DISCOVER 2400C/2200M/2000C

SIDE SCAN PROCESSOR SOFTWARE

USER'S MANUAL

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1 - INTRODUCTION

This manual describes the operation of EdgeTech's Discover Side Scan acquisition software, as configured for the FSDW (Full Spectrum® Deep Water) family of simultaneous dual frequency sidescan sonars, this covers models 2400-C, 2200-M and 2200-C. The Discover application is also used in slightly different configurations to support other EdgeTech Side Scan and Sub-Bottom sonar products, with a great deal of commonality in functionality and appearance. The end user benefits flow directly from this common approach. One key element of commonality is a standardized Ethernet based input /output for sonar data.

1.1 SYSTEM DESCRIPTION

The EdgeTech Discover based FSDW topside processor may be configured for 2 possible telemetry systems;

1) Starmux® (via coax or twisted pairs) or

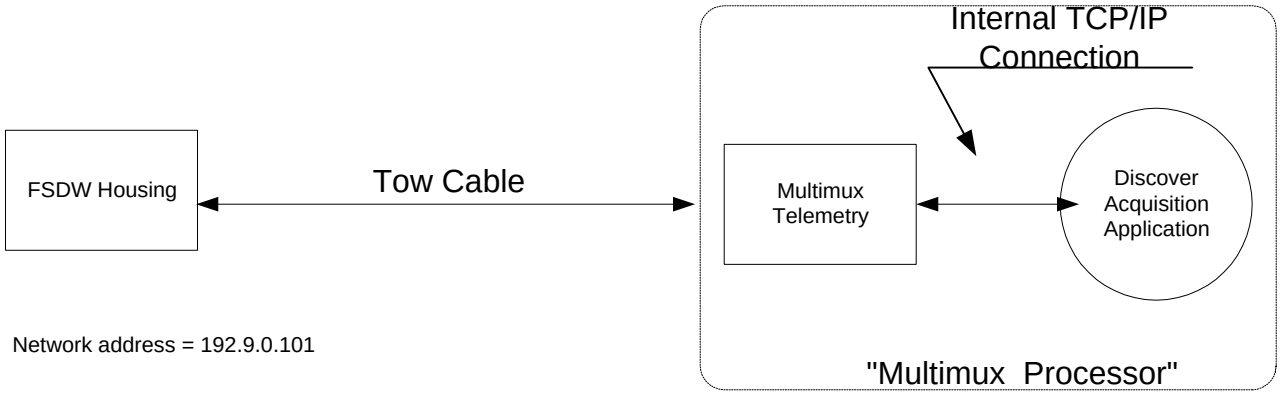
2) Multimux (via 6 conductor cable)

In the STARMUX configuration, the towfish power supply, and digital telemetry system are housed in an external 19" rack. Connection to the Discover Processor is made through a standard CAT5 straight ethernet cable. Refer to the Starmux Digital telemetry Link manual for more information.

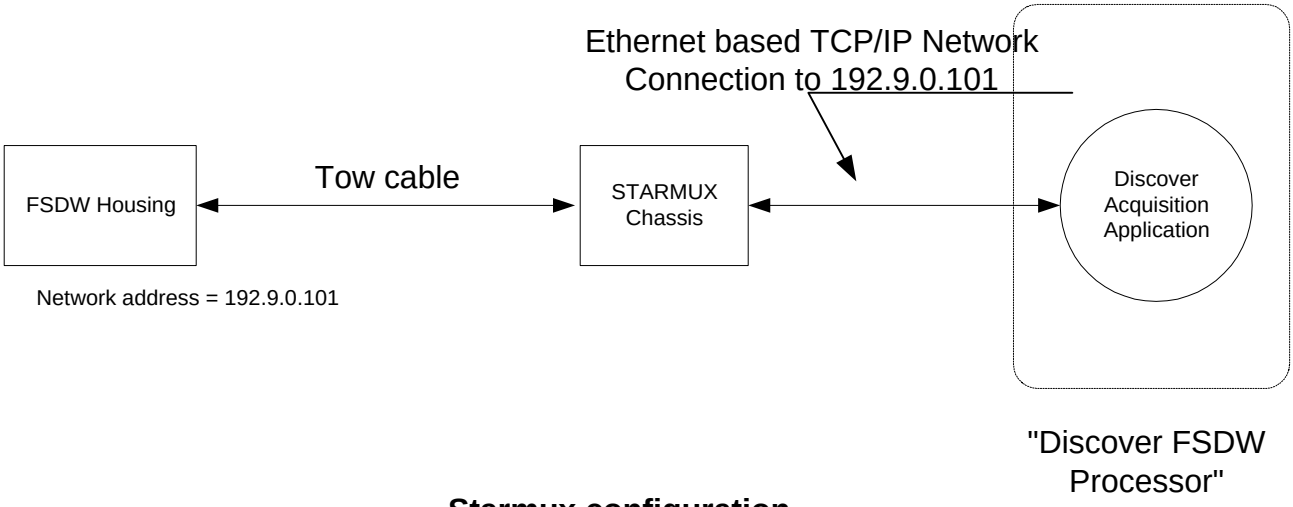
The Multimux configuration of the processor houses the display and acquisition processing as well as the towfish power supply and telemetry system. These all reside in a 19" rack mounted Windows © based PC system. The Multimux configuration is used with EdgeTech Multimux, 6 conductor cable and supports shorter cables than the co-axial based Starmux telemetry.

Navigation and auxiliary inputs are all made to this common processor

The software environment for these 3 cases is shown diagrammatically below.

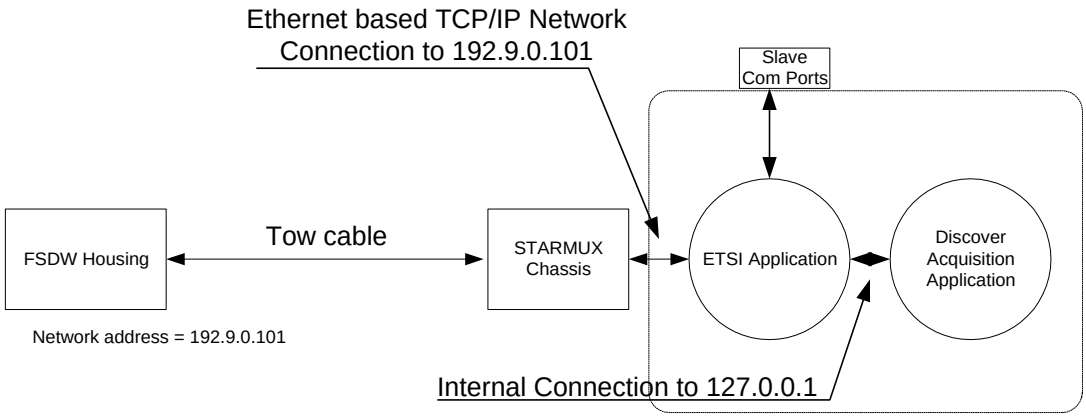


Multimux configuration



Starmux configuration

In addition to these 2 hardware configurations, the Discover application may be configured to "connect" directly to the FSDW wet end system, at TCP/IP address 12.9.0.101, or may be configured to connect indirectly via the ETSI (EdgeTech Sonar Interface application via the internal TCP/IP address 127.0.0.1. The additional functionality provided by the intermediate ETSI application is that physical serial ports resident in the FSDW housing may be replicated byte for byte in the Discover FSDW topside computer. Sonar control and data messages are passed through the ETSI application without modification. However, the serial port messages present on the telemetry link to and from the FSDW sonar hardware, are intercepted and formatted so that bytes in at the sonar end appear as bytes out on the Discover processor and vice versa. This allows direct and transparent user access to serial port devices connected to the FSDW Sonar hardware.



Starmux configuration

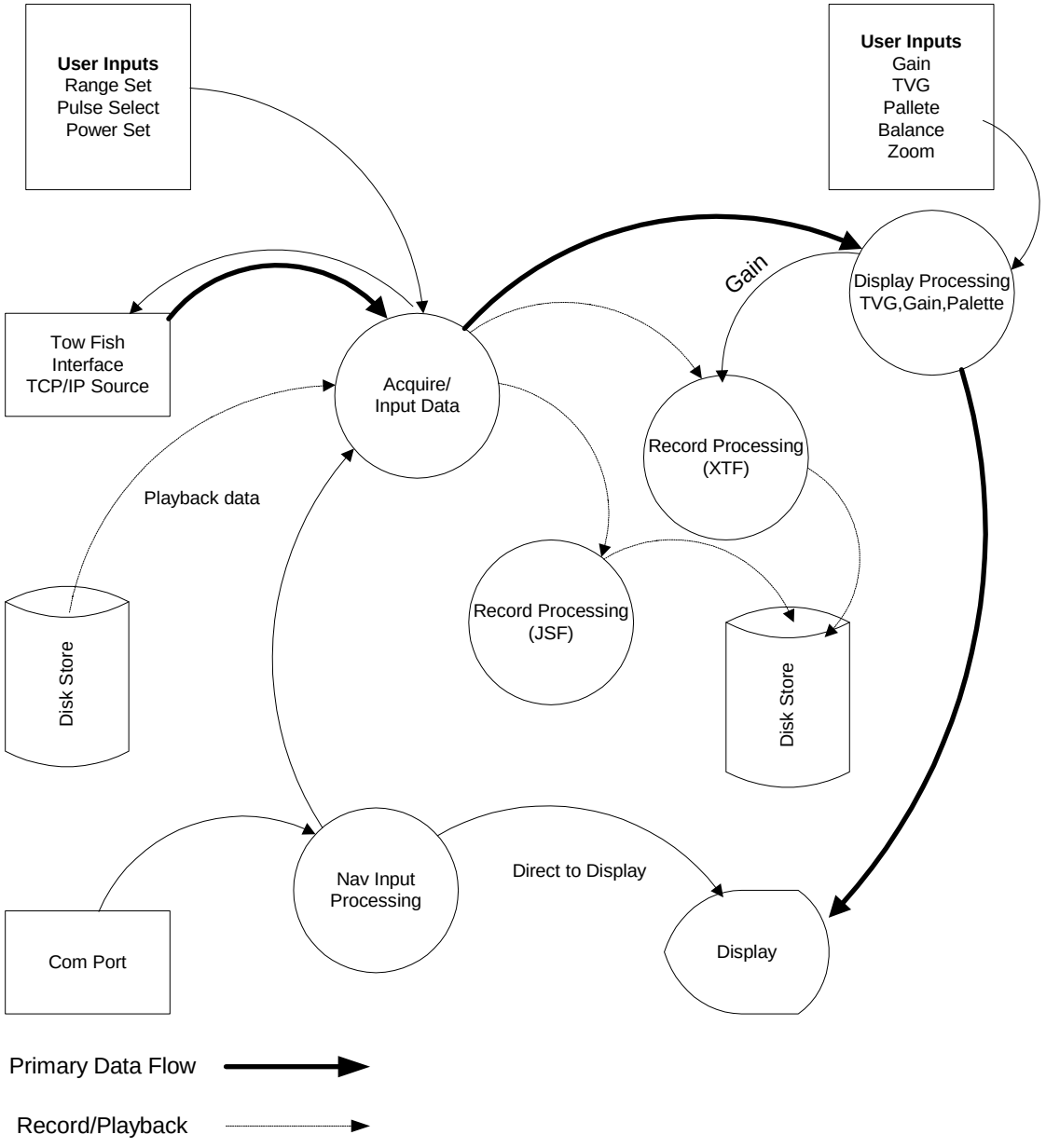
The diagram above shows the Starmux/ETSI/Discover configuration, but is equally applicable to the Multimux/ETSI/Discover variant.

In both cases the Discover processor hardware/operating system environment, must provide a TCP/IP ethernet link on the 192.9.0.xxx subnet with address in the range 2 to 200 but not 101

(Typically 99). The Discover application however is made to connect to the ETSI application via the internal network address of 127.0.0.1.

2 - GENERAL DATA FLOWS

The flow diagram below shows the general processing concepts and data flows associated with the Discover Acquisition software.



Discover Processing Diagram

2.1 KEY FEATURES

2.1.1 DATA SOURCES

All data and command interfaces with the sonar sub-system are implemented using TCP/IP (Transport Control Protocol/Internet Protocol). This TCP/IP interface may be provided directly by the sonar system as in the case of the MP-X, 4200FS and FSDW sonars, or by additional support hardware and software as in the case of the 272TD sonar.

The source for Navigation (and other auxiliary data) is generally via serial ports on the processor, but may also be derived from other TCP/IP sources for MP-X and FSDW systems.

2.1.2 RECORDING OF "RAW" DATA

To the fullest extent possible, the data received from the sonar system is recorded to disk in the native EdgeTech format ".jsf" without any of the user's run time display-processing options applied, such as screen gain, software TVG etc. The only User settings which unavoidably affect the recorded data are those implemented by the sonar system, such as range settings, pulse power levels and so on. This is only true for native format recorded data which supports a floating exponent format. Due to the limited dynamic range of the standard XTF data format, the user's Gain setting must be applied to the data before fixing and truncating the data to 16 bits. Other valuable system setting information is also lost, which may be valuable for later system error diagnosis.

2.1.3 RECORD WHILE PLAYBACK

The independent operation of the playback and recording modules of the Discover software allow some very useful data operations.

1) During real-time data acquisition, only the record module is available. This may be engaged to log data in native JSF format or XTF format. This may be started, paused or stopped at anytime during acquisition.

2) During Playback, the record operation may be started, paused or stopped at any time.

3) During Recording, the Playback operation may be started, paused or stopped at any time. The data file source for playback may also be changed.

4) When recording to a file the format may be specified to be either native JSF or XTF format. This allows for transcription of JSF file to XTF format at any time. The reverse is NOT true.

