall Display all contain the same tools, and functionality for examining data. These tools are described below.

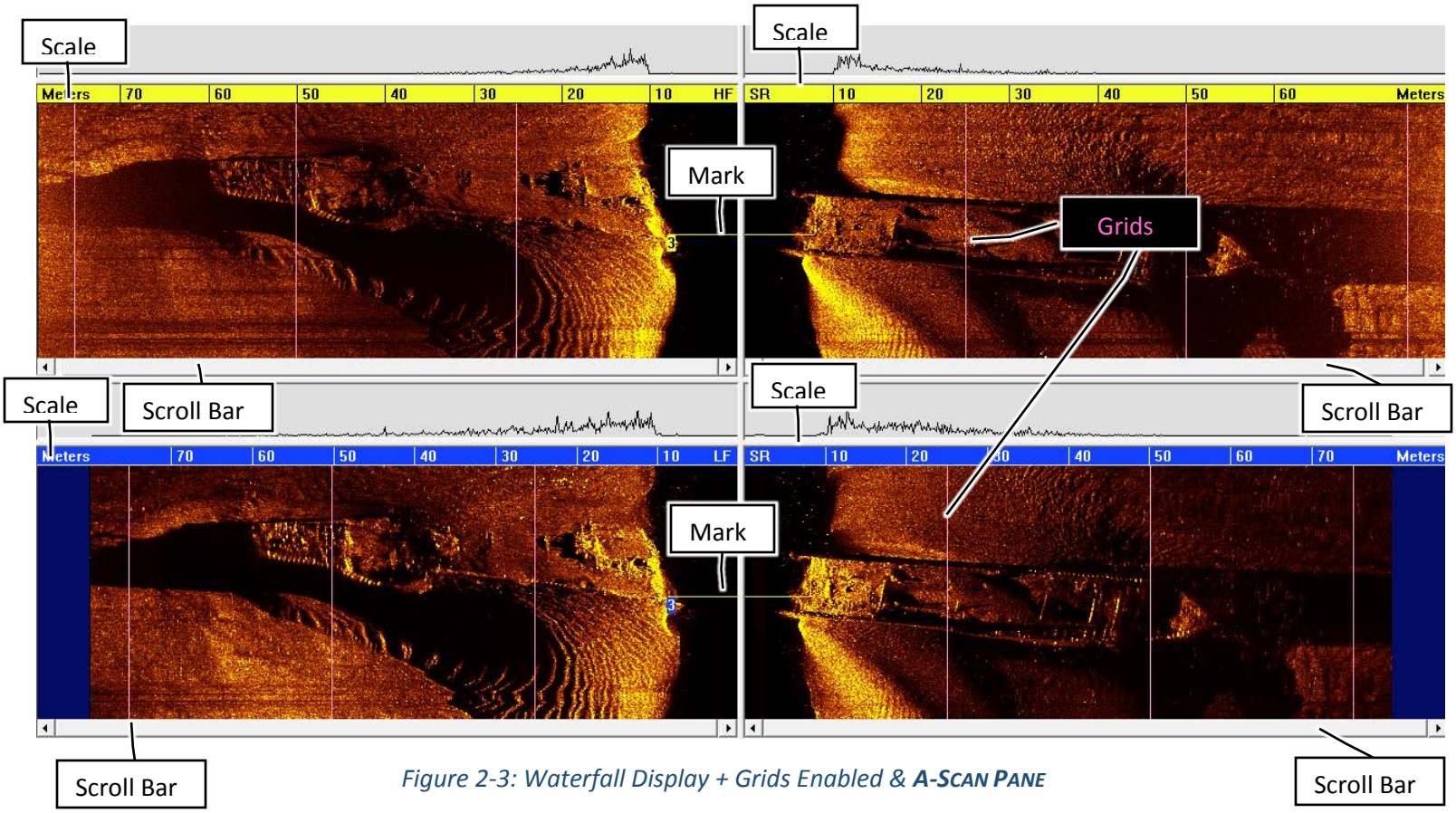

*Figure 2-3: Waterfall Display + Grids Enabled & **A-SCAN PANE***

Each pane (starboard/port and High/Low Frequency) have their own ruler and accompanying **A-SCAN PANE**, which presents a crosssectional repesentation of the returning echoes.

Data Window – Displays intensity of sonar return data

Scale – Reference for scale of data collected; can be set to Meters, Feet, Milliseconds and Yards. Scale is for display only and not recorded in .jsf.

> **NOTE:** To change the units on the scale, see the **GRIDS - SCALE.**

Zoom In – Press and hold the left mouse button and drag to select a zoom in region of the data

Zoom Out – Double Left-Click mouse and release to zoom out and display all data

Scroll Bar – Scroll up or down to pan around inside the data set inside the waterfall

Mark – Dashed line on waterfall indicates an event mark or annotation is present at that position

Grid Lines [Yellow] – A grid can be enabled to visualize data within a customizable, controlled structure

> **NOTE:** To Enable Grids, see the **GRIDS.**

2.2 Shortcut Toolbar

The Shortcut Toolbar performs many of the features already described, but without the need to navigate through the various tabs and menus. **FIGURE 2-4** provides a full depiction of the Shortcut Toolbar, while the figures that follow provide close-ups of its three segments with call-outs.

Figure 2-4: Shortcut Toolbar

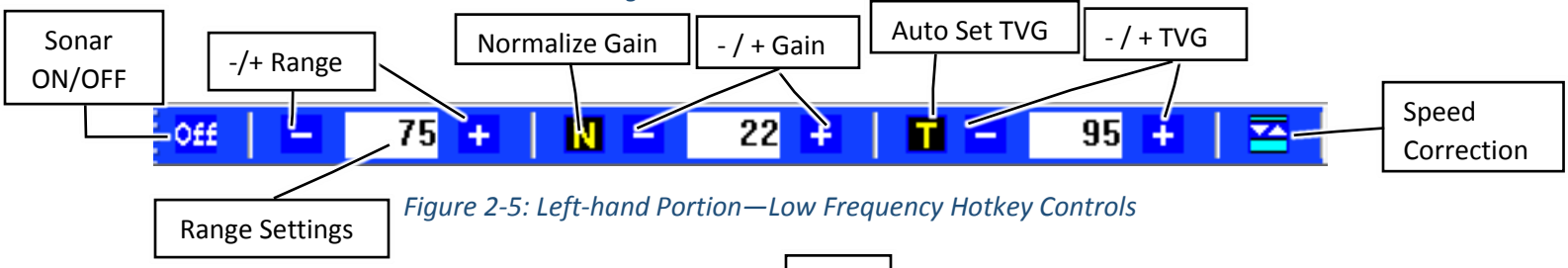

Figure 2-5: Left-hand Portion—Low Frequency Hotkey Controls

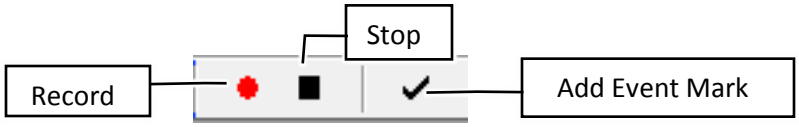

Figure 2-6: Center Portion

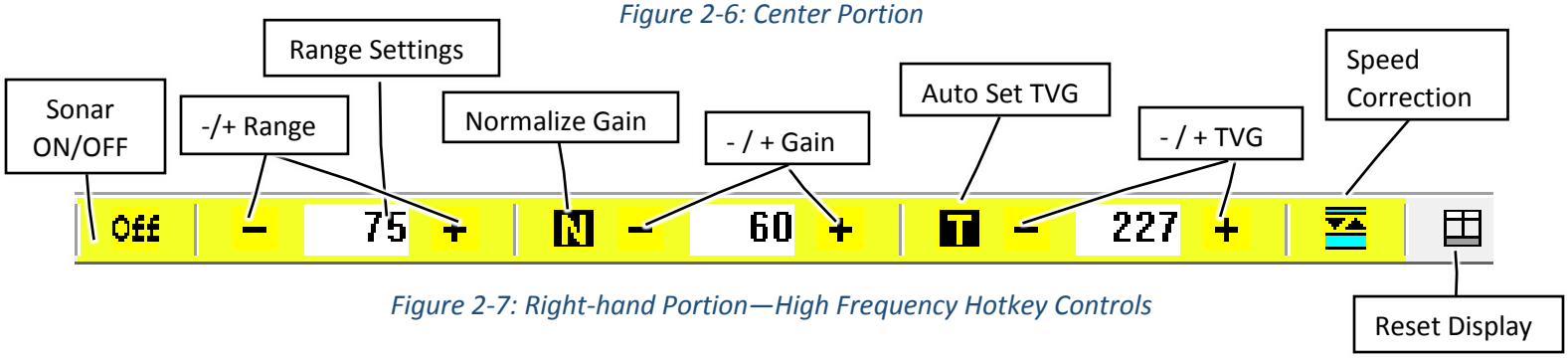

Figure 2-7: Right-hand Portion—High Frequency Hotkey Controls

Transmit ON/OFF – Toggles between Transmit ON/OFF

Range – The range of signal propagation, in meters, on the port and starboard sides.

- / + Range – Increasing the range will increase the distance of the signal propogration.

Normalize Gain – Recalculates scale factor, which is applied to data prior to display. This scale factor is chosen to cause Peak value of the return to just reach maximum intensity on Display, when the associated TVG value is set to 00dB. The scale factor is recomputed each time the normalized button is pressed.

- /+ Gain – The display gain setting is environmentally dependent and changes with use of Normalize Gain. Data with similar amplitudes will be correctly displayed once the Normalize button is pressed. Increasing gain will increase data amplification in the display. Decreasing gain has the opposite effect. Gain values are frequency dependant, but know in rare instances, negative gain can be used.

Auto Set TVG – A data-calculated Time Varied Gain based on ping returns; applied to data before display.

- / + TVG – Time Varying Gain in dB per 100 meters to apply to the pixel data. TVG is applied beginning at the seafloor. Bottom tracker must be enabled for this to work effectively only when seafloor is selected. In Combined Systems, Side Scan TVG can be set at time zero (origin) or Seafloor.

Playback – Starts playback. Clicking during playback will slow down the playback rate.

Pause – Pauses Playback

Stop – Stops Playback

Fast Forward – Speeds up the playback rate

Mark – Inserts a new mark and increments the mark number

Reset Display – Restores Displays to original configuration

2.3 A-Scan Pane

The returning echo, shown in the A-Scan Pane, is dependent on many factors, such as the environment, pings, and range. The receive signal amplitude, including display gains, will be plotted in the A-Scan Pane. Using the High and Low Frequency Hot Keys in the Shortcut Toolbar, optimize the input Gain and TVG to data received from towfish for ideal viewing and detail.

FIGURE 2-8 shows Discover without Normalized Gain and TVG. Notice the light areas and the difficult to view image in both the High and Low Frequency waterfalls. Contrast this with **FIGURE 2-11,** which shows the Normalized Gain and TVG. Notice the difference in Image quality. The A-Scan Pane displays the signal amplitude.

FIGURE 2-9, **FIGURE 2-10**, **FIGURE 2-12**, and **FIGURE 2-13** are cropped close-ups of High/Low Freq. A-Scan Pane.

HF: Contrast **FIGURE 2-9** (without Normalized Gain and TVG) with **FIGURE 2-12** (with Normalized Gain/TVG).
LF: Contrast **FIGURE 2-10** (without Normalized Gain and TVG) with **FIGURE 2-13** (with Normalized Gain/TVG).

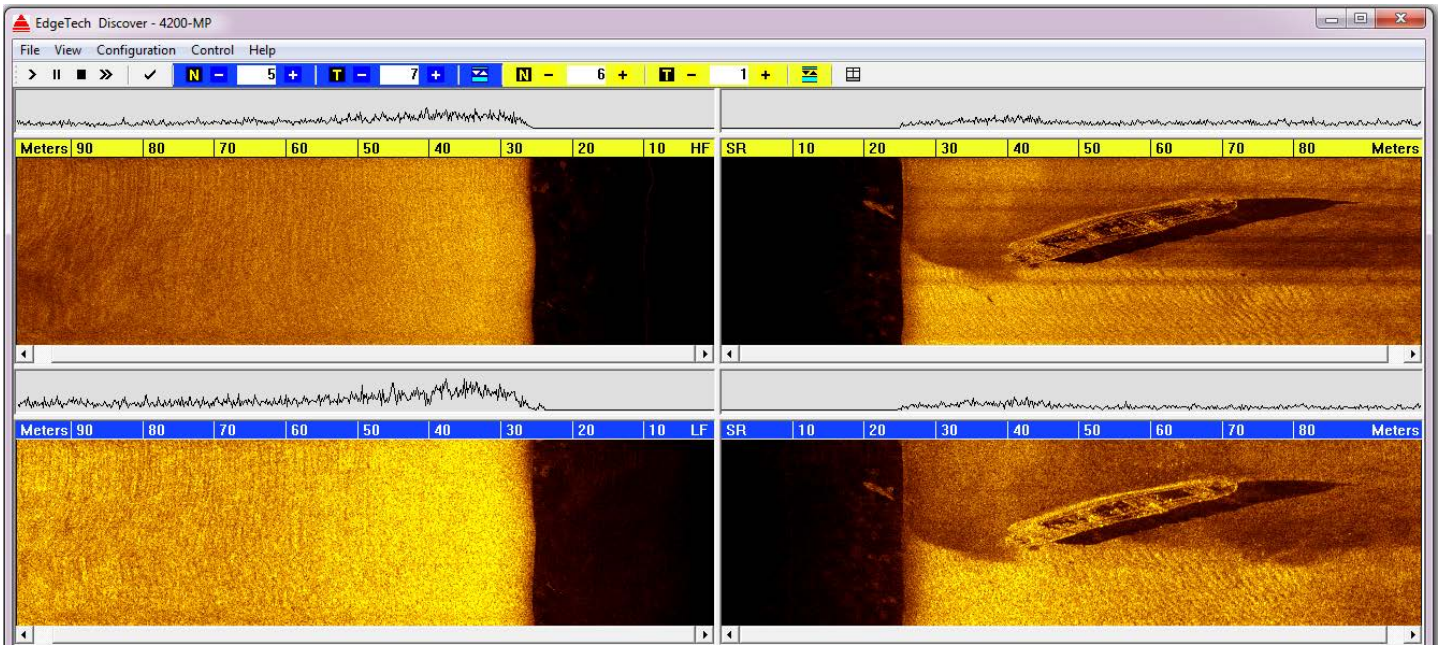

Figure 2-8: The DISCOVER (4) Waterfalls without Normalized Gain and TVG

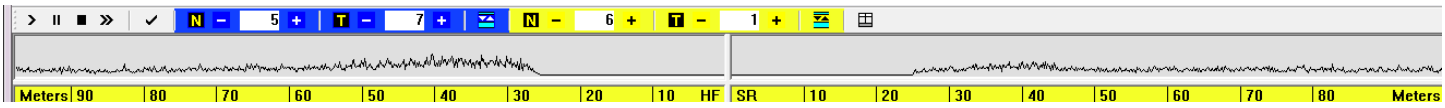

Figure 2-9: A Cropped Close-up of the High Frequency A-Scan Pane without Normalized Gain & TVG

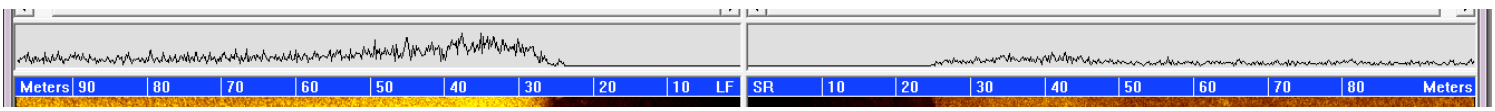

Figure 2-10: A Cropped Close-up of the Low Frequency A-Scan Pane without Normalized Gain & TVG

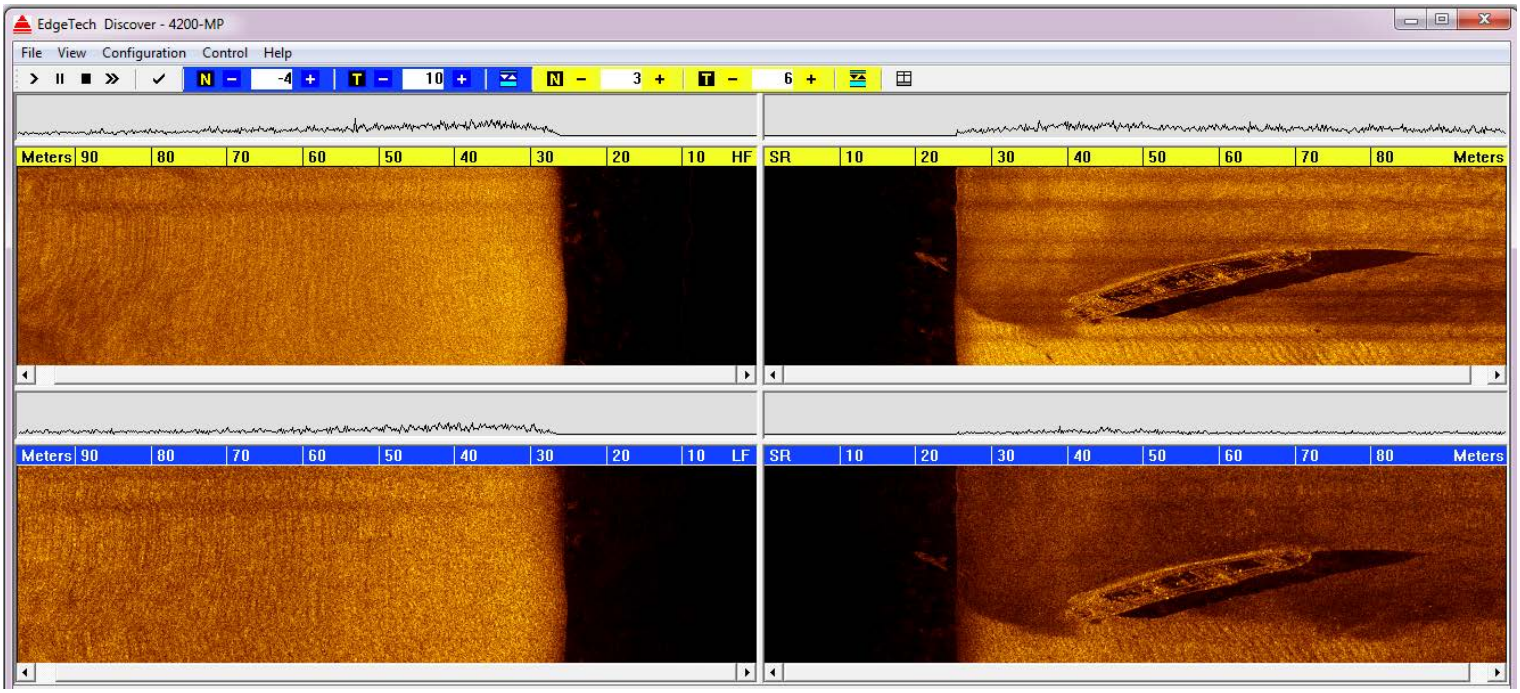

Figure 2-11: The DISCOVER (4) Waterfalls with Normalized Gain and TVG

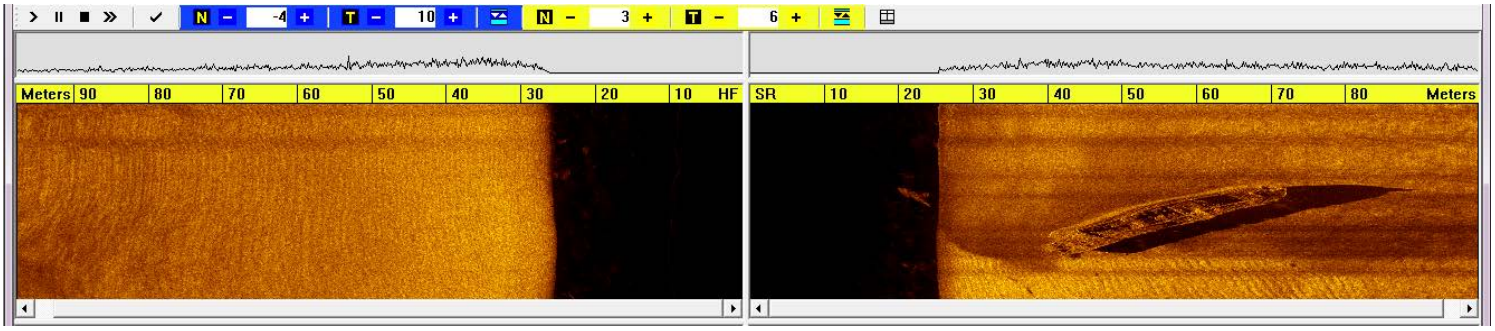

Figure 2-12: A Cropped Close-up of the High Frequency A-Scan Pane with Normalized Gain and TVG

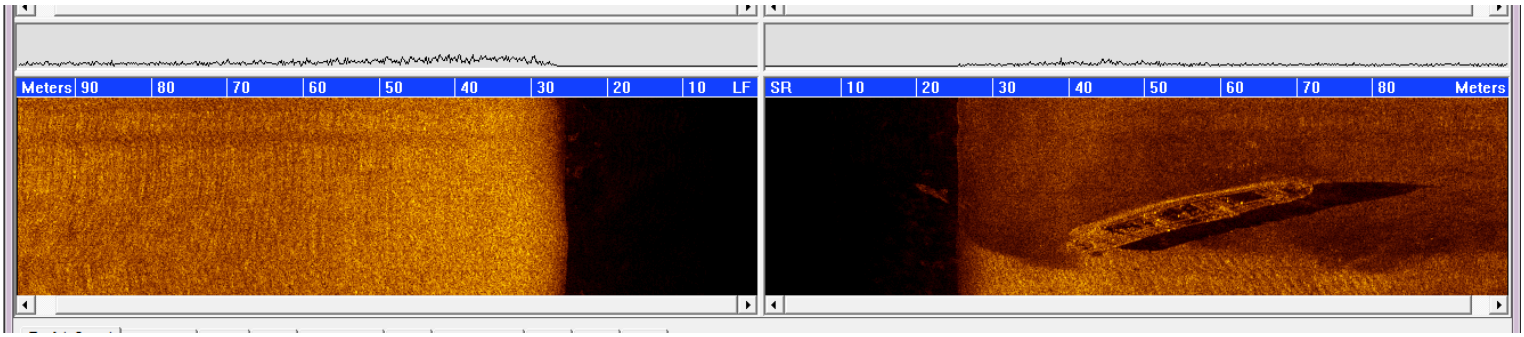

Figure 2-13: A Cropped Close-up of the Low Frequency A-Scan Pane with Normalized Gain and TVG

2.4 Top Menu Bar

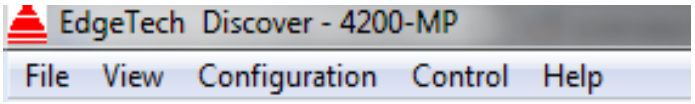

Figure 2-14: The DISCOVER Drop-Down Menu Options

Menus for the Side Scan Sonar module are described below.

