Sea Scan® Survey

V2.5.0

Easy-to-use PC-based software for side-scan SONAR
data collection, processing, viewing, and analysis for use
with Sea Scan HDS SONAR Systems

Marine Sonic Technology, Ltd.

Part Number   SSS-2HDSSVY-0003

This product was designed and developed by a team of engineers at Marine Sonic Technology, Ltd.

Technical Support

For technical support call (804) 693-9602 or visit our web site at http://www.marinesonic.com.

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Introduction

This Manual

Welcome to Sea Scan® Survey software manual, Version 2.4.0. This manual introduces new users to the 2010 version of the Sea Scan® Survey *SONAR*[151] collection and processing program. Sea Scan® Survey, Version 2.4.0, is part of the Marine Sonic Technology, Ltd. side-scan SONAR system, Sea Scan® High-Definition *SONAR* (HDS[151]). The user is assumed to have little or no experience with side-scan *SONAR* systems and software.

The material in this manual is organized into discrete sections for easy acquisition of the basics about how to navigate through the most common screens or collect data quickly. There is even a chapter devoted to *Frequently Asked Questions*[109] (FAQ[151]). Those wishing to go beyond the basics will find
in-depth explanations[114] in the latter part of the manual.

A reference guide to abbreviations, acronyms, and symbols commonly used in SONAR discussions is in the Glossary[151]. As an added feature, look for italicized words in the text, as these terms are defined in the Glossary.

Instructions on assembly, maintenance, or repair of Sea Scan® Survey *side-scan SONAR*[151] systems can be found in separate Marine Sonic Technology, Ltd. maintenance and operation manuals.

The Sections of This Manual

This manual is organized into the following sections:

Tip | **Italicized words in text are defined in the Glossary.**

Understanding SONAR

SONAR is a coined word derived from the phrase, <u>SO</u>und <u>N</u>avigation <u>A</u>nd <u>R</u>anging. *SONAR*[151] generally refers to the system that uses acoustic (sound) energy transmitted through water. At the heart of that system is the *transducer*[151], the device that converts electrical energy to sound and vice versa and is responsible for generating the sound pulse. That same *transducer* is also used to receive the echo that "bounces" off objects encountered along its path. Thus, *SONAR* is a system that determines the position of unseen underwater objects by transmitting sound waves and measuring the time it takes for their echo to return after hitting the object.

Side-Scan Systems

Because of their innate flexibility, side-scan systems such as Sea Scan® *HDS* can be used in many applications, some of which involve highly sophisticated remotely operated vehicles (ROVs[151]) or autonomous underwater vehicles (AUVs[151]). But the most common side-scan systems are towed behind a surface vessel and comprise three elements:

1. the control unit containing the software

2. the *towfish*[151] with *transducers* mounted on each side

3. the cable that connects the *towfish* to the surface vessel that follows a prescribed track or course through the water

The images they create can be used for geologic studies, locating sunken objects, or ensuring the waterway is clear and safe for shipping.

The *transducer* assembly is towed on a steady course and at a constant depth through the water. As it is towed, the assembly emits sound pulses at precise and regulated intervals. The system receives the returning echoes from the *water column*[151] and seafloor shortly after emitting a pulse. This continues for a short period until the next pulse is transmitted, thus beginning a new cycle. The returning echoes from one pulse are displayed on the *SONAR* window as one single line, with dark and light portions of that line representing strong or weak echoes relative to time. The stronger the *SONAR*'s returning signal, the brighter the mark that appears on the *SONAR* window or *waterfall*[151]. The resulting

accumulated lines then form a coherent picture of the seafloor.

Each of the two *transducers* provides information unique to their particular side of the *towfish*. In between them is the boat's track immediately below the *towfish*. That center display or *water column* loosely relates to the boat's track. It communicates details about objects encountered before the first bottom return and can include things such as surface returns, debris, fish, and objects protruding from the sea floor.

The quality of the *SONAR* data will depend on operator management and the data-gathering process, which involves vessel course, tow speed, *towfish* altitude above the bottom, sea conditions, and range settings. For example, a higher range setting yields a larger data sample with more of the seafloor displayed; but the data will not have as high a resolution.

Figure 1 provides an indication of the objects a towfish can reveal on a sea floor. Figures 2–4 typify actual objects observed with the Sea Scan® Survey system.
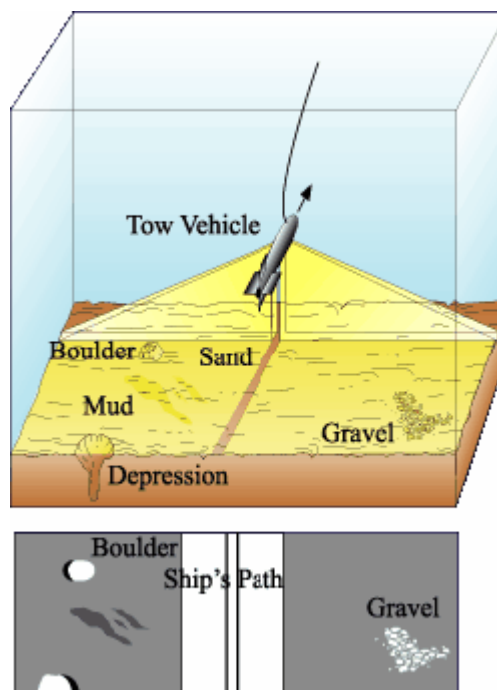
- **Figure 1. Side-scan operation reveals features or objects on the sea floor**
  (figure courtesy of the USGS)
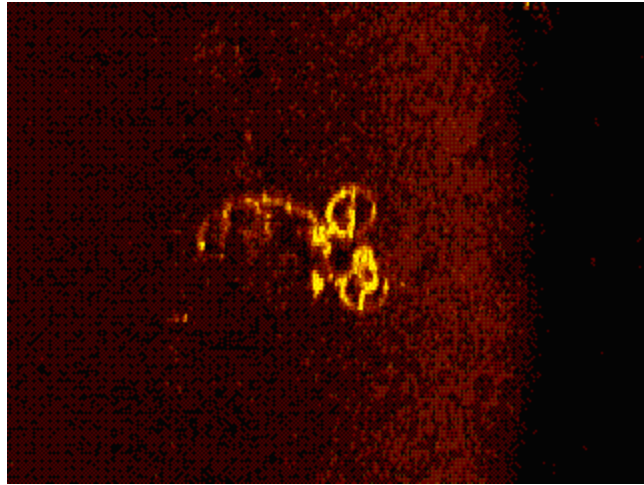
- **Figure 2. 600-kHz image of a 10-speed bicycle (identified with Sea Scan® PC software)**
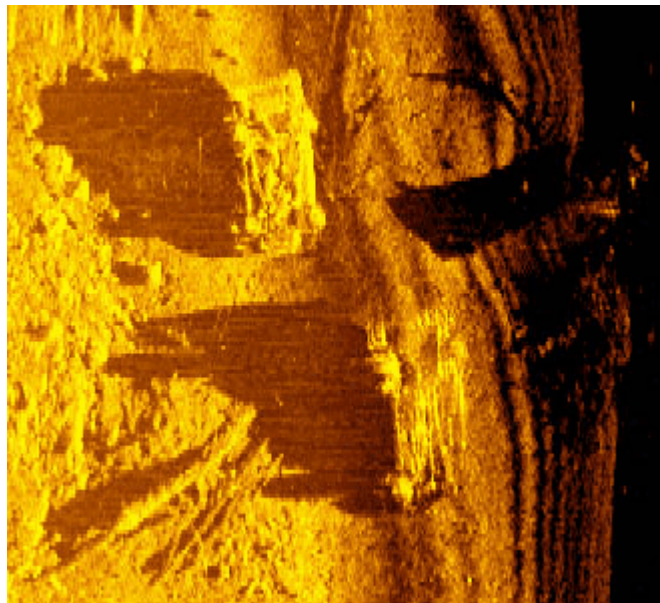
- **Figure 3. Two upside-down submerged cars (identified with Sea Scan® PC software)**
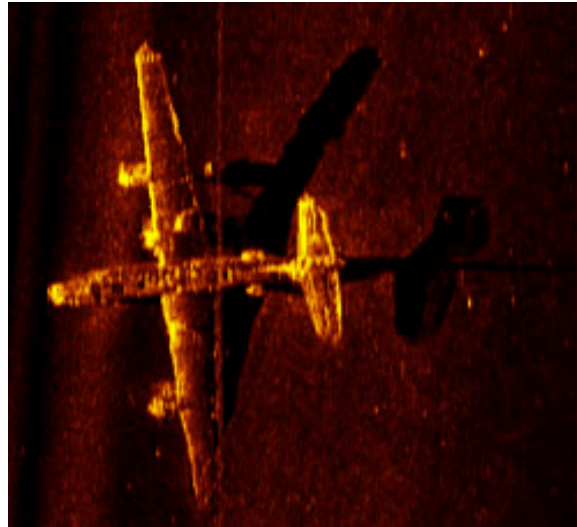
- **Figure 4. Navy PB4Y-2 Privateer Aircraft (identified with Sea Scan® PC software)**

Sea Scan Survey Software

Sea Scan® Survey represents the latest in sophisticated software development. It is part of the Sea Scan® *HDS* system developed by Marine Sonic Technology, Ltd. It is easy to use and is compatible with Microsoft Windows™ operating systems. In fact, the software has been designed so that the Sea Scan® Survey windows and buttons have the same appearance and practical use as those in typical Microsoft programs.

Sea Scan® Survey is specialized for use with Marine Sonic Technology, Ltd. high-resolution side-scan systems. This software package is distinctive for use in search-and-recovery missions. Sea Scan® Survey users include local police forces, the U.S. Coast Guard, the U.S. Navy, the Department of Homeland Security, and the U.S. military.

Figure 5 graphically shows the components that make up a Sea Scan® Survey system.
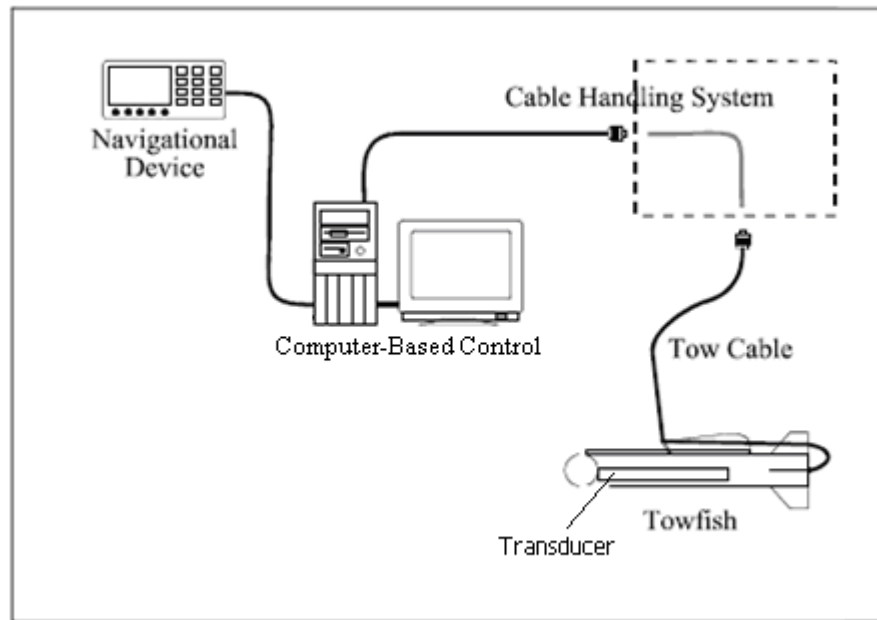
• **Figure 5. The basic components of a Sea Scan® Survey system**

The operator can view wide tracts of the seafloor because the *transducers ping* along the *swath* width and the software records the strength of the echoes from the sea bottom. The *towfish* is towed just above the seafloor bottom. The *transducers* periodically emit narrowly focused beams of sound perpendicular to the path of motion. The sound pulses pass through the water but are reflected from the seafloor and objects, such as wreck sites that sit on the seafloor. The computer records the echo signal strengths as they return and draws the entire *SONAR* record line on the screen. Thus, an image is built, line by line, as the *SONAR* record line from each ping returns and is drawn on the screen.

Overview of the Sea Scan® Survey Software

System Requirements

Sea Scan Survey requires the following capabilities.

Intel-based Windows© Operating System	XP, Vista, Windows 7
Hard drive space	100 _MB_ 151 + data storage
Available _RAM_ 151	512 _MB_ minimum; 1 _GB_ 151 recommended
Processor Speed	1.6 _GHz_ 151 or better
Other Features	Ethernet or _USB_ 151 2.0 port
Screen Resolution	1024 x 768 minimum or higher

Loading the Software

> _**Tip**_ **All instructions in this manual assume a right-handed user and left clicks unless otherwise indicated.**

The Sea Scan® Survey application is as easy to load onto your personal computer (_PC_ 151) or laptop as any Windows-based program.

> _**Tip**_ **The symbols < > surrounding a word in bold throughout this document indicate an action you can take by clicking on that word or symbol**

1. Insert the Sea Scan Survey compact disk (_CD_ 151) into the _CD_ drawer.

2. After the _CD_ has loaded, go to <**My Computer**>.

3. Move your mouse pointer to the drive containing the _CD._

4. Double click the left mouse button to show the contents of the _CD._

5. Place the mouse pointer over the installation program icon and double click the left mouse button. The Setup Wizard will open.

6. Click <**Next**> with the left mouse button.

7. A window will open regarding the License Agreement. Read the agreement carefully. If you accept its terms, move your mouse pointer to the button next to the statement, <**I agree**> at the bottom left of the open window. Click on that button.

8. A window will open that permits you to install the components you want and to deselect those you don't. Simply click <**Next**> to accept the components that are selected.

9. A window will open in which you may choose an alternate location for installing the program. Allow Sea Scan Survey to place the files where indicated or follow the instructions on the screen to designate a different location. Then click <**Install**> at the button at the bottom of the box.

10. A window will open asking you to wait for the program to be installed. It requires no action on your part.

11. Click <**OK**> to exit the Wizard when a box opens indicating that the FTDI CDI Drivers have been installed.

12. Click <**Finish**> when the final setup screen opens.

The Sea Scan Survey icon will now be available on your desktop as a shortcut for opening the program. Double click with the left mouse button on the icon to start the program.

The Help Files

The Sea Scan Survey side-scan *SONAR* software makes it easy for novices to learn how to manipulate the screens and begin to collect data almost immediately. To quicken the learning process, Marine Sonic Technology, Ltd. has developed a **Help** ⌐37⌐ file that describes every function and key. Thus, a fairly comprehensive "virtual" software manual for Sea Scan Survey resides on your computer as soon as you successfully load the software.
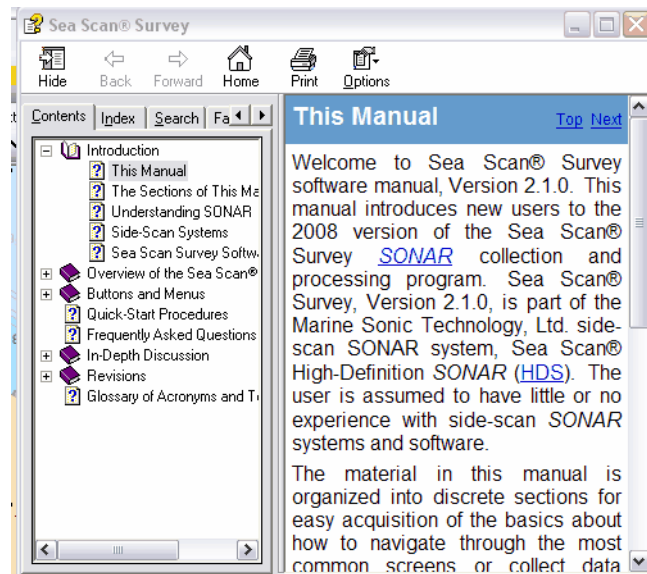
In addition, the buttons identify themselves for you, as shown in the figure that follows.
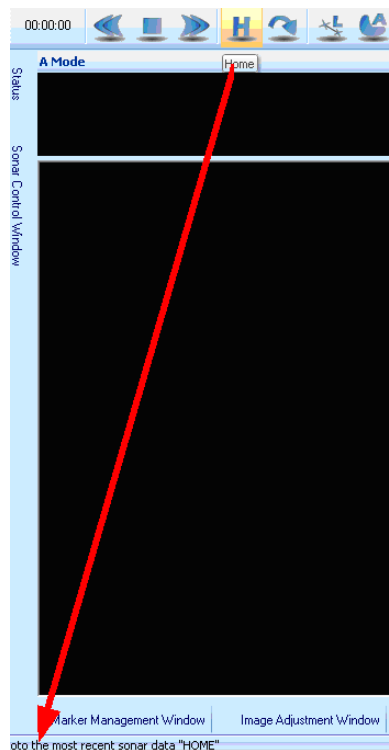
Buttons and Menus

Introduction to Each Window

Before you begin to run the Sea Scan® Survey software itself, get to know the features that are available to you. This chapter introduces you to all the basic buttons, menus, and screens that you will use as you collect and analyze *SONAR* data. In the next chapter, *Quick Start: Procedures* 94, you will learn how to run the data collection application and gather data during a *SONAR* run.

Start Sea Scan Survey by double clicking on the Sea Scan Survey icon if it resides on your desktop. Another approach is to click on <**Start**> at the bottom left of your computer screen. Then, click on <**All Programs**>. Select <**Marine Sonic Technology, Ltd**> from among the list of programs on your computer. You will see the name listed to the right. Click on the name, <**Sea Scan Survey**>.

The software will start and you will see the introductory window, which presents the company logo, version number, as well as contact information.
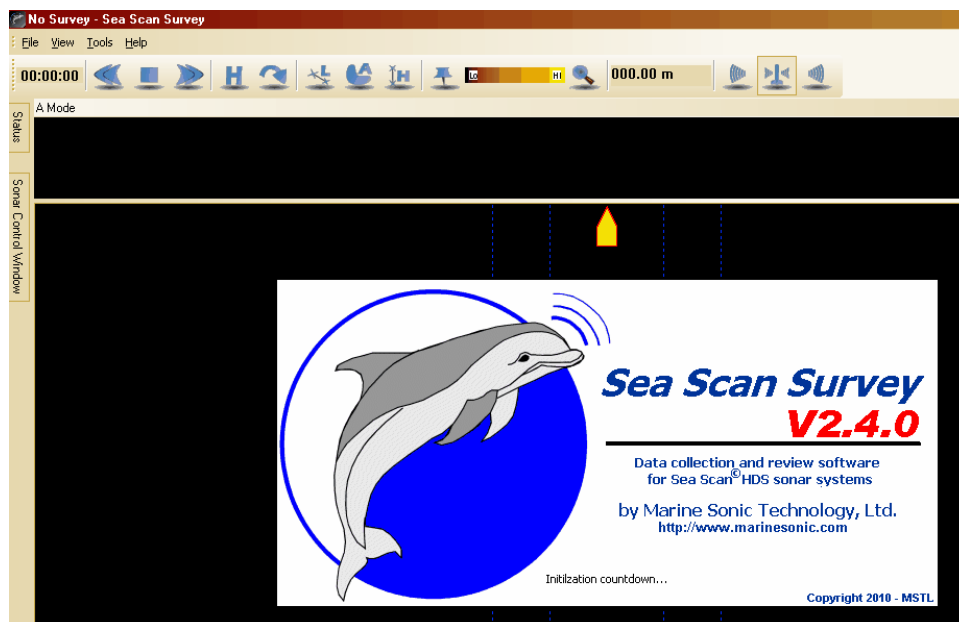
After the application has fully loaded, the workspace window will open. The remainder of this chapter presents an overview of each item you will see there, along with an explanation about the screens, buttons, and menus.

Caption Bar

The caption bar at the top left of the window displays the name of the software and the current open survey or data file.

Depressor vane test.xvy [continue survey mode] - Sea Scan Survey
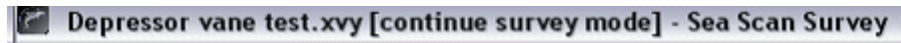
If the survey fails to open for some reason, a message will display in the caption bar in place of the name of the survey. At the top right of this caption bar, you will see the usual Minimize <−>, Expand <▱>, and Close <⊠> Windows-based control buttons.

At the left of the caption bar is the system menu. Access this menu by clicking on the Marine Sonic Technology, Ltd. dolphin in the far left top corner. You will now see a pull-down menu that offers the usual Windows-based choices.
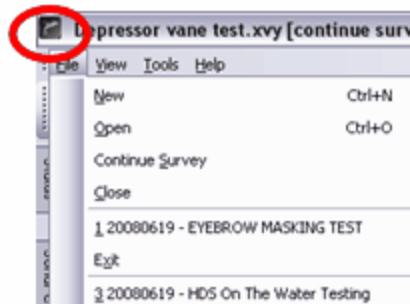
Status Bar

The **Status** bar runs along the bottom of the workspace window [13] and presents information at the far left about each button in the *waterfall* toolbar and in the main menu dropdown lists (shown here defining the Color Palette [70] button), the range and *transducer* settings, the Global Positioning System (*GPS* [151]) status (quality of the incoming signal), the *waterfall* speed and scroll direction (here stopped), total amount of time in a survey or data file, and the *SONAR* status.

Tool Definitions

Jump to a particular time.

The leftmost portion of the Status bar at the bottom defines any waterfall tool [21] you point to with the mouse pointer. It also gives a brief explanation of any item listed in the main menu dropdown lists (here, explaining the Jump To button).

Waterfall Scroll Speed and Direction

STOPPED

The Status bar shows how fast the waterfall is scrolling (1x to 30x) and in what direction; otherwise, it will indicate that the waterfall is stopped. The waterfall automatically scrolls at 1x forward when a file is opened.

The waterfall speed shown in the Status bar is relative, not absolute.

Total Time

01:13:43

The Status bar shows the total amount of survey or data time in the buffers in hours:minutes:seconds (from left to right).

SONAR Status

Sonar Connected

The *SONAR* **Status** bar portion of the Status bar is at the right end. It will have a **green** background and also indicate in words that the *SONAR* is connected. The background will be **red** and the words will indicate that the *SONAR* is off when it is not connected.

Sonar NOT Connected

SONAR Information

65.0 ft @ 150/150

The ***SONAR*** **Information** bar portion presents the *range*[151] and *frequency* of the transducers.

GPS Status

172.2 ft

The **GPS Status** bar portion shows the estimated accuracy. If under 50 feet accuracy, the background turns **green**, above 50 feet, the background turns **Yellow**; if the background turns **red**, the GPS data is insufficient, invalid, or lost.

Work Area

The work area is your palette for acquiring, evaluating, and marking incoming *towfish* data. As in the sample below, the work area also shows the echo information that creates a picture of the seafloor.
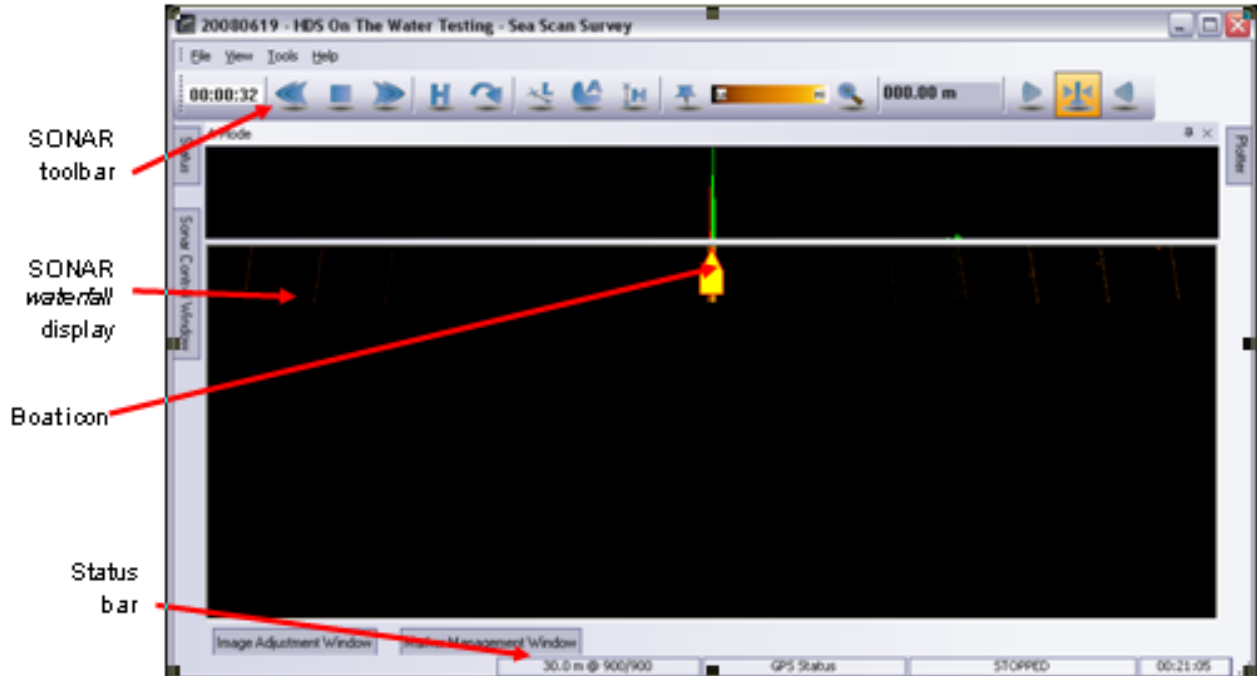
Main Menu Bar

File

As is standard with any Windows-based program, the **File** pull-down menu allows you to create a <**New**> file, <**Open**> an existing one, <**Continue Survey**>, or <**Exit**>.

Tip	**Use the <Alt> button to access the menu. Then the corresponding underlined letter can be pressed on the keyboard.**
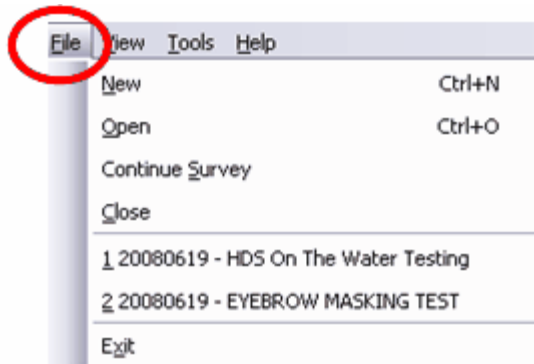
New

Opens the **Begin a New Survey** Wizard. The Wizard asks for a survey folder (where you want the information stored), name for the file, a brief description (so you can discriminate in the future between multiple survey files), and the filename prefix. Sea Scan Survey requires this detail because you are creating a "filing cabinet" for all the data files, the survey file, *marker* snapshots, and the *waypoint* data that you collect during a survey.
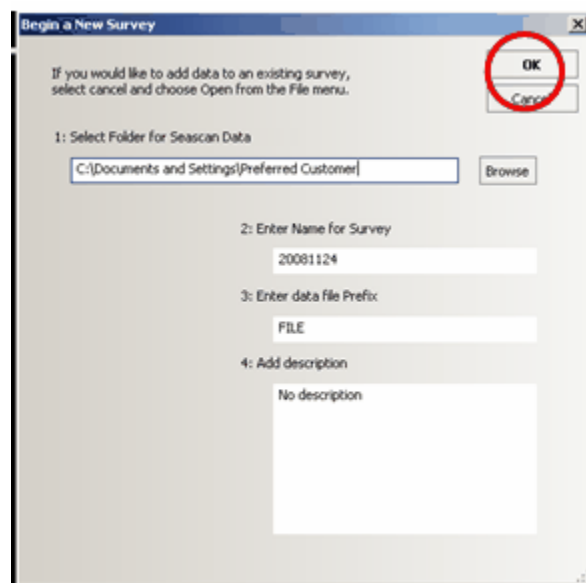
The settings in the window are the default entries that the software has automatically assigned. To change the default survey location, click on the < **Browse**> button (see above figure). To change the survey name and/or data file prefix or to add a description, replace the information in the white boxes with your own designations.

