DISCOVER SUB-BOTTOM SOFTWARE

USER SOFTWARE MANUAL

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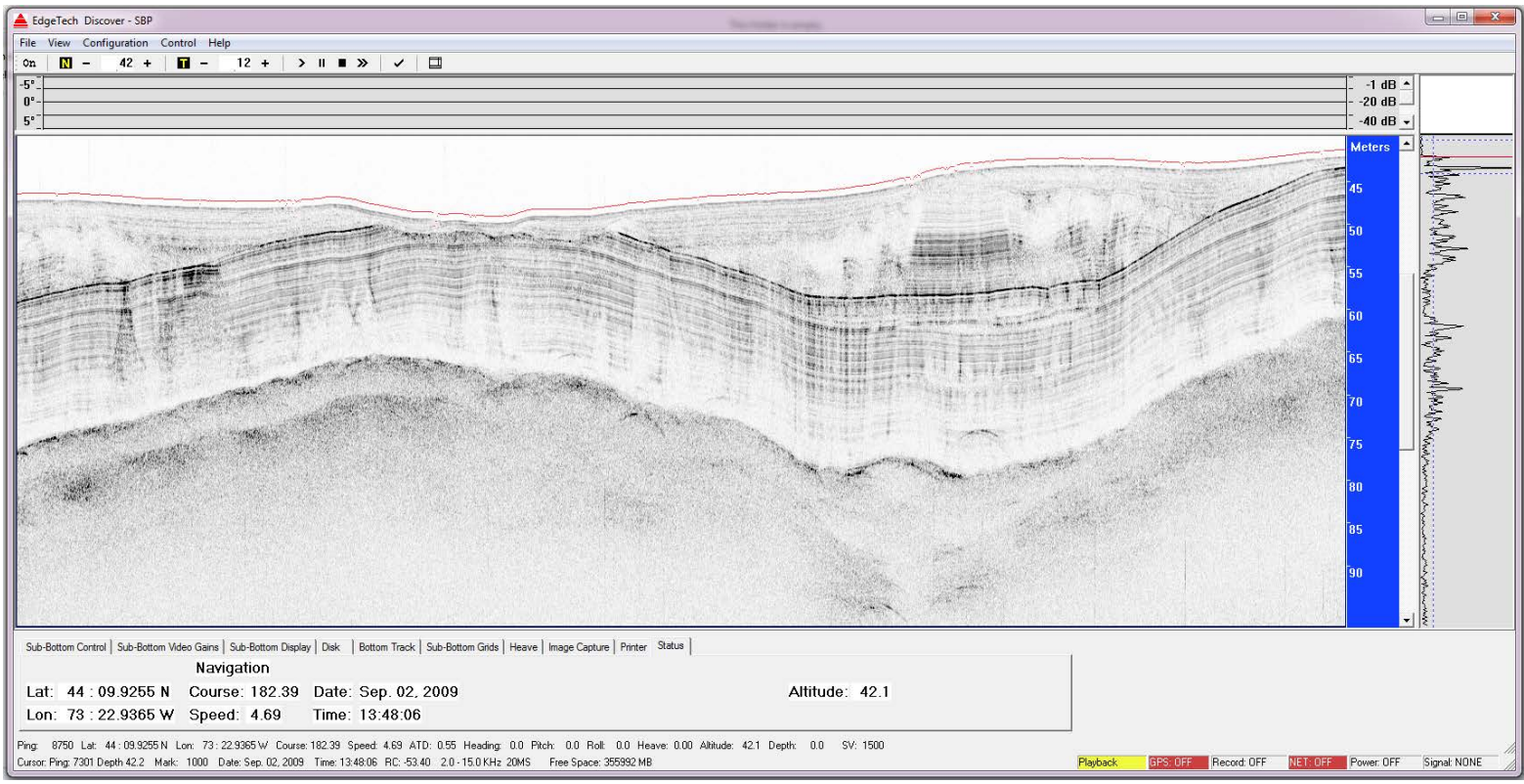
2/3/2018



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ABOUT THIS DOCUMENT

We, the employees at EdgeTech, would like to thank you for purchasing an EdgeTech Sub-Bottom Profiling system. 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 equipment.

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 Sub-Bottom Software. Although this manual encompasses the latest operational features of DISCOVER Sub-Bottom Software, some features may be periodically upgraded. Therefore, the information in this manual is subject to change and should be used for reference only.

This manual is suited for the following Units:

- 2000: Combined Side Scan Sonar & Sub-Bottom Profiler
- 2200 & 2205: AUV / UUV / ROV / ASV / USV Sonars
- 2300: Combined Side Scan Sonar, Bathymetry, & Sub-Bottom System
- 2400: Deep Towed
- 3100: Portable Sub-Bottom Profiler
- 3200: High Penetration Sub-Bottom Profiler
- 3300: Hull Mount Sub-Bottom Profiler

Please refer to your system's Hardware Manual for Hardware related information.

Liability

EdgeTech has made every effort to document the DISCOVER Sub-Bottom Software accurately and completely. However, EdgeTech assumes no liability for errors or for any damages that result from the use of this manual or the software it documents. EdgeTech reserves the right to upgrade features of this equipment, and to make changes to this manual, without notice at any time.

Revision History

REVISION	DESCRIPTION	DATE	APPROVAL
A	Initial Software Release	07/26/2017	HS
B	Updates to Manual	02/03/2018	TS

Cautions and Notes

Where applicable, warnings, 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.

CAUTION!

The equipment affiliated with the Discover Sub-Bottom Software contains static sensitive devices that are extremely sensitive to static electrical charges, which may be developed on the body and the clothing. Extreme care should be taken when handling these devices both in and out of the circuit board. Normal handling precautions involve the use of anti-static protection materials and grounding straps for personnel.

The equipment generates, uses and can radiate radio frequency energy, and if not installed properly may cause interference to radio communications. It has not been tested to compliance to the appropriate FCC rules designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user, at his own expense, will be required to take whatever measures needed to correct the interference. It is the user's responsibility to verify that the system complies with the applicable FCC emission limits.

High Voltage may be present in the Tow Fish, power amplifier and the topside processor. Use caution when the electronics are removed from their containers for servicing. Operation with improper line voltage could cause serious damage to the equipment.

SOFTWARE SERVICE OVERVIEW

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.

Software Updates and Enhancements

EdgeTech customers can download new software releases with all modifications and enhancements from the EdgeTech website. Major software issues, should they occur, will be reported directly to the customer. New software releases consist of the following:

- Software enhancements
- Software fixes and changes
- Product integration
- Documentation updates to on-line help
- Tests for compatibility with other modules

Software patches consist of software that has undergone the following:

- Minor software enhancements
- Software fixes and changes

EdgeTech customers are entitled to contact **EDGETECH CUSTOMER SERVICE** by telephone, facsimile, or e-mail to report a difficulty, to discuss a problem or to receive advice on the best way to perform a task. When contacted, EdgeTech Customer Service will do the following:

- 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

CUSTOMER SERVICE

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 Model and 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

For more information please go to www.EdgeTech.com.

COMPANY BACKGROUND

EdgeTech (formerly EG&G Marine Instruments) traces its history in underwater data acquisition and processing back to 1966. 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 acquisition software that is provided with each Side Scan and Sub-Bottom Systems. This manual documents the version designed specifically for Sub-Bottom Systems.

EdgeTech Full Spectrum® sonar systems employ advanced CHIRP technology to obtain high resolution, low noise data records. DISCOVER works by triggering the hardware to send out a linear CHIRP pulse, and then displaying 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 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, SEG-Y or XTF file for later playback. For compatibility with other EdgeTech products, DISCOVER Sub-Bottom interfaces to Sonar.exe and the analog interface boards to generate and transmit CHIRP pulses. Each time the system turns on, a startup file automatically launches Sonar.exe, which runs in the background.

DISCOVER Sub-Bottom's data and control connections are entirely through TCP/IP connections, allowing the program to run on Windows® 7 / 10. This connection may include, but is not limited to: directly connected computers using a crossover cable, computers connected via standard Ethernet hub, or computers connected using the EdgeTech STARMUX Digital Telemetry Link and FS-IU (Topside Interface Unit). DISCOVER Sub-Bottom can also be run on the EdgeTech Full Spectrum® Sonar System computer.

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.

Select Key features of DISCOVER Sub-Bottom Include:

- A Waterfall Display
- Waveform data displays
- Reflection coefficient
- Echo strength
- Data recording and playback
- NMEA GPS navigation input
- Sonar commands and controls
- Sonar diagnostics
- Ping (return) number
- Manual Marks thru Discover software
- Event/Fix Marks (sent to DISCOVER from a Custom GPS string
- Thermal printer support for waterfall data output

1.1.1 Bottom Tracking

The Bottom Tracking is functionality integral to the Sub-Bottom Profiler. Bottom Tracking is the altitude of the transducer off the seafloor. It is shown in the **MAIN WATERFALL DISPLAY**, identified by a red line displayed 1 unit above the current bottom. To enable bottom tracking, see **BOTTOM TRACK**.

1.1.2 Applications

This system has the unique ability to strip away the world's oceans and provide high resolution Sub-Bottom images. This tool lends itself to various tasks that include:

- Geological Surveys
- Geohazard Surveys
- Archeological Surveys
- Mining/Dredging Surveys
- Environmental Site Investigations
- Sediment Classification
- Buried Pipeline & Cable Surveys
- Pre & Post Marine Construction Surveys
- Map Natural Resources
- Beach re-nourishment
- Imaging fluidized mud
- Scour/erosion surveys
- Imaging biologics in water column
- Full ocean depth Sub-Bottom imaging (hull mount systems)

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) can be input either to Discover via Serial port or to sonar Serial/TCP/UDP port. If the processing computer does not have a dedicated Serial Port, a USB-to-serial adapter can be used in its place.

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 and SEG-Y formats. While SEG-Y files can be played back in Discover, XTF files cannot. Both file types 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. DISCOVER can also record XTF and SEG-Y when these options are selected.

> **NOTE:** Even if both XTF and SEG-Y are selected to record simultaneously, the system will still record a JSF, totaling 3 files. JSF should be archived.

> **WARNING!**
>
> Data stored in or transferred to SEG-Y format cannot be transferred back to XTF and/or JSF. Any information supported in XTF or JSF, but not supported in SEG-Y will be permanently lost.

1.1.5 Sonar Data Types

The Discover Sub-Bottom records:

Analytic Signal: Match filtered data. This complex data consists of real and imaginary pairs. DISCOVER Sub-Bottom data is recorded in this format because it contains additional frequency information not present in envelope data.

DISCOVER Sub-Bottom does not record Raw or Envelope Data. JSTAR Diagnostic Software may be used to store JSF file with these types of signal. When recording or converting data to SEG-Y file format, the user may select to store it in Envelope or Analytic type.

1.1.6 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, XTF, and SEG-Y simultaneously. Record can be started or stopped at any time during acquisition.

1.1.7 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 topside processor, an Ethernet switch that networks both topside processors, or by running the third-party program on the topside processor. For more information, contact **EDGETECH CUSTOMER SERVICE**.

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

The National Marine Electronics Association (NMEA) is a non-profit association of manufacturers, distributors, dealers, educational institutions, and others interested in peripheral marine electronics occupations. The NMEA 0183 standard defines an electrical interface and data protocol for communications between marine instrumentation.

The user can adjust settings between DISCOVER and a user-provided Navigation System via a Serial Port with NMEA-type Message Annotation Input. See **NAVIGATION-ANNOTATION** for more detail.

1.3 Modules

DISCOVER Sub-Bottom has 2 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 install on machine with less than 4 GB RAM or 32-bit OS.

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

For DISCOVER Target Logger features, see **DISCOVER APPS**.

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 old Coverage Mapper install on machines with less than 4 GB RAM or 32-bits OS.

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

For DISCOVER Coverage Mapper features, see **DISCOVER APPS**.

1.4 TRIGGERING

There are two trigger modes: Internal and External. These are defined below.

1.4.1 Internal Trigger

DISCOVER Sub-Bottom is set to Internal Trigger by Default. In this mode, the user may specify the ping rate in Hertz.

> **NOTE:** The maximum ping rate is determined by pulse type and length, and is automatically limited based on the pulse selected.

1.4.2 External Trigger

In this mode, the system is triggered by the external event received via the Trigger IN BNC connector in the back of the system. When the hardware trigger is asserted (active log) a new ping occurs.

Discover External Triggering is available if the sonar system supports this feature:

Available In: 2000, 2200, 2205, 2300, 2400, 3200, 3300

Unavailable In: 3100

> **Note:** The system can be configured to take in a positive edge trigger, it just requires a modification to the sonar.ini file. Contact **EDGETECH CUSTOMER SERVICE** for further assistance in this matter.

Figure 1-1: TTL - Negative Edge Trigger of 5ms (minimum)

EdgeTech's Sonar expects TTL negative edge trigger of 5ms minimum to operate.

For more information, see **TRIGGER CONFIGURATION**.

> **Note:** Each subsystem has a minimum trigger interval (maximum rate), which is dependent on Pulse Type and proportional to pulse length. A longer pulse sets a longer minimum interval, to keep ON|OFF duty cycle of Power Amplifier below the maximum allowed, typically 1:10. The used trigger interval will be the **larger** of the user interval and Power Amplifier imposed limit.

2.0 DISCOVER SUB-BOTTOM INTERFACE

DISCOVER Sub-Bottom contains a single waterfall display for viewing data in real-time or during playback. The Waterfall Display has an accompanying X-Y Plotting window, which represents the reflection coefficient. The DISCOVER Sub-Bottom Display has three window panes, one being the waterfall Display; the second is the Waveform Display, and the X-Y plot window. Each window can be resized with mouse left-click and drag.

This section will go through the Discover Sub-Bottom Interface and the Software Features. An image of DISCOVER Sub-Bottom without Data is shown in **FIGURE 2-1**, whereas **FIGURE 2-2** shows data.

All the features labeled in **FIGURE 2-1** are discussed below in greater detail below.