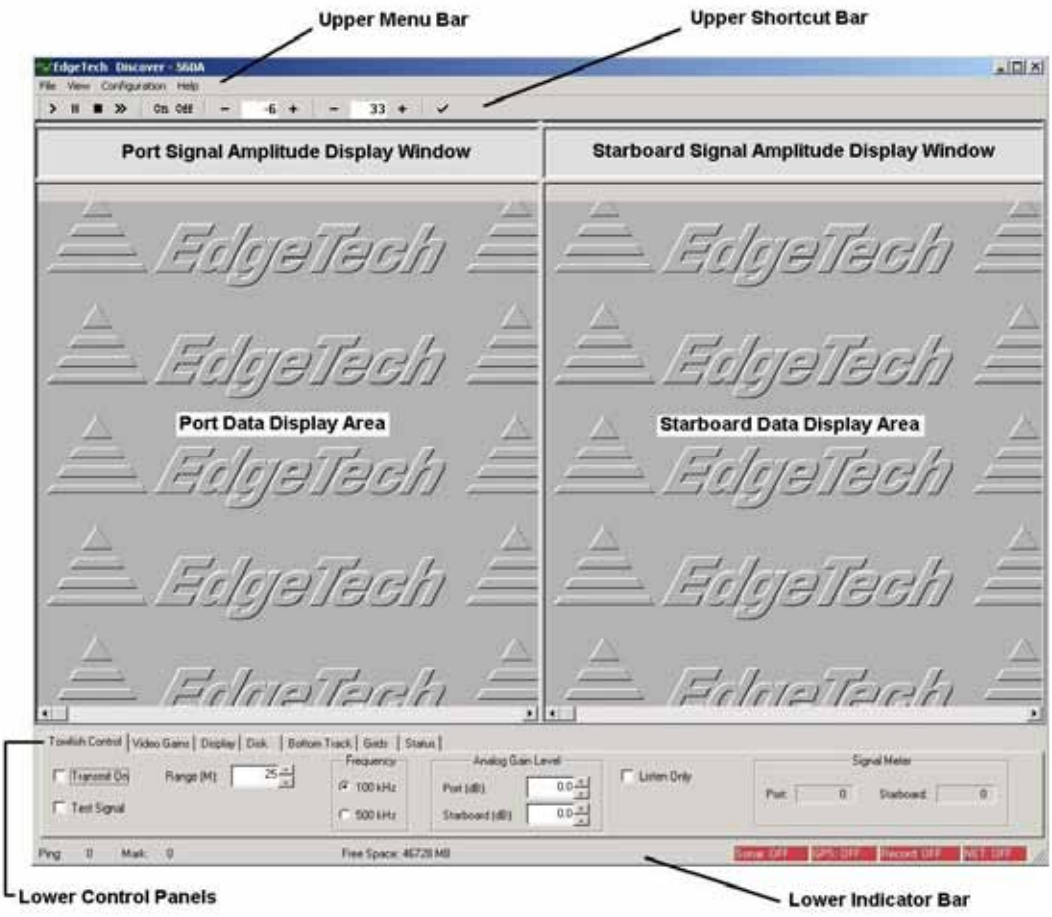
   For this reason we recommend that all data is acquired and archived on the native JSF format, as nothing is lost during record.

   Items 2) and 3) above allow the user to concatenate (join together) several input files into one output file, and also to "snip" a section out of an input file to make a shorter output file.

3 - SONAR CONTROLS

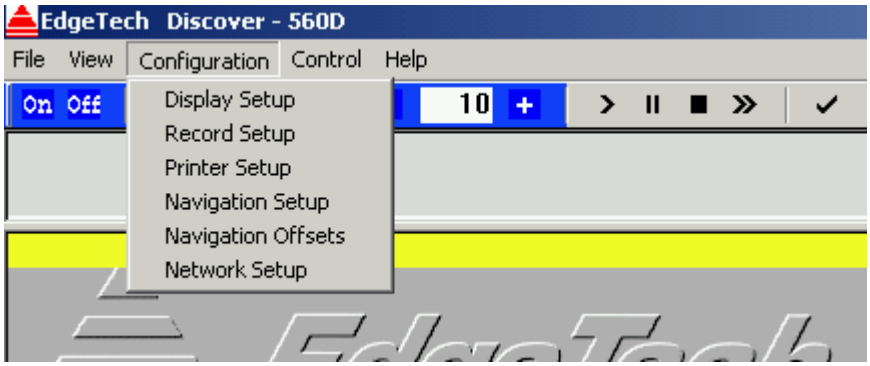
This document describes the DISCOVER™ Software features and operation. The Discover Software is a Side Scan Sonar Digital Data Acquisition program

The Discover Software is designed to have a very easy to operate graphical user interface:



3.1 MENUS

The Discover Configuration Settings are accessible by selecting the pull down menu at the top of the screen marked “Configuration.”



The Configuration pull down sub menu is shown above.

NOTE: Not all Discover Versions implement every feature described herein. If an item is not applicable to all versions, this is noted as a footnote to each control.

Each sub menu item is described below.

3.1.1 RECORD SETUP

MAXIMUM FILE SIZE (MB): This selection allows the user to set the maximum size of the recorded data file. When the maximum file size is reached the software will automatically close the current file and open another file with a 001, 002, 003 etc appended to the end of the file name. This feature is very useful for breaking long survey lines into small easily managed data files. Setting a size greater than 600 MB may prevent the resulting files from being copied onto CD-ROM disks.

FREE DISK SPACE WARNING (MB): This selection allows the user to set a minimum limit for the disk space-warning indicator. This indicator will alert the operator when the available disk space is approaching zero (disk is nearly full). Default value is 10 Megabytes.

XTF OUTPUT : The default recording format is EdgeTech's native format, jsf. The system can be forced to create an additional XTF formatted file by enabling this check box. Due to XTF limitations differing record sizes, separate files for High and Low frequency are created. The XTF filename will be the entered name (xxyyzz), with H or L appended: eg. xxyyzzH.xtf or xxyyzzL.xtf.

3.1.2 PRINTER SETUP

This configuration window is for selecting one of the supported thermal printers. Currently the following printers are supported:

- Ultra 120
- Ultra 200
- EPC HSP 100
- EPC 1086
- EPC 1086 (early models)
- EPC 9206
- TDU-850
- ISys V8.5
- ALDEN/GEOPRINTER 975

Invert Print mirrors the sidescan data on the printout

3.1.3 DISPLAY SETUP

TVG START [Toggle]: This selection allows the user to select the starting point of the Time Varied Gain (TVG). The TVG can be applied beginning at the towfish ("origin") or seafloor. The seafloor location is determined by the bottom tracking. In order for the Sea Floor setting to be used the software must be bottom tracking reliably.

SOUND SPEED [Numeric Display, Entry]: This selection allows the user to adjust the sound speed in water. Adjusting the Speed of Sound will affect the range scale and size dimensions. Unless you have an accurate measurement of the sound speed then this value should remain at the default value of 1500m/sec.

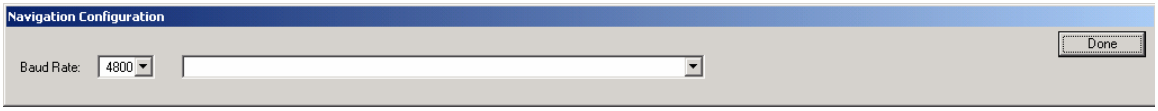
SLANT RANGE CORRECTION ON [Check Box]: This selection allows the user to toggle the slant range correction on/off. In order for the data to be slant range corrected the software must be bottom tracking reliably. If checked, the sea floor altitude from the bottom tracking feature is used to convert the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

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

MANUAL SPEED [Kn]: This feature allows the user to manually force the towfish speed to a certain value. In order to make the software accept the new value you must enable the override selection box. This feature is not recommended for use during real-time data acquisition. This feature is best used during playback on data that lacks the proper speed input from the navigation system.

3.1.4 NAVIGATION SETUP

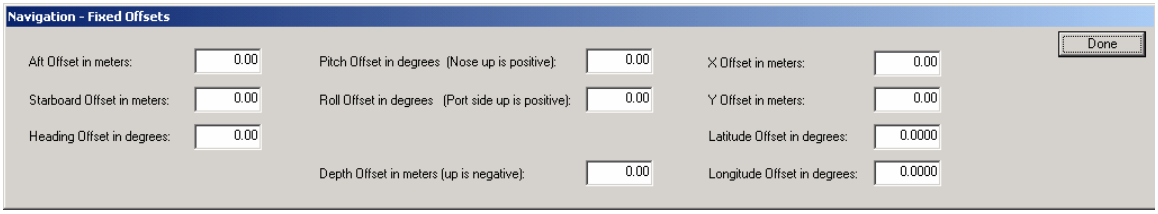
See also Navigation Interface Section



BAUD RATE: This selection allows the user to select the navigation input port baud rate. The default is 4800. Serial Port Selection is made through settings in the Discover_Defualts.jni file. See Navigation Interface Section.

Note: The large window in the middle of the navigation Configuration panel will display the last valid NMEA 0183 message that the Discover Software detected.

3.1.5 NAVIGATION OFFSETS:



Navigation Offsets are used only for target location determination using the Target Logger. These values are NOT recorded with the data, only the raw navigation data from the GPS or Navigation Interface such as Hypack® is recorded to disk. The navigation information displayed in the Status Tab is the raw navigation information.

There are 3 sets of Fixed Offsets: One related to the position of the towfish versus the GPS antenna, one related to Hull mounted systems and one when raw navigation information is known to have errors.

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

SENSOR DISPLACMENT

AFT OFFSET (M): This selection box allows the user to enter a layback distance value for the towfish. A towfish attached to the bow of the vessel will have negative value. This info is also recorded with the XTF

STARBOARD OFFSET (M): This selection box allows the user to enter a fixed distance value for the towfish. A towfish towing from the port side of the vessel will have negative value

HEADING OFFSET (DEGREE): This selection box allows the user to enter a fixed offset for the heading information coming from the towfish.

HULL MOUNT ADJUSTMENT

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

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

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

INPUT NAVIGATION CORRECTIONS

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

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

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

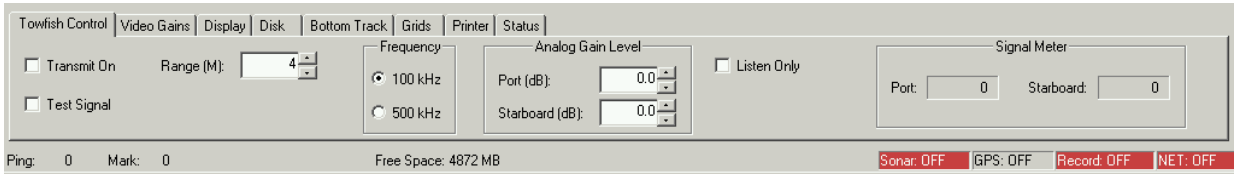
LATITUDE OFFSET (DEGREE): This selection box allows the user to enter a fixed offset for the latitude information.

LONGITUDE OFFSET (DEGREE): This selection box allows the user to enter a fixed offset for the longitude information.

3.1.6 NETWORK CONFIGURATION

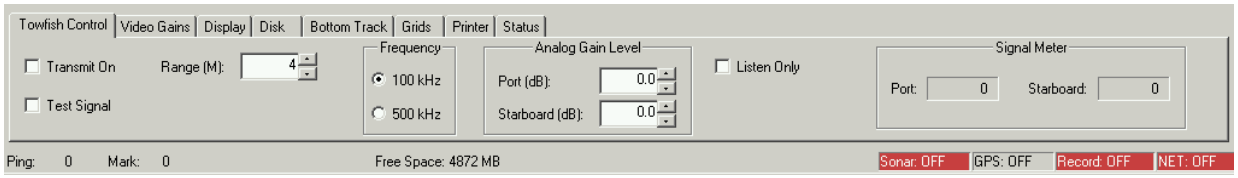
For 560A, 560D systems the sonar IP should be set to 127.0.0.1 and the Sonar Port Number to 1700.
For 560AP and 560DP systems the sonar IP should be set to 192.9.0.101 and the Sonar Port Number to 1700.
The Output Port Number is to connect to 3rd party topsides. The value of 1800 is default it can however be changed from the Discover.jni file.

3.2 LOWER CONTROL PANEL FEATURE DESCRIPTIONS



The DISCOVER Lower Control Panel consists of individual Tab selection sheets that are activated by clicking on the corresponding tab. The Features of each of theses Control Tabs are described below:

3.2.1 TOWFISH CONTROL – 560A/D [1]



The control tabs for the DF1000 and 272 fish are quite similar. The only differences are those required to support the non-simultaneous dual frequency behavior of the 272 towfish. The

[1] 560A and 560D processors only

DF1000 controls provide *simultaneous* independent range control for each frequency. The 272 provides a single range selection regardless of frequency chosen. The range (and other settings) for each frequency is retained when changing frequency

TRANSMIT ON: This selection allows the user to toggle the Towfish trigger On and Off. During real-time acquisition this selection should be on. This can also be controlled from the upper tool bar via the On Off buttons located to the right of the Playback Controls.

TEST SIGNAL: This selection allows the user to turn on a test signal so that they can verify that the topside unit is operating properly. When this feature is selected the A/D portion of the topside electronics will induce a square wave signal that will produce vertical test lines in the data area. This feature should remain off during normal operation.

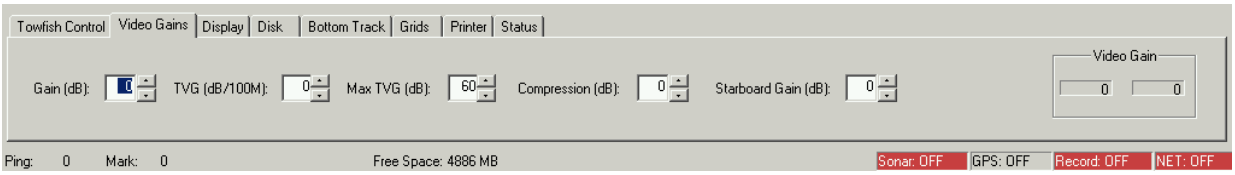
RANGE (M): This selection allows the user to select the operation range of the system. Please note that the 500kHz signal is limited to around 100 meters maximum range. The 560D configuration allows separate range entries for each frequency. The final system firing rate will be set by the longest range setting.

FREQUENCY: This selection allows the user to select the operation frequency of the system. 100kHz for the longer ranges and 500kHz for the higher resolution ranges < 100 meters. The 560A system implements this as an exclusive radio button allowing only one selection to be active. The 560D supports one or both selected.
ANALOG GAIN LEVEL: This selection allows the user to adjust the analog gain of the signal prior to being digitized. This feature is mainly used for balancing the port and starboard channels. This gain control will affect the raw data recorded by the system.

LISTEN ONLY: When checked, and the Transmit ON is off, the towfish power will be set to zero, and the sonar signals digitized as normal. This allows monitoring of noise levels in the absence of backscatter signals.

SIGNAL METER: This is a display box only and requires no input from the operator. During normal operation this meter should read a value greater than zero and less than 32000.

3.2.2 VIDEO GAINS



NOTE: Simultaneous Dual frequency systems (560D) will show a dual row of controls. The high frequency system controls will be on the top.