An alternative to that approach is to click on the <**Tools**> button. At the pull-down menu, select <**Start a New Survey**>.
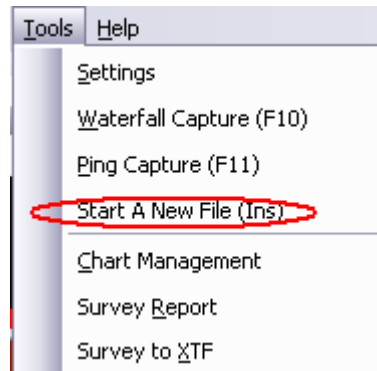
The window will open and the screen, "**Begin a New Survey**," will appear.

Open

Two choices are immediately presented to you when you click on the **Open** command: you can choose to open a **Survey** or a **File**.

Opening a Survey

When you open a **Survey**, you are actually retrieving a filing cabinet full of files that include all the *marker*[151]s and *waypoint*[151]s you inserted during data collection. These files are set up in such a way that the software can move seamlessly through the large amounts of data it has collected. Thus, all the data in that **Survey** filing cabinet can be accessed without your having to look through individual files.

Tip | **When you wish to view a marker or waypoint that you inserted during a search, the software automatically sifts through all the files it has stored in that Survey "filing cabinet." The software then shows that location in the Navigation Plotter window.**

When you open a **Survey**, the software automatically starts *buffering*[151] (loading) the first file in that survey into memory. Survey files end in the extension, *.xvy*[151]. You cannot add files to the opened survey.

Tip | **The only way to append new files to an existing survey is to select Continue Survey at the File dropdown list.**

Opening a File

When you open a **File**, which is one file that contains data only, the software automatically starts loading the file. The *SONAR* Data Stream files end in the extension, *.sds* |151|. In this mode, you cannot create markers or waypoints. However, you can select and open multiple files. As you select the files to open, the software creates a temporary survey; this temporary survey will be deleted when you close the files or end the program.

Continue Survey

When you open an existing **Survey** file to continue adding data to it, the software will create a new data file and will be ready to record the new information. Then, as the new information is recorded, it will be appended to the end of the pre-existing data in that opened survey file.

Tip   **You cannot accidentally overwrite a survey. A query box always pops up and asks for confirmation before overwriting.**

Most Recently Used Survey/Files List

This listing appears beneath the <**C**ontinue **Survey**> option on the <**File**> pull-down menu. It shows your most recently opened or created surveys. Left click on one of these in the list and the software will immediately open the survey for you.

Exit

This option immediately exits the program.

Tip   **Sea Scan Survey constantly saves data to its files, so there is no need to click on <Save> before exiting the program.**

View

The **View** pull-down menu shows the windows that you can open as you work. These windows can then be docked and/or hidden when not needed (see also *Docking Semantics* |39|). Simply click on the window you wish to open. A check mark will remain there as long as the checked window is open.
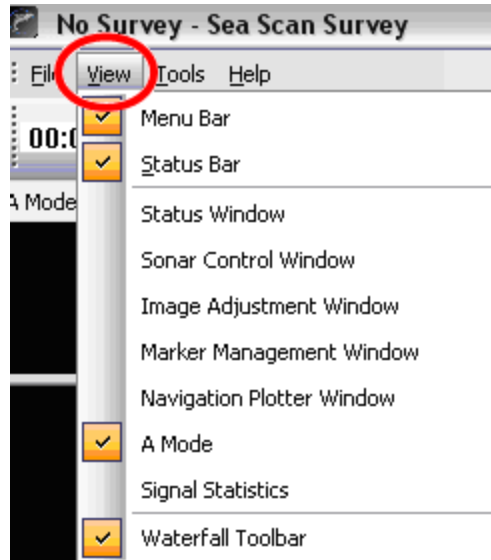
Menu Bar
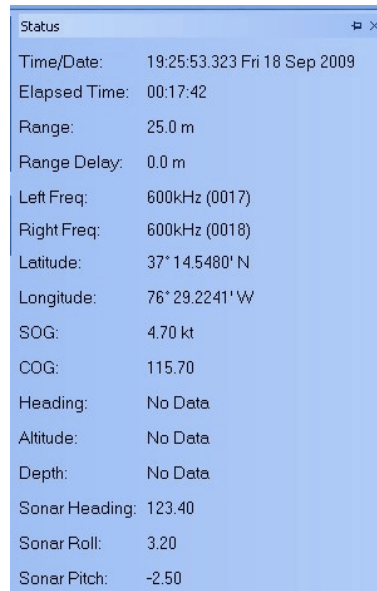
Click this option in the <**View**> pull-down menu to show or hide the Main Menu bar. The default placement of the **Menu** bar is normally at the top of the Sea Scan Survey window.

Status Bar

Click this option in the <**View**> pull-down menu to show or hide the Status bar. The **Status** bar is in a fixed location at the bottom of the Sea Scan Survey window and cannot be moved.

Status Window

Click this option in the <**View**> pull-down menu to show or hide the Status window. The default placement of the Status window is up to you. (See the discussion on *Docking Semantics* ⌐39¬ for how to adjust window placement.)

SONAR Control Window

Click this option in the <**View**> pull-down menu to show or hide the *SONAR* **Control Window**. The default placement of the *SONAR* **Control Window** is up to you. (See the discussion on *Docking* ⌐39¬ *Semantics* ⌐39¬ for how to adjust window placement.)

Image Adjustment Window
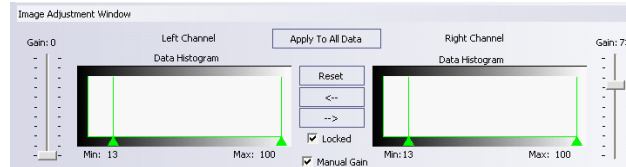
Click this option in the <**View**> pull-down menu to show or hide the **Image Adjustment Window**. The default placement of the **Image Adjustment Window** is up to you. (See the discussion on *Docking Semantics*⌐39⌐ for how to adjust window placement.)

Marker Management Window

Click this option in the <**View**> pull-down menu to show or hide the *Marker* **Management Window**. The default placement of the *Marker* **Management Window** is up to you. (See the discussion on *Docking Semantics*⌐39⌐ for how to adjust window placement.)

Navigation Plotter Window
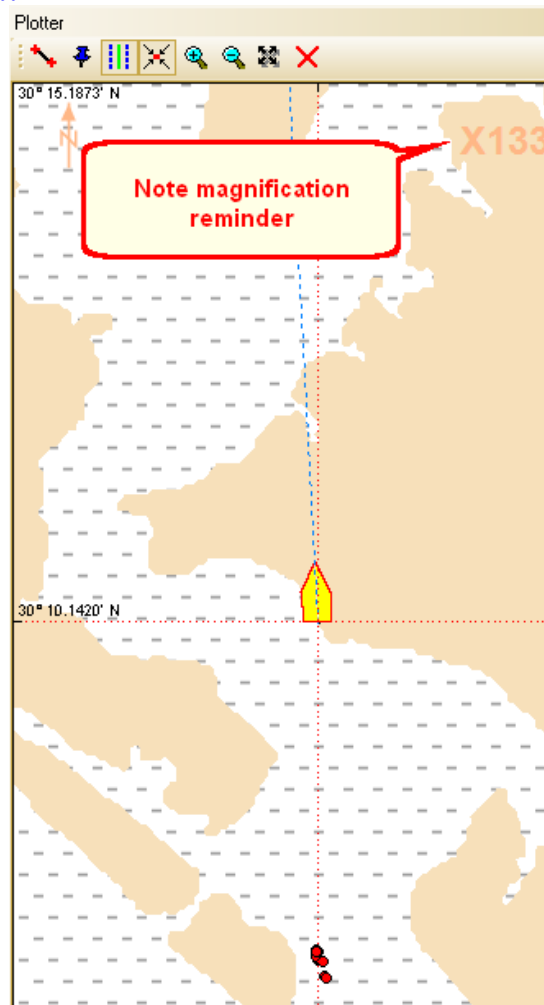
Click this option in the <**View**> pull-down menu to show or hide the **Navigation Plotter Window**. The default placement of the **Navigation Plotter Window** is up to you. (See the discussion on *Docking Semantics* 39 for how to adjust window placement.)

A-Mode Window

Click this option in the <**View**> pull-down menu to show or hide the **A-Mode Window**. The default placement of the **A-Mode Window** is up to you. (See the discussion on *Docking Semantics* 39 for how to adjust window placement.)

Signal Statistics Window
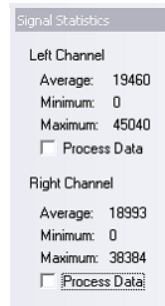
Click this option in the <**View**> pull-down menu to show or hide the ***Signal Statistics*** [151] **Window**. The default placement of the ***Signal Statistic*s Window** is up to you. (See the discussion on ***Docking Semantics*** [39] for how to adjust window placement.)

Waterfall Toolbar

Click this option in the <**View**> pull-down menu to show or hide the *Waterfall* toolbar.

Tools

The **Tools** pull-down menu provides access to the settings you can adjust when starting a search or any time during the data capture process. Simply click the option you wish to open.
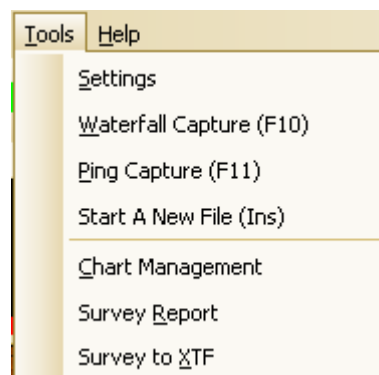
Settings

Click **Settings** and a window opens. This window provides you access to the settings you can adjust as you collect *SONAR* data. At each of the seven categories of **Waterfall**, *SONAR*, **Navigation & Fathometer**, **Units**, **Survey**

Settings, **Marker Labels**, or **Application**, you will see a **<−>** (indicating that all the pages under that category are open, as shown below for the **Waterfall** folder); or you will see a **<+>**, indicating that more pages are available under that category, as shown in the **SONAR** and **Navigation & Fathometer** pages. Click on the **<+>** to open that category. Then, click on any of those headings in the list to view the relevant page.
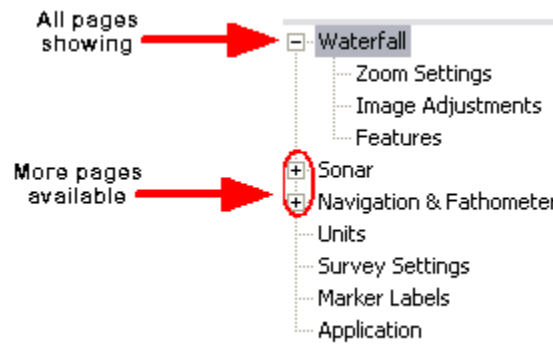
Waterfall Capture

Click on **Tools**, then **Waterfall Capture** and the **Save Screen Capture** window opens. At this window, you can take an instant snapshot of the current screen and save the image as a bitmap (*bmp*⌐151⌐) image file. You then choose the file name and the location where you wish to save the image file. Click on **<Save>** to save the image file. If you do not wish to save the image file, click on the **<Cancel>** button.

Tip | **You can press the F-10 key at any time to pull up this same screen.**
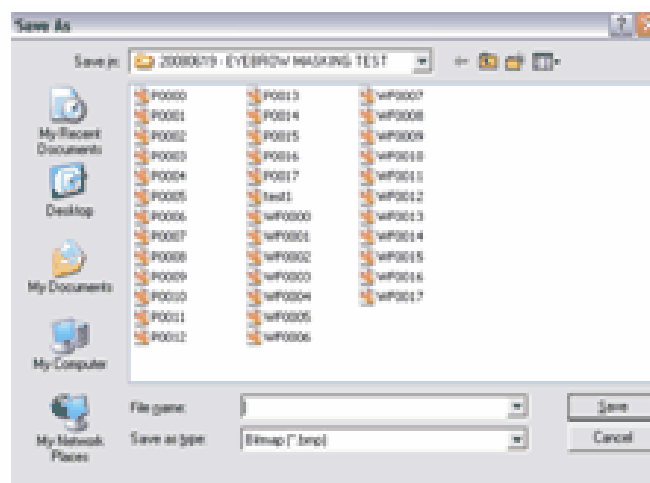
Ping Capture

Click on **Tools**, then *Ping* **Capture**, and the **Save** *Ping* **Capture** window opens. If you would like to save the raw data from a *ping* [151] that you are pointing to in the *waterfall* display window, you can do so by saving this *ping* capture as a comma-separated value (*csv* [151]) text file.

Tip | **You can press the F-11 key at any time to pull up this same screen.**
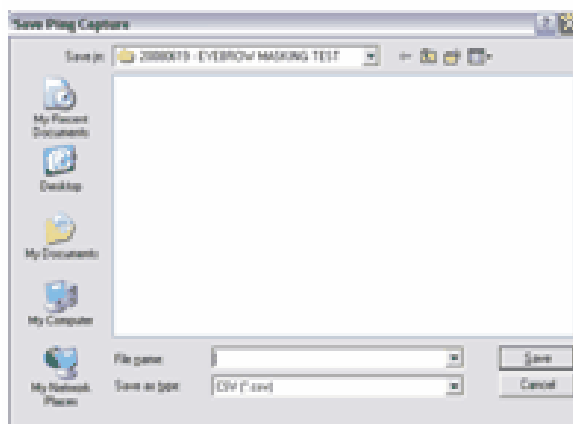
Start a New File (Ins)
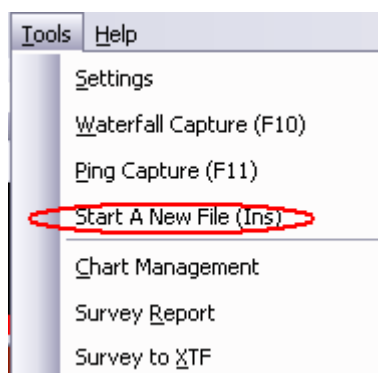
This shortcut option allows you to start a new file from the <**Tools**> pull-down menu. This becomes convenient when doing surveys and you want to ensure that a survey line is in one file.

Chart Management

Click on **Tools**, then select this item to run the Chart Management software for the Electronic Navigation Charts.
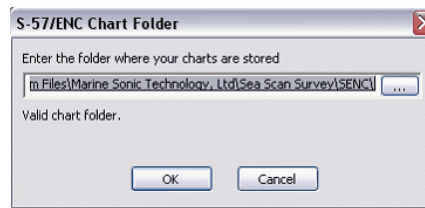
Sea Scan Survey V2.4.0 contains a new version of the S-57 Electronic Navigation Chart (*ENC)*|151| charting code.   This new version is incompatible with any previously installed S-57 chart databases in Sea Scan Survey. Therefore, if you have V2.3.0 or earlier, uninstall Sea Scan Survey and the USA Charts. A new USA coastline installer now addresses this issue.

Sea Scan Survey uses two separate charting folders:

1.   USENC for the unlicensed/free S-57 charts

2.   LSENC folder for the licensed/purchased S-57 ENC charts.

The details on chart management for each chart type are listed below.

Unlicensed/Free (NOAA USA Coast Line) S-57 charts

To use the unlicensed/free S-57 charts in Sea Scan Survey, you must install the " *Install Sea Scan Survey USA Charts.exe*" installation package.   This will create a base chart database, add the World Vector Shoreline (WVS|151|) data, and optionally install precompiled National Oceanic and Atmospheric Administration (NOAA)|151| USA coastline charts. If you install the NOAA USA coastline charts using the installer and do not need to update, remove, or change the charts, then you do not have to do anything else.

To update or remove charts from the database, Sea Scan Survey uses the USENC folder for your chart database.   To select charts for use with Sea Scan Survey, visit NOAA's ENC chart downloader web site: *http://www.charts.noaa.gov/ENCs/ENCs.shtml.*

Once there, choose the particular set of charts you would like to use.

Tip | **Marine Sonic Technology Ltd. offers the NOAA unlicensed/free charts in the complete installation package and updates are issued at least once a year.**

If you do not require the full set of charts, then choose a set organized by Coast Guard district, by state, or by region. By installing only the charts you need, you will reduce the amount of disk space needed and possibly speed up the chart-drawing process in Sea Scan Survey.

No license is required for these, so the only files you need are the charts files themselves.

Tip

> **When you download the charts keep them as** *.zip* **files. Do not extract them.**

To install charts into the Sea Scan Survey charting database,

1. Start Sea Scan Survey and choose Chart Management from the Tools menu. This will open the Cell Manager program. The cell manager starts by asking the location of the chart database. This is typically *C:\Program Files\Marine Sonic Technology, Ltd\Sea Scan Survey\USENC* for the unlicensed/free charts. You can browse to the folder using the [...] button that is at the side.
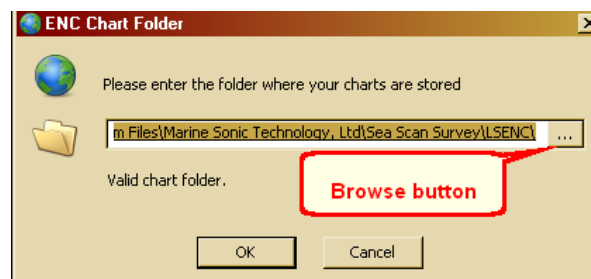
2. When you have entered the correct folder, the window will say "Valid chart folder," as shown in the above figure. Click the *<OK>* button, and then click the <Install Exchange Set> button. This will open the ENC Chart Management Window.
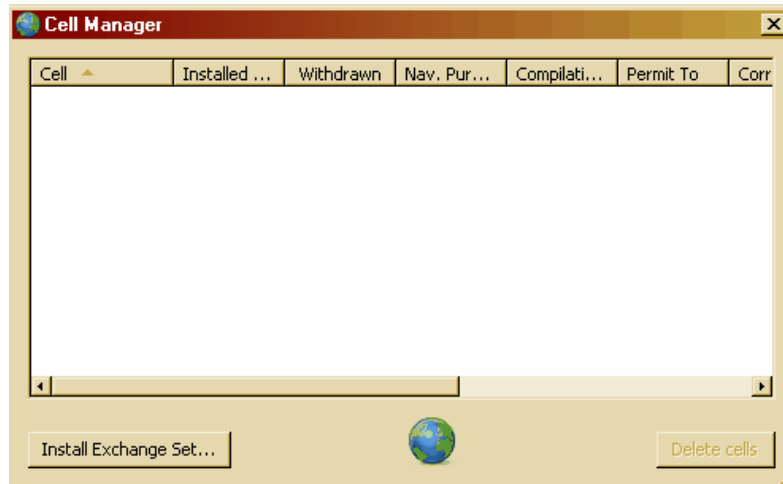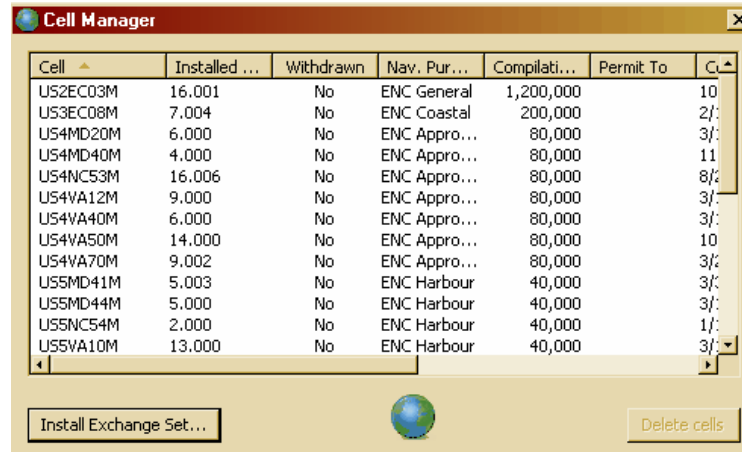
3. Choose the <Path to the compressed Exchange Set> button.   Browse to the location where your charts are stored using the [...] button (see above). This is the location where you downloaded the charts. You can browse to the location by using the [...] button.   If it is a valid zip file containing a chart set, the name of the chart set will appear below the path. If it is not valid, the program will say "Not a zip archive containing an Exchange Set" below the path. Click the <Next> button.
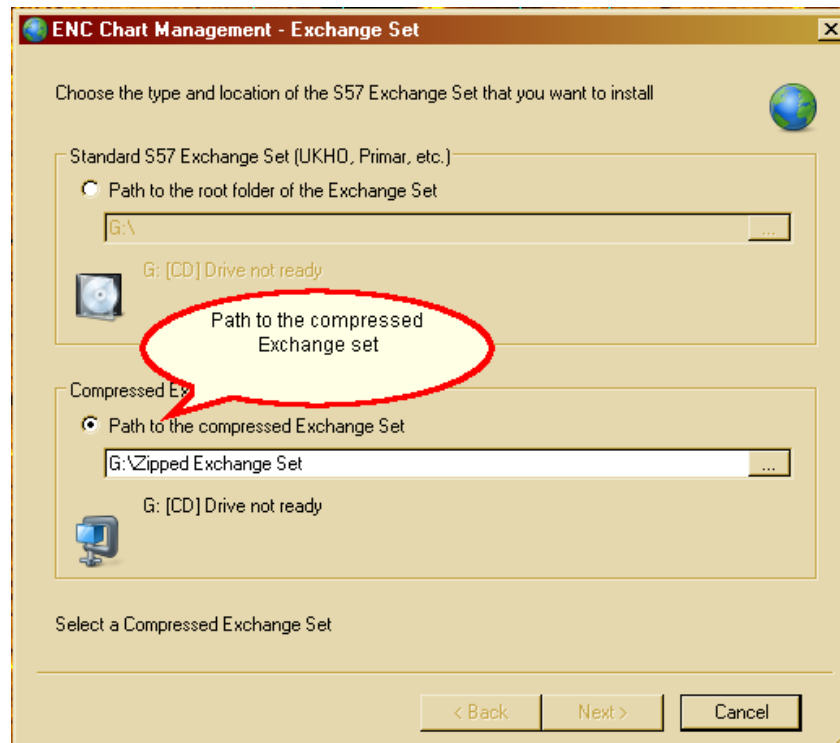
4. Choose the installation options. It is generally a good idea to check all of them: Pause on Error and Delete old withdrawn cells (to prevent buildup of unused data). Click the <Next> button.
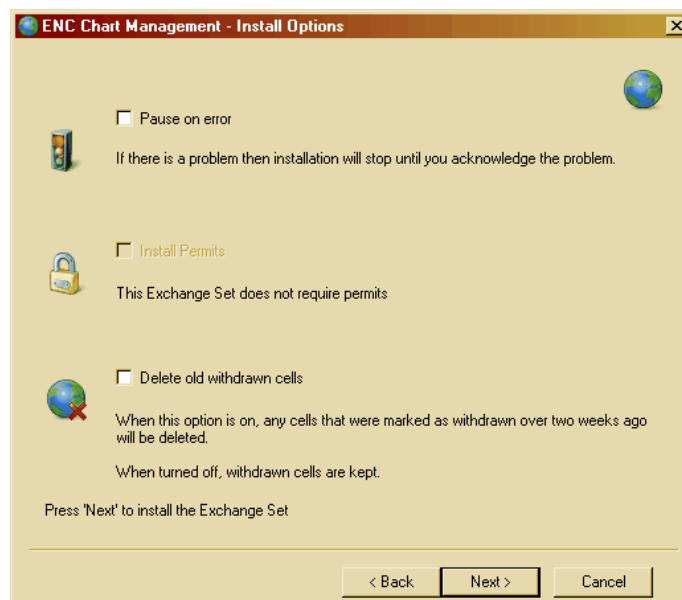
5. The application will now begin to install the chart sets (this may take several minutes).

6. Close the application when it has completed installing the chart sets.

S-57 Charts for Other Areas Outside of the USA

Before you use the licensed S-57 charts in Sea Scan Survey, you must install the "*Install Sea Scan Survey Licensed Charts.exe*" installation package.   This will create a base chart database, add the World Vector Shoreline data, and install USB drivers for the USB security *dongle* [151].   **When installing or using the licensed charts, the USB security *dongle* must be plugged in to the computer**.
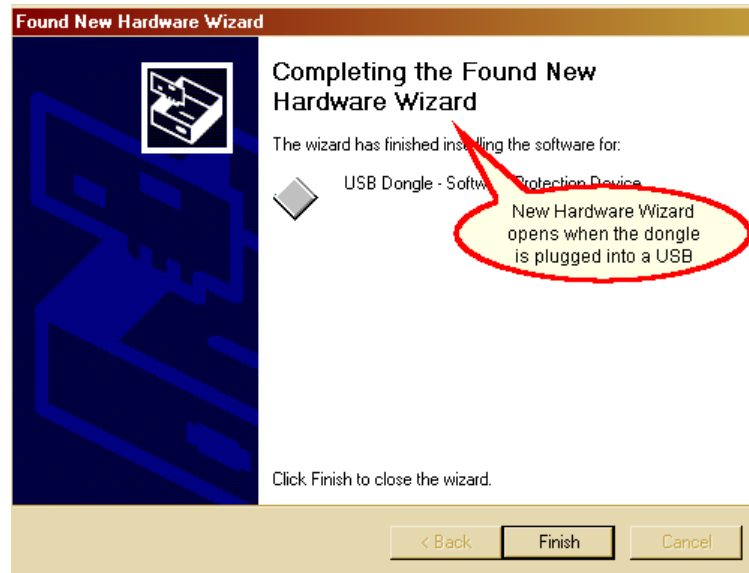
Sea Scan Survey uses the LSENC folder for your chart database. However, before you can purchase charts for use with Sea Scan Survey, you must choose a chart provider. Currently, there are two major chart providers to choose from: the United Kingdom Hydrographic Office (*http://www.ukho.gov.uk/*) and Primar (*http://www.primar.no/*).

When you have chosen the chart provider you would like to use, you must locate a distributor (in order to purchase the charts). Both chart providers have a link on their web pages to their distributors.

Tip | **We suggest you narrow the distributors down geographically and then choose the best one based on their willingness to work with you to purchase charts.**

After finding the distributor, pick out the S-57 ENC charts you would like to purchase. This is generally accomplished by using a chart catalog.

Warning | **SOME DISTRIBUTORS DO NOT SELL THE S-57/ENC CHARTS, SO PAY CLOSE ATTENTION TO THE DISTRIBUTOR LISTS, AS THE LISTS SHOULD INDICATE WHAT FORMATS THE CHART DISTRIBUTOR CARRIES.**

The chart catalog is usually a piece of software that allows you to choose charts graphically for the area you are interested in. Both chart-provider companies offer free downloading of their chart catalogs.   When you have downloaded and installed a company's chart catalog, you use that chart catalog to select the charts you want and place them in the Chart Basket.   When you have completed filling your basket, you then must save the basket to a file.

ENC charts are typically sold as on a subscription basis.   The length of the subscription determines how long you have access to chart updates.   Typically, 1-month, 3-month, and 12-month subscriptions are available.   Generally, the shorter the subscription, the cheaper the charts will be. At the end of the subscription interval, you will still be able to use the charts; however, you will no longer receive updates.

Tip
Make sure you check with your chart distributor for details about the subscription service and updates.

To order the charts in your basket, you typically send the Chart Basket file to the distributor by e-mail along with your User Permit that is associated with your licensing *dongle.* The User Permit is a 28-character code made up of letters and numbers.

Tip
You should have received a User Permit with the Sea Scan HDS system; however, if you need to retrieve it, you can use Sea Scan Survey to get it. Do this by opening the Plotter Settings. Make sure the "Premium S-57" chart is selected. If the premium charts were not enabled before opening the plotter settings, click the Apply button upon selecting the premium charts, then click on the Configure button. Failing to do so will result in the User Permit not being found.