FILE | VIEW | CONFIGURATION | CONTROL | HELP |

> **NOTE:** To see section sub-menus, see section first.

2.4.1 File Menu

In the File menu, the user can load configurations or save a configuration.

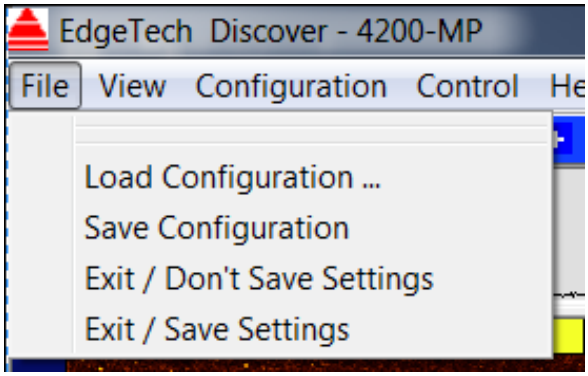

Figure 2-15: File Menu

2.4.1.1 Load Configuration

Loads configuration previously saved.

2.4.1.2 Save Configuration

Saves existing configuration.

> **NOTE:** The arrangement of DISCOVER will be saved, but not all the default value parameters will be saved.

2.4.1.3 Exit / Don't Save Settings

Exits without saving settings.

2.4.1.4 Exit / Save Settings

Exits and saves current settings in DiscoverLast4200MP.Jni or DiscoverLast4200SP.Jni

2.4.2 View Menu

Enable floating displays for the pitch/roll, altitude, depth, cable counter, and water depth values.

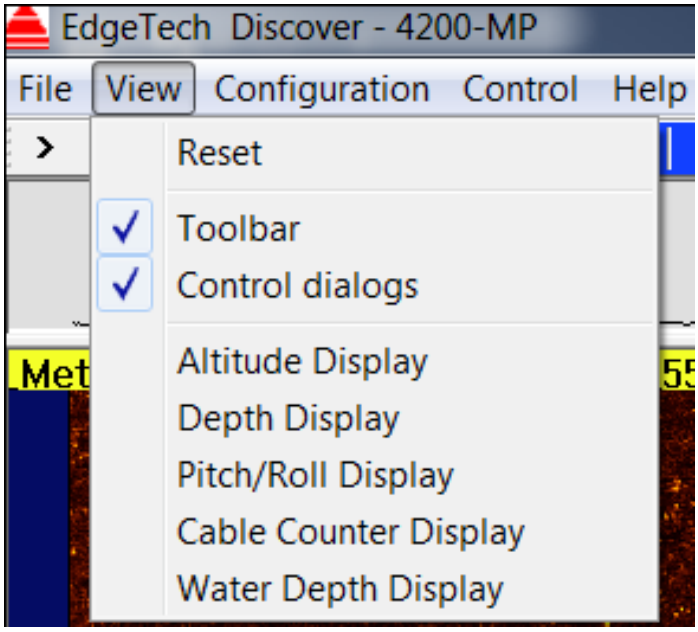

Figure 2-16: View Menu

2.4.2.1 Reset

If the user changes or customizes the size of the Low and High Frequency Waterfalls and/or **A-SCAN PANE**, this will restore these windows to default. Clicking this will not open a dialogue box.

2.4.2.2 Toolbar

(✓ Toolbar) shows the Toolbar is visible, and this is enabled by default. Displays or hides the Shortcut Toolbar.

2.4.2.3 Control Dialogs

(✓ Control Dialogs) shows the Control Dialogs is visible, and this is enabled by default. Displays or hides the Control Panel.

2.4.2.4 Altitude Display

Figure 2-17: Altitude Display Dialogue Box

Indicates towfish altitude above bottom as determined by bottom tracker. The user can enable an (audible and display) alert if altitude falls below specified value, see **ALERTS CONFIGURATION**. With this alert enabled and the tow fish moves too close to the bottom, this status will blink red (alert state).

2.4.2.5 Depth Display

Figure 2-18: Depth Display Dialogue Box

Displays the towfish depth if a pressure sensor option has been installed.

2.4.2.6 Pitch/Roll Display

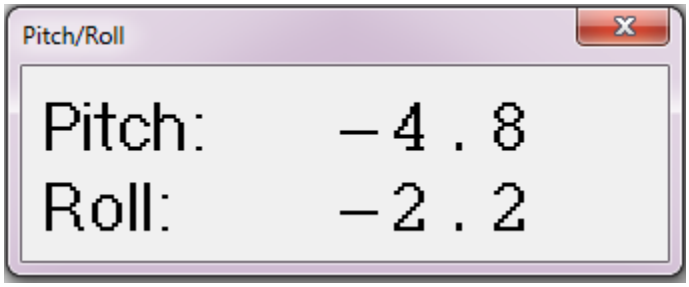

Figure 2-19: Pitch/Roll Display Dialogue Box

Displays the pitch and roll reading on the main status line if checked and the system is fitted with a required motion sensor.

2.4.2.7 Cable Counter Display

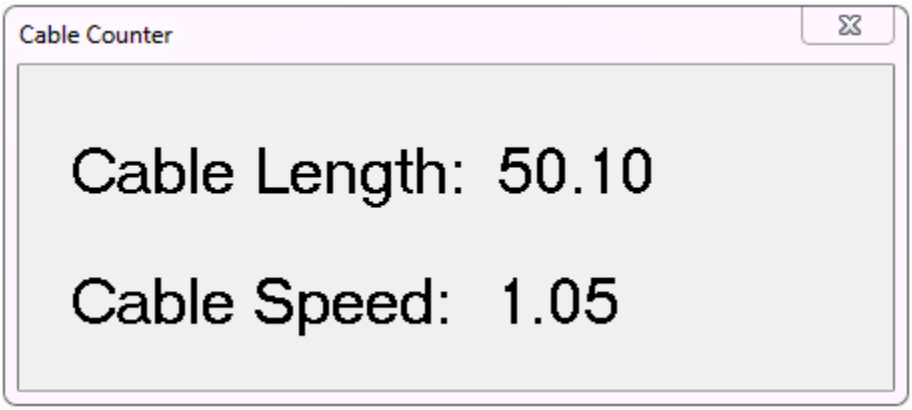

Figure 2-20: Cable Counter Display Dialogue Box

The Cable Counter is a valuable tool for estimating the position of the sonar in the water and for safely deploying or retrieving it. This dialogue shows the winched speed and length of cable pay-out. For more information, See **LAYBACK**.

The units for Cable Out Length and Cable Spooled Speed are as per the settings on the actual sensor (Metric or Imperial). For example, Hydrographic Smart Cable Counter can be set to feet or meters. The user must change the settings on the physical cable counter interface to display the preferred unit.

For more information, see **CABLE COUNTERS**.

2.4.2.8 Water Depth Display

Figure 2-21: Water Depth Display Dialogue Box

Displays the sum of the depth of the towfish and the towfish altitude above bottom as determined by bottom tracker, to provide an approximate overall water depth.

2.4.3 Configuration Menus

DISCOVER's Configuration settings are accessible by selecting the pull-down menu at the top of the screen.

DISPLAY | RECORD | PRINTER | IMAGE CAPTURE | NAVIGATION | EXTERNAL FEATURES | SONAR PORT SETTINGS | SYSTEM TIME SET | TRIGGER | NETWORK | SERIAL PORTS | MULTIPULSE CALIBRATION | ALERTS | LAYBACK

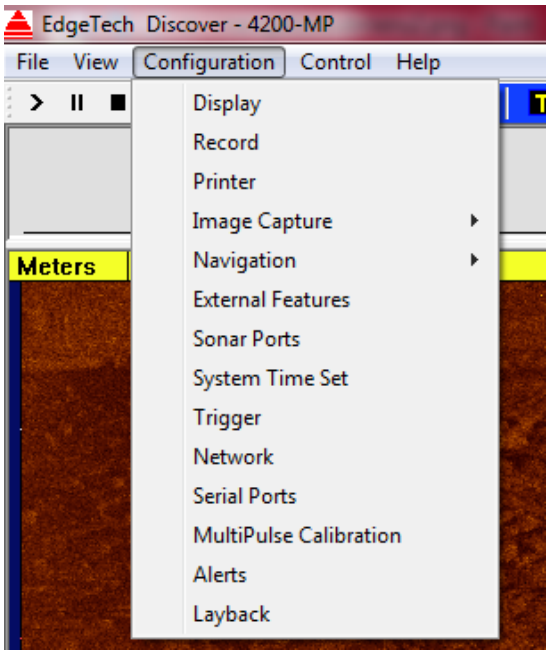

Figure 2-22: Configuration Menu

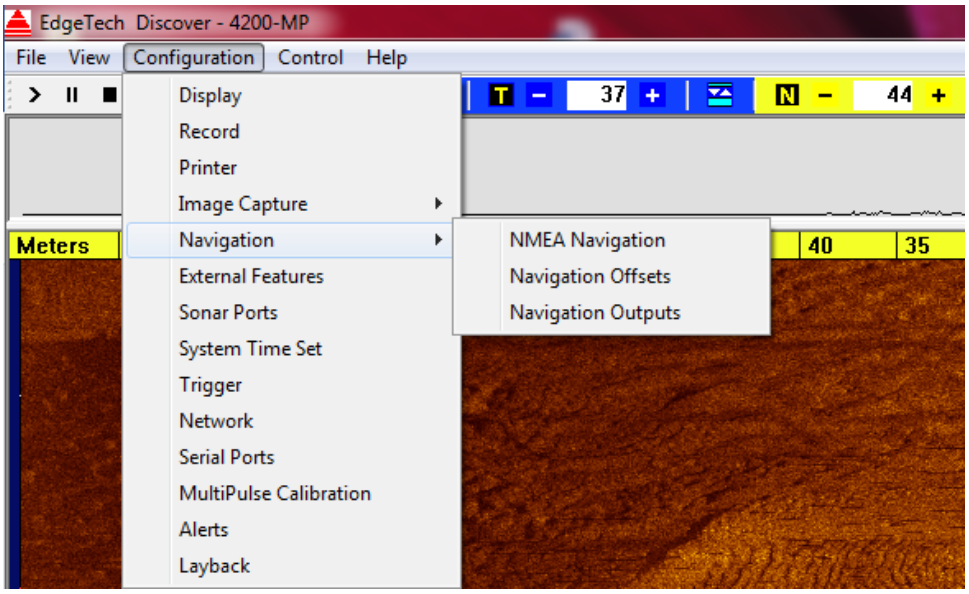

Figure 2-23: Navigation Configuration Submenu

| NAVIGATION | NMEA NAVIGATION | NAVIGATION OFFSETS | NAVIGATION OUTPUTS |

2.4.3.1 Display Configuration

The display configuration window allows the user to change the various settings for how the data is displayed in the waterfall. Except for Manual Speed and Altitude, which are recorded in the JSF file when checked, these settings do not affect the data recorded in a JSF file.

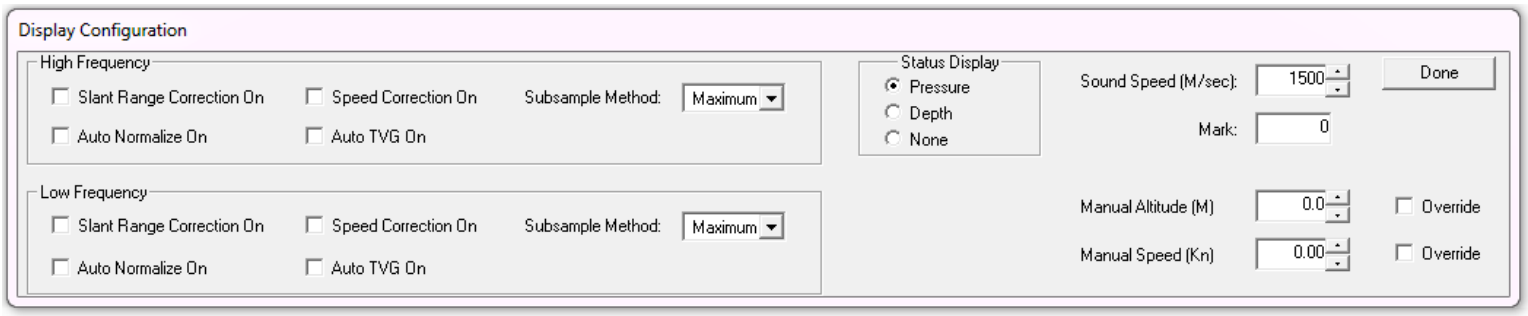

Figure 2-24: Display Configuration

AUTO NORMALIZE / AUTO TVG [Check Box]: To turn Auto Gain and Auto TVG on, start DISCOVER and Acquire or playback data by checking the Sonar ON boxes located in the Towfish Control Tab, as shown in **FIGURE 2-24**.

> **NOTE:** Display gain is applied to data recorded in the XTF format. EdgeTech's JSF format data is unaffected by this display scaling. The gain set automatically may be manually modified to suit, using + / - Gain.

When set to AUTO, the Gain and TVG windows are grayed out on the DISCOVER main window. The operator can still click the N and T buttons in the **SHORTCUT TOOLBAR**, as shown in **FIGURE 2-25**. These buttons should be used the first time the system starts acquiring sonar data to speed up the centering of the gains. The gains will increase or decrease the numbers in the grayed out boxes to achieve the proper values. Since the gains are based on range, it will take a few minutes of recording for the system to gather enough data to determine the correct values.

Figure 2-25: Display Buttons

DEPTH SOURCE [Check Box]: This allows the user to select Pressure, Depth, or None. This information is displayed in the bottom right side of DISCOVER window. If pressure calibration is necessary, see **2.4.4.2**.

SOUND SPEED [Numeric Display, Entry]: This selection allows the user to adjust the sound speed in water based on variations in temperature, salinity, and depth. Adjusting the speed of sound will affect the displayed range scale. Ping rates will remain unchanged. The default value is set to 1500m/sec.

SLANT RANGE CORRECTION ON [Check Box]: This selection allows the user to toggle the slant range correction on/off. In order for the data to be slant range corrected, the software must have a valid altitude measurement (e.g., be bottom tracking). If checked, the sea floor altitude from the bottom tracking feature is used to convert the standard slant range side scan data to a ground range data using a flat bottom assumption. The bottom track data may be overridden using the Manual entry box and checking the Override option.

SPEED CORRECTION ON [Check Box]: This selection allows the user to toggle the speed correction on/off. A speed corrected image is adjusted in the along track dimension to make the vertical display pixel cover the same length of ground as the CURRENT across (horizontal) track pixel size to present a geometrically correct image (i.e., square objects should appear square in the image). Consequently, changing the across track ZOOM factor will automatically affect the vertical display zoom. In order for the data to be speed corrected the system must be receiving a valid GPS (NMEA) input for speed over the ground or using manual speed override.

MANUAL ALTITUDE [In Meters]: This feature allows the user to manually force the Slant Range correction to use a certain fish altitude. In order to make the software accept the new value you must enable the override selection box. This feature is not recommended for use during real-time data acquisition. This feature is best used during playback in areas where it is difficult to automatically bottom track due to soft seafloor materials or suspended sediments in the water.

MANUAL SPEED [In Knots]: This feature allows the user to manually force the towfish speed to a certain value. In order to make the software accept the new value you must enable the override selection box. This feature is best used during playback on data that lacks the proper speed input from the navigation system. This value affects the image only when speed correction is enabled.

2.4.3.2 Record Configuration

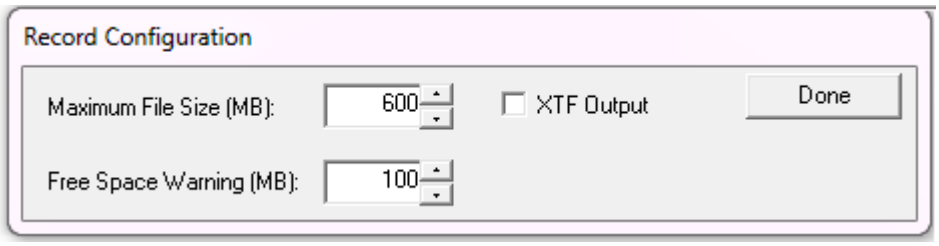

Figure 2-26: Record Configuration Window

The Record Configuration window allows the user to set the maximum file size before the current file is closed and a new one is automatically created during a survey. This feature is useful for breaking up long survey lines into small, easily-managed data files.

In this window, the user can also customize how much file space they would like to have left on the hard drive before receiving a warning. The default value for this setting is 100 MB. Finally, the user can choose whether to record data in XTF (eXtended Triton Format).

Finally, the user can choose whether to record data in XTF (eXtended Triton Format) alongside JSF files.

MAX FILE SIZE (MB): [Numeric Display, Entry]: Customizable maximum file size settings. Default: 600 MB.

FREE SPACE WARNING (MB): [Numeric Display, Entry]: Automatic warning when storage falls below set threshold. Default: 100 MB

XTF OUTPUT [Check Box]: User can choose data record format.