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

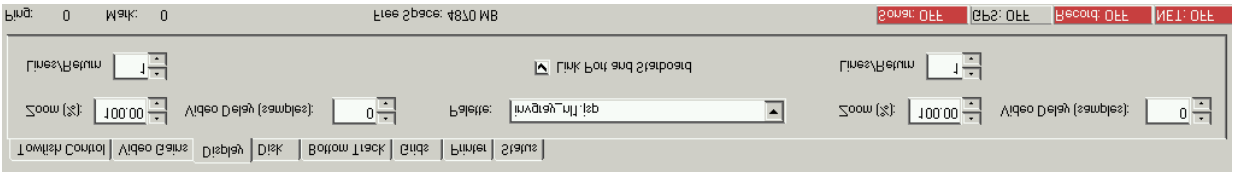
TVG (dB/100m) [Display, Entry]: This value is used to apply exponential time varying gain to the Displayed WATERFALL data for both the port and starboard signals. This gain is NOT applied to the recorded data in any format, nor is it applied to the data displayed in the top amplitude vs range display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

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

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

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

3.2.3 DISPLAY



ZOOM (%): There are two of these selection boxes located in the control panel, one for port and one for starboard. These selections allow the user to adjust the Horizontal Zoom factor for the port and starboard displays. 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. See section 3.5.2

LINES/RETURN: There are two of these selection boxes located in the control panel. These selections allow the user to adjust the Vertical Zoom for the port and starboard displays. If set to one the one echo set is mapped to one line of screen pixels. If set to 2, then the echo data is

duplicated and written to 2 horizontal lines of screen pixels. Useful for seeing details in the echo data.

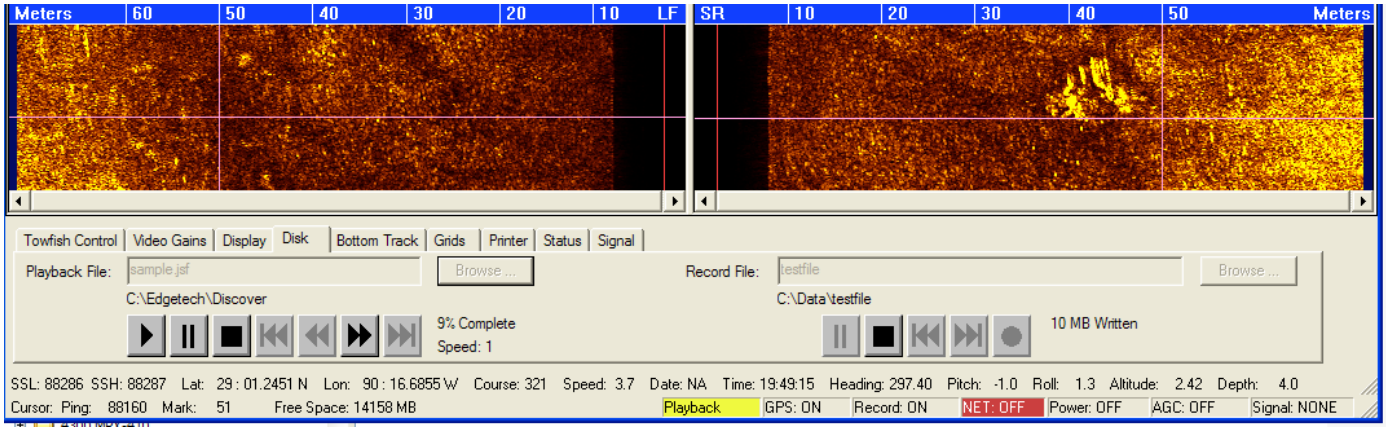
VIDEO DELAY (Samples): There are two of these selection boxes located in the control panel. These selections allow the user to adjust the video delay from the centerline for the port and starboard displays. On screen zooming using the mouse is more efficient, and affects these values. See section 3.5.2

PALETTE: This pull down menu allows the user to a pre-defined color palette 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.

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

Note: None of these settings affect the stored data.

3.2.4 DISK



PLAYBACK FILE: This feature allows the user to enter a path and filename or select "Browse" and look for a specific file to be replayed. The VCR type controls below this box are used to control the selected data file. You can also control this file from the VCR controls located in the Upper Shortcut Menu.

RECORD FILE: 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 VCR type controls below this box are used to control the selected data file. You can also control this file from the VCR controls located in the Upper Shortcut Menu.

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

NOTE: The Discover application DOES NOT provide support for reading XTF format files.

XTF File Output (Real Time)

By default, sonar data stored by the Discover software is in EdgeTech native format (a modified Segy format, *.JSF), however the system will store data in XTF format if the format is so enabled (See Section 3.1.1). It is preferable to store the data in the native format as valuable system setting information is stored along with the data, allowing for advanced data interpretation. The native 'jsf' format also supports higher dynamic range than is achievable in XTF format. If XTF is required, the systems' current gain settings are applied to the native data before scaling and fixing to 16 bit XTF records.

XTF File Conversion (during Playback)

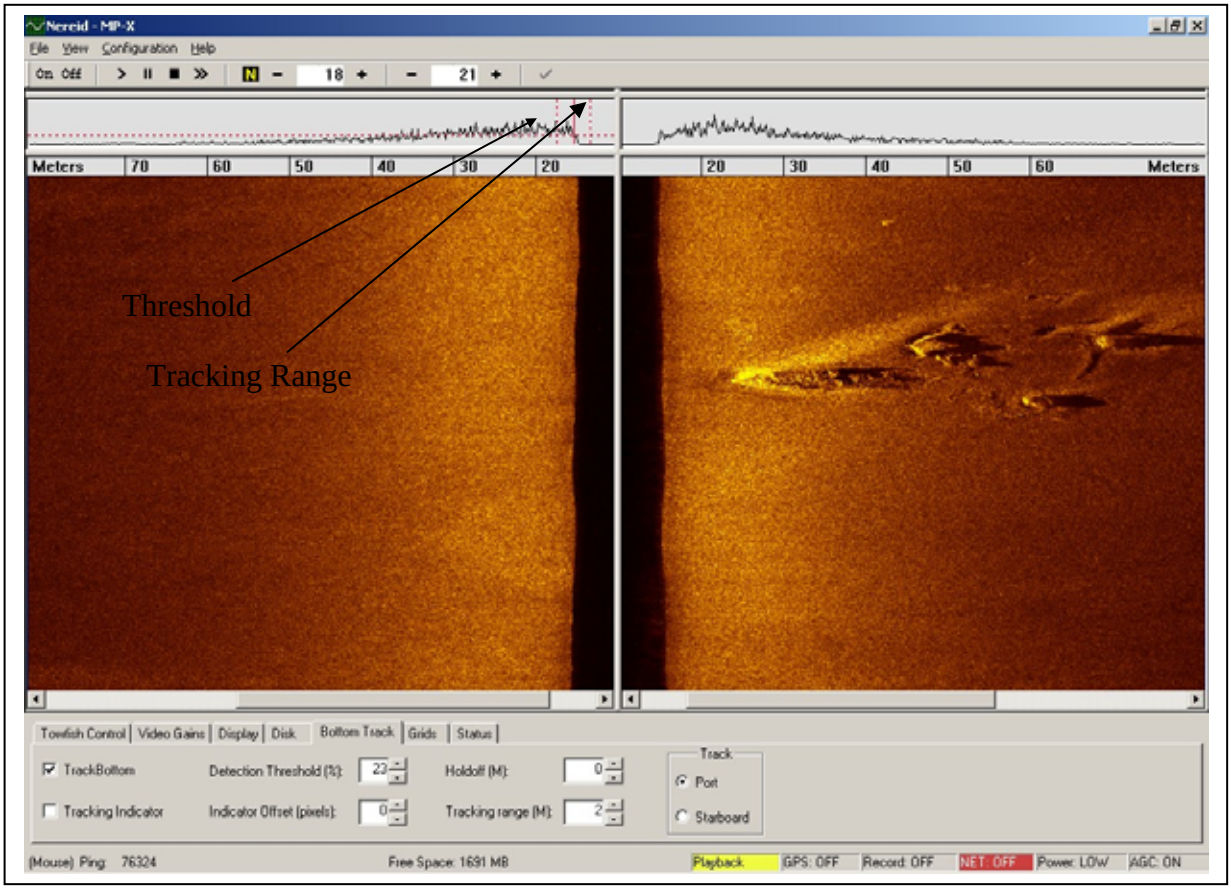
To support XTF output of native format recorded data, the system provides simultaneous playback and recording capability. The input file format MUST BE native format data (.jsf). The output file format may either native or XTF format. The data recording may be started and stopped at ANY time during (and before or after) playback, and thus supports creating "snippets" of arbitrary length from the input data file that may support only small screen shots of valuable or interesting data, or the entire input file in XTF format. The navigation data, and roll, pitch motion sensor data acquired during recording will be reproduced in the XTF output. Sections of Data files may also be concatenated in this manner, by keeping the recording file open and selecting various input files for playback.

3.2.5 BOTTOM TRACKING

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

TRACKING INDICATOR: This Feature is not currently implemented.

DETECTION THRESHOLD [%] [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. e.g. Double clicking the mouse in the window 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. See Section 3.5.1

INDICATOR OFFSET [pixels]: This selection allows the user to offset the Tracking Indicator by a user-defined # of pixels. This feature is helpful when you have a very hard

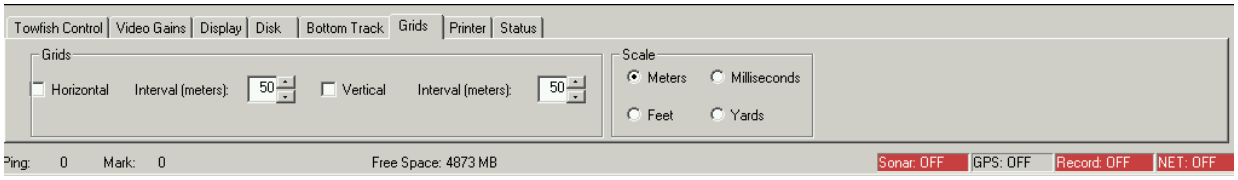
bottom material which makes it is hard to see the tracking indicator. **(not currently implemented)**

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

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

TRACK: This selection allows the user to select the channel (Port or Starboard) for bottom tracking. This feature is very useful if you have excessive noise on one channel and not the other. An example of this would be; if you are towing the fish near the surface off of the port side you may encounter some vessel wake noise on the starboard side.

3.2.6 GRIDS



HORIZONTAL: This selection allows the user to toggle the Horizontal Scale Lines On or Off. Please note that in order for the Horizontal Scale Lines to be displayed you must have a navigation with valid speed, or Manual speed, input.

INTERVAL (meter): This selection allows the user to select the desired spacing between the Horizontal Scale Lines.

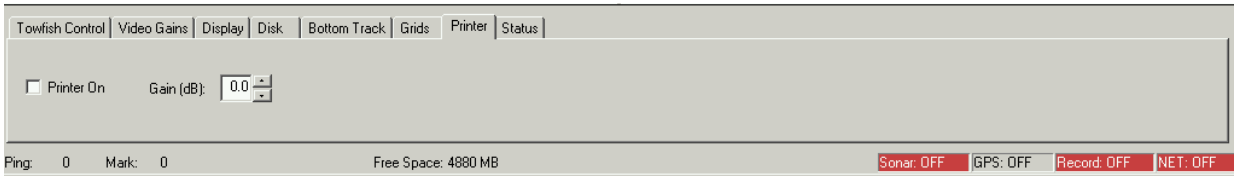
VERTICAL: This selection allows the user to toggle the Vertical Scale Lines On or Off. These Scale Lines will work with or without a navigation input.

INTERVAL (meter): This selection allows the user to select the desired spacing between the Vertical Scale Lines.

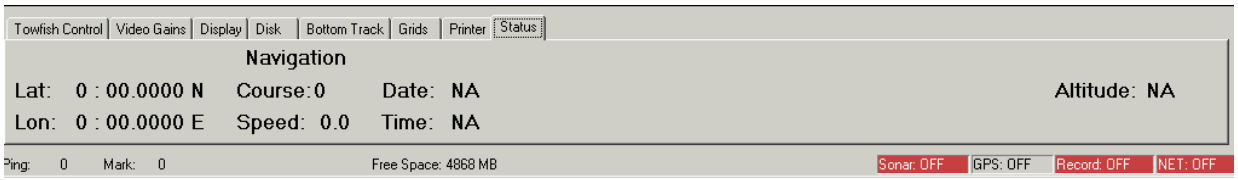
SCALE: This selection allows the user select the units for the Horizontal and Vertical Scale Lines.

Note: Scale Lines are for the video display of the data only and do not affect the recorded data in any way.

3.2.7 PRINTER



3.2.8 STATUS



The Status Display Panel provides a comprehensive view of all the important system information. This panel requires no input from the user.

NAVIGATION: This section of the Status Display Panel will display all the navigation information that the software is receiving from the navigation input.

ALTITUDE: This section of the Status Display Panel will display the towfish altitude in meters. This feature 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.

3.3 LOWER INDICATOR BAR FEATURE DESCRIPTIONS

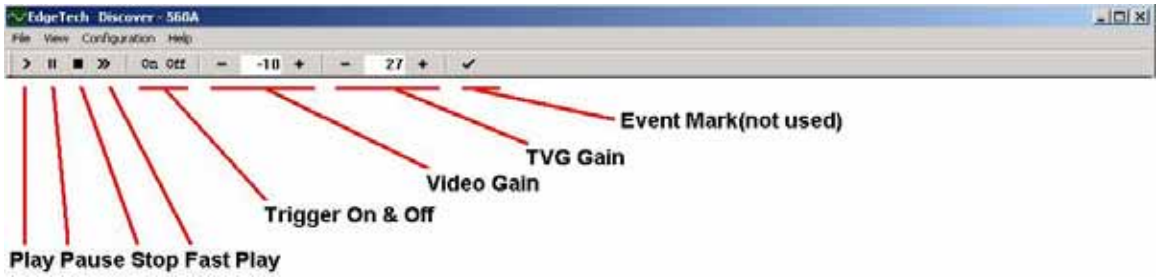
PING: This Section of the Lower Indicator Panel displays the current ping number since the DISCOVER Software opened. When the data is paused during playback the cursor position will be displayed in this area.

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

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

SONAR, GPS, RECORD, AND NET: This section of the Lower Indicator Panel displays the status of the indicated feature. RED indicates a state of Off or Not Active. During Normal operation all these indicators should be on (WHITE). Of course if you do not want to record data then a RED indicator here is acceptable.