 Below are the windows described in the above Tip.
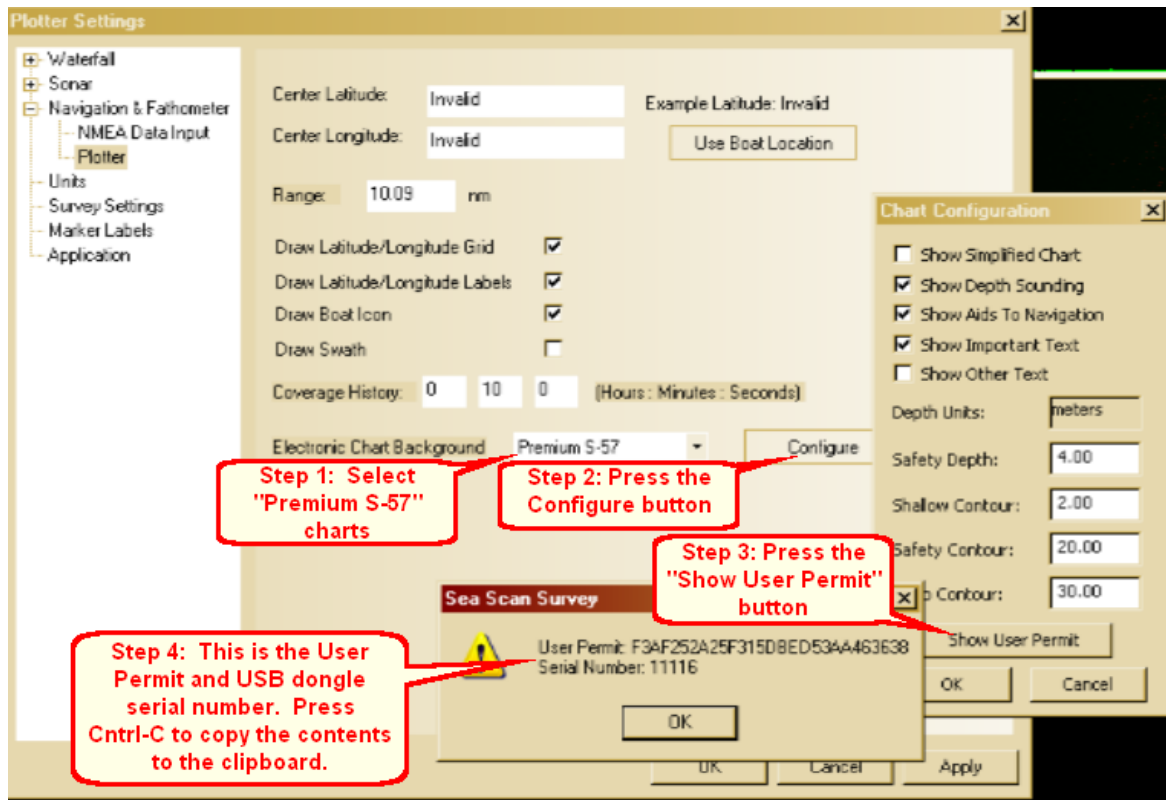
When you have sent your Chart Basket and user permit to the chart distributor (and paid them), they will send you a permit file and instructions on retrieving the charts. They may also send you the charts on CDs or DVDs. With the permit file and the charts, you can now install them into the Sea Scan Survey charting database.

Warning

YOU MUST USE THE FOLLOWING APPROACH USING SEA SCAN SURVEY TO ACCESS AND DOWNLOAD THE LICENSED FROM THE CDs/DVDs THE CHART DISTRIBUTOR SENDS. NO PC-BASED INSTALLER WILL SUPPORT THIS PROCESS.

To install the charts into the Sea Scan Survey charting database,

1. Start Sea Scan Survey and choose Chart Management from the **Tools** menu. This will open the Cell Manager program. The cell manager starts by asking the location of the chart database (typically *C:\Program*

Files\Marine Sonic Technology, Ltd\Sea Scan Survey\LSENC\) for the licensed charts. You can browse to the folder using the [...] button.

2. After you have entered the correct folder, you will see "Valid chart folder" in the window. Click <OK>, then click the *<Install Exchange Set>* button. This will open the ENC Chart Management Window.

3. Choose the <Path to the root folder of the Exchange Set> button.   Browse to the location where your charts are stored. This is probably your CD/DVD drive. You can browse to the location by using the [...] button.   If it is a valid location, the name of the chart set will appear below the path. If it is not, the program says "Not an exchange set" below the path. Click the <Next> button.

4. Next, choose the installation options. It is generally a good idea to check all of them: Pause on Error, Install Permits (required), and Delete old withdrawn cells (to prevent buildup of unused data). Click the <Next> button.
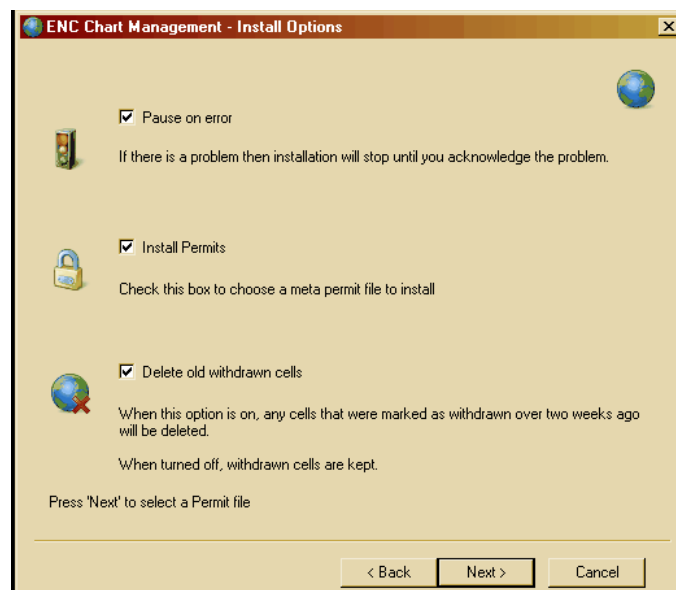
5. The last step before the installation process begins is to select the permit file. This file should be a text file that the chart distributor sent you when you purchased the charts.   It is usually called *permit.txt*. Click the [...] button to browse to the location where you stored the permit file.   When a valid permit file is chosen, the application will indicate it by displaying the

permit data and version.

6. Click the <Next> button to begin installation of the permits. When the permits have been installed, click the <Next> button. The application will now begin to install the chart sets.   Close the application when it has completed installing the chart set or click the *<Install Exchange Set>* button again to install another chart set.
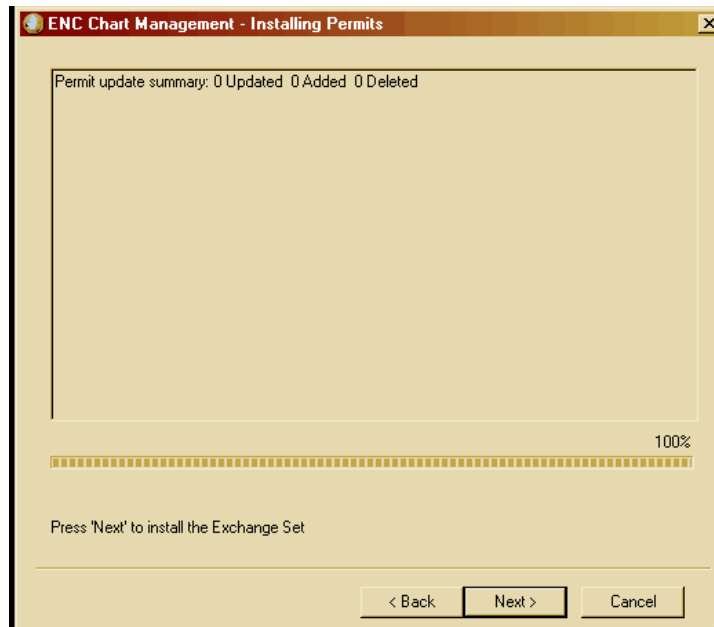
Tip

You may need to repeat this process for more than one chart set. In fact, you may have to perform these actions for <u>each</u> CD.

ENC Chart Management - Installing Exchange Set

```
Australia AU436150  4.000  (issued 6/3/2009) permit expiry date is 1/31/2011
Australia AU436150  4.000  (issued 6/3/2009) installed and updated
Australia AU160150  5.000  (issued 11/24/2009) permit expiry date is 1/31/2011
Australia AU160150  5.000  (issued 11/24/2009) installed and updated
Australia AU5XX193  2.003  (issued 1/29/2010) permit expiry date is 1/31/2011
Australia AU5XX193  2.003  (issued 1/29/2010) installed and updated
Australia AU160120  1.003  (issued 10/7/2009) permit expiry date is 1/31/2011
Australia AU160120  1.003  (issued 10/7/2009) installed and updated
Australia AU5XX208  7.001  (issued 1/4/2010) permit expiry date is 1/31/2011
Australia AU5XX208  7.001  (issued 1/4/2010) installed and updated
Australia AU5X200W  4.000  (issued 10/21/2009) permit expiry date is 1/31/2011
Australia AU5X200W  4.000  (issued 10/21/2009) installed and updated
Australia AU435151  7.001  (issued 2/19/2010) permit expiry date is 1/31/2011
Australia AU435151  7.001  (issued 2/19/2010) installed and updated
Australia AU434151  5.001  (issued 2/10/2010) permit expiry date is 1/31/2011
Australia AU434151  5.001  (issued 2/10/2010) installed and updated
Australia AU433151  4.000  (issued 10/22/2009) permit expiry date is 1/31/2011
Australia AU433151  4.000  (issued 10/22/2009) installed and updated
```

58%

Installing cells   15%

< Back   Next >   Stop

Now that the exchange set has been installed, it is ready for use in Sea Scan Survey. If the chart background does not update properly, it may be necessary to close Sea Scan Survey and reopen it.

Deleting Charts

You may want to delete charts at some point in time.   To delete charts,

1. Start by opening the Chart Management application from the **Tools** menu in Sea Scan Survey.

2. Choose the unlicensed chart database folder as instructed above.   Then, use the mouse to select the charts you wish to delete.

3. Click the <Delete Cells> button when ready to remove the selected charts. To select multiple charts, hold down the *CTRL* or *SHIFT* key while clicking on the charts.

Additional Charts

In addition to the S-57 charts, the Unlicensed and Licensed chart installers now include the WVS (World Vector Shoreline) data.   This data fills in where there is no S-57 ENC data. It is not nearly as detailed as the S-57 charts can; in fact, It generally is just an outline of the shore.
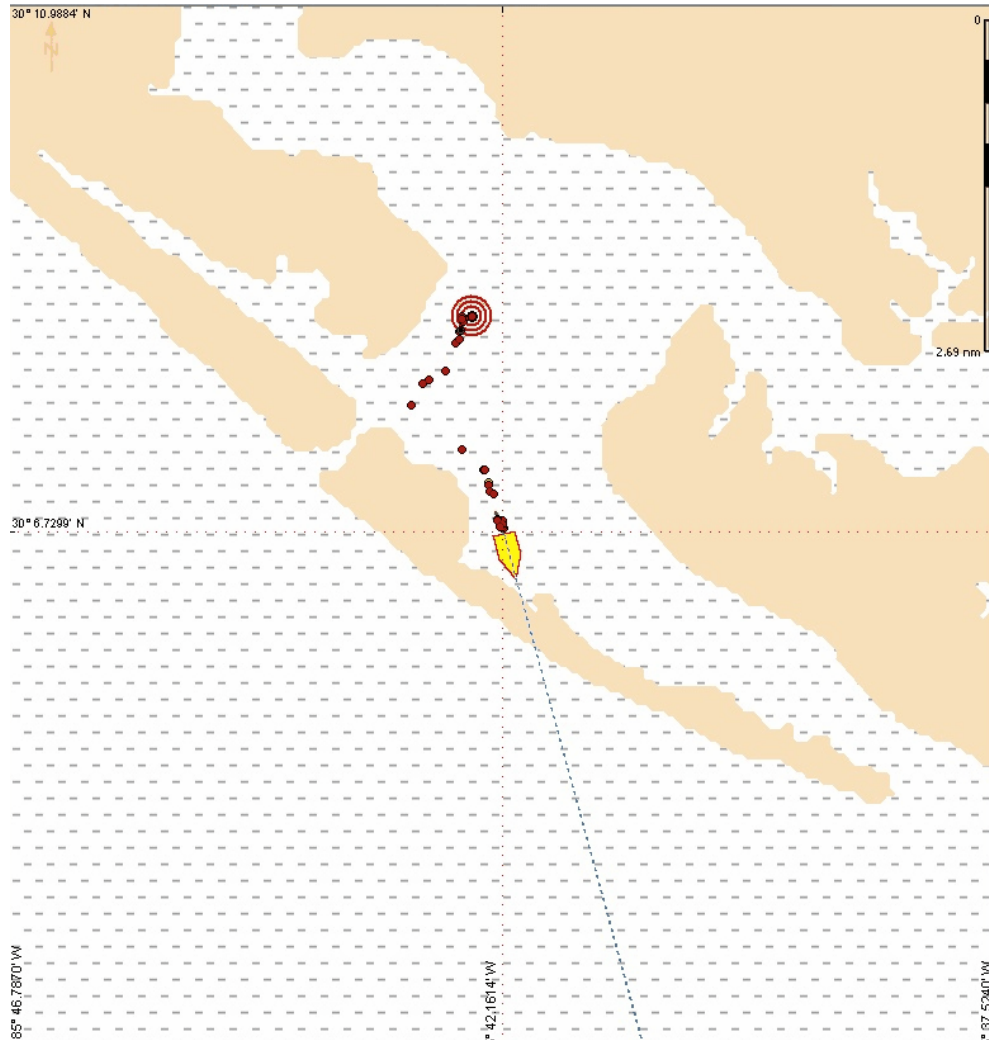
Survey Report

Export a survey and markers as an _HTML_ [151] (Hypertext Markup Language) report that generates in the report subfolder. It will then open the report in your default web browser. The report has been specially formatted to facilitate printing.
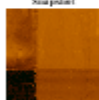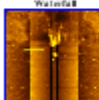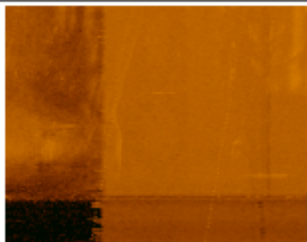
Please note that using this feature will tie up the Sea Scan Survey application until all _markers_ and _waypoints_ have been processed. Each marker and waypoint will be successively highlighted by a green box as the file processes the information to complete the report, which will be exported to your web browser for viewing. A sample survey report is shown below. Note the corporate logo in the top left corner. This logo can be changed to that of your organization (see how to change the logo in Exporting a Survey [139], in the In-Depth [114] section).

SDS-to-XTF Converter

This menu item runs the dialog window where you can convert *SONAR* Data Stream (*sds* 151) data to eXtended Triton Format (*xtf* 151). The *xtf* file format is used widely for recording various types of hydrographic survey data, including side-scan *SONAR*, shallow seismic and multibeam bathymetry, associated position, and attitude information. It is the most commonly used format for this type of information exchange in the hydrographic survey industry.

Click the [···] button at the right for the "File to Convert" to bring up an Open File window. There you can select an *sds* file to convert. Click the [···] button at the right of the "Output File" to bring up an Open File window to select an *xtf* file where you wish to place the converted data.

Click the <**Convert This**> button to start the conversion. Click the <**Close**> button to close the *sds*-to-*xtf* converter window.
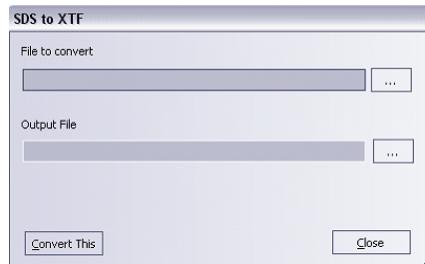
Help

This menu option will open the Sea Scan Survey **Help** pull-down menu. There you can choose to view **Help** topics or **About Sea Scan Survey** by clicking on either topic.

Tip | **The Help file is basically a virtual version of this software manual that you can access at any time you need information.**
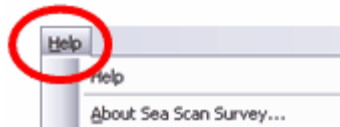
Help Topics

Click **Help** to open this virtual user's manual. As with any Windows-based program, this help file is indexed and searchable.
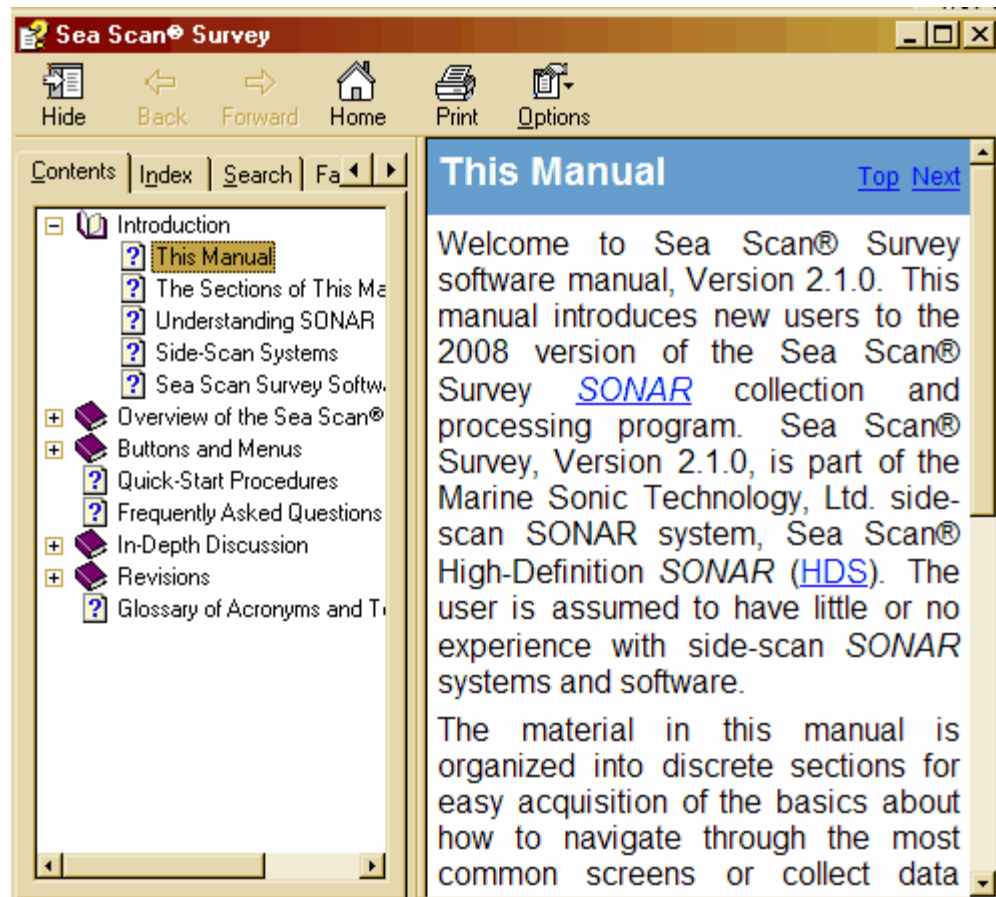
About Sea Scan Survey

Click **About Sea Scan Survey** to open the window that shows the current version number of the software as well as contact information for Marine Sonic Technology, Ltd. Click on <**OK**> to close the window.
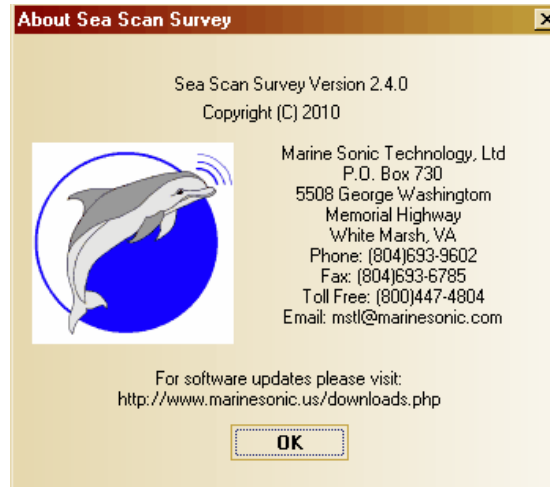
Docking Semantics

The Sea Scan Survey work area can become quite congested if you open multiple windows as you are collecting data, yet you will need and want access to the various windows. These can now be managed quite easily with the unique capability to move or hide windows until you need access because this software contains a convenient feature that allows you to open windows of information, then "dock" or store them on the sides of the work area for future reference. Think of these as tabs on a "file folder" that you close and stack on the sides of your work area, then re-open when you need them. You can find these under the <**View** 16> pull-down menu. They include the <**Status_Window** 18>, <**SONAR Control_Window** 18>, <**Image_Adjustment_Window** 19>, <**Marker_Management Window** 19>, <**Navigation_Plotter_Window** 20>, <**A-Mode_Window** 20>, and < **Signal_Statistics_Window** 21>. Simply select the one you want and that window will open.

To dock the window, click on the thumbtack icon at the top right of the window.

Click on the tab to open the docked folder; click on the <**x**> at the top right of the opened tab to close it.

Docking Markers

Docking markers are like compass-style arrows that you can use to orient the windows you open from the **View** [16] pull-down menu. When you click by one of the selections, that window pops up on your work area screen. Press in the caption bar and hold down on the mouse button; the compass-style arrows will appear.

Docking markers
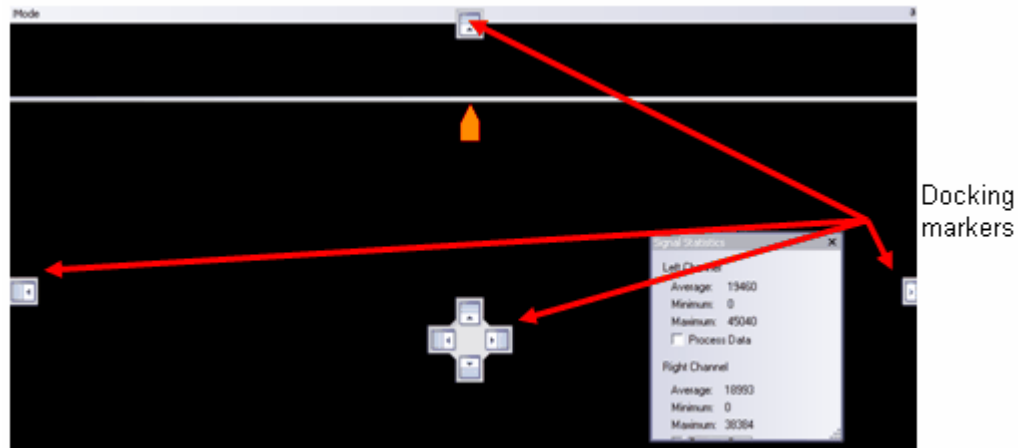
Press the mouse button and hold it down as you drag the opened window toward one of the compass-style arrows. When you reach the arrow you want, simply hold your mouse pointer over that arrow. A dark blue strip in the work area window appears just before the window docks to show where that window will reside.

You have the choice of letting the window "float" anywhere within your workspace area or attaching it at the top, bottom, left, or right side of the work area. The window will remain in that location until you minimize, close, or drag it to another location. Further, if you close, then reopen the window later, it will pop up where you last placed it.

Docked to the left of the work area
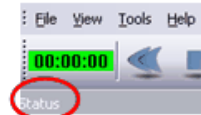
Docked at the top above the work area

Floating in the work area window

Docked at the bottom of the work-area window

Tip **You can always place your mouse pointer over one of the open windows, disable the thumbtack icon, and drag that window to a new location.**

Tab Interface

When you want several windows available to you but don't want to clutter the work area window unnecessarily, a convenient option is to dock multiple windows at the side of the work area window with just the name of that window showing. Dock them by using the thumbtack to auto-hide them.

Simply click on the window you want open under the **View** [16] pull-down menu. When the window opens, drag and center it over the compass arrow at the location you have chosen.

Auto Hide

After the window is docked where you want it, click at the margin to the side of the window. Then click on the Auto Hide icon at the top of the window.

When you move your mouse pointer back to the work area window, the window will automatically close except for the tab heading, which will be visible at the side of your workspace. You can reopen that window at any time simply by moving your mouse pointer back to the side of your workspace and pointing at the tab you want.

Before moving a window that has the Auto Hide feature enabled, you must click again on the Auto Hide icon to disable it. Then you can drag the window to a new location and re-enable the Auto Hide feature.

Tip | **You can always click and drag at the bottom corner of any floating window to resize it.**

Docking Window Features

A wealth of functions and information is available at the various docking windows. These windows are the ones you will use most frequently.

Navigation Plotter Window

The **Navigation [Plotter]**[151] **Window** displays the current location of the surface vessel. The boat is represented by an icon that is rotated to show the course or heading (if the heading is available and if the boat icon option has been selected in the Plotter Settings window).
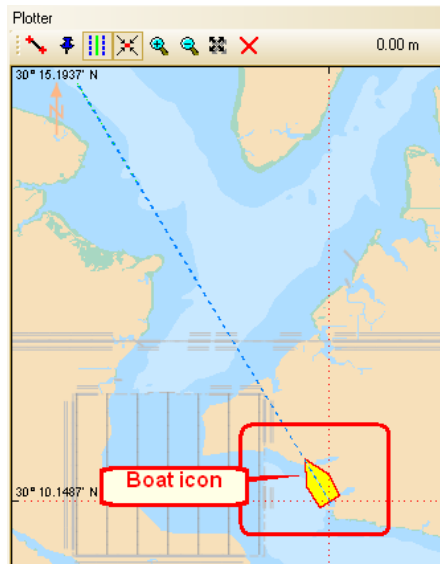
The *SONAR swath* is displayed to show the estimated coverage. The [*swath*][151] coverage for the left [*channel*][151] (*transducer*) is shown with **red** lines. The *swath* coverage for the right *channel* is shown with **green** lines. The boat path is displayed with a black line (_____). The Plotter will show the boat's location (including the direction the bow is pointing) even when the *SONAR* is off; however, the Plotter <u>will not</u> draw a swath when the *SONAR* is off or if that option has been de-selected. Some data is necessary for the Plotter to show a track; that data may be simply a rub check or by having the *SONAR* on for a second.
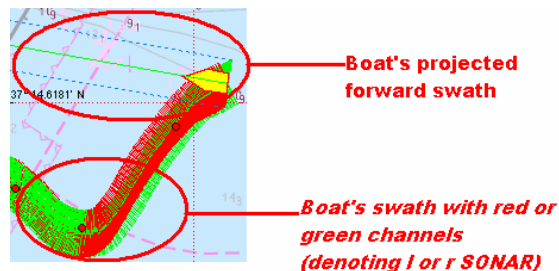
The **Navigation Plotter Window** displays the scale in user-defined units in the upper corner. The Plotter window also displays the actual [*L/L*][151] grid lines and

labels. Note the red bull's eye just to the stern of the vessel; that bull's eye denotes a marker.
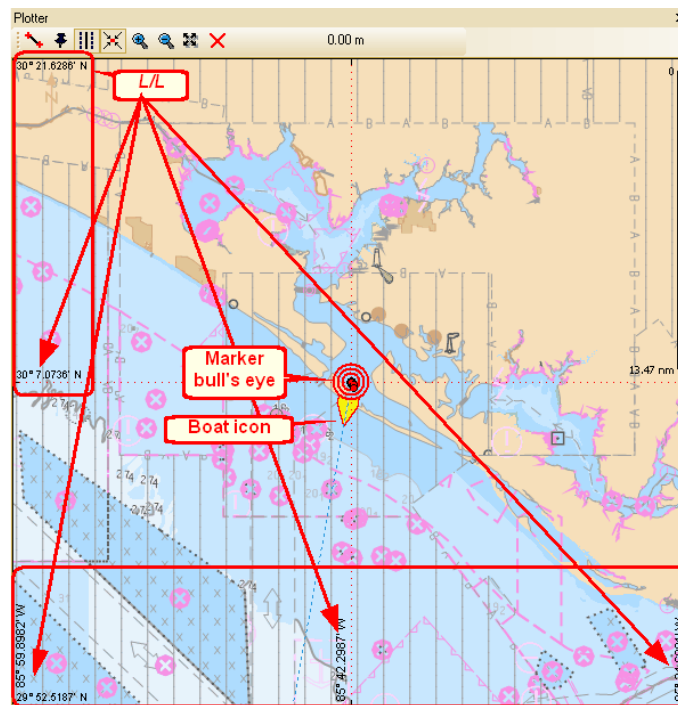
The **Navigation Plotter** has two valuable default functions, **Center/Pan** and **Marker/Waypoint Information**. These functions are available when no Plotter tool is activated.

