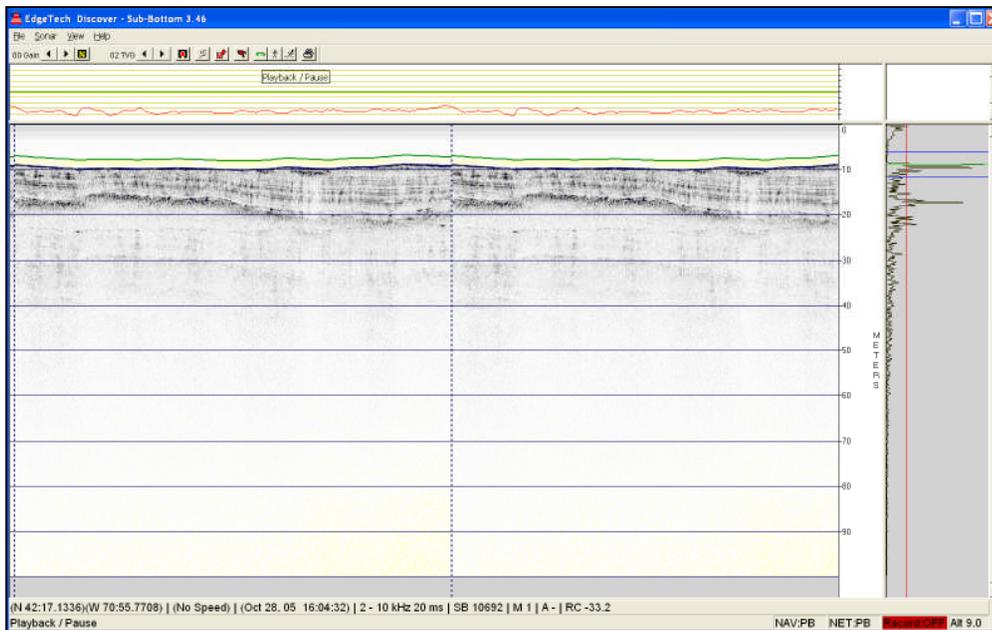


DISCOVER SB Software

DISCOVER SUB-BOTTOM SOFTWARE USER'S MANUAL

Revision: 1.1 / May 2009



Email: info@EdgeTech.com
Web: <http://www.EdgeTech.com>

P.O. Box 850
4 Little Brook Road
West Wareham, MA 02576
Tel: 508 291-0057 / Fax: 508 291-0975

FORWARD

This manual is intended to provide the user with an understanding of the operation of the EdgeTech Discover Sub-Bottom Software. General sub-bottom profiling information may be found in papers published in the Journal of the Acoustical Society of America, Offshore Technology Conference, IEEE Journal of Oceanic Engineering by L.R. LeBlanc and S.G. Schock.

The information, figures and specifications in this manual are proprietary. Materials in this manual are issued in strict confidence on condition that it not be copied, reprinted or disclosed to a third party either wholly or in part without the prior written consent of EdgeTech.

Although this manual has been revised to cover the latest operational features of Discover Sub-Bottom Software, some features may be periodically upgraded. Portions of this manual such as parts lists, schematics, and test features are subject to change and should be used for reference only.

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

Since clear and concise documentation is important for successful operation and understanding of the equipment, we invite you to contact us with any questions or comments, so that we may enhance this manual.

WARRANTY

All equipment and software manufactured by EdgeTech is warranted against defective components and workmanship for a period of one year after shipment. Warranty repair will be done by EdgeTech, free of charge. Shipping costs are to be borne by the customer. Malfunction due to improper use is not covered in the warranty and EdgeTech disclaims any liability for consequential damage resulting from defects in the performance of the equipment. No product is warranted as being fit for a particular purpose and there is no warranty of merchantability. This warranty applies only if:

- i. The items are used solely under the operating conditions and in the manner recommended in Seller's instruction manual, specifications, or other literature.
- ii. The items have not been misused or abused in any manner or repairs attempted thereon.
- iii. Written notice of the failure within the warranty period is forwarded to Seller and the directions received for properly identifying items returned under warranty are followed.
- iv. The return notice authorizes Seller to examine and disassemble returned products to the extent Seller deems necessary to ascertain the cause for failure.

The warranties expressed herein are exclusive. There are no other warranties, either expressed or implied, beyond those set forth herein, and Seller does not assume any other obligation or liability in connection with the sale or use of said products. Any product or service repaired under this warranty shall be warranted for the remaining portion of the original warranty period only.

Equipment not manufactured by EdgeTech is supported only to the extent of the original manufacturer's warranties.

WARNING

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.

CONTENTS

| | |
|---|---------------------|
| FORWARD | i |
| WARRANTY | ii |
| WARNINGS | iii |
| TABLE OF CONTENTS | iv |
| QUALITY | vii |
| | |
| 1 INTRODUCTION | 1-1 |
| 1.1 OVERVIEW | 1-1 |
| 1.1.1 Discover Sub-Bottom..... | 1-1 |
| 1.1.2 Applications | 1-2 |
| 1.2 SOFTWARE DISPLAYS | 1-3 |
| 1.3 OPERATOR CONTROLS | 1-4 |
| | |
| 2 DISCOVER SETUP | 2-1 |
| 2.1 INSTALLATION | 2-1 |
| 2.1.1 Install Shield | 2-1 |
| 2.2 DISCOVER SUB-BOTTOM –RESTRICTED-..... | 2-5 |
| | |
| 3 OPERATIONS..... | 3-1 |
| 3.1 GENERAL | 3-1 |
| 3.2 OPERATOR INTERFACE..... | 3-1 |
| 3.3 DISCOVER SB USER UNTERFACE..... | 3-1 |
| 3.3.1 Waterfall Display | 3-2 |
| 3.3.2 Wave Form Display | 3-2 |
| 3.3.3 Main Status Line | 3-3 |

CONTENTS

| | | |
|------------|-----------------------------------|------------|
| 3.3.4 | Toolbar | 3-4 |
| 3.3.5 | Pull Down Menus | 3-5 |
| 3.3.6 | Using the Trackball..... | 3-6 |
| 3.3.7 | Using the Keyboard | 3-6 |
| 3.4 | SONAR CONTROLS | 3-6 |
| 3.4.1 | Sonar Control..... | 3-7 |
| 3.4.2 | Sonar Control Page 2 | 3-8 |
| 3.4.3 | Display | 3-9 |
| 3.4.4 | Display Page 2 | 3-11 |
| 3.4.5 | Status Bar | 3-13 |
| 3.4.6 | Network..... | 3-14 |
| 3.4.7 | Navigation..... | 3-15 |
| 3.4.8 | Printer..... | 3-16 |
| 3.4.9 | Alerts..... | 3-18 |
| 3.4.10 | Logs..... | 3-19 |
| 3.4.11 | Misc..... | 3-20 |
| 3.4.12 | Record..... | 3-21 |
| 3.4.13 | Playback..... | 3-24 |
| 3.4.14 | Image Capture..... | 3-25 |
| 4 | FILE FORMATS | 4-1 |
| 4.1 | EDGETECH NATIVE FILE FORMAT | 4-1 |
| 4.2 | STANDARD SEG-Y FORMAT..... | 4-1 |
| 4.2.2 | Trace Header | 4-2 |
| 4.2.3 | Binary Header | 4-3 |
| 4.2.4 | EBCDIC Header | 4-4 |
| 4.3 | XTF FORMAT | 4-8 |

CONTENTS

| | |
|---|------------|
| 4.4 RAW DATA CAPTURE FORMAT | 4-8 |
| 4.5 SONAR DATA TYPES | 4-8 |
| 4.6 PALETTE FILE FORMAT | 4-9 |
| 5 TRIGGERING AND COUPLING | 5-1 |
| 6 NAVIGATION INPUT | 6-1 |
| 6.1.1 NMEA Approved Sentence Structure..... | 6-1 |
| 6.1.2 Port Parameters | 6-2 |
| 6.1.3 Inputs..... | 6-2 |
| 7 CUSTOMER SERVICE | 7-1 |
| 7.1 STATEMENT | 7-1 |
| 7.2 RETURNED MATERIAL AUTHORIZATION..... | 7-2 |
| 7.3 SOFTWARE SERVICE AGREEMENT (SSA)..... | 7-4 |

Quality

To our customers:

Thank you for purchasing one of our products. At EdgeTech, it is our policy to provide high quality, cost-effective products and support services that meet or exceed your requirements, to deliver them on time and to continuously look for ways to improve. We all take pride in the products we manufacture.

We want you to be entirely satisfied with your equipment. The information in this manual will get you started. It tells you what you need to get your equipment up and running, and introduces its many features.

We always enjoy hearing from people who use our products. Your experience with our products is an invaluable source of information that we can use to continuously improve what we manufacture. We encourage you to contact or visit us to discuss any issues whatsoever that relate to our products or your application.

The Employees of EdgeTech

1 INTRODUCTION

1.1 OVERVIEW

1.1.1 DISCOVER SUB-BOTTOM

Discover SB is a limited function, diagnostic topside for EdgeTech Full Spectrum® chirp sonar systems. Discover SB supports the 3200-XS sub-bottom system. It is furnished as an aid to help verify correct EdgeTech Full Spectrum® Sonar operation prior to or during deployment. Discover SB includes the following capabilities:

- A waterfall, reflection coefficient, and waveform data displays.
- Frequency data analysis for advanced system diagnostics.
- Data recording and playback.
- Limited thermal printer support for waterfall data output
- NMEA GPS navigation input
- Sonar command and control
- Sonar diagnostics

The Discover Sub-Bottom program is supported under Microsoft's Windows 2000 and Windows XP operating systems. The data and control connections to the Discover SB program are entirely through TCP/IP connections.

The data and control connections to the Discover SB program are entirely through TCP/IP connections, allowing the Discover SB program to run (executed) on any Windows 98 / NT / 2000 based computer that can establish a TCP/IP connection to the EdgeTech Full Spectrum® sonar system. This connection may include, but is not limited to, computers connected directly using a crossover cable, computers connected via a standard Ethernet hub, or computers connected using the EdgeTech STARMUX™ digital telemetry link and FS-IU (topside Interface Unit). Discover SB can also be run on the actual EdgeTech Full Spectrum® sonar system computer.

EdgeTech Full Spectrum® sonar systems employ advanced Chirp technology to obtain high resolution, low noise data records. EdgeTech's advanced Chirp technology employs long duration, wide band frequency modulated transmit pulses. Return sonar echo data is processed to remove the FM carrier, and produce high-resolution images of the echo field. Discover SB allows monitoring of this normal de-chirped sub-bottom data, as well as raw chirped data. This latter data type is often useful for diagnostic purposes.

For compatibility with other EdgeTech products, the Discover SB program interfaces to a second program that is run in the background. Sonar.exe interfaces with the DSP and the analog interface boards to generate and transmit chirp pulses. A startup file launches the sonar.exe program automatically every time the system is booted.

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:

- ◆ Imaging fluidized mud to a resolution of 8 cm
- ◆ Sediment classification
- ◆ Buried pipeline and cable location & routing
- ◆ Dredging studies for inlets
- ◆ Scour/erosion surveys in rivers and streams
- ◆ Marine geotechnical surveys
- ◆ Bridge erosion surveys
- ◆ Hazardous waste target location
- ◆ Geological surveys
- ◆ Archeological surveys
- ◆ Imaging biologics in water column
- ◆ Mapping clam populations
- ◆ Beach renourishment
- ◆ Offshore Oil applications
- ◆ Full ocean depth sub-bottom imaging (hull mount systems)

1.2 SOFTWARE DISPLAYS

Real-time Video Display- The software displays Sub-bottom cross section data in a dedicated window.

Real-time Geo-referencing- The sub-bottom data are geo-referenced when navigation information is supplied.

Real time Processing- Real time processing includes removals of swell effects, adaptive automatic gain control and time variable gain. Data are logged in real time in JSF, and optionally SEG-Y, or XTF.

Reflection Coefficient- Since the EdgeTech sonar is linear; the measured reflection coefficient can be used to identify the type of material (i.e. sand, clay, mud etc.) on the bottom. A graph of the reflection coefficient is displayed in real time. Reflection coefficients are calculated when displayed and are not stored with the sonar data.

Navigation- One of the computer's RS232 ports can be configured to receive navigation data from a navigation computer or from a GPS. A NMEA 0183 string can be recorded through this interface. Navigation information is stored in the parsed NMEA messages with the sonar data. Approximate position information is also stored in the sonar data messages trace header.

Interactive screen interpretation- Using the mouse, the operator can get information on each ping.

Other Software features:

- Echo strength
- Layer depth
- Sonar return number, record number, file number, mark number
- Event/Fix marks
- Frequency data analysis for advanced system diagnostics
- Sonar Diagnostics

1.3 OPERATOR CONTROLS

- Two stage TVG
- Bottom tracking
- Display gain
- Preamp gain
- Horizontal and vertical zoom
- Waveform display of individual acoustic return
- Direct path suppression
- Heave removal
- Swell filter
- Display annotation & Event mark
- Pulse selection, rate and power
- A/D delay
- Printed and recorded media

2 DISCOVER SETUP

2.1 INSTALLATION

Discover Sub-Bottom consists of a single executable file “Discover-Sub-bottom.exe” and a standard Windows initialization file. The initialization file stores user options and configuration parameters. If the file does not exist, then default values are used, and it will be created when the current settings are saved or the program is exited.