2.4.3.3 Printer Configuration

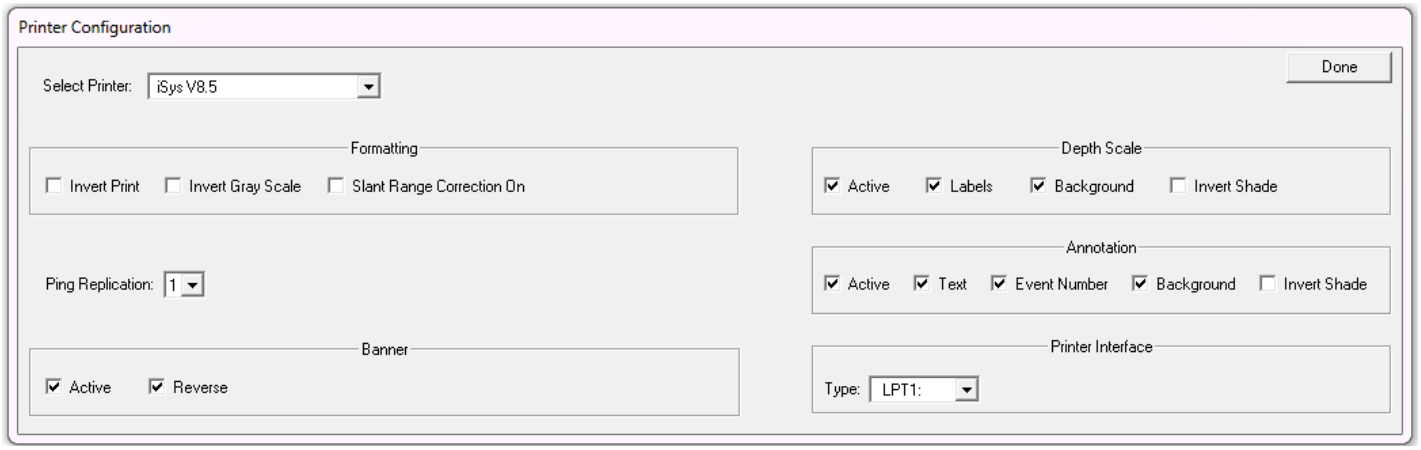

Figure 2-27: Printer Configuration Window

Printer Configuration allows user to select one of the currently supported thermal printers:

- EPC HSP 100
- EPC 1086-NT
- EPC 9206
- iSys V8.5
- TDU 850
- iSys v12
- Ultra 200
- Ultra 120
- Ultra 120-HD
- Ultra 200 HD
- EPC 1086
- EPC 1086 Old
- Geoprinter 975

> **NOTE:** Depending on your specific configuration, more or fewer printers may be supported. However, at this time, EdgeTech Topsides no longer supports parallel printers.

SELECT PRINTER [Drop Down Selection]: Choose a Printer.

FORMATTING

INVERT PRINT [Check Box]: Flips the port and starboard channel positions on the paper.

INVERT GRAYSCALE [Check Box]: Changes white to black and black to white.

SLANT RANGE CORRECTION ON [Check Box]: Toggle slant range correction on/off in printing.

PING REPLICATION [Drop Down Selection]: Changes the number of lines printed for each ping.

BANNER

ACTIVE [Check Box]: Turning banner on or off. Checked by Default.

REVERSE [Check Box]: Mirrors the banner at data record footer on printout. Checked by Default.

DEPTH SCALE

ACTIVE [Check Box]: Turns depth scale on or off. Checked by Default.

TEXT [Check Box]: Enables or disables Text in printouts. Checked by Default.

BACKGROUND [Check Box]: Checked by Default.

INVERT SHADE [Check Box]: Enables / disables invert shading in printouts. Unchecked by Default.

ANNOTATION

ACTIVE [Check Box]: Turns Annotations on or off. Checked by Default.

TEXT [Check Box]: Enables or disables Text in printouts. Checked by Default.

EVENT NUMBER [Check Box]: Enables / disables Event numbers in printouts. Checked by Default.

BACKGROUND [Check Box]: Checked by Default.

Invert Shade [Check Box]: Changes color of shadows to black. Unchecked by Default.

PRINTER INTERFACE

TYPE [Drop Down Selection]: Always select NETWORK, which allows connection to a wireless printer. LPT1, LPT2, LPT3 should not be selected as parallel printing is no longer supported. If a wireless printer is already hooked up to your computer, the IP address and Port number will auto populate. If it does not, you can manually enter it.

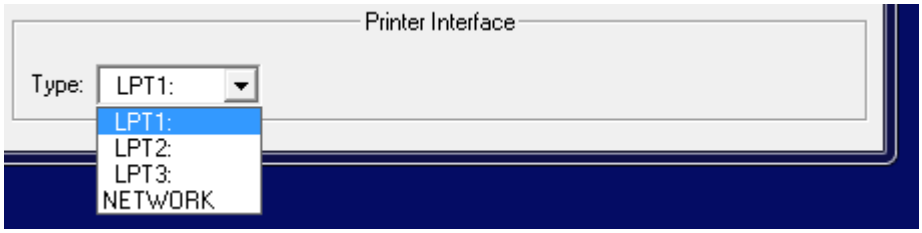

Figure 2-28: Printer Interface Dropdown

2.4.3.4 Image Capture Configuration (SSH and SSL)

Image Capture Configuration provides image capture options in SSH(Side Scan High) & SSL(Side Scan Low).

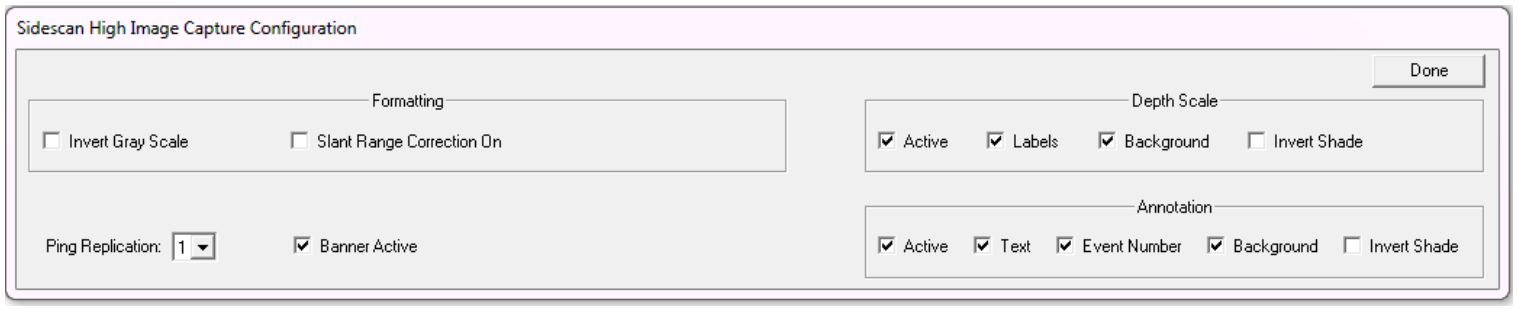

Figure 2-29: Image Capture Configuration Window

Many of these options are similar to what is described in **PRINTER CONFIGURATION**.

FORMATTING

INVERT GRAY SCALE [Check Box]: Enables Invert Gray Scale.

SLANT RANGE CORRECTION ON [Check Box]: Toggle slant range correction on/off in Image Capture.

PING REPLICATION: Changes the number of lines printed for each ping

BANNER ACTIVE [Check Box]: Checked by Default.

DEPTH SCALE

ACTIVE [Check Box]: Checked by Default.

LABELS [Check Box]: Checked by Default.

BACKGROUND [Check Box]: Checked by Default.

INVERT SHADE [Check Box]: Unchecked by Default.

ANNOTATION

ACTIVE [Check Box]: Enables / disables special annotations or messages send to a COM port in saved images. Checked by Default.

TEXT [Check Box]: Enables / disables Text in saved images. Checked by Default.

EVENT NUMBER [Check Box]: Enables / disables Event numbers in saved images. Checked by Default.

BACKGROUND [Check Box]: Enables / disables background in saved images. Checked by Default.

INVERT SHADE [Check Box]: Changes color of shadows to black in saved images. Unchecked by Default.

2.4.3.5 Navigation Configuration

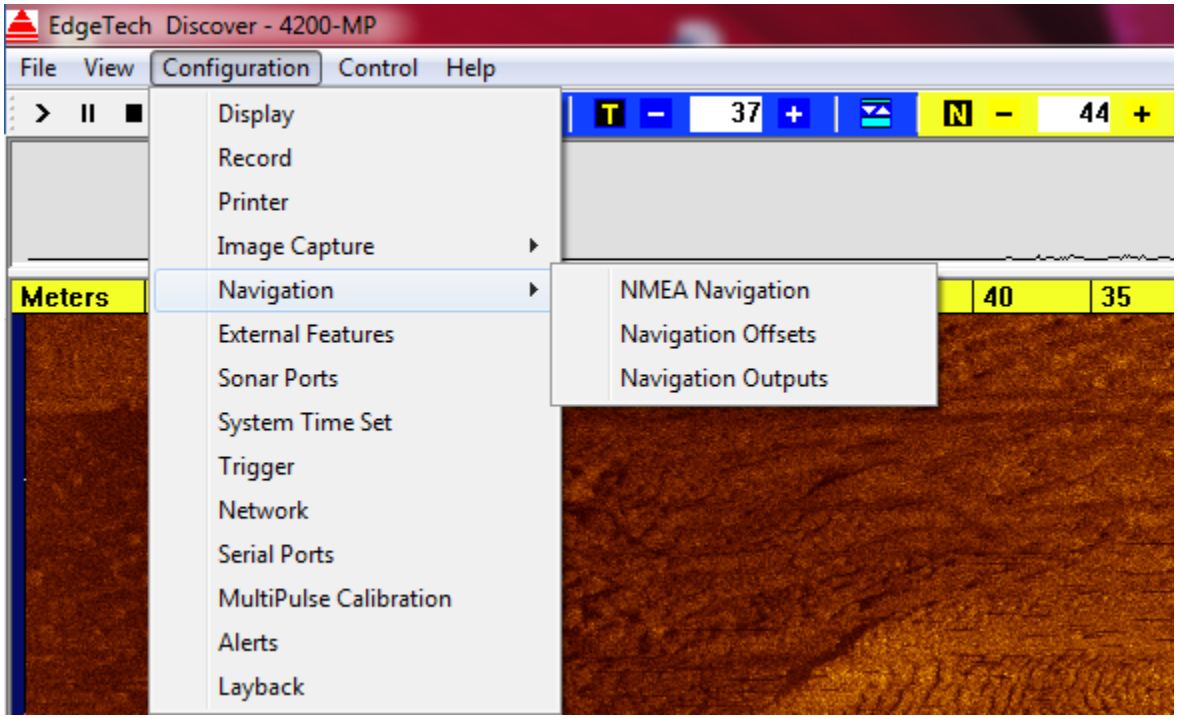

Figure 2-30: Navigation Configuration

The Navigation Configuration has three submenus:

NMEA NAVIGATION CONFIGURATION | NAVIGATION OFFSETS | NAVIGATION OUTPUTS

2.4.3.6 NMEA Navigation Configuration

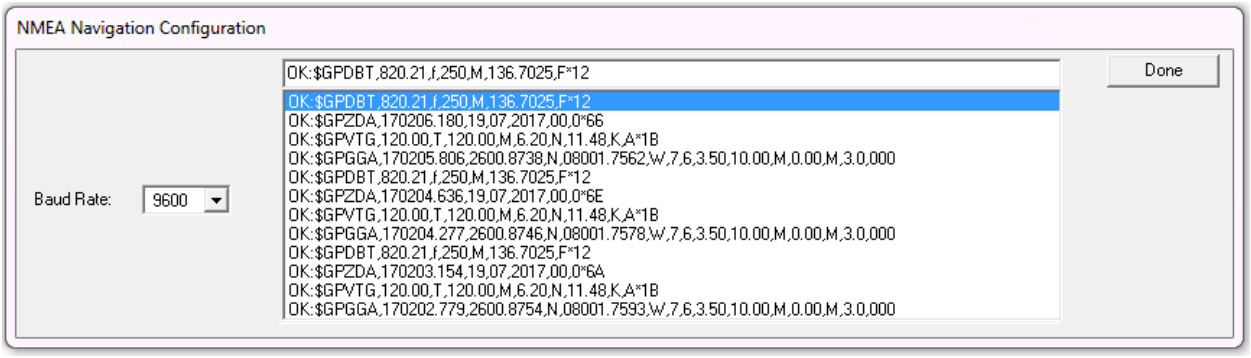

Figure 2-31: Navigation Configuration Window

The NMEA Navigation configuration window displays the last 12 message types at the baud rate that are received by DISCOVER. These are incoming messages to the DISCOVER serial port. The default baud rate is 4800.

BAUD RATE [Drop Down Selection]: Default: 4800. However, it can be set to 1200 – 115200.

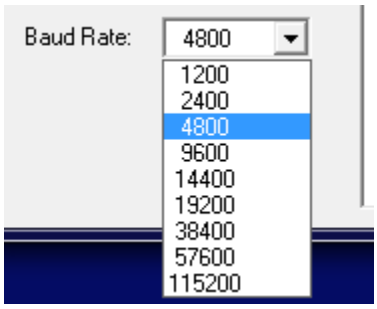

Figure 2-32: Baud Rate Options

These messages are described in more detail in **NAVIGATION-ANNOTATION**.

2.4.3.7 Navigation Offsets

Navigation offsets are used only for target location determination using the Target Logger module (for more information, see provided addendum 0018974). These values are recorded in the JSF files.

There are three sets of fixed offsets, each used for the following scenarios:

- Determining the position of the towfish versus the GPS antenna (Sensor Displacement)
- Specifically for hull mounted systems (Hull Mount Adjustments)
- For use with raw navigation information with known errors (Input Navigation Correction)

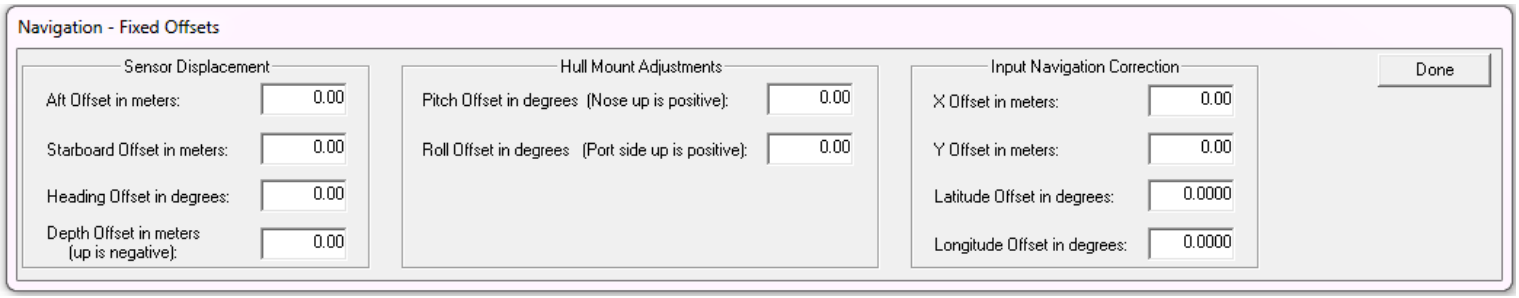

Figure 2-33: Navigation Offsets Window

> **NOTE:** The operator should log the Navigation Offsets and insert them every time the data is being played back.

SENSOR DISPLACMENT

AFT: This selection box allows the user to enter a layback distance value from the GPS antenna to the towpoint. A towpoint in front of the GPS antenna will have a negative value. This info is also recorded in the XTF.

DEPTH OFFSET: This selection box allows the user to enter a fixed offset for the towfish depth.

STARBOARD OFFSET: This selection box allows the user to enter a distance value from the GPS antenna to the towpoint. A towpoint on port side of the GPS antenna will have a negative value.

HEADING OFFSET: This selection box allows user to enter a fixed offset for heading information coming from the towfish, such as to correct for magnetic variation to get a true north estimate.

> **NOTE:** All Sensor Displacement information is very important if the DISCOVER Coverage Mapper and Target Logger applications are in use.

HULL MOUNT ADJUSTMENT: In hull mount configuration the towfish Pitch and Roll information needs to be corrected to the Pitch and Roll of the survey vessel to account for lever effect, hence the need to make some adjustments.

PITCH OFFSET: This selection allows user to enter a fixed offset for pitch information coming from the towfish.

ROLL OFFSET: This selection allows user to enter a fixed offset for roll information coming from the towfish.

INPUT NAVIGATION CORRECTIONS: Depending of the type of input navigation, UTM or Lat/Long, either the X & Y field or the Lat/Long fields need adjustment for known errors in the raw navigation input.

X OFFSET: This selection allows the user to enter a fixed offset for the Easting information.

Y OFFSET: This selection allows the user to enter a fixed offset for the Northing information.

LATITUDE OFFSET: This selection allows user to enter a fixed offset for latitude information.

LONGITUDE OFFSET*:* This selection allows user to enter a fixed offset for longitude information.

2.4.3.8 Navigation Outputs

The navigation outputs popup is accessible by navigating to **Configuration > Navigation > Navigation Outputs**. The window is shown in **FIGURE 2-34**.

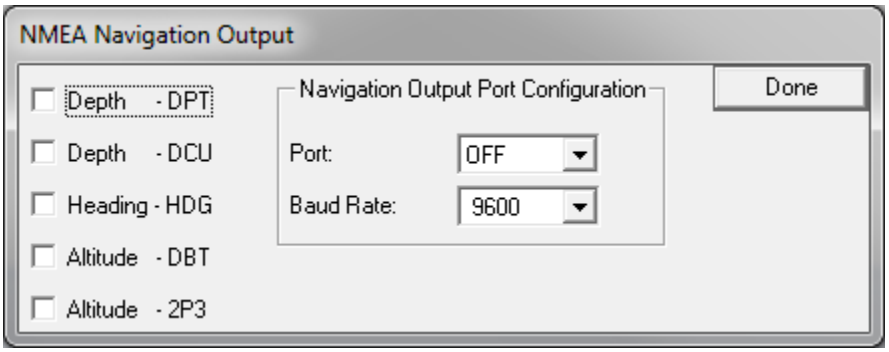

Figure 2-34: Navigation Output Popup

By checking off these boxes, user can choose the NMEA navigation message type DISCOVER will output. There are two ways to configure Output Port:

1. Set the Port and Baud Rate in the popup, which will edit the .jni files automatically.
2. Manually edit the DiscoverLast4200MP.jni/SP.Jni file under [OUTPUTSERIAL1] for 4200-MP/SP.

DEPTH– DPT [Check Box]: Standard Water depth.

DEPTH – DCU [Check Box]: Custom water depth output format

HEADING – HDG [Check Box]: Standard Heading – Deviation & Variation

ALTITUDE – DBT [Check Box]: Standard Depth Below Transducer

ALTITUDE – 2p3 [Check Box]: Custom Depth Below Transducer output format

NAVIGATION OUTPUT PORT CONFIGURATION

PORT [Drop Down Selection]: The serial port on the topside computer that will output the navigation data selected.

BAUD RATE [Drop Down Selection]: Default is set to 9600. Supported baud rates: 1200 –115200.

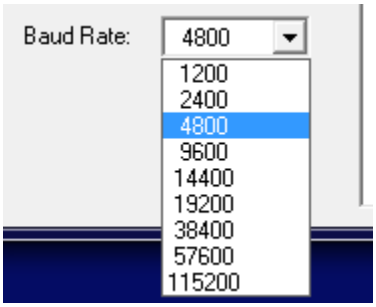

Figure 2-35: The Baud Rate Selection Drop Down

2.4.3.9 External Features Configuration

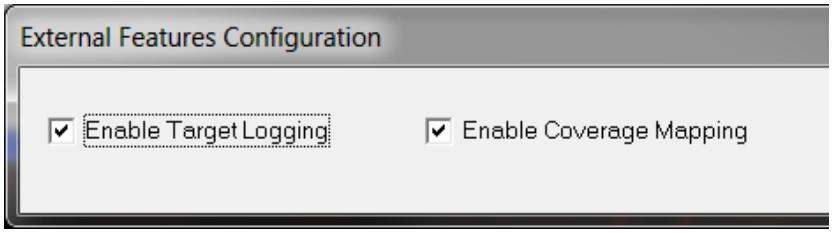

Figure 2-36: External Features Configuration

External features window enables / disables the Target Logger and Coverage Mapper modules.

> **NOTE:** Both Target Logger and Coverage Mapper are enabled by default.

ENABLE TARGET LOGGING [Check Box]: Turns Target Logger on and off.

ENABLE COVERAGE MAPPING [Check Box]: Turns Coverage Mapper on and off.

2.4.3.10 Sonar Port Setting

The Sonar Port Setting dialog box **FIGURE 2-38** provides a way to configure the RS-232 Serial or TCP/UDP ports in 4200 MP/SP towfish. Any one of two available RS-232 serial ports and TCP/UDP ports can be configured from this menu. To configure a port, enable the port by checking the Enable check box. Next, select the baud rate and appropriate parser, allowing the hardware to recognize the incoming data strings.