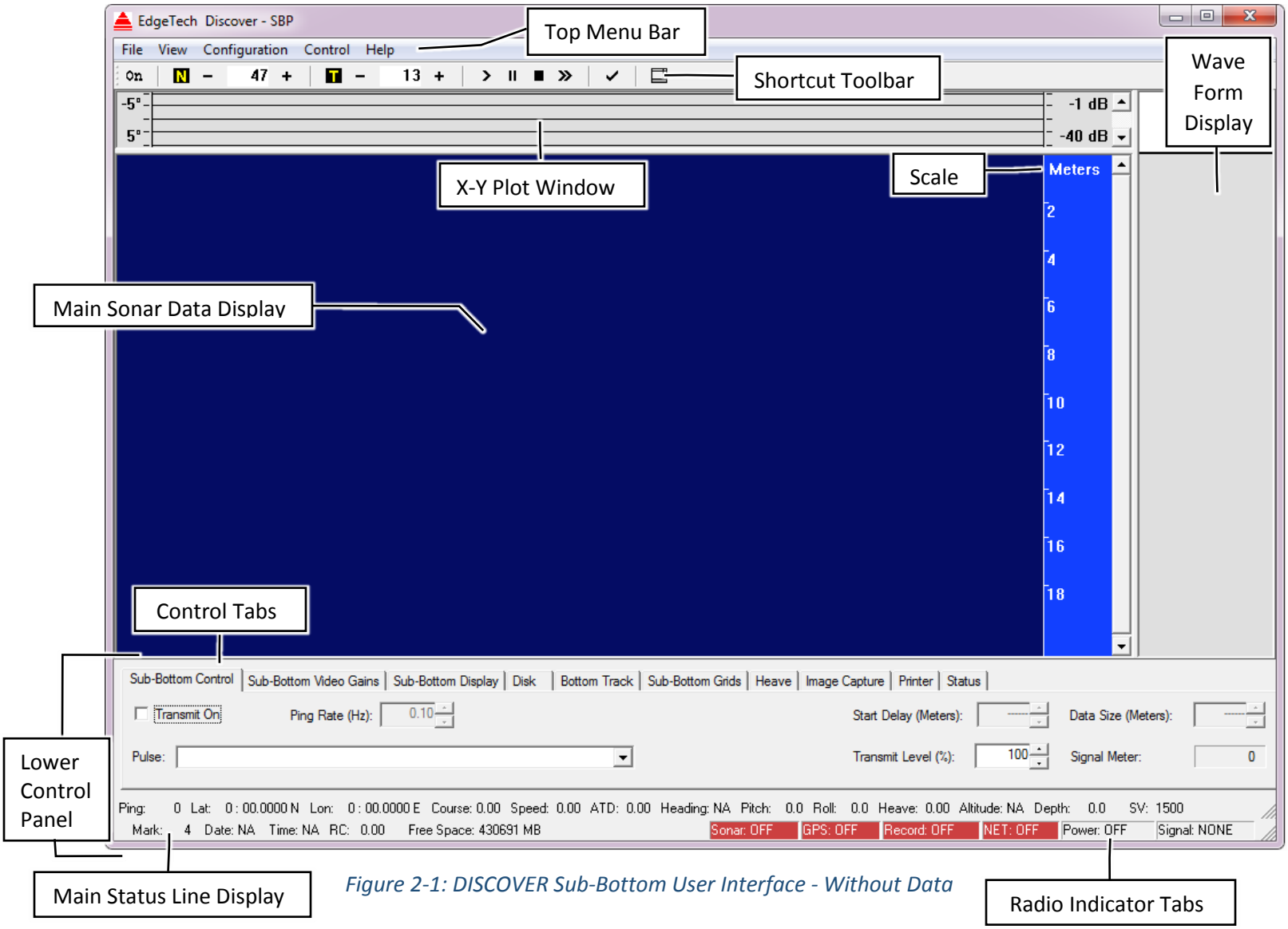

Figure 2-1: DISCOVER Sub-Bottom User Interface - Without Data

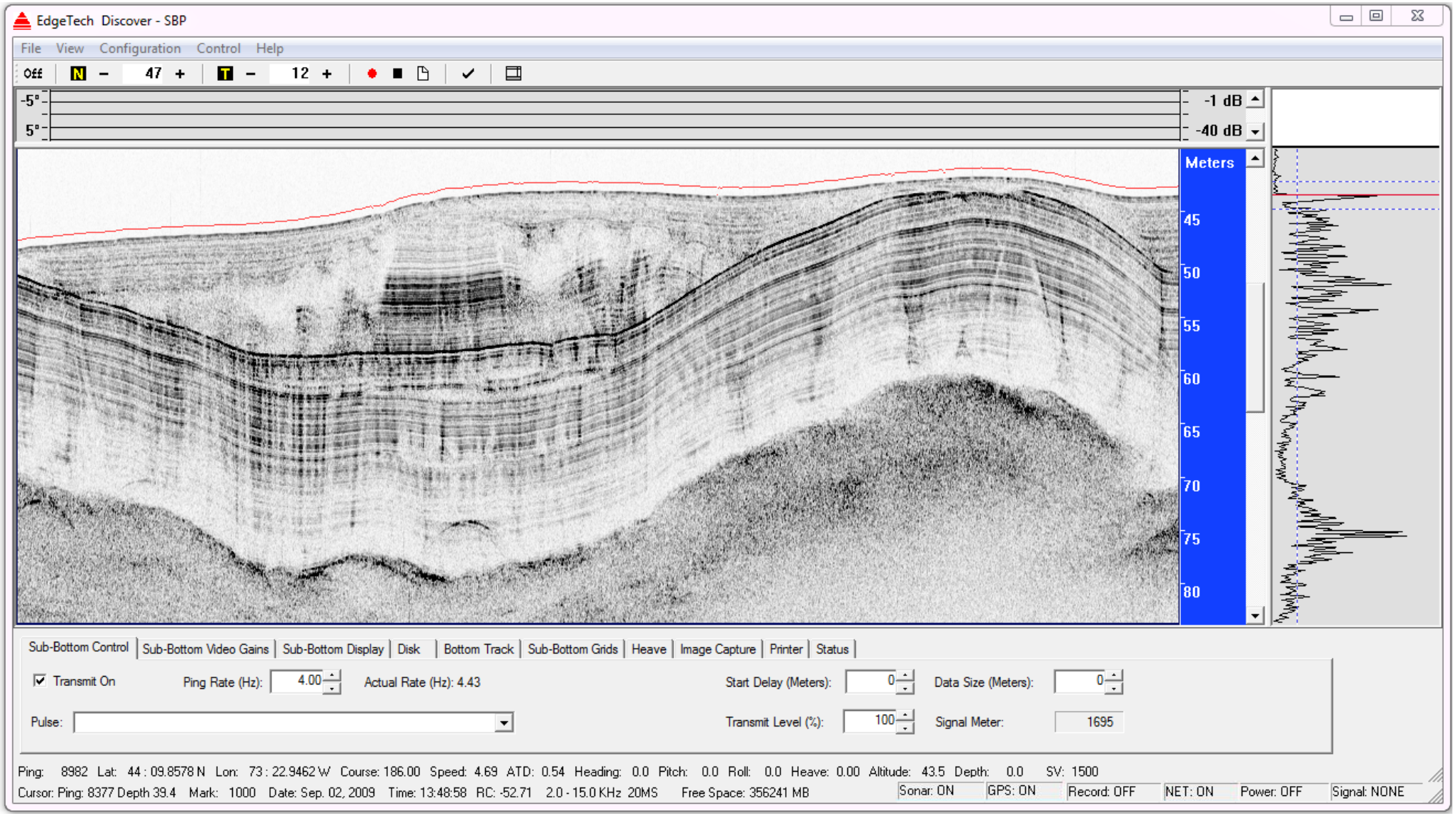

Figure 2-2: DISCOVER Sub-Bottom User Interface - With Data

The DISCOVER Sub-Bottom Interface consists of the following with more information provided below:

WATERFALL DISPLAY

Displays the Sub-Bottom sonar data during recording and playback

WAVEFORM DISPLAY

Displays the signal amplitude as an X-Y plot of sonar data

SHORTCUT TOOLBAR

| Transit ON/OFF | Normalize Gain, - / + Gain | Auto Set TVG (Time Varied Gain), - / + TVG | Playback, Pause Playback, Stop Playback, Fast Forward | Mark | Reset Displays

X-Y PLOT WINDOW

Plots Reflection Coefficient and when available the Tow Fish pitch and roll

TOP MENU BAR

Provides control options

FILE

VIEW

CONFIGURATION

| DISPLAY | RECORD | PRINTER | IMAGE CAPTURE | NAVIGATION | DISCOVER APPS |

| REFLECTION COEFFICIENT | MULTIPULSE | TRIGGER | SONAR PORT SETTINGS | NETWORK|

| SERIAL PORTS | ALERTS | LAYBACK |

| NAVIGATION | NMEA NAVIGATION | NAVIGATION OUTPUTS | HEAVE SENSOR OFFSETS

CONTROL

HELP

LOWER CONTROL PANEL [consists of 3 parts]

CONTROL TABS

| SUB-BOTTOM CONTROL | SUB-BOTTOM VIDEO GAINS | SUB-BOTTOM DISPLAY | DISK |

| BOTTOM TRACK | SUB-BOTTOM GRIDS | HEAVE | IMAGE CAPTURE | PRINTER | STATUS |

MAIN STATUS LINE DISPLAY

RADIO INDICATOR TABS

2.1 Waterfall Display

The Waterfall display shows cached data and provides tools to edit data during recording and playback.

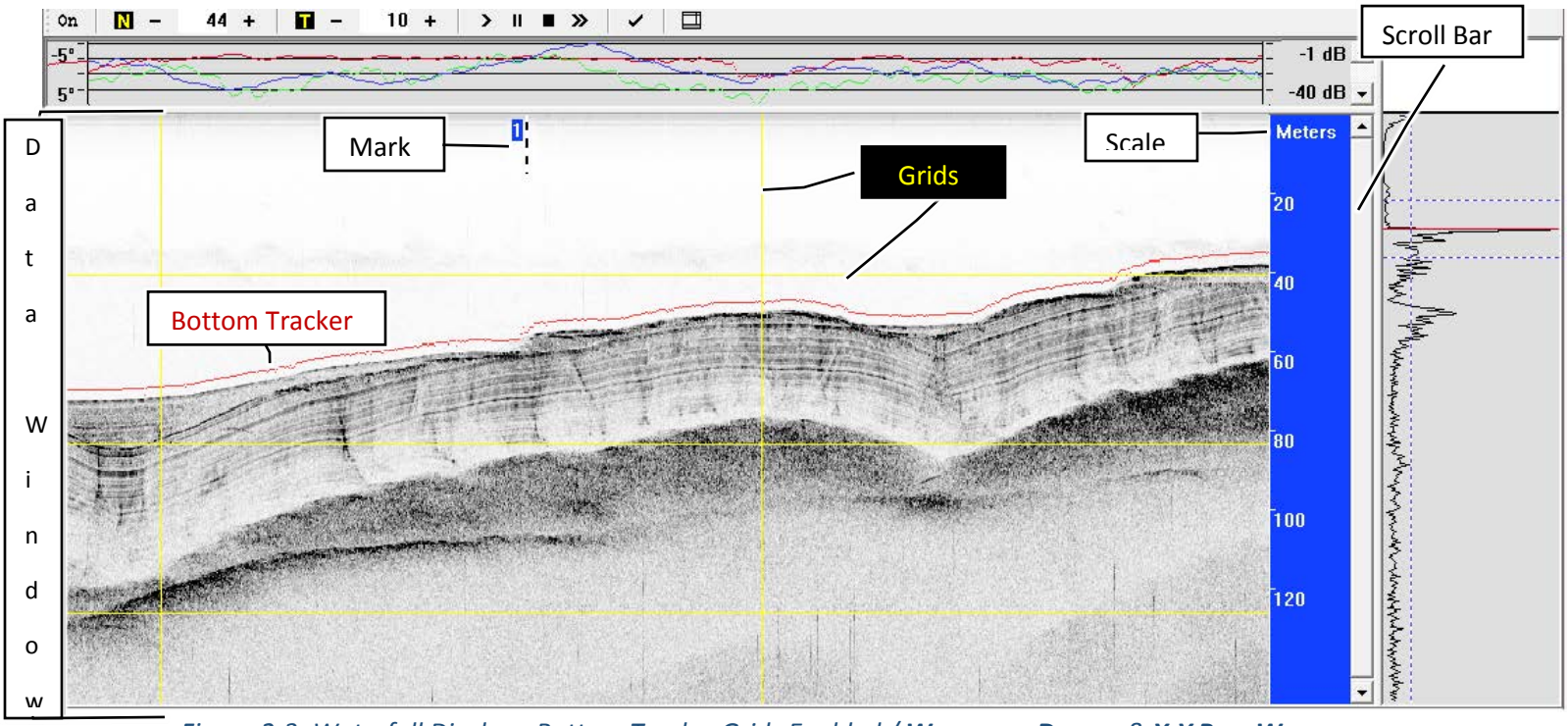

*Figure 2-3: Waterfall Display - Bottom Track + Grids Enabled / **WAVEFORM DISPLAY** & **X-Y PLOT WINDOW***

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 scale, see the **SUB-BOTTOM 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

Bottom Tracker – Displays the bottom with a red line; displayed 1 unit above current bottom position

> **NOTE:** To Enable Bottom Tracker, see the **BOTTOM TRACK**.

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

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

2.2 Waveform Display

The waveform display displays the signal amplitude as an X-Y plot of the current sonar data. The scope display is a convenient method of adjusting the bottom tracker.

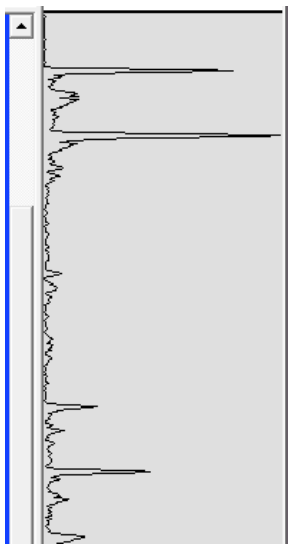

Figure 2-4: Close up of Waveform Display Without Tracking Window

See **FIGURE 2-3** for interaction between **WATERFALL DISPLAY,** Waveform Display, and **X-Y PLOT WINDOW**.

> **NOTE:** To Enable Bottom Tracker, see the **BOTTOM TRACK**.

With Bottom Tracker enabled, left-click in the oscilloscope Waveform Display at the position of the seafloor, tracking cursor can be reset to the seafloor. Left-Click and drag the cursor in the area around the pick will set the tracking window width between the two, blue horizontal and vertical dotted lines.

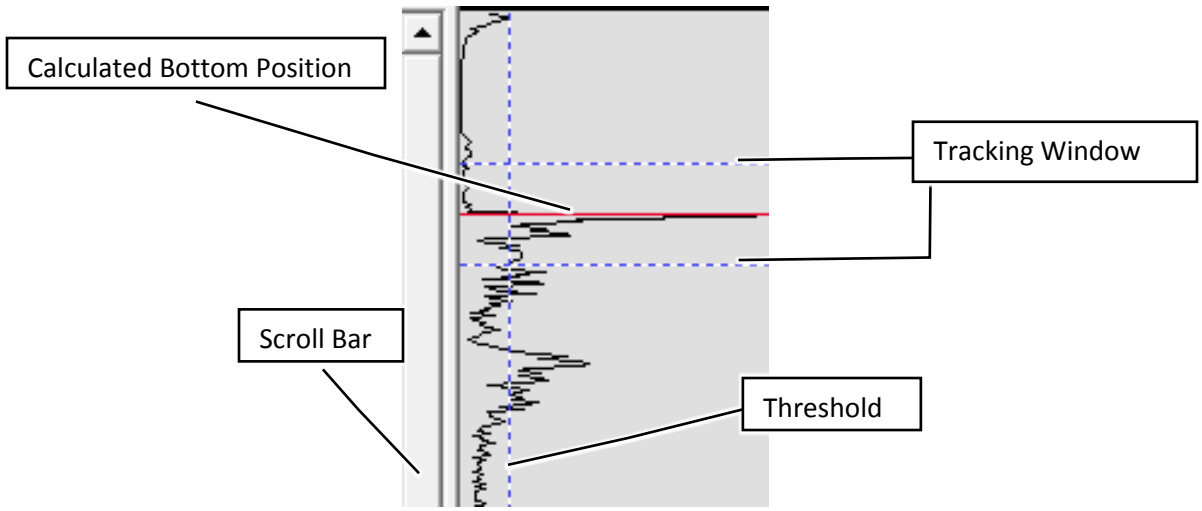

Figure 2-5: A Cropped Waveform Display with Bottom Tracker and Tracking Window

By double-clicking the mouse on the oscilloscope Waveform Display, the vertical dotted blue Threshold line can be adjusted to track either strong or weak reflections.

> **NOTE:** The Tracking Algorithm searches below the Calculated Bottom Position for the seafloor by comparing each Envelope value with the Threshold. The seafloor is the first point the Envelope exceeds the Threshold. If no Envelope values exceed the Threshold, the Tracking Window assumes the seafloor depth has not changed and the Threshold does not move.
>
> Left-clicking and dragging in Main Waterfall Display, you can dynamically adjust the zoom factor. A double click will zoom out to previous display.

Scope Plot – Plots the current trace data in an x – y plot.

Bottom Tracker – Indicates the current bottom track threshold; Movable by user.

> **NOTE:** To Enable Bottom Tracker, see the **BOTTOM TRACK**.

Tracking Window – (2) Horizontal Dashed White & Blue Lines; Indicates bottom track range; Movable by user.

Threshold – Single, Dashed White & Blue Vertical Line; Indicates data's high points; Movable by user.

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

Set: Bottom Tracker – Double Left-click the mouse in new location to select or change the bottom track; changing this will change Tracking Window.

In **FIGURE 2-6**, the Bottom Track Feature was not correctly set up. When the correct bottom was double clicked in the **WAVEFORM DISPLAY**, the Bottom Tracker moved in the Data Window.

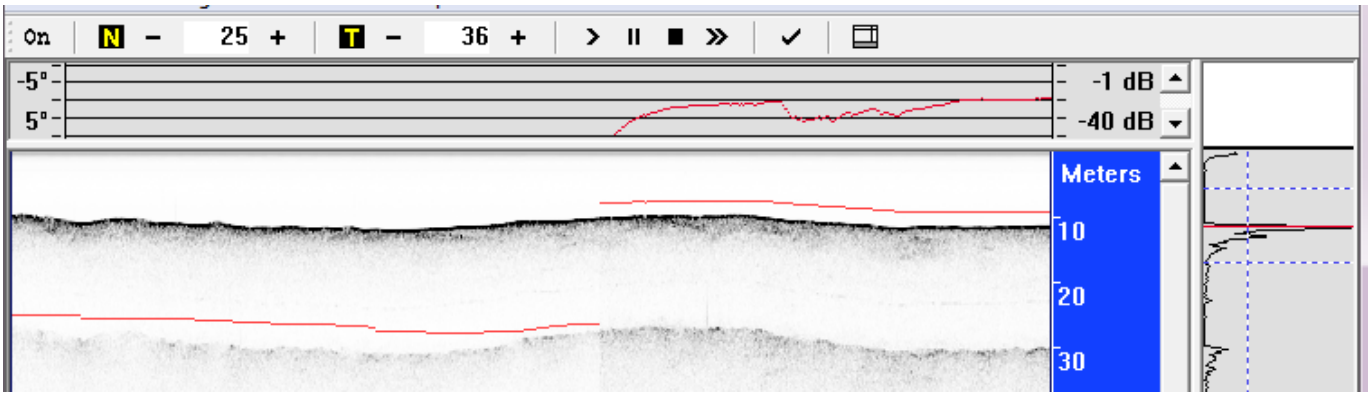

Figure 2-6: Set: Bottom Tracker to Data

2.3 Shortcut Toolbar

The Shortcut Toolbar is located on the top of the display window, but below the pulldown menus. Shortcut Toolbar buttons provide shortcuts for some of the most common control panel items. All items in the Shortcut Toolbar are duplicated in a control panel item. Most of these options are summarized below:

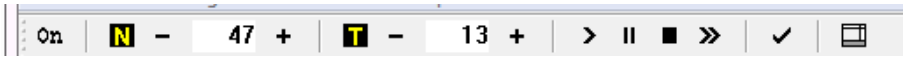

Figure 2-7: Top of Discover Menu

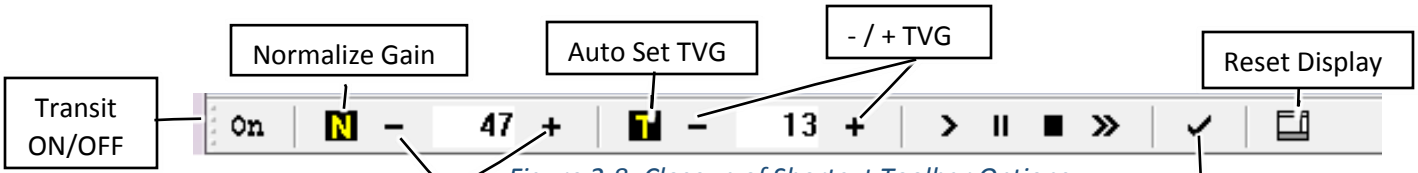

Figure 2-8: Closeup of Shortcut Toolbar Options

Figure 2-9: Closeup of the Playback Controls

Transit ON/OFF – Toggles between Transit ON/OFF

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 between -20dB and +20dB tend to be the most useful.