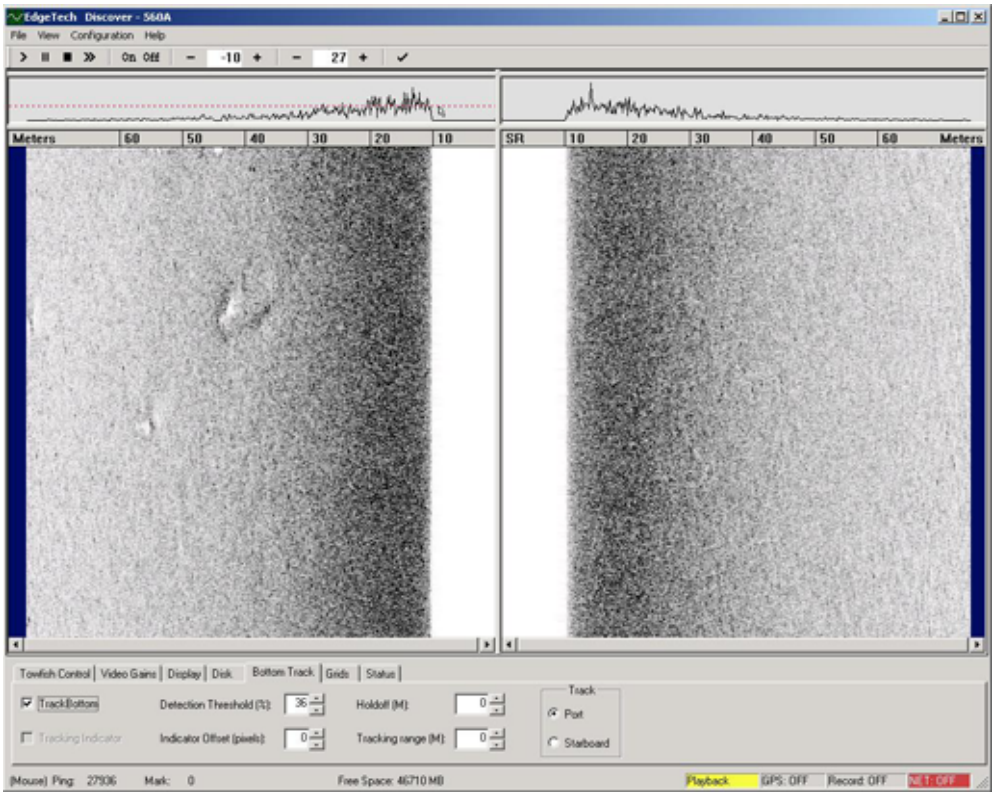
3.4 SHORTCUT BAR



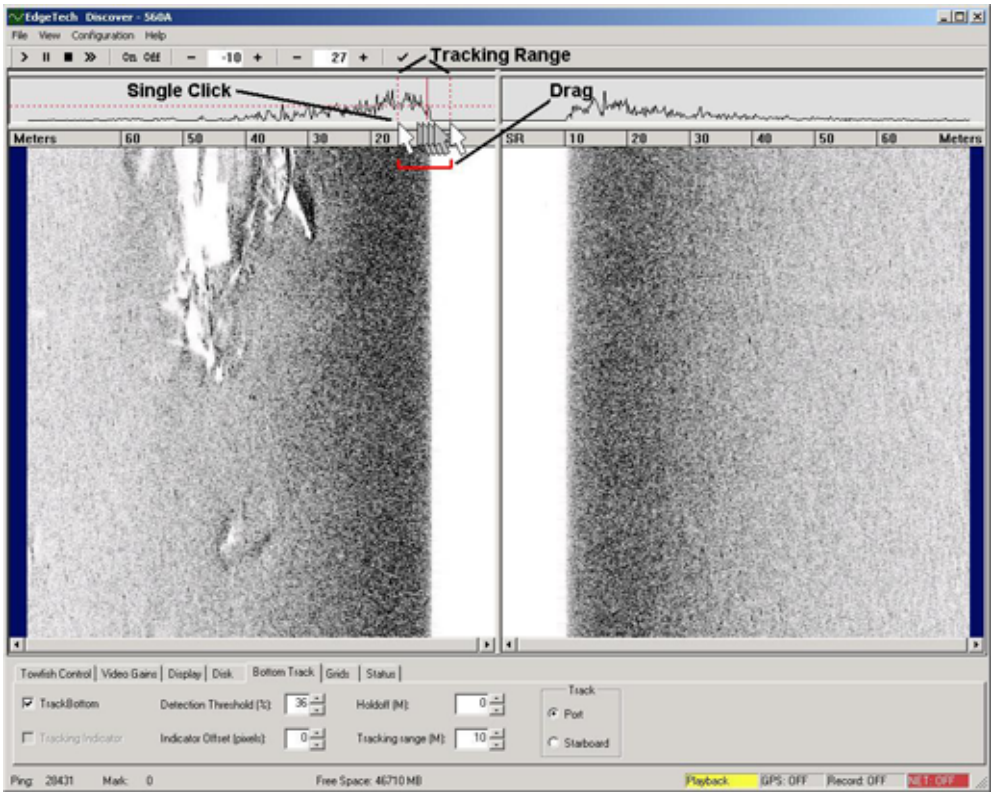
3.5 SCREEN CLICKS AND OTHER SHORTCUTS

3.5.1 BOTTOM TRACKING

With the Bottom Tracking Feature activated you can adjust the Threshold by double clicking the left mouse button in the sonar signal amplitude display window. See the image below.



The Tracking Range can be adjusted by single Clicking and Holding the left mouse button while dragging the cursor across the signal to the desired range and releasing. This may take a couple of tries to get the desired result. See image below.



Summary:

The search routine looks for the first sample that passes the operator entered threshold value within the track window (and outside of the holdoff 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 the threshold
- Click and drag to set the window start and end points

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

3.5.2 ZOOM

To zoom into a target on the data display, press and hold down the left mouse button, drag across the screen (Horizontal or Diagonal) and release. Double-clicking the left

mouse button in the data area will return the sonar data to full resolution. Note: You can use the scroll bars at the bottom of each data display to scroll horizontally through the zoomed data.

4 - NAVIGATION-ANNOTATION INTERFACE

Connect any industry-standard NMEA 0183 GPS to the Navigation COM port on the EdgeTech Processor (Com 1 is default). Most GPS receivers made in the past 5+ years output the NMEA 0183 (version 1.5, 2.0/2.1, or 2.3) data language. GPS receivers can be connected by a serial cable (provided by the GPS manufacturers) to the EdgeTech topside through a standard 9- pin serial port. Refer to section 4.5 below for the pin out of the 9 pin serial connector.

The following information describes the serial port interface parameters for acquiring navigation strings from a connected GPS unit or integrated navigation computer to the Discover processor serial port. The system will also accept Annotation and Event mark strings in accordance with Section 4.4.10.

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

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

4.1 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 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

4.2 PORT PARAMETERS

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

4.3 PORT SELECTION

The port assigned to receive the navigation messages is assigned in a supporting file for the Discover application or any other user named *.jni file. This is a simple text file with many system settings and parameters, to set the assigned port, edit the file and make the changes as below:

The section and syntax for the serial port assignment and configuration is:

```
[Nav0]
Baud=4800
Port=1
Enable=1
```

The file is large so it is easiest to search for the Keyword [Nav0] to find this section.

The baud rate and port number to use are set here. Valid Baud rates are 4800 to 19200 depending on your NMEA source.

The Discover software will support up to 3 serial ports for connecting to any sources of these serial data strings. The messages may come in on any enabled port, or they may all be input via one port. No distinction or priority is given to any port over another. It is safest to only enable those ports you need that are supplying valid data.

The format for the remaining ports is as above with the keywords, [Nav1, Nav2].

4.4 INPUTS

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

4.4.1 GLL – GEOGRAPHIC POSITION – LATITUDE/LONGITUDE

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

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

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

NOTE:

Other supported navigation strings for position are: GGA, RMA, RMC

4.4.2 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>

xxxxxx.xxx	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	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.

4.4.3 GGU - GEOGRAPHIC POSITION - X AND 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>

xxxxxxxx.x	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	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.

4.4.4 GGA – GLOBAL POSITIONING SYSTEM FIX DATA

Time, Position and fix data for a GPS receiver.

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

llll.ll	Latitude
a	Character label for N/S or E/W
yyyy.yy	Longitude
q	Quality indicator
nn	Number of satellites in use
d.d	Horizontal dilution
a.a	Altitude
g.g	Geoidal separation (meters)
e.e	Age of differential data
rrrr	Reference Station ID

4.4.5 RMA – RECOMMENDED MINIMUM SPECIFIC LORAN-C DATA

Position, course and speed from a Loran-C receiver

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

For fields see NMEA 0183 Specification

4.4.6 RMC – RECOMMENDED MINIMUM SPECIFIC GNSS DATA

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

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

For fields see NMEA 0183 Specification

4.4.7 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.

4.4.8 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.

4.4.9 HDG - HEADING, DEVIATION AND VARIATION

4.4.10 EVT - EVENT & ANNOTATION (EDGETECH CUSTOM)

Event mark and related annotation provided by an integrated navigation system

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

S	ASCII character status flag. M = Print and Store event mark
Message	Event annotation or just annotation message up to 23 characters long.

NOTES:

Annotation and event marks are placed on the starboard display 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 port display screen as a tick mark and mark number.

4.4.11 EMA - EVENT, SET MARK, AND ANNOTATION (EDGETECH CUSTOM)

Event mark number and annotation provided by an integrated navigation system

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

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

NOTES:

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.

NOTE:

A shortcut to the Windows HyperTerminal application is provided to check the navigation input. You must quit the Discover 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, the navigation strings should be updated once a second or faster.

4.5 SERIAL PORT CONNECTIONS

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

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

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

Pin # 2 (usually brown) is Receive (which would connect to the transmit pin on the GPS). This connection will take the position data from the GPS for use in the Discover software. This is a necessary connection for GPS communications

Pin # 5 (usually green) is Ground. This can be connected to the common ground from the GPS wiring. This is a necessary connection for GPS communications

Pin # 3 (usually red) is Transmit. This connection will go back to the GPS. 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.

4.6 TROUBLESHOOTING

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

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

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

Problem: No communications between GPS and Discover Software

Solution: When Discover isn't getting the GPS data during data acquisition, it's a good idea to check outside of Discover to be sure the serial port is receiving the data. If the ports do not see any GPS data coming in, then Discover will not be able to see

the signal. HyperTerminal, one of the programs which come with Windows, is a useful troubleshooting utility, since it reads any information being received by the system through any available COM port. Here are the steps:

Notes: Discover and all other programs, especially any that use COM ports for other connections, should be closed while running the HyperTerminal program.

The GPS should be set to its NMEA mode in its Interface Setup area for this test.

The GPS should be set to its Simulator mode if indoors or having difficulty obtaining the GPS Sat. fix.

1. Click Start, then Programs, then Accessories, then Communications, then HyperTerminal
2. In the window that opens titled HyperTerminal, double-click on the icon which says "Hyperterm", the one with the monitor sitting next to a phone.
3. If a window comes up asking if you want to configure a modem now, select "No" or "Cancel". Otherwise, proceed to the next step.
4. Another window titled "Connection Description" appears. In the Name: box, type in the letter t for "test". Click on OK.
5. Another window pops up with the title "Phone Number". The only field of interest here is Connect Using:, which must be set to "Connect to COM1". Click on OK.
6. The window "COM1 Properties" appears. The only field to change here is Bits per second:, which should be set to "4800", since the NMEA 0183 standard specifies 4800 baud rate. Click on OK.
7. The main white HyperTerminal window becomes completely visible, hopefully with GPS data scrolling upward. Every sentence must begin with a dollar sign and five letters. If the screen is blank, this means no data is coming in through the port.
8. When finished viewing the screen, select "Exit" from the File menu. When asked if you want to disconnect now, click on Yes. When asked if you want to save session, click on No.

Repeat the above steps for other COMs, replacing COM1 with COM2, COM3 and COM4. If none of these will reveal 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. I get an error message. This means that the COM port you have selected is not available or functioning properly. Close HyperTerminal and repeat the process, trying a different COM port. If you are certain that you are selecting the proper COM port, contact EdgeTech for further troubleshooting tips.
2. I get a blank screen with a flashing cursor. The COM port you've chosen is not currently receiving NMEA data. Close HyperTerminal and repeat the process, trying a different COM port. If you are certain that you are selecting the proper COM port, check the output settings on the GPS. If you are certain that the GPS is outputting NMEA strings, use a Null Modem to swap pin 2 and 3 (TX & RX).
3. I get a screen with text scrolling upward. You're successfully connected to your GPS unit. Good GPS data will look like the following:

   $GPRMC,201502,A,4251.2939,N,07054.4254,W,000.0,000.0,291002,016.3,W*7C
   $GPGGA,201502,4251.2939,N,07054.4254,W,1,07,1.7,55.6,M,-32.7,M,,*4A
   $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

The data you see scrolling by indicates your current position (among other things). Note the COM port used and exit HyperTerminal. When asked if you want to disconnect now, click on Yes. When asked if you want to save session "Test", click on No.

5 - TARGET LOGGER

5.1 INTRODUCTION

EdgeTech's Discover Target Logger is used for feature mensuration, logging and recall.

Right clicking on the scrolling sonar image in the Discover software launches the Target Logger.

If the Target Logger is already running when a target is designated in the waterfall (right click), the Target Logger becomes the active window.

If Discover software is not running, Target Logger can be initiated by activating the desktop shortcut.

A mouse button "right click" action in the sonar data waterfall display causes Discover to select an area of imagery, centered about the current cursor location. This area of imagery is displayed in full resolution in the Target Logger main window. The default window size of the target image is 200 vertical display lines by the full sonar range. The vertical size for the window can be changed by modifying the `'TargetWindow'` entry in the active Discover Software initialization file (DiscoverLastxxxx.Jni). Caution should be exercised before making this larger, to ensure adequate processor resources (RAM memory, CPU speed etc) are available to handle larger data windows.