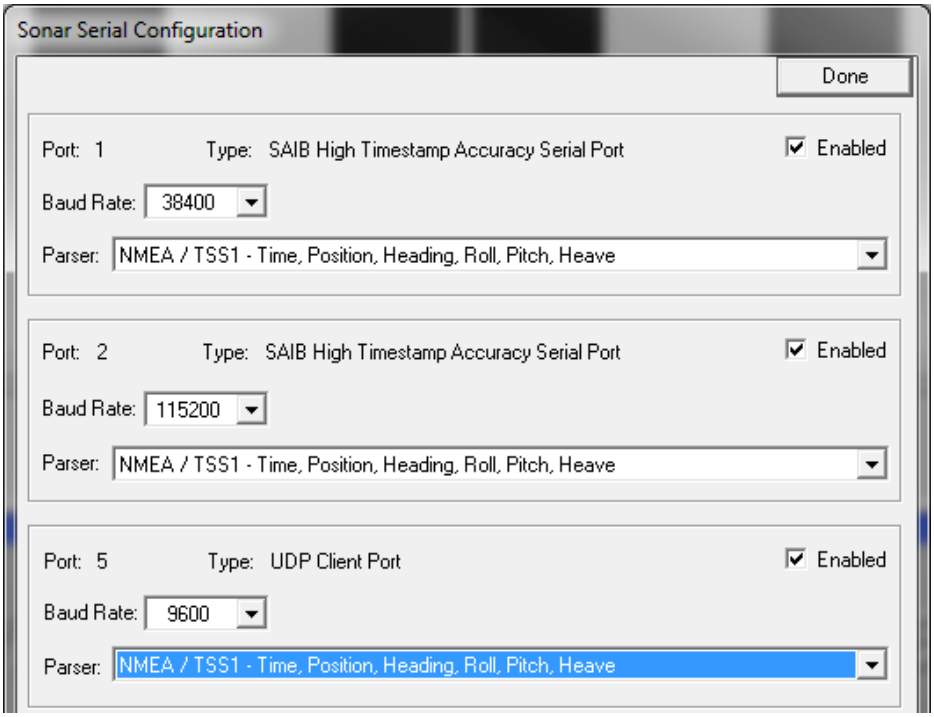

Figure 2-37: Sonar Serial Configuration

2.4.3.11 System Time Set Configuration

The system time set configuration allows the user to choose whether the topside computer should synchoronize with DISCOVER's time.

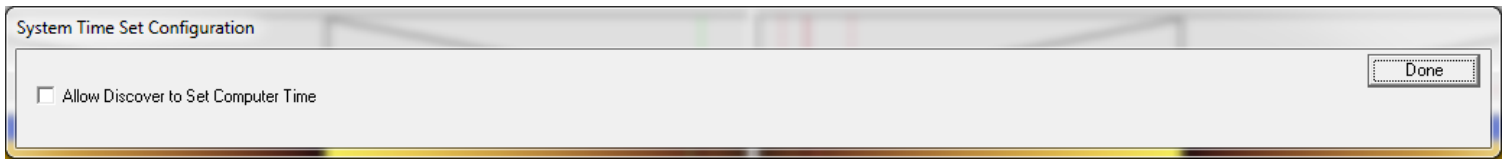

Figure 2-38: System Time Set Configuration

2.4.3.12 Trigger Configuration

From the trigger configuration window, the user can choose a Trigger Master, as well as enabling/disabling an External Trigger.

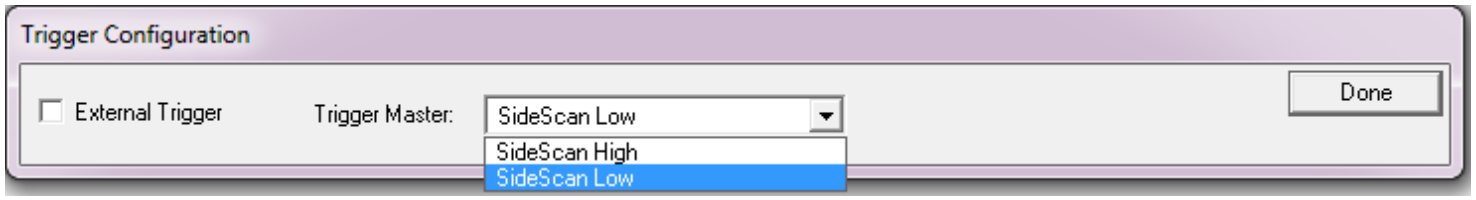

Figure 2-39: Trigger Configuration

The 4200 system supports either single frequency or simultaneous dual frequency operation. In simultaneous dual frequency mode, the two systems must be arranged to transmit at the same time to minimize inter-system interference.

In all but extreme circumstances, when running in dual simultaneous mode, the 4200 should be run with the SSH configured to be the master. If only one subsystem is active (high or low), selection of Side Scan High or Side Scan Low as master system will have no effect, and system will run at supported range rate.

EXTERNAL TRIGGER [Check Box]: Enables External Triggering. Unchecked by Default.

2.4.3.13 Network Configuration

The network configuration window allows the user to change the IP (Internet Protocol) address and control port number of the towfish.

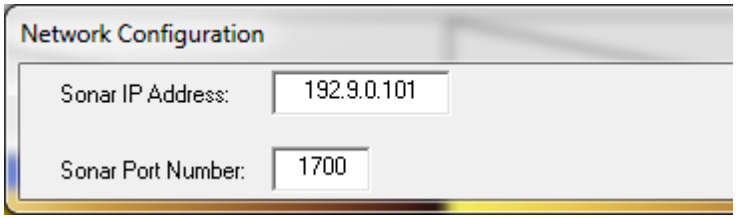

Figure 2-40: Network Configuration Window

CAUTION! DO NOT change this parameter unless a corresponding change has been made to towfish subsystem. This should only be done in truly exceptional circumstances, by expert users or system administrators.

2.4.3.14 Serial Configuration

The Serial Configuration menu allows the user to enable the settings for the different serial ports on the 4200 topside, along with changing their individual baud rates.

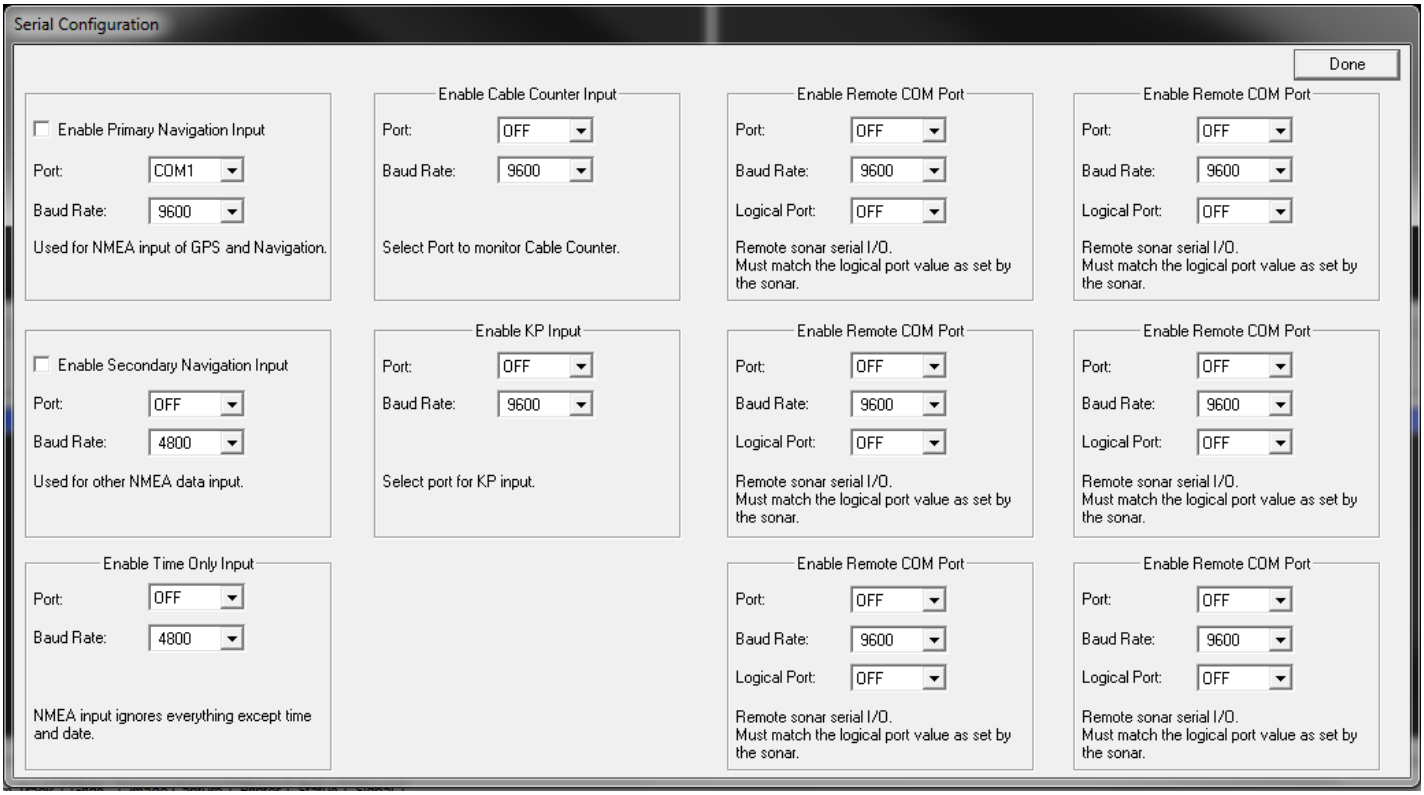

Figure 2-41: Serial Configuration Window

DISCOVER allows two separate navigation devices coming in on different serial ports. Remote COM ports give the user the ability to link a serial device connected to the 4200 Tow Vehicle to DISCOVER via the telemetry link.

TIME-ONLY PORT: This port is used to input Time-only messages (e.g., ZDA).

CABLE COUNTER PORT: This port is used to input a cable out value from a Sheave. A list of cable counters currently supported by DISCOVER, along with an explanation of their formats, is provided in appendix **B.0**.

KP INPUT: This input is a means to enter a value for the number of kilometers of pipeline surveyed.

2.4.3.15 Alert Configuration

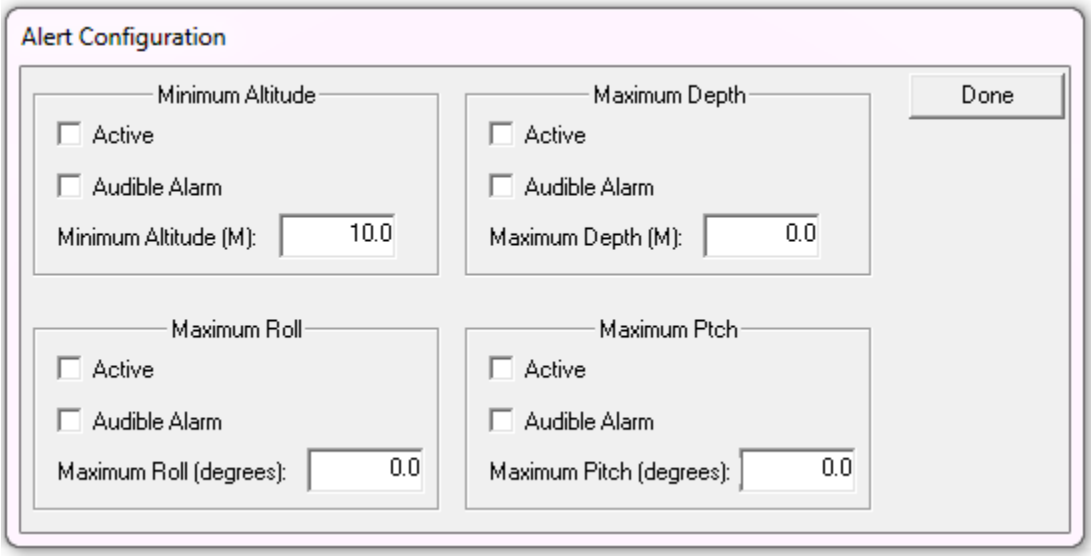

Figure 2-42: Alert Configuration Window

Users can use the alert configuration window to set alarms that will alert the operator for user-specified Minimum Altitude, Maximum Roll, Maximum Depth, and Maximum Pinch. Customize alerts types, activate and deactivate alerts.

ACTIVE [Check box]: Enables alert.

AUDIBLE ALARM [Check box]: Enables sound alarm.

MINIMUM ALTITUDE (M) [Numeric Display, Entry]: The minimum altitude in meters before the alarm. This requires that bottom tracking is on and accurately tracking the bottom.

MAXIMUM DEPTH (M) [Numeric Display, Entry]: The maximum depth before the alarm.

MAXIMUM ROLL (degrees) [Numeric Display, Entry]: The maximum roll before the alarm.

MAXIMUM PITCH (degrees) [Numeric Display, Entry]: The maximum pitch before the alarm.

2.4.3.16 MultiPulse Calibration

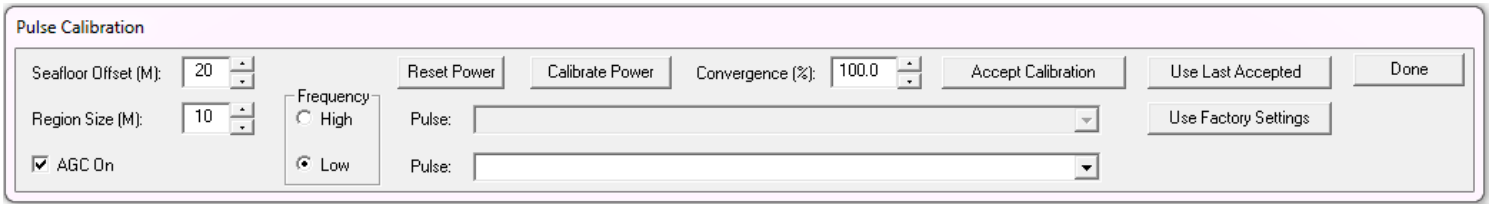

Figure 2-43: The Multipulse Configuration

SEAFLOOR OFFSET (M) [Numeric Display, Entry]: A blanking range for the calibration data window.

REGION SIZE (M) [Numeric Display, Entry]: Window size of the calibration data window.

AGC ON [Checkbox]: Turns Automatic Gain Control On/Off.

RESET POWER [Button]: Resets the pulse calibration power for the selected pulse.

CALIBRATE POWER [Button]: Generates a new pulse power calibration file for the selected calibration window.

COVERGENCE (%) [Numeric Display, Entry]: Calibration convergence factor for the pulse selected.

ACCEPT CALIBRATION [Button]: Enables the Calibrated MultiPulse Calibration.

USE LAST ACCEPTED [Button]: Clicking this will use the Last Accepted Configuraton used.

USE FACTORY SETTING [Button]: Clicking this will return to Factory Setting.

FREQUENCY [Selection]: Choose which frequencies you will select, either High or Low.

PULSE [Dropdown Selection]: A drop-down selection displaying all available pulses.

2.4.3.17 Layback Configuration

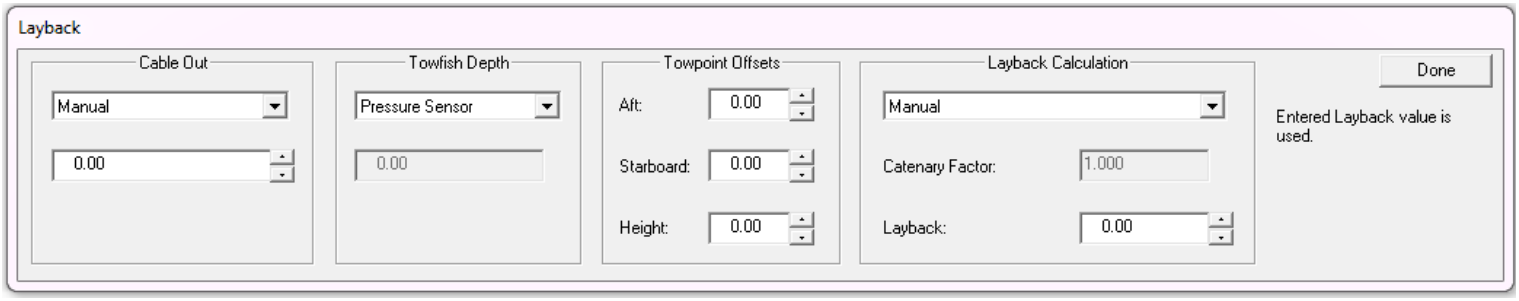

Figure 2-44: Layback Window

Layback is the horizontal distance (meters) from the tow point on the survey vessel to the Tow Fish. The layback function tracks the sonar Tow Fish by inputting or calculating the offsets of the Tow Fish.

Depending on available sensors, the surveyor may choose one of three methods for calculating layback:

1. Manually
2. Using the Hypotenuse Equation
3. Using a Catenary Factor

Sonar data collected with layback will have the layback values permanently stored in the JSF file. Layback information can be modified during playback to generate corrected maps. However, layback values entered during playback do not override the existing numbers. During playback, the software defaults to playing back the data without layback. To use recorded layback values, users must select the playback from the drop-down menu in 'layback calculations'.

The Catenary factor is expected to be between 0 and 1; with 0 representing the Tow Fish directly below tow point and 1 representing the angle of attack to be zero degrees (horizontal). For exact layback reading, a USBL (Ultra-short baseline) is required.

> **NOTE:** All values entered in this menu are expected to be in meters.

The layback window is broken up into four sections, as described below:

CABLE OUT - allows three options for determining the length of cable in the water:

- Manually entering the estimated amount of cable
- Data from a cable counter on the vessel's winch that is input through a topside serial port
- The originally calculated cable out value used during playback

TOW FISH DEPTH - contains three options for choosing the depth of the tow vehicle:

- Manually entering the estimated depth

- Calculating Tow Fish depth with input from an optional pressure sensor (stored in JSF file during recording and can be seen in PSI and depth in meters)

$-DPT (legacy, not used by the current system), allows data to come in through a serial port from a pressure sensor as an NMEA string. The expected format for the NMEA pressure data string is:

$-- DPT, x.x,x.x,.x.*hh<CR><LF>

TOW POINT OFFSETS - offset (distance in meters) from GPS to tow point, and manually entered by User.

> **NOTE:** Values are the same as the Aft Offset, Starboard Offset, and Depth offset from **NAVIGATION OFFSETS**.

LAYBACK CALCULATION - There are three options to choose from in calculating layback. Hypotenuse uses the equation that layback equals the square root of the difference between the square of the cable out and the square of the sum of the depth and the tow point height, i.e.:

$$L = \sqrt{[(cable\ out)^2 - (d + h)^2\,]}$$

Equation 2-1

Catenary calculates the layback by using the line out times the catenary factor (angle of attack). Finally, choosing playback uses the originally calculated layback value, and manual is one of the options.