> **Center/Pan**: Place your mouse pointer at a location you select in the Plotter window, then double click with the left button. The Plotter will center on that location.
>
> **Marker/Waypoint Information**: A single left click in the Plotter window selects the closest *marker* or *waypoint*. Click the mouse pointer on a *marker* or *waypoint* dot to see in the ***Marker* Management Window** the *L/L*, classification (whether marker or waypoint), and a preview image if the target is a *marker*. When you click on the *marker* or *waypoint*, a bull's eye will appear.
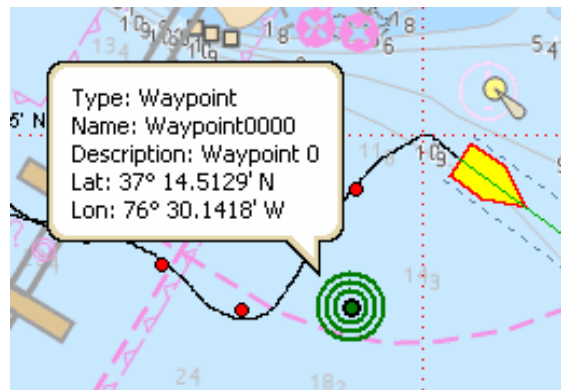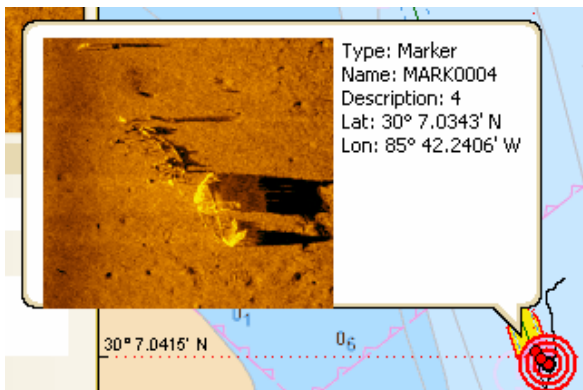
Tip **The color of the *marker* bull's eye correlates to the priority you have attached to that marker (high, medium, etc.). *Waypoints* always have a green bull's eye.**

The information will be highlighted in **blue** in the **Marker Management Window** [54]. Also, the corresponding marker or waypoint dot that you selected will become **Yellow** on the Plotter.

Tip **No Plotter tool can be activated if you want to use either the Center/Pan or Marker/Waypoint information functions.**

Right click on the **Navigation Plotter Window** to reveal a pop-up menu with the following options:

Plotter Window Settings
Auto Scale
Auto Center
Create Waypoint
Delete Marker or Waypoint
Edit Waypoint

At this pop-up window, you can access plotter settings, adjust the plotter window itself, or create or edit *waypoints*. The approach for *waypoints* is very convenient and easy:
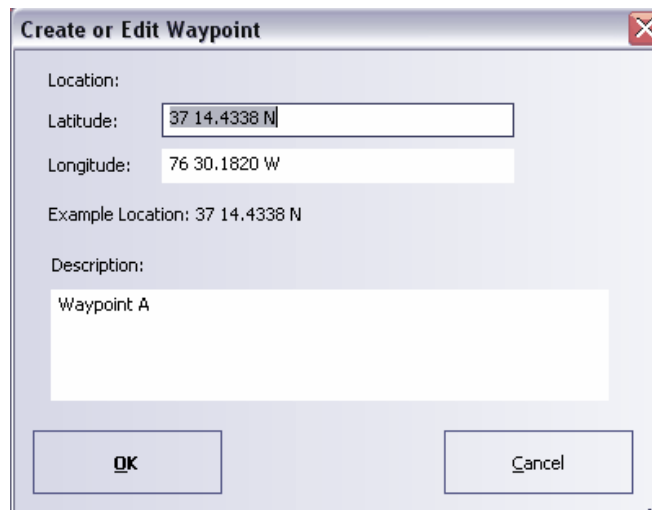
1. If you right click randomly in the plotter window, the pop-up window opens with the <**Create Waypoint**> option available, but the other waypoint options **gray**, thus not accessible.

Plotter Window Settings
Auto Scale
✔ Auto Center

Create Waypoint
Delete Marker or Waypoint
Edit Waypoint

2. If you right click <u>on</u> a waypoint, then it displays the <**Edit Waypoint**> option.

Plotter Window Settings
Auto Scale
✔ Auto Center

Create Waypoint
Delete Marker or Waypoint
Edit Waypoint
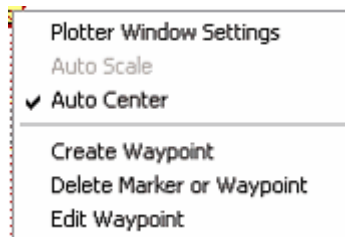
3. If you then select either the <**Create Waypoint**> or <**Edit Waypoint**> option, a dialog box opens that allows you to manually enter *L/L* information and any description you would like to add.

Create or Edit Waypoint

Location:

Latitude: 37 14.4338 N

Longitude: 76 30.1820 W

Example Location: 37 14.4338 N

Description:

Waypoint A

OK   Cancel

The **Navigation Plotter Window** displays all the markers and waypoints within its view area in relation to the actual *SONAR* data, giving a real-time view of the operation. It also shows vector-encoded digital <u>geo-referenced charts</u> 86 in the background for real-time orientation if you select that option.

Toolbar

The Toolbar contains the following tools:

Length : Depress this tool, click once at the starting point on the Plotter, then click again at the end to draw a line; the software will calculate the length for you and show it at the right side of the toolbar. That measurement will remain there until you replace it with another measurement. Click the Escape **<Esc>** key to deactivate this tool.

Waypoint : Depress this tool then click twice in the Plotter window where you want to place a *waypoint*. The location and any details you add will be listed in the **Marker_Management_Window** 54 and a dot will be placed at that location in the Plotter window. Click the Escape **<Esc>** key to deactivate this tool.

Map-Bearing Line : Click on this tool to enable a set of lines that extend from the bow of the boat across the chart showing the projected direction and swath (very helpful when performing a search with overlapping lanes). This line can be turned off 86 if preferred.

Projected forward swath
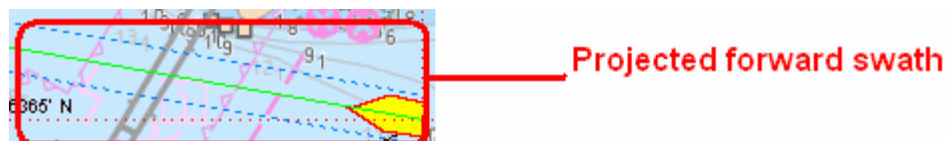
Automatic Center : Click on this tool to enable the auto-center feature of the Plotter window to return the boat to the center of the grid when it goes off the Plotter window. Click again or click the Escape **<Esc>** key to disable it.

Zoom In : Click once on the magnifying glass icon at the top of the *waterfall* toolbar to zoom in 5%; hold the button down and, every fifth of a second, the software will advance another 5%. Click the Escape **<Esc>** key to deactivate this tool.

Zoom Out **:** Click once to zoom out 5%; hold the button down and, every fifth

of a second, the software will retreat another 5%. Click the Escape **<Esc>** key to deactivate this tool.

Zoom Box ⌖ : Click on this tool to draw a box around a particular area of interest and zoom in on it. Click to set the center of the Zoom Box, then drag to change the size of the zoom to encompass the area of interest. Click the button again to deactivate this tool.

Marker/Waypoint Information Tool: Activate this default tool by clicking on a particular *marker* or *waypoint* in the Plotter window. That item will then be highlighted in the **Marker Management Window** 19 . In addition, a window will pop up in the Plotter window next to the *marker* or *waypoint* and show *L/L*, classification (whether *marker* or *waypoint*), and a preview image (if a *marker*). This information will remain as long as you point to the item. A "bull's eye" will highlight the particular item you have clicked on.
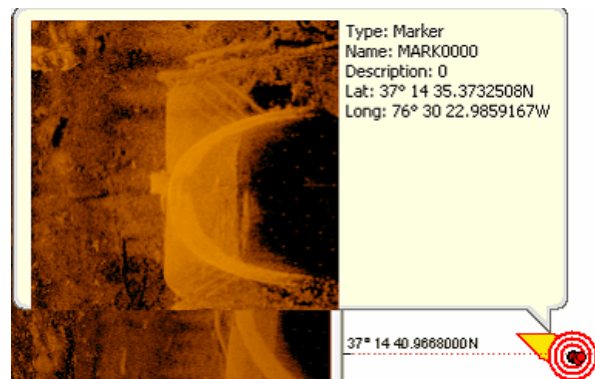
Pan: This is a default tool. A double left click re-centers the plotter on the point where you clicked.

Clear Navigation Tool ✕ : Click on this tool to clear all the navigation data in the display and start displaying new data from the time you clicked the button.

Tool Readout Area   0.00 m : The Tool Readout Area is to the right of the other buttons. It displays the length when that tool is activated.

SONAR Control Window

The ***SONAR* Control Window** displays the current *SONAR* hardware settings and allows you to make changes to them. As shown in the figure below, you have access to the buttons to turn the *SONAR pinging* on or off; to select the *frequency* for each *transducer*, to lock the two channels to the same *frequency,* to change the *Range*, to set *Range Delay*, to disable *Range Delay* or to return it to its prior settings, and to

alter the *ping* rate based on the *SOG*. Click on the buttons to change the settings. When that particular button is active, it will be **red**. The inactive buttons will be black. The buttons will be **gray** when the *SONAR* has not been started or is not connected (as shown here).

SONAR Power

Turn *SONAR* power on to start the data collection process by clicking the **<ON>** button in the **Sonar Control Window**[48]. The **ON** letters will become **red** after you have depressed the button; the letters in the opposing button will then appear black. The communication process between the *SONAR* and the application occurs in 5 seconds or less, so power will be supplied to the *transducers* almost immediately. They will begin to *ping* (emit the acoustic pulse) and the incoming reflection data will be recorded and displayed in the data window.

You will also see confirmation that the transducers are receiving power by observing a **red** signal line in the *waterfall* display window. It will show the letters *PW*[151] (**PW**) in the center of the *water column* just below the boat icon. Concurrently, the *transducers* will begin gathering data and the *waterfall* display will begin scrolling.

Data collection starts as soon as the transducers receive power

Transducers

Each pull-down box represents a *transducer channel*.   Each *channel* can be selected separately, as the left *channel* is independent of the right *channel*.   You can select both the left and right *transducers* or neither one (as shown, neither is selected).   At the pull-down box, you can select a separate *frequency* for each *transducer* if warranted.

Frequency choices for the transducer
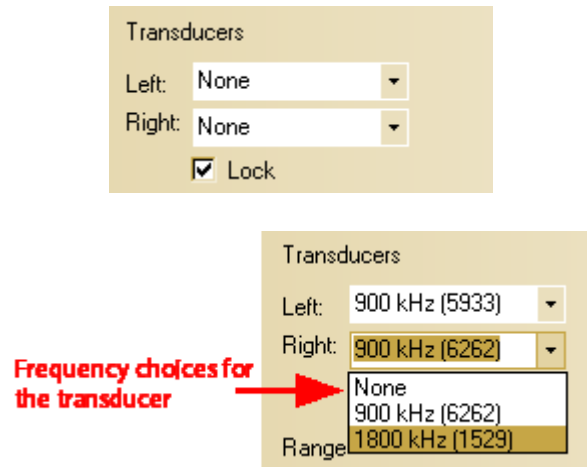
If there is an interruption in the data stream for any reason, you will see a **Yellow** line across the *waterfall* display window and the accompanying letters *DL* [151] (**DL**) in the center of the *water column*.   These letters indicate that communication was momentarily lost to the *transducers*; that is, you have experienced a momentary "data loss."

Data was lost momentarily to both transducers
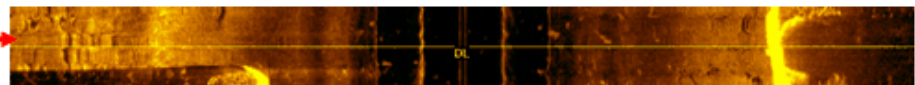
The Sea Scan Survey application also alerts you in the *waterfall* display when you change *transducer* frequency [151].   You will see a deep **blue** line and the letters *FS* [151] (for frequency switch) in the center of the water column at the point in the data when you made the change.   These indicators in the record are convenient ways of reminding you of transients or changes you made during the survey.

Frequency change to the transducers at this point in the survey
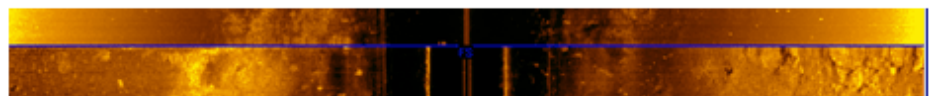
Range

Change the *range* in increments of 10 if you have set the units for a short range (feet); otherwise, the range is in increments of 5 (meters or yards). Depress the arrow < ▾ > to the right side of the current range setting in the pull-down box to select from the list.

Alternatively, you can click the lower < **<** > or higher < **>** > buttons to the side of the current range setting.
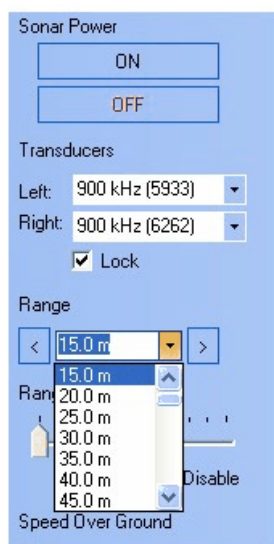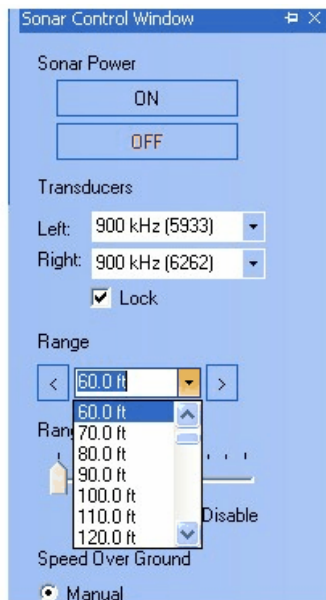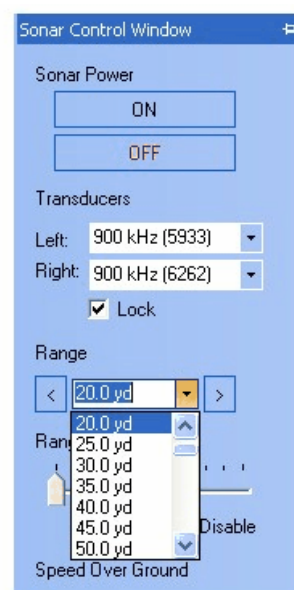
Meters   Feet   Yards

> *Tip* | **Remember, the longer the range setting, the lower the maximum *ping* rate.**

Range Delay
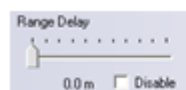
Move the slider to set the amount of *range delay*[151] you desire. The number you set will affect the image in the *waterfall* display window as well as the data that is collected.

Speed Over Ground (SOG)
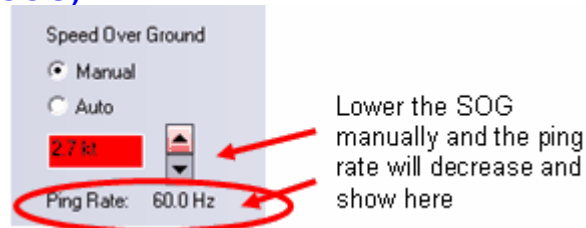
The _SOG_|151| buttons give you manual control over the perceived *SOG* that is indicated in the *SONAR waterfall* display. Thus, you can set the *SOG* higher or lower than the <u>actual</u> boat speed. The *SOG* text box will show the number you have selected.   Use manual *SOG* when control over the *ping* rate is desired, such as during a rub check (see the section, _Quick Start Procedures_|94|*,* for a detailed explanation of how to perform a rub check). Otherwise, use Auto *SOG* to allow the actual GPS-reported *SOG* to control the *ping* rate.

As the *SOG* goes up or down, you will see the *ping* rate increment or decrement accordingly.

Status Window

The boat icon in the center of the *water column* can be moved up and down to show the collection points for that particular set of data in the **Status Window** display. You will see details such as Elapsed Time, which is the date and time of the *ping* since the file started; *SONAR* details (*range, range delay,* and each channel's frequency and serial number); navigation information (*L/L:* _Latitude_|151|/_Longitude_|151|, *SOG:* Speed over Ground, _COG_|151|*:* Course over Ground, and heading); _fathometer_|151| information (altitude and depth), and attitudinal information about the *SONAR* heading (<u>yaw)</u>|151|, <u>roll</u>|151|, and <u>pitch</u>|151|.

The Time/Date presents actual Greenwich Mean Time (<u>GMT</u>|151|), a term originally referring to mean solar time at the Royal Observatory in Greenwich, London, England. In addition, all elapsed time now shows the time; the date is shown in the Status window also.

Status	⌗ ✕
Time/Date:	17:50:17.239 Thu 19 June 2008
Elapsed Time:	00:00:32
Range:	30.0 m
Range Delay:	0.0 m
Left Freq:	900kHz (0001)
Right Freq:	900kHz (0001)
Latitude:	37° 14.2191' N
Longitude:	76° 29.9748' W
SOG:	No Data
COG:	No Data
Heading:	No Data
Altitude:	No Data
Depth:	No Data
Sonar Heading:	No Data
Sonar Roll:	No Data
Sonar Pitch:	No Data

The heading (*yaw*), *roll*, and *pitch* information will show when the *SONAR* is activated and sending data.

Status		⊟ ✕
Time/Date:	19:25:53.323 Fri 18 Sep 2009	
Elapsed Time:	00:17:42	
Range:	25.0 m	
Range Delay:	0.0 m	
Left Freq:	600kHz (0017)	
Right Freq:	600kHz (0018)	
Latitude:	37° 14.5480' N	
Longitude:	76° 29.2241' W	
SOG:	4.70 kt	
COG:	115.70	
Heading:	No Data	
Altitude:	No Data	
Depth:	No Data	
Sonar Heading:	123.40	
Sonar Roll:	3.20	
Sonar Pitch:	-2.50	

The heading (*yaw*) readout gives the magnetic heading in degrees from the compass in the towfish; this heading is useful information for relating the orientation of the towfish to that of the boat. The *roll* and *pitch* are also in degrees; there is no magnetic variation involved with them.

Tip

+Roll is a roll to the right or tilted down to the right side
-roll is rolled to the left or tilted down to the left side.
+Pitch is nose up
-pitch is nose down.

Warning

MAGNETIC READINGS FROM THE COMPASS IN THE TOWFISH MAY SHOW VARIANCES IN DIFFERENT REGIONS.

Marker Management Window
This window displays a list of all the *marker*s and *waypoints* you have inserted into your current survey. When you select a *marker* or *waypoint* from this list, that *marker*/*waypoint* becomes active and you will see details about it, including a snapshot of the *marker*, the name you designated for it, and any description you inserted.

You can insert a *marker* in the *waterfall* by double clicking on the object you see there while the Marker tool is activated. That new *marker* will immediately become part of the list of *markers* in the *Marker* **Management Window**.
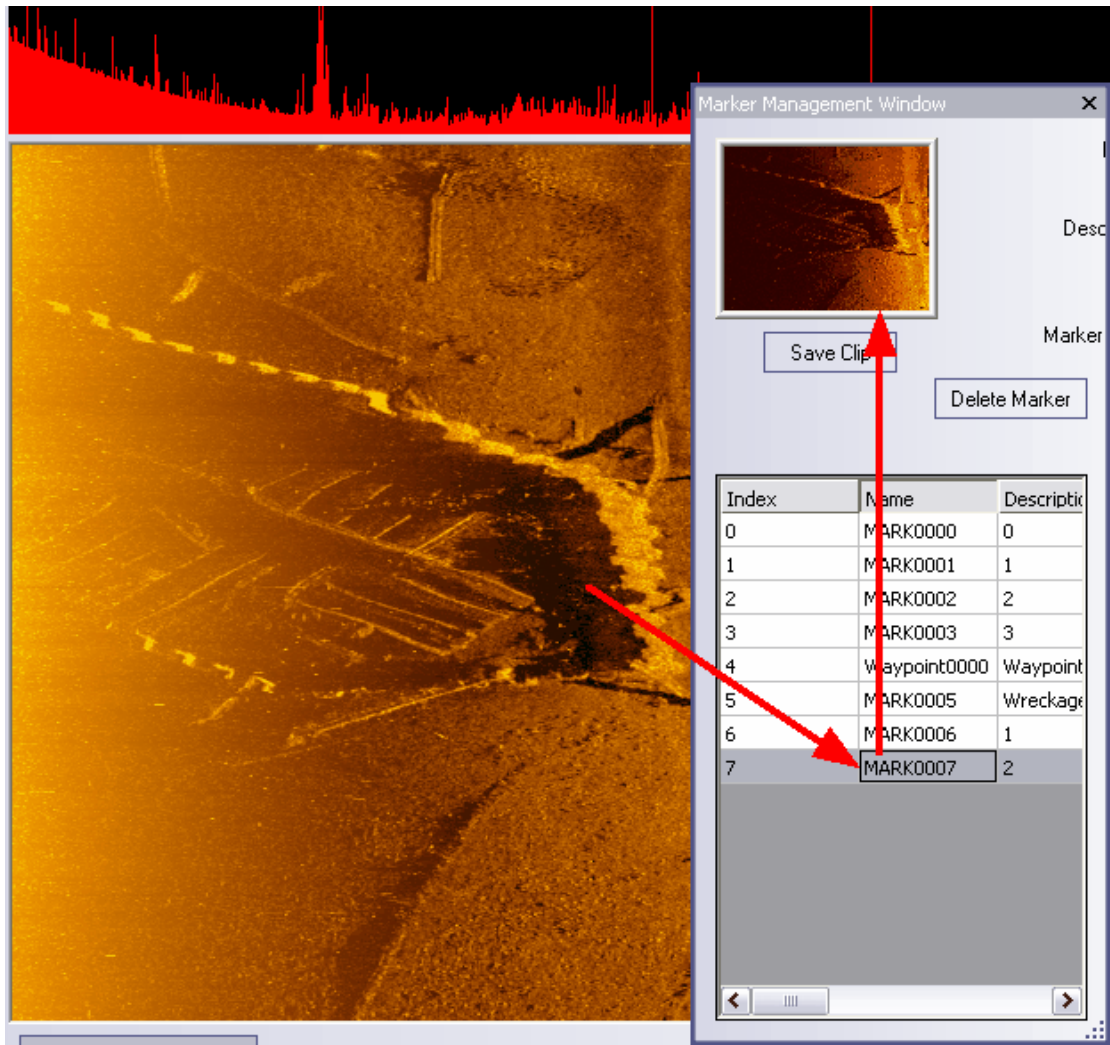
Tip   *Markers* are used to "tag" tangible targets of interest; *waypoints* are used to label locations of interest. Both are invaluable for relocating a target or area of interest, especially when you have recorded a large volume of data.
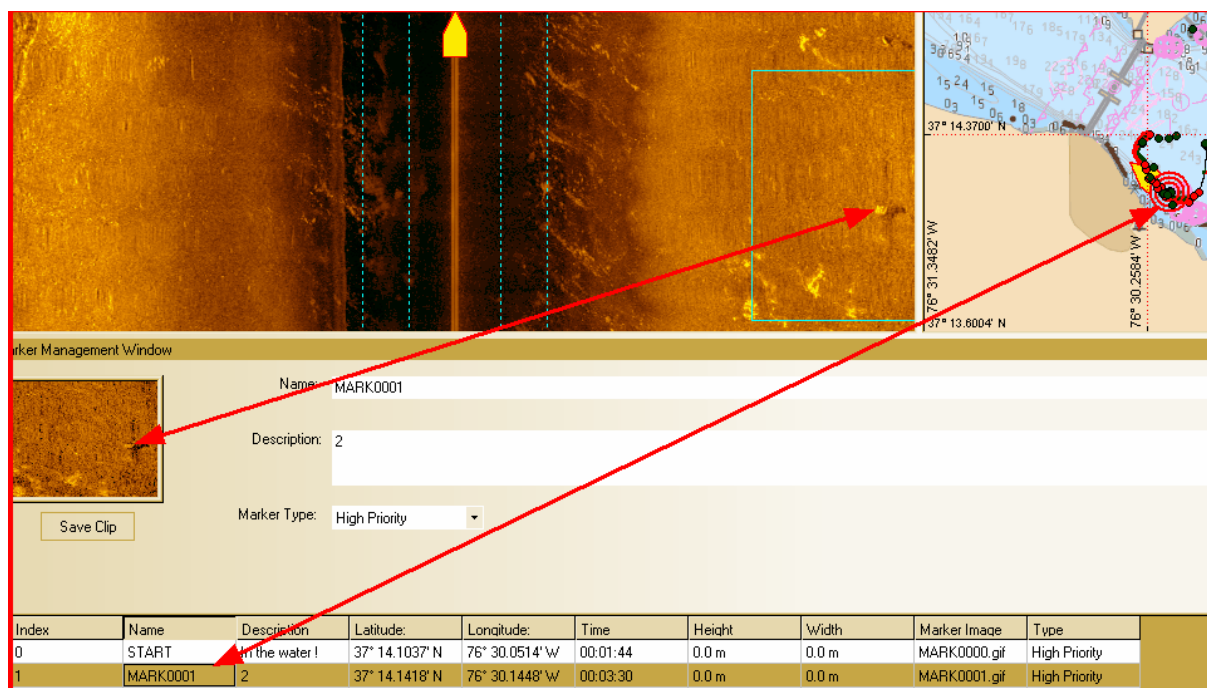
Click and hold down the mouse button over something of interest in the *waterfall* display while the Marker tool is activated to bring up a white box to that location. The information in the box shows the *L/L* coordinates for that location.

37° 14 08.9089N 76° 30 11.3419W
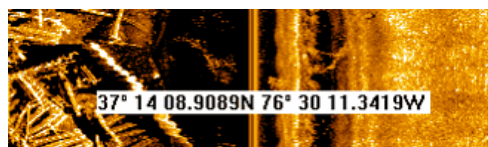
If you click on the snapshot image of a *marker* in the ***Marker* Management Window**, you will see that image in the *waterfall* (inside a **green** flashing rectangle, as shown in the figure that follows) as well as in the **Marker Management Window** (its snapshot as well as a **blue** highlighted line of text in the *marker/waypoint* list). If you click on a *waypoint*, you will see a blank snapshot image, but the *waypoint* will be visible in the <u>Navigation Plotter</u> [20]. The width of the snapshot will be that of the **green** flashing rectangle, *not that of the image.*

> **Tip**
>
> The size of the *marker* outline in the *waterfall* display will be the same as that which you set as the zoom size for the zoom tool. Bring up <u>S</u>ettings, then the Zoom settings window, to change the zoom size.

Markers and waypoints can be deleted by clicking on the <**Delete Marker**> button at the far right of the ***Marker* Management Window**. When you click the button, you will be asked if you are sure you want to perform this action. Click <**OK**> and the marker or waypoint will be deleted. <u>That deletion is permanent</u>.