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

- / + TVG – Time Varying Gain in dB per 100 meters of depth to apply to the pixel data. TVG is applied beginning at the seafloor. Bottom tracker must be enabled for this to work effectively. 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

2.4 X-Y Plot Window

This window plots a visual display of the Reflection Coefficient, Roll, and Pitch. It is often helpful for the user to consider these factors in combination with the data.

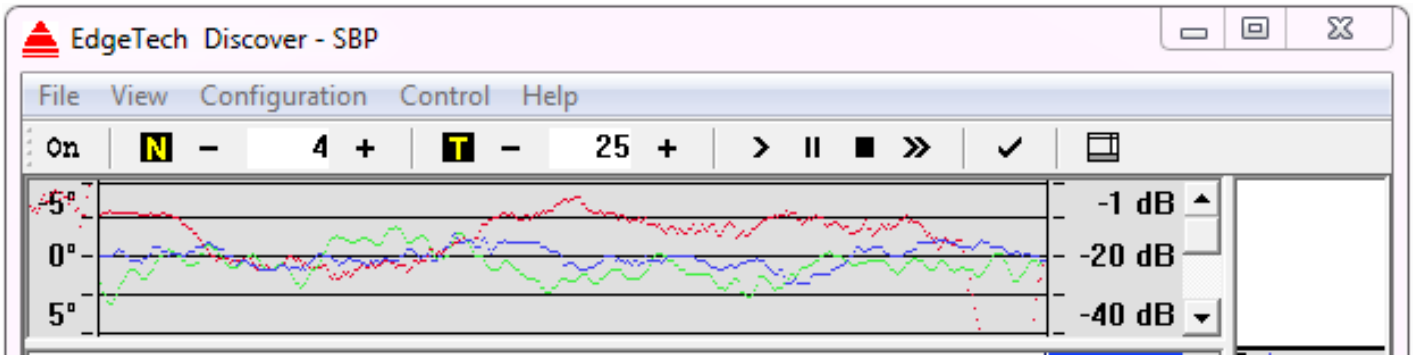

Figure 2-10: The X-Y Plot Window

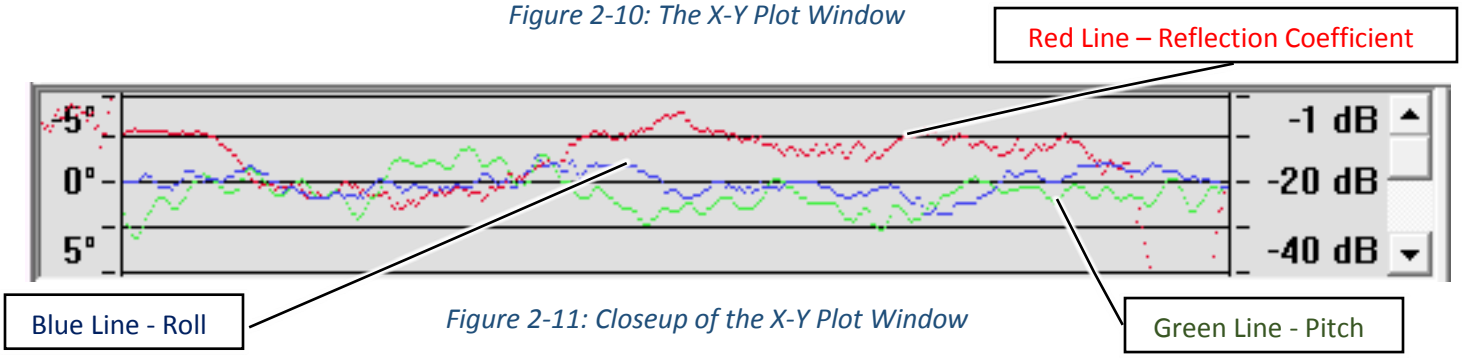

Figure 2-11: Closeup of the X-Y Plot Window

> **NOTE:** –5° to +5° [left] is for plotting the Pitch/Roll.
>
> – 1dB to -40dB [right] is used for plotting the Reflection Coefficient.

See **FIGURE 2-3** for interaction between **WATERFALL DISPLAY, WAVEFORM DISPLAY**, and X-Y Plot Window.

FIGURE 2-12 shows the Reflection Coefficient as dots instead of a line. Should this error occur, change the **REFLECTION COEFFICIENT CONFIGURATION**.

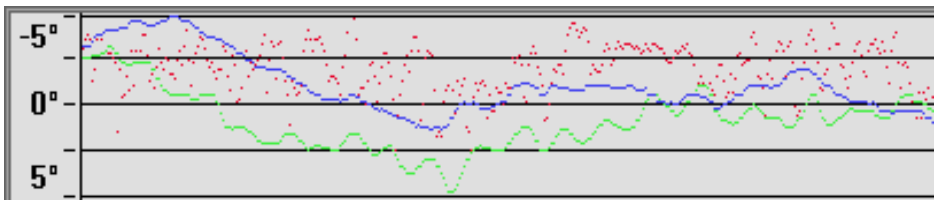

Figure 2-12: Errored Reflection Coefficient Plot, with Normal Pitch/Roll

2.5 Top Menu Bar

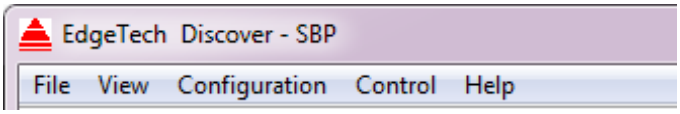

Figure 2-13: The DISCOVER Drop-Down Menu Options

Menus for the Sub-Bottom module are described below.

FILE | VIEW | CONFIGURATION | CONTROL | HELP |

2.5.1 File

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

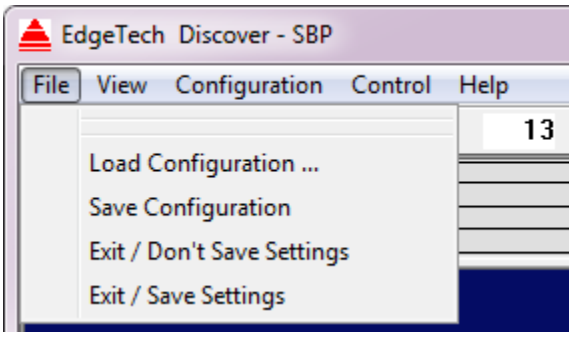

Figure 2-14: *File Drop Down Menu*

2.5.1.1 Load Configuration

Loads previously saved configuration

2.5.1.2 Save Configuration

Save current settings in DiscoverSBPLastUsed.Jni

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

2.5.1.3 Exit / Don't Save Settings

Exits without saving settings

2.5.1.4 Exit / Save Settings

Exits and saves current settings in DiscoverSBPLastUsed.Jni

2.5.2 View

In the View Menu, Toolbar and Control Dialogs can be viewed or hidden. Floating displays for the Pitch/Roll, Altitude, Depth, Cable Counter, and Water Depth can be enabled.

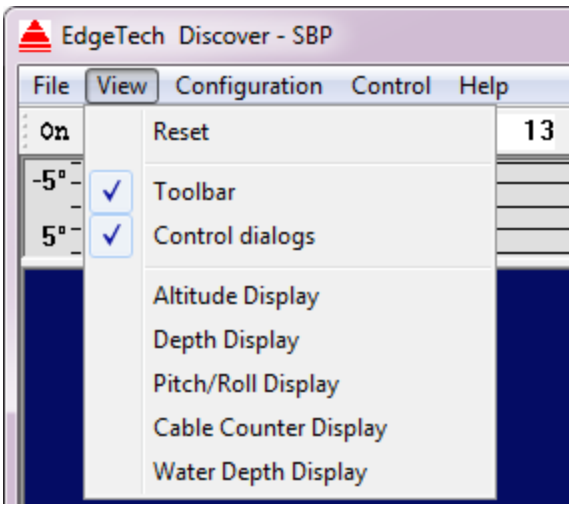

Figure 2-15: View Drop Down Menu

2.5.2.1 Reset

If the user changes or customizes the size of the **WATERFALL DISPLAY**, and/or **WAVEFORM DISPLAY**, and/or **X-Y PLOT WINDOW**, this will restore these windows to default. Clicking this will not open a dialogue box.

2.5.2.2 Toolbar

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

2.5.2.3 Control Dialogs

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

2.5.2.4 Altitude Display

Figure 2-16: Altitude Display Dialogue Box

Indicates Tow Fish 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).

2.5.2.5 Depth Display

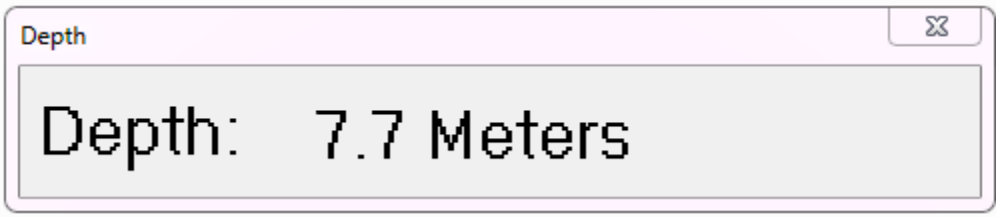

Figure 2-17: Depth Display Dialogue Box

Displays the Tow Fish depth.

2.5.2.6 Pitch/Roll Display

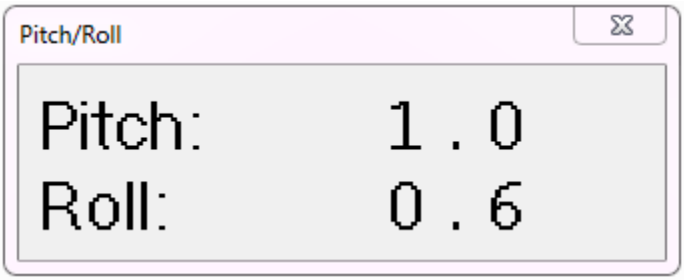

Figure 2-18: Pitch/Roll Display Dialogue Box

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

2.5.2.7 Cable Counter Display

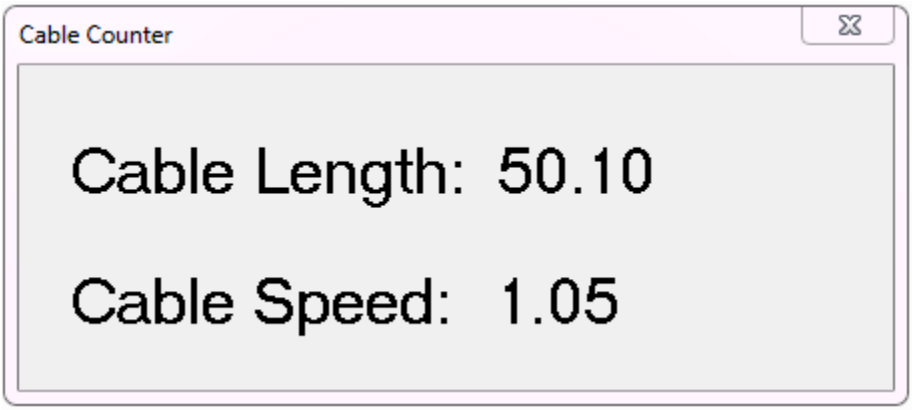

Figure 2-19: Cable Counter Display Dialogue Box

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**.

2.5.2.8 Water Depth Display

Figure 2-20: Water Depth Display Dialogue Box

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

2.5.3 Configuration

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

| **DISPLAY** | **RECORD** | **PRINTER** | **IMAGE CAPTURE** | **NAVIGATION** | **DISCOVER APPS** |

| **REFLECTION COEFFICIENT** | **MULTIPULSE** | **TRIGGER** | **SONAR PORT SETTINGS** | **NETWORK** |

| **SERIAL PORTS** | **ALERTS** | **LAYBACK**

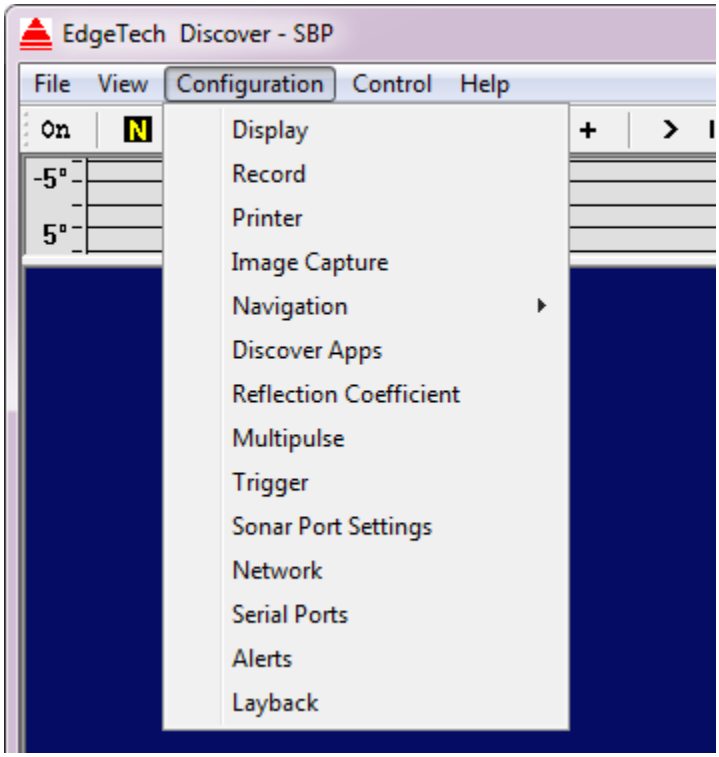

Figure 2-21: Configuration Drop Down Menu

| **NAVIGATION** | **NMEA NAVIGATION** | **NAVIGATION OUTPUTS** | **HEAVE SENSOR OFFSETS**

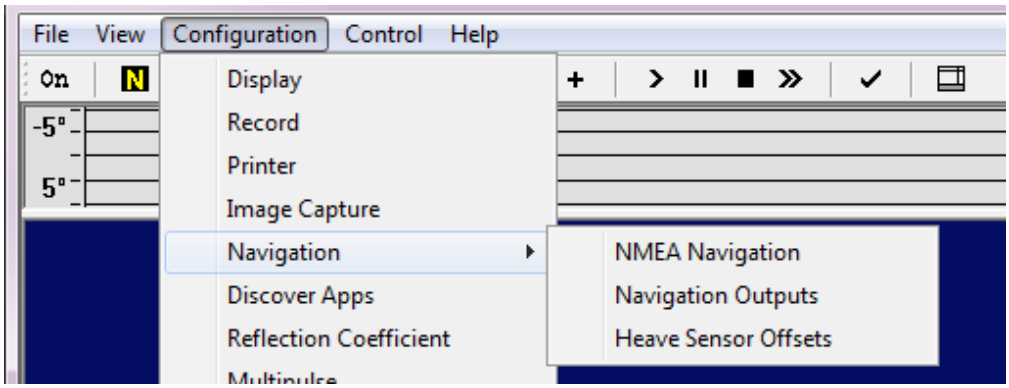

Figure 2-22: Navigation Configuration Submenu

2.5.3.1 Display Configuration

The display configuration window allows the user to change the various settings for how the data is displayed in the waterfall. These settings do not affect the data recorded in a JSF file.

Figure 2-23: Display Configuration Window

WATER SOUND SPEED (M/sec) [Numeric Display, Entry]: Allows 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.

AUTO NORMALIZE / AUTO TVG [Check Box]: To turn Auto Gain and Auto TVG on, start DISCOVER and acquire data by checking the Sonar ON box located in the **SUB-BOTTOM CONTROL TAB**. When set to AUTO, the Gain and TVG windows are grayed out in the **SHORTCUT TOOLBAR**, however the operator can still click the N and T buttons, as shown in **FIGURE 2-24**. 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 gains are range based, the system must record for a few minutes to gather sufficient data to determine accurate values.

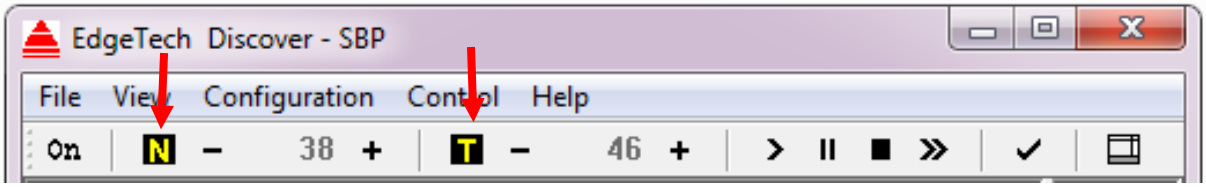

Figure 2-24: Display Buttons

STATUS DISPLAY [Check Box]: Allows the user to select Pressure, Depth, or None. This is displayed in top right-side of the **MAIN STATUS LINE DISPLAY**.

MARK [Numeric Display, Entry]: Displayed number is the last added mark to the data. For each added mark, the number will increase by one. To start the mark numbering at 1, set Mark field to "0." The User can enter any number between 0 – 1,048,499[no commas]. For more information, see **SHORTCUT TOOLBAR**.

2.5.3.2 Record Configuration

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) and SEG-Y files, alongside JSF.