Installation consists of copying the “Discover-Sub-bottom.exe” executable to a suitable directory on the Windows PC, e.g.: C:\Edgetech\Topside after the Install Shield has been run.

2.1.1 INSTALL SHIELD

To install Discover Sub-Bottom an Install shield must first be run; open the Install shield and click next.

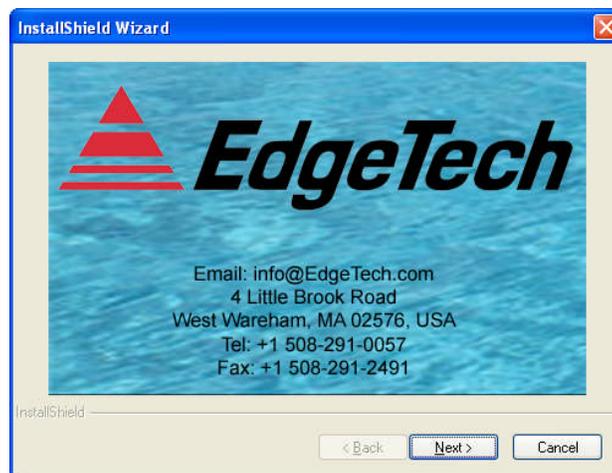


Figure 2-1 Install Shield Window

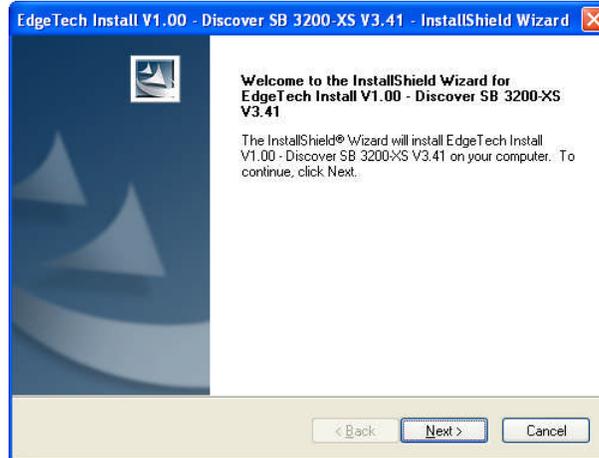


Figure 2-2 Install Discover SB

Please read through the warranty. To continue running the Install shield, click “I accept the license agreement”.



Figure 2-3 License Agreement Window

The Install shield must set up Discover on the computer. If “Complete” is selected, Discover SB and all affiliated files will be installed on the C:\ drive under the EdgeTech folder. If this is not convenient, select “Custom” and place Discover SB where it is easily accessible.

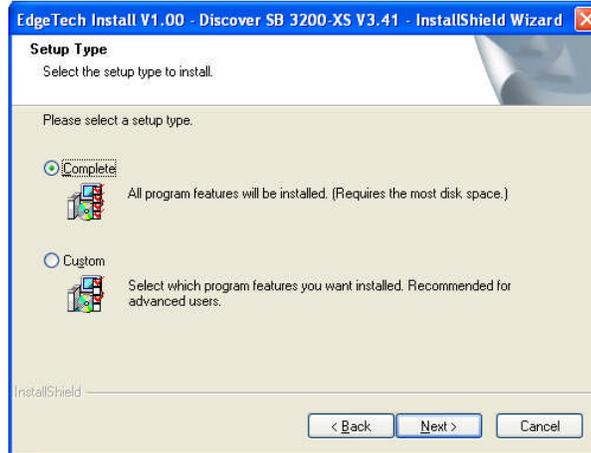


Figure 2-4-1 Setup Window



Figure 2-5-2. Setup Window

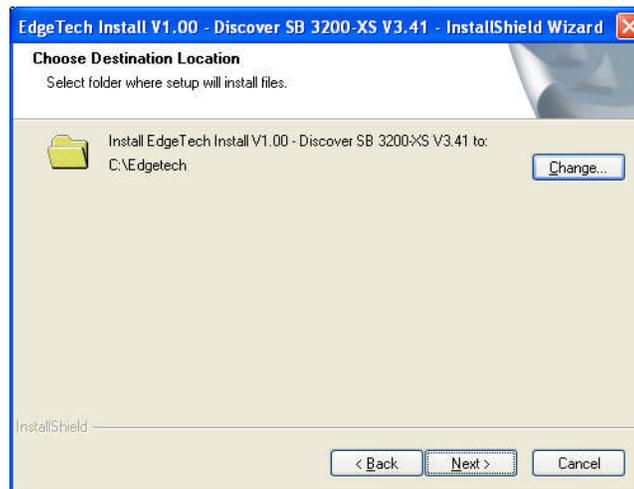


Figure 2-6 Destination Location Window

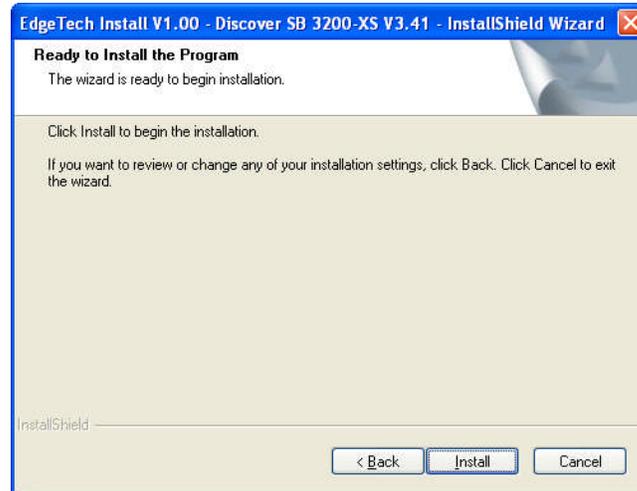


Figure 2-6 Ready to Install Window

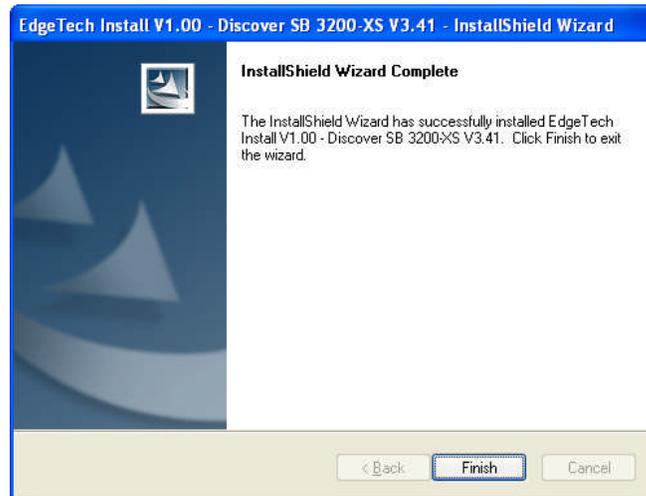


Figure 2-7 Install Complete

Possible error message: If Discover SB is already on the machine, when Install shield is opened, it will display the following message. This window is for uninstalling/removing or repairing the Discover SB program.

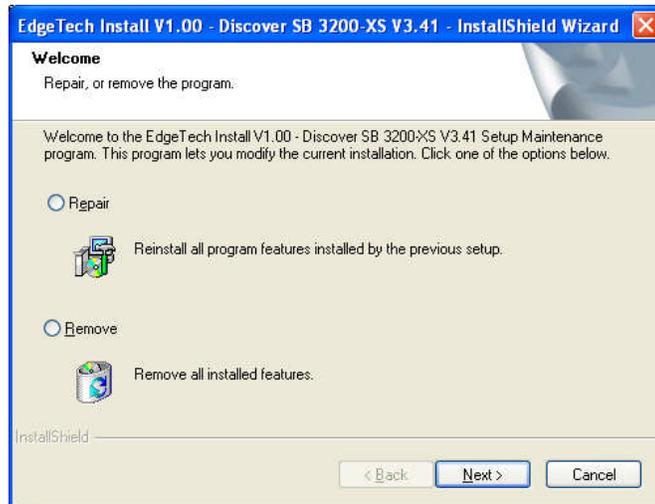


Figure 2-7 Repair or Remove Window

2.2 DISCOVER SUB-BOTTOM –RESTRICTED-

If Discover Sub-Bottom program is restricted this means that you are running an unlicensed version of Discover Sub-Bottom. To register go to the help drop down menu and click on Password Maintenance. Contact EdgeTech technical support at info@EdgeTech.com and include your Machine ID number. The Machine ID number will be in the upper left quadrant of the Insert Password Window, as seen in Figure 2-10. EdgeTech will provide a personalized password (machine specific).

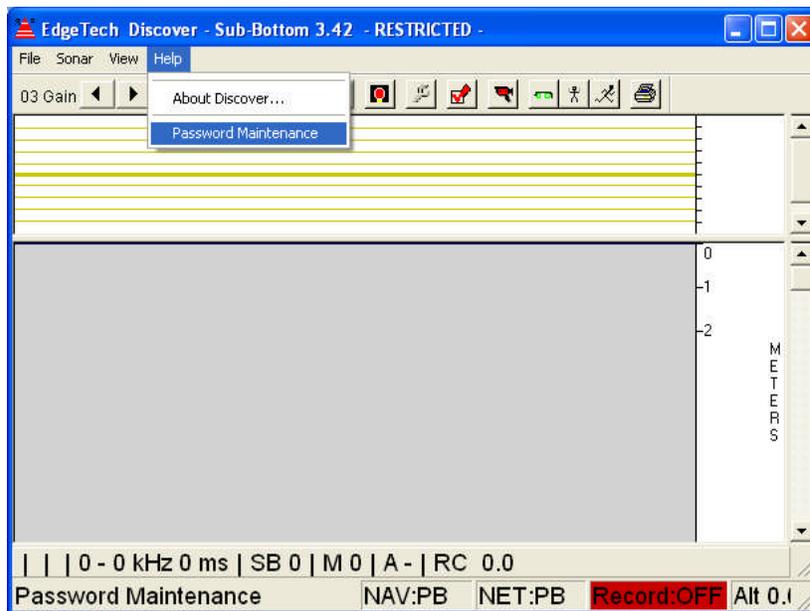


Figure 2-9 Discover Main Screen



Figure 2-10 Insert Password Window

3 OPERATIONS

3.1 GENERAL

The purpose of this section is to provide general information on the operation of the Discover SB software. It is not intended to be a textbook for interpretation of the sub-bottom data. EdgeTech reserves the right to change the software features and operation of this product at any time to improve on the user or hardware interfaces. To upgrade your system to the latest configuration, contact EdgeTech sales at sales@edgetech.com.

3.2 OPERATOR INTERFACE

The operator communicates with the system through a video screen, keyboard and trackball.

All sonar controls are found in the pop up control panel window. The user interface consists of several tabs. For example there is a tab that sets up and controls the printer attached to Discover SB. A status bar in the lower part of the screen displays current operational parameters.

All of the panels have factory default settings. When changes are made to various settings, they are remembered when the system is shut down. Those default settings are stored in file **DiscoverSBPDefaults.Jni**. On power-up the settings in **DiscoverSBPDefaults.Jni** are loaded. The user can create and save different configuration.

3.3 DISCOVER SB USER UNTERFACE

The normal Discover SB display consists of the following:

- Main Sonar Data Display
- Pull Down Menus for Command and Control
- Toolbars for frequently used commands.
- Status bar for sonar control and sonar data status.
- Control Panels - tabbing dialog boxes for modifying parameters.

These items are described in greater detail below.

The main display is split into sections two ways horizontally and two vertically. Each window can be resized by moving the mouse pointer to its splitter, then moving the mouse while holding down the left mouse button.