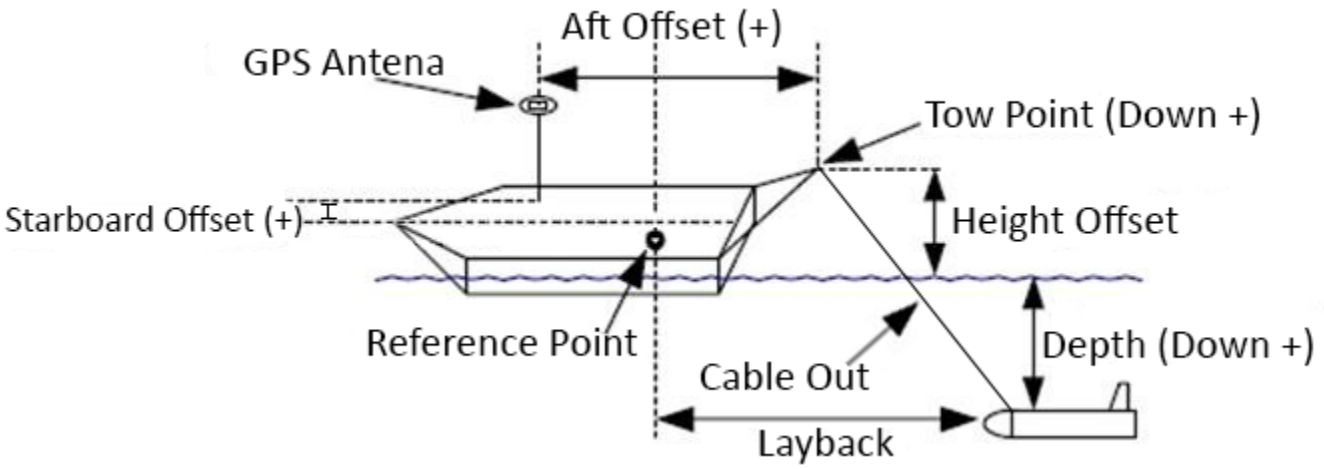

Figure 2-45: Layback Diagram

$$\sqrt{Cable\ Deployed^2 - (Towfish\ Depth + Towfish\ Height)^2} = Layback$$

Equation 2-2

For example, if 50m of Cable is Deployed, the Towfish Depth is 25m, and Towfish Height is 3m.

$$\sqrt{50\ Meters^2 - (25\ Meters + 3\ Meters)^2} = Layback$$

$$\sqrt{1716} = 41.4\ Meters = Layback$$

2.4.4 Control Menus

The Control menus provide access to more advanced features not commonly used in the software.

| ADVANCED SONAR CONTROLS | EXTERNAL DEVICE CONTROLS | CONNECTION INFORMATION |

| DIAGNOSTIC INFORMATION | XTF OUTPUT CONTROL |

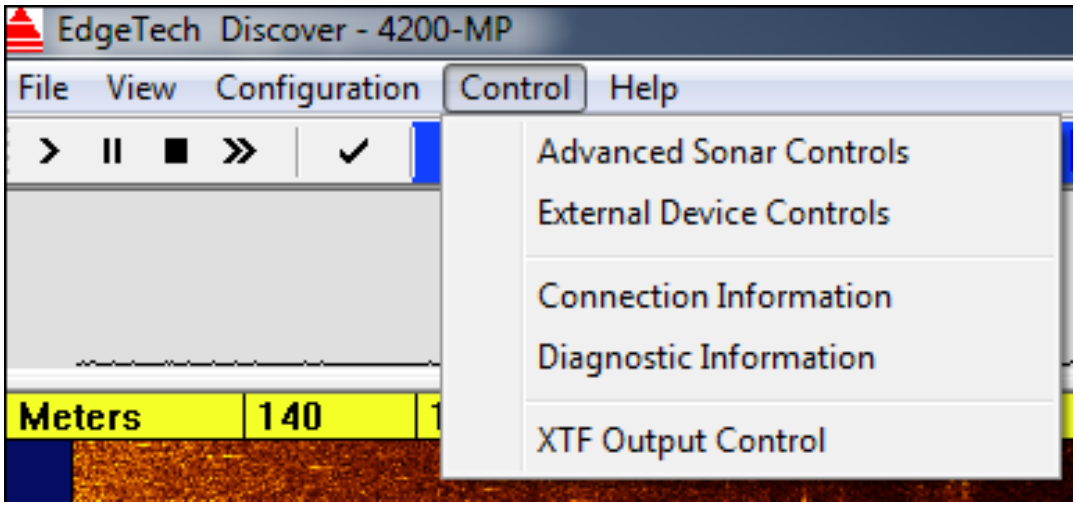

Figure 2-46: Control Menu

2.4.4.1 Advanced Sonar Controls

This pull down menu option allows access to the transmit Power Level controls.

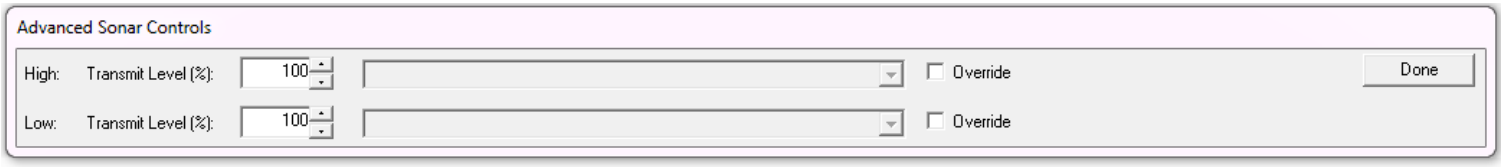

Figure 2-47: Advanced Sonar Controls Window

HIGH and LOW

TRANSMIT LEVEL [Numeric Display, Entry]: The High and Low Transmit Level (%) to control the transmit power level. Turning the transmit level off on one or both subsystems can help when troubleshooting the system.

PULSE [Dropdown Selection]: Shows the list of available pulses to override the current pulse. Should be done ONLY by advanced users in special situations.

OVERRIDE [Checkbox]: This allows the user to manually override High/Low Frquencies pulses. Should be done ONLY by advanced users in special situations.

FISH POWER ON [Checkbox]: Turn fish power On/Off.

2.4.4.2 External Device Controls

The External Device Controls dialogue allows enabling of an External Device and corresponding controls, detailed below. Also available in the 4200 system is an option for zeroing out the pressure sensor in air, which, if necessary, should be done when the tow vehicle is at water surface level, along with options for the optional Responder.

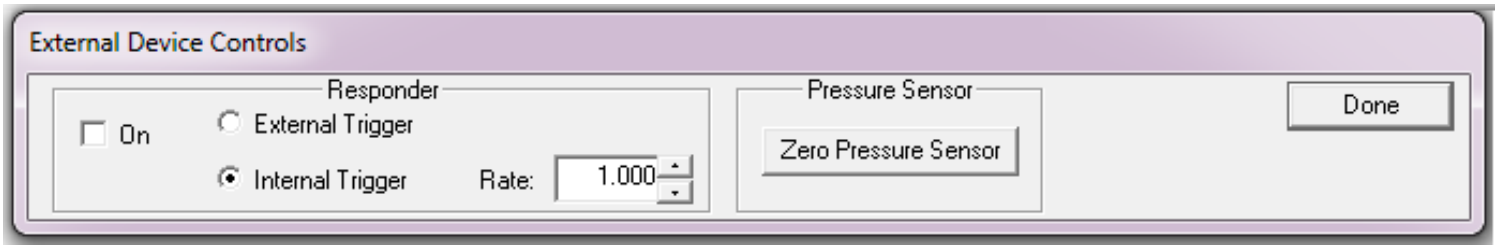

Figure 2-48: External Device Controls

RESPONDER

ON [Checkbox]: Turns interface with an external device on/off.

External Trigger [Selection]: Enable External Triggering by selecting this option.

Internal Trigger [Selection]: Enable Internal Triggering by selecting this option.

Rate [Numeric Display, Entry]: Control box, use this field to enter the transmit rate in seconds.

PRESSURE SENSOR

ZERO PRESSURE SENSOR [Button]: The External Device Controls available to the 4200 system include an option for zeroing out the pressure sensor in air, which, if necessary, should be done when the tow vehicle is at water surface level.

> **NOTE:** The pressure sensor should always be zeroed before deployment! Contact **EDGETECH CUSTOMER SERVICE** for more information.

2.4.4.3 Connection Information

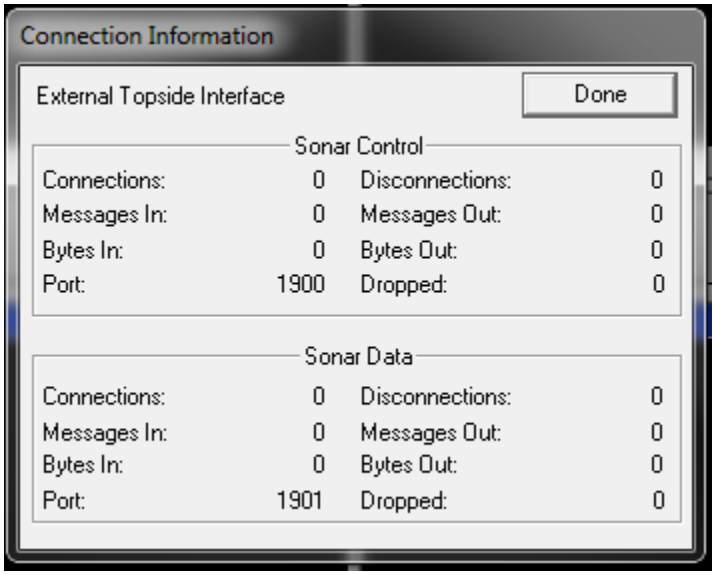

Figure 2-49: Connection Information

The Connection Information pop-up, as shown in **FIGURE 2-50**, displays the DISCOVER application external topside interface to control Sonar Subsystem for data acquisition and logging, including the number of connections and disconnections and In/Out messages.

2.4.4.4 Diagnostic Information

The diagnostic information window displays the state of the connection between the DISCOVER application and the sonar unit and the connection between 4200 top side box Net Burner and the sonar, as shown in **FIGURE 2-51**.

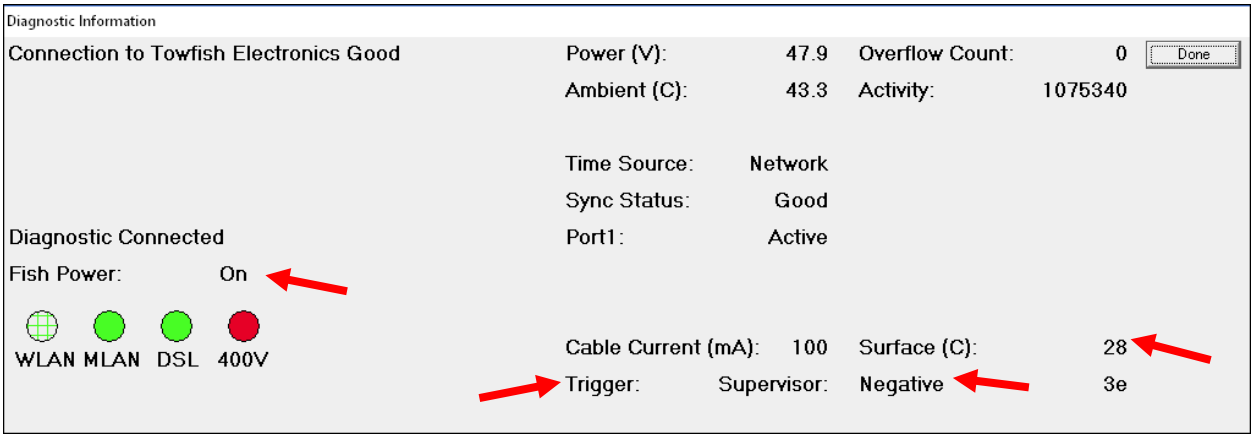

Figure 2-50: Diagnostic Information Window

In the image shown above, the system is fully operational with no problems, and the connection to the towfish is good. Other reported data are:

Power (V): Nominally 48 VDC. This is the primary internal supply voltage for the towfish.

Ambient (C): This is the internal ambient temperature of the towfish. This should be between 0 and 60 degrees C max. A value over this amount may prevent correct towfish operation.

Activity: Shows pinging activity counter has no specific meaning but should be changes when pinging.

Overflow Count: Reflects the sonar overflow, e.g., network queue overflow, Disk queue overflow, etc.

Fish Power: The Net Burner power to fish is on.

Cable Current: The cable current from topside box to towfish.

Surface ©: The topside box temperature.

Trigger: External Trigger On/Off.

Supervisor: External Trigger is set to “Positive” or “Negetive” meaning set to rising or falling edge.

The following figure is an example of a serial port is configured but is not in use.

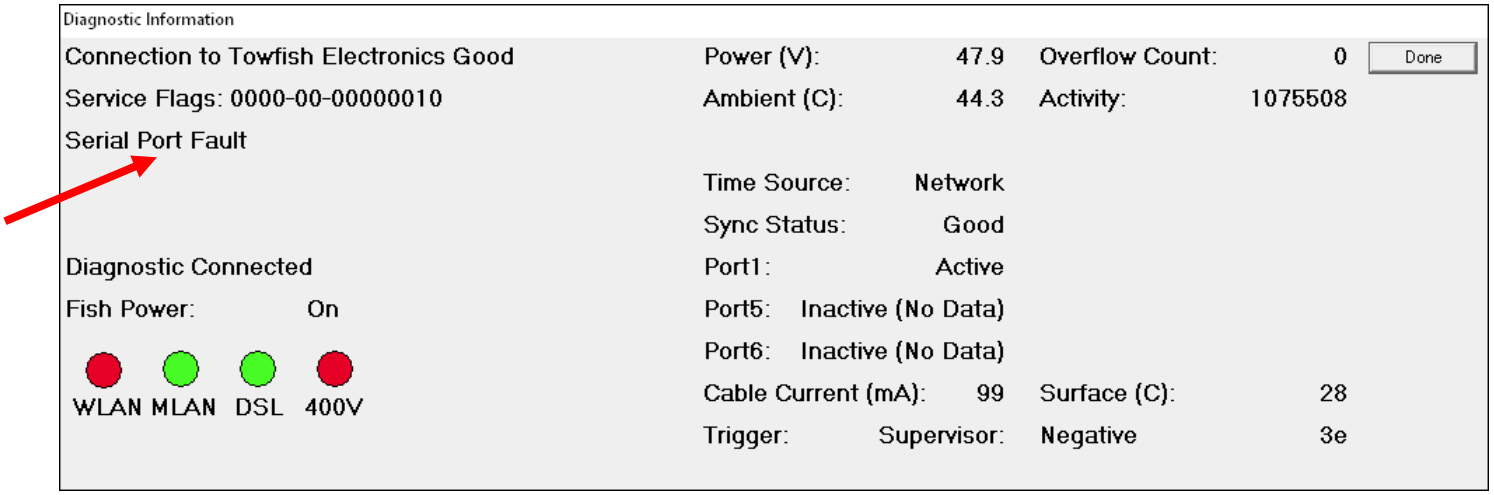

Figure 2-51: Serial Port Fault Due to being Configured by Unused

Major problems are reported in red on the Diagnostic Information window, and provide a vital clue for diagnosing connectivity issues. Examples of diagnostic displays with these kinds of errors include:

NETWORK ERROR

In **FIGURE 2-53**, the software communication between the topside and the towfish has been lost (i.e., no Ethernet connection or towfish is shut down). This indicates a network cable problem, possibly due to an unplugged or bad cable between: the laptop to the topside, internal connection to the modem in the rackmount topside or wireless modem.

In **FIGURE 2-54**, The Discover application and Top side box cannot communicate with towfish due to tow fish power supply problem, tow cable, or possibly a complete failure of the towfish computer to boot properly. A Ping command to this connection will return no reply.

Figure 2-52: Network Error

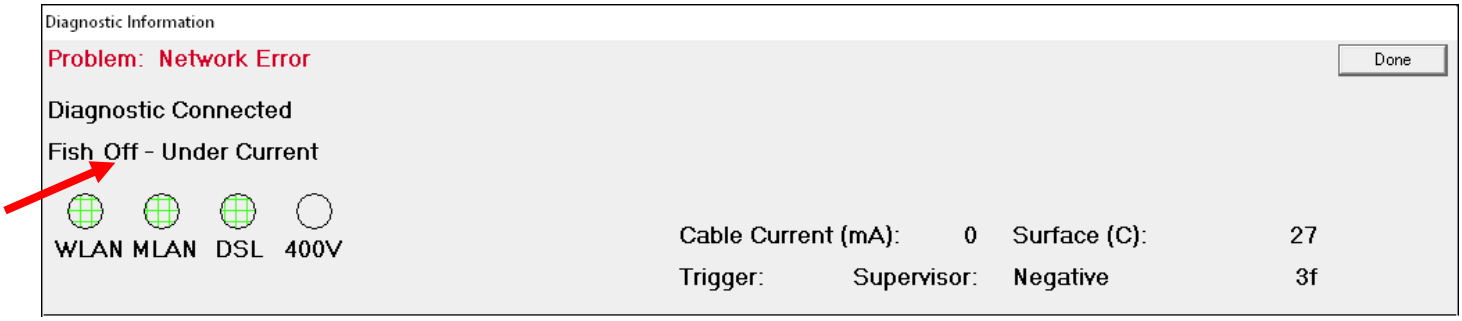

Figure 2-53: Fish Off

Sometimes a power cycle of the topside interface unit will correct this error. Also, check the laptop computer for the correct IP address (LAN connection the IP is 192.9.0.99; Wireless IP is 192.9.0.100), and refer to the 4200 User's Hardware Manual PN 0004823 for additional hardware information.

2.4.4.5 XTF Controls

NEWFILE ON RANGE CHANGE [Check Box]: The generation of a new file can be forced on a range scale change by checking this box. This ensures the production of XTF files without any range scale changes inside the file.

Figure 2-54: XTF Controls Window

2.4.5 Help

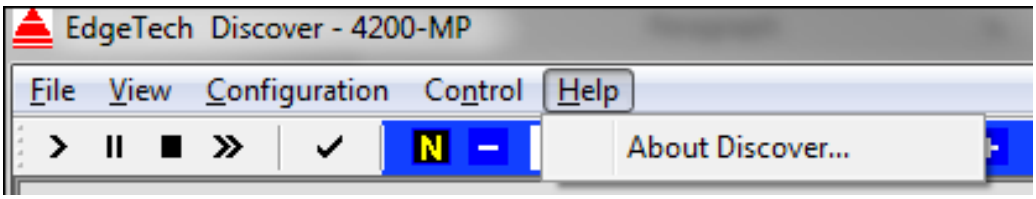

Figure 2-55: Help Menu

2.4.5.1 About Discover

The About Discover provides Copyright, Version, and EdgeTech Contact information.

Figure 2-56: About Discover

2.5 Lower Control Panel

The Lower Control Panel is comprised of three sections: **MAIN STATUS LINE DISPLAY**, **RADIO INDICATOR TAB,** and **CONTROL TABS**. These three are labeled in The Multipulse Configuration, shown in **FIGURE 2-58** and the Single Pulse Configuration, shown in **FIGURE 2-59**.

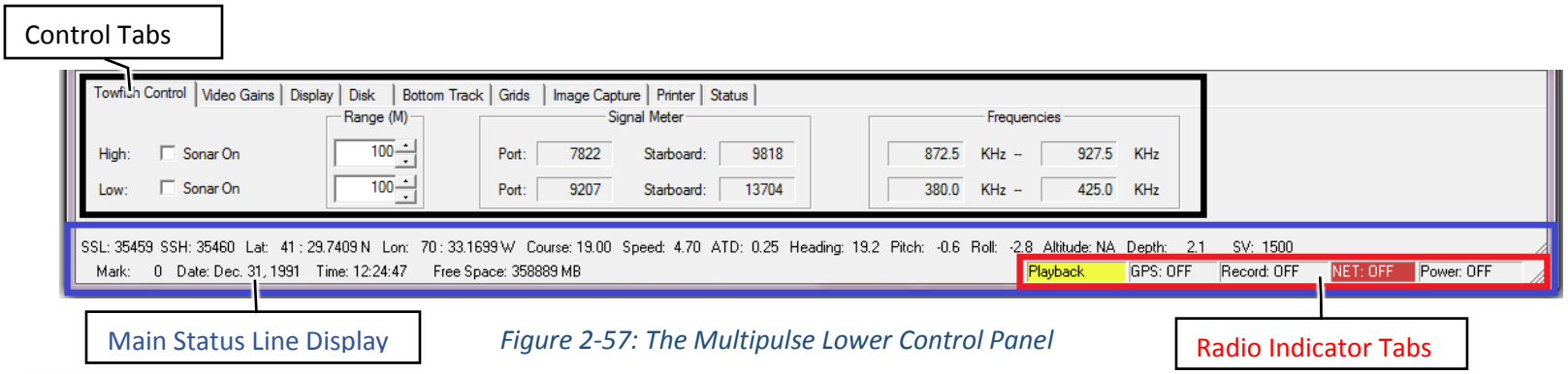

Figure 2-57: The Multipulse Lower Control Panel

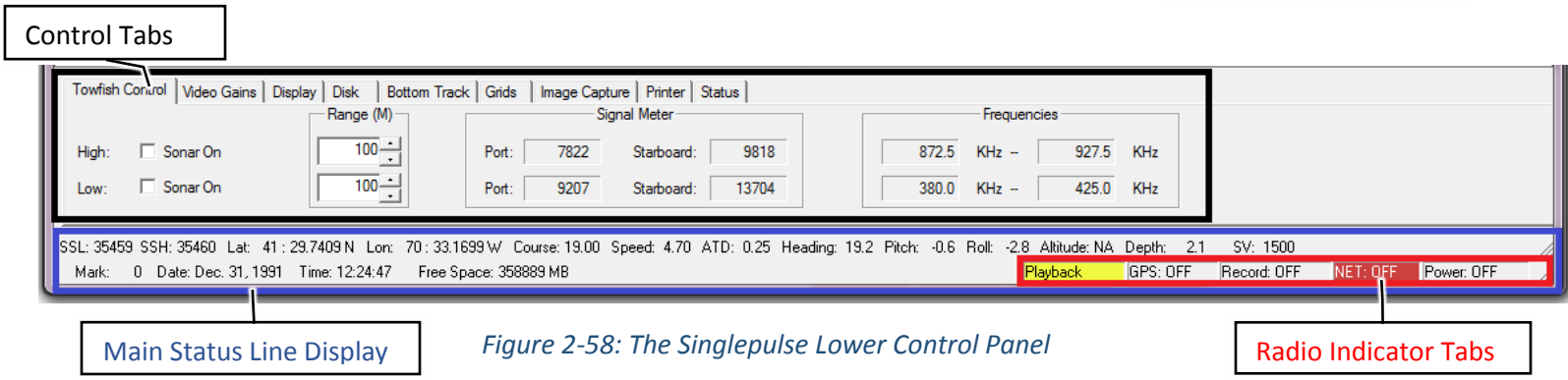

Figure 2-58: The Singlepulse Lower Control Panel

2.5.1 Main Status Line Display

The Main Status Line Display of the Lower Indicator Panel, as shown in **FIGURE 2-60**, has a read only tool that displays current system information and is divided into two parts: Top and Bottom Lines. This bar sits below the Sonar Control Panel. The parts of this panel are detailed below.