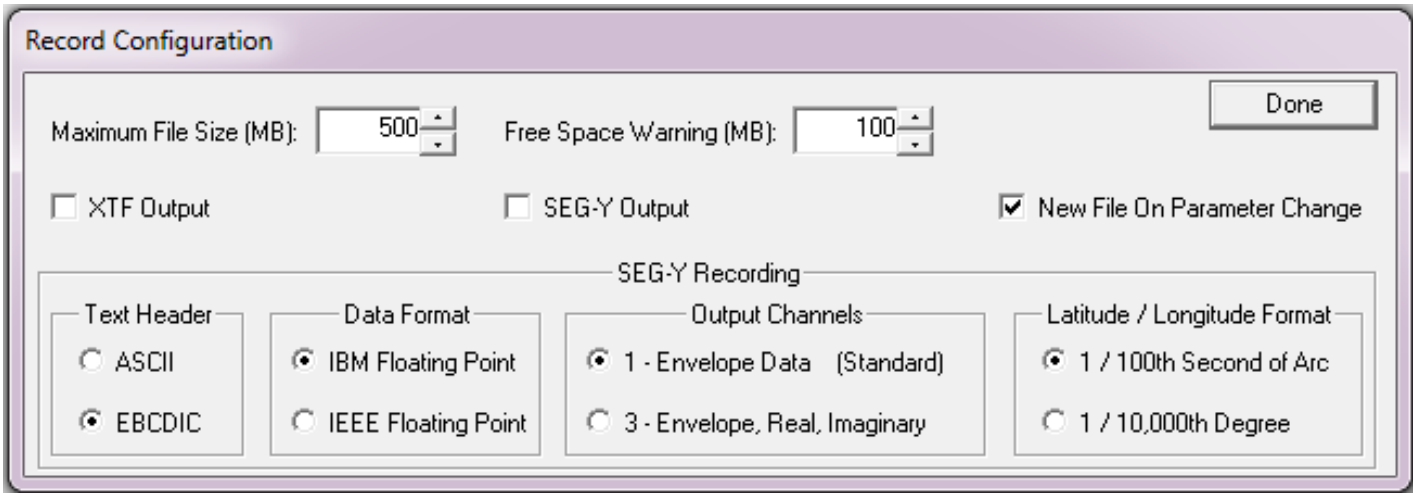

Figure 2-25: Record Configuration Window

MAX FILE SIZE (MB): [Numeric Display, Entry]: Customizable maximum file size settings. Default: 500 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. Can be enabled simultaneously with SEG-Y. Unchecked by Default.

SEG-Y OUTPUT [Check Box]: User can choose data record format. Can be enabled simultaneously with XTF. Unchecked by Default.

> **NOTE:** Even if XTF and/or SEGY are checked, the system will still record a corresponding JSF file.

NEW FILE ON PARAMERE CHANGE [Check Box]: Checked by Default.

TEXT HEADER

ASCII [Check Box]: Unchecked by Default.

EBCDIC [Check Box]: Checked by Default.

DATA FORMAT

IBM FLOATING POINT [Check Box]: Checked by Default.

IEEE FLOATING POINT [Check Box]: Unchecked by Default.

OUTPUT CHANNGELS

1 – ENVELOPE DATA (Standard) [Check Box]: Checked by Default.

2 – ENVELOPE, REAL, IMAGINARY [Check Box]: Unchecked by Default.

> **NOTE:** Default Settings should work most of the time, but due to variation in SEG-Y standard, some may need to change default values of EdgeTech data to be compatible with other post-processing softwares.

LATITUDE / LONGITUDE FORMAT

1 / 100th SECOND OF ARC [Check Box]: Checked by Default.

1 /10,000th DEGREE [Check Box]: Unchecked by Default.

2.5.3.3 Printer Configuration

Figure 2-26: 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 start and end positions on the paper.

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

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 2-27: Printer Interface Dropdown

2.5.3.4 Image Capture Configuration

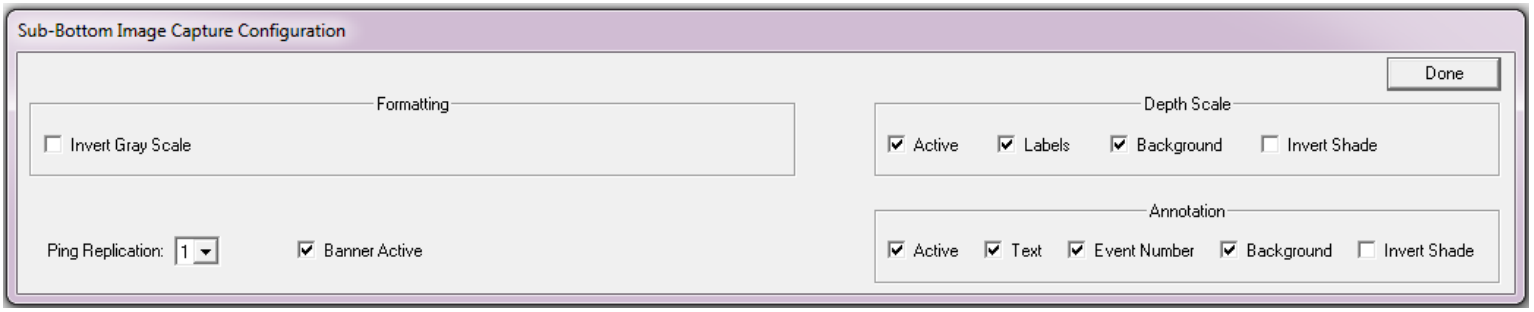

Figure 2-28: Image Capture Configuration Window

This window allows the user to manipulate what information is saved during Image Capturing.

FORMATTING:

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

PING REPLICATION [Drop Down Selection]: 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.

2.5.3.5 Navigation Configuration

The Navigation Configuration has three submenus:

NMEA NAVIGATION | NAVIGATION OUTPUTS | HEAVE SENSOR OFFSETS

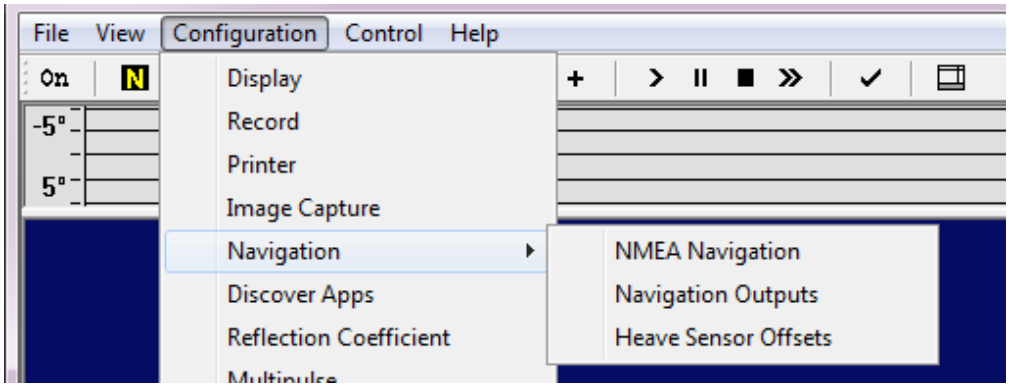

Figure 2-29: Navigation Configuration Submenu

2.5.3.6 NMEA Navigation

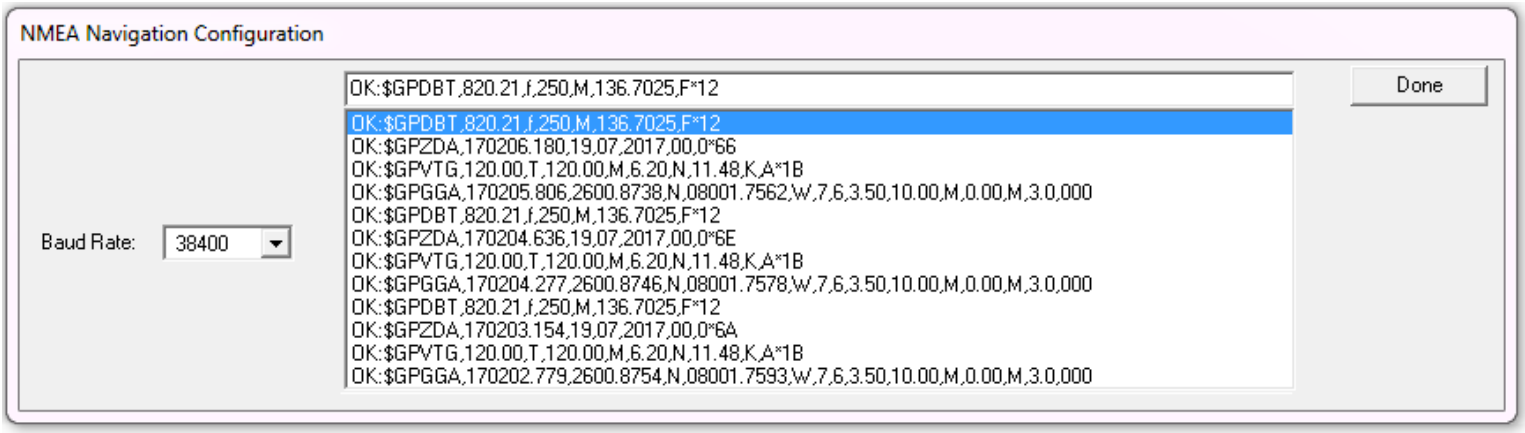

Figure 2-30: NMEA Navigation Configuration Window

The NMEA navigation configuration window displays the message types at the baud rate that are received by DISCOVER. These are incoming messages to the DISCOVER serial port.

BAUD RATE [Drop Down Selection]: Can be set to 1200 – 115200.

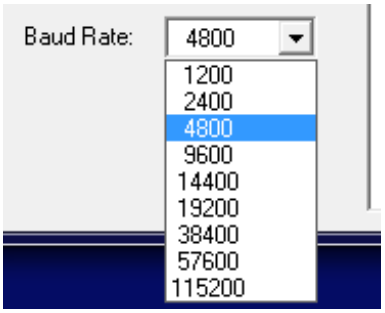

Figure 2-31: Baud Rate Options

2.5.3.7 NMEA Navigation Outputs

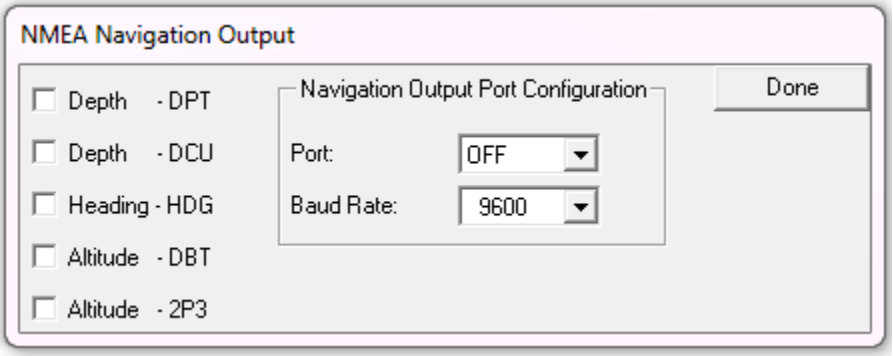

Figure 2-32: NMEA Navigation Output Configuration Window

By checking these boxes, the user can choose the NMEA navigation message type DISCOVER will output. This **does not** configure the Output Port.

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 computer port the GPS is plugged into.

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

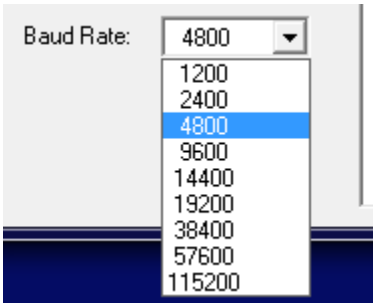

Figure 2-33: The Baud Rate Selection Drop Down

2.5.3.8 Heave Sensor Offsets

The Heave sensor readings will be used to adjust the display and printout. Transducer Aft or Starboard of Heave sensor has a positive offset. Transducer Forward or Port of the Heave sensor has a negative offset.

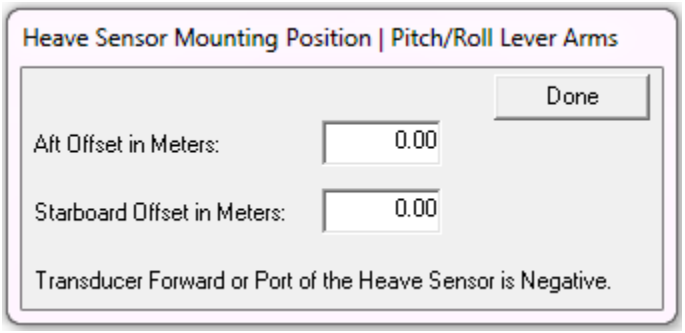

Figure 2-34: Heave Sensor Mounting Position Configuration Window

For more Information see **HEAVE CONTROL TAB.**

2.5.3.9 Discover Apps

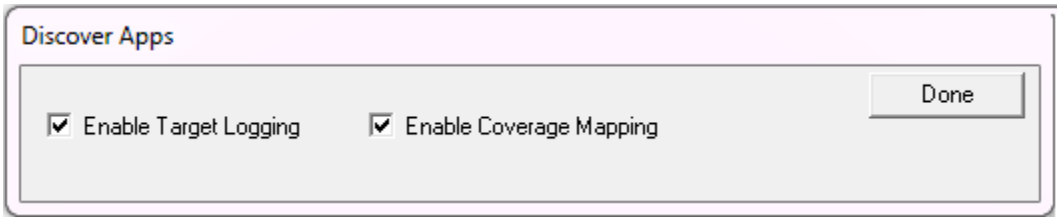

Figure 2-35: Discover Apps Configuration Window

The Discover Apps window enables / disable the Target Logger and Coverage Mapper modules.

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

ENABLE TARGET LOGGING [Check Box]: Enables/Disables interface between DISCOVER and Target Logger. Target Logger is primarily used for taking images from targeted points in the data.

For more information, see Manual Folder > Target Logger Software Module Addendum [0018974].

ENABLE COVERAGE MAPPING [Check Box]: Enables/Disables interface between DISCOVER and Coverage Mapper. Coverage Mapper is primarily used in surveys for plotting grids and large, connected data plots.

For more information, see Manual Folder > Coverage Mapper Software Module Addendum [0018975].

2.5.3.10 Reflection Coefficient Configuration

EdgeTech Sub-Bottom Sonar Systems are linear; the measured refection coefficient can be used to identify the type of material (i.e. sand, clay, mud etc.) on the bottom. A graph of the refection coefficient is displayed in real time in the **X-Y PLOT WINDOW**. Reflection coefficients are calculated and displayed in real-time and playback, they are not stored with the sonar data.

The Reflection Coefficient aids in determining bottom sediment classification. This calculation is a ratio of the transmitted energy vs. the measured received energy assuming normal incidence.

Discover software displays the peak value of the first reflector, scaled by a reference calibration value, and converted to decibel. To account for towfish motion, seafloor roughness and slope, it is necessary to apply a moving average to the reflection coefficient value. (20 pings recommended).

> **NOTE:** Towfish attitude and seafloor topography drastically affect the Reflection Coefficient (RC) because of the dynamic nature of the environment individual RC values for each ping are not very useful. Use moving average filter (Time Constant in Pings) for a better RC estimate.

The Reflection Coefficient is shown in the **MAIN STATUS LINE DISPLAY**, and ranges from 0 to -40. If the calculation falls outside of this range, then alterations can be made in this Configuration.

For the Reflection Coefficient measurement to be useful, the Bottom Tracking feature MUST BE on. Without knowing the location of the bottom, calculating an accurate Reflection Coefficient is impossible.

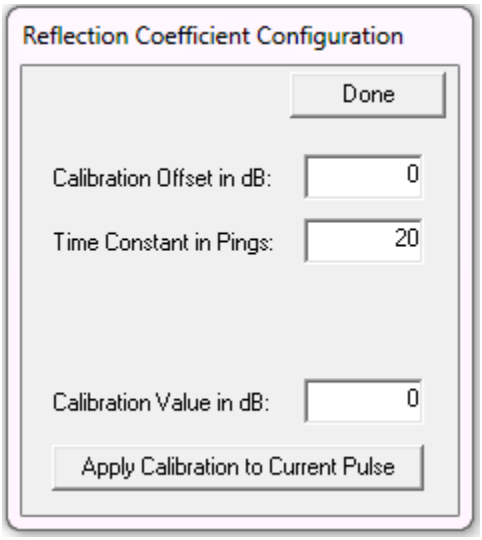

Figure 2-36: Reflection Coefficient Configuration Window

CALIBRATION OFFSET IN dB [Numeric Display, Entry]: Using this function, the user can change the Calibration offset temporarily for the current survey. If this is used, the CALIBRATION VALUE IN dB should

be set to 0. The Reflection Coefficient should range from 0 to –40. Therefore, the value inserted into this field should seek to bring the RC to this range of values.

TIME CONSTANT IN PINGS [Numeric Display, Entry]: Regardless of Calibration Offset and Calibration Value, the Reflection Coefficient must have averaging done to it. Therefore, putting a value here will help edit the data and is a moving average. This should be set to a smaller number to start with.

For example, setting this value to 20, will average the calculation of the Reflection Coefficient over the previous 20 pings. This value inputted into the field must be positive.

CALIBRATION VALUE IN dB [Numeric Display, Entry]: Using this function, the calibration is added to the current pulse when "Apply Calibration to Current Pulse". A calibration must be done for each pulse separately. Oncethis has been completed, the Calibration Value can be saved for future surveys. The Calibration Value can be changed at any time and provides a corrected value to the Reflection Coefficient. If this is used, the CALIBRATION OFFSET IN dB should be set to 0.

> **NOTE:** The Calibration File is stored in the system and associated with the specific pulse used to calibrate it. Assuming nothing changes in the system hardware, this calibration needs only to be done once. Hardware Change to certain components, may require Calibrations to be re-done.