3.3.1 WATERFALL DISPLAY

The data in the waterfall display is cached. Using the mouse a region can be selected to zoom in or out on the data or the scroll bars can be used to pan around inside the data set. Moving the mouse over a sonar data record in the waterfall will display information specific to that record in the status bar.

| Item | Description |
|--|---|
| Waterfall Data | Displays the intensity of sonar return data. The display is cached so that data can be repainted when zooming or panning and statistics of the data can be displayed. |
| Mouse: Zoom Out | Click and release the left mouse button to zoom out on the display so that all data is displayed. |
| Mouse: Zoom In | Press the left mouse button and drag to select a zoom in region. |
| Scroll Bar | Scroll up or down to pan around inside the waterfall. |
| Mouse: Current Statistics and Information. | Move the mouse pointer to a ping and the selected status information will be displayed in the main status bar. |
| Dashed Line | A dashed line on the waterfall indicates that an event mark or annotation is present at that position. |
| Green Line | A green line is drawn 1 display unit above the current bottom track position. Line Color and offset can be customized, see 3.4.3 Display and 3.4.11 Misc. |

Table 3-1 Waterfall Display

3.3.2 WAVE FORM 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.

| Item | Description |
|------------|---|
| Scope Plot | Plots the current trace in an x – y plot. |

| | |
|--|--|
| Red Vertical Line | Indicates the current bottom track threshold. Line Color and offset can be customized, see 3.4.11 Misc. |
| Green Horizontal Line | Indicates the current bottom track position. Line Color and offset can be customized, see 3.4.11 Misc. |
| Blue Horizontal Lines | Indicates the bottom track range. Line Color and offset can be customized, see 3.4.11 Misc. |
| Scroll Bar | Scroll up or down to pan around inside the waterfall. |
| Mouse: Current Statistics and Information. | Move the mouse pointer to a ping and the selected status information will be displayed in the main status bar. |
| Mouse: Set bottom track position and threshold | Click and release the left mouse button to set the current bottom track position and threshold |
| Mouse: Set bottom track range | Press the left mouse button and drag to select the bottom track range. If only a very small drag is performed then the track range is set to zero and the tracker is disabled. |

Table 3-2 Wave Form Display

3.3.3 MAIN STATUS LINE

The Main Status Line is located at the bottom of the display under the waterfall display.

| Item | Description |
|--------------------------------------|--|
| GPS Status | Displays the status of the GPS input. If GPS is not being received blinks red (alert state), otherwise it is gray. |
| Network Status | Displays the status of the sonar TCP/IP link. If not connected blinks red (alert state). |
| Record Status | Displays the status of the disk recording. If not recording blinks red (alert state). |
| Altitude Status | Indicates the altitude above bottom as determined by the selected bottom tracker. If too close to the bottom blinks red (alert state). |
| Current Mouse Position Status / Help | Displays help on the control that the mouse is on or statistics about the ping the mouse is pointing to. |
| Current Run Time Status | Displays information about the current ping (e.g. GPS fix, ping number, signal strength, etc) as specified in the "Status Bar" options page. |

Table 3-3 Main Status Line

3.3.4 TOOLBAR

The Tool bar is located on the top of the display window, above the Waterfall display and below the pull down menus. Toolbar buttons provide shortcuts for some of the most common control panel items. All items in the toolbar are duplicated in a control panel item. Most of these options are summarized below:

| Item | Description |
|---|--|
|  Gain Control: Up / Down | The display gain setting should normally be set to 00 (dB). This will cause data with similar amplitudes to be correctly displayed once the Normalize button is pressed. Increasing the gain will cause the data to be further amplified in the display. Decreasing the gain has the opposite effect. Gain values between -20dB and +20dB tend to be the most useful. Use right mouse click to reset to reference. |
|  Gain Control: Normalize | This recalculates the scale factor, which is applied to the data prior to displaying it. This scale factor is chosen to cause the Peak value of the return to just reach maximum intensity on the displays, when the Associated gain value is set to 00dB. The scale factor is recomputed for each press of the normalization button. |
|  TVG Control: Up / Down | Time Varying Gain in dB per 100 meters of depth to apply to the pixel data. The TVG is applied beginning at the seabed if the bottom tracker feature is enabled otherwise from the beginning of the record and continues until the MAX value is reached. |
|  Ping On / Off | Turns pinging on and off. |
|  Show Control Panel | Displays and or hides the control panel. |
|  Insert Mark | Inserts a new mark and increments the mark number. |
|  Toggle Record | Toggles between disk record and idle. |
|  Toggle Playback / Pause Playback | Toggles between starting Playback and pausing playback. |
|  Playback slower | Slows down the playback rate. |
|  Playback faster | Speeds up the playback rate. |

| | |
|--|--|
|  Printer On / Off | Turns the waterfall printout on and off. |
|--|--|

Table 3-4 Toolbar

3.3.5 PULL DOWN MENUS

| Item | Description |
|-----------------------------------|--|
| File / New Mark | Inserts a new event mark and increments the mark number. |
| File / Record to file | Toggles between disk record and idle. |
| File / Playback/Pause | Toggles between starting Playback and pausing playback. |
| File / Playback slower | Slows down the playback rate. |
| File / Playback faster | Speeds up the playback rate. |
| File / Printer On / Off | Turns the waterfall printout on and off. |
| File / Load Configuration | Open configuration previously saved. |
| File / Save Configuration | Save current settings in DiscoverSBPLastUsed.Jni |
| File / Exit / Don't Save Settings | Exits without saving settings. |
| File / Exit – Save | Exits and saves current settings in DiscoverSBPLastUsed.Jni |
| Sonar / On | Turns pinging on and off. |
| Sonar / Control Panel | Displays and or hides the control panel. |
| View / Toolbar | Displays and or hides the toolbar. |
| View / Status Bar | Displays and or hides the status bar. |
| View / Gain Up – Down - Reset | Modifies current gain. |
| View / Normalize | Modifies reference gain. |
| View / Zoom | Zooms in and out in waterfall. |
| Help / About | Displays current Discover Sub-Bottom version information. |
| Help/Password Maintenance | Prompts for an authorization code to enable unrestricted option. |

Table 3-5 Pull Down Menus

3.3.6 USING THE TRACKBALL

There are several areas on the screen where mouse or trackball clicks will modify the display or cause a function to execute.

3.3.6.1 Left Button

By clicking the mouse arrow in the oscilloscope waveform (envelope) display at the position of the seafloor, the tracking cursor can be reset to the seafloor. Clicking and dragging the left cursor in the area around the pick will set the tracking window width (distance between the two blue lines).

By clicking the mouse arrow on the oscilloscope waveform (envelope) display, the vertical red threshold line can be adjusted to track either strong or weak reflections

NOTE:

The tracking algorithm searches below the upper blue line for the seafloor by comparing each envelope value with the threshold. The seafloor is defined as the first point (below the upper blue line) that the envelope exceeds the threshold. If none of the envelope values exceed the red line (threshold), the tracking cursor (horizontal red line) assumes the seafloor depth has not changed and the cursor (horizontal red line) does not move.

By clicking and dragging the arrow in the main data window, you can dynamically adjust the zoom factor. A double click will zoom out to maximum.

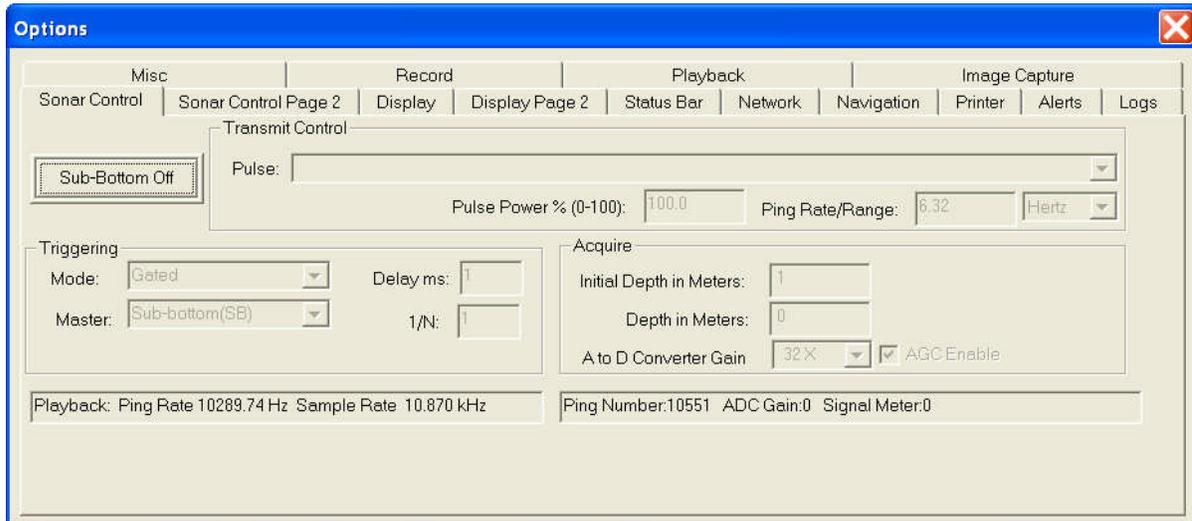
3.3.7 USING THE KEYBOARD

Discover SB functions and features were designed to minimize the use of a keyboard. The keyboard is mainly used for entering file names and annotations. Most commands can be executed from the control panel via the trackball.

3.4 SONAR CONTROLS

All sonar controls are accessible by clicking the Control Panel Icon or by selecting Control Panel in the Sonar Menu.

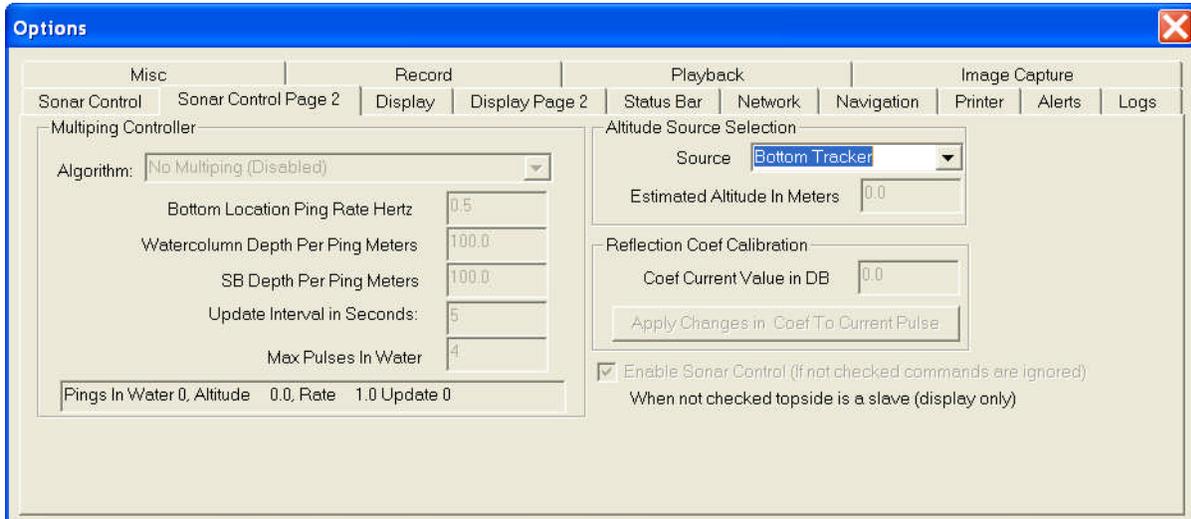
3.4.1 SONAR CONTROL



| Item | Description |
|----------------------------------|---|
| Sub bottom Sonar On / OFF | This button turns the sonar system ON or OFF. If the system is recording when the sonar is switched off, the archiving is paused. Turning the sonar back ON will also restart the recording to the same file. Note: To start a new file recording, not the sonar, must be stopped. |
| Pulse | Currently selected transmit pulse. Each vehicle has a set of 3 or more pulses. Refer to section 3.6 for systems with multiple vehicles. |
| Pulse Power % | Pulse power level (0 to 100 %). |
| Pulse Rate/Range | Specifies the ping rate in hertz or ping range in meters. |
| Triggering Mode | See Triggering and Coupling section |
| Triggering Delay in ms | Delay from the trigger event to when the sonar pings and begins collecting data. |
| Triggering 1/N | Trigger decimator. A value of 1 will ping on every trigger, 2 will ping on every other trigger, etc. |
| Acquire: Initial Depth in Meters | Sets the data window. Samples before this value are discarded by the Sonar to reduce network bandwidth. This can be used to exclude the water column from the displayed and stored data. |
| Acquire: Depth in Meters | Sets the data window. If zero, indicates that all data for the specified ping rate / range are returned. |

| | |
|-------------|--|
| ADC Gain | Analog to Digital Converter Gain |
| AGC Enable | Toggle on/ off Automatic Gain Control (Recommended on) |
| Status Line | Displays the current ping status as reported from the sonar program. |