For the default settings the processor requirements are:

RAM: 512Mbytes minimum,

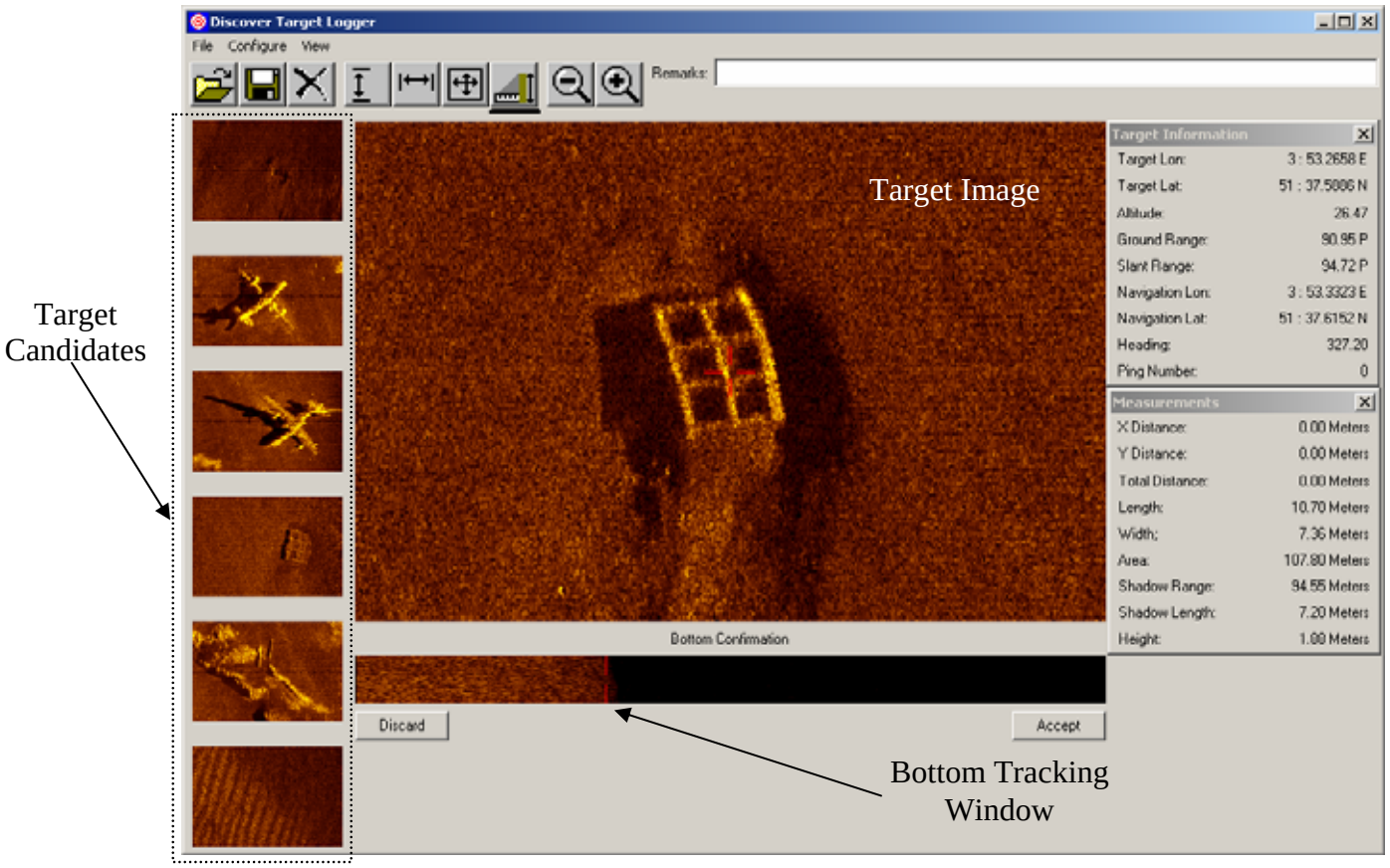
CPU: Pentium 3 or higher,

CPU Speed: > 1 GHz

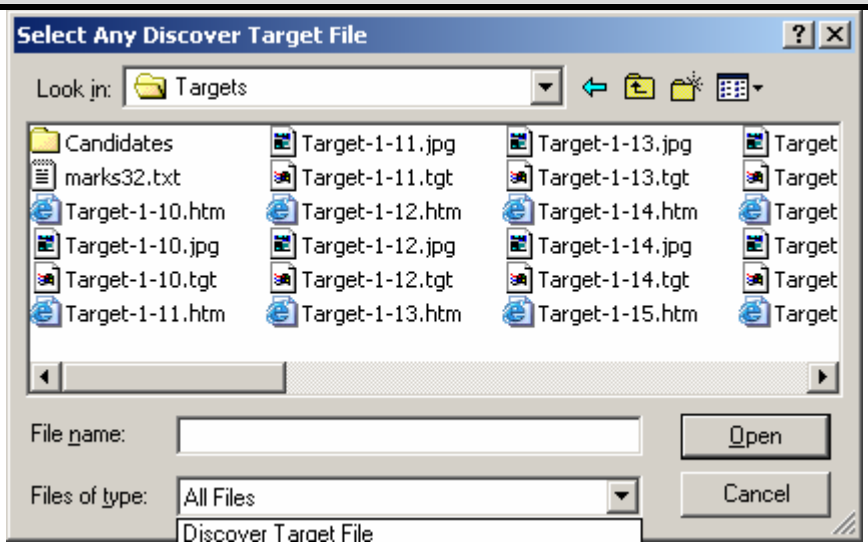
5.2 OPERATION

As the sonar data is scrolling down the display, a target of interest may become visible. By placing the cursor over the target and right clicking, you will activate the Target Logger; log the target into the candidate directory, and open a target window. If the target is saved, you will also generate a mark file that can be imported into the Maptech® ® Software and plotted on a chart. Within the target window you can zoom, pan, save, get the exact location, and measure object dimensions and height from shadow information.

5.2.1 WINDOW LAYOUT



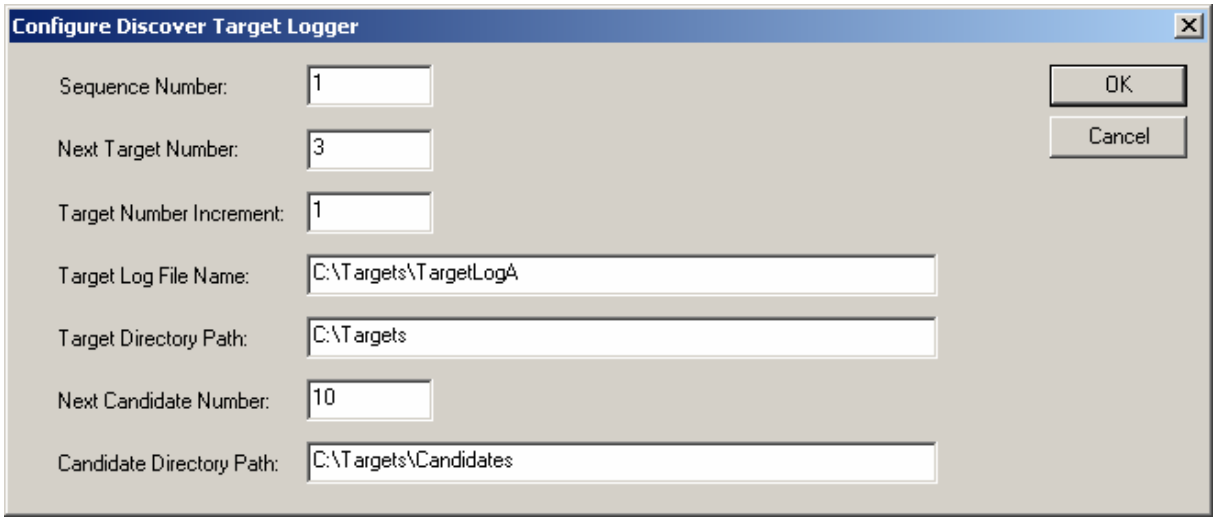
5.3 FILE MENU

Menu	Action Performed
Open	 Click this to get a Windows dialog box where you can specify a target or a target candidate file to open. Make sure the File Type is set to the file type you are opening or to "All Files"
Close	Removes from the working window the target image that has the active focus. This does not delete the image. The image can be re-opened from the candidates or targets directory
Save	This saves the currently loaded target window. The target name is "Target-X-Y.tgt" Where X is the sequence number and Y is the target number. The sequence number is set from the Target Setting Configuration menu If the target has already been saved it will be resaved as "Target-X-Y-Z.tgt" Where Z is a number appended to the original target file name. Each time a target is saved 3 files are generated: • Target-X-Y.tgt Actual Sonar data around the target • Target-X-Y.jpg Image of the target • Target-X-Y.htm Target Image with info and annotation in htm format for easy printing and sharing.
Delete	This button will delete the selected target from the candidate directory if it has not been saved yet or from the target directory if it was saved and re-loaded.

Exit	Select 'Exit' to exit the Discover Target Logger application

5.4 CONFIGURATION MENU

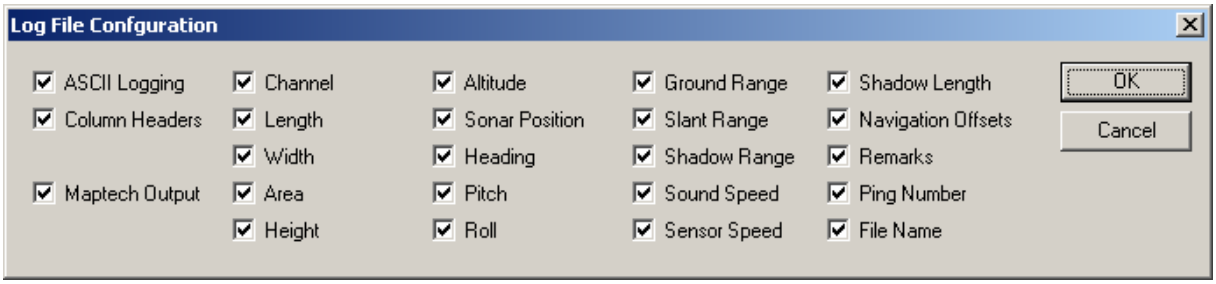
5.4.1 TARGET SETTINGS



Configuration Parameter	Meaning or Action Performed
Sequence Number	This value is associated with the Target File Name. The target name is "Target-X-Y.tgt" Where X is the sequence number and Y is the target number.
Next Target Number	This value is associated with the Target File Name. The target name is "Target-X-Y.tgt" Where X is the sequence number and Y is the target number.
Target Number Increment	Use this field to set the number increment for the file name, or decrement if negative.
Target Log File Name	Use this field to set the name of the Target Log File. Refer to section 5.4.5 for a description of the file Format

Target Directory Path	Use this field to set the directory where the target files will be saved. The default path is: C:\Targets
Next Candidate Number	Next candidate number to be used
Candidate Directory Path	Use this field to set the directory where the candidate target files are saved. The default path is: C:\Targets\Candidates Note: Candidate files remains in this directory unless saved or deleted.

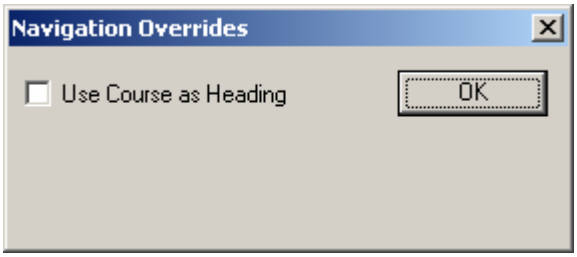
5.4.2 LOG FILE CONFIGURATION



Configuration Parameter	Meaning or Action Performed
ASCII Logging	Check this box to enable logging to the Target log selected in the configuration menu
Column Headers	Check this box to enable the output of column headers to the log file
Maptech® Output	Check this box to enable the generation of the ‘marks32.txt’ Maptech® mark input file.
Channel	Check this box to enable output of channel information (e.g. Port)
Length	Check this box to enable output of measured target length
Width	Check this box to enable output of measured target width
Area	Check this box to enable output of measured target surface area

Height	Check this box to enable output of calculated target height
Altitude	Check this box to enable output of sonar height from the seafloor. Note: Proper bottom tracking is required to get meaningful altitude information.
Sonar Position	Check this box to enable output of the raw towfish navigation information before any offset implementation.
Heading	Check this box to enable output of Sonar towfish heading at the target location. This information is from the heading sensor, if present on the towfish.
Pitch	Check this box to enable output of towfish pitch at the target location. This information is from the motion sensor, if present on the towfish.
Roll	Check this box to enable output of towfish roll at the target location. This information is from the motion sensor, if present on the towfish.
Ground Range	Check this box to enable output of the actual ground distance between the towfish and the target.
Slant Range	Check this box to enable output of the distance between the towfish and the target.
Shadow Range	Check this box to enable output of the calculated ground distance between the towfish and the beginning of the target shadow.
Shadow Length	Check this box to enable output of the measured target shadow lenght
Sensor Speed	Check this box to enable output of the towfish speed at the location of the target. This information is from the GPS or Navigation input.
Sound Speed	Check this box to enable output of the Sound speed used for range calculation. The default value is 1500m/s. This value is changed from the Discover software.
Navigation Offsets	Check this box to enable output of the Pitch, Roll, Aft and Starboard offsets as inserted in the Discover software during acquisition.
Remarks	Check this box to enable output of any remarks added to the target file.
Ping Number	Check this box to enable output of the ping number at the location of the target
File Name	Check this box to enable output of the sonar data file name associated with the target.

5.4.3 NAVIGATION OVERRIDES



If the sonar towfish is not equipped with a heading sensor, check this box to use the survey vessel course (GPS or Boat Gyro) for calculations.

5.4.4 MAPTECH® MARK FILE FORMAT

Maptech® is navigation software that is provided as an option with the EdgeTech Discover software. Maptech® software provides real-time viewing of the ship track lines superimposed on navigation charts.

Please refer to the Maptech® web page for a complete description of the format http://www.Maptech® .com/support/doc.cfm?docid=137&plid=24&CFID=135562&CFTOKEN=74009708

Note: The row was transposed to column for display purposes.

Record Version	4005
Always 1	1
Symbol	10
Color	255
Name	48sgw20
Note	Unidentified manmade target
Latitude	3097.59
Longitude	-233.266
Time/Date	0
PositionLocked	1

5.4.5 LOG FILE FORMAT

If the ASCII Logging is enabled from the Configuration menu, a comma separated vector file is created. The target ID, Longitude, Latitude and Time & Date are always default. Other information is added to the file by checking the appropriate box in the ASCII Logging Configuration menu.

5.4.5.1 Default File

Tgt ID	Target Lon	Target Lat	Date & Time
24	80:04.7962 E	26:06.3056 N	20021581609

5.4.5.2 All Fields

Note: The row was transposed to column for display purposes.