You can classify and sort markers by designation, name, etc. The designation

includes various standard types of targets that consist of four marker types. These types have default labels and colors:

High priority	**Red**
Medium priority	**Blue**
Low priority	**Green**
Clear	**Yellow**

You can change the standard designations to something more personalized or specific in the *Marker* Label settings.
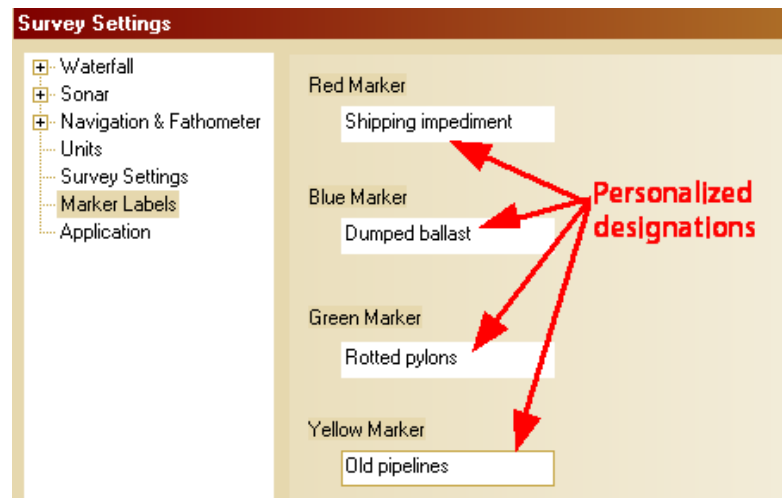
The <**Save Clip**> button just below the snapshot in the *Marker* **Management Window** permits you to create a clip, which is data file consisting of approximately 500 pings around the marker you saved. This data file with the file name extension . *sds*[151], will be about 300 MB[151] in size, small enough the send as an e-mail attachment via the Internet. It will contain navigational information; and the image can be adjusted, enhanced, and even measured by the individual receiving the e-mail attachment.

Signal Statistics Window

The **Signal Statistics Window** displays statistical information about the current *ping* that the boat icon is pointing to in the *waterfall* display. Also, you have access to a separate set of data about each *channel* at this window. The average, minimum, and maximum signal levels are displayed there.

In addition, each *channel* has its own checkbox that allows the statistical data to be calculated from raw data or data that has been processed using the **Image Adjustment Window** [19] settings.
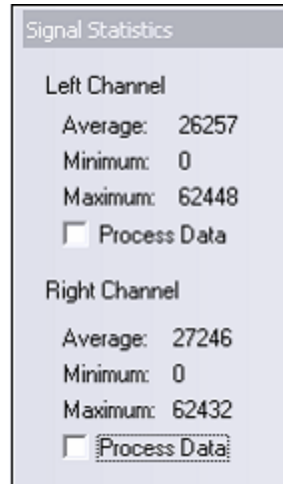
A-Mode Window

You can use the boat icon in the *waterfall* display to concurrently see a graph with information about that *ping*. The graph is arranged in the same manner as the *waterfall*, with information about the left *channel* at the left side of the graph and data for the right *channel* to the right. In keeping with standard marine orientation, the left channel is shown in **red**; the right channel is shown in **green** (this approach also is used in the Navigation Plotter |43| to show the *transducers* in the boat's track).

The background in the **A-Mode Window** is black no matter which channel is used. When you switch to single-channel display in the *waterfall*, the **A-Mode Window** will also change to reflect the data in the *waterfall*.

Time is shown on the horizontal axis and signal *intensity* |151| on the vertical axis. The units are arbitrary, but

　　　　　time =　　　　0 to maximum range and
　　　　　intensity =　　0 to maximum sound level

Image Adjustment Window

The **Image Adjustment Window** allows you to adjust the incoming data to clarify the images you see in the *waterfall* display. To facilitate this process, the window has separate sliders where you can adjust the *gain* |151| (signal amplifier) separately for the left and right *channels*. The time-varied gain (*TVG* |151|) in the system is automatic unless you deselect that function in the **Settings** window (see the section, *In Depth*

Discussion |114|, for an explanation about Image Adjustment).
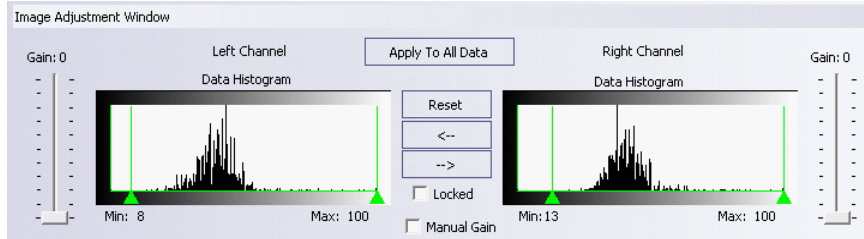
Histogram Control

The ***Histogram*** |151| **Control** permits you to specify how the data will appear in the color palette |78| you have selected. To do this, adjust the sliders (**Min**, **Max**) shown under each *channel's histogram* in the **Image Adjustment Window** |59|.
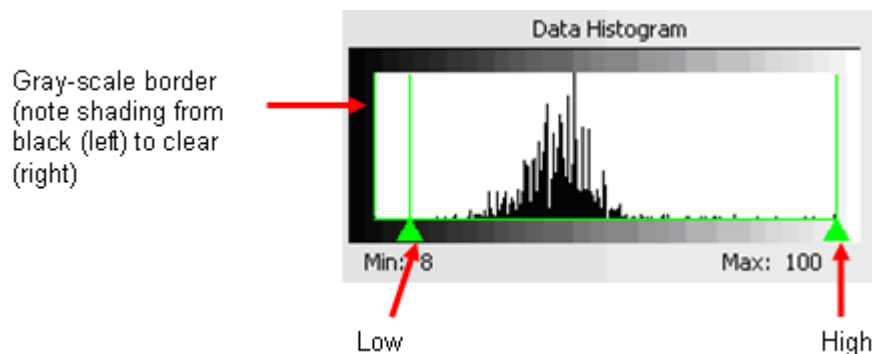
The left slider (see the first **red** arrow above) controls the low-end cutoff point; after you have moved it to the place where you want it, any data to the <u>left</u> of this slider will now be represented as the lowest color in the color palette. The **green** color of the slider will change to **red** when you click and drag it. It will revert to **green** when you release the mouse button. The slider can be adjusted from a low of zero to a high of 100.

The right slider (see the second **red** arrow above) controls the high-end cutoff point for the *histogram* data. After you move the slider to its new location, any data to the right of this slider will now be represented as the highest color in the color palette. The **green** color of the slider will change to **red** when you click and drag it. It will revert to **green** when you release the mouse button. The slider can be adjusted from a low of zero to a high of 100.

Tip | **Note the gray-scale border around the Color Scale window above. The shading from solid black at the far left to clear at the far right represents the full range of color brightness.**

Reset Button

Reset

<--

-->

You can separately alter the *gain* for each *channel* or use the left or right *Histogram* settings to bring out the detailed data throughout a survey or when reviewing the data afterward. Click <**Reset**> to return your adjustments of both *histograms* to their original default settings of Min: 0 and Max: 100.

Transfer Left Button

Reset

<--

-->

Click on this button to transfer the right-*channel histogram* control settings to the left-*channel histogram*.

Transfer Right Button

Reset

<--

-->
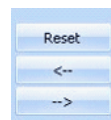
Click on this button to transfer the left-*channel* histogram control settings to the right-*channel histogram*.

Locked Button

☑ Locked
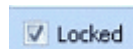
Click on the <**Locked**> button to lock the left and right *histogram* controls together so that when you adjust one, the other will adjust accordingly.

Manual Gain

☐ Manual Gain

Click to activate the **Manual Gain** feature. This permits you to make separate adjustments to each *channel*.

Manual gain

After Auto gain

Auto gain artifact
(caused by bright
return)
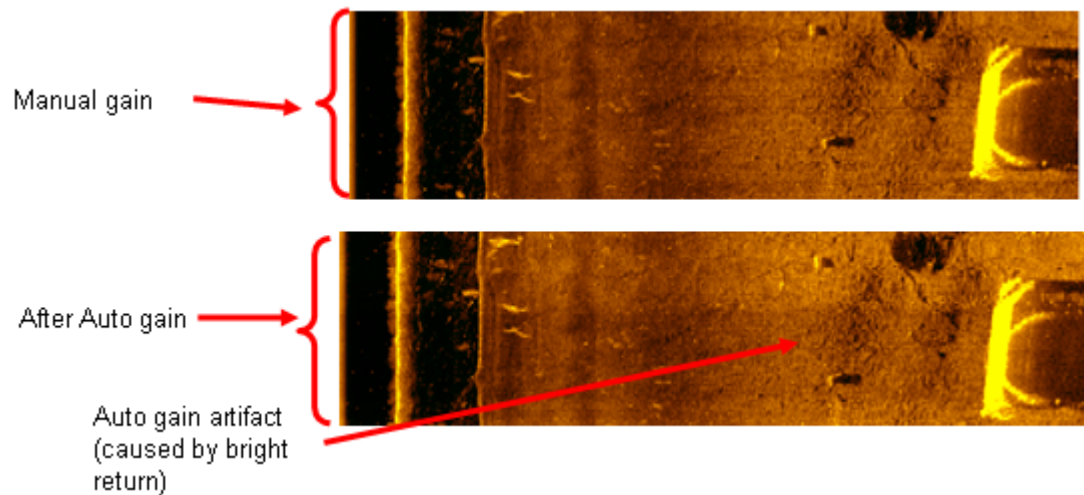
Manual Gain Sliders

When Manual Gain is enabled, you can move each slider with your mouse pointer to the level you prefer, from zero (bottom) to 100 (top) to adjust the overall gain and essentially "brighten" the image.   The setting will show at the top of the slider.

Apply-To-All-Data Button
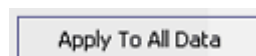
The changes made to the Image Adjustment settings are always applied to the newest data being displayed in the *SONAR waterfall* display. Click on <**Apply to All Data**> at the top center of the **Image Adjustment Window** 59 and the changes will be applied to the whole image.

SONAR Waterfall Display
The *SONAR Waterfall* display is your comprehensive viewing and work surface, so it always takes the majority of the work area.
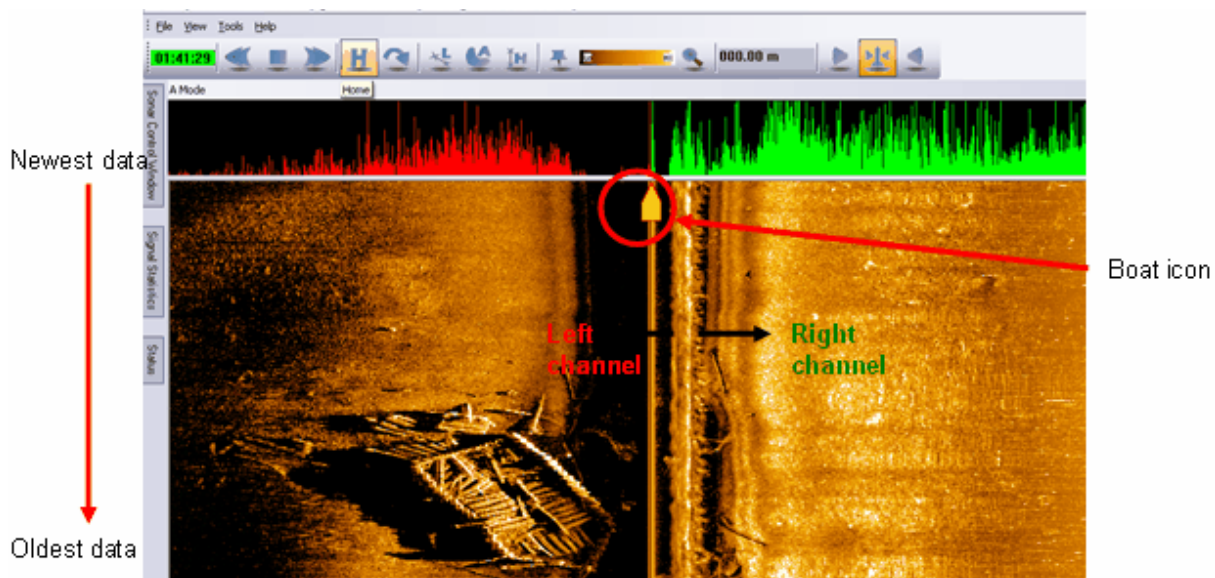
The newest data is always at the top; the oldest data will be at the bottom. The left *channel* will show at the left of the display area; the right *channel* will be at the right. The images on the *waterfall* will be in the color that you specify.

Access the color choices by clicking on—

<u>T</u>ools pull-down menu
<u>S</u>ettings
Waterfall
Image Adjustments
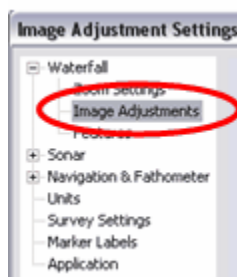
The **Settings** window will be displayed. At the menu, click on <**Image Adjustments** > under the *Waterfall* section to see the broad range of color choices available to you.

A right click on the **Palette Control** Bar brings up the **Image Adjustment Settings** window, where the **Palette Control** bar is also available. Another way to access the **Image Adjustment Settings** window is by using the pull-down menus at **Tools, Settings,** *Waterfall*, **Image Adjustment.**

A shortcut approach to accessing important *waterfall*-related controls is to right click in the *SONAR Waterfall* **Display**. This action will call up the *waterfall* pop-up menu, which contains the following options:

Image Adjustment Settings

Zoom Settings

Feature Settings

SONAR Interface

NMEA Data Input

Zoom Size at 100, 200, and 400 pixels
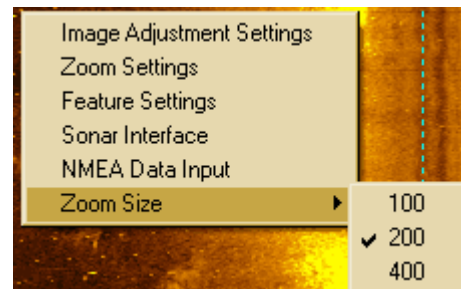
SONAR Waterfall Toolbar

Your principal tools for operating the *waterfall* reside just above the *waterfall* display area for quick access and constant reference. You will need and use these most frequently. You will find there (from left to right) the following information and buttons: **Elapsed Time Indicator**; **Rewind; Stop**;   **Fast Forward**; **Home**; **Jump-To**; **Length**; **Area**;

Height; *Marker;* **Palette Control**; **Zoom**; the **Measurement Readout** (in user-selectable units); and **Left** *transducer channel*, **Both** *channel*s, and **Right** *transducer channel*.

When you first open a data file or survey, the software places you at the start of the file, so the *waterfall* will be blank, as shown earlier. By using controls on the *waterfall* toolbar, you can advance through the data. These include the **Rewind**, **Stop**, **Fast Forward**, **Home**, and **Jump-To** controls.   Otherwise, you can use the **Marker Management Window** 54 to go to any position in the data that has been marked with a *marker* (see the discussion on *Markers* 135 in the section, *In Depth Discussion* 114).

> *Tip*
>
> **If your mouse has a scroll wheel, you can flick the wheel to move quickly through the *waterfall*. Just click anywhere in the *waterfall*, then flick or control the mouse scroll wheel to move through the *waterfall*. The Scroll speed will change with the mouse movement.**

If you left click on the *SONAR Waterfall* display when no *SONAR* tools are active, you can use the default **Range** 126 function. This valuable utility shows you the *slant range* from the *towfish* to the current mouse pointer position. This slant range is displayed right next to the mouse pointer.

Sea Scan Survey can correct for the slant range if altitude information is available.
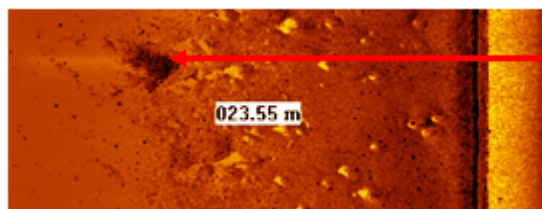
The distance (red arrow) from the *water column* to an object is revealed by a left click next to the object

Elapsed Time Indicator

This "running clock" at the top left of the *waterfall* toolbar displays the amount of time elapsed from the start of the file to the current displayed data in hours:minutes:seconds. A **green** background behind the numbers represents the

most current data in the *waterfall* screen.

If the data in the *waterfall* display is not the most current information, the background color of the **Elapsed Time Indicator** will change from **green** to **red** when recording data or to **white** when reviewing data.

Recording Mode: `01:40:5`

Review Mode: `01:40:51`

Rewind Button

This button decreases the *waterfall* view speed when you click it. The more you click this button, the faster the display will run backward. You can also activate this button by pressing the <**Page Down**> key.

Stop Button

Push the Stop button to halt the *waterfall*. Push the button again to restart the *waterfall*. You can also activate this button by pressing the <**End**> key.

Fast Forward Button

This button increases the *waterfall* view speed when you click it. The more you click this button, the faster the display will run forward. You can also activate this button by pressing the <**Page Up**> key.

Home Button

Click on the **Home** button to move immediately to the most current data.

Jump-To Button

Click on the **Jump-To** button to open the **Jump-To** window.
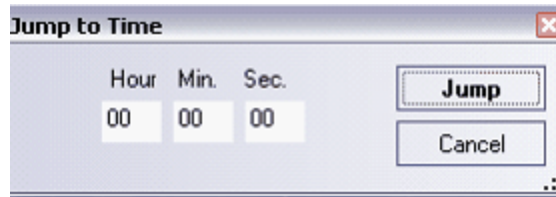
Here you can enter a time in hours, minutes, and seconds relative to the start of the survey (as indicated by the Elapsed Time indicator at the top left of the *waterfall* toolbar). Then click on the **<Jump>** button and the data will immediately move to that time. If you enter an invalid time, nothing will happen and the Jump-To window will close.

Speed-Over-Ground Correction

The *Sonar Waterfall* Display corrects for *SOG* on a ping-by-ping basis. This is accomplished by dynamic adjustment of the displayed *ping* height.

Waterfall Boat Icon

As soon as you open Sea Scan Survey, you will see the boat icon in the center of the *water column*. It remains in the center as long as the two-channel mode is set (both *transducers* are on). If only one *channel* is set, the icon will be to the left or right. Its position in the *water column* communicates the point from which all the data is being reported in the various docking windows (Status 18, Image Adjustment 19, SONAR 18 , etc.).

You can click and drag the icon down the *water column* to another point. Observe the Status Window data as you move the icon to see the collection points for that particular set of data (Elapsed Time, *Latitude*, *Longitude*, *SOG*, and *COG*).

Measurement Tools

The Length, Area, and Height buttons on the *waterfall* toolbar are your basic yardsticks while collecting data. Each one, discussed next, allows you to measure a target of interest in the current *waterfall* display.

Length Tool

 or
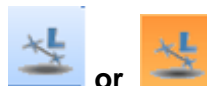
Click on the **Length** tool button on the *waterfall* toolbar to activate the tool. This button will become **orange** when activated. The *waterfall* will pause while the length

tool is active; this permits you time to measure a target of interest on the *waterfall* display. Do this by clicking first at one end of the target of interest to set the first anchor point, then clicking at the other end of the target to set the ending anchor point. The length of that target will be displayed in the *waterfall* toolbar.

Right click or press the <**ESC**> button while the **Length** tool is activated and the tool will be deactivated.

The **Length** tool will be **orange** when the tool is active (see the figure below). The length will be updated while you move the mouse pointer from the first anchor point to set the last one. When you are finished with that tool, simply click on it to deactivate it.

Measuring length of an object on the seabed (note the point-to-point line over object drawn with the Length tool. The line will flash while the tool is activated.)

Area Tool

 or
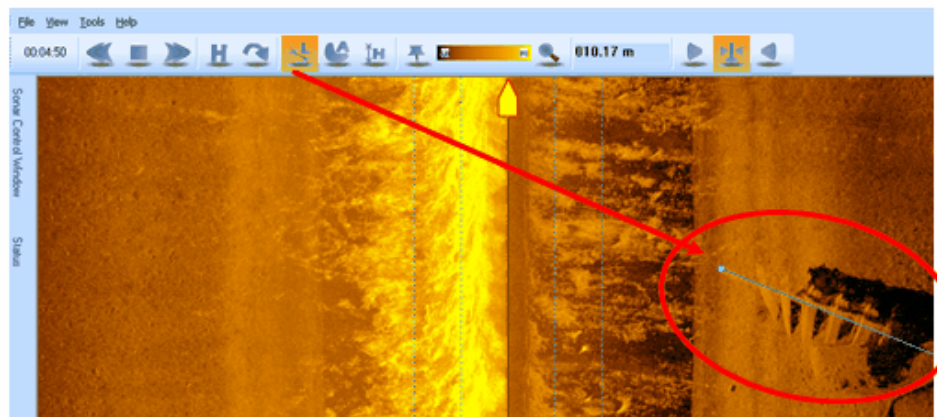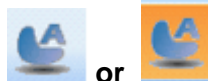
Click on the **Area** tool in the *waterfall* toolbar to activate this tool. The button will become **orange** when activated. As with the length tool, the *waterfall* pauses when the area tool is active; this permits you time to measure the area of a target of interest on the *waterfall* display. Do this by clicking first at an initial point on the target of interest, then continue clicking around it until the area is outlined. Next, double click to close off the area. The resulting measurement will be displayed in the measurement readout in the *waterfall* toolbar.
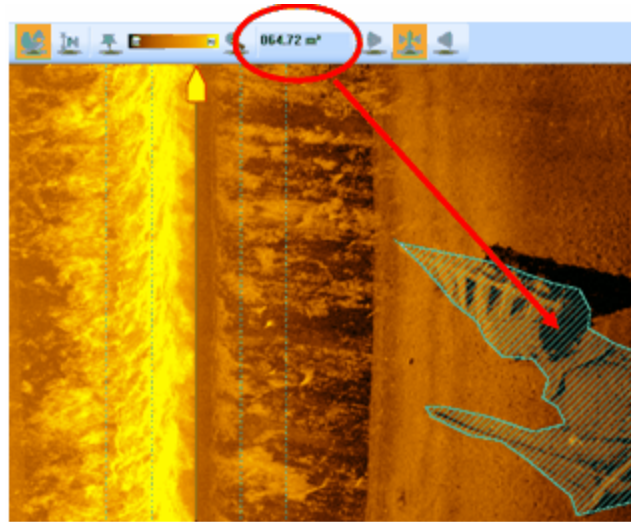
Area measurement of highlighted object

Right click or press the <**ESC**> button while the **Area** tool is activated to deactivate the **Area** tool.

Click once on the activated **Area** button to deactivate the area tool; you can also click on any of the other tools to deactivate the **Area** tool.

Height Tool

 or
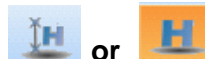
Click on the **Height** tool to activate it. As do the other measurement tools, the button will become **orange** when the **Height** tool is active. As before, the *waterfall* pauses while the height tool is active; this permits you time to measure the height of a target of interest on the *waterfall* display. The **Height** tool uses three points to calculate height: the first bottom return, the end of the object that caused the *shadow*, and the end of the *shadow*. Click once at each of the three required points in any order. When you have set the last point, the measurement will be displayed in the measurement readout in the *waterfall* toolbar.

3 anchor points:

End   Beginning   Bottom return
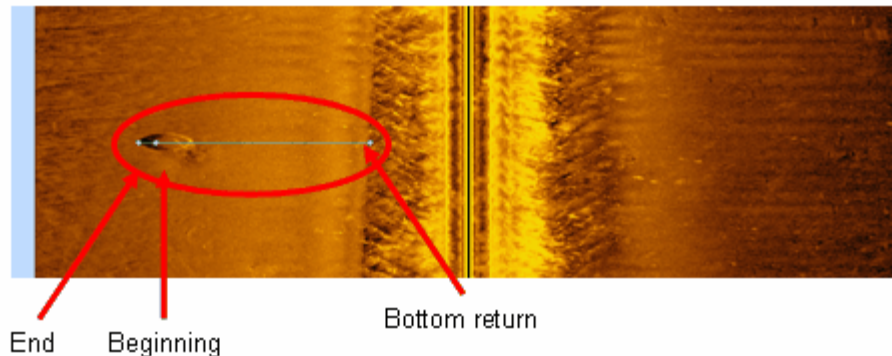
Right click while the **Height** tool is activated or press the **<ESC>** button to deactivate the height tool. Click once on the activated **Height** button to deactivate it.

Palette Tool

The **Palette Control** displays the <u>current</u> palette color, from the lowest value on the left to the highest value on the right.

Click on the **Palette Control** to invert the current color scheme; right click the **Palette Control** to show the **Image Adjustments** ⁵⁹ window. The color palette also is accessible by clicking on the **Tools** pull-down menu, **Settings**, *Waterfall*, **Image Adjustments**, then the dropdown menu in the **Image Adjustment Settings** window.

Zoom Tool

 or
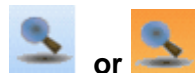
Click on the **Zoom** tool button to activate it. The button will become **orange** when the **Zoom** tool is active and the mouse pointer will become a small magnifying glass symbol. The *waterfall* WILL NOT pause while the zoom tool is active unless you hold down the left mouse button. When you do so, the area you are pointing at with the magnifier on the *waterfall* display will become larger.

Round magnifying glass applied to same image

Image before magnification

This action pauses the *waterfall*. Continue to hold down the left mouse button and move the mouse pointer; the magnified view will be updated to show magnified data where the mouse is pointing.

Release the left mouse button and the *waterfall* display will resume. Click once on the activated **Zoom** button or press the <**ESC**> button to deactivate it.

Last Measurement Readout

004.21m

This measurement at the far right of the *waterfall* toolbar shows you the last measurement that you took. Any measurement made with the **Length**, **Height**, or **Area** tools will appear here.

Channel Mode

Both channels activated

The **Channel** **Mode** buttons on the Sea Scan Survey *waterfall* toolbar consist of a button for the **Left** *channel*, a button for **Both** *channel*s, and a button for the **Right** *channel*. Only one of the *channel* mode buttons may be selected at a time. Thus, if you want both *channel*s, click on the button for **Both**; otherwise, you cannot select the left and right buttons together.

The *channel* mode button for the currently active *channel* mode will appear **orange** when activated.

Left Channel: When you click the Left *channel*, only the incoming data for the left *channel* will be shown in the *waterfall* display. However, data will continue to be collected for the other channel.

Both Channels: When you click on Both *channel*s, the incoming data for both *channel*s will be shown in the *waterfall* display.

Right Channel: When you click the right *channel*, only the incoming data for the right *channel* will be shown in the *waterfall* display. However, data will continue to be collected for the other channel.

To help in correlating exactly where the current *waterfall* data is coming from in relation to the auxiliary windows (Status window 18, Statistics window 21, A-Mode window 20, for example), a boat icon is displayed in the *waterfall* window in relation to the left and right *channels.* If the *waterfall* is set to receive data from both *channels*,

the icon will be at the center of the *waterfall.* If only one *channel* is collecting data, the icon will center on that side of the *waterfall* display.

Click and drag this icon up or down the water column to move the sampling point and retrieve data from an area of interest that you observe in the *waterfall* display. You can observe the changes in the Status window ⌐18⌐ as you move the icon.

Tip | **Click the Escape <Esc> key to deactivate any active tool.**

Settings Window

Access the **Settings Window** by clicking on the **Tools** pull-down menu, **Settings**, then **Survey Settings**. The following window opens:

As discussed earlier ⌐21⌐, at the left of the **Settings** window are headings that give you access to settings you can adjust or refinements you can make as you collect *SONAR* data. Click on any of the headings to view the relevant page. For example, the settings you see in the above figure for access and data collection purposes show you information that is stored in the system registry; these settings load every time you start

the Sea Scan Survey software. Even if the registry settings are incorrect, all the survey data will be in place and accessible. Thus, if you see an error message that the system cannot be restored, Sea Scan Survey will assign a default layout. This box occasionally pops up even when the registry information is correct. If this occurs, simply close the file, then reopen it.
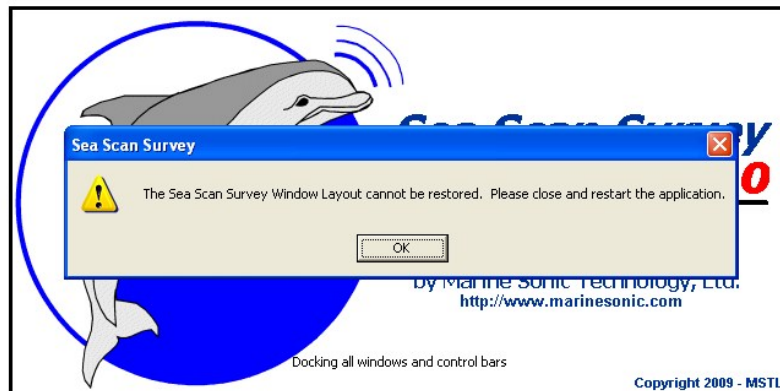
The window shows where the survey is stored on the computer, the Survey Name, the File Prefix, and a Description. The Description is the only field that you can edit. The others are filled in when you create a survey and are for reference only.