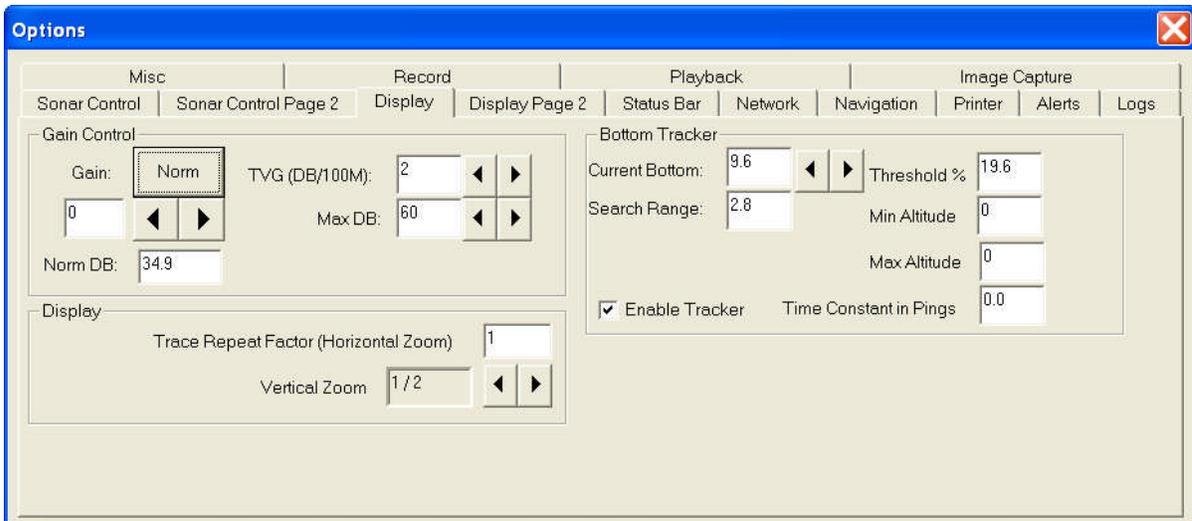
3.4.2 SONAR CONTROL PAGE 2



| Item | Description |
|-----------------------------------|--|
| Multiplying Controller Algorithm | When enabled, the Discover changes the ping rate and data window to support multiple pings in the water. A valid altitude source must be available to use the multiplying controller. Please review the appending on “Supporting Multiple Pings in the Water” for details of usage of these options. |
| Bottom Location Ping Rate Hertz | Ping rate to use in bottom location mode. This is useful to lock onto the bottom when the altitude source is the bottom tracker before enabling multiplying mode. |
| Watercolumn Depth Per Ping Meters | In multiplying mode, specifies the amount of data to collect in the water column (before the bottom). |
| SB Depth Per Ping Meters | In multiplying mode, specifies the amount of data to collect after the bottom. |
| Update Interval in Seconds | Interval at which the ping rate is updated when in multiplying mode. |
| Max Pulses in Water | Maximum number of concurrent pings in the water when multiplying is enabled |

| | |
|-----------------------------------|---|
| Altitude Source Selection | Source of the altitude estimate used for multiping and other processing. |
| Estimated Altitude in Meters | When the altitude source is “Estimated Altitude”, this is the operator entered altitude used. |
| Reflection Coef Calibration value | This is a value, in tenths of a DB used to scale all data. A new value is only applied when the “Apply Changes” button is pressed. The calibration value is set for each pulse. It should be selected such that a perfect reflector (the air – water interface) yields the maximum value of 0(DB). The reflection coef, is the amplitude of the return at the peak near the bottom trackers current position. |
| Enable Sonar Control | When checked, parameters on this page are sent to the Sonar when they are modified. When not checked, the Discover X-STAR is in passive observer mode. In this case it will receive data but not send sonar commands. |

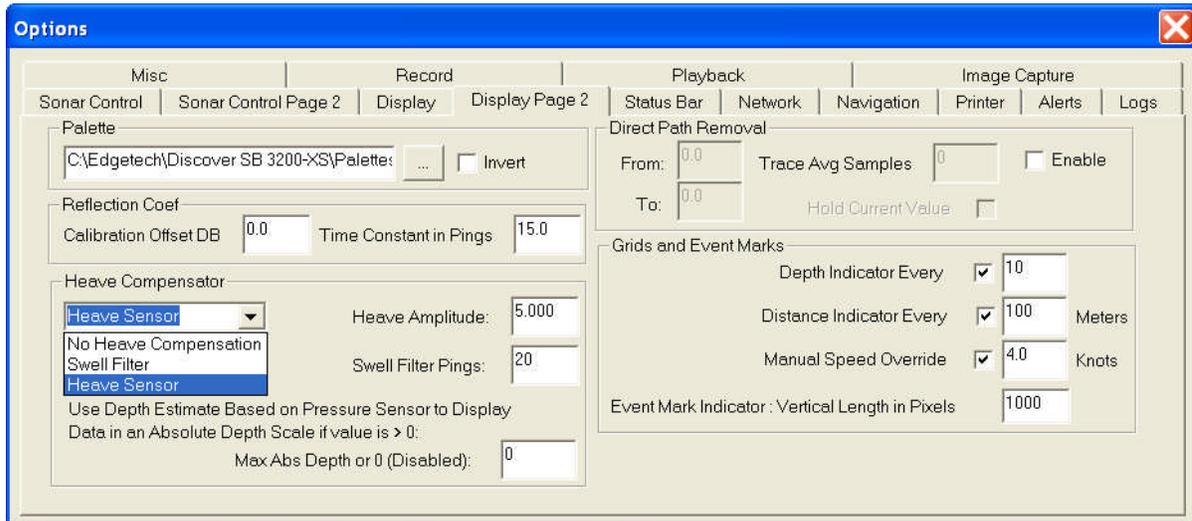
3.4.3 DISPLAY



| Item | Description |
|------|--|
| Gain | Gain in dB to apply to every pixel of data |
| Norm | Normalize data. When pressed, the display data is re-scaled so that the maximum value of the next ping is set to display as maximum display intensity. |

| | |
|---------------------------------------|---|
| Norm DB | When the normalization is completed, the Norm dB field is set to the new overall scale factor. |
| TVG (DB/100M) | Time Varying Gain in dB per 100 meters of depth to apply to the pixel data. The TVG is applied beginning at the seabed if the bottom tracker feature is enabled otherwise from the beginning of the record and continues until the MAX value is reached. |
| Max DB | TVG Maximum value in dB |
| Trace Repeat Factor (Horizontal Zoom) | Sub-sampling or replication factor for pixel data horizontally. When greater than 1, each ping of data is repeated the specified number of times on the waterfall display. This is useful for a close up inspection of the data but not recommended for normal operation. |
| Vertical Zoom | Sub-sampling or replication factor for pixel data vertically. |
| Bottom Tracker Current Bottom | Current bottom in nominal display units. The bottom tracker adjusts this value when enabled. TVG is applied beginning at this position. Note that for a dual (side scan) display, a negative value indicates that the bottom tracker will operate on the first channel (usually port) and a positive value indicates that the tracker will operate on the second channel (usually starboard). |
| Bottom Tracker Range | Search range from the current bottom in display units for the bottom tracker algorithm. A value above threshold must be within this range of the current bottom for the tracker to adjust the current bottom. If 0 then the tracker is disabled. |
| Bottom Tracker Threshold | Minimum value required for a detected seabed bottom. The bottom tracker will not modify the current bottom unless the sonar return is above this value. |
| Bottom Tracker Min Altitude | Minimum depth for the bottom tracker. The bottom tracker will not move the current bottom below this value. |
| Bottom Tracker Max Altitude | Max depth for the software to search for the bottom |
| Bottom Tracker Time Constant | When non-zero, the bottom trackers estimated altitude, which can otherwise be noisy / jagged, is smoothed out with a low pass filter. |
| Enable Tracker | Enable or disable the bottom tracking |

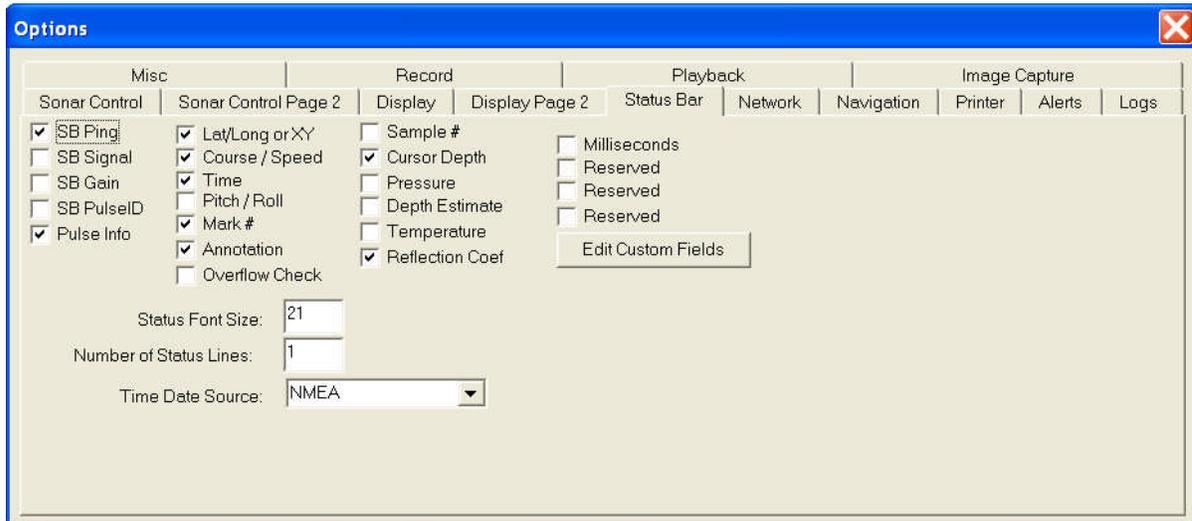
3.4.4 DISPLAY PAGE 2



| Item | Description |
|--|--|
| Palette | Used to select a color palette file for data display. Different linear and logarithmic pallets are available for better visualizing the data |
| Invert | If checked, the data is inverted prior to being processed by the palette. |
| Reflection Coef Calibration Offset DB | Additive offset in DB for the reflection coefficient display. The reflection coefficient. Calibration value on the Sonar / Advanced tab only applies to acquired data. This is an additional bias / temporary adjustment that can be used during playback as well. This value is not saved with the data and is for display purposes only. |
| Reflection Coef Time Constant in Pings | When non-zero, the reflection coefficient values are smoothed with a low pass filter. |
| Heave Compensator: <i>No Heave Compensation</i> <i>Swell Filter</i> <i>Heave Sensor</i> | The selected heave sensor readings will be used to adjust the display and printout. |
| Heave Amplitude | This will only be applicable if the heave sensor is selected as the Heave Compensator. The heave amplitude can be increased or decreased with in a thousandth of a degree. (Recommended correction from ± 0.1 to ± 1.5) |
| Swell Filter Pings | This will only be applicable if the swell filter is selected as the Heave Compensator. As an alternative to a heave sensor, a swell filter can be applied to the bottom track position and used to adjust the display and printout. A |

| | |
|--|--|
| | value of 0 disables the swell filter. |
| Display Max Abs Depth | When non-zero, this value is the total absolute depth in the waterfall and data is displayed on an absolute scale (where 0 is the surface of the water). To work properly, a pressure sensor must be present to estimate fish depth. This is an effective method to remove heave in rough seas. |
| Direct Path Removal From | Specifies a range for estimation and removal of the direct path signal. The “direct path” is typically the acoustic direct path between the transducer and hydrophone sensors. This can generate a repeatable constant pattern at the start of a data set which can be estimated and subtracted out. |
| Direct Path Removal To | End of range for direct path estimation and removal. |
| Trace Avg Samples | Time constant for low pass filter used to estimate the direct path. |
| Direct Path Removal Enable | When enabled, the estimated direct path is subtracted from the sonar data prior to displaying in the waterfall. |
| Hold Current Value | When checked, the calculated direct path is held (fixed), when not checked the signal is continuously estimated. |
| Depth Indicator | Toggle On/Off. Horizontal (depth) grid marks can be painted on the waterfall display at the interval specified if this check box is checked. (in meters or milliseconds) |
| Distance Indicator | Toggle On/Off. Vertical (distance) grid marks can be painted on the waterfall display at the interval specified if toggled on. (in meters) |
| Manual Speed Override | When checked, the NMEA speed is ignored and the specified constant value is used for painting the distance grid marks. |
| Event Mark Indicator: Vertical Length in Pixels | Specifies the length of event mark indicators on the waterfall display. If there are a lot of event marks, a long indicator line can obscure the waterfall data. |

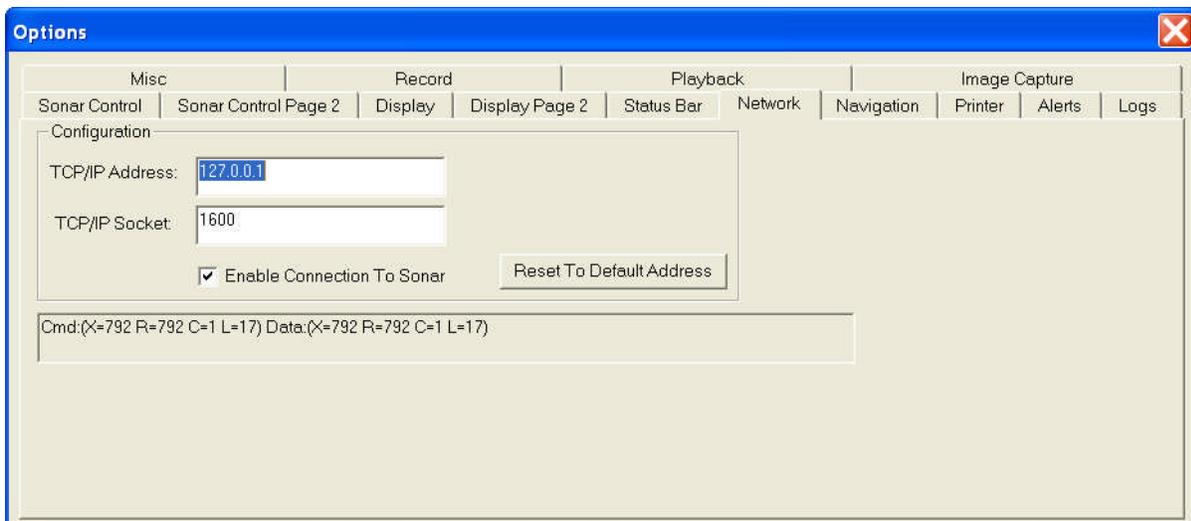
3.4.5 STATUS BAR



| Item | Description |
|----------------|--|
| SB Ping | Displays the ping number on the main status line if checked |
| SB Signal | Displays the signal meter value in tenths of a percent on the main status line if checked. |
| SB Gain | Displays the ADC gain on the main status line if checked |
| SB Pulse ID | Displays the unique pulse identification number |
| Lat/Long | Display the GPS position fix on the main status line if checked |
| Course / Speed | Displays the GPS derived course and speed on the main status line if checked |
| Time | Displays the GPS derived time on the main status line if checked |
| Pitch / Roll | Displays the pitch and roll reading on the main status line if checked and the system is fitted with the optional motion sensor |
| Mark | Displays the mark number and annotation on the main status line if checked. |
| Overflow Check | Displays the data overflow counter on the main status line if checked. If the overflow count increases then some data is being dropped, either inside the bottle or in the topside. It is normal to see this value increment when the pinging is turned on or off. Since it is based on a discontinuity this can also happen if a trigger decimator is |

| | |
|------------------------|--|
| | not 1 in some triggering modes (eg coupled mode). |
| Sample # | Displays the sample # of the mouse pointer on the main status line if checked. |
| Cursor Depth | Displays the depth in user units of the mouse pointer on the main status line if checked |
| Pressure | Displays pressure reading from the optional pressure sensor. |
| Depth Estimate | Displays towfish depth estimated form the pressure reading |
| Temperature | Displays water ambient temperature FS-DW systems only |
| Reflection Coef | Displays the actual sea floor reflection coefficient |
| Edit Custom Fields | In addition to the predefined items above, there is a 240 byte header (similar to SEG-Y) for each ping. Any field from this header can be displayed on the status line using these custom field options. |
| Status Font Size | Used to select the font (text size) of the status display |
| Number of Status Lines | Used to select the number of status lines drawn in the bottom of the screen |
| Time and Date Source: | Specifies the source of the Time and Date stamp, either NMEA (navigation data) or CPU Clock. |