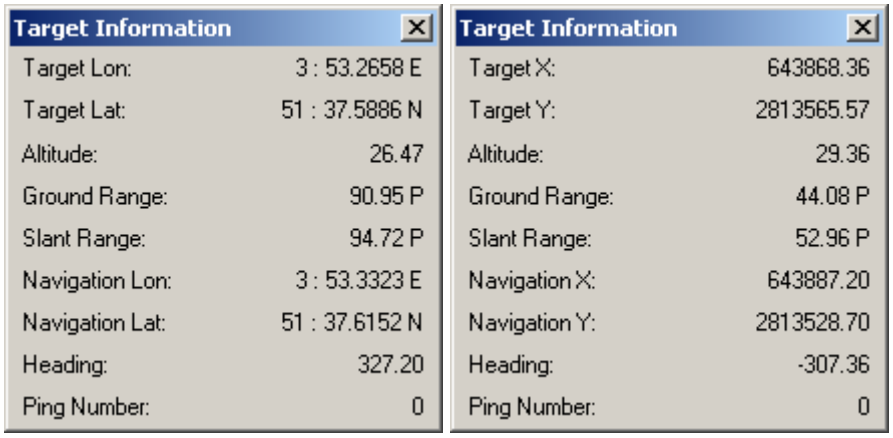
Tgt ID	26
Target Lon	80:06.5379 E
Target Lat	26:05.5793 N
Date & Time	20021581549
Channel	Starboard
Length	5.71
Width	9.08
Area	23.46
Height	0.82
Shdw Len	3.6
Shdw Rng	40.49
Altitude	10.7
G Range	38.7
Heading	103.59
Speed	5.4
Nav Lon	80:06.5434 E
Nav Lat	26:05.5996 N
S Range	40.1
Ping Num	13412
W spd	1500
Pitch	-0.2
Roll	-1.2

Hd Off	0
P Off	0
R Off	0
Aft Off	0
Stb Off	0
File Name	intra1000.jsf
Remarks	Navigation hazard

5.5 VIEW MENU

Three sets of windows can be opened to display target position, target dimensions and navigation offsets.

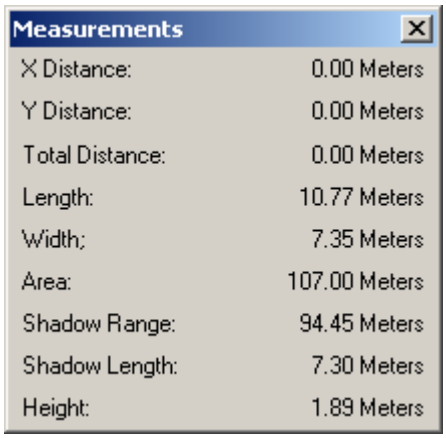
5.5.1 TARGET INFORMATION



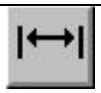
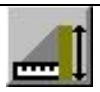
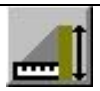
Item	Meaning
Target Lon Target X	Target Longitude or X Position corrected for offsets
Target Lat Target Y	Target Latitude or Y Position corrected for offsets
Altitude	Towfish height from seafloor. Proper bottom tracking is required to get meaningful altitude information

Ground Range	Ground distance between the towfish and the target. A “P” after the range indicates Port Side, while an “S” indicates Starboard Side.
Slant Range	Actual distance between the towfish and the target. A “P” after the range indicates Port Side, while an “S” indicates Starboard Side.
Navigation Lon Navigation X	Raw longitude information from GPS or Navigation input
Navigation Lat Navigation Y	Raw latitude information from GPS or Navigation input
Heading	Sonar towfish heading at the target location. This information is from the heading sensor on the towfish if available.
Ping Number	Ping number at the location of the target

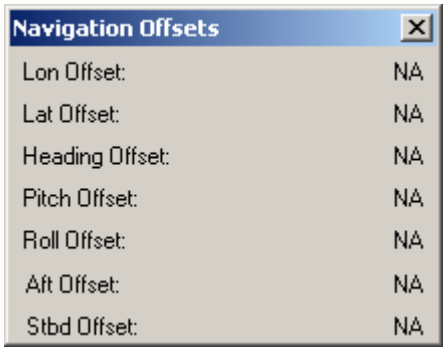
5.5.2 MEASUREMENTS

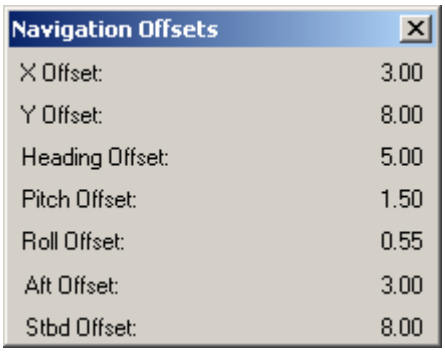


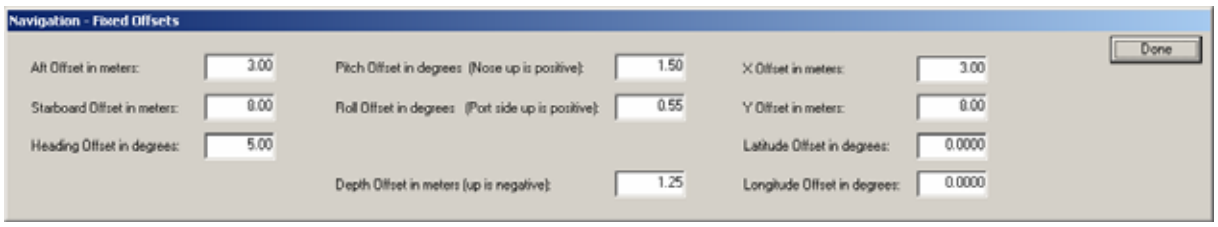
Item	Meaning
X Distance	Temporary value that measures the cursor across track (X) displacement. Right click and drag cursor.
Y Distance	Temporary value that measures the cursor along track (Y) displacement. Right click and drag cursor.
Total Distance	Temporary value that is calculated from the X & Y values that measure the cursor’s actual displacement. Right click and drag cursor.

Length	Press first the  icon then right click and drag the cursor over the longest dimension of the target to measure its length.
Width	Press first the  icon then right click and drag the cursor over the shortest dimension of the target to measure its width.
Area	Press the  icon then right click and drag the cursor over the over the target of interest to measure its approximate surface area.
Shadow Range	Press the  icon then right click the cursor at the beginning or the far end of the target shadow to get its ground range (nearest point) from the sonar towfish.
Shadow Length	Press the  icon then right click the cursor at the beginning of the target shadow and drag until the end of the shadow to get its ground length.
Height	Height is the distance which an object stands above the seabed. An object on the seafloor casts an acoustic shadow on the side facing away from the towfish. The length (or across track range) of this shadow is used along with the towfish altitude and ground range to calculate the target height. See Section 5.8

5.5.3 NAVIGATION OFFSETS

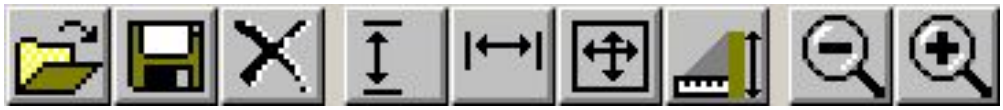




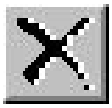
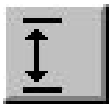
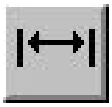
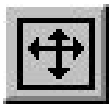
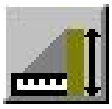


The Target Logger uses the navigation offsets entered in the Discover Configuration/Navigation Offsets tool to determine the target position. Please refer to the proper section of the manual for an explanation of these fields.

5.6 ICONS ON THE TASKBAR



Immediately underneath the menu list is the taskbar of icons (see above picture). The first set of icons has to do file management. The second set is associated with the measurement tools operated by using the right mouse button. The third set is related to the zoom feature.

	**Open** icon. Click this to get a Windows dialog box where you can specify a target file to open. Make sure the File Type is set to the file type you are opening or to "All Files" This icon is equivalent to choosing **File** ♦ **Open** from the main menu.
	**Save** icon. This saves the currently loaded target window. The target name is "Target-X-Y.tgt" Where X is the sequence number and Y is the target number. The sequence number is set from the Target Setting Configuration menu If the target has already been saved it will be resaved as "Target-X-Y-Z.tgt" Where Z is a number appended to the original target file name. Each time a target is saved 3 files are generated: • Target-X-Y.tgt Actual Sonar data around the target • Target-X-Y.jpg Image of the target • Target-X-Y.htm Target Image with info and annotation in htm format for easy printing and sharing.
	**Delete** icon. This button will delete the selected target from the candidate directory if it has not been saved yet or from the target directory if it was saved and re-loaded
	**Length** icon. Press this icon then right click and drag the cursor over the longest dimension of the target to measure its length.
	**Width** icon. Press this icon then right click and drag the cursor over the shortest dimension of the target to measure its width.
	**Area** icon. Use this measurement pointer tool by right clicking and dragging the shaded box over the target to get an approximate measure of the surface area of the target.
	**Height** icon. Use this measurement pointer tool to find the height of an object by measuring it shadow. Proper bottom tracking indicator is necessary for accurate measurement.
	**Zoom out** icon. Reduces the size of the displayed image. The aspect ratio of the image is preserved, as the target data is always speed and slant range corrected.
	**Zoom in** icon. Enlarges the size of the displayed image. The aspect ratio of the image is preserved, as the target data is always speed and slant range corrected.

5.7 TARGET IMAGE

A right click on the waterfall display causes Discover to define an area centered on the current cursor location. The default window size of the target image is 200 lines by the full sonar range. The vertical size for the window can be changed by modifying the 'TargetWindow' line in the active Discover Software initiation file (DiscoverLastxxxx.Jni). The target location can be adjusted by zooming in and double right clicking the cursor over the target location.

Note: For better target images the Discover image should be speed corrected.

5.8 BOTTOM TRACKING

The Bottom Tracking confirmation window allows fine adjustment or manual adjustment of the seafloor location for proper target measurement. To manually adjust the seafloor location, left double-click the area on the bottom tracking window where the bottom is thought to be.

Note: The target image will be distorted if the bottom tracking was disabled or improperly tracking the seafloor in the area where the target was selected

5.9 REMARKS FIELD

Insert annotation related to the target in the remarks field. When loading a saved target the remarks field is populated with the target's associated annotation. You can modify this text or type new text. If you click **SAVE**, any text that may be present here will then be associated as an annotation to the currently displayed target. The annotation will be available for the currently displayed file whenever that file is opened.

5.10 TARGET CANDIDATES

Every time there is a right click action on the sonar data waterfall, a candidate target is created. Up to 7 candidates can be displayed at one time on the Target Logger. If more candidate targets are generated the 6 most recent one are displayed. All candidates are stored in C:\targets\Candidates in the default directory or any other directory selected in the Configure\Target Setting Menu.

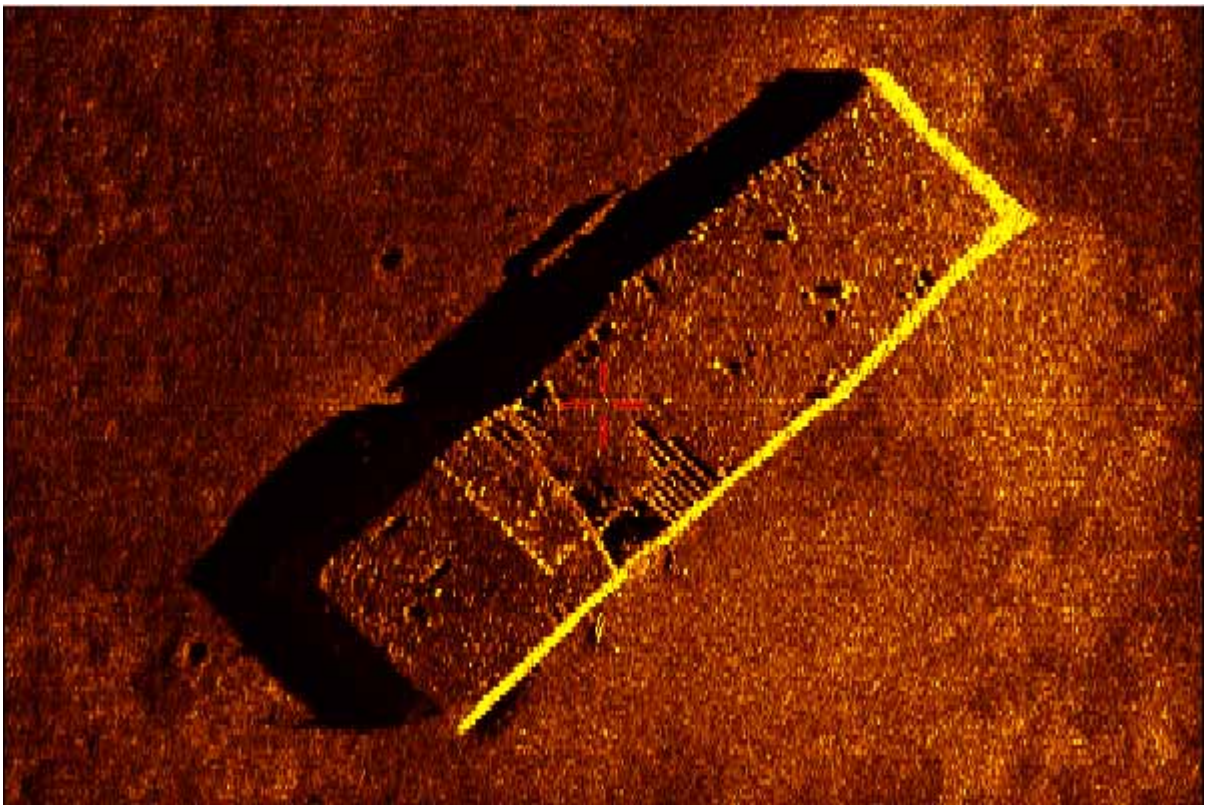
The candidate file stored 'Candidate???.cdt' is the actual sonar data in the area of the target.

The operator can either save the candidates, which deletes the candidate file and creates a target file, or delete the candidate.

5.11 HTM FILE OUTPUT

If a target is saved, an .htm file containing a link to the target image along with navigation and target position is generated (see below). Any Internet browser can be used to view and print the target.