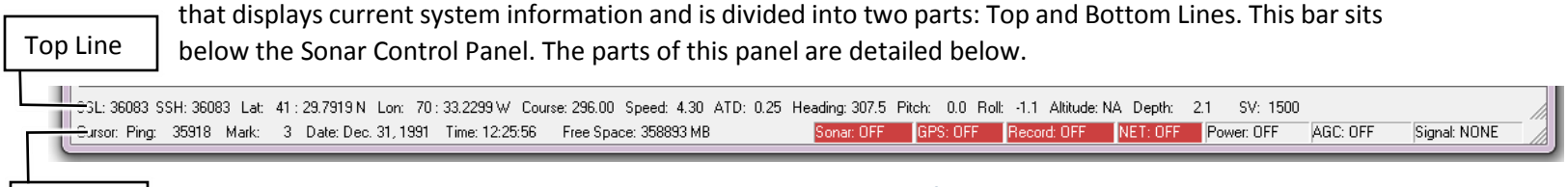

Figure 2-59: The Main Status Line Display Section of the Lower Control Panel

2.5.1.1 Top Line

SSL & SSH: This section of the Lower Indicator Panel displays the current ping number since the towfish was powered on for each of the 2 subsystems.

LAT / LONG, COURSE, ATD (ALONG TRACK DISTANCE), AND SPEED: Displays current latitude/longitude, course, along-track distance between pings, and speed data from the GPS.

HEADING, PITCH, AND ROLL: This section displays the towfish compass data.

ALTITUDE: This section displays the current fish altitude as calculated from the Bottom Tracker function.

DEPTH: This section displays the depth of the towfish in meters or PSI.

SV: Sound Velocity by default is set to 1500 meters per second. Changeable in **DISPLAY CONFIGURATION**.

2.5.1.2 Bottom Line

CURSOR PING: When the cursor is positioned over the waterfall screen, the System Ping number associated with the position will be displayed in this area.

MARK: This section of the Lower Indicator Panel displays the current Event Mark number.

DATE & TIME: Current Date & Time.

> **NOTE:** Information displayed in Date and Time depends on the following:
>
> 1. If pinging and receiving NMEA messages, (e.g. RMC or ZDA) the message time is displayed.
> 2. If pinging, but not receiving NMEA message, Sonar time is displayed.
> 3. If not pinging, time and date are N/A.
> 4. If in playback, the date and time recorded in the .jsf file is displayed.

FREE SPACE: This section of the Lower Indicator Panel displays the remaining amount of data storage space on the current drive in Megabytes.

2.5.2 Radio Indicator Tabs

This section of the Lower Panel Controls displays the status of the indicated feature. RED indicates a state of Off or Not Active. During Normal operation, all these indicators should be on (WHITE), as shown in **FIGURE 2-61**. If the user does not want to record data, a RED RECORD: OFF indicator is acceptable.

Figure 2-60: The Radio Indicator Tabs Section of the Lower Control Panel

SONAR: Shows Sonar On/Off. During Playback, this will be yellow and read "Playback."

GPS: Displays the status of the GPS input. If GPS is not being received turns red (alert state). GPS: err indicates GPS data is garbled or is not in the correct format.

RECORD: Displays the status of the disk recording. If not recording turns red (alert state). Yellow indicates the power is not set to full.

NET [Network]: Displays the status of the sonar TCP/IP link. If not connected turns red (alert state).

POWER: ON/OFF. Yellow indicates the power is not set to full.

AGC: Automatic Gain Control, can be turned On/Off by selecting Checkbox in **MULTIPULSE CALIBRATION**.

SIGNAL: Displays information about the current ping, as one of the following: none, good, low, max.

2.6 Control Tabs

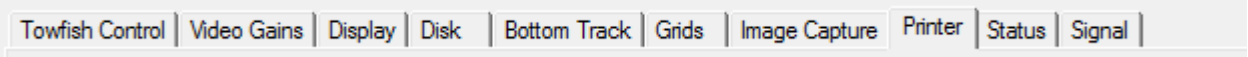

Figure 2-61: The Top of the Control Tabs

The DISCOVER Sonar Controls consists of individual tab selection sheets that are activated by clicking on the corresponding tab.

> **NOTE:** The Towfish Control Tab differs depending on the System:
>
> **MULTI-PULSE (MP) TOWFISH** / **SINGLE PULSE TOWFISH (SP)**

| **TOWFISH CONTROL** - **DISCOVER 4200-MP** / **DISCOVER 4200-SP** | **VIDEO GAINS** | **DISPLAY** | **DISK** |
BOTTOM TRACKING | **GRIDS** | **IMAGE CAPTURE** | **PRINTER** | **STATUS** | **SIGNAL (4200-MP ONLY)** |

2.6.1 Towfish Control

The Towfish Control Tab differs depending on the System:

MULTI-PULSE (MP) TOWFISH / **SINGLE PULSE (SP) TOWFISH**

2.6.1.1 DISCOVER 4200-MP Towfish Control Tab

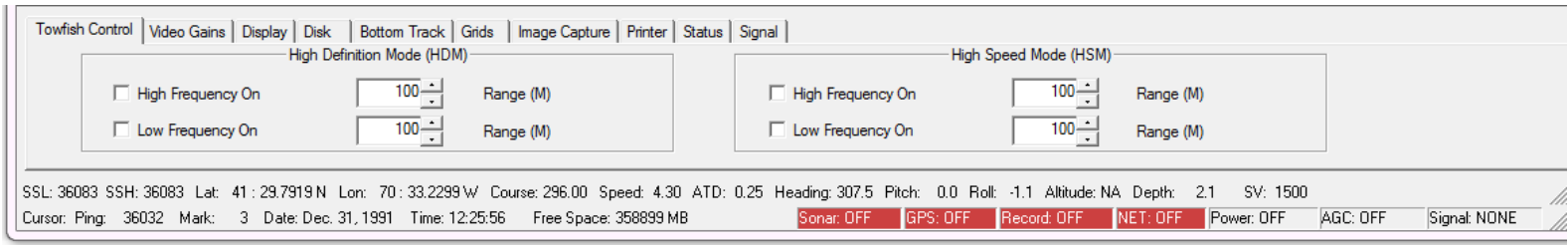

Figure 2-62: DISCOVER 4200-MP Towfish Control Tab

The 4200-MP system provides two basic modes of operation and two signal output options, both of which are controlled via this tab. The frequency range can be changed here as well.

HIGH DEFINITION MODE (HDM):

HIGH FREQUENCY ON [Check Box]: Selecting this checkbox will turns on pinging for High Frequency Sonar.

LOW FREQUENCY ON [Check Box]: Selecting this checkbox will turns on pinging for Low Frequency Sonar.

RANGE (M) [Numeric Display, Entry]: The range of signal propagation, in meters, on the port and starboard sides. The range for each frequency can be altered from this tab.

HIGH SPEED MODE (HSM)

HIGH FREQUENCY ON [Check Box]: Selecting this checkbox will turns on pinging for High Frequency Sonar in High Speed Mode.

LOW FREQUENCY ON [Check Box]: Selecting this checkbox will turns on pinging for Low Frequency Sonar in High Speed Mode.

RANGE (M) [Numeric Display, Entry]: The range of signal propagation, in meters, on the port and starboard sides. The range for each frequency can be altered from this tab.

MODE	SIGNAL OUTPUT OPTION
High Definition Mode (HDM)	Single Frequency Operation (High OR Low Frequency)
	Dual Simultaneous Operation (High AND Low Frequency)
High Speed Mode (HSM)	Single Frequency Operation (High OR Low Frequency)
	Dual Simultaneous Operation (High AND Low Frequency)

Table A-1: Towfish Control Modes and Signal Outputs

2.6.1.2 DISCOVER 4200-SP Towfish Control Tab

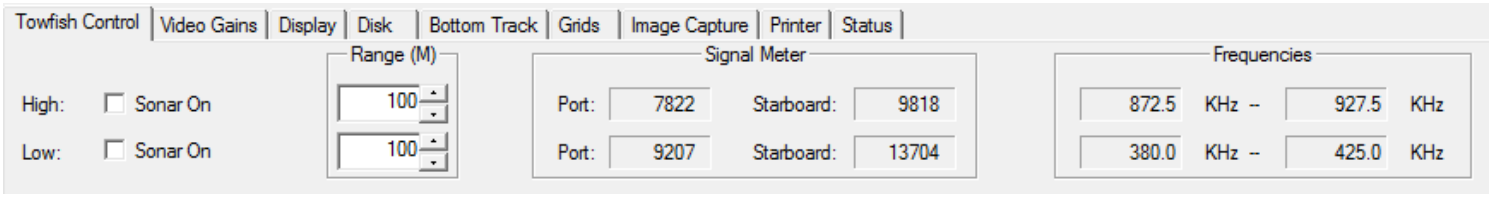

Figure 2-63: DISCOVER 4200-SP Towfish Control Tab

The 4200-SP system provides two basic modes of operation that are controlled via this tab:

- Single mode operation – side scan high or side scan low
- Dual simultaneous mode – both side scan high and side scan low on

HIGH SONAR ON [Check Box]: Selecting this checkbox will turns on pinging for High Frequency Sonar.

RANGE (M) [Numeric Display, Entry]: The range of signal propagation, in meters, on the port and starboard sides. The range for each frequency can be altered from this tab.

LOW SONAR ON [Check Box]: Selecting this checkbox will turns on pinging for Low Frequency Sonar.

RANGE (M) [Numeric Display, Entry]: The range of signal propagation, in meters, on the port and starboard sides. The range for each frequency can be altered from this tab.

SIGNAL METER: Top: High-Frequency / Bottom: Low Frequency. This table shows maximum return signal level reported by the Sonar.

FREQUENCIES: Top: High-Frequency / Bottom: Low Frequency. This table represents maximum and minimum frequencies put out by the system (300/900 kHz in this example).

2.6.2 Video Gains

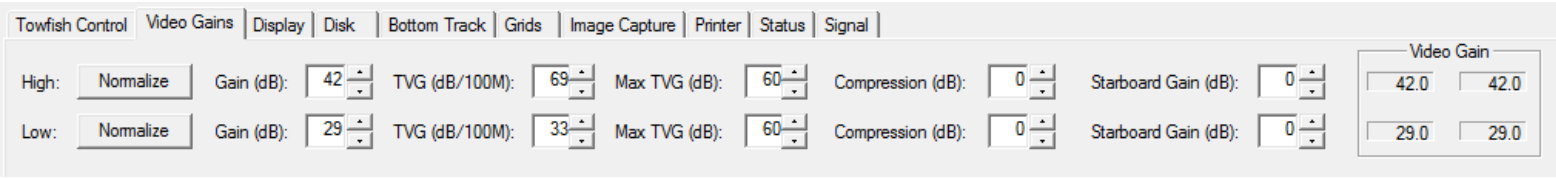

Figure 2-64: The Video Gains Tab

NORMALIZE [Button]: This button sets the display gain of each channel to a value suitable for the current maximum echo levels. For very weak signals, a high gain will be applied, and for strong signals, a low gain. The value chosen is shown in the Gain box and may be adjusted manually by the user. This function is the same as clicking the "N" hotkey.

See note in **DISPLAY CONFIGURATION**.

GAIN (dB) [Display, Entry]: This selection allows the user to adjust the overall video gain for both the port and starboard signals.

TVG (dB/100m) [Display, Entry]: This value is used to apply exponential time varied gain (TVG) to the displayed waterfall data for both the port and starboard signals. This gain is NOT applied to the recorded data in any format, nor is it applied to the data displayed in the top amplitude vs range display window. The origin for the start of the gain may be selected as the time origin or the sea floor. (See Sound Speed entry above)

MAX TVG (dB) [Display, Entry]: To enter the slope or the limit of the TVG ramp, click on the value to be changed and enter the new value. The time-varying gain slope is used to adjust the image gain with increasing range to compensate for signal loss with range. The TVG limit stops the gain increasing with range at the displayed limit.

COMPRESSION (dB) [Display, Entry]: This entry supports a value of 0, 5, 10, 15, 20, 25, or 30 dB. A value of zero causes the display palette to be used in a linear fashion, mapping the input signal range to 256 shades of color/gray scale. A value > 0 causes the palette to be progressively compressed, so as to emphasize small signals while relatively reducing the intensity of stronger signals.

STARBOARD GAIN (dB) [Display, Entry]: This selection allows the user to adjust the individual gain of the starboard signal so that the data display can be corrected for any imbalance between the port and starboard channel.

2.6.3 Display

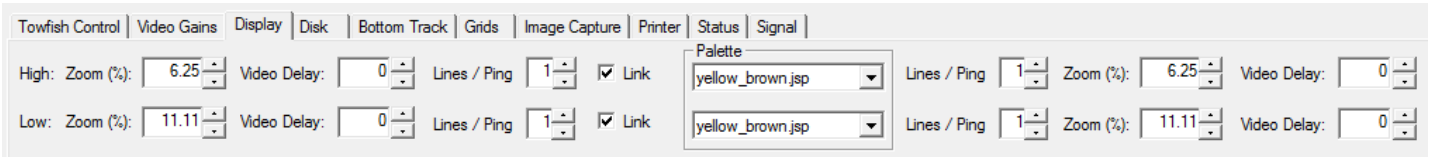

Figure 2-65: The Display Tab

ZOOM (%): There are two of these selection boxes located in the control panel, one for port and one for starboard. These selections allow the user to adjust the Horizontal Zoom factor for the port and starboard displays. When the "Link" box is checked off, the input applies to both port and starboard.

A factor of 100% maps one sonar sample to one screen pixel. A value of 10% maps 10 sonar samples to one screen pixel. On screen zooming using the mouse is more efficient and affects these values. Zoom can be set from 1.33 – 800%. 800 is 8x, meaning 8 samples per pixel, and 1.33% is 75 sonar samples per pixel.

To zoom into a target on the data display, press and hold down the left mouse button, drag across the screen (Horizontal or Diagonal) and release. Double-clicking the left mouse button in the data area will return the sonar data to full resolution.

> **NOTE:** The user can use the scroll bars at the bottom of each data display to scroll horizontally through the zoomed data.

LINES/PING: There are two of these selection boxes located in the control panel. These selections allow the user to adjust the Vertical Zoom for the port and starboard displays. When the "Link" box is checked off, the input applies to both port and starboard. If set to one the one echo set is mapped to one line of screen pixels. If set to 2, then the echo data is duplicated and written to 2 horizontal lines of screen pixels. This feature is useful for seeing details in the echo data.

VIDEO DELAY (Samples): There are two of these selection boxes located in the control panel. These selections allow the user to adjust the video delay from the centerline for the port and starboard displays. On screen zooming using the mouse is more efficient, and affects these values.

PALETTE: This pull-down menu allows the user to selection from 9 pre-defined color palettes for the data that is being displayed. This feature also allows the user to inverse the image by selecting the desired inverse color palette from the list. There is pallete selection for both High and Low Frqnecy Waterfall, which are set independantly. The default setting is set to gray.jsp.

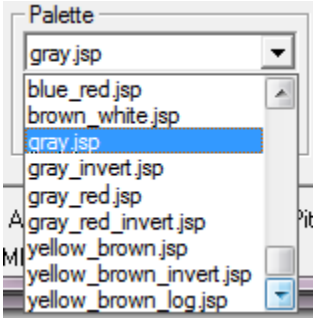

Figure 2-66: The 9 Pre-Defined Color Palette Options

LINK (PORT AND STARBOARD): This selection allows you to link both the port and starboard displays so that all the changes that you make within this control panel will affect both channels.

2.6.4 Disk

Figure 2-67: The Disk Tab

PLAYBACK FILE: This feature allows the user to 'Browse' and look for specific file(s) to play back. The controls below this box are used to control the selected data file. The controls below this box are used to control the selected data file. Users can also control this file from the controls located in the **SHORTCUT TOOLBAR**. The fast forward button will increase the playback speed. The play button will decrease the playback speed. The pause button will stop the file and allow playback to continue from the same point. The stop button will end playback and will start at the beginning again if the play button is pressed again

RECORD FILE: This feature allows the user to record a file. To do so, the user can 'Browse,' look for a specific directory, then enter the name in the Record File field. If the user does not specify a name, DISCOVER will autogenerate a date-time file name. The controls below this box are used to control the selected data file. The user can also control this file from the controls located in the **SHORTCUT TOOLBAR**.

2.6.4.1 XTF Support

The DISCOVER software provides support for writing XTF (eXtended Triton Format) files for use with other 3rd party topsides for post processing and mosaicking.

XTF File Output (Real Time):

By default, sonar data stored by the DISCOVER software is in EdgeTech's JSF format. However the system will store data in XTF format if so enabled. The JSF format also supports a higher dynamic range than is achievable in XTF format.

> **NOTE:** Newer revisions of XTF have the same dynamic range, as they now support a 16-bit floating point data format with weighting factor.

XTF File Conversion (Playback)

To support XTF output of JSF-recorded data, the system provides simultaneous playback and recording capability. If XTF is required, data can be recorded in both JSF and XTF. The data recording may be started and stopped at ANY time during (and before or after) playback, and thus supports creating "snippets" of arbitrary length from the input data file that may support only small screen shots of valuable or interesting data, or the entire input file in XTF format.

The navigation data, and pitch/roll motion sensor data acquired during recording is reproduced in the XTF output. Sections of Data files may also be concatenated in this manner, by keeping the recording file open and selecting various input files for playback.

> **NOTE:** The XTF format does NOT support side scan data with dual frequency operation at independent or differing ping rates, however, when XTF recording is enabled, a separate XTF file is generated for high and low freqeuency respectively so that the operator can still run dual frequency at different ranges/ping rates if desired. There are many post processing packages that read the XTF format but do not properly support range scale changes within a file. A new file can be forced on a range scale change.

2.6.5 Bottom Tracking

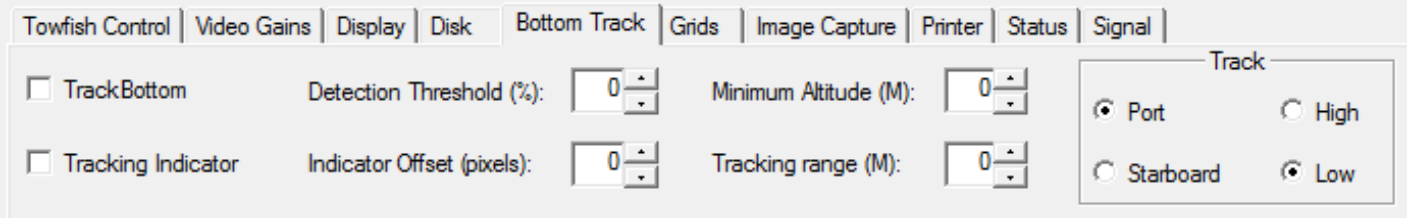

Figure 2-68: The Bottom Tracking Tab

The Bottom Tracking tab controls all aspects of DISCOVER's bottom tracking features. Some bottom track features can also be activated by double-clicking inside the **WATERFALL DISPLAY**.