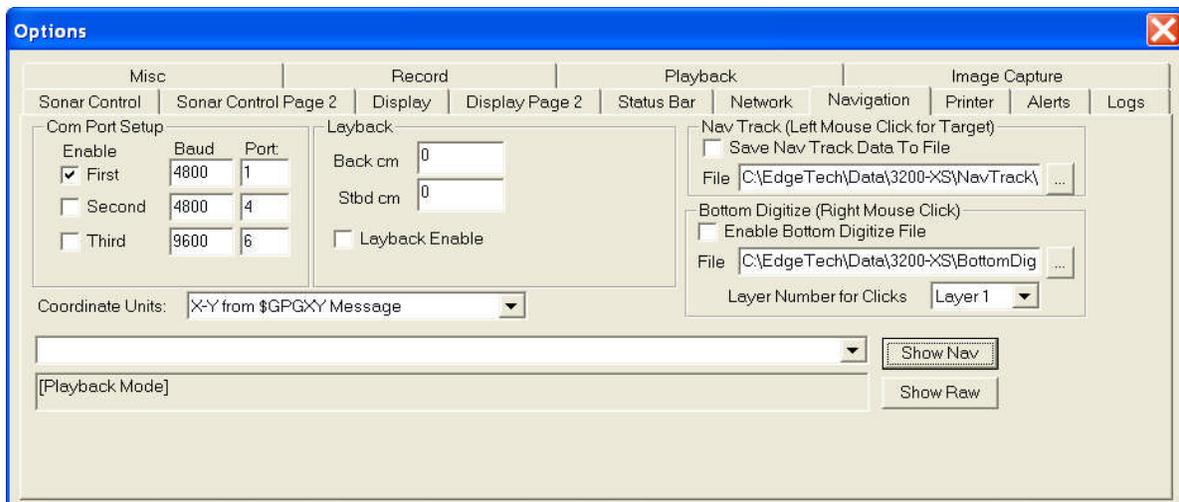
3.4.6 NETWORK



| Item | Description |
|----------------|---|
| TCP/IP Address | Address of the sonar computer or FS-IU topside to |

| | |
|----------------------------|---|
| | connect to. This should be in the form of four digits separated by periods, e.g. 192.10.0.100 |
| TCP/IP Socket | Socket number of the sonar computer to connect to. This should be a decimal integer and is typically 1700 |
| Reset to Default Address | Resets the TCP/IP address and socket number to 127.0.0.1 (the same computer Discover is running on) and 1600. These are the default values if connecting to the EdgeTech ETSI (EdgeTech Sonar Interface) application. |
| Enable Connection to Sonar | When checked, Discover connects to the sonar via the TCP/IP address / socket pair. When not checked, Discover does not connect to the sonar (useful for playback only mode). |
| Status Line | Displays the current status of the command and data sockets. If the connect count is odd (C=1 for example) then the socket is connected. When both the data socket and the command socket are connected then network status on the main status bar should change from blinking red to gray. |

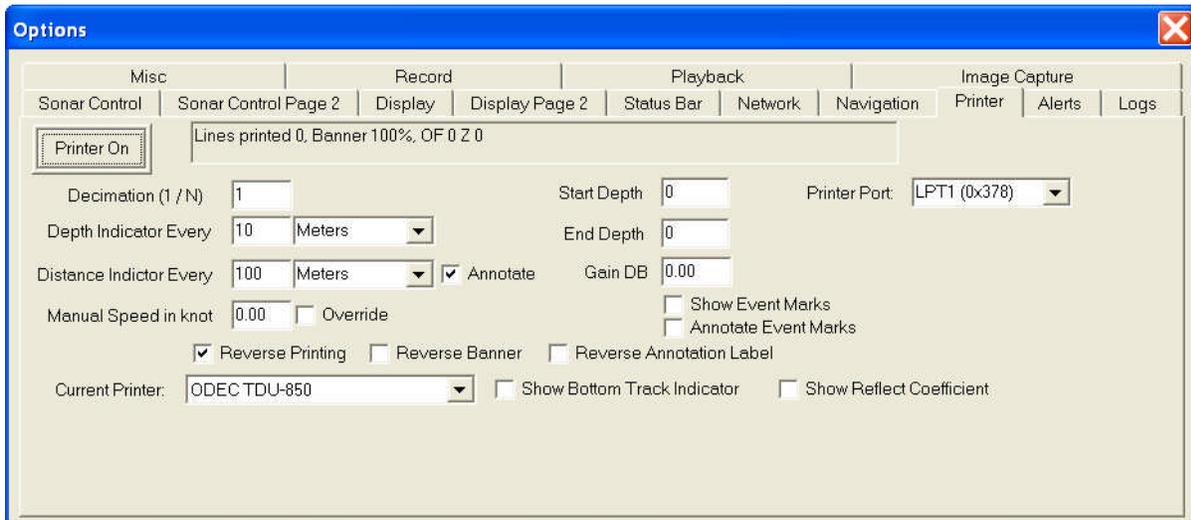
3.4.7 NAVIGATION



| Item | Description |
|---|---|
| Com Port Setup Enable First, Second, Third | GPS and other data can be picked up from up to 3 serial ports. In addition, if connecting to ETSI this type of data can also be received from ETSI via a TCP/IP link. |
| Com Port Setup / Baud | Specifies the baud rate of the input data. For standard NMEA inputs 4800 baud is recommended. |
| Com Port Setup / Port | This is the actual port number (e.g. 1 for COM1:) that the |

| | |
|-------------------------------------|---|
| | NMEA device is attached to. |
| Layback Back cm | Layback from the GPS source to the tow body. |
| Layback Stbd cm | Layback from the GPS to the tow body Starboard / Port(-Starboard) bias. |
| Layback Enable | When enabled, GPS coordinates are biased by the layback values. |
| Coordinate Units | Specifies which NMEA sentence to used for coordinate display. |
| Nav Track File and Enable | When enabled, navigation track information is written to the specified file. |
| Bottom Digitization File and Enable | When enabled, bottom digitization information is written to the specified file. |
| Show Nav | Press this button to update the pull down list box with the most recent navigation values parsed. |
| Show Raw | Press this button to update the pull down list box with the raw NMEA strings most recently received. A “?” character is prefixed to each string that Discover does not parse / recognize. |

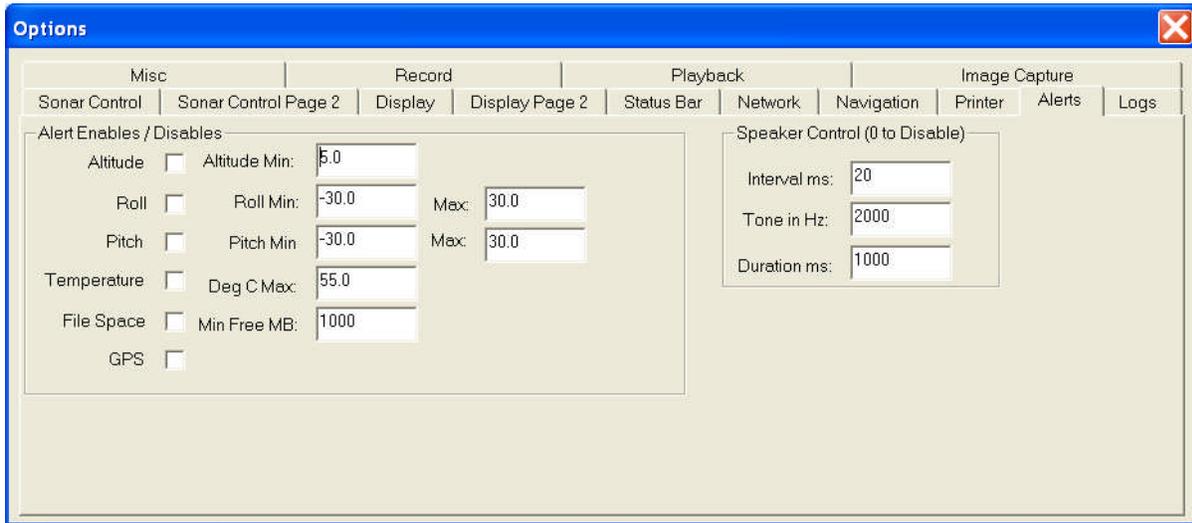
3.4.8 PRINTER



| Item | Description |
|-------------|--|
| Printer On | When checked enables data output to the printer. |
| Status Line | Indicates the depth of the printer queue. If the printer is not fast enough then data to be printed may be dropped in record mode. In this case the overflow count in the status |

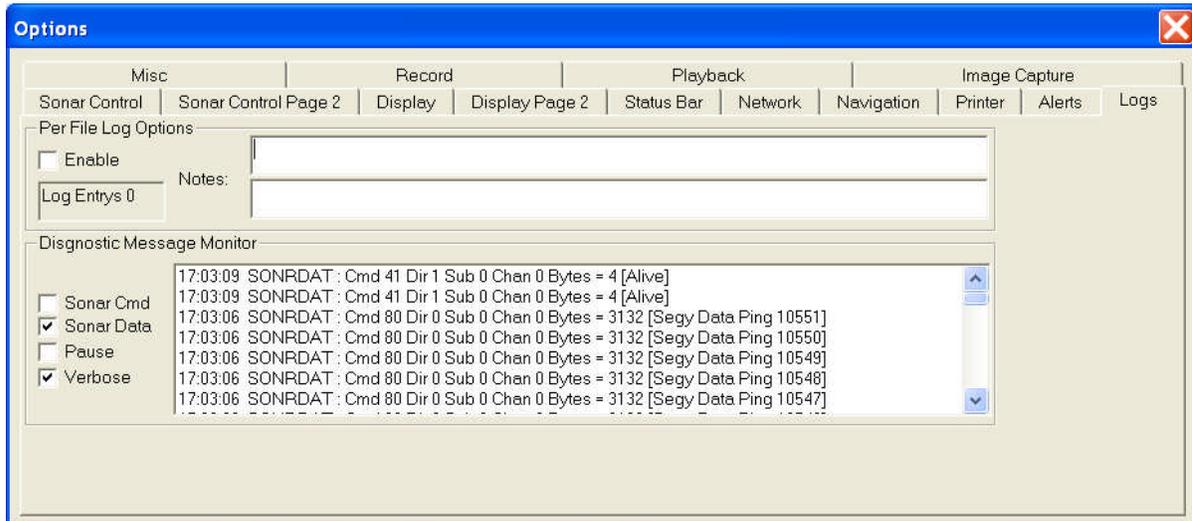
| | |
|--|---|
| | will increment. |
| Decimation (1 / N) | Positive value. A decimation of 1 will print every ping of data, 2 every other line, etc. For a slow printer increasing the decimation factor should reduce or eliminate printer queue overflows and provide a more uniform printout. |
| Depth Indicator | When enabled draws horizontal (depth) grid marks on the print out at the specified interval. |
| Distance Indicator | When enabled draws vertical (distance) grid marks on the print out at the specified interval. |
| Annotate (grid) | When checked, text labels are displayed on the grid. |
| Manual Speed in knot | Used to draw the distance indicator based on the constant specified velocity if enabled (and ignores the NMEA supplied speed) for the printout. |
| Override (Manual Speed) | When checked, the NMEA speed is ignored and the specified constant value is used for painting the distance grid marks in the printout. |
| Reverse Printing | When checked, the waterfall is printed in the reverse orientation, so that the top of the page becomes the bottom and vice versa. |
| Reverse Banner | When checked, the navigation information in the lower part of the printout is printed in reverse order. |
| Reverse Annotation Label | The annotation can be printed from bottom to top on in reverse order. |
| Start Depth | Starting depth in display units for the printout. |
| End Depth | Total depth in display units for the printout. |
| Gain DB | Additional gain to be applied to the printout. |
| Show / Annotate Event Marks | When checked, event marks are shown by a line down the page and optionally a text label (annotation) is displayed for each one. |
| Current Printer | Select one of the supported printers |
| Show Bottom Track / Reflection Coefficient | Prints Bottom Track and or Reflection Coefficient |
| Printer Port | LPT port IO address that the printer is attached to. |