Click on <**OK**> to apply the settings and close the Settings window. Click on <**Apply**> to apply the settings and keep the **Settings** window open. Click on <**Cancel**> to close the **Settings** window without making any changes to the current settings.

Waterfall

Access the **Waterfall** settings by clicking on the **Tools** [21] pull-down menu. Select **Zoom Settings**, **Image Adjustments**, or **Features** windows from here.
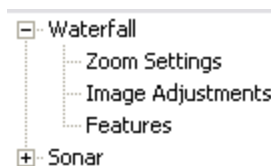
Zoom Settings

The **Zoom Settings** window gives you access to settings you can apply to the *SONAR waterfall* Zoom tool. Here, you can adjust the shape, size, and zoom percentage.

Shape: Sets the shape of the Zoom tool lens you access at the *waterfall* taskbar. Choose Rectangular or Round

Size: Sets the size of the Zoom lens in pixels

Zoom: Sets the magnification that is applied to the data shown with the Zoom tool
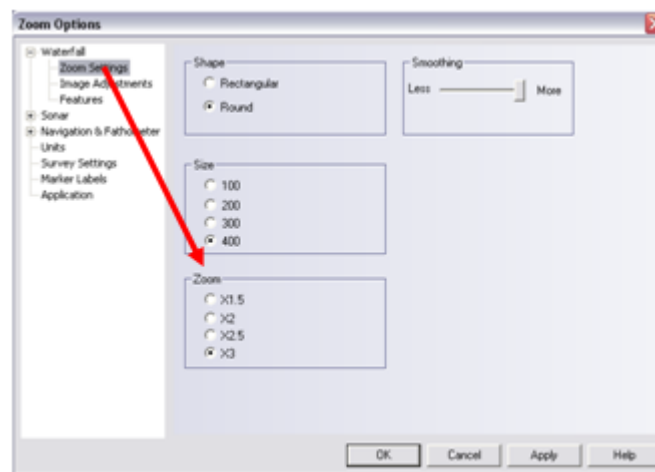
Smoothing: This option allows you to adjust the amount of *Gaussian smoothing*[151] that you can apply to the Zoom lens. The range slider adjusts from Less to More. Simply move the slider to set this option.
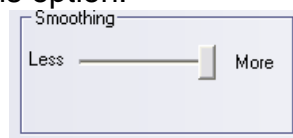
Tip
The size of the *marker* outline in the *waterfall* display will be the same as that which you set as the zoom size for the zoom tool. Bring up <u>S</u>ettings, then the Zoom Settings window, to change the zoom size.

Image Adjustments
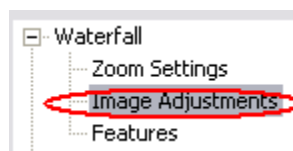
The **Image Adjustments** window gives you access to settings options you can apply to the appearance of incoming data in the *waterfall* display. Here, you can choose to view the raw incoming data rather than software-adjusted images, disengage the Automatic *TVG* so you can manually adjust gain, use the Manual *TVG* sliders, apply the settings to all new data, select the color palette arrangement from low to high or invert the colors, and decide on the optimal color scheme for comfortable viewing.
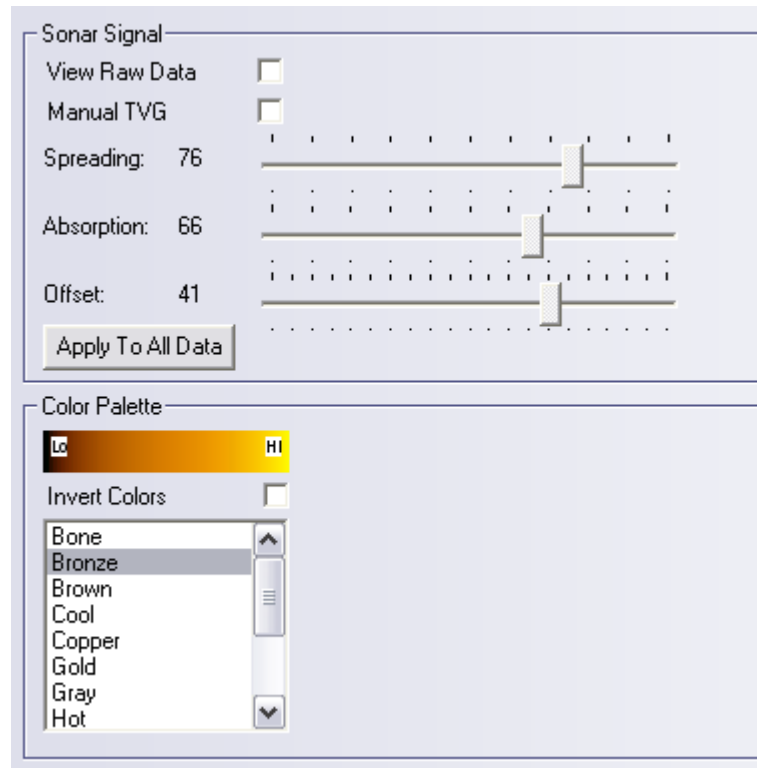
View Raw Data
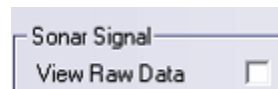
View Raw Data: Click on this box to disengage the Sea Scan Survey software adjustment features. You will now be able to view or export the raw process data (for example, gain settings) without system corrections. The raw data better translates into third-party software mosaic package outputs.

To export the raw data,
   1. click on <**Tools**>, **Settings, Waterfall, Image Adjustments**
   2. click on View Raw Data
   3. click <OK>

4. click on <**T**ools>, then click on **Survey to *XTF***.

5. View the .*xtf* files in the survey folder to determine which shows the raw data. The difference is notable.

Linear raw data

Logarithmically compressed raw data

Processed data
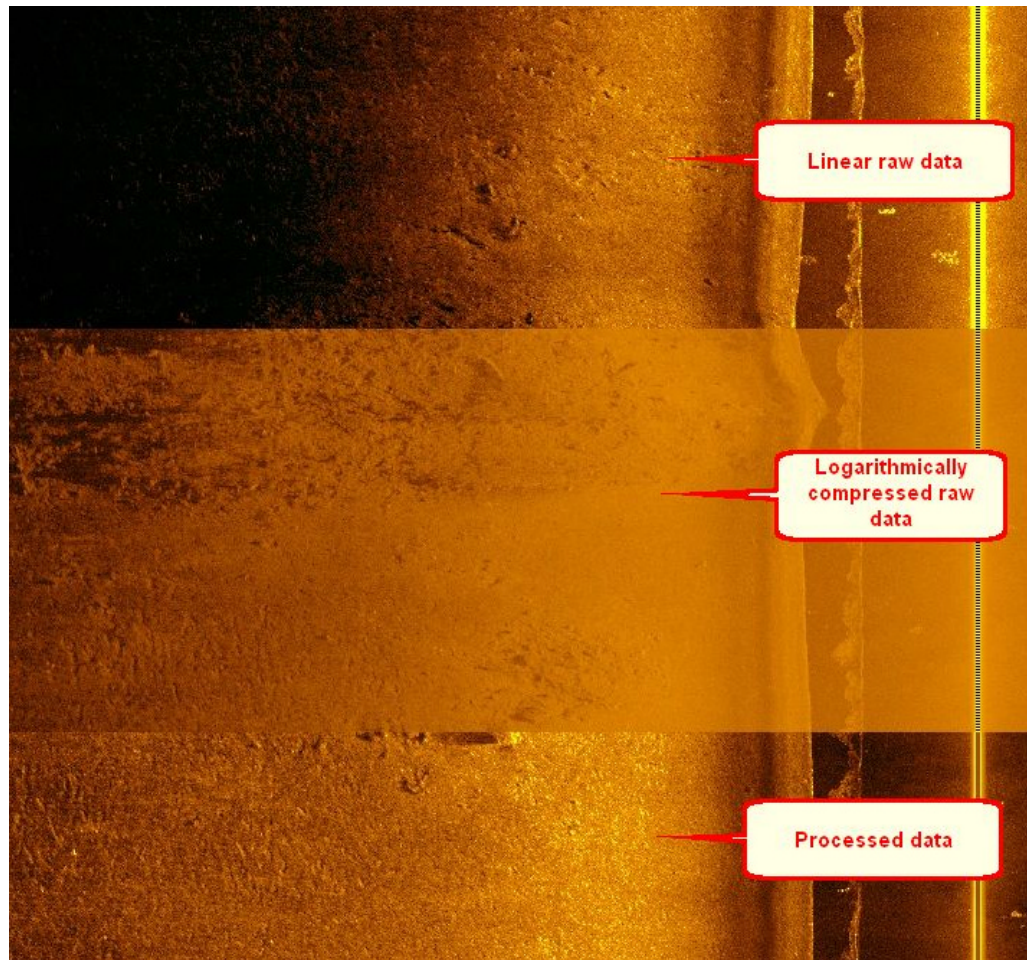
Deselect the checked box to return to the automatically corrected mode.

Manual TVG

Manual TVG ☐

Manual *TVG*: Click on this box to disengage the Automatic *TVG* so that you can make manual adjustments to the gain for all incoming data.

Deselect the checked box to return the system to the automatic mode of data correction.

Manual TVG Sliders
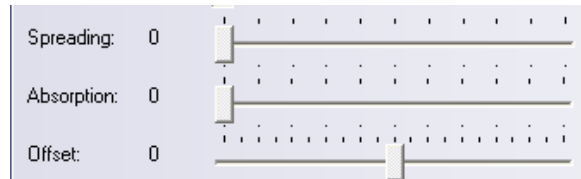
Manual *TVG* Sliders: The three manual *TVG* sliders are useful only when the **Auto Gain** feature is inactive; that is, when you have clicked on the Manual *TVG* box (see above). Each slider represents a specific type of correction for the *SONAR* data.

Spreading Slider: Corrects for the spreading loss of the *SONAR* beam. It can be adjusted from 0 to 100.

Absorption ₁₅₁ **Slider**: Corrects for *absorption* losses. It can be adjusted from 0 to 100.

Offset Slider: Offsets the data in the positive or negative direction. It can be adjusted from +100 to –100.

Apply to All Data: The changes made to the Image Adjustment settings are always applied to the newest data in the *SONAR waterfall* display. Click on <**Apply to All Data**> and the changes will be applied to the whole image and you will see the effect on all the new data entering the *waterfall* display.
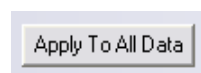
Color Palette
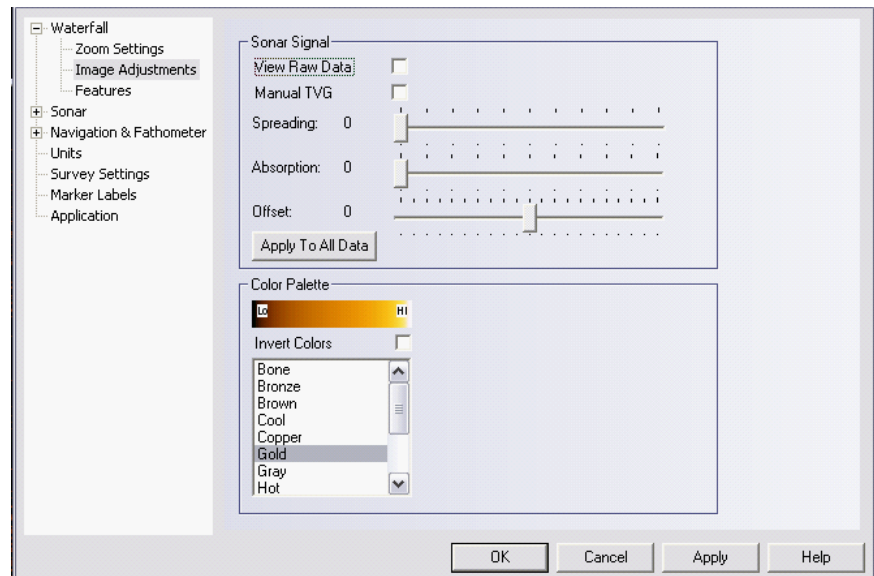
Color Palette

The **Color Palette** settings in the **Image Adjustments** window is where you choose the color of the data in the *waterfall* display. Simply select the color palette you would like to use from the list.

To reverse the palette so that the lowest value becomes the highest value and vice versa, simply click on the **Invert Colors** box. The light and dark values will now be reversed in the *waterfall* display.
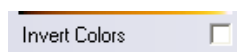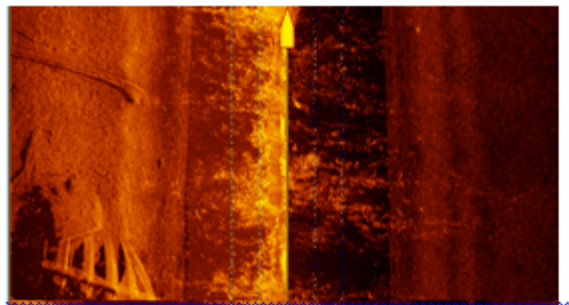
Waterfall before inverting color
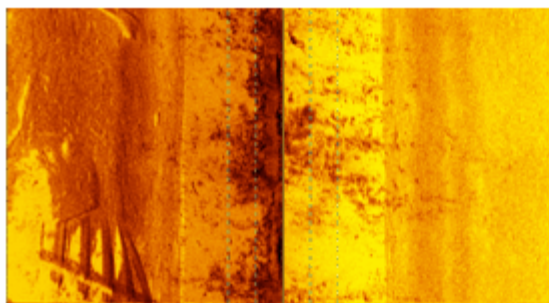
Waterfall after inverting color

> **Tip**
>
> **For a shortcut, right click anywhere in the *waterfall* window and a pop-up box will appear. From that box, you can click on Image Adjustment settings to open the above window.**

Features
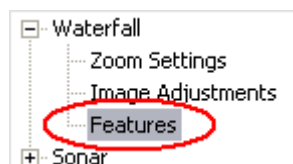
The **Features** settings in the **Settings** window allow you to turn on or off the various features of the *SONAR waterfall* display. These settings include the following options:

> *SOG* correction
> *Slant range* correction
> A 10% line
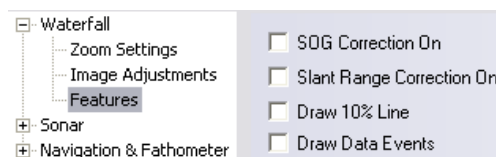
The 10% line appears in the *waterfall* as a dashed line at 10% and 20% of the current range. The 10% and 20% lines are intended to serve as guides of the optimal towing distance off the bottom (in most cases). The exception is in cases when the range is less than about 65 feet (20 meters) and the seafloor is not smooth.

> *Tip* For a shortcut, right click anywhere in the *waterfall* window and a pop-up box will appear. From that box, you can click on Features to open the above window.

SONAR

The *SONAR* settings affect Sea Scan Survey <u>only</u> during data collection.

Resolution

You can adjust several resolution settings for the *SONAR* data collection system at the **SONAR Resolutions Settings** window.
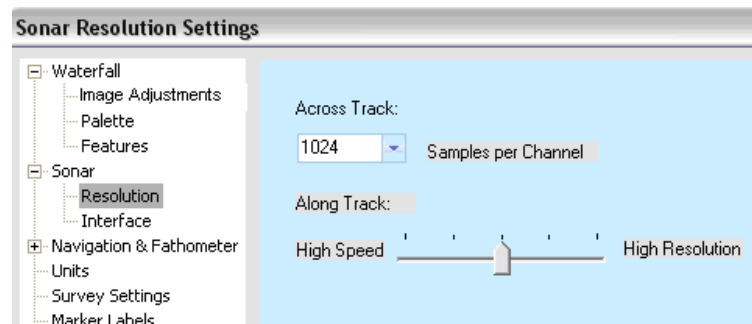
Across Track
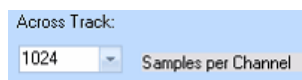
This setting affects the *SONAR* hardware by controlling the resolution of *SONAR* data that is collected. It is basically the width of the sample and the setting is in samples per *channel*. Access this list by clicking on the arrow to the right of the window, where you will see that the settings are listed from highest to lowest.

Along Track

This setting affects the *ping* rate and effectively controls several aspects of *SONAR* data collection. First, it controls the virtual width of *SONAR* data or virtual samples per *channel*. The lower the number of virtual samples per *channel*, the faster the *SONAR* can be towed. Conversely, the higher the number of virtual samples per *channel*, the slower the *SONAR* must be towed.

This setting is controlled by a slider that goes from High Speed to High Resolution.

Click and drag the slider toward **High Resolution** to <u>reduce</u> the effective towing speed. This will increase the along-track resolution. Move the slider toward **High Speed** to reduce the along-track resolution.

Tip | Cover a greater area by increasing the towing speed and lowering the resolution. Slow the towing speed and raise the resolution to see detail. For general use, keep the settings in the middle.

Interface
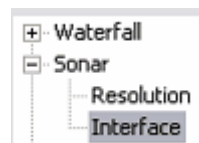
A ***SONAR* Interface** is a section of the software that is responsible for communicating with the *SONAR* hardware. It translates software settings and commands into hardware commands. Also, it validates and forms the data stream from the *SONAR* hardware.

Because of this *SONAR* interface, the software can be used with different *SONAR* hardware configurations. For example, some of these configurations include a ***Towfish***, which interfaces with a topside computer; a **Network**, which is connected through an Ethernet cable and is used with embedded *SONAR* systems; and a **Simulator** for testing and training purposes.

The **Simulator** provides an additional function; that is, you can set the starting navigation information such as location and [SOG]151 so that you can set simulations at any location in the world.

The *SONAR* **Interface Settings** window allows you to select the type of *SONAR* interface you wish to use. The **Available Interfaces** list box shows you what is available. Select one of these to determine whether that interface is active or stopped.

Available Interfaces

Simulator	Start
Network	
Simple Topside Unit	
RX Only Network	
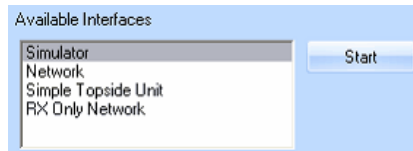
Start the interface by selecting one of those in the list. Then click on the <**Start**> button to the side of the list. If the button reads <**Stop**>, then the interface you selected is already in use.

Stop the interface by selecting the currently active interface in the **Available Interfaces** list box and click the <**Stop**> button.

Tip

When you start an interface, if the <Start> button turns into a <Stop> button and no error messages pop up, then the selected *SONAR* interface has started successfully. Look at the *SONAR* status section in the Status Bar at the bottom of the display area window to check the status of the *SONAR* connection. Wait 10 to 20 seconds. If the *SONAR* status reads, "*SONAR* not connected," please refer to the *SONAR* Hardware Operations Manual to troubleshoot the problem.

Navigation and Fathometer

NMEA (National Marine Electronics Association) Data Input
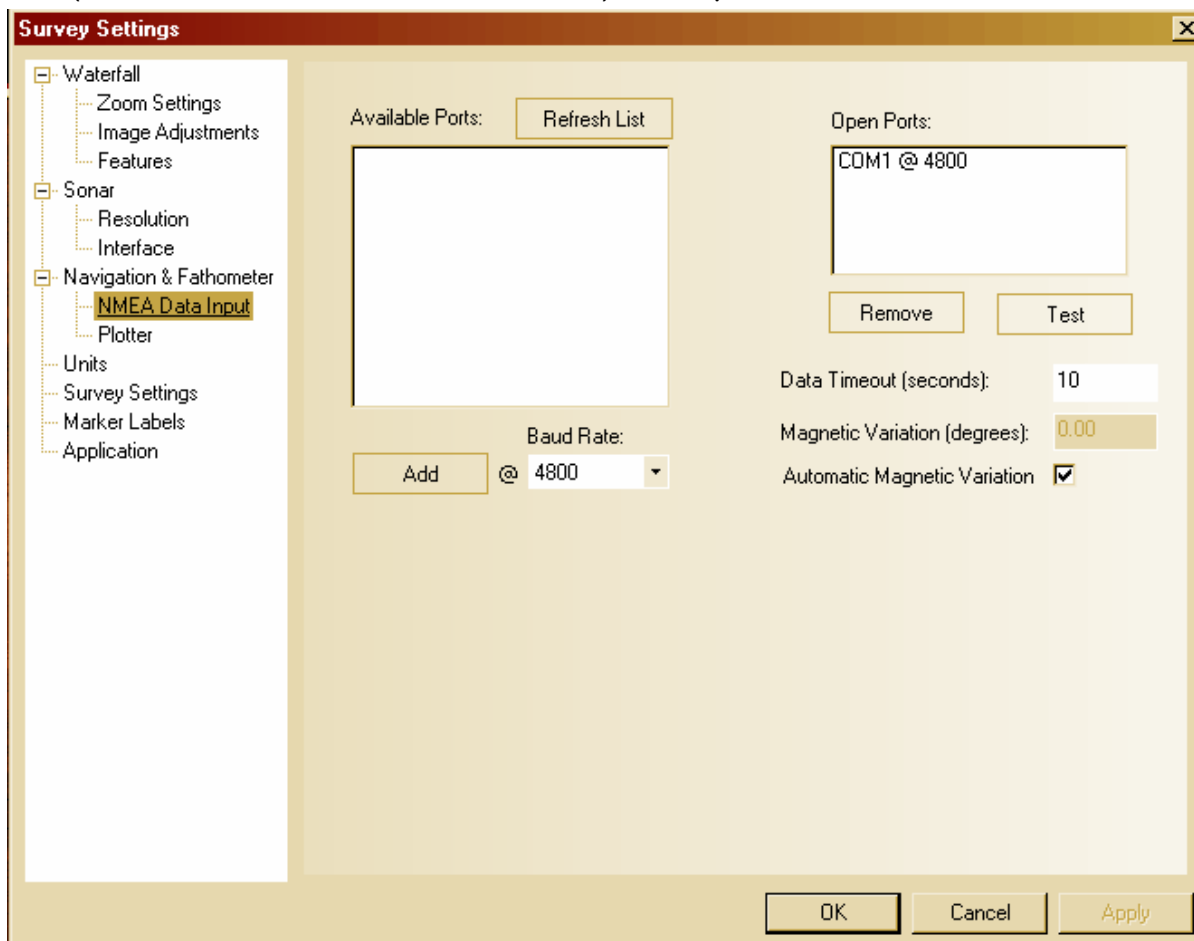
This window lists the available serial ports. Here, you also can select among the available ports and set the *baud rate*[151] at which to receive the *NMEA*[151] *0183 strings*[151].   It, too, is accessed under <**Tools**>, <**Settings**>, <**Navigation & Fathometer**>, then <**NMEA Data Input**>.
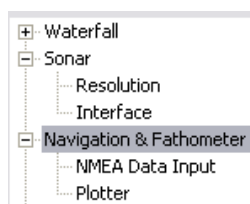
This window also lists the open communication ports. .
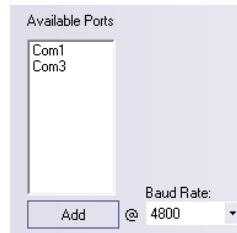
This window also shows the *baud rates* at which the ports are currently set. You may click on the arrow to the right and select a different rate if you prefer.
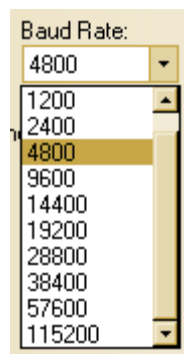
Here you are able to set the navigation data timeout. This timeout invalidates the navigation if no data is received for the period that the timeout specifies.
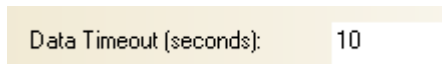
Below the timeout box are two boxes that are useful to account for magnetic variations in your area. If magnetic variances occur, you can set the variance manually in the box below (if grayed out as in this example, unclick the check in the Automatic Magnetic Variation box, then insert the variation in decimals).
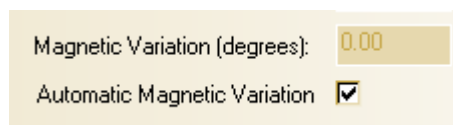
Otherwise, place a check in the Automatic Magnetic Variation checkbox (as shown above) and the GPS headings will correlate with those from the towfish This feature can be quite helpful for navigation purposes or when marking important sites or discoveries when there is a significant disparity between true and magnetic headings.

Tip | Course headings are based on true north.

This window displays the individual *NMEA* 0183 strings (standardized protocols that allow marine instruments to transmit and receive information) that Sea Scan Survey supports. (See also the in-depth discussion of required and accepted NMEA 0183 strings of data in the section, *In Depth Discussion* [114].)

It also lists the available ports presents a brief description of the type of connection so that you can differentiate among the items on the list.
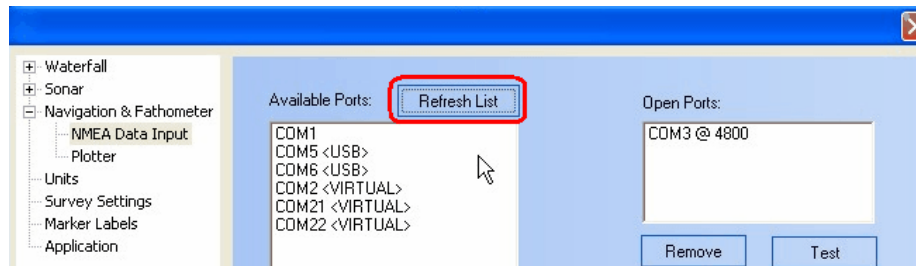
Press the <**Refresh List**> button (as shown in the above figure) to update the list of available ports if you have connected new hardware (e.g., a GPS). An hourglass will appear while the application verifies communication with the new hardware.

 In addition, the number of bad or incomplete strings that have been received will show in **Test Communication Window**. You can open the **Test Communication Window** by clicking on the <**Test**> button on the *NMEA* [130] data input page.
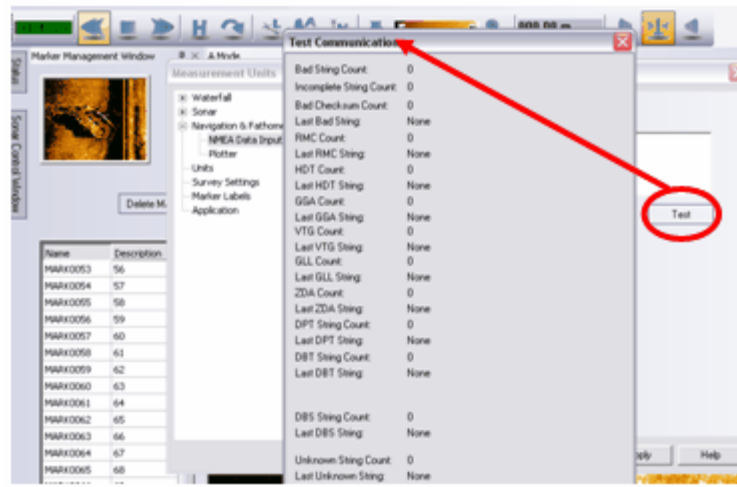
Tip Check the "at-a-glance" indicator that reveals whether the navigation data is present and whether the readings are good.