APPLY CALIBRATION TO CURRENT PULSE [Button]: By clicking this button, the user will apply the settings configured to the current pulse file.

Reflection Coefficient Calibration

Discover Sub Bottom Profiler software allows the user to determine remotely, the seabed morphology i.e., the type and density of particular seafloor composition or sediments, such as sand, clay, rock, mud, etc. using a reflection coefficient (value in 0 through -40dB). It is necessary however that the system be calibrated.

It is recommended that this calibration be performed during the pre-underway checkout of the system while the ship is still at the pier. This procedure adjusts the system gain constant so that the reflection coefficient provides an estimate of the ratio between the pressure amplitude of the pulse striking the seafloor and the amplitude of the reflected pulse.

The reflection coefficient depends on the sediment type. For example, for gas-free sediments, the following table can be used to predict the sediment type of the top layer of sediments.

SEDIMENT TYPE	REFLECTION COEFFICIENT
Sand	-10 to -6 dB
Silt	-20 to -10 dB
Clay/mud	< -20 dB

Table 2-1: Reflection Coefficient and Sediment Type

If the sonar is not calibrated, the displayed reflection coefficient is only a measure of the relative changes in sediment type and cannot be used to predict the sediment type.

During the calibration, the vehicle is inverted and lowered to at least 3 meters beneath the sea surface. Each pulse is transmitted at the air-water interface and the system constant in each pulse text file is adjusted so that the reflection coefficient reads 0 dB (logarithmic scale) or 1 (linear scale).

To calibrate the reflection coefficient, perform the following procedure:

1. Pick a location to perform the calibration where the water depth is at least 4 meters and the air-water interface is smooth (less than 1 cm of roughness or wave height)
2. Invert the towed vehicle and support the vehicle by the corners so the fish hangs level with the top of the fish down.
3. Lower the vehicle to 1" (2 cm) beneath the sea surface and adjust the lifting bridle until the bottom of the fish is level with the sea surface.
4. Lower the vehicle to 1 meter above the seafloor. The fish should be a minimum of 3 meters (2 meters for SB-424) beneath the sea surface.
5. Verify that the fish is sufficiently far from the vessel so hull reflections do not interfere with the measurement. The vessel hull should not be within 45 degrees of the acoustic axis of the fish to prevent illuminating the hull with the main lobe of the transmitters.
6. Go to Configuration / Reflection Coefficient Configuration and set Calibration Offset in dB to: 0 and Time Constant in Pings to: 20
7. Select a pulse from the Discover pulse menu and commence transmitting.
8. Click on the envelope display to update the envelope. Set the vertical blue/white dashed line so that the tracking threshold is about half of the sediment-water interface peak. Click along the depth axis at the distance that the fish is beneath the air-water interface to start tracking the air-water interface. Verify the horizontal red line passes through the peak of the air-water interface reflection. (The red line indicates the position where the reflection coefficient is measured).
9. Read the current Reflection Coefficient value in the status bar at the bottom of the display screen.
10. Go to Configuration / Reflection Coefficient Configuration and note the current Calibration Value in dB. Add or subtract to this number a value to make it zero.
11. If the Reflection Coefficient shown in the task bar is between .95 and 1.05, the calibration for the pulse is accurate to within 0.5 dB (1 is perfect reflection).

12. Proceed back to step (7) for a second pulse.

If the above calibration method is not practical, the surveyor may opt for a secondary method where the fish is deployed and towed over an area where the seafloor sediment type is known. Read the measured RC value in the status bar, add or subtract to this number in the Calibration Value field to make it as the expected value for the know sediment type.

2.5.3.11 Multipulse Configuration

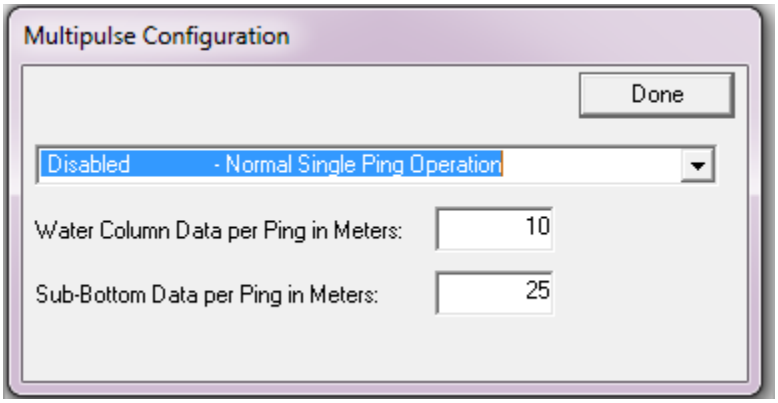

Figure 2-37: Multipulse Configuration Window

> **NOTE:** Multipulse is an advanced configuration for use Hull Mounted systems or when the sonar is 300 meters (or more) from seafloor.

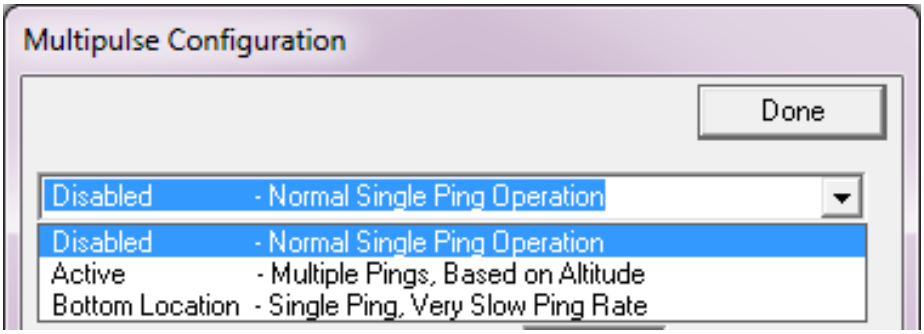

Figure 2-38: The Multipulse Configuration Drop Down Menu

[DROPDOWN PULSE SET]

DISBALED – Normal Single Ping Operation

This should be selected when the operator wishes to choses to control the ping rate.

ACTIVE – Multiple Pings, Based on Altitude

The Sub-Bottom System's normal operation mode, which allows the unit to transmit once the bottom has been found. When selected, pulse selection is disabled. Additionally, 'Start Delay', 'Data Size', 'Pulse', and 'Data Size' which appear in **SUB-BOTTOM CONTROL** are grayed-out and cannot be changed; the 'Ping Rate' is grayed-out and will be adjusted automatically. The **SUB-BOTTOM CONTROL** MUST be displayed when this option is selected.

BOTTOM LOCATION – Set Single Ping or Multiple Pings

Bottom location should be the first one used in this menu, as it is used primarily to find the bottom. Once the bottom has been located, the active – Multiple Pings can be enabled. When Bottom location is selected, the unit's Ping rate is disabled and software sets the ping rate to 0.1 Hz, very slow pinging. This mode is appropriate when the bottom is deeper than 300 meters, allowing adequate transmit and receive data. 'Start Delay' and 'Data Size' which appear in **SUB-BOTTOM CONTROL** are grayed-out and disabled.

WATER COLUMN DATA PER PING IN METERS [Numeric Display, Entry]: In systems where there is a significant water column, it can be edited out so only a present amount of the water column is shown. For example, in depths of 300 meters, is it needless to see the 300 meters of water column, so it can be limited to 10 meters above the seafloor.

SUB-BOTTOM DATA PER PING IN METERS [Numeric Display, Entry]: This is depth penetration of the seafloor.

2.5.3.12 Trigger Configuration

Figure 2-39: Trigger Configuration Window

EXTERNAL TRIGGER [Check Box]: The user can choose a Trigger Master and Enable / Disable an External Trigger. Enables External Triggering. Unchecked by Default.

> **Note:** The system can be configured to take in a positive edge trigger, it just requires a modification to the sonar.ini file. Contact **EDGETECH CUSTOMER SERVICE** for further assistance in this matter.

Figure 2-40: TTL - Negative Edge Trigger of 5ms (minimum)

EdgeTech's Sonar expects TTL negative edge trigger of 5ms minimum to operate.

> **Note:** There is a minimum trigger interval (maximum rate) of each subsystem, which is dependent on the Pulse Type, and is proportional to the pulse length. A longer pulse will set a longer minimum interval, to keep the ON|OFF duty cycle of the Power Amplifier below the maximum allowed, typically 1:10. The actual trigger interval used will be the LARGER of the user interval and Power Amplifier imposed limit.
>
> If the trigger is divided there will be a vertical transmit artifact in the data of the subsystem that is being divided. This may or may not be suitable based on survey requirements.

2.5.3.13 Sonar Port Settings

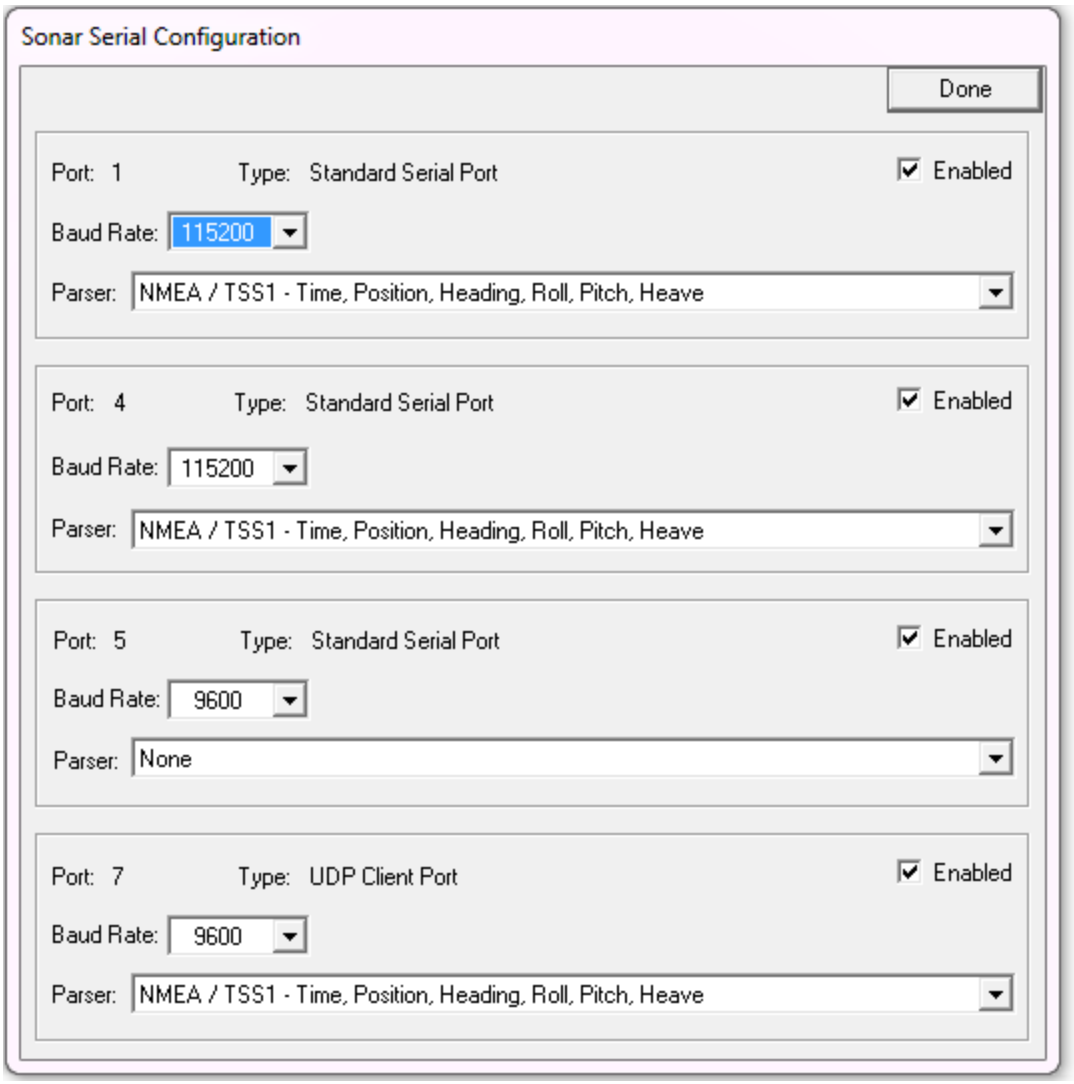

Figure 2-41: Sonar Port Settings

The Sonar Port Settings dialog box, shown in **FIGURE 2-41** provides a way to configure the RS-232 Serial or TCP/UDP ports in the Tow Fish. Any one of the four available RS-232 Serial 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 hardware to recognize incoming data strings.

2.5.3.14 Network Configuration

Figure 2-42: Network Configuration Window

The Network Configuration window allows the user to change the IP (Internet Protocol) address and control port number of the Tow Fish. Displays the Sonar IP Address and Sonar Port Number.

The IP address and port number shown in **FIGURE 2-42** are specific to 3100P. Sonar IP Address' and Sonar Port Numbers for each Sub-Bottom system are listed below.

2000: Combined Side Scan Sonar & Sub-Bottom Profiler

Sonar IP Address: 127.0.0.1 / Sonar Port Number: 1600

2200 & 2205: AUV / UUV / ROV / ASV / USV

Sonar IP Address: 192.9.0.101 / Sonar Port Number: 1700

2300: Combined Side Scan Sonar, Bathymetry, & Sub-Bottom System

Sonar IP Address: 127.0.0.1 / Sonar Port Number: 1600

2400: Deep Towed

Sonar IP Address: 127.0.0.1 / Sonar Port Number: 1600

3100: Portable Sub-Bottom Profiler

Sonar IP Address: 192.9.0.31 / Sonar Port Number: 1620

3200: High Penetration Sub-Bottom Profiler

Sonar IP Address 127.0.0.1 / Sonar Port Number 1700

3300: Hull Mount Sub-Bottom Profiler

Sonar IP Address 127.0.0.1 / Sonar Port Number 1700

CAUTION!

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

2.5.3.15 Serial Port

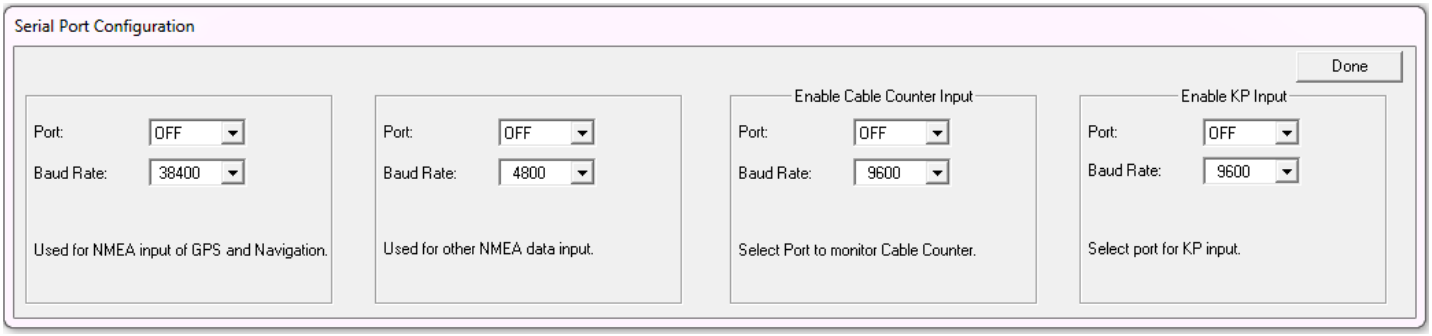

Figure 2-43: Serial Port Configuration Window

The serial configuration menu allows user to enable settings for different serial ports on the UNIT, along with changing their individual baud rates.

CABLE COUNTER PORT: Used to input cable out value from a Sheave. A list of DISCOVER supported cable counters, along with an explanation of their formats, is provided in **APPENDIX B CABLE COUNTER**.

KP INPUT: Enables value entry for number of kilometers of pipeline that have been surveyed.

> **Note: Identifying Ports** – If using multiple ports, or are converting USB to COM, check Device Manager – Ports (COM & LPT) will list all Port connections, as shown in **FIGURE 2-44**.