3.4.9 ALERTS



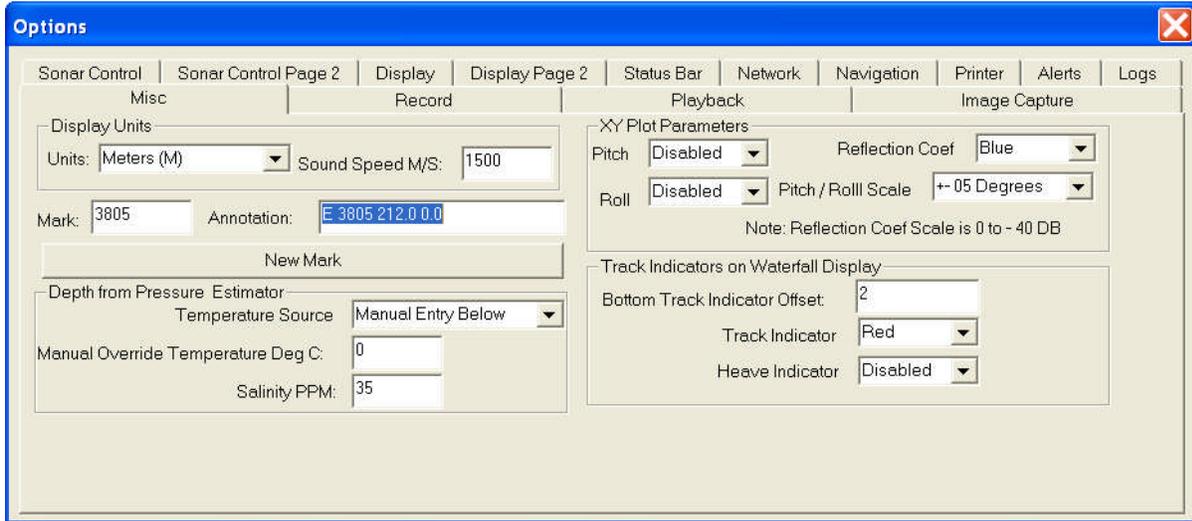
| Item | Description |
|-----------------|---|
| Altitude | Enable an alert if the altitude is below the specified value |
| Pitch / Roll | Enable an alert if the pitch roll sensors (if present) report values outside the specified range. |
| Temperature | Enable an alert if the temperature sensor (if present) exceeds the specified range. This is not implemented for most towfish. |
| File Space | Enable an alert if the file space available for recording data to is below the specified value. |
| GPS | Enable an alert if there is no current GPS position fix. |
| Speaker Control | When alert condition exists, an audible sound can be generated from the built in speaker to alert an operator. |
| Interval ms | Interval between tones. |
| Tone in Hz | Frequency of tone in Hz. |
| Duration ms | Length of tone in MS. |

3.4.10 LOGS



| Item | Description |
|----------------------|--|
| Per file Log Options | When enabled, an ASCII text file is created for each .jsf file and displays the settings at the beginning of the file. New entrees are added to this file when a setting (such as the ping rate) changes. |
| Enable | Enable per .jsf file log file. |
| Notes | Text to insert in the log file. |
| Message Log | The sonar communicates to Discover via messages. Example messages are a pitch roll reading or a ping of sonar data. The message log displays the most recent messages received, and is useful for diagnostic purposes. |
| Sonar Cmd | Show sonar commands in the log. |
| Sonar Data | Show sonar data in the log. |
| Pause | Pause the log to make it easy to read the entries. |
| Verbose | Show detailed information. |

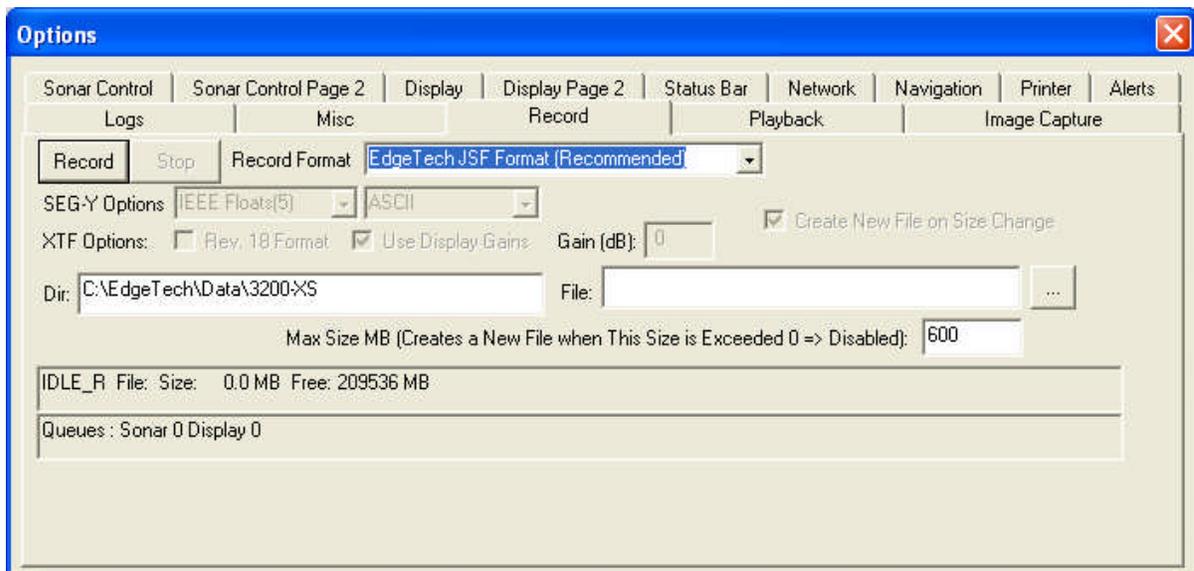
3.4.11 MISC

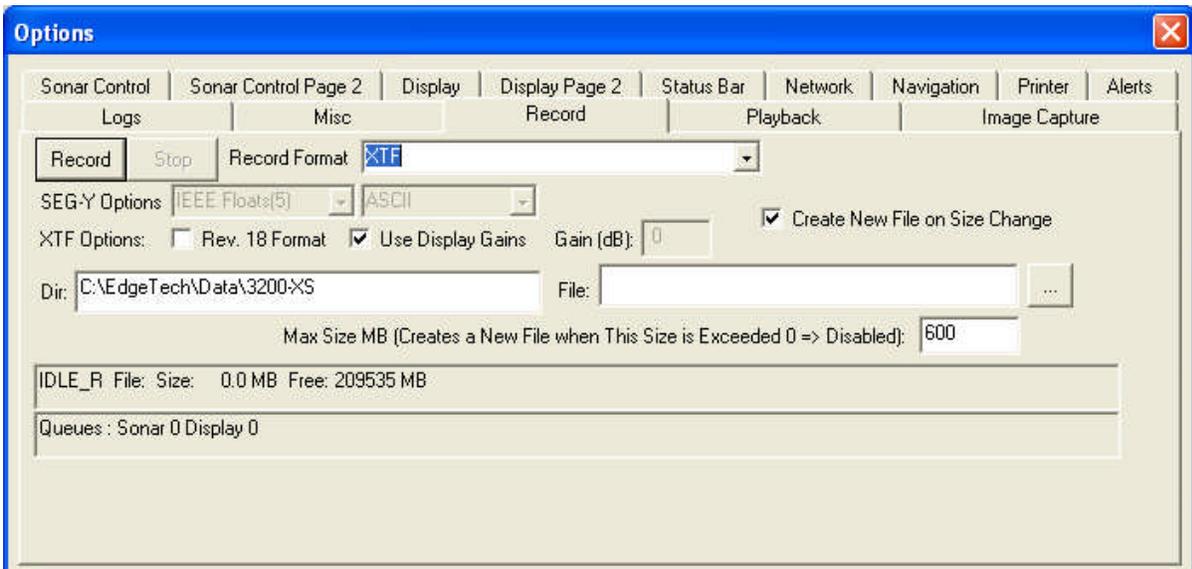
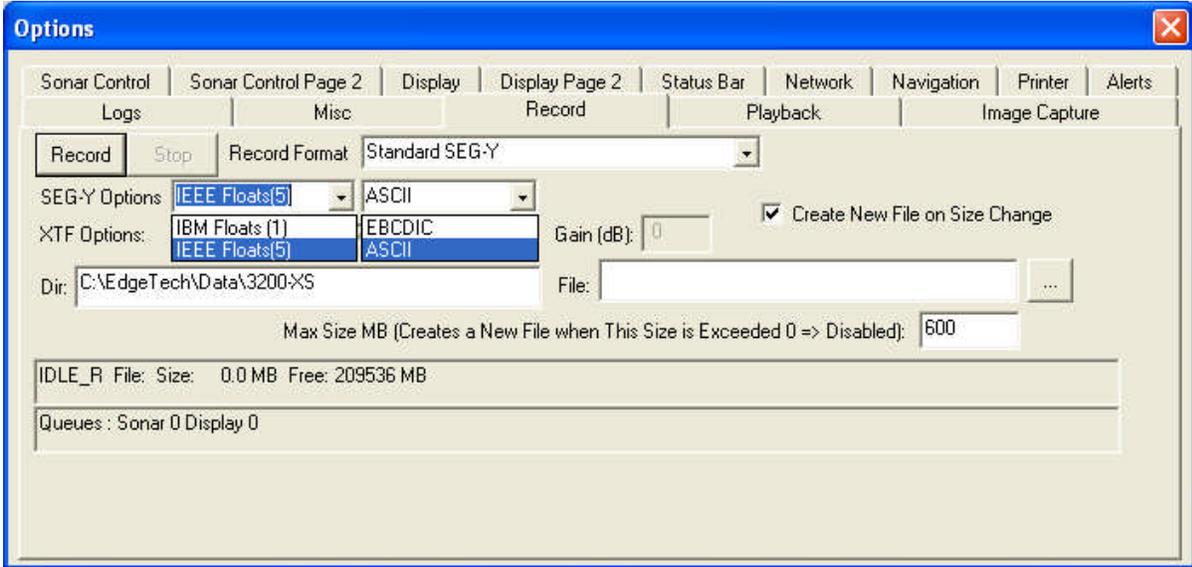


| Item | Description |
|------------------------------------|--|
| Display Units | Sets the display user units for most displays. The waterfall axis will display the scale in these units. |
| Sound Speed M/S | Enter value used for depth calculation (1500m/s default) |
| Mark | When changed, a mark number / annotation will be inserted into the data stream. There is also a button on the toolbar (and here) to increment the mark number and insert an event mark [New Mark]. |
| Annotation | When changed, a mark number / annotation will be inserted into the data stream. |
| Depth From Pressure Estimator | Depth is estimated from pressure (if a pressure sensor is present) based on these values. |
| Manual Override Temp | Allows user to manually override temperature (in Degrees Celsius) |
| Salinity PPM | Allows user to set salinity, for normal sea water a salinity value of 35 should be used. For fresh water use 0. |
| XY Plot Parameters Pitch | Select the color for the optional pitch data displayed on the XY plot on the top of the waterfall. |
| XY Plot Parameters Roll | Select the color for the optional roll data displayed on the XY plot on the top of the waterfall. |
| XY Plot Parameters Reflection Coef | Select the color for reflection coefficient data displayed on the XY plot on the top of the waterfall. |
| Pitch / Roll Scale | Allows user to scale incoming the pitch and roll. |

| | |
|-------------------------------|---|
| Bottom Track Indicator Offset | Bottom track indicator confirms that reflection coefficient data is calculated from the water sea floor interface. The offset unit is based on the display unit (m, ms or samples) |
| Tack Indicator | Select the color for the bottom track indicator |
| Heave Indicator | Select the color for the heave indicator. The heave indicator displays the heave amount offset from the bottom track indicator. Most systems do not have a heave sensor, and so the heave indicator should be disabled. |