Plotter
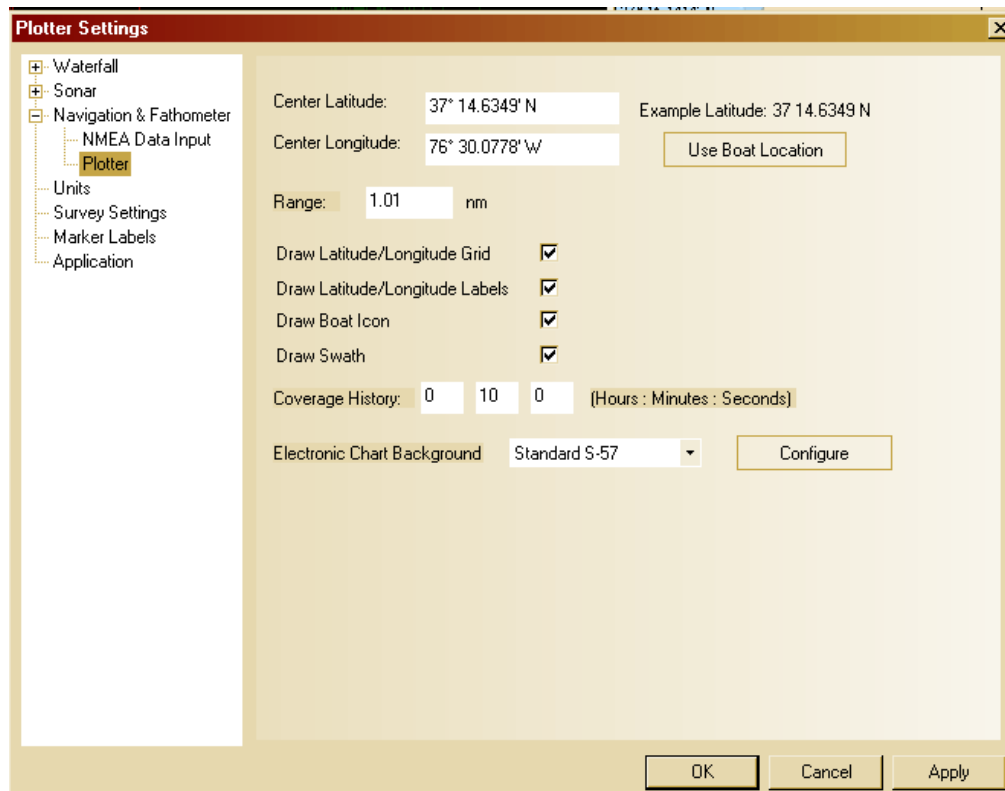
You can refine Plotter details by accessing **Tools**, **Settings**, **Navigation & Fathometer,** then **Plotter**.

For example, you can view the current center position and range information or click on the check box to <**Use Boat Location**> option.   You can fill in several boxes to set other details:

Range: An edit box that allows you to set the range in the unit of measure you specified in the **Units** 89 window. If you set for a small range, all the measurement tools will readjust accordingly; they will also automatically adjust if you set for larger units.

Draw Latitude/Longitude Grid Check Box.

Draw Latitude/Longitude Labels Check Box.

Draw Boat Icon: Click on the **Draw Boat Icon** to draw the boat in the **Navigation Plotter Window.**

Draw Swath: Click on this option to show the left and right swaths off the stern of the vessel in the **Navigation Plotter Window**.

Coverage History: An edit box that allows you to specify how far back in time you want to see the coverage. The time is specified in hours:minutes:seconds (as indicated by the Elapsed Time indicator at the top left of the waterfall 21.
toolbar 21). The default amount of coverage history time is 10 minutes.

Caution
> **The longer the time that you set for coverage, the busier the Sea Scan Survey software will be trying to maintain updates on the display, so keep the coverage history small while scanning.**

Electronic Chart Background: Turn the digital chart capability on or off. If the charts are available, you can choose either Standard Electronic Navigation Charts (*ENC* 151) charts or Premium *ENC* charts.

Configure: A check box that opens another window where you can customize the details on the Plotter charts.

Center Latitude: Invalid   Example Latitude: Invalid

Center Longitude: Invalid   Use Boat Location

Chart Configuration   ✕

Range:
☐ Show Simplified Chart
☑ Show Depth Sounding
Draw Latitud ☑ Show Aids To Navigation
☑ Show Important Text
Draw Latitud ☐ Show Other Text

Draw Boat Id
Depth Units: meters

Coverage His   linutes Seconds)
Safety Depth: 4.00

Electronic Ch   Configure
Shallow Contour: 2.00

Safety Contour: 20.00

Deep Contour: 30.00

OK   Cancel

If you select all the chart options available to you, the chart will be highly detailed and show similar features as in paper charts (landmarks, bridges, North orientation, hazards to navigation, depth with fractions in subscript). However, the detailed charts will require more system memory and may slow data processing.
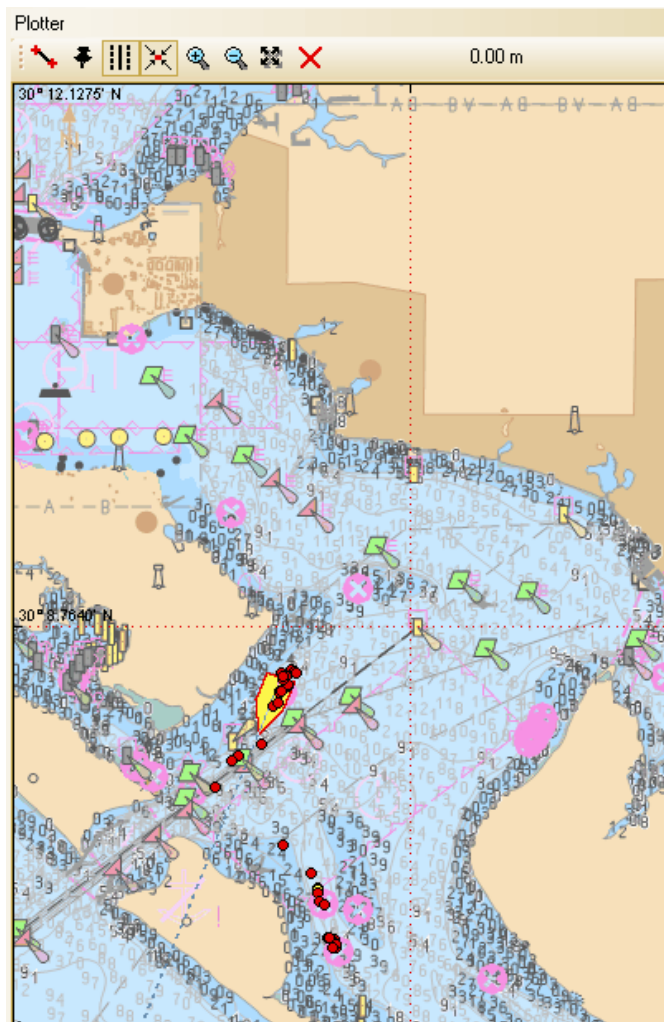
Warning

> MARINE SONIC TECHNOLOGY, LTD. WARNS AGAINST YOUR DEPENDING ON THESE DIGITAL CHARTS FOR NAVIGATION PURPOSES. THEY ARE STRICTLY FOR SUPPORTING A SEARCH AND IDENTIFYING POTENTIAL TARGETS OF INTEREST.

Units

Here you can select the units that you prefer to use. The selections you make here will be reflected everywhere in the application where latitude and longitude are displayed.

You will see boxes for each of the following adjustments:

Small Ranges: Feet, Meters, Yards

Long Ranges: Kilometers, Meters, Miles, Nautical Miles

Depth: Feet, Meters

Velocity: Feet per Second, Kilometers per Hour, Knots,
                                    Meters per Second,
                                    Miles per Hour

Location Type: Lat/Long Decimal Degrees
                                    Lat/Long Decimal Minutes
                                    Lat/Long Decimal Seconds
                                    UTM

Location Significant Digits: 1–8
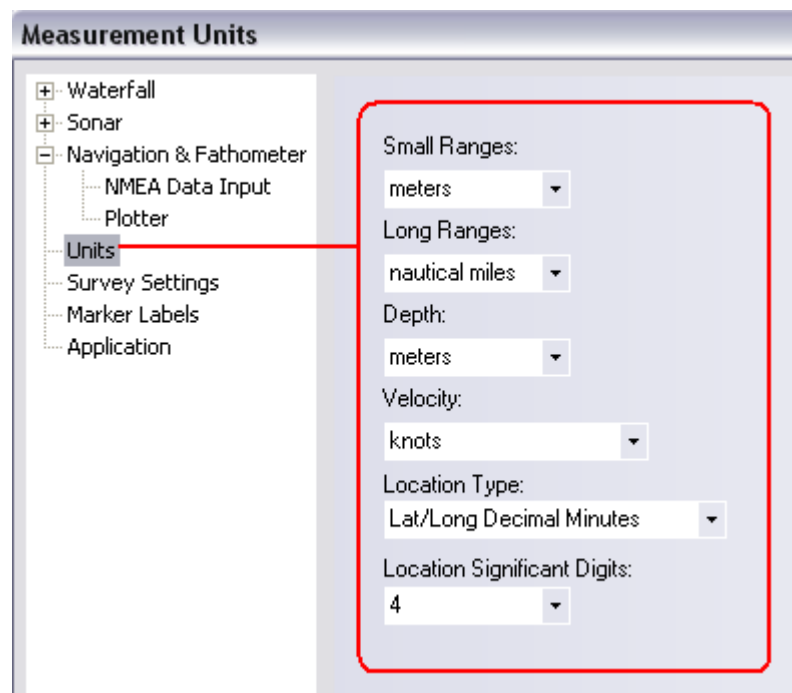
Survey Settings

As discussed [earlier](72), this window permits you to view the data settings and to add descriptive information about the file to the one area that permits additions.
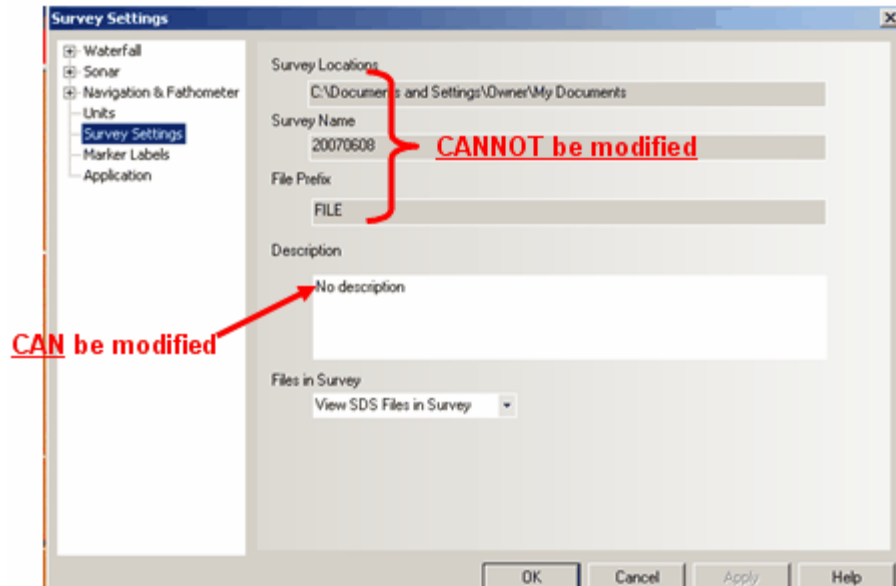
Marker Labels

Click on **Settings**, then select **Marker Labels** to personalize or make changes to the priorities that you can assign to the markers during a survey. The default color settings are as follows:

Red Marker: High Priority

Blue Marker: Medium Priority

Green Marker: Low Priority

Yellow Marker: Clear

These will remain the default settings until you change them.

Personalized designations
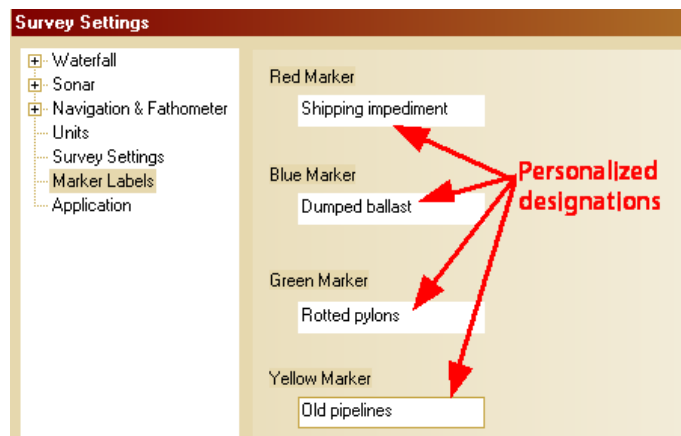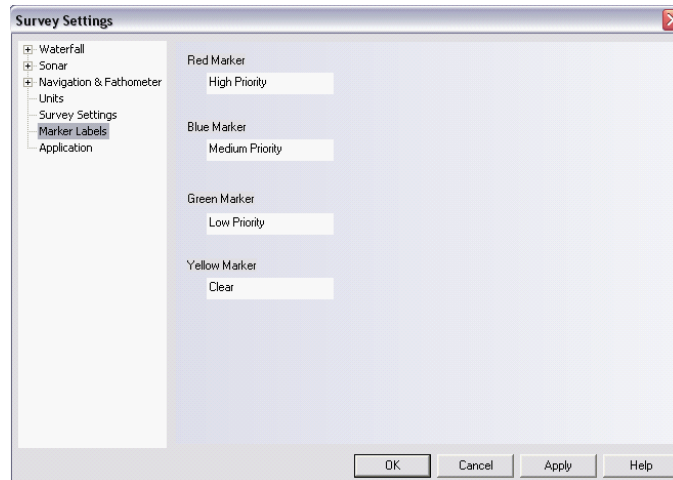
Application
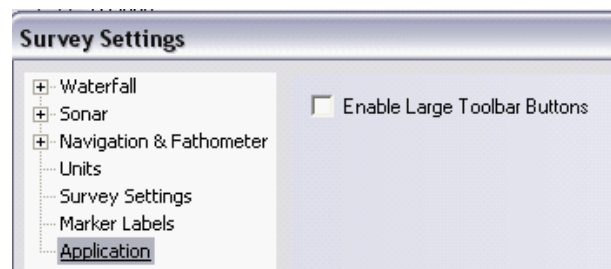
Viewing and accessing the *waterfall* display toolbar buttons can be difficult under certain on-the-water conditions. Visibility may be a factor, as may the size of the viewing area because of a small laptop computer screen or touch-screen setup. In the **Application** window is a button that allows enlargement of the *waterfall* display toolbar buttons for just such a situation.

By clicking on that option, the *waterfall* display toolbar buttons significantly enlarge while the remainder of the workspace area remains the same.

Quick-Start Procedures

Sea Scan Survey controls the collection and review of the *SONAR* imagery and navigational input and displays the information for you on the computer screen. It allows you to control the *SONAR* data collection process, review, analyze, and save the *SONAR* image along with the markers and waypoints that you have inserted. The *towfish ping* rate and *SONAR* signal processing also are controlled by the software, and the software automatically communicates with the *towfish* to determine status and configuration.

The following is a step-by-step description for setting up the Sea Scan Survey hardware on a survey vessel and running an operation:

1. Set up the computer system.

2. Make sure the topside box is attached to the computer. (See the instructions that accompanied the topside box for details on connecting and testing the unit.)

3. Plug in the tow cable according to the instructions that accompanied the *towfish*.

Warning	**DO NOT PLUG OR UNPLUG THE TOW CABLE WHEN THE *SONAR* POWER IS ON. THIS ACTION MAY DAMAGE THE TOWFISH AND/OR THE INTERFACE UNIT.**

4. Open the Sea Scan Survey software and start a <u>New Survey</u> [14] file.

5. Set the range ⌐18⌐ to the desired search range.

Set the range
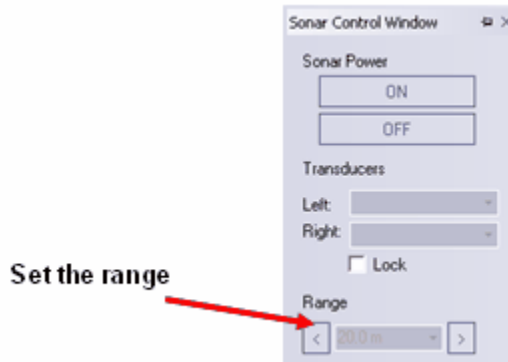
6. Connect the data output cable of the external *Global Positioning System (GPS)* into one of the serial ports of the computer.

7. Turn on the *GPS.*

8. Click on **Tools**, **Settings**, **Navigation & Fathometer**, then **NMEA Data Input** to show the available serial ports. If the GPS does not show up in the list of available ports, click on the <**Refresh List**> button; the system will search for and communicate with the newly attached hardware.
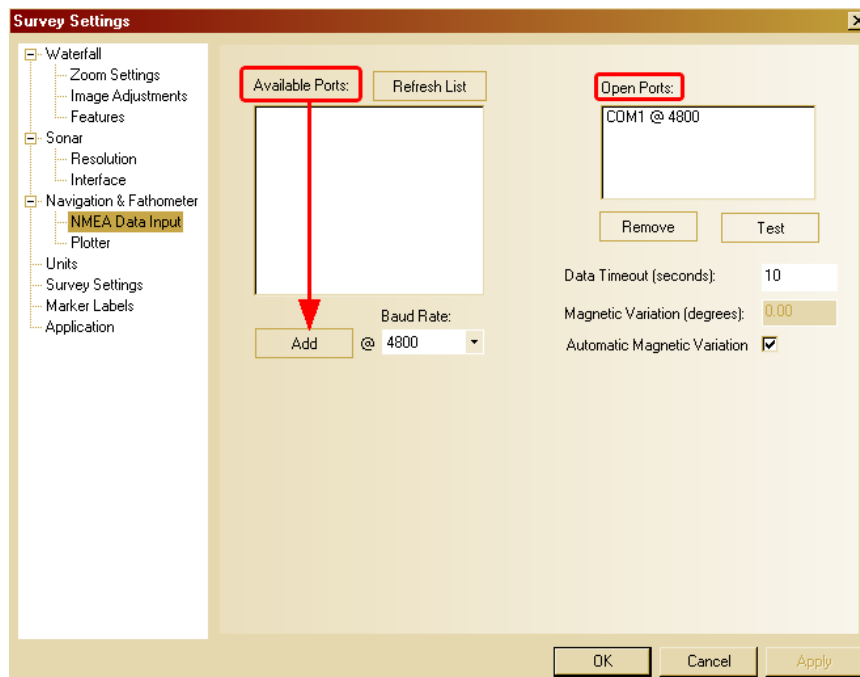
a. Select from among the available ports in the list and click <**Add**>.

b. Make sure the port's *baud rate*|151| matches that of the *GPS*. The port you selected will now appear in the Open Ports window.

Tip | **A baud rate of 4800 is the NMEA standard.**

c. Click on that port, then click <**Test**>. The Test Communication Window|83| will immediately open.

d. Review the at-a-glance light indicator in the Test Communication Window to assure that information is coming in from the *GPS* (position, range, *SOG*).
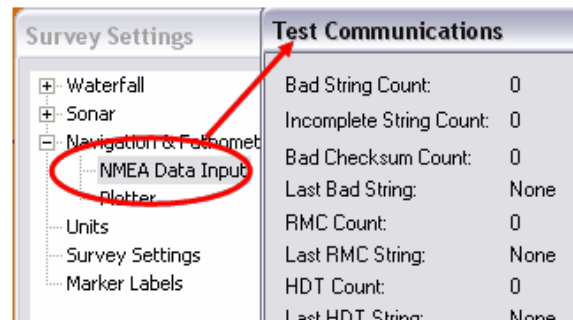
9. Secure all the system components and cables.

10. Open the **SONAR Control Window**|18| and turn on the *SONAR* (doing this now gives you the opportunity to do a rub check before inserting the *towfish* into the water. Further, you can monitor the computer screen to avoid hitting the *towfish* against the seabed during its release.)
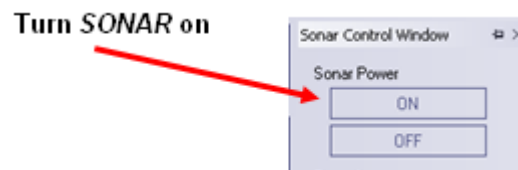
The *transducers* will immediately begin *pinging*. Sea Scan Survey will respond and you will begin receiving *SONAR* data in the *waterfall* display.

11. Set the *frequency* for each *transducer* in the **SONAR Control Window**|18| at the separate pull-down menus for each one. You also have the option of

selecting **None**.

Warning | IF <u>NO</u> TRANSDUCERS ARE SELECTED, THE SYSTEM CANNOT COLLECT DATA.
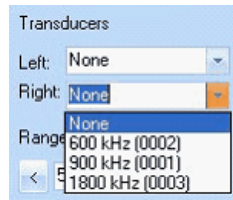
If you change frequencies, you will see a **blue** indicator line and the letters **FS** in the water column.
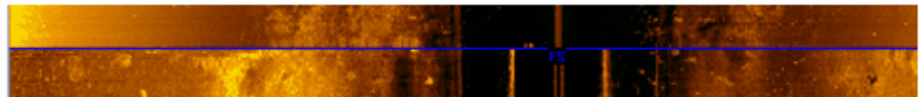
12. Make sure both *channels* are <u>on</u> at the *waterfall* toolbar.

13. Prepare Sea Scan Survey for a Rub Check.

    a.   Set the *SOG* to <**Manual**> at the **SONAR Control Window** 18 and increase the *SOG* so that the data scrolls down the screen.
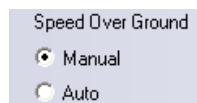
    b.   Set the Range Delay to 0.
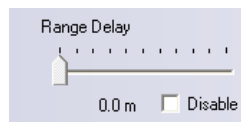
    c.   Press the **Forward** button repeatedly to fast forward the flow of data.

d. Open the **Image Adjustment Window**[19] and reset the *histogram* sliders**.**
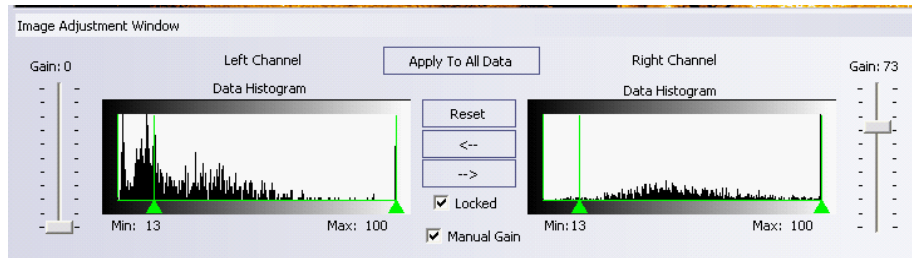
14. Do a Rub Check on the *transducers* to ensure they are communicating properly with the software.

   a. Rub your hand over one *transducer*, then the other (best to do one at a time to confirm that each *transducer* shows up on the correspondingly correct side of the *waterfall*).

   b. Observe the *waterfall* display. If you see a corresponding narrow band appear across the appropriate side of the *waterfall* display (left or right), the *transducers* are connected properly and are reporting as expected.

The left and right rub check results in the *waterfall* display window
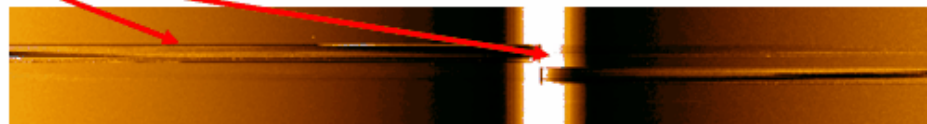
Tip

Try one or more of these tips for more effective rub checks:
- **dry your fingers thoroughly before rubbing each *transducer***
- **use a crumpled piece of paper to test the *transducers***
- **use a burst of compressed air (the best method)**

15. Now, readjust the settings for Auto *Ping* Rate at the **SONAR Control Window** [18] and turn off Manual *TVG* at the **Image Adjustment Settings** [19] window to start data collection.

16. Put the *towfish* in the water in one of two ways:

    a.   Stop the boat and slowly pay out cable. If you know the bottom contour to be smooth, lay the towfish gently on the bottom, then pull it up a few feet.

    b.   Slow the boat and slowly pay out cable. Watch the computer screen and make adjustments to the cable based on the *waterfall SONAR* images.

Tip

> **To set the *towfish* height above bottom, follow the 10% rule: Set the *towfish* altitude so that it is 10% of your current range setting. Thus, for a range of 50 meters, keep the *towfish* 5 meters above the bottom. However, local conditions may require some adjustment to that rule.**

17. Open the **Settings** [21] window and select **Features**. There you can turn on the 10% and 20% altitude-above-bottom lines if you haven't already done so.

18. Monitor *towfish* descent on the *waterfall* display. You will be able to observe the boat icon in the center of the *water column* because both sonar channels are on and you can observe the 10% and 20% lines inserted at step 17 above. You can also watch the *water column;* if it narrows too quickly, the *towfish* may hit bottom.

Watch for sudden narrowing of the water column

10% and 20% lines
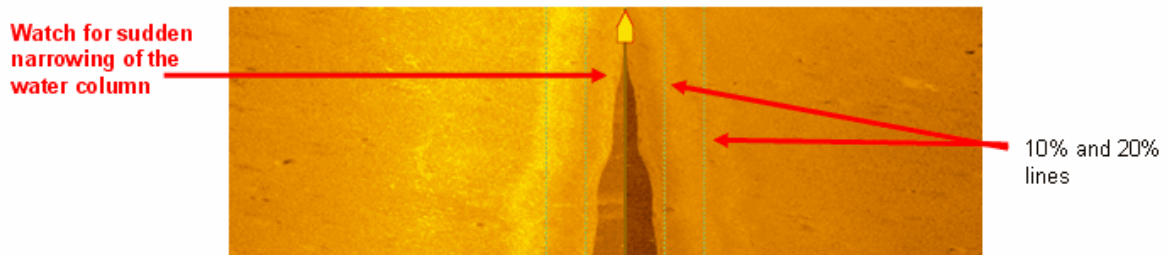
19. Monitor the range of the towfish from the bottom using the default range function.
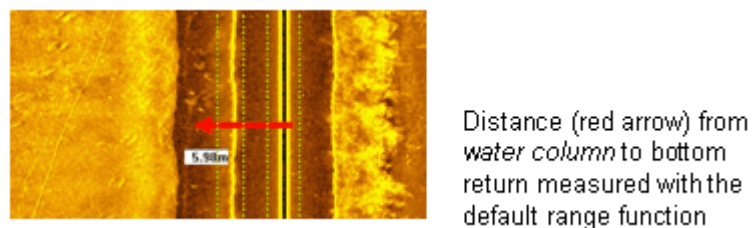
Distance (red arrow) from *water column* to bottom return measured with the default range function

5.98m

20. Set the range in the **SONAR_Control_Window** [18]. The settings are in increments of 10 feet.
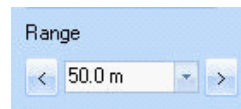
21. Watch the waterfall display as you change the range settings and you will see the difference between one range and another, as in the figure that follows. (Some image adjustment may be needed when you change the range.)
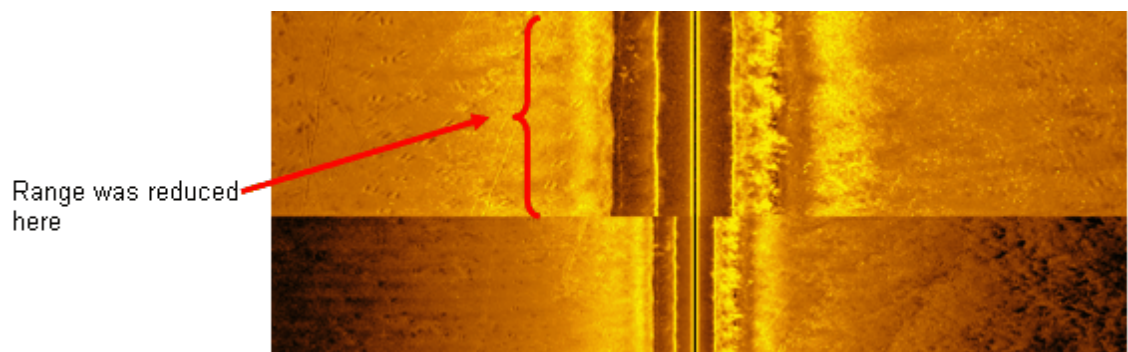
22. Adjust the gain and channel Histograms [19] for best viewing.
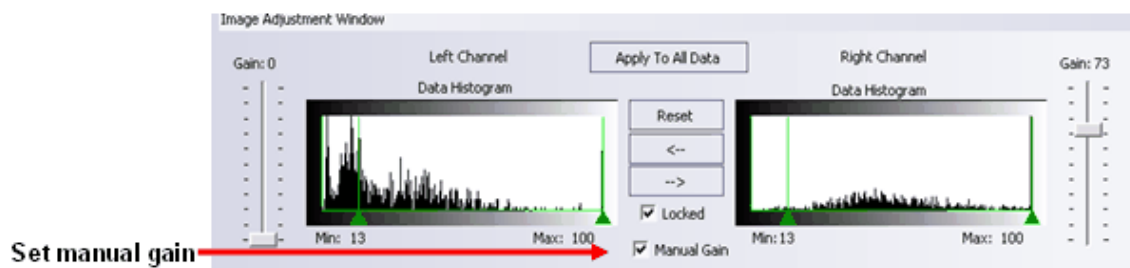
23. Select the check from the Manual TVG box to return the system to Auto TVG.