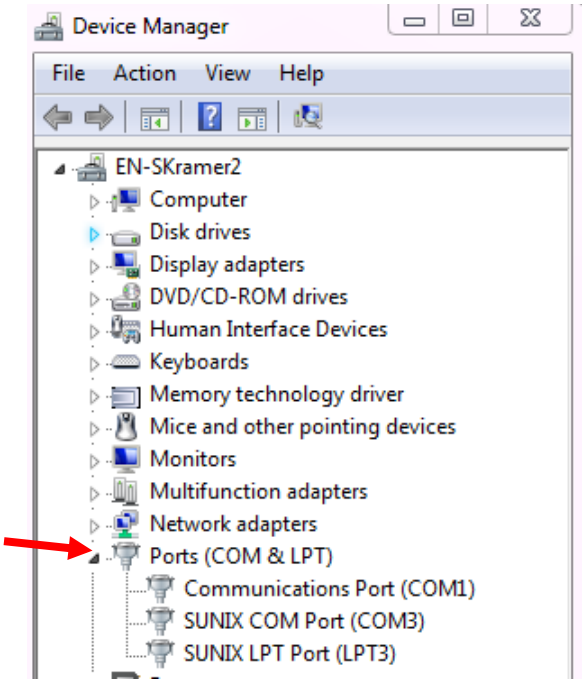

Figure 2-44: Device Manager – Ports (COM & LPT)

2.5.3.16 Alert Configuration

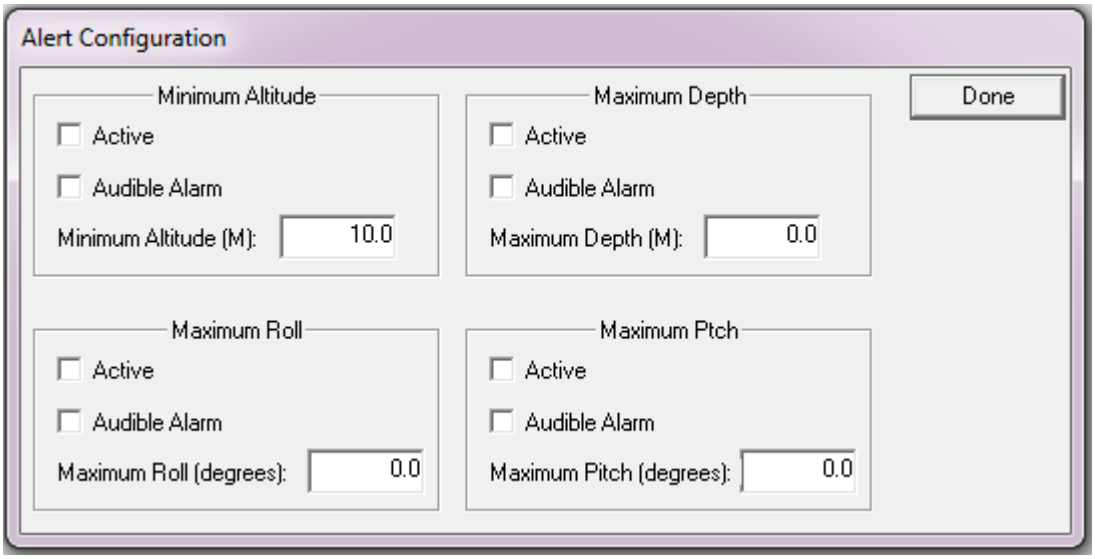

Figure 2-45: The Alert Configuration Window

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.

(4) ACTIVE [Check box]: Enables alert.

(4) AUDIBLE ALARM [Check box]: Enables sound alarm.

MINIMUM ALTITUDE (M) [Numeric Display, Entry]: The minimum altitude in meters before the alarm.

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.

2.5.3.17 Layback Configuration

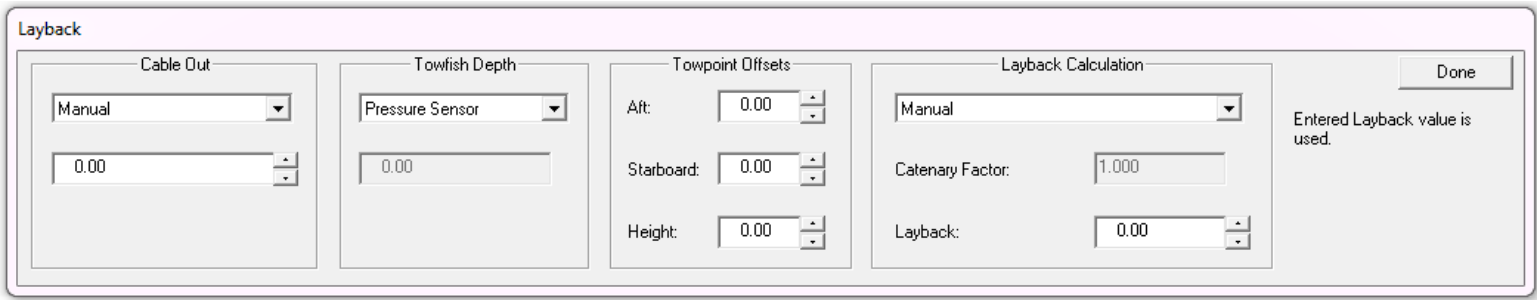

Figure 2-46: The Layback Configuration Dialogue

Layback is the horizontal distance (meters) from a reference 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.

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 root 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.

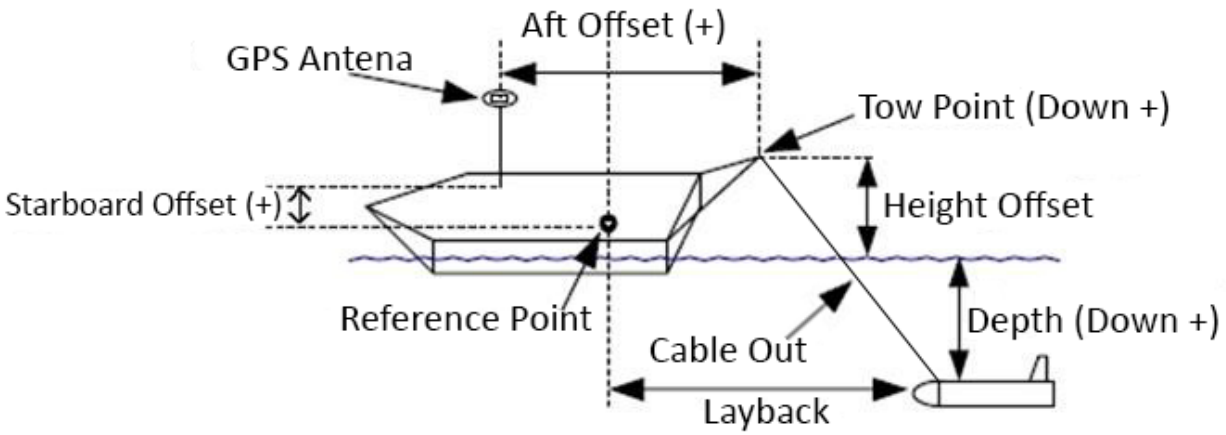

Figure 2-47: Layback Diagram

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

Equation 2-2

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

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

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

2.5.4 Control

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

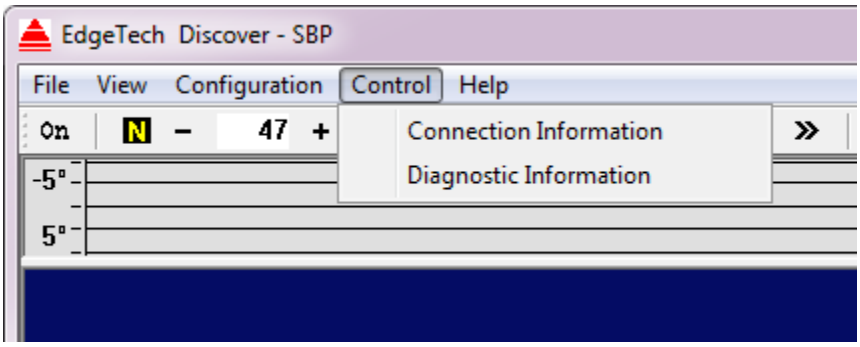

Figure 2-48: Control Drop Down Options

CONNECTION INFORMATION | DIAGNOSTIC INFORMATION

2.5.4.1 Connection Information

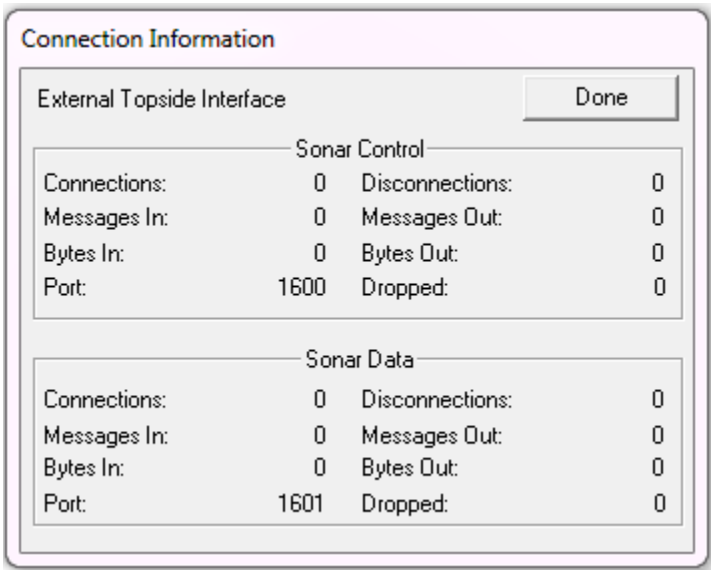

Figure 2-49: Connection Information

The Connection Information displays the DISCOVER Sub-Bottom external topside interface to control Sonar Subsystem for data acquisition and logging, including the number of connections and disconnections and messages in/out.

2.5.4.2 Diagnostic Information

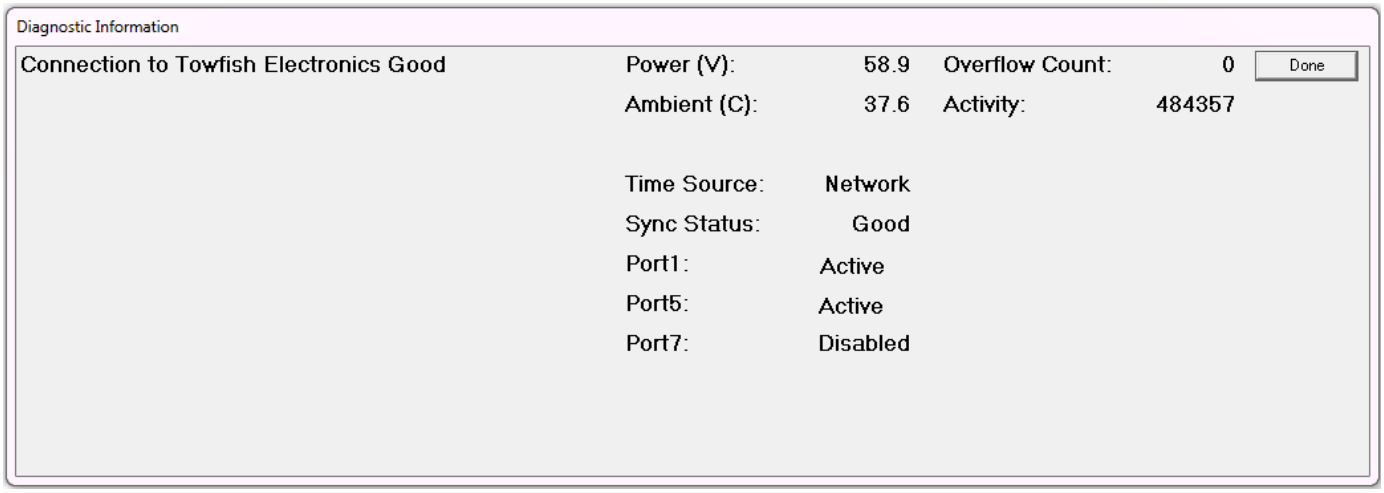

Figure 2-50: Diagnostic Information

The Diagnostic Information window displays the state of the connection between DISCOVER and the sonar unit being controlled. In **FIGURE 2-50**, the system is fully operational with no problems, and the connection to the Tow Fish is good. Other reported data are:

Power (V): Nominally 50 VDC. The primary internal supply voltage for the Tow Fish.

Ambient (C): Internal ambient temperature of Topside or Tow Fish; should be between 0 and 60°C max. A value over this amount may prevent correct Tow Fish operation. In Rack-Mounts, this displays the Tiger Sub-Bottom Stack, specifically the SIBU card.

Activity: Shows pinging activity counter has no specific meaning, but should change when pinging.

Overflow Count: Reflects sonar overflow (network overflow, matched filter overflow, etc.)

FIGURE 2-51 shows an example of a configured serial port (red arrow), that is not in use.

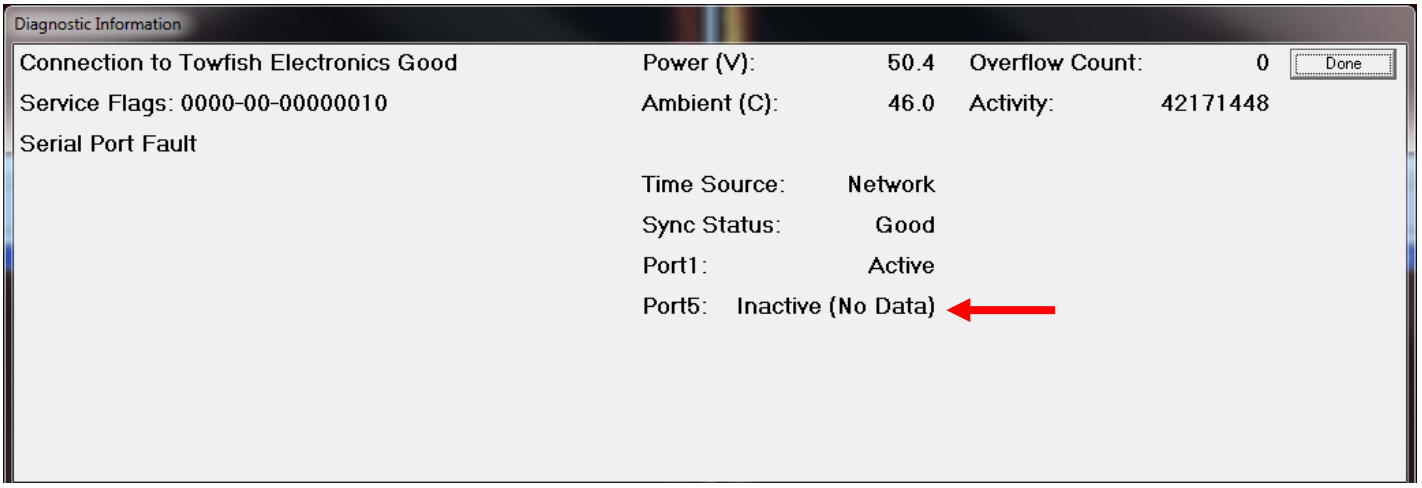

Figure 2-51: Serial Port Fault Due to being Configured to be active and Unused

Major problems are reported in red on top right of the Diagnostic Information window and provide a vital clue for diagnosing connectivity issues.

Network Error

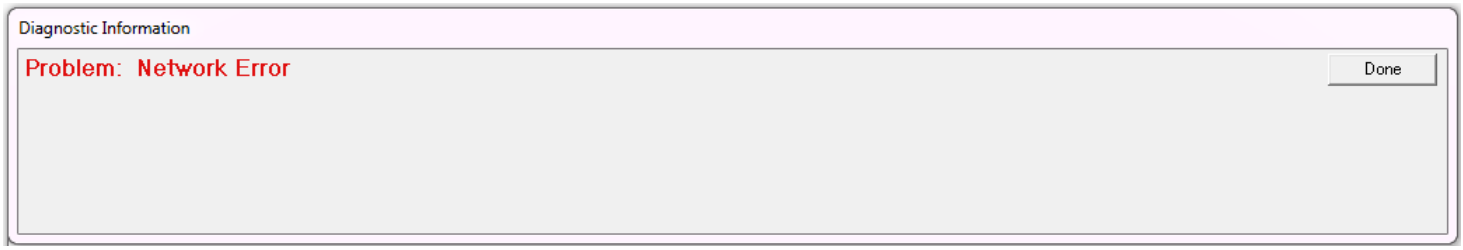

Figure 2-52: Network Error

FIGURE 2-52 shown below that the software communication between the topside and the Towfish has been lost (i.e., no TCP/IP PING 192.9.0.xxx connectivity). This indicates a network cable problem, possibly due to cable unplugged or bad cable from the laptop to the tow fish power supply, the tow cable, noise, excessive length, or signal attenuation, or possibly a complete failure of the Towfish computer to boot properly.

Sometimes a power cycle of the topside interface unit will correct this error. Also, check the laptop computer for the correct IP address and refer to the Hardware Manual for additional information.

2.5.5 Help

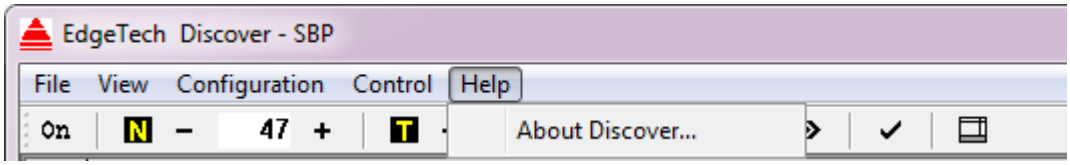

Figure 2-53: Help Drop Down Options

2.5.5.1 About Discover

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

Figure 2-54: About Discover Window

2.6 Lower Control Panel

The Lower Control Panel is comprised of three sections: **MAIN STATUS LINE DISPLAY**, **RADIO INDICATOR TAB,** and the **CONTROL TABS**. These three are labeled in **FIGURE 2-55.**

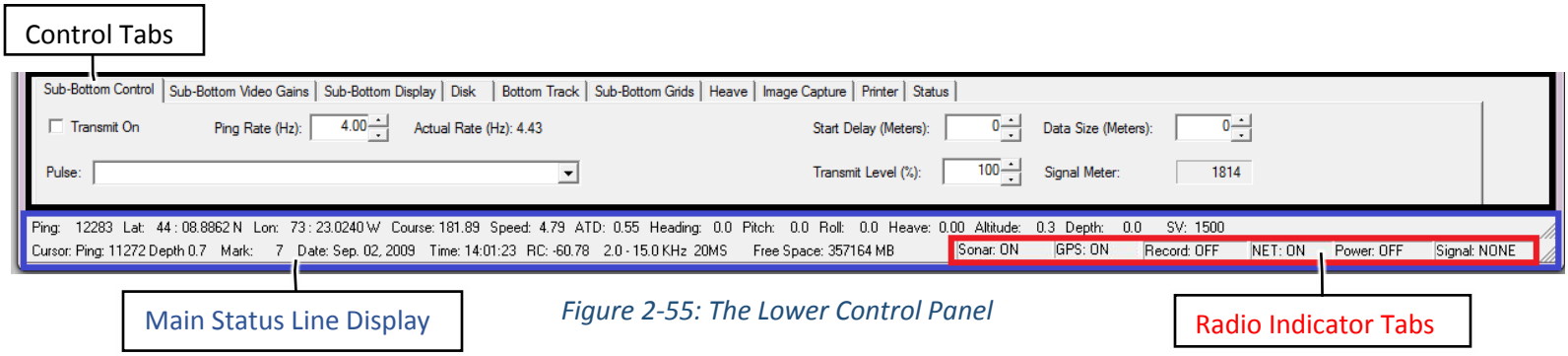

Figure 2-55: The Lower Control Panel

2.6.1 Main Status Line Display

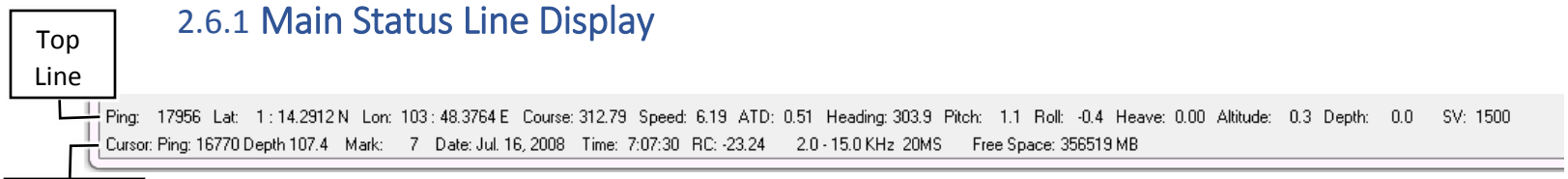

Figure 2-56: The Main Status Line Display Section of the Lower Control Panel

The Main Status Line Display is below the Control Tabs and has a read only tool that displays current system information and is divided into two parts: Top and Bottom Lines, which are described below.