TRACK BOTTOM: This selection allows the user to toggle the bottom tracking feature On and Off. Bottom Tracking is required for proper operation of the TVG (seafloor), Image Correction, and Towfish Altitude Display features. Once the bottom track feature is turned on, the user will need to use the following control features to adjust it so that it is tracking reliably.

TRACKING INDICATOR: This feature allows the display of a line parallel to the seafloor to indicate that the software is properly tracking the ocean bottom.

DETECTION THRESHOLD [%] [Display, Entry]: This selection allows the user to limit the bottom tracking to a user-defined percentage of the **A-SCAN PANE**. This setting will vary depending on bottom types but a good place to start is about half of the peak signal at the first returned displayed in the **A-SCAN PANE**. To enter a threshold for bottom tracking, click on "threshold" and enter the new threshold. The threshold refers to the position of the threshold in the top trace display window.

These values are more efficiently set graphically using the mouse: double clicking the mouse in the window sets the threshold at that horizontal level. For very small bottom returns temporarily expand the **A-SCAN PANE** to accurately place the threshold using the mouse.

The search routine looks for the first sample that passes the operator entered threshold value within the track window (and outside of the Hold off range) displayed as red dash lines in the scope display. The current tracked position of the seafloor is indicated by a solid red line.

The threshold and tracking window can be set using the mouse via the top "scope" graphic display:

- Double click to set threshold
- Click and drag to set the window start and end-point

Double clicking at the correct height in track window, sets threshold but will NOT affect the window width.

INDICATOR OFFSET [pixels]: This selection allows the user to offset the Tracking Indicator by a user-defined # of pixels. This feature is helpful when you have a very hard bottom material which makes it is hard to see the tracking indicator.

MINIMUM ALTITUDE [M]: This selection allows the user to manually force the tracking algorithm to exclude a region out to a certain distance from the towfish from consideration in choosing bottom candidates. The region extending from 0 meters out to the hold off range are excluded from the bottom tracker. This feature is very helpful when there is a large amount of clutter in the water column below the towfish that makes bottom tracking difficult. It is important for the operator to monitor the tracking indicator frequently when this feature is used. If the water below the towfish gets shallower than the Hold off setting, then the bottom tracking feature will be operating incorrectly.

TRACKING RANGE [M] [Display, Entry]: This selection box is used to adjust the width of the tracking window in meters. Bottom candidates meeting the threshold requirement outside of this window are not valid. This window can also be set graphically using the mouse by clicking at the start point and "dragging" to the end point.

TRACK: This selection allows the user to select the channel (Port or Starboard; High or Low frequency) for bottom tracking. This feature is very useful if you have excessive noise on one channel and not the other. *Example:* Towing fish near surface off of the port side and encounter vessel wake noise on starboard side.

2.6.6 Grids

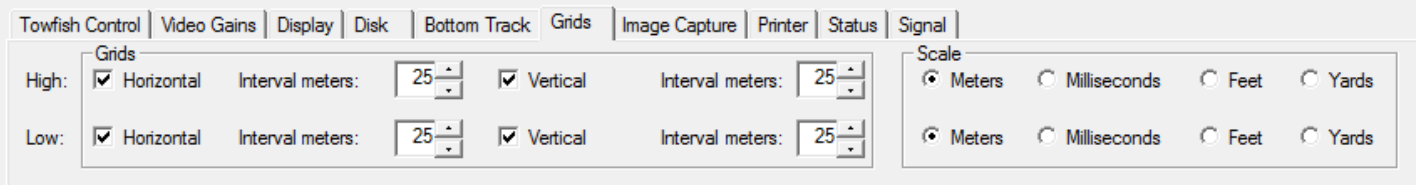

Figure 2-69: The Grids Tab

GRIDS:

HORIZONTAL [Check Box]: Allows user to toggle horizontal scale lines on or off. For horizontal scale lines to be displayed, navigation input with valid speed, or manual speed is required. Horizontal (depth) grid marks can be painted on the waterfall display at the specified interval, if checked, and can be customized to display in meters or milliseconds.

INTERVAL (M) [Numeric Display, Entry]: Allows user to select spacing between horizontal scale lines.

VERTICAL [Check Box]: Allows user to toggle vertical scale lines on or off. These work with or without navigation input. Vertical grid marks can be painted on the waterfall display at the specified interval, if checked, and can be customized to display in meters or milliseconds.

INTERVAL (M) [Numeric Display, Entry]: Allows user to select spacing between vertical scale lines.

SCALE: Users can select units for horizontal and vertical scale lines in meters, milliseconds, feet, or yards.

> **NOTE:** Scale Lines are for the video display of the data only and do not affect the recorded data in any way. All other inputs such as range and offsets remain in meters.

2.6.7 Image Capture

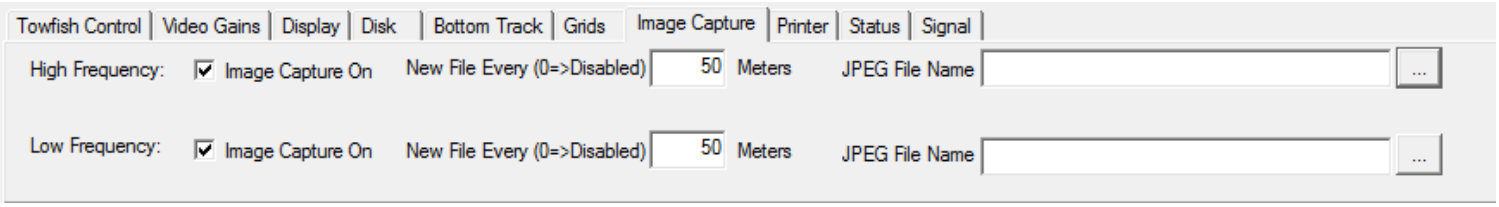

Figure 2-70: The Image Capture Tab

The image capture feature allows the user to have JPG snapshots of the Waterfall Display. The user can set the file name and save location for each image. Image Capture can also be set up to be taken at intervals (in meters). These features are described in more detail below. The option can be enabled for high frequency, low frequency, or both simultaneously.

IMAGE CAPTURE ON [Check Box]: Enables Image Capture. A standard .JPG file can be created and viewed on screen or printed.

NEW FILE EVERY __ METERS [Numeric Display, Entry]: 0 = disabled. The image capture feature also allows the user to have a new file generated after 'x' number of meters. The image capture feature allows the user to have JPEG snapshots of the waterfall display taken at intervals (in meters) that can be set by the user. This tab also gives the user the ability to set the file name and location where each image will be saved. The option can be enabled for high frequency, low frequency, or both simultaneously.

JPEG FILE NAME [Display, Entry]: Click "…" option to Browse and set the path or location.

> **NOTE:** DISCOVER allows saving of large .JPG images. Keep in mind that during long surveys, there are limitations to CPU storage and excessive saving of .JPG images can use Computer Resources excessively. EdgeTech recommends against creating .JPG images during real-time acquisition, as this can be done post-survey at points of interest.

2.6.8 Printer

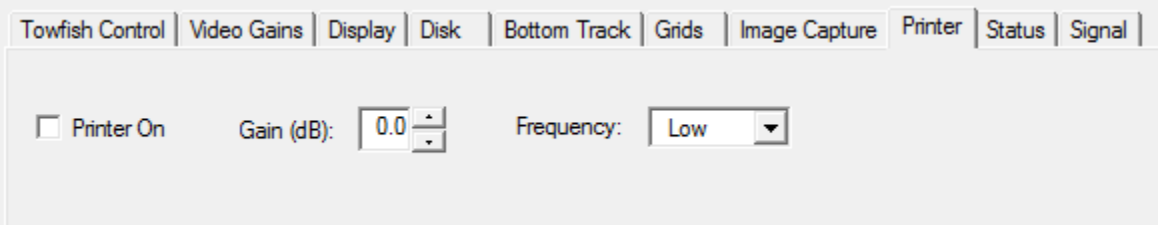

Figure 2-71: The Printer Tab

Using the check box and drop-down menus the user can setup a printer. Several printers are supported. Refer to the **PRINTER CONFIGURATION**.

PRINTER ON [Check Box]: Enables Printer.

GAIN (dB) [Numeric Display, Entry]: Adjusting this value adds to the gain to the printed record only, and will not affect data in the Waterfall Display. Increasing the gain will darken the data during printing, whereas decreasing the gain will lighten the data during printing. The use of this is up to the discretion of the surveyor. The present Gain and TVG shown in the **SHORTCUT TOOLBAR WILL** have no effect on the intensity of the printout.

Frequency [Drop down Selection]: The user can choose which Frequency they wish to print: Low or High. Only one Frequency can be printed at a time.

2.6.9 Status

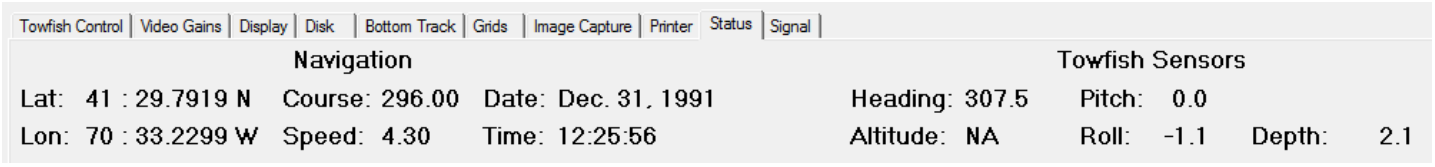

Figure 2-72: The Status Tab

The Status Tab provides a comprehensive view of the most important system information. This tab is read-only, and requires no input from the user.

NAVIGATION: Displays position information that the software is receiving from the navigation input.

ALTITUDE: Displays towfish altitude in meters, and requires the bottom tracking feature to be activated. It is very important for the operator to periodically verify that the bottom tracking feature is tracking the bottom reliably. If the bottom tracking feature is not properly tracking the bottom it will cause this display to indicate a false altitude value.

2.6.10 Signal (4200-MP Only)

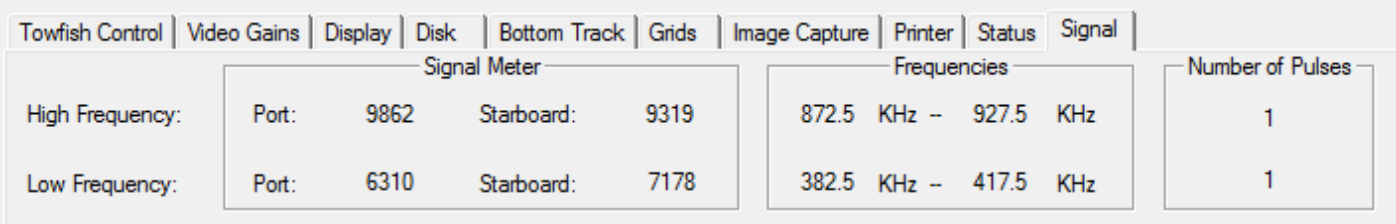

Figure 2-73: The Signal Tab

This read only tab displays information regarding Signal Meter, Frequencies, and Number of Pulses.

3.0 NAVIGATION-ANNOTATION

DISCOVER 4200 can interface with any industry-standard NMEA 0183 GPS via the COM port on the topside processor (COM 1 is default). Most GPS receivers made in the past 5+ years output the NMEA 0183 (version 1.5, 2.0/2.1, or 2.3) data language. GPS receivers can be connected by a serial cable (provided by the GPS manufacturers) to the EdgeTech topside through a standard 9- pin serial port. A USB to serial adapter will also input NMEA data. Refer to **SERIAL PORT CONNECTIONS** for the pin out of the 9 pin serial connector. Baud rates of 1200, 2400, 4800, 9600, 14400, 19200, and 38400 are supported. Higher baud rates may not work.

The following information describes the serial port interface parameters for acquiring navigation strings from a connected GPS unit or integrated navigation computer to the DISCOVER processor serial port. The system will also accept Annotation and Event mark strings in accordance with sub-section **EVT: EVENT & ANNOTATION (EDGETECH CUSTOM)**.

Several of the messages conform to the NMEA 0183 protocol. For additional information refer to:

NATIONAL MARINE ELECTRONICS ASSOCIATION NMEA 0183
STANDARD FOR INTERFACING MARINE ELECTRONICS NAVIGATIONAL DEVICES
Version 2.00
January 1, 1992

3.1 NMEA Approved Sentence Structure

The following is a summary of the approved navigation sentence structure:

$aabbb,c---c*hh<CR><LF>

ASCII	HEX	DESCRIPTION
"$"	24	Start of Sentence
aa		Dummy characters to start the Address Field (e.g. GP), not used by EdgeTech products.
bbb		Sentence Formatter. Mnemonic code identifying the data type and the string format of the successive fields.
","	2C	Field Delimiter. Starts each field except Address and Checksum fields. If it is followed by a null field, it is all that remains to indicate no data in the field.

Table A-1: NMEA Approved Sentence Structure

3.2 Port Parameters

The following are the default port parameters that cannot be changed:

PARAMETER	DESCRIPTION
Interface	RS-232C
COM Port	User choice limited to installed serial ports Baud Rate: 4800/9600
Data Bits	8
Start Bits	1
Stop Bits	1
Parity	None
Handshaking	None

Table A-1: Port Parameters

3.3 Port Selection

The port assigned to receive the navigation messages is assigned by the user via the Serial Port Setup dialog window. This is accessed via the *Configuration* > *Setup* pull down menus, as shown in **FIGURE 3-1**.

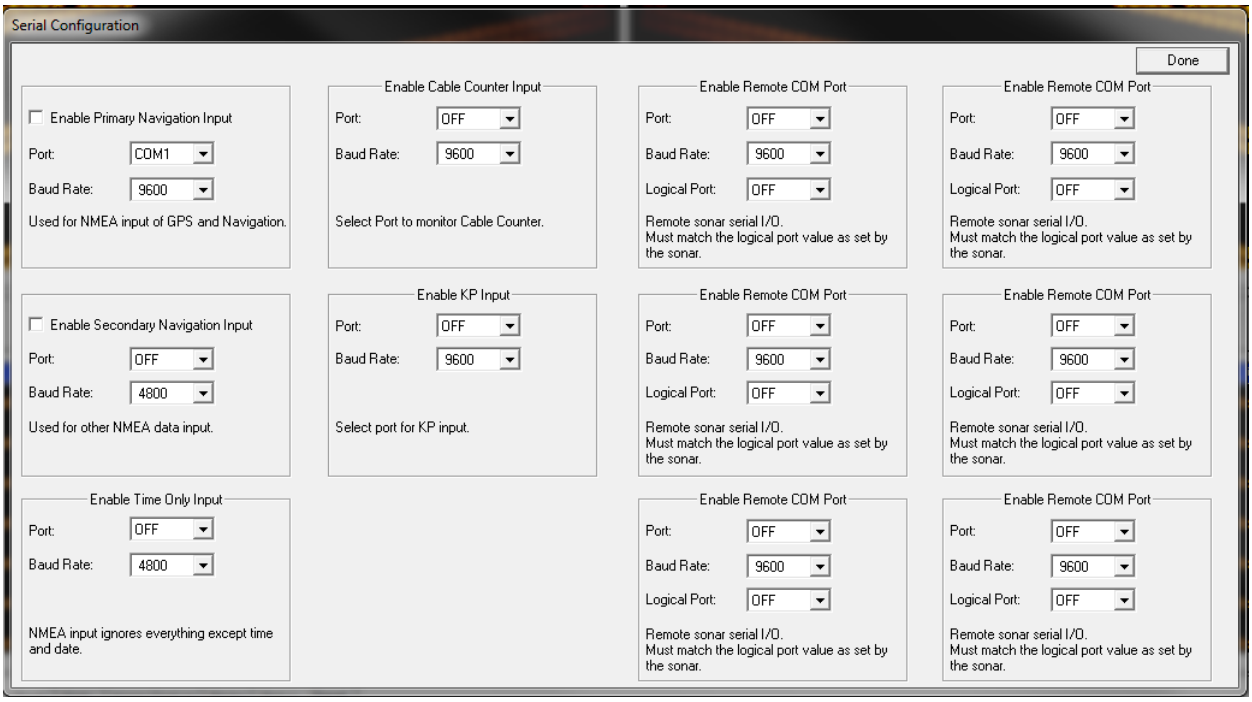

Figure 3-1: Port Selection

The user can setup the primary, secondary, or both navigation ports to receive Time and Positional messages from the GPS. The secondary port can be used to supply additional NMEA data such as Gyro heading, Event Mark, etc.

Valid Baud rates are 1200-115200 depending on your NMEA source. Higher rates are not yet supported.

The DISCOVER software will support up to two navigation input serial ports for connecting to any sources of these NMEA serial data strings. The messages may come in on any of the two enabled ports, or they may all be input via one port. No distinction or priority is given to any port over another. It is safest to only enable those ports needed for supplying valid data.

> **NOTES:** DISCOVER can receive navigation data on both ports at the same time, as long they are not the same. For instance is not recommended to receive two ZDA on both ports.
>
> GPS information are displayed in the DISCOVER status bar once the Sonar is transmitting / waterfalling.

3.4 Inputs

The following sub-sections are the approved NMEA sentences recommended for use with DISCOVER-based systems.

The list of discussed NMEA and Edge Tech messages are:

GLL, **GXY**, **GGU**, **GGA**, **RMA**, **RMC**, **VTG**, **ZDA**, **HDG**, **EVT**, and **EMA.**

The list of compatible, but not discussed NMEA and Edge Tech messages are:

DBT, DPT, EMA, ETC, GDA, HDT, and MTW.

> **NOTES:** The minimum recommended NMEA message that should be used ought to be a position message such as GGA, GLL, GGU, GXY, or RMC. RMC is best, as it contains both time and date, whereas the other position strings do not. If a ZDA message is used as well, this will not matter. However, for a single message, RMC is the best choice.
>
> In the message types described below, "*hh" refers to an optional checksum field.

3.4.1 GLL: Geographic Position – Latitude / Longitude

Latitude and Longitude of the present vessel position, time of position fix and status.

$--GLL,xxxx.xxx,a,yyyyyy.yyy,b,hhmmss.ss,A*hh<CR><LF>

ASCII	DESCRIPTION
xxxx.xxx	Degrees|Minutes.decimal - 2 fixed digits of degrees, 2 fixed digits of minutes and a variable number of digits for decimal fractions of minutes. Leading zeros always included for degrees and minutes to maintain fixed length.
a	N for North Latitude or S for South Latitude
yyyyy.yyy	Degrees|Minutes.decimal - 3 fixed digits of degrees, 2 fixed digits of minutes and a variable number of digits for decimal fractions of minutes. Leading zeros always included for degrees and minutes to maintain fixed length.
b	E for East Longitude or W for West Longitude
hhmmss.ss	Time of position fix. Hours|Minutes|Seconds.decimal - 2 fixed digits of hours, 2 fixed digits of minutes, 2 fixed digits of seconds and a variable number of digits for decimal fractions of seconds. Always pad with leading zeros. This field is optional.
A	Status. Single character field: A = Yes, Data Valid, Warning Flag Clear V = No, Data Invalid, Warning Flag Set

Table A-1: GLL – Geographic Position Latitude Longitude

> **NOTE:** Other supported navigation strings for position are: GGA, RMA, and RMC.

3.4.2 GXY: Geographic Position – X / Y Coordinates

X and Y coordinates of the present vessel position, in millimeters, time of position fix and status.

$--GXY,xxxxxx.xxx,a,yyyyyy.yyy,b,hhmmss.ss,*hh<CR><LF>

ASCII	DESCRIPTION
xxxxxx.xxx	Double floating point numeric, may have leading negative sign. Represents horizontal axis of plane (X coord)
a	Character label for X (Must be valid ASCII character, but value is ignored)
yyyyyy.yyy	Double floating point numeric, may have leading negative sign. Represents horizontal axis of plane (Y coord)
b	Character label for Y (Must be valid ascii character, but value is ignored)
hhmmss.ss	Time of position fix. Hours|Minutes|Seconds.decimal - 2 fixed digits of hours, 2 fixed digits of minutes, 2 fixed digits of seconds and a variable number of digits for decimal fractions of seconds. Always pad with leading zeros.