Target-1-2

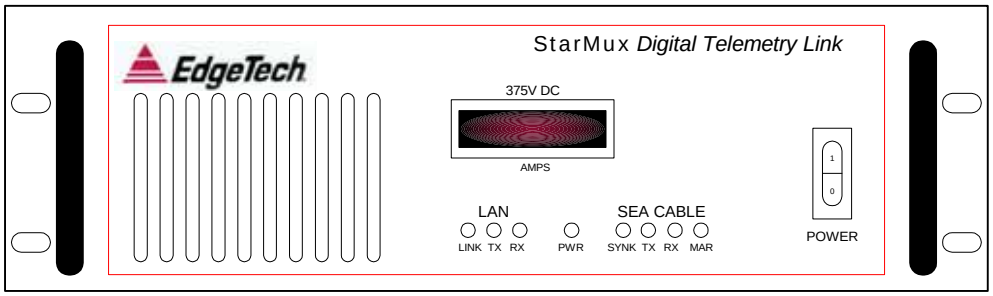


Sunken Barge offshore Dania Beach, Florida

Target Latitude:	26:08.0775 N	Target Longitude:	80:04.8786 W
Heading:	1.26 Degrees	Ground Range:	36.2 Meters to Port
Speed:	3.2 Knots	File:	Barge & Tires008.jsf
Length:	37.96 Meters	Width:	10.96 Meters
Height:	2.03 Meters		

EdgeTech Marine

6 - STARMUX TELEMETRY OPTION



6.1 INTRODUCTION

6.1.1 SYSTEM DESCRIPTION

The StarMux digital telemetry link uses advanced modulation techniques to optimize the performance of existing cables and umbilical, while receiving sub bottom and side scan data at high rates, up to 7 megabits/sec.

EdgeTech's adaptive digital StarMux technology works over extremely long cable up to 10 kilometers long without degradation in data quality.

The capability of a real-time half-duplex trigger bit is added for external synchronization and is independent of the mainstream data.

In addition to high data rates and external triggering over long cables, the link provides power to the sub sea system. Both data and power are combined to a single coaxial or twisted pair cable using a unique filtering system designed by EdgeTech.

The StarMux system consists of a topside unit and wet end unit. The topside maintains the main power supply, a modem, the external trigger transceiver and filtering. The wet end unit is similar to the topside but maintains a bank of capacitors and DC to DC converters for power distribution.

6.1.1.1 Telemetry System

The telemetry system consists of a modem placed in the topside unit and at the wet end. The modems differ in that the wet end modem can transmit data at a higher rate than that of the topside modem. This allows for the topside processor to receive sonar data at a maximum rate while data to the sonar system is typically in the form of commands and its rate is not critical. Communication between the modem and the local processing system is done through a 10 base-T Ethernet connection. In essence, the topside and wet end processing systems are connected via Ethernet while the two modems and the cable between them appear transparent.

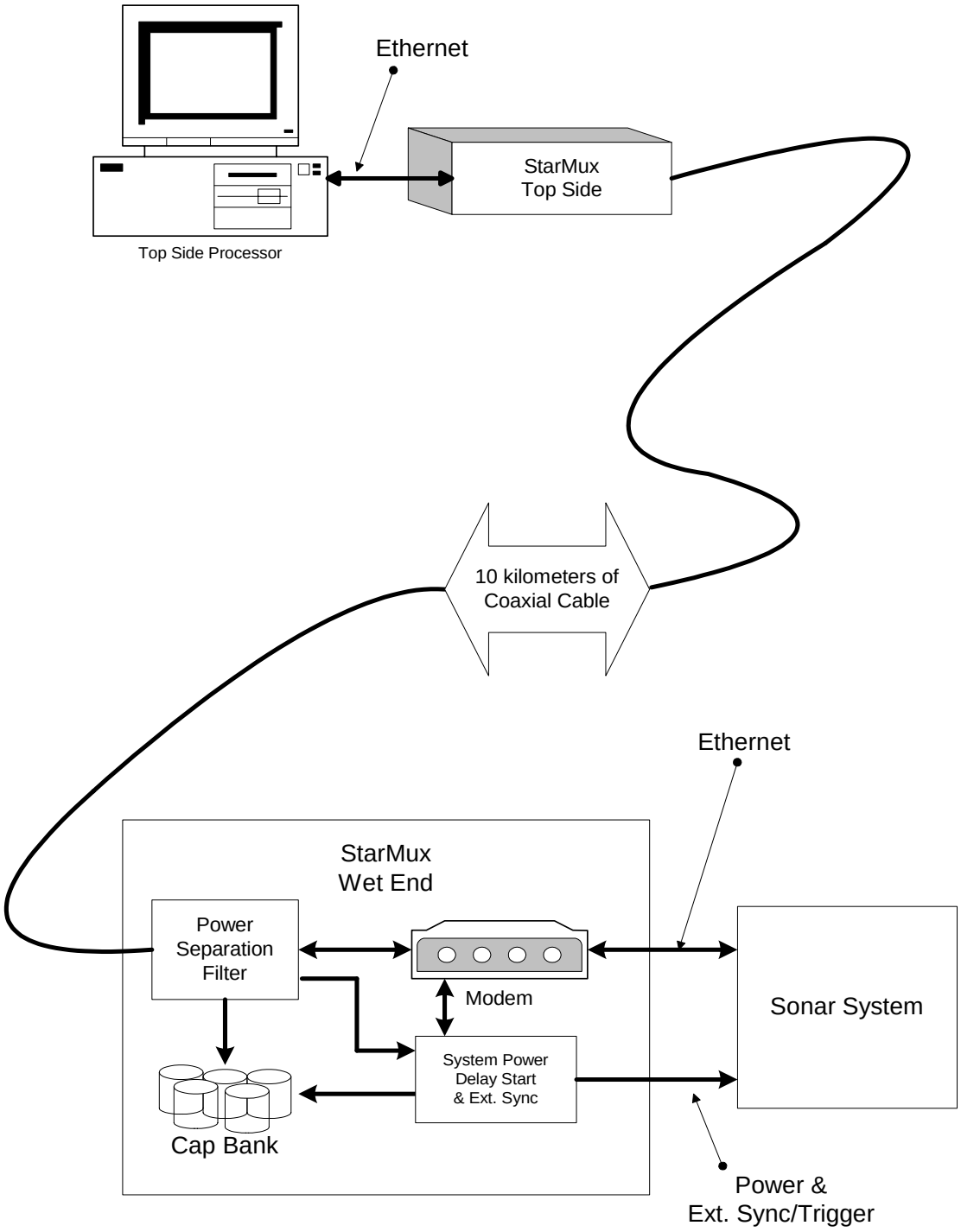
6.1.1.2 External Trigger

The external trigger function has a transceiver in both the topside and wet end units. This is a supplemental channel that is independent of the mainstream data and is not subject to collisions or latencies associated with Ethernet. Though it has a low data rate (2 bits per second), it is also low latency (about 1ms).

6.1.1.3 Power System

The StarMux power system is comprised of a 110/220 Volt AC to 375 Volt DC converter power supply residing in the topside unit. The wet end unit receives power from the topside and provides power distribution to all of the wet end components and sub-systems. For its primary voltage, a 375-to-48 volt DC to DC converter is used to provide as much as 300 watts of power to the main processing system.

StarMux Telemetry System



6.1.2 APPLICATIONS

The StarMux system can be used to provide telemetry and power to any sonar system with Ethernet capability and a maximum power requirement of 600 watts at 48 Volts DC. The maximum cable length tested is 9000 meters. Data rates through the telemetry system will depend on the cable length, quality, and electrical characteristics.

As described in the next section, there are two system configurations related to StarMux power; a 400-Watt standard system and an optional 1200-Watt system. The 4300FS system uses the 400W topside option.

6.1.3 CABLE

The StarMux system is dynamically adaptive to a variety of cables and umbilicals. Using StarMux™, the wet and dry parts of the system are digitally linked via coax or multi-conductors cables. The type of conductor determines the maximum cable length, and the expected bandwidth. Cables up to 10 kilometers long work with the link.

6.1.4 DIFFERENT SYSTEM CONFIGURATIONS

6.1.4.1 400 Watt Standard

The standard StarMux system will provide up to 400 Watts of power to the sonar system. The external trigger capability and modems are both standard.

6.1.4.2 1200 Watt (option)

The 1200-Watt StarMux system has all of the features of the standard system. In addition, auxiliary power is provided for external sub-sea systems. There are two choices of auxiliary power. The first option is 185 to 375 Volts DC output (depending on cable length and type) at approximately 1 Amp. The second option offers a 48 Volt DC output at approximately 3.5 Amps.

6.1.5 SPECIFICATIONS

6.1.5.1 Topside Power Unit

Enclosure: 5-1/4"Hx19"Wx17"D Rack mountable case.

Weight: 16.8 kg. (37 lbs.)

I/O Ports: Ethernet 10BaseT RJ-45 Connector, 5-Pin Circular Sea Cable Connector

Environment:

Temperature: Operating 5ºC. to 40ºC., Non-operating -40ºC. to 45ºC.

Humidity: Operating 20% to 80% relative humidity, non-condensing. Non-operating 5%-95%.

Vibration: Normal ship environment.

Options: Spare Parts Kit

Electrical

Operating Power:	85-264VAC auto switch, 47-500 Hz
Output Power (Standard):	400 Volts DC @ 1 Amp
Output Power (Optional):	400 Volts DC @ 3 Amps

6.1.5.1.1 Digital Link

Connection:	Ethernet RJ-45
Up-link Data Rates (send to fish):	0.8 megabits/sec Max
Down-link Data Rates (Receive):	4.0 megabits/sec Max

6.1.5.1.2 External Trigger

Connection:	BNC
Level:	TTL
Minimum Pulse Width:	1 ms
Maximum Pulse Width:	500 ms
Data Rate:	2 Bits/sec
Jitter:	< 1 ms Max

6.2 INSTALLATION

6.2.1 SELECTING A SET UP LOCATION

As a safety precaution, StarMux should be mounted in a standard 19-inch rack that is properly secured and grounded. It is particularly important that the area be dry and free from vibration. It is not advisable to operate the unit in an open deck or in direct sunlight where the unit can get wet or overheated.

6.2.2 INPUT POWER

StarMux operates from a 120 VAC or 240 VAC (47 to 63Hz) power source. For proper operation, the power source must be clean; i.e., continuous and free from electrical noise. High-amplitude, high-frequency noise spikes superimposed on the input power lines may be coupled into the processor electronics. If large enough, the spikes may either degrade the communications link or cause the telemetry system to fail completely indicated by an absence of communication and control.

The AC power cord is terminated in a standard U.S. 3-prong plug. For non-U.S. standard power outlets, you may supply your own power cord.

There is no selection switch for the input AC voltage. As mentioned in the specifications, the input AC voltage can range from 85 VAC to 264 VAC.

6.2.3 SYSTEM SETUP

After StarMux has been properly installed, you can make the necessary connections to your system. Refer to Figure 2-1 at the end of this section for an illustration of a typical system connection.

- Connect the Ethernet cable between the StarMux and host computer. Since the StarMux telemetry system is transparent to the main processing system, it is not necessary to assign an Ethernet address to it for normal operation.
- Connect the underwater cable to the wet end portion of StarMux prior to the top end.
- Connect the dry end of the tow cable to the female circular connector on the top side unit.

- Connect the main power cord to the AC receptacle on the top side unit.
- If applicable, connect the external trigger to the BNC connector on the rear panel. See specifications.

Caution:

Always connect the wet end connector before connecting the cable to the deck (top side) unit to prevent the risk of damage to the system and the unnecessary hazards of handling a live cable.

6.3 OPERATION

6.3.1 GENERAL

The purpose of this section is to provide information on the operation of the StarMux system. EdgeTech reserves the right to change the 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 the EdgeTech sales office.

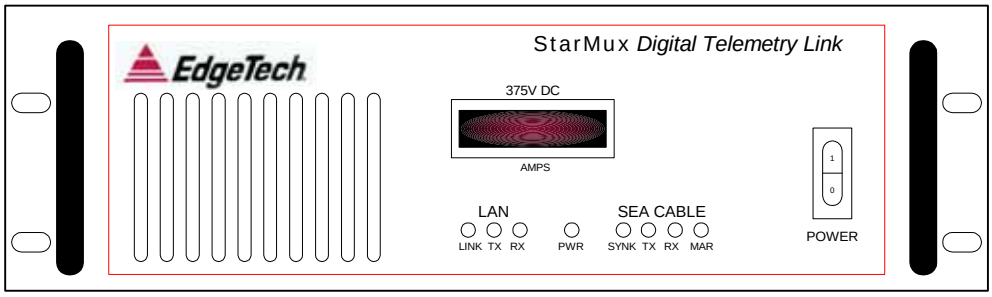
6.3.2 OPERATOR INTERFACE

6.3.2.1 AC Power

The StarMux system is a source of power and telemetry. In general, there are no control features other than the AC power switch on the front panel. Alternately pressing the switch labeled POWER turns StarMux ON and OFF.

6.3.2.2 Front Panel Status

The front panel of the StarMux contains LEDs that indicate power and data transmission status. The following illustration describes the front panel.



6.3.2.2.1 LAN Link LED

This LED should be illuminated solid GREEN when a proper LAN connection exists between the Starmux unit and the Computer running the Discover-4300 software.

If this not ON when both units are powered ON, then either the connection cable is bad, or is not of the right type (**NOTE :** A Direct [not cross-over] type cable is required.)

6.3.2.2.2 LAN Tx LED

This LED will flash ON when network traffic is moving from the Starmux Unit to the Computer.

6.3.2.2.3 LAN Rx LED:

This LED will flash ON when network traffic is moving from the Computer to the Starmux.

6.3.2.2.4 PWR:

This LED will be ON when the Modem unit has good power.

6.3.2.2.5 SEACABLE Sync LED

Solid Green light indicates communication Link between StarMux modem and the remote modem in the towfish is established.

Off : link is down, no remote modem detected.

Flashing: Link has dropped, system is training and attempting to link.

6.3.2.2.6 SEACABLE Tx LED

Flashing: A frame of data is being transmitted on the towcable to the towfish.

Off : link is idle

6.3.2.2.7 SEACABLE Rx LED

Flashing: A frame of data is being received on the towcable from the towfish.

Off : link is idle

6.3.2.2.8 *Understanding the LED sequence*

Under normal conditions, the LAN light should be ON as soon as both the Starmux and the Computer are powered on and the Computer has booted. The SEACABLE SYNC LED first comes up flashing. A link should be established within 1 to 2 minutes, and the LED should remain permanently on.

When a message from the topside processor is sent to the towfish, the RX LED (LAN) flashes, followed by the SEACABLE TX LED. A reply can be seen on the LEDS : The SEACABLE RX LED will flash, followed by the LAN TX LED

6.3.2.2.9 Amp Meter:

This amp meter provides feedback on the cable current. Under normal conditions it should read between 0.2-.0.35 (short cable) and 0.3 to 0.5 Amps on a long cable. This value fluctuates while the computer on the towfish is booting up. If there is a sudden increase in the current (> 1amp) , shut down the StarMux immediately, as this normally indicates water ingress in the cable or connectors.

Caution:

When the system is powered down, it takes the internal power supply 5 seconds thereafter to shut down. It takes an additional **four minutes** for the capacitance bank at the wet end to dissipate its energy after a full charge. After system power down, the user must wait this period before making any cable disconnection or risk of damage and injury can occur.