2.6.1.1 Top Line

PING: The current ping number associated with data.

LAT / LONG, COURSE, SPEED, and ATD (ALONG TRACK DISTANCE TRAVELED): This section displays current latitude/longitude, course, along-track distance, and speed data from the GPS.

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

ALTITUDE: This section displays current Tow Fish altitude as calculated from Bottom Tracker.

HEAVE: Displays the Heave. See **HEAVE CONTROL TAB** and/or **HEAVE SENSOR OFFSET**.

DEPTH: Displays the Tow Fish depth in meters or PSI. Changeable in **DISPLAY CONFIGURATION**.

SV: Sound Velocity. Default: 1500 meters per second. Can be changed in **DISPLAY CONFIGURATION.**

2.6.1.2 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.

DEPTH: The depth within the data where the cursor is hovering. Measured in Meters.

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 time of the message is displayed.
> 2. If is 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.

RC: The Reflection Coefficient is a calculation based on peak energy returned from the bottom and from a perfect reflector. For experienced Sub-Bottom users, it can determine the sediment classification of the seafloor. This value should be anywhere from 0 to -40. If outside of this range, and the user wishes to use it for data interpretation, consider altering the **REFLECTION COEFFICIENT CONFIGURATION**.

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

2.6.2 Radio Indicator Tabs

Figure 2-57: The Radio Indicator Tab Section of the Lower Control Panel

This section of the Lower Indicator Panel displays the status of the indicated feature. During normal operation, all these indicators should be on (WHITE), as shown in **FIGURE 2-57**. RED indicates an alert state, meaning the tab is Off or Not Active. The Power indicator can be yellow if the power is not set to full. The GPS indicator shows "GPS err" if GPS data is garbled or not in the correct format. RECORD: OFF (RED) indicator is acceptable when data is not recording.

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 blinks 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 blinks red (alert state). Yellow indicates the power is not set to full.

NET [Network]: Displays the status of the sonar TCP/IP link.

POWER: ON/OFF. This displays the signal transmission strength. Yellow indicates power is not set to full.

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

2.7 Control Tabs

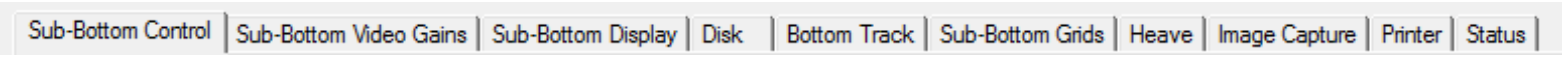

Figure 2-58: The Top of the Control Tabs

The DISCOVER Sonar Controls consists of individual tab selection sheets that are activated by clicking on the corresponding tab. All Sonar Controls are accessible when **CONTROL DIALOGS** is visible in the **VIEW MENU**.

| **SUB-BOTTOM CONTROL** | **SUB-BOTTOM VIDEO GAINS** | **SUB-BOTTOM DISPLAY** | **DISK** |
BOTTOM TRACK|**SUB-BOTTOM GRIDS** | **HEAVE** | **IMAGE CAPTURE** | **PRINTER** | **STATUS** |

2.7.1 Sub-Bottom Control

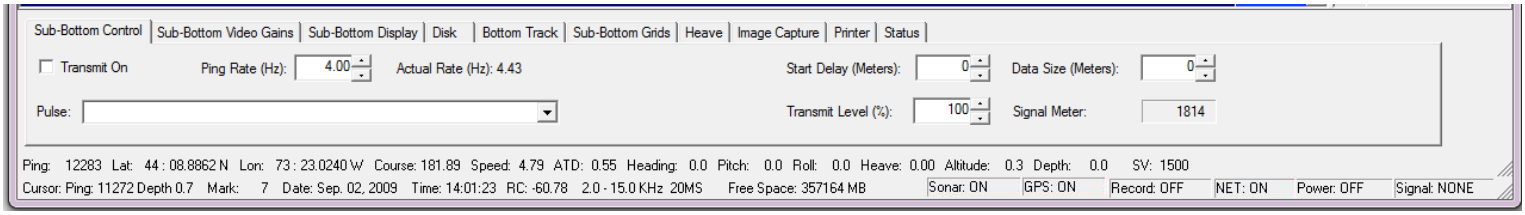

Figure 2-59: The Sub-Bottom Control Tab

Sub-Bottom Control is the primary acquisition tab. Parameters set in this tab are crucial and can't be changed in Playback. This tab is for the hardware configuration of the system, while others are for Software/Display setting.

> **NOTE:** Hovering the cursor over the entry fields in this tab, will provide information and ranges for the field.

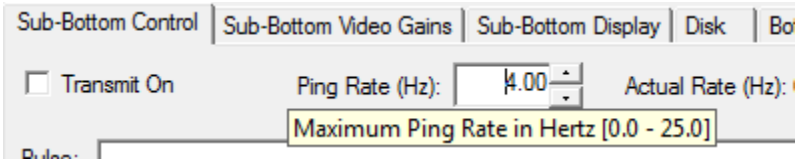

Figure 2-60: Example of Provided Information when Cursor Hoovers over an Entry Field

TRANSMIT ON [Check Box]: Selecting this checkbox will turns on pinging for the Sub-Bottom.

PING RATE (Hz) [Numeric Display, Entry]: Number of pings. The ping rate ranges from 0-25 Hz. However, for some pulses, the maximum ping rate will be less than 25Hz due to pulse length.

PULSE [Display, Drop-down]: A drop-down selection displaying all available pulses in Sub-Bottom System.

START DELAY (M) [Numeric Display, Entry]: Should a user want to see only data and eliminate water column from view, this will limit the data in view. If, for example, the bottom started at 100meters, the user could change the Start Delay to 75meters, eliminating some of the water column from view.

TRANSMIT LEVEL (%) [Numeric Display, Entry]: Value should always be at 100%, unless in very shallow water – under 5meters.

DATA SIZE (M) [Numeric Display, Entry]: The displayed data range. User can enter between 0 and 100.

> **NOTE:** If Start Delay and Data Size are in use – ex. 75meters – it will factor the 75meters Start delay, then add 50meters of penetration to the data.

SIGNAL METER [Numeric Display, Entry]: Shows the maximum returned signal for a given ping.

2.7.2 Sub-Bottom Video Gains

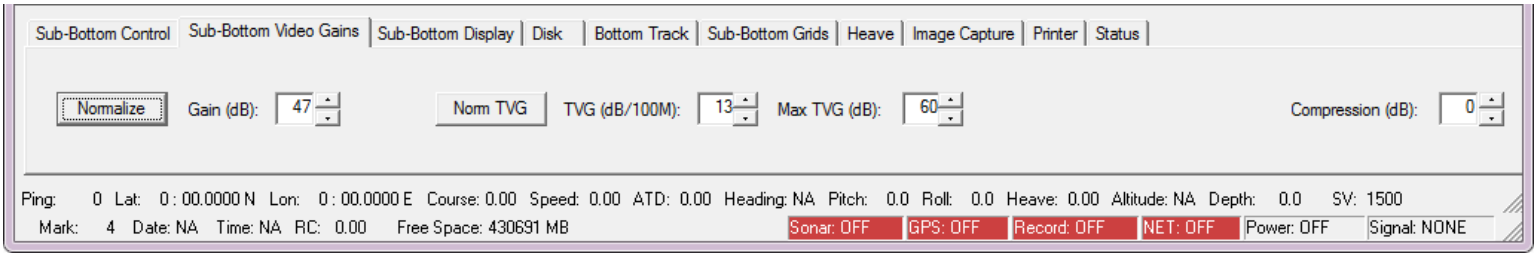

Figure 2-61: The Sub-Bottom Video Gains Tab

NORMALIZE [Button]: This button sets the display gain 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 manually adjusted by the user. Clicking the "N" button in the Shortcut Toolbar will have the same effect.

GAIN (dB) [Numeric Display, Entry]: This selection allows the user to adjust the overall video gain.

NORM TVG [Button]: This button sets the display Time Varied Gain to a value suitable for the current maximum echo levels. TVG works as a function of time, increasing the gain for weaker, or more distant signals, which visually strengthens the returns below seafloor rather than those close to the seafloor. The value chosen is shown in the TVG box and may be manually adjusted by the user. Clicking the "T" button in the Shortcut Toolbar will have the same effect.

TVG (dB/100m) [Numeric Display, Entry]: This value is used to apply exponential time varying gain (TVG) to the displayed waterfall data. 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) [Numeric 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) [Numeric 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 warp, strengthening the display of the weaker signals and weakening the display of the stronger signals. Typically, this is used to make the data appear more visually similar.

2.7.3 Sub-Bottom Display

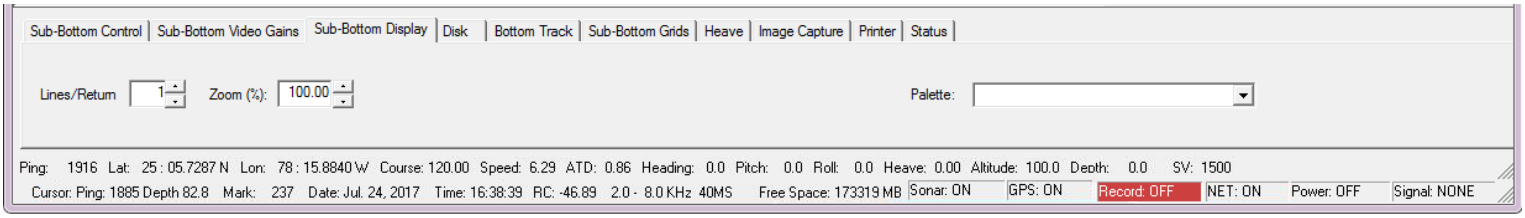

Figure 2-62: The Sub-Bottom Display Tab

LINES/RETURN [Numeric Display, Entry]: This selection allows the user to adjust the Vertical Zoom. If set to one, then one ping of data is mapped to one line of screen pixels. If set to 2, then one ping is duplicated and written to 2 horizontal lines of screen pixels. This feature is useful for seeing details in the echo data.

ZOOM (%) [Numeric Display, Entry]: This allow the user to adjust the Vertical Zoom factor.

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 pixels per samples, 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 (Vertical or Diagonal) and release. Double-clicking the left mouse button in the data area will return the sonar data to full resolution.

PALETTE [Drop Down Selection]: 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. The default setting is set to gray.jsp.

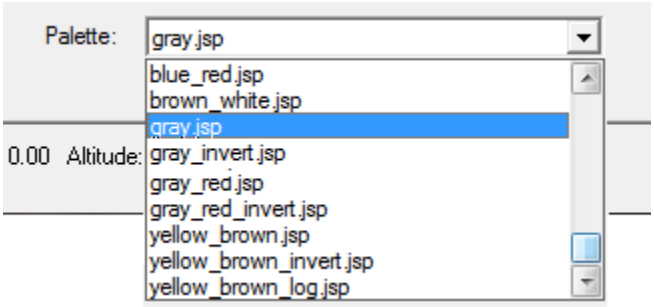

Figure 2-63: The 9 Pre-Defined Color Palette Options

2.7.4 Disk

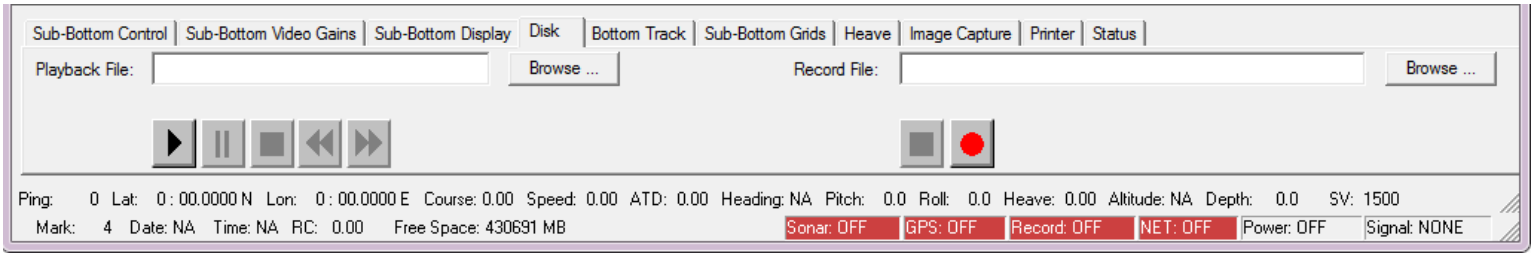

Figure 2-64: The Disk Tab

PLAYBACK FILE [Display, Entry]: This feature allows the user to enter a path and filename or select "Browse" and look for a specific file to be replayed. 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 [Display, Entry]: This feature allows the user to enter a path and filename or select Browse and look for a specific directory and enter the name in the "Select any DISCOVER Data File" pop up window. 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**.

2.7.5 Bottom Track

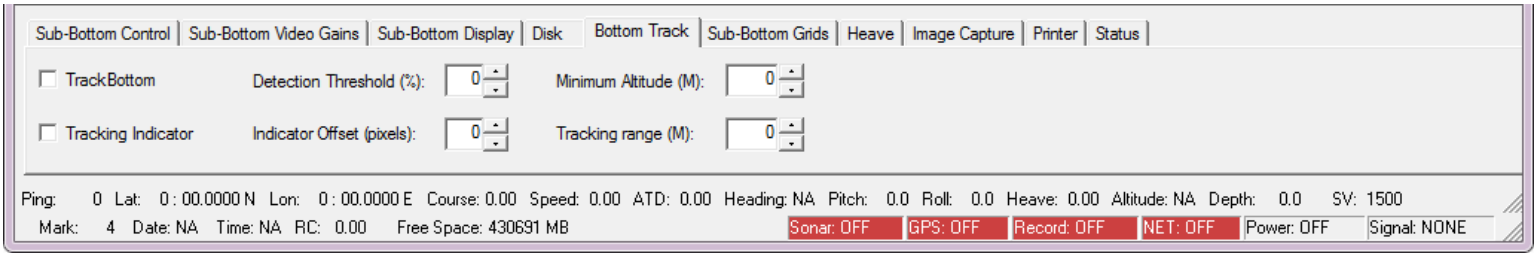

Figure 2-65: The Bottom Track Tab

TRACK BOTTOM [Check Box]: 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), and Tow Fish 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 [Check Box]: 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 (%) [Numeric Display, Entry]: This selection allows the user to limit the bottom tracking to a user-defined percentage of the sonar signal display window. This setting will vary depending on bottom types but a good place to start is about half of the peak signal displayed in the sonar signal amplitude display window. 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 **WAVE FORM DISPLAY** sets the threshold at that horizontal level. For very small bottom returns temporarily expand the top window 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 correct height in **WAVE FORM DISPLAY** sets threshold, but won’t affect window width.

INDICATOR OFFSET (pixels) [Numeric Display, Entry]: 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) [Numeric Display, Entry]: This selection allows the user to manually force the tracking algorithm to exclude a region out to a certain distance from the Tow Fish 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 Tow Fish 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 Tow Fish gets shallower than the Hold off setting, then the bottom tracking feature will be operating incorrectly

TRACKING RANGE (M) [Numeric Display, Entry]: This field adjusts the width of the tracking window in meters. Bottom candidates meeting threshold requirement outside of this window are not valid. This window can be set graphically by left-clicking at the start point and "dragging" to the end-point.