3.4.12 RECORD



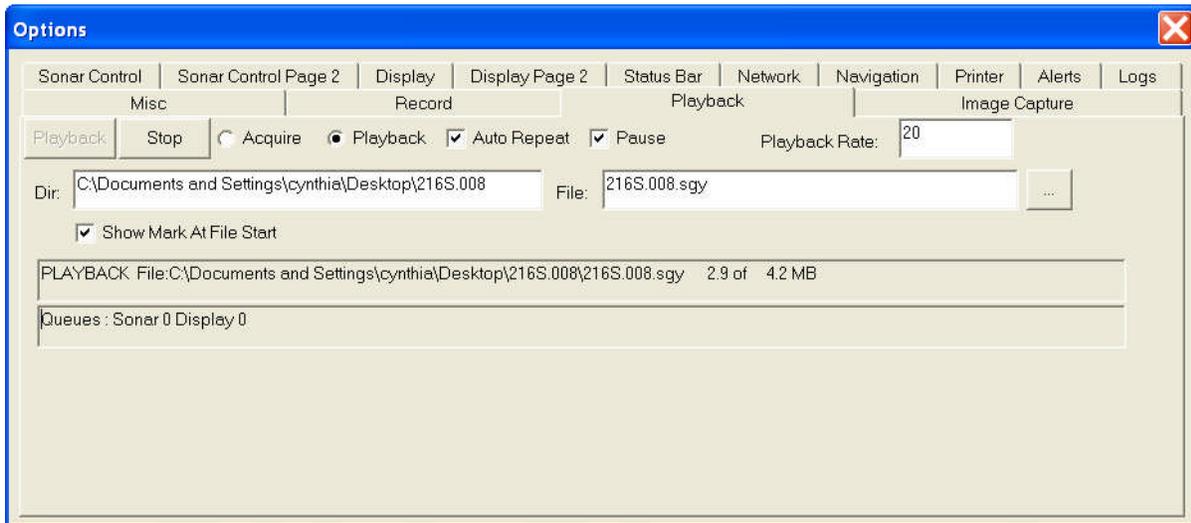


| Item | Description |
|--------|--|
| Record | When pressed, begins recording data to the record file. The record file name includes a sequence number, which |

| | | |
|--------------------------------|-------------------|---|
| | | is incremented when recording begins. |
| Stop | | When pressed, stops recording, the file is closed, and the next time the record button is pressed a new file will be created. |
| Record Format | | You can record in JSF, XTF or “standard SEG-Y” formats. We strictly adhere to the SEG-Y standard which severely restricts the information that can be recorded. Therefore it is highly recommended that during acquire mode all data be recorded in JSF file format ONLY. It is possible to playback and record at the same time to transcribe the data into XTF or SEG-Y for use by other applications as a post acquisition step. |
| SEG-Y Options | IBM Floats (1) | Original standard for SEG-Y |
| | IEEE Floats (5) | Predominant floating-point representation for the last 25 years |
| | EBCDIC | Extended Binary Coded Decimal |
| | ASCII | American Standard Code for Informational Interchange |
| XTF Options | Rev 18 Format | Use XTF Rev. 18 Format. This stores the scale factors in the header; there is no gain applied to the data prior to storage. Some older XTF readers do not support this version of the format. |
| | Use Display Gains | If not using Rev. 18 Format, this option scales the data with the base gain applied to the display prior to storage. |
| | Gain(dB) | If not using Rev. 18 Format or the display gains, this allows the scaling of the data by a fixed amount prior to storage. |
| Create New File on Size Change | | Many SEG-Y and XTF readers do not support changes to acquisition parameters inside a file. This option will generate a new file on changes to the size or offset of the data. When operating with Multiplying these parameters are constantly changing. |
| File | | Base file name for recording |
| Dir | | Base directory for recording |
| Max Size MB | | A new file with the same base name and sequential numerical extension will be created when the max file size limit is reached. The max size should be set to less than 650MB in order to archive the data on a CD. |
| Status Line | | Indicates the current state of disk IO. Indicates the true record file name when recording is active (including the sequence number). |

| | |
|-------------------|--|
| Queue Status Line | Indicates the internal queue status of the record queue. The record queue holds the data pending to be written to disk. If the processor / disk combination is not fast enough for the data rate then data inside the queues could be dropped. This status line indicates whether the performance is adequate. |
|-------------------|--|

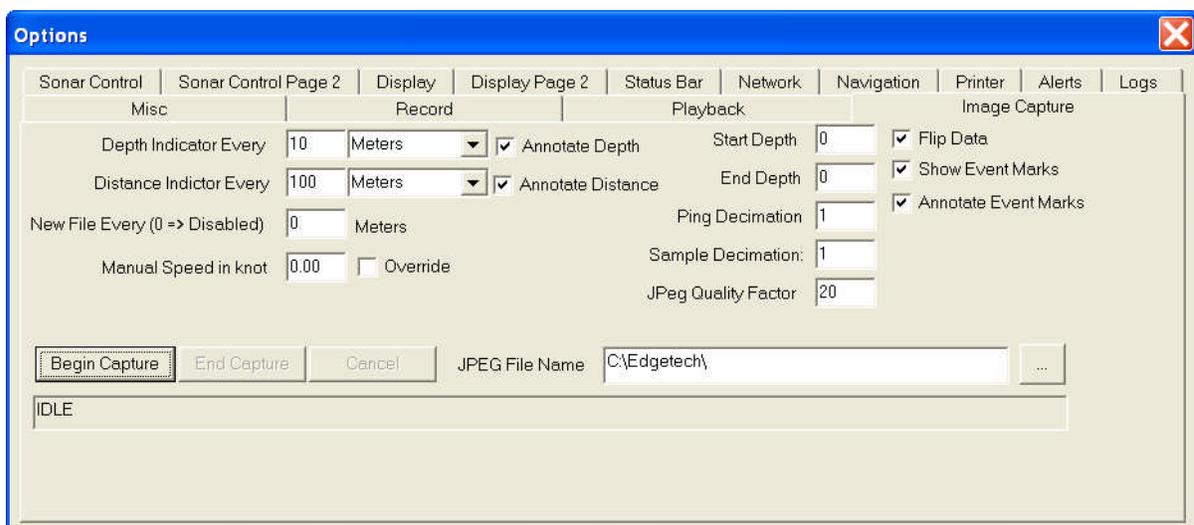
3.4.13 PLAYBACK



| Item | Description |
|---------------|---|
| Playback | When pressed, begins playback of data from the playback file. |
| Stop | When pressed, stops playback. |
| Acquire | Discover operates in two major modes: Acquire – which acquires data in real-time and playback, which plays back data previously acquired. Turning pinging on will switch automatically to acquire mode. |
| Playback | Second operating mode. When the “Playback” button is pressed Discover is automatically switched to playback mode (and real-time data, if present IS IGNORED). |
| Auto Repeat | Continuously play back the same file for demo or analysis purposes. If auto-repeat is enabled the same file is opened again when the end of file is reached. |
| Pause | Pauses playback |
| Playback Rate | Sets the playback rate in messages per second. A message |

| | |
|-------------------------|---|
| | is normally a ping of data. |
| File | Current file name for playback. |
| Dir | Base directory for playback. |
| Show Mark at File Start | Prints a vertical line on the screen when a new file starts |

3.4.14 IMAGE CAPTURE



As an alternative to printing out the waterfall on thermal paper, a standard .JPG file can be created and viewed on screen or printed on a standard printer. This section specifies parameters for and controls for creating a .JPG image. To use this feature, select the desired generation parameters, begin playing back the file, press the “Begin Capture” button, wait till the end of the desired region, and finally press the “End Capture” button. It is important to note that while very large .JPG images can be created, both Discover SB and .JPG readers have practical limitations on the size of a .JPG image. If the image becomes too large excessive CPU resource can be required or creation can fail. We recommend against creating .JPG images during real-time acquisition.

| Item | Description |
|--------------------|--|
| Depth Indicator | Enable to display a depth grid on the .JPG image |
| Distance Indicator | Enable to display a distance grid on the .JPG image. |

| | |
|-----------------------------|--|
| New File Every | Specify a non-zero value to generate a sequence of .JPG images. This is important for a very long line. Most .JPG readers have problems with file sizes near or bigger than 1 MB in size. |
| Manual Speed | Used to override the NMEA speed for the distance indicators. |
| Start and End Depth | Used to create an image only for the specified altitude (if in relative mode on the Display Tab) or depth range.(if in absolute depth mode). |
| Ping Decimation | For large lines, a decimation factor greater than 1 can help to pack more into a single image. This will of course reduce image resolution. |
| Sample Decimation | For large lines, a decimation factor greater than 1 can help to pack more into a single image. This will of course reduce image resolution. |
| JPEG Quality Factor | This is a value between 0 and 100. A value of 100 is perfect quality (very poor compression). A value of 0 is extremely poor quality. Values between 20 and 80 tend to yield good quality and compression tradeoffs. |
| Flip Data | Reverses data. |
| Show / Annotate Event Marks | When checked, event marks are shown by a line down the page and optionally a text label (annotation) is displayed for each one. |
| File Name | File name of generated .JPG file. |
| Begin Capture | Start capturing trace data. |
| End Capture | End capturing trace data and create the JPG image. |
| Cancel | Cancel data capture and discard all data. Do not create an image. |

4 FILE FORMATS

Data can be archived to the hard drive of the system in two formats, the EdgeTech format and the SEG-Y format. We **STRONGLY** recommend that the EdgeTech format is used all the time as the EdgeTech Format stores much greater amount of information than the standard SEG-Y.

NOTE:

Data stored in EdgeTech format can be converted to SEG-Y format by playing it back on the Discover SB program.

WARNING

Data initially stored in SEG-Y format cannot be transferred back. All the information not supported by the standard will be permanently lost.

4.1 EDGETECH NATIVE FILE FORMAT

Details can be found in the JSF file format manual Doc. 990-0000048-1000.

4.2 STANDARD SEG-Y FORMAT

The SEG-Y format is one of several tape standards developed by the Society of Exploration Geophysicists (SEG). It is the most common format used for seismic data in the exploration and production industry.

NOTE

The included file, SegyStandardType.h is provided below.

4.2.1.1 Description

When Standard Segy format is selected:

- All sonar data in traces is represented via IBM 32-Bit floating point numbers (as per the standard).

- All fields are byte oriented as per the standard (Big Endian). That is, for a 32-bit integer, the 8 MSBs are in the first byte.
- The EBCDIC header is really in EBCDIC (and not ascii).

For Intel based processors, all of the above are not standard and will require conversions. For example, the sonar data must be converted from IBM to IEEE floating point. Integers must be converted from Big Endian to Little Endian, and the EBCDIC header must be converted to ASCII. ONLY envelope data is saved (one float per sample).

4.2.2 TRACE HEADER

For the standard 240 byte trace header, the following fields are filled in. All other fields not listed below are set to 0.

sgy->reelSeq:

Reel ping number (starts at 1).

sgy->lineSeq:

Reel ping number again (starts at 1)

sgy->channel_number:

Channel number of data (starts at 1). Always 1 for a single channel system.

sgy->event_number:

Ping number

sgy->traceID:

Always set to 1

sgy->vertSum:

Always set to 1

sgy->horSum:

Always set to 1

sgy->dataUse:

Always set to 1

If XY Coordinates:

sgy->coordUnits:

1 for XY

sgy->coordScale

Scale factor (Value is currently 1)

sgy->recLongOrX

X Source Coordinate as defined in JSF Format.

sgy->recLatOrY:

Y Source Coordinate as defined in JSF Format.

If Lat/Long Coordinates:

sgy->coordScale:

-100

sgy->coordUnits:

2 for Lat long
sgy->recLongOrX:
X Group Coordinate as defined in JSF Format * 0.6
sgy->recLatOrY:
Y Group Coordinate as defined in JSF Format * 0.6

sgy->sourceLongOrX:
Same as recLongOrX
sgy->sourceLatOrY:
Same as recLatOrY

sgy->sampleLength:
Samples in trace
sgy->deltaSample:
Sample interval in us
sgy->correlated:
Always 1
sgy->sweepStart:
Start frequency
sgy->sweepEnd:
End frequency
sgy->sweepLength:
Sweep Length
sgy->sweepType:
Always 1
sgy->aliasFreq:
Alias frequency (1/2 of sample rate)
sgy->year:
Current year
sgy->day:
Current day
sgy->hour:
Current hour
sgy->minute:
Current minute
sgy->second:
Current second
sgy->timeBasisCode:
2 for GMT

4.2.3 BINARY HEADER

The binary header structure is also listed below. There is a single binary header at the start of every segy file. We fill in the following fields in the binary header:

binHeader.lineNum:

Incremented on each file
binHeader.reelNum:
 same as lineNumber
binHeader.tracesPerRecord = 1;
binHeader.samplesPerTrace:
 Samples per trace. If the operator changes parameters to cause a new value, a new file is created.
binHeader.samplesPerTraceOriginal:
 Same as samplesPerTrace
binHeader.format = 1;
binHeader.sampleIntervalus:
 Sample interval in us
binHeader.sampleIntervalusOriginal:
 Same as sampleIntervalus
binHeader.measurementSystem = 1;
binHeader.cpdFold = 1;
binHeader.traceSortCode = 1;
binHeader.verticalSumCode = 1;
binHeader.sweepFreq0:
 Start frequency
binHeader.sweepFreq1:
 End frequency
binHeader.sweepLengthms:
 Sweep length
binHeader.sweepType = 1;

4.2.4 EBCDIC HEADER

The EBCDIC header at the start of every segy file contains the card number and names EdgeTech as the source but has no information useful for interpreting the data.