6.3.2.3 Back Panel

The back panel of the StarMux contains the Ethernet, trigger and the serial connection. The following picture describes the back panel:

6.3.2.3.1 DATA Connection:

This Ethernet port connects the StarMux to the topside processor**. A straight Ethernet cable is used.**

6.3.2.3.2 SERIAL PORT Connection

This may be USED in the 4300FS configuration to provide additional diagnostic information to the user via the Discover | Diagnostic dialog box.

6.3.2.3.3 SYNC Connection

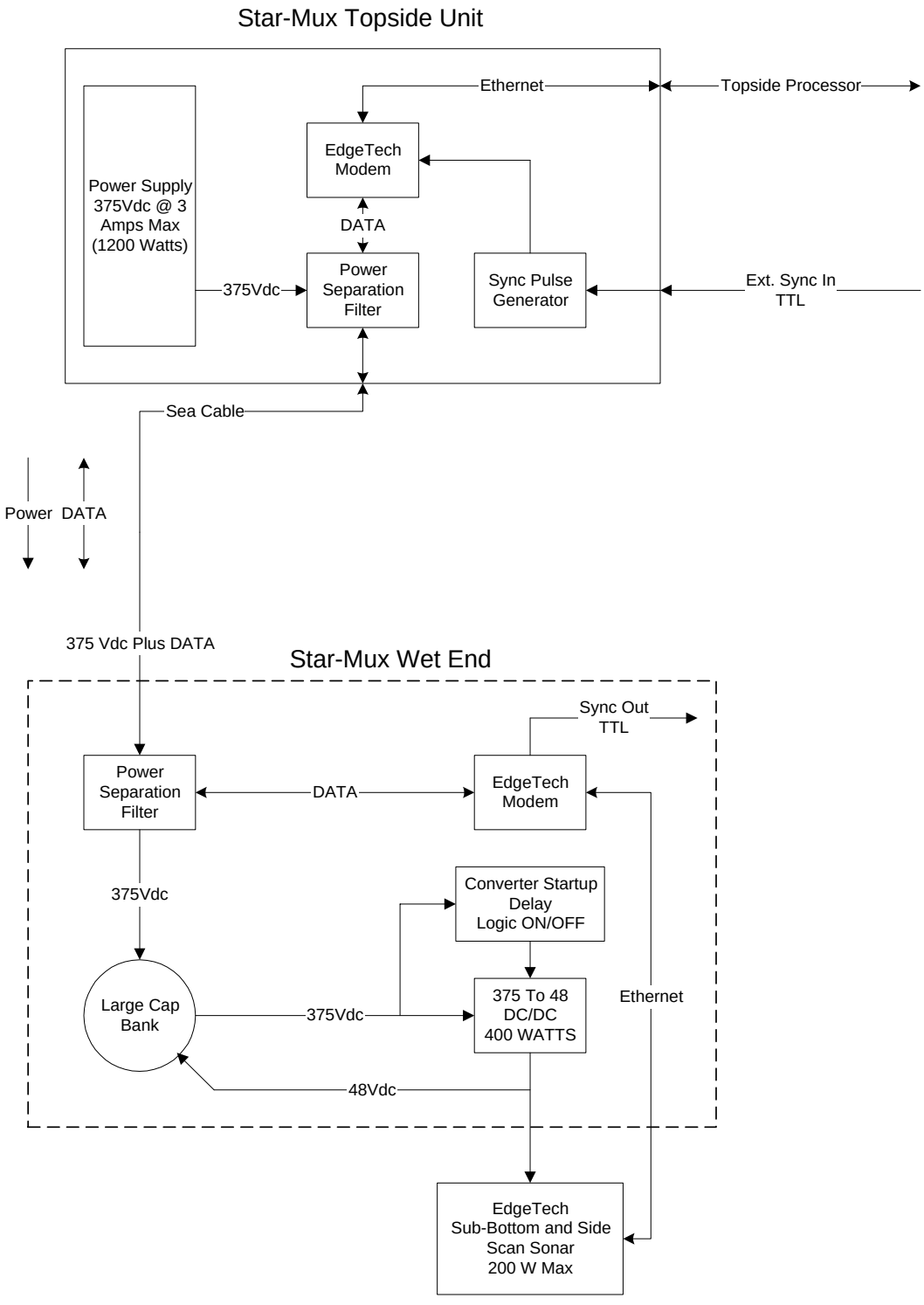
Use this BNC connector to input TTL level trigger

6.3.2.3.4 FSIU and Ext Trigger

Not Used.

6.3.2.3.5 SEA CABLE Connection

This Amphenol connector is used by the main tow cable (deck cable) to provide power and telemetry to the towfish


Star-Mux Topside Unit
Ethernet
Topside Processor
Power Supply
375Vdc @ 3
Amps Max
(1200 Watts)
EdgeTech
Modem
DATA
375Vdc
Power
Separation
Filter
Sync Pulse
Generator
Ext. Sync In
TTL
Sea Cable
Power
DATA
375 Vdc Plus DATA
Star-Mux Wet End
Sync Out
TTL
Power
Separation
Filter
DATA
EdgeTech
Modem
375Vdc
Converter Startup
Delay
Logic ON/OFF
Large Cap
Bank
375Vdc
375 To 48
DC/DC
400 WATTS
Ethernet
48Vdc
EdgeTech
Sub-Bottom and Side
Scan Sonar
200 W Max

6.4 THEORY OF OPERATION

6.4.1 GENERAL

The StarMux system is primarily made up of three subsystems. They are (1) the AC/DC power supply and power distribution, (2) the modem set and (3) the external trigger modem. In addition, there is a Power Separation Filter (PSF), which helps to combine (1) and (2) allowing the use of a single coax cable or single shielded twisted pair cable for simultaneous power and data transmission. In this section, each portion of the StarMux is discussed.

6.4.1.1 Power Distribution

The complete power distribution system of StarMux is shown in the diagram of Figure 4-1. At the topside the main power supply converts 85 to 264 VAC to 375 VDC at 1 Amp (3 Amps for the 1200 Watt option). The high output voltage accounts for any voltage drop that may occur over long cable lengths. This voltage is combined with the Modem I/O data using the PSF. At the wet end, the incoming power is received by a PSF, where data is stripped from the power and fed into the wet end modem. The power out from the PSF is then connected to a 2,350 micro-Farad capacitor bank and a DC to DC converter. The DC to DC converter can accept as little as 185 Volts DC up to 375 Volts DC and convert it to 48 Volts DC as the main processor power. This power source is also received by a capacitor bank of 61,100 micro-Farads. Both capacitor banks are on a single board and help to reduce electronic noise and minimize power supply drop. Using the 48-volt power source, a secondary power source is generated to power the modem and external trigger mode.

6.4.1.2 Modem Set

The Modem set allows for high speed digital communications over long cables using Discrete Multi-Tone (DMT) based rate adaptive technology. The modems are capable of detecting noise and will retrain for optimal performance. This means the modems

will automatically adjust themselves to the cable conditions providing the highest rate possible for the given cable. Because the modems are asymmetrical, the downstream data rates from the host modem will be higher than the upstream rates from the remote modem. The higher rate downstream channel is used to send sonar data from the wet end processor to the topside. Data rates of approximately 5 megabits per second have been achieved over 9,000 meters of 0.68 diameter coax cable. The lower rate upstream channel is used to send commands and set up data to the wet end processor. Upstream data rates are typically 200 to 400 kilobits per second.

6.4.1.3 External Trigger Modem

The external trigger modem consists of a transceiver that uses Frequency Shift Key (FSK) modulation and decoding. The modem uses two separate frequencies enabling one-way simultaneous communication. The input to the modem uses a one-shot multi-vibrator to allow for a minimum pulse width of one milli-second at the input. There is an optional one-shot on the output as well to tailor the received pulse if necessary.

6.4.2 FREQUENTLY ASKED QUESTIONS

1. What are the power requirements?

   The system operates from 110/220 VAC 50/60 Hz. Depending on the requirements, StarMux can provide up to 1200 Watts of power to your system.

2. What are the data cable requirements?

   Almost any high quality coax or shielded twisted pair cable will work with good results. Lower data rates may result if the cable is too long or of poor quality.

3. What is the longest cable I can use?

   The longest cable we recommend is 10 kilometers of UNOLS 0.68 Coax by Rochester Corporation. However, maximum lengths will differ depending on cable type and quality.

4. How does StarMux interface with my system?

   The most common method of interfacing is through the 10 Base-T Ethernet connection. There is an Ethernet connection at each end, which allows StarMux to be transparent to your system. Acting only as a median for power and data.

6.5 TROUBLESHOOTING

6.5.1 SYMPTOM/PROBABLE CAUSE

Topside unit does not power up

- Power cable not connected
- Blown or broken fuse on rear panel

Unable to send/receive external trigger pulse

- Modem power disconnected
- Problem with external trigger circuit

Modem LEDs not on

- Modem power cable inside topside chassis disconnected
- Modem power switch in the OFF position

Modem Sync LED not on or flashing

- Sea cable disconnected
- Wet end unit not getting power
- Power separation filter disconnected
- Problem with modem set
- Excessive noise in the environment or cable too long

Modem communication LED on/off cycle is longer than 3 seconds

- Poor sea cable connection
- Problem with modem set

Unable to send/receive data when modem appears to be functioning

- Ethernet line is disconnected at either end
- Problem with processor system outside of StarMux

6.6 THEORY OF OPERATION

6.6.1 GENERAL

The StarMux system is primarily made up of three subsystems. They are (1) the AC/DC power supply and power distribution, (2) the modem set and (3) the external trigger modem. In addition, there is a Power Separation Filter (PSF), which helps to combine (1) and (2) allowing the use of a single coax cable or single shielded twisted pair cable for simultaneous power and data transmission. In this section, each portion of the StarMux is discussed.

6.6.1.1 Power Distribution

The complete power distribution system of StarMux is shown in the diagram of Figure 4-1. At the topside the main power supply converts 85 to 264 VAC to 375 VDC at 1 Amp (3 Amps for the 1200 Watt option). The high output voltage accounts for any voltage drop that may occur over long cable lengths. This voltage is combined with the Modem I/O data using the PSF. At the wet end, the incoming power is received by a PSF, where data is stripped from the power and fed into the wet end modem. The power out from the PSF is then connected to a 2,350 micro-Farad capacitor bank and a DC to DC converter. The DC to DC converter can accept as little as 185 Volts DC up to 375 Volts DC and convert it to 48 Volts DC as the main processor power. This power source is also received by a capacitor bank of 61,100 micro-Farads. Both capacitor banks are on a single board and help to reduce electronic noise and minimize power supply droop. Using the 48-volt power source, a secondary power source is generated to power the modem and external trigger mode.

Included in the power distribution, is the Auxiliary output power. Two options are available. The first option is raw sea cable voltage ranging from 185 VDC to 375 VDC at 1 Amp. For safety reasons, the output of this voltage source is only enabled

when there is a feedback line in the mating connector. The second option provides a 24 or 48 Volt DC output up to 200 Watts.

6.6.1.2 Modem Set

The Modem set allows for high speed digital communications over long cables using Discrete Multi-Tone (DMT) based rate adaptive technology. The modems are capable of detecting noise and will retrain for optimal performance. This means the modems will automatically adjust themselves to the cable conditions providing the highest rate possible for the given cable. Because the modems are asymmetrical, the downstream data rates from the host modem will be higher than the upstream rates from the remote modem. The higher rate downstream channel is used to send sonar data from the wet end processor to the topside. Data rates of approximately 5 megabits per second have achieved over 9,000 meters of 0.68 diameter coax cable. The lower rate upstream channel is used to send commands and set up data to the wet end processor. Upstream data rates are typically 200 to 400 kilobits per second.

6.6.1.3 External Trigger Modem

The external trigger modem consists of a transceiver that uses Frequency Shift Key (FSK) modulation and decoding. The modem uses four separate frequencies enabling two-way simultaneous communication. The input to the modem uses a one-shot multi-vibrator to allow for a minimum pulse width of one milli-second at the input. There is an optional one-shot on the output as well to tailor the received pulse if necessary.

6.6.2 FREQUENTLY ASKED QUESTIONS

5. What are the power requirements?
   The system operates from 110/220 VAC 50/60 Hz. Depending on the requirements, StarMux can provide up to 1200 Watts of power to your system.
6. What are the data cable requirements?
   Almost any high quality coax or shielded twisted pair cable will work with good results. Lower data rates may result if the cable is too long or of poor quality.

7. What is the longest cable I can use?

   The longest cable we recommend is 10 kilometers of UNOLS 0.68 Coax by Rochester Corporation. However, maximum lengths will differ depending on cable type and quality.

8. How does StarMux interface with my system?

   The most common method of interfacing is through the 10 Base-T Ethernet connection. There is an Ethernet connection at each end, which allows StarMux to be transparent to your system. Acting only as a median for power and data.

6.7 TROUBLESHOOTING

6.7.1 SYMPTOM/PROBABLE CAUSE

Topside unit does not power up

- Power cable not connected
- Blown or broken fuse on rear panel

Unable to send/receive external trigger pulse

- Modem power disconnected
- Problem with external trigger circuit

Modem power LED not on

- Modem power cable inside topside chassis disconnected
- Modem power switch in the OFF position

Modem communication LED not on

- Sea cable disconnected
- Wet end unit not getting power
- Power separation filter disconnected
- Problem with modem set

Modem communication LED on/off cycle is longer than 3 seconds

- Poor sea cable connection
- Problem with modem set

Unable to send/receive data when modem appears to be functioning

- Ethernet line is disconnected at either end
- Problem with processor system outside of StarMux

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 3100, 3200-XS, 4100, 4200-FS and 4300 MP-X systems to the plant in West Wareham, MA. The system models 2000-C, 2200-M, 2200-S, 2400-C, 3300-HM, 4400-SAS and 4500-DF are supported from the plan in Boca Raton, FL.

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 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 application.

To contact technical support personnel at EdgeTech.

4 Little Brook Rd.
West Wareham, MA. 02576
Tel: 508 291-0057
Fax: 508 291-2491
After Hours: 508 291-9722
Email: sales@edgetech.com

1141 Holland Drive, Suite 1
Boca Raton, FL 33487
Tel: 561 995-7767
Fax: 561 995-7761
After Hours: 561 995-7606

7.2 RETURNED MATERIAL AUTHORIZATION

All Returned Material

It is necessary to obtain a Returned Material Authorization (RMA) number prior to returning any equipment to EdgeTech. This is to assist EdgeTech to recognize 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 issued RMA number on all documents and correspondence as well.

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

Outside Continental United States

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 repairs it has to 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.