2.7.6 Sub-Bottom Grids

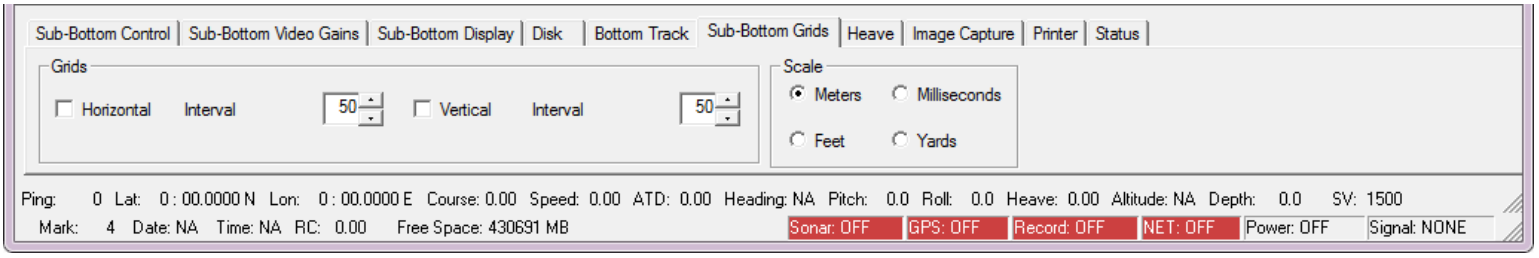

Figure 2-66: The Sub-Bottom Grids Tab

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 customize 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.

2.7.7 Heave

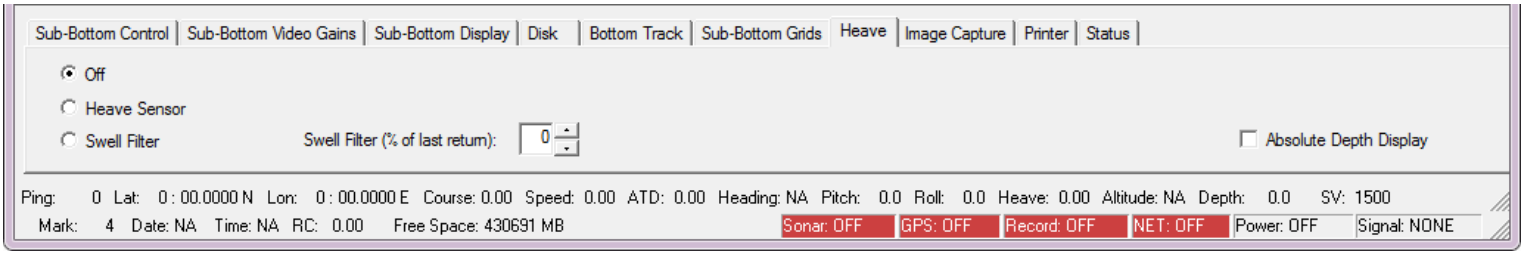

Figure 2-67: The Heave Tab

Heave refers to the vertical movement of the boat as it moves through waves. Heave helps to correct the movement of the waves from the data returns from the bottom, which provides smooth imaging rather than sawtooth, or jagged, results from a survey. The Heave sensor readings will be used to adjust the display. Typically, Heave is used in Hull-mounts, as Heave Correction in Tow Fish systems is difficult.

For more Information see **HEAVE SENSOR OFFSETS**.

OFF [Check Box]: Turns the Heave function on/off. When turned on, this will interface with Sonar.exe. When enabled, Heave is disabled. Off is enabled by default.

HEAVE SENSOR [Check Box]: Allows for Sonar.exe to interface with a Heave sensor in a hull mounted or Pole-mounted system, which would have been precisely installed into the Hull window. The Heave sensor will calculate the heave and input it within the data to smooth the displayed data. This information is stored in .JSF file. Heave must be configured to be input via a Sonar Serial Port to select Heave Sensor.

SWELL FILTER [Check Box]: A swell filter is a software function an operator can use to account for heave. This information is not stored in the .JSF file.

SWELL FILTER (% of last return) [Numeric Display, Entry]: Allows the user to determine the percentage of the swell filter used in data processing in the Waterfall Display.

ABSOLUTE DEPTH DISPLAY [Check Box]: Enables calculation of water column depth from a pressure sensor on the boat or a tow fish. A pressure sensor must be present to estimate fish depth.

2.7.8 Image Capture

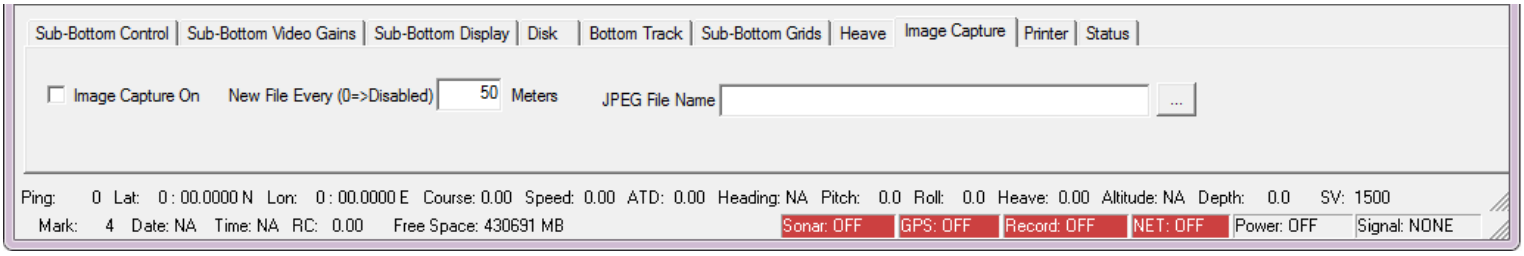

Figure 2-68: The Image Capture Tab

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.

IMAGE CAPTURE ON [Check Box]: Enables Image Capture. A standard .JPG file can be created and viewed on screen or printed. When Checked, this launches a window, prompting the user to create a path for all image captures. All image captures will be saved in this user-established path. This can also be changed/accessed in **JPEG FILE NAME**.

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, however there must be a valid navigation input for this function to work. This tab also gives the user the ability to set the file name and location where each image will be saved.

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

> **Note:** DISCOVER Sub-bottom 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.

2.7.9 Printer

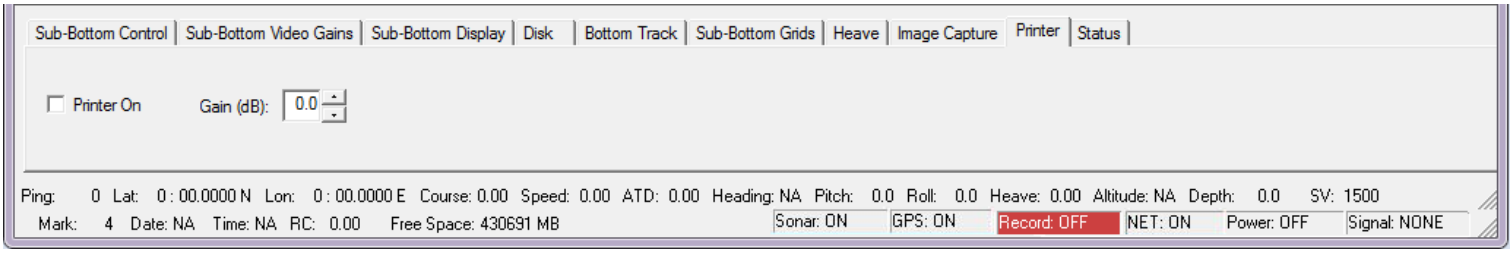

Figure 2-69: The Printer Tab

Using the check box and drop-down menus the user can setup a printer. Several printers are supported. For more information, including how to set up a specific printer, refer to the **PRINTER CONFIGURATION**.

PRINTER ON [Check Box]: Enables DISCOVER interface with the selected 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** have no effect on the intensity of the printout.

2.7.10 Status

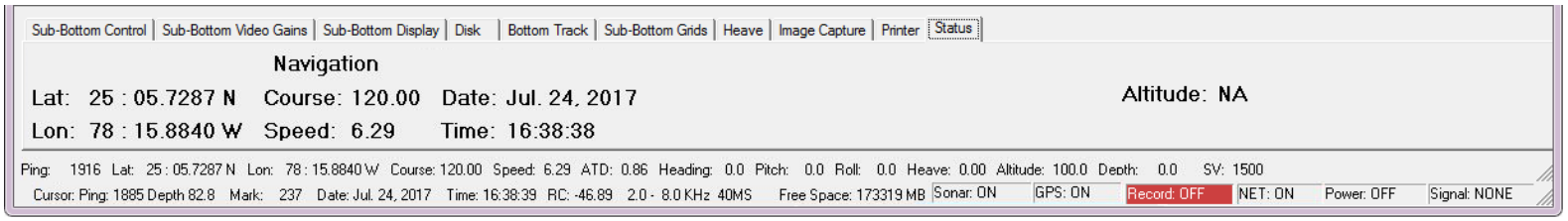

Figure 2-70: The Status Tab

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 Tow Fish 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.

3.0 NAVIGATION-ANNOTATION

DISCOVER SUB-BOTTOM 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 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 GPS manufacturers) to 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 pin out of 9-pin serial connector.

Supported baud rates: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, and 115200. Higher baud rates may not work.

The following information describes Serial Port Interface Parameters for acquiring Navigation Strings from a connected GPS or integrated navigation computer to DISCOVER processor serial port. The system will accept Annotation and Event mark strings in accordance with **EMA: EVENT, SET MARK & ANNOTATION**.

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 3.01

January 1, 2002

3.1 NMEA Approved Sentence Structure

The following provides a summary explanation of the approved sentence structure:

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

ASCII	HEX	DESCRIPTION
"$"	24	Start of Sentence
aa		Dummy characters to start Address Field (e.g. GP), not used by EdgeTech products
bbb		Sentence Formatter. Mnemonic code identifying data type and string format of successive fields.
" , "	2C	Field Delimiter. Starts each field except Address and Checksum fields. If followed by a null field, it is all that remains to indicate no data in the field.
c---c		Data Sentence Block. Data field(s) preceded and separated by delimiters.
"*"	2A	Optional Checksum Delimiter.
Hh		Optional Checksum Field
<CR><LF>	0D 0A	Terminates Sentence

Table 3-1: Summary of Explanations of Approved Sentence Structure

3.1.1 PORT Parameters

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

Table 3-2: PORT Parameters

3.2 Inputs

The following are approved NMEA sentences recommended for use with the DISCOVERY based systems.

The list of NMEA and Edge Tech messages are:

GLL, **GXY**, **GGU**, **GGA**, **VTG**, **RMA**, **RMC**, **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.

> **NOTE:** 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.

3.2.1 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 3-3: GLL – Geographic Position Latitude Longitude

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

3.2.2 GXY – Geographic Position – X and Y Coordinates

X and Y coordinates of the present vessel position, 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 3-4: GXY – Geographic Position-X and Y Coordinates

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

3.2.3 GGU – Geographic Position – X / Y Coordinates

X and Y coordinates of the present vessel position, 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 3-5: 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.

3.2.4 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 3-6: GGA – Geographic Position – X and Y Coordinates

3.2.5 VTG – Track Made Good and 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 3-7: VTG – Track Made Good and Ground Speed

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

3.2.6 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.

3.2.7 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

3.2.8 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 3-8: ZDA – Time & Date

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

Time and date from the computer CPU are also recorded and could be displayed if GPS time and date are not available.

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

3.2.9 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
x.x	Magnetic sensor heading, degrees
x.x	Magnetic deviation, degrees E/W1,3
x.x	Magnetic variation, degrees, E/W2,3

Table 3-9: 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.

3.2.10 EVT – Event & Annotation (EdgeTech custom)

Event mark and related annotation provided by an integrated navigation system

$EGEVT,S,<Message>,<Message>,<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 3-10: EVT – Event & Annotation

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

A shortcut to 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
```

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

3.2.11 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 3-11: 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.

3.3 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 3-12: Pin Out Description

The different pins from the comport connection that EdgeTech's processors use for communication are detailed below:

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.

3.4 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 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.

> **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).

Follow the steps below for this procedure:

1. Set the GPS to its NMEA mode in its Interface Setup area for this test.
2. Set GPS to its Simulator mode if indoors, or if having difficulty obtaining a GPS satellite fix.
3. Run the Tera Term executable file at C:\Edgetech\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 process, trying a different COM port. If you are certain you are selecting proper COM port, contact EdgeTech for further troubleshooting tips.

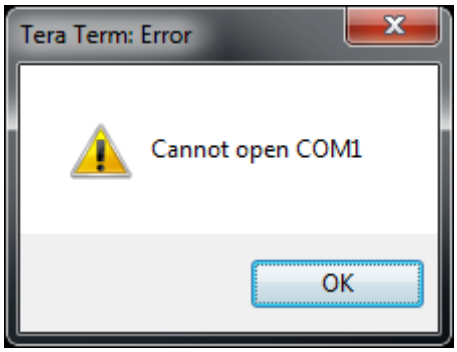

Figure 3-1: Tera Term Error Message

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

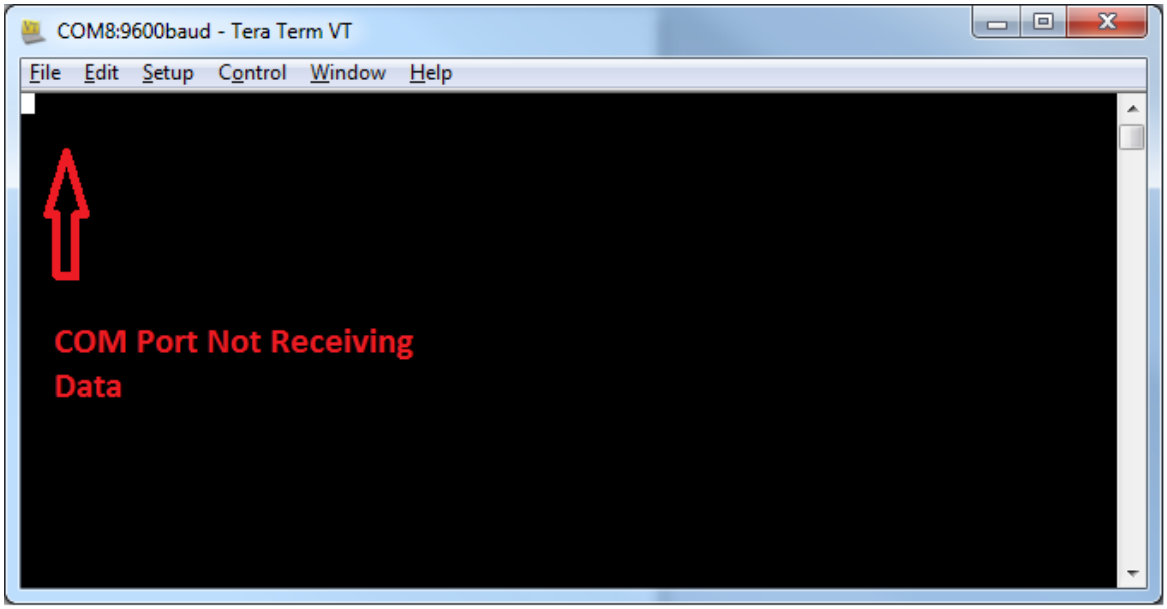

Figure 3-2: COM Port Not Receiving Data (Blinking Cursor)

3. A screen with text scrolling upward appears. You are successfully connected to your GPS unit. Good GPS data will look like, as shown in **FIGURE 3-3**.

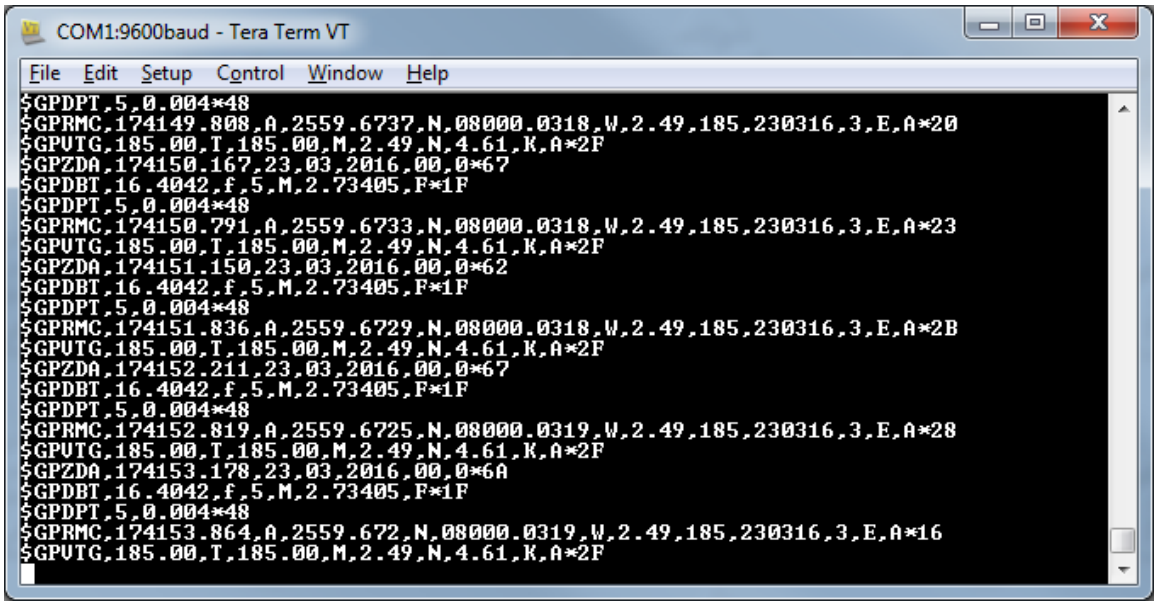

Figure 3-3:Accurate GPS Data

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

A.0 UPDATING DISCOVER

The entire DISCOVER Sub-Bottom installed InstallShield is available on the EdgeTech company website. To download and install:

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

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

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

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

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

B.0 CABLE COUNTERS

The following cable counters are compatible with DISCOVER Sub-Bottom:

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

Appendix 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).

Appendix 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

Appendix 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.

Appendix Table B-4: Hydrographic Smart Cable Counter