Table A-1: GXY – Geographic Position-X and Y Coordinates

> **NOTE:** The hhmmss.ss field is optional. This format provides high accuracy (mm level) positions over smaller X- Y ranges from + 999,999m to -999,999m

3.4.3 GGU: Geographic Position – X / Y Coordinates

X and Y coordinates of the present vessel position in decimeters, time of position fix and status.

> **NOTE:** GGU string has a similar format as GXY but provides support for larges planes.

$--GGU,xxxxxxxx.x,a,yyyyyyyy.y,b,hhmmss.ss,*hh<CR><LF>

ASCII	DESCRIPTION
xxxxxxxx.x	Double floating point numeric, may have leading negative sign. Represents horizontal axis of plane (X coordinate).
a	Character label for X (Must be a valid ASCII character, but value is ignored).
yyyyyyyy.y	Double floating point numeric, may have leading negative sign. Represents vertical axis of plane (Y coordinate).
b	Character label for Y (Must be a valid ASCII character, but value is ignored).
hhmmss.ss	*Time of position fix. Hours|Minutes|Seconds.decimal - 2 fixed digits of hours, 2 fixed digits of minutes, 2 fixed digits for seconds and a variable number of digits for decimal fractions of seconds. Always pad with leading zeros.*

Table A-1: GGU – Geographic Position – X and Y Coordinates

> **NOTE:** The hhmmss.ss field is optional. This format provides for lower accuracy (1/10th m level) positions over larger X-Y ranges from + 99,999,999m to -99,999,999m

3.4.4 GGA: Global Positioning System Fix Data

Time, Position and fix data for a GPS receiver.

$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,q,nn,d.d,a.a,M,g.g,M,e.e,rrrr,*hh

<CR><LF>

ASCII	DESCRIPTION
xxxxxxxx.x	Double floating point numeric, may have leading negative sign. Represents horizontal axis of plane (X coordinate).
a	Character label for X (Must be a valid ASCII character, but value is ignored).
yyyyyyyy.y	Double floating point numeric, may have leading negative sign. Represents vertical axis of plane (Y coordinate).
b	Character label for Y (Must be a valid ASCII character, but value is ignored).
hhmmss.ss	*Time of position fix. Hours|Minutes|Seconds.decimal - 2 fixed digits of hours, 2 fixed digits of minutes, 2 fixed digits for seconds and a variable number of digits for decimal fractions of seconds. Always pad with leading zeros.*

Table A-1: GGA – Geographic Position – X and Y Coordinates

3.4.5 RMA: Recommended Minimum Specific Loran-C Data

Position, course and speed from a Loran-C receiver

$--RMA,A,llll.ll,a,yyyyy.yy,a,d.d,.e.e,f.f,g.g,h.h,j,k*hh<CR><LF>

For fields see NMEA 0183 Specification.

3.4.6 RMC: Recommended Minimum Specific GNSS Data

Time, Date, Position, course and speed provided from a GNSS receiver

$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,d.d,e.e,ddmmyy,g.g,j,k*hh<CR>

<LF>

For fields see NMEA 0183 Specification

3.4.7 VTG: Track Made Good & Ground Speed

The actual track made good and speed relative to the ground

$--VTG,x.x,T,x.x,M,x.x,N,x.x,K*hh<CR><LF>

ASCII	DESCRIPTION
x.x	Floating point numeric
T	Degrees True
M	Degrees Magnetic
N	knots
K	Kilometer/hour

Table A-1: VTG: Track Made Good & Ground Speed

NOTE: Magnetic heading corrected for local deviation and Easterly/Westerly variation would provide more accurate true vessel heading in degrees.

3.4.8 ZDA: Time & Date

UTC, day, month, year, and local time zone

$--ZDA,hhmmss.ss,dd,mm,yyyy,ll,zz*hh<CR><LF>

ASCII	DESCRIPTION
hhmmss.ss	Universal Time Coordinated (UTC). Hours|Minutes|Seconds.decimal - 2 fixed digits of hours, 2 fixed digits of minutes, 2 fixed digits of seconds and a variable number of digits for decimal fractions of seconds. Always pad with leading zeros.
dd.mm	Day(01 to 31)|.Month(01 to 12)
yyyy	Year
ll	Local zone description, 00 to □13 hour. This field is optional and ignored.
zz	Local zone minutes' description, same sign as local hours. This field is optional.

Table A-1: ZDA: Time & Date

NOTE: This message is essential to correct system operation as this is used to set the correct time in the data recorded by the DISCOVER application, or sent to 3rd Party Topsides, as well as to correctly set the time of the sonar acquisition application running in the towfish.

Zone description is the number of whole hours added to local time to obtain GMT, Zone description is negative for East longitudes.

Fix marks are bars across the time zero line in all channels.

3.4.9 HDG: Heading, Deviation & Variation

Heading (magnetic sensor reading), which if corrected for deviation, will produce Magnetic heading, which if offset by variation will provide True heading.

$--HDG,x.x,x.x,a,x.x,a*hh<CR><LF>

ASCII	DESCRIPTION
HDG	Magnetic sensor heading, degrees
x.x	Magnetic deviation, degrees E/W1,3
x.x, a	Magnetic variation, degrees, E/W2,3

Table A-1: HDG: Heading, Deviation & Variation

NOTES: To obtain Magnetic Heading:

- Add Easterly deviation (E) to Magnetic Sensor Reading
- Subtract Westerly deviation (W) from Magnetic Sensor Reading

To obtain True Heading:

- Add Easterly variation (E) to Magnetic Heading
- Subtract Westerly variation (W) from Magnetic Heading

Variation and deviation fields shall be null fields if unknown.

3.4.10 EVT: Event & Annotation (EdgeTech Custom)

Event mark and related annotation provided by an integrated navigation system

$EGEVT,S,<Message>,*hh<CR><LF>

ASCII	DESCRIPTION
S	ASCII character status flag. M = Print and Store event mark
Message	Event annotation or just annotation message up to 80 characters long with a maximum number of messages being 10

Table A-1: EVT: Event & Annotation

> **NOTE:** Only the first 23 characters of the first message is saved in the data segy data. A maximum of 10 <Messages> separated by commas may be sent.
>
> Annotation and event marks are placed on the screen when received, printed on the printer if on, and stored on disk along with time, date and coordinates.
> Event marks are displayed on the top of the screen as a tick mark and mark number.

A shortcut to the Windows HyperTerminal application is provided to check the navigation input. You must quit the MP-X application before running, and may need to modify the properties if not running at 4800 baud. A sample display is shown below:

```
$GPGLL,2600.0100,N,800000.0000,W,151228.99,A*67
$GPVTG,315.65,T,314.15,M,3.8,N,7.0,K*48
$GPZDA,151229.25,28.08,1997,06,00*45
$EGEVT,M,EventNo,Time,Position,Annotation,*73
```

```
$GPGLL,2600.0125,N,8000.0025,W,151229.50,A*84
$GPVTG,316.65,T,315.15,M,3.9,N,7.1,K*33
$GPZDA,151229.75,28.08,1997,06,00*45
$EGEVT,M,EventNo,Time,Position,Annotation,*48
```

```
$GPGLL,2600.0150,N,800000.0050,W,151229.99,A*12
$GPVTG,315.85,T,314.65,M,3.8,N,7.0,K*58
$GPZDA,151230.25,28.08,1997,06,00*72
$EGEVT,M,EventNo,Time,Position,Annotation,*48
```

3.4.11 EMA: Event, Set Mark & Annotation (EdgeTech Custom)

Event mark number and annotation provided by an integrated navigation system

$ETEMA,NNNNNN, <Message>,**hh<CR><LF>

ASCII	DESCRIPTION
NNNNNN	Mark number to use for this event.
Message	Event annotation message up to 23 characters long

Table A-1: EMA: Event, Set Mark & Annotation

> **NOTE:** This message should only be used if it is imperative that the event mark number be externally controlled, otherwise the $EGEVT message should be used. If the mark number sent is the same as the current mark number the message will be ignored.

```
$GPGLL,2600.0100,N,800000.0000,W,151228.99,A*67
$GPVTG,315.65,T,314.15,M,3.8,N,7.0,K*48
$GPZDA,151229.25,28.08,1997,06,00*45
$EGEVT,M,EventNo,Time,Position,Annotation,*73
```

```
$GPGLL,2600.0125,N,8000.0025,W,151229.50,A*84
$GPVTG,316.65,T,315.15,M,3.9,N,7.1,K*33
$GPZDA,151229.75,28.08,1997,06,00*45
$EGEVT,M,EventNo,Time,Position,Annotation,*48
```

```
$GPGLL,2600.0150,N,800000.0050,W,151229.99,A*12
$GPVTG,315.85,T,314.65,M,3.8,N,7.0,K*58
$GPZDA,151230.25,28.08,1997,06,00*72
$EGEVT,M,EventNo,Time,Position,Annotation,*48
```

> **NOTE:** The number of incoming strings should be limited to the five mentioned above. For accurate fixes, the navigation strings should be updated once a second or faster.

3.5 Serial Port Connections

The following chart depicts the pinout of the male DB9, RS232 connector found on the computer.

9 PIN MALE PIN-OUT	
Pin 1	Carrier Detect (CD) input
Pin 2	Receive Data (RD) input
Pin 3	Transmitted Data (TD) output
Pin 4	Data Terminal Ready (DTR) output
Pin 5	Signal Ground
Pin 6	Data Set Ready (DSR) input
Pin 7	Request To Send (RTS) output
Pin 8	Clear To Send (CTS) input
Pin 9	Ring Indicator (RI) input

Table A-1: Pin Out Description

The following outlines the different pins from comport connection the EdgeTech processor uses for communication:

PIN # 2 (usually brown)

The Receive Data (RD) pin, which connects to the transmit pin on the GPS, receives data input from the GPS for use in DISCOVER software. This is a necessary connection for GPS communications.

PIN # 5 (usually green)

The Signal ground pin is connected to the common ground from the GPS wiring. This is a necessary connection for GPS communications.

PIN # 3 (usually red)

The Transmit pin is connected to the common from the GPS wiring. Pin # 3 is not a necessary connection for using DISCOVER software for Real-Time positioning. Only proper connections to pins number 2 and 5 are needed for to log navigation data.

3.6 Troubleshooting

PROBLEM: When connected to a GPS, the computer's mouse acts erratically and seems to be 'jumping.'

SOLUTION:
A Windows bug discovered by Microsoft where Windows detects a connected GPS as a mouse--this produces a jumping cursor problem. The following are the directions supplied by Microsoft support to correct the problem:

1. Turn off the GPS and close DISCOVER Software.
2. Right-click on the My Computer icon and select Properties.
3. Select the Hardware tab, and click the Device Manager button.
4. Next to "Mice and other pointing devices," click the plus button to expand this list. You should see at least two items listed. One is the mouse you normally use, and the other will probably be listed as "Microsoft Serial Ball Point."
5. Highlight "Microsoft Serial Ball Point" and click the Disable button at the top of the window (it is usually the second button from the right; hover the cursor over it and read the Tool Tip to verify).
6. In the confirmation message window that appears, click Yes.
7. Close the Device Manager.
8. Plug in/turn on your GPS.
9. Restart DISCOVER software, or let Windows load before plugging in or turning on the GPS for a quick fix.

PROBLEM: No communications between GPS and DISCOVER Software.

SOLUTION:
When DISCOVER is not receiving the GPS data, first verify DISCOVER's primary/secondary COM ports and baud rate matches those of the GPS. Then, using a terminal program such as *Tera Term*, verify the information received by the COM port. Follow the steps below for this procedure:

> **NOTE:** DISCOVER and all other programs, especially any that use COM ports for other connections, should be closed while running Tera Term (a terminal emulator program).

1. Set the GPS to its NMEA mode in its Interface Setup area for this test.
2. Set GPS to Simulator mode if indoors, or if you are having difficulty obtaining a GPS satellite fix.
3. Run the Tera Term executable file at C:\Edhetech\Utilities.

4. Click on the Setup menu, and under the drop down, select Serial Port. The Tera Term Serial port setup window pops up.
5. Select the port number, baud rate, data 8 bits, parity to none, stop 1 bit, and set flow control to none. Finally, set the transmit delay set to 0.

Repeat the procedure above for the other COM ports. If none of these are receiving GPS input, then the problem lies in the physical serial port, the GPS receiver, or the connection between the two.

At this point, one of three things can happen:

1. An error message appears. This means that the COM port you have selected is not available or functioning properly. Close Tera Term and repeat the process, trying a different COM port. If you are certain that you are selecting the proper COM port, contact EdgeTech for further troubleshooting tips.

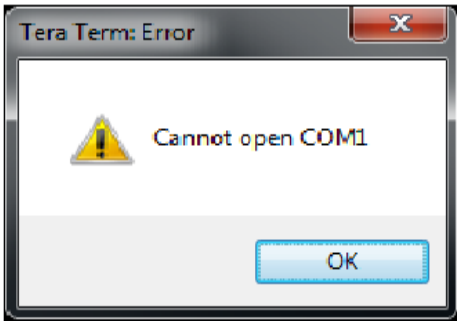

Figure 3-2: Tera Term Error Message

2. A blank screen with a flashing cursor appears (**FIGURE 3-3**). The COM port you have chosen is not currently receiving NMEA data. Close Tera Term and repeat the process, trying a different COM port. If you are certain that you are selecting the proper COM port, check the output settings on the GPS. If you are certain that the GPS is outputting NMEA strings, use a Null Modem to swap pin 2 and 3 (TX & RX).

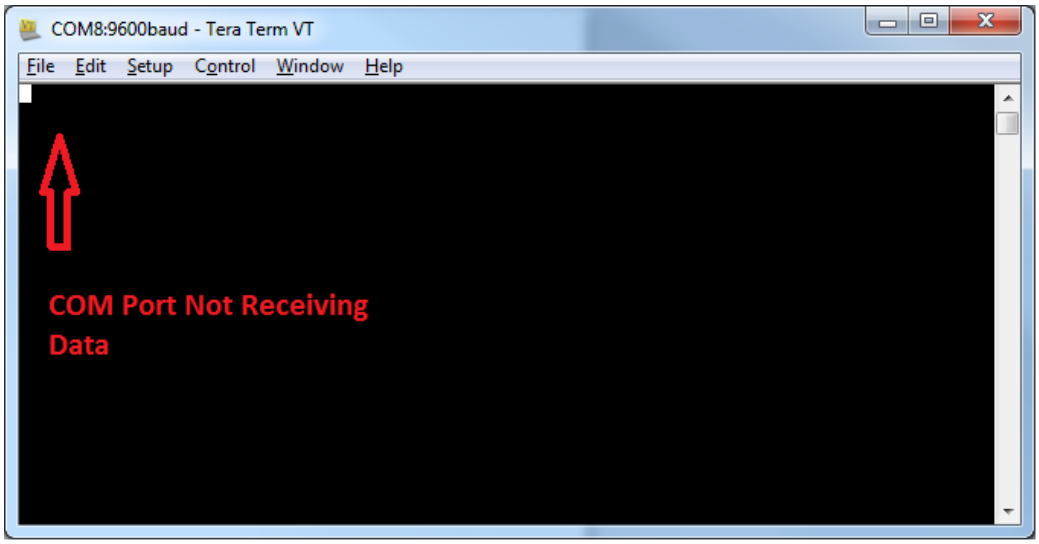

Figure 3-3: COM Port Not Receiving Data (Blinking Cursor)

3. A screen with text scrolling upward appears. You are successfully connected to your GPS unit. Good GPS data will look like (**FIGURE 3-4**).

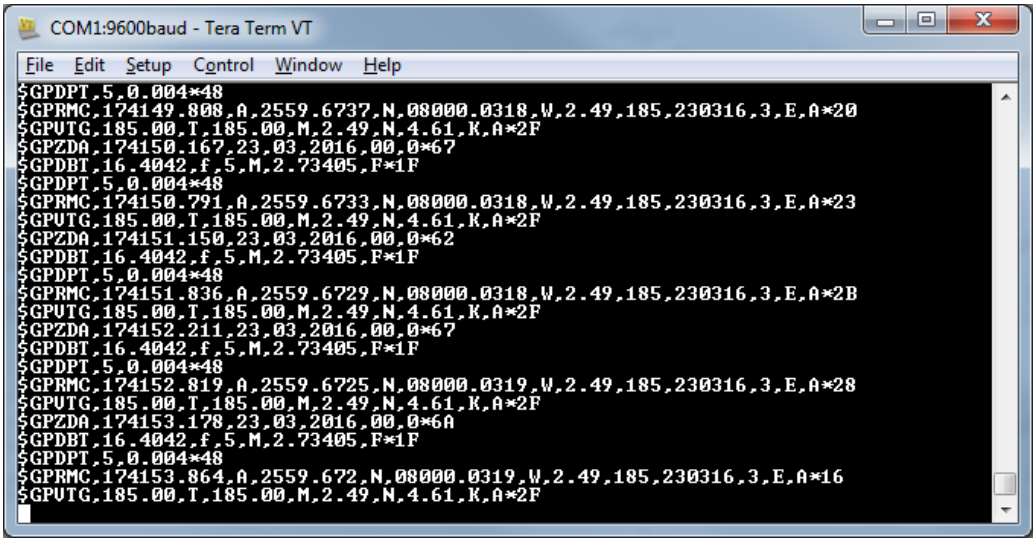

Figure 3-4: Healthy GPS Data

The data you see scrolling by indicates your current position (among other things). Note the COM port used and exit Tera Term.

A.0 DOWNLOADING & UPDATING DISCOVER

The entire DISCOVER 4200 InstallShield is available on the EdgeTech company website. To download and install it:

1. Navigate to the following URL in any web browser:

   http://www.edgetech.com/underwater-technology-support/

2. Navigate down to the heading which states "Discover Software Available for Download" and click on the "4200 Discover Software" link.

3. Download the InstallShield zip folder and then extract it.

4. EdgeTech recommends copying this file to the C drive for the topside and executing.

Users that already have an older version of DISCOVER 4200 installed may only want to update the individual executable files. To do this, contact EdgeTech **CUSTOMER SERVICE**.

B.0 CABLE COUNTERS

The following cable counters are compatible with DISCOVER 4200:

B.1 MacArtney MK2

Format: L = lll,l m<lf> or S=sss,sss m/s<lf>

ASCII	DESCRIPTION
L	Header for cable length
lll	Cable length
m	Cable length unit
S	Header for cable speed
sss	Cable speed
m/s	Cable speed unit

Table B-1: MacArtney MK2

Example: L=10835.81 S=1.05

B.2 LCI-90

Format: RD,-TTTTT.TT,-SSS.SSS,PPP.PPPP,CCCC<CR><LF>

ASCII	DESCRIPTION
'-'	Stands for an optional minus sign, which is always the first character (but omitted if the data is positive).
TTTTT.TT	Cable Tension
SSSS.SSS	Cable Speed
PPP.PPPP	Cable Out Length
CCCC	A 4-digit decimal field, which contains the sum of the ASCII value of all preceding characters, including the commas (but not including the four CCCC characters).

Table B-2: LCI-90

Example: RD,396.361,1.05,10828.8,1245

B.3 TCount

Format: Address: [+ or -]1234[cr][lf]

ASCII	DESCRIPTION
1234	Counter value: -92 X circumference to 8100 X circumference

Table B-3: TCount

Example: 3:+10814.48

B.4 USGS Custom 3PS SD-41

Example: 01, 396.361, , 10793.62, , 1.05, ,

The forth column is the Cable value

B.5 Hypack

Format: [Cable Tension], Cable Speed], [Cable Length],

[Cable Tension], [Cable Speed], [Cable Length]

Example: 10823.95 HYPACK METERS

B.6 XDR

Format: $- -XDR,D,[Cable Length]

Example: $GPXDR,D,10819.39

Do not care '- -' 'XDR,D,' 6 characters

B.7 Hydrographic Smart Cable Counter

Format: $CCANNNNNN.NM,+CCCC<cr><lf>

Example: $CCA10798.2M,+1000

ASCII	DESCRIPTION
A	can be A, B, C, D depending on internal setting
NNNNNN.N	The cable out value a fixed number of characters with leading zeros
M	Can be M - Meters or F - Feet, Feet are converted to Meters
+/-CCCC	The calibration value which is ignored.

Table B-4: Hydrographic Smart Cable Counter