4.2.4.1 Include File

```
/* ----- */
/* SegyStandardType.h */
/* ----- */
/* */
/* (c) Copyright 2002 EdgeTech, */
/* */
/* This file contains proprietary information, and trade secrets of */
/* EdgeTech, and may not be disclosed or reproduced without the prior */
/* written consent of EdgeTech. */
/* */
/* EdgeTech is not responsible for the consequences of the use or misuse */
```

```
/* of this software, even if they result from defects in it. */
/* */
/* Disk storage an playback of data. */
/* ----- */

#ifndef SEGYSTANDARDTYPE_H__
#define SEGYSTANDARDTYPE_H__

typedef struct
{ /* Offset Description */

    /* 0 Sequence numbers within line */
    long lineSeq;
    /* 4 Sequence numbers within reel */
    long reelSeq;
    /* 8 Original field record number or trigger number */
    long event_number;
    /* 12 Trace channel number within the original field record */
    long channel_number;
    /* 16 X */
    long energySourcePt;
    /* 20 X */
    long cdpEns;
    /* 24 X */
    long traceInEnsemble;
    /* 28 Trace identification code: seismic data = 1 */
    short traceID;
    /* 30 X */
    short vertSum;
    /* 32 X */
    short horSum;
    /* 34 X */
    short dataUse;
    /* 36 X */
    long sourceToRecDist;
    /* 40 X */
    long recElevation;
    /* 44 X */
    long sourceSurfaceElevation;
    /* 48 X */
    long sourceDepth;
    /* 52 X */
    long datumElevRec;
    /* 56 X */
    long datumElevSource;
    /* 60 X */
    long sourceWaterDepth;
```

```
/* 64 X          */
long recWaterDepth;
/* 68 Elevation Scaler: scale = 1          */
short elevationScale;
/* 70 Coordinate Scaler: scale = 1          */
short coordScale;
/* 72 X          */
long sourceLongOrX;
/* 76 X          */
long sourceLatOrY;
/* 80 X          */
long recLongOrX;
/* 84 X          */
long recLatOrY;
/* 88 Coordinate Units: = 2 (Lat/Long)          */
short coordUnits;
/* 90 X          */
short weatheringVelocity;
/* 92 X          */
short subWeatheringVelocity;
/* 94 X          */
short sourceUpholeTime;
/* 96 X          */
short recUpholeTime;
/* 98 X          */
short sourceStaticCor;
/* 100 X          */
short recStaticCor;
/* 102 Total Static in MILLISECS added to Trace Start Time (lower 2 bytes)*/
short totalStatic;
/* 104 X          */
short lagTimeA;
/* 106 X          */
short lagTimeB;
/* 108 X          */
short delay;
/* 110 X          */
short muteStart;
/* 112 X          */
short muteEnd;
/* 114 Number of samples in this trace (unless == 32767)          */
short sampleLength;
/* 116 Sampling interval in MICROSECONDS (unless == 1)          */
short deltaSample;
/* 118 Gain Type: 1 = Fixed Gain          */
short gainType;
/* 120 Gain of amplifier          */
```

```
short gainConst;
/* 122 X */
short initialGain;
/* 124 X */
short correlated;
/* 126 X */
short sweepStart;
/* 128 X */
short sweepEnd;
/* 130 X */
short sweepLength;
/* 132 X */
short sweepType;
/* 134 X */
short sweepTaperAtStart;
/* 136 X */
short sweepTaperAtEnd;
/* 138 X */
short taperType;
/* 140 X */
short aliasFreq;
/* 142 X */
short aliasSlope;
/* 144 X */
short notchFreq;
/* 146 X */
short notchSlope;
/* 148 X */
short lowCutFreq;
/* 150 X */
short hiCutFreq;
/* 152 X */
short lowCutSlope;
/* 154 X */
short hiCutSlope;
/* 156 year of Start of trace */
short year;
/* 158 day of year at Start of trace */
short day;
/* 160 hour of day at Start of trace */
short hour;
/* 162 minute of hour at Start of trace */
short minute;
/* 164 second of minute at Start of trace */
short second;
/* 166 Time basis code: 2 = GMT */
short timeBasisCode;
```

```
/* 168 X */
short traceWeightingFactor;
/* 170 X */
short phoneRollPos1;
/* 172 X */
short phoneFirstTrace;
/* 174 X */
short phoneLastTrace;
/* 176 X */
short gapSize;
/* 178 X */
short taperOvertravel;
/* 180-240 : User defined area */
char userDefined[60];
} SegyStandardType;
/* end of segy trace header */

#endif /* SegyStandardType */

/* ----- */
/*                end StorageFormats.cpp                */
/* ----- */
```

4.3 XTF FORMAT

XTF format details can be obtained from Triton Imaging, Inc.

4.4 RAW DATA CAPTURE FORMAT

The Graph tab of the Control Panel has an option to capture its current data and save it to a file. This data is stored with no header as 32-bit floating-point values (IEEE). The size of the file determines the number of samples in the trace.

4.5 SONAR DATA TYPES

The Discover SB supports three types of sonar data, which are useful to display.

Raw Data: Unprocessed data directly from the ADC. This data is useful for diagnostic purposes only.

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

Envelope: This is the square root of the sum of the squares of the real and imaginary components of the analytic signal data. This is how waterfall data is normally displayed. Only ½ the bandwidth is required as compared to analytic signal data.

4.6 PALETTE FILE FORMAT

Each display channel can have a color palette, which is specified by a .jsp file. These files are text files with numbers separated by white space. The numbers must be ordered in groups of 4. For each group the values are:

- Index (0 to 255)
- Red Intensity (0 to 255)
- Green Intensity (0 to 255)
- Blue Intensity (0 to 255)

The indices must be increasing in value. If there are gaps in the index then intermediate color values will be interpolated. Here is an example table for a linear gray step wedge type palette:

| | | | |
|-----|-----|-----|-----|
| 0 | 0 | 0 | 0 |
| 255 | 255 | 255 | 255 |

5 TRIGGERING AND COUPLING

To avoid interference the Discover SB system supports the following different type of triggering Modes:

Internal Trigger: In this mode the user may specify the ping rate in Hertz (e.g. 3Hz) or ping range (in Meters). The system will use the closest available inter-ping interval (e.g. 332.99ms), and repeatedly re-trigger the system at the expiration of this period.

Coupled Mode: This mode applies only to a combined sub-bottom and side scan system. In coupled mode the applicable subsystem is triggered when the master subsystem triggers. The trigger timing for coupled systems takes account of differing transmit pulse lengths and minimizes inter channel interference.

Gated: Gated and internal trigger modes are similar in that an internal timer determines the trigger rate. However, in gated mode a hardwired trigger input line is monitored. Whenever the trigger line is asserted (active low), the trigger is inhibited for the trigger delay period (as described below). If the next ping time is longer than the specified delay, then the asserted trigger input has no effect.

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 low) a new ping occurs.

Note that there is a minimum trigger interval (maximum rate) of each subsystem which is dependant on the Pulse Type used, and is proportional to the pulse length. That is, a longer pulse will also 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 the Power Amplifier imposed limit.

6 NAVIGATION INPUT

The following information describes the serial port interface parameters for acquiring navigation strings from a connected GPS unit or integrated navigation computer to the MP-X serial port.

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

6.1.1 NMEA APPROVED SENTENCE STRUCTURE

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

$\$aabb,c---c*hh<CR><LF>$

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

6.1.2 PORT PARAMETERS

Interface: RS-232C
 Com Port: 2
 Baud Rate: 4800
 Data Bits: 8
 Start Bits: 1
 Stop Bits: 1
 Parity: none
 Handshaking: none

6.1.3 INPUTS

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

GLL – Geographic Position – Latitude/Longitude

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

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

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
 yyyy.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

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>`

| | |
|------------|--|
| 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. |

NOTE:

The hhmmss.ss field is optional.

GGU - Geographic Position - X and Y Coordinates

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

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

| | |
|------------|---|
| 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). |
| yyyyyyy.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. |

NOTE:

The hhmmss.ss field is optional.

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>`

| | |
|-----|------------------------|
| x.x | Floating point numeric |
|-----|------------------------|

| | |
|---|------------------|
| T | Degrees True |
| M | Degrees Magnetic |
| N | knots |
| K | Kilometer/hour |

NOTE:

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

ZDA - Time & Date

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

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

| | |
|-----------|--|
| 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 and ignored. |

NOTES:

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

The GLL string provides a more accurate time reference since it is related to the position fix.

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.

EVT - Event & Annotation (EdgeTech custom)

Event mark and related annotation provided by an integrated navigation system

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

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

NOTES:

Only the first 23 characters of the first message is saved in the data segy data.

A maximum of 10 <Messages> separated by commas may be sent.

Annotation and event marks are placed on the screen when received, printed on the printer if on, and stored on disk along with time, date and coordinates.

Event marks are displayed on the top of the screen as a tick mark and mark number.

NOTE:

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

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

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

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

NOTES:

The number of incoming strings should be limited to the five mentioned above.

For accurate fixes, navigation should be updated once a second or faster.

7 CUSTOMER SERVICE

7.1 STATEMENT

All equipment manufactured by EdgeTech is warranted against defective components and workmanship for a period of one year.

In order to be able to serve you faster, please address any concerns related to the Discover Sub-Bottom Software to the plant in West Wareham, Massachusetts.

If the situation requires sending equipment back for repair please refer to the following page for detailed shipping procedures.

Our customer service personnel in both plants enjoy hearing from the people who use our products. Your experience with our products is a valuable source of information that we will use to continuously improve our products. We encourage you to contact or visit us to discuss any issues related to our products.



sales@EdgeTech.com
<http://www.EdgeTech.com>

PO Box 850
4 Little Brook Road
West Wareham, MA 02576
Tel: (508) 291-0057
Fax: (508) 291-0975

7.2 RETURNED MATERIAL AUTHORIZATION

It is necessary to obtain a Returned Material Authorization (RMA) number prior to returning any equipment to EdgeTech. This will help EdgeTech in recognizing your equipment when it arrives at our receiving dock, and to assist us in tracking your equipment while it is at our facility. The material should be shipped to the address indicated above.

Please refer to the RMA number on all documents and correspondence as well.

All returned material must be shipped prepaid. **Freight collect shipments will not be accepted.**

The following steps apply only to material being returned from outside the Continental United States. These steps should be followed carefully to prevent delays and additional costs.

1. All shipments must be accompanied by three copies of your proforma invoice, showing the value of the material and the **reason for its return**, if the reason is for repair it must be clearly stated in order to come through customs faster and without duties being charged. Whenever possible, please send copies of original export shipping documents with the consignment.
2. If the value of the equipment is over \$1000, the following Shipper's oath must be sent with the invoice. This oath can be typed on the invoice, or on a separate letterhead.

"I, _____, declare that the articles herein specified are the growth, produce, or manufacture of the United States; that they were exported from the United States from the port of _____, on or about _____; that they are returned without having been advanced in value or improved in condition by any process of manufacture or any other means; and that no drawback, or allowance has been paid or admitted hereof."

Signed _____

3. If there is more than one item per consignment, a packing list must accompany the shipment. It is acceptable to combine the proforma invoice and packing list as long as the contents of each carton are clearly numbered and identified on the invoice.
4. Small items can be shipped prepaid directly to EdgeTech by FedEx, DHL, UPS, Airborne, etc.
5. If the equipment is the property of EdgeTech (formerly EG&G Marine Instruments Division) please insure for full value.
6. Fax one invoice, packing list, and copy of airway bill to EdgeTech upon shipment.

7.3 SOFTWARE SERVICE AGREEMENT (SSA)

Software maintenance is included free of charge for one year following purchase of an EdgeTech system. The Software Service Agreement covers the following services that enable an EdgeTech customer to continue to receive software updates, documentation and enhanced telephone, fax and e-mail support after the first year.

Software Updates and Enhancements

SSA customers receive regular new software releases along with any technical and user's manual changes.

NEW SOFTWARE RELEASES CONSIST OF:

- Software enhancements that are not on the price list
- Software fixes and changes
- Product integration
- Beta site testing
- Tests for compatibility with other modules

SOFTWARE PATCHES CONSIST OF SOFTWARE THAT HAS UNDERGONE:

- Minor software enhancement
- Software fixes and changes

Software Performance Report

A customer may also submit reports by means of a SPR (Software Performance Report) form to EdgeTech. The report may be related to a problem, an inquiry or a specific request for a software enhancement. We will attend to the SPR at a priority level depending on the seriousness of the problem and the availability of a work-around.

Software Telephone, Fax and E-mail Support

The SSA entitles a customer to contact EdgeTech User Support representatives by telephone, fax or e-mail to report a difficulty, discuss a problem or receive advice on the best way to do a task. EdgeTech User Support will:

Respond within 24 hours

Immediately attend to serious problems affecting customer's operations

Attempt to find an immediate work-around

Annual Software Maintenance Agreement Fee

Contact Sales Dept.

TERMS

This agreement is for one calendar year and is renewable upon payment to EdgeTech.

If the agreement lapses, paying that year's maintenance fee can renew it.

Regular software releases with all modifications and enhancements will automatically be forwarded to the user.

This agreement DOES NOT address CUSTOMER-SPECIFIED modifications and/or enhancements, which may be ordered separately.

EdgeTech software upgrades are meant for the sole use of clientele that have purchased a system within a year or have a Software Service Agreement. Any reproduction or file sharing is prohibited.