Image Adjustment Settings
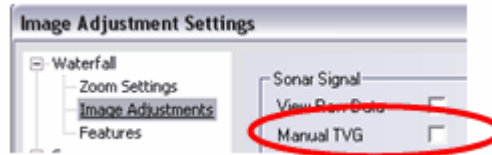
24. Set the color palette you prefer for the incoming data if you haven't already done so.
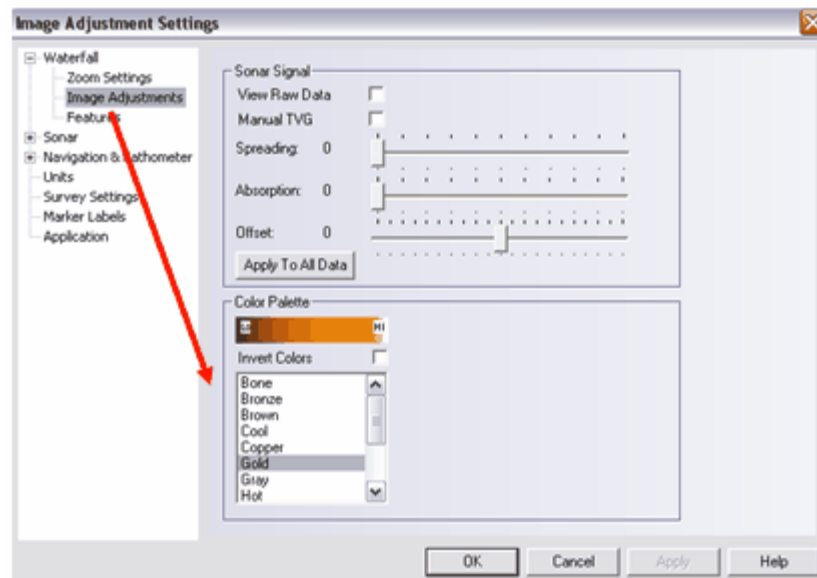
25. Open the Navigation Plotter Window 43 .

   a. Note that the Plotter displays actual SONAR data as well as geo-referenced *latitude* and *longitude* as the towfish moves through the water.

   b. In addition, the Plotter displays an icon of the boat that is rotated and offset to show course and heading if available.

   c. Right click in the Plotter Window to bring up a menu with the following options:

Plotter Window Settings
Auto Scale
✔ Auto Center

Create Waypoint
Delete Marker or Waypoint
Edit Waypoint

Tip | **Options that are** grayed out **in the Plotter Window options box become accessible when you perform a related action (as in inserting a** *waypoint* **).**

d. Turn on the geo-referenced charts feature in the <u>Settings</u>[21] window and select either Standard or Premium charts.

Coverage History: 0 10 0 (Hours : Minutes : Seconds)

Electronic Chart Background   Standard S-57   ▼   Configure

OK   Cancel   Apply
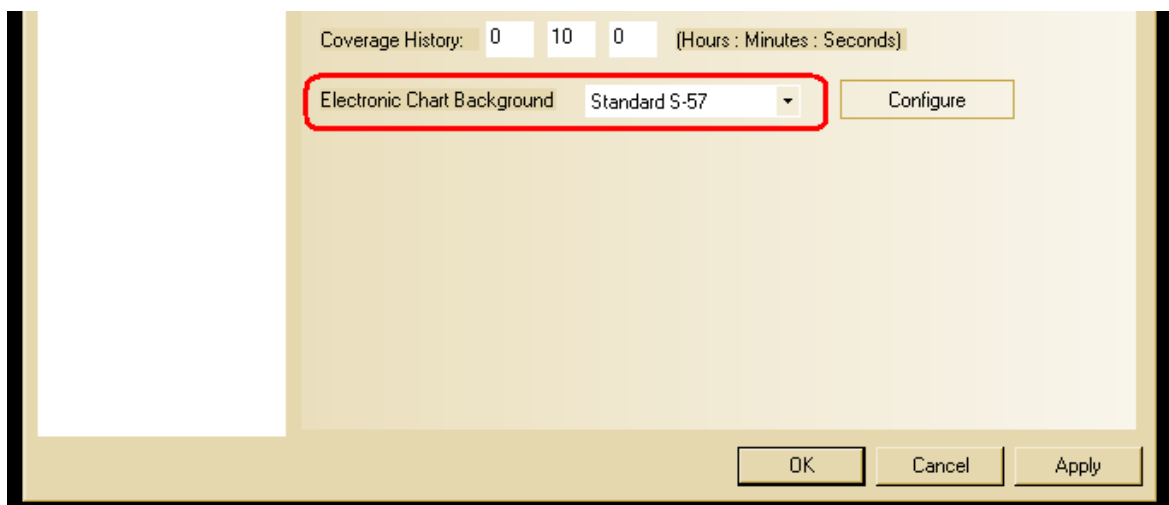
e. Click on the <**Configure**> button to set the parameters for the S-57 charts.
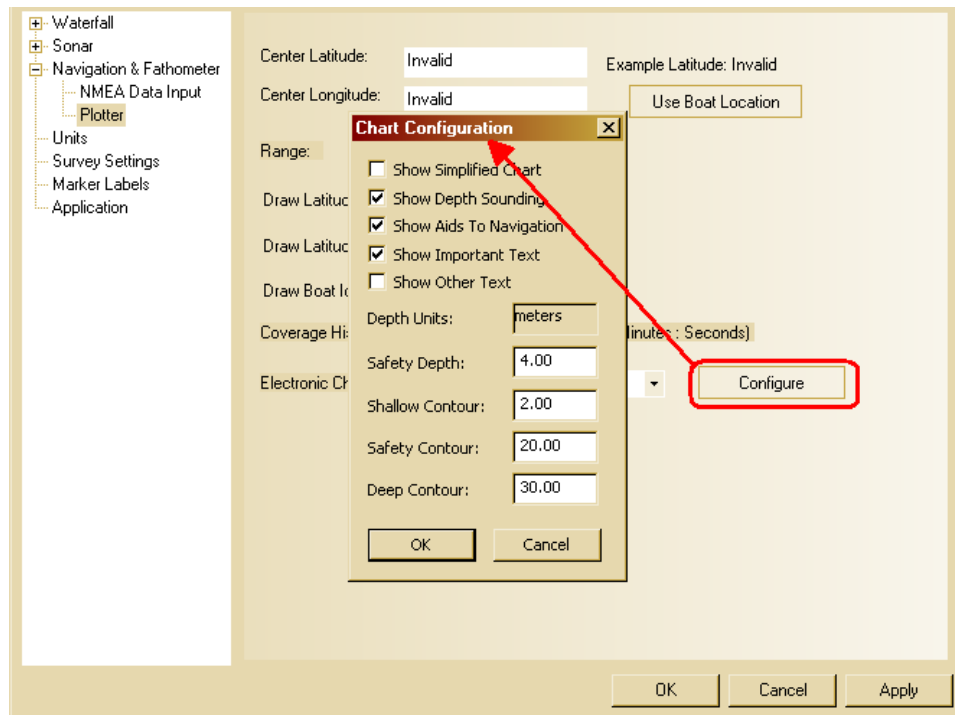
f. Click on the Zoom Box Tool on the <u>Plotter toolbar</u> [47] so you can drag a box around an object of interest in the Plotter Window.

Zoom box tool and drawn box
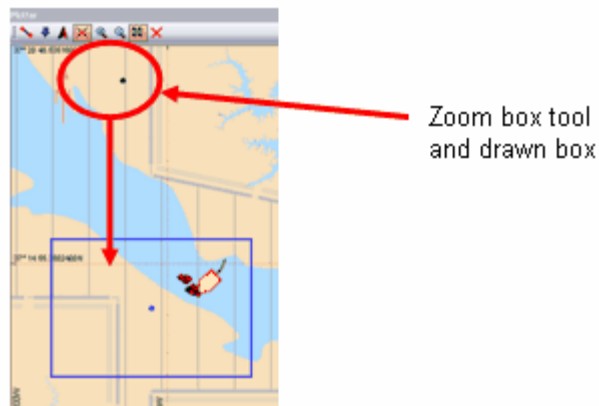
g. Click on the Auto-Scale Plotter Button so that, as you accrue marker/waypoint markings, you can rescale the plotter window to reveal all the markers/waypoints and the navigation data.

25. Open the <u>Marker Management Window</u> [54] where you can see a preview image, name, classification, etc., of each marker that you designate. Waypoints will also be listed but will not have a preview image.

26.Set the Units ⁸⁹ to those you prefer if you haven't already done so. They will become the default units of measure until you change them.
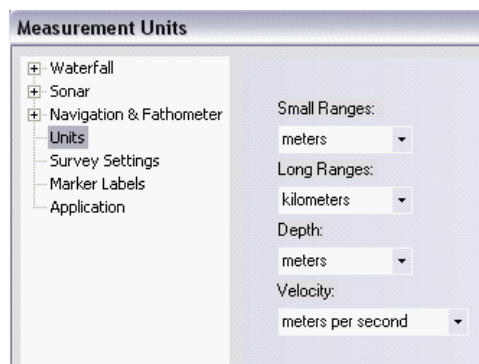
27.Move your mouse pointer around the waterfall display area and hold down the mouse button at various points. This will give you a corrected slant range for the point identified.

Left mouse button used to obtain slant range for these oyster tong marks
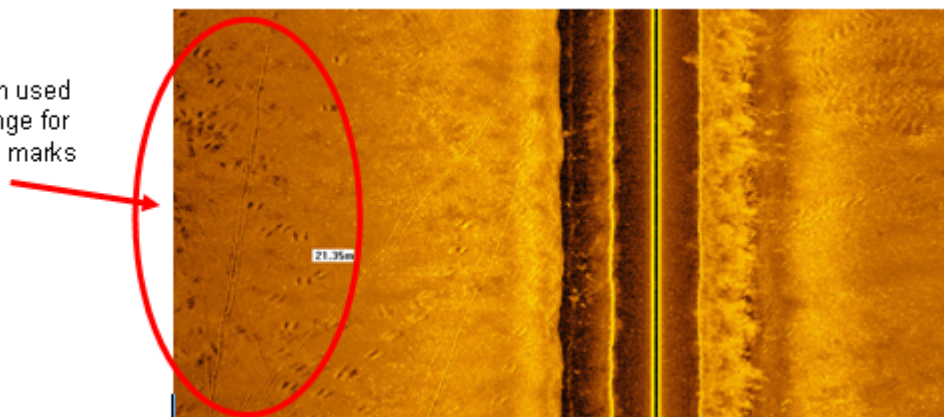
> **Tip**
>
> **When interpreting seafloor returns,**
> - shadows **BEFORE** an object (in relation to the water column) are from <u>holes in the seabed.</u>
> - shadows **AFTER** an object are from <u>shadows above the seabed.</u>

28. Create markers by double clicking on each target of interest in the waterfall display or on the Navigation Plotter. The markers you place will show on both the **Navigation Plotter Window** [20] and the **Marker Management Window** [19] (as shown below). You can use these markers later to facilitate returning to a location of interest because the individual positions are saved for each marker.

Details about the object and a snapshot in the Marker Management Window
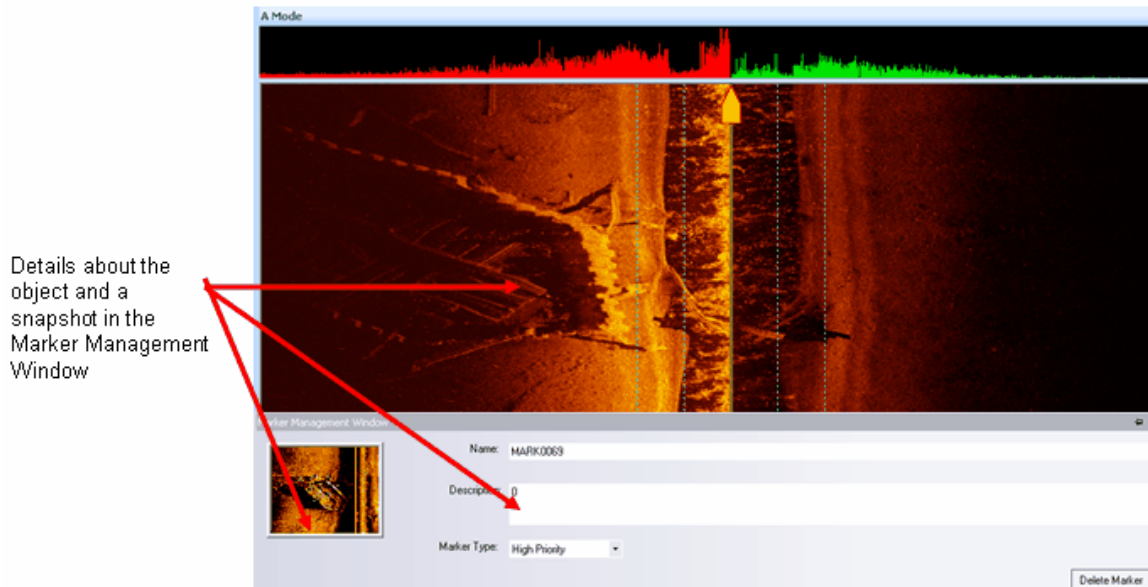
a. During data acquisition or during review, classify the markers [91] you collect by tagging them with color and/or a symbol according to their relevance. This step makes it easier later or sort and/or delete non-relevant ones.

b. Create any waypoints here and enter their locations manually.

29. Take a length measurement of any targets of interest, as in the figure above, using the Length [67] icon on the waterfall toolbar. Activate the Length tool, click at the first point of the target, then click again at the other end. Sea Scan Survey will draw a line in the display window between those points and the measurement will show at the top of the toolbar.

30. You can also take a slant range measurement of any targets of interest (the

straight-line distance from the towfish to an object at any given location) using the Length 67 tool on the waterfall toolbar. Activate the Length tool, click at the center of the water column, then click again at the other end. Sea Scan Survey will draw a line in the display window between those points and the measurement will show at the top of the toolbar.

Slant range measurement taken from center of the *water column* to the edge of shadow using the Length tool
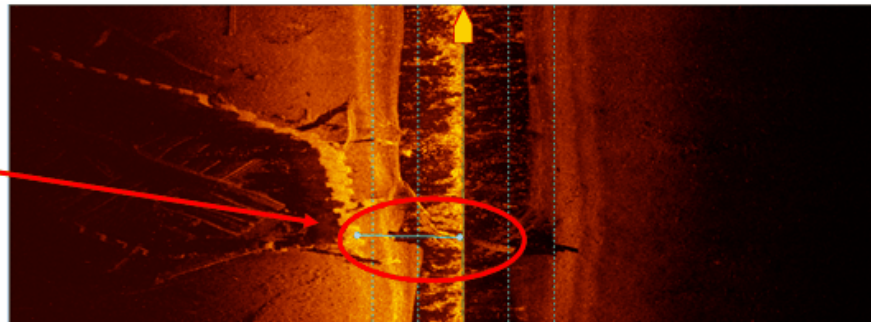
31. To modify the descriptions you've assigned to any given survey, right click anywhere in the waterfall display to open the Settings window 72. Then click on <**Survey Settings**>. You can modify the description in the lower block. Also, if multiple files are in the Survey folder, they will be shown in the box at the bottom of the window; you can scroll through the list if multiple files are available. Note that when the window is active, it adds one more set of lines to the data file.
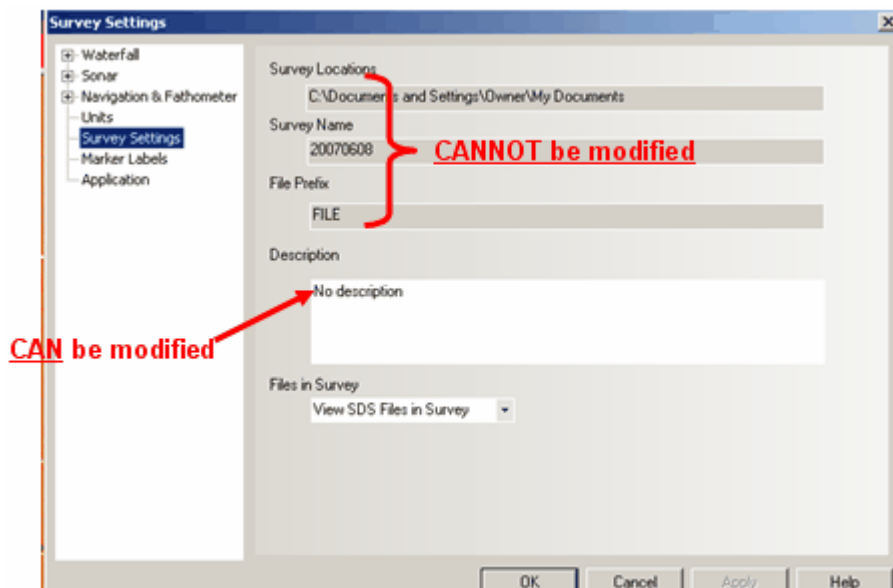
32. Personalize the marker designations or make adjustments to their colors in the Settings 72 window at Marker Labels.
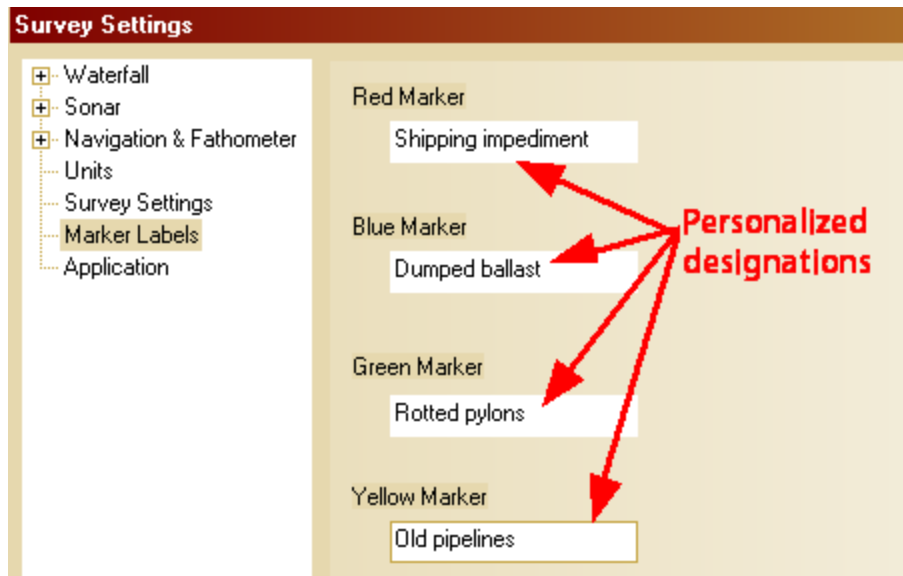
33. After completing the data-gathering run, stop the boat and slowly bring in the *towfish* cable.

Warning

> **KEEP THE *SONAR* <u>ON</u> AND MONITOR THE *WATERFALL* CLOSELY AS THE BOAT STOPS TO RETRIEVE THE *TOWFISH* IN CASE THE *TOWFISH* SINKS WHEN FORWARD MOTION CEASES AND COLLIDES WITH THE SEAFLOOR.**

34. Exit the program and perform needed shutdown operations.

35. Begin data review operations.

    a.   Open the Survey file 15 .

    b.   Open the **Image Adjustment Window** 59 and turn on the *Auto TVG* if you haven't already done so.

    c.   Adjust the *histograms* to your liking there.

    d.   Use the fast forward or reverse speed adjustments at the *waterfall* toolbar to scan through the data quickly or to slow the data flow as you search specific areas.

Tip

> **If your mouse has a scroll wheel, you can flick the wheel to move quickly through the *waterfall*.**

e.   If you see a target of interest, click on Zoom to view it more closely. The *waterfall* will pause while you are zooming.

f.   Mark any targets that interest you.

g.   Bring up the **Marker Management Window**[19].

h.   Review the *markers* and any notes you attached to them.

i.   Click on any *marker* you want to view more closely and the software will return you to that location in the *waterfall* display window.

j.   Make more *markers* if you want.

k.   Export the survey or particular images for later use:

(1)   Export the survey in *xtf* format to a specified location for later use in other applications if you wish.

(2)   Export any marker image by clicking on the preview image in the **Marker Management Window**[19], then click on the **Tools** pull-down menu. From there, click on Waterfall Capture. You will receive prompts to specify a location.

36. You have now done a complete survey using the Sea Scan Survey software, from startup through data review. Congratulations!

Frequently Asked Questions

How to do I do a Rub Check?

1. Make sure the *SONAR* is connected (the software indicates this by displaying the words, "*SONAR* Connected," in the status bar) and that it has power.

2. Make sure the **SONAR Control Window** [18], the **A-Mode Window** [20], and the **Image Adjustment Window** [19] are showing.

3. In the **Image Adjustment Window** [19], reset the Histogram controls.

4. In **Settings** [21], open the **Image Adjustment Settings** [59] window and click on the Manual *TVG* box.

5. Click on the **Fast Forward** button at the top of the *waterfall* repeatedly (this sets the update rate for new *SONAR* data to its maximum).

6. In the **Sonar Control Window** [48], set the range to 30 meters, set the *SOG* to Manual, and set the *SOG* so that the *ping* rate reads 10 Hz.

7. Turn on both *transducers*.

8. Make sure the *transducers* on the *towfish* are dry, then use one of the following approaches to test them:

   - dry your fingers thoroughly, then rub each transducer
   - use a crumpled piece of paper
   - use a burst of compressed air (the best method)

9. Test one *transducer*, then the other to confirm that each *transducer* shows up on the correspondingly correct side of the *waterfall*. If you have multi-frequency *SONAR*, switch to the High-Frequency setting by clicking on the high-frequency option in the **Sonar Control Window** [48]. Repeat the rub check for the High-Frequency left/right channels.
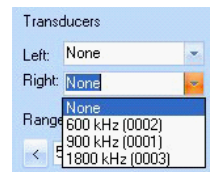
10. Observe the *waterfall* display. If you see a corresponding narrow band appear across the appropriate side of the *waterfall* display (left or right), the *transducer*s are connected properly and are reporting as expected. If no signal shows in the *waterfall*, Troubleshooting procedures should be executed.

The left and right rub test results in the *waterfall* display window.
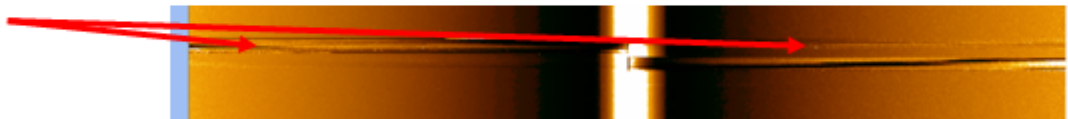
How do I set up the software when initially starting to collect data?   What are some common control settings?

Have the **Image Adjustment Window** 59, the **Status Window** 52, **SONAR Control Window** 48, and the **A-Mode Window** 59 visible during *SONAR* operation. After a successful rub check is performed, the image adjustments will need to be reset.

1. Turn Manual *TVG* <**On**> at **Settings** in the **Image Adjustment Settings** window.

2. Click the reset button for the left and right *transducers* in the **Image Adjustment Window** 59.

3. Set the range at the desired operating range in the **Sonar Control Window** 48 . If you are not sure what range to operate on, set the range to ½ the average maximum range for the *SONAR* you are using.

4. When the *SONAR* is placed in the water, find the first bottom return. When you are assured that the *SONAR* is at operating depth (i.e., not crashing into the bottom or into objects in the water column), turn the Auto *TVG* <**On**> or adjust the Manual *TVG*.

5. Adjust the *histogram* for each *channel* in the **Image Adjustment Window** 59 by sliding the Minimum *histogram* sliders so that the average signal levels are just visible in the **A-Mode Window** 59. Then, slide the Maximum *histogram* sliders so that the peak signals are just clipping.

I need to find X; what range do I set my *SONAR* on?

As a general guideline, set the *SONAR* maximum range to 10 times the intended target size. For example, a car you are searching for is 5 meters long, so set for a range of 50 meters. Of course, you can reduce the range

further if you so desire or if local conditions warrant.

How do I set up the navigation Plotter?

1. Open the Navigation Plotter Settings by selecting the **Settings** option from the **Tools**[21] menu. This will show the Settings Window.

2. Expand the Navigation & Fathometer settings branch, then select the Plotter settings item. This will show the Navigation Plotter Settings in the Settings[21] Window.

3. Set the center location for the Plotter. Either enter a location or click the <**Use Boat Location**> button for the current position received from the *GPS* as the center position for the navigation Plotter.

4. Enter the range. This represents the amount of coverage the Plotter will initially display. This should typically be set to the approximate size of the area to be surveyed.

5. Check the Draw *Latitude/Longitude* Grid box.

6. Check the Draw *Latitude/Longitude* Labels check box.

7. Enter 30 minutes for the coverage history. This will display 30 minutes of navigation data in the navigation Plotter. If desired, enter a different amount of time.

8. Check the Draw Boat Icon box.

9. Turn the digital charts on or off. You have three options with this feature:

   - No digital charts
   - Premium S-57 charts (only these can be configured)
   - Standard S-57 charts

Tip

The charts on the plotter may slow computer operation; thus, you may wish to de-select that option when the charts aren't needed by changing the Navigation settings.

10. Open the **Navigation_Plotter_Window** [20] by selecting **Navigation Plotter** from the **View** menu. The boat will now show on the Plotter as the boat moves through the water.

11. After you have set up these specifications, they will remain the default settings for all future surveys until you change them.

What height off of the bottom should the *towfish* be?

The *towfish* should be towed off the bottom at approximately 10% to 20% of the *SONAR*'s current range setting. If there are obstacles in the water column, the *SONAR* should be towed at a height that will ensure the safety of the equipment. You will be able to observe the 10% and 20% lines in the *waterfall* display if you have enabled those features in the **Settings** [21] window. These lines may help you avoid ramming the *towfish* into the seabed. Care should be taken, however, if the range is less than about 65 feet (20 meters) above the seafloor. Then, 10% equates to about 6 feet (2 meters) of altitude above bottom; at this proximity, any protruding object or irregularity in the seafloor can be potentially hazardous to the *towfish*.

What is the optimal speed to tow the system at for best image quality?

Run the system with *Auto SOG* [48] (Auto *ping* rate) for best image quality. The *SONAR waterfall* display will do *SOG* corrections on a ping-per-ping basis.

Operate the *SONAR* at any speed that is less than the maximum speed attainable for the particular range setting the *SONAR* is set to. When the maximum speed is exceeded, the *SOG* readout in the **SONAR_Control Window** [48] will turn **red**. When it does, slow the boat slightly until the *SOG* readout returns to its normal operating color (black text with a white background).

How can I find a particular file for a marker or target of interest?

1. Open the **Marker_Management_Window** [54] by selecting **Marker Management Window** from the **View** menu. The **Marker Management Window** will list all the markers associated with the currently opened survey along with any designations or priorities you have specified.

2. Select the desired *marker* by clicking on the marker in the *marker* list. The filename the *marker* is associated with will be listed on the same row as the *marker* that is selected in the *marker* list.

3. Alternatively, click on any **red** dot in the Plotter window.   A bull's eye will appear around the dot and a window will open next to the mouse cursor. The

box will identify the dot as a marker (or waypoint), present a snapshot of the *marker*, designated number, any information you have inserted about the target, and the *L/L*.

What do the lines and letters in the *waterfall* mean?

You will see confirmation that the *transducers* are receiving power by observing a **red** signal line in the *waterfall* display window. It will show the letters **PW** in the center of the *water column* just below the boat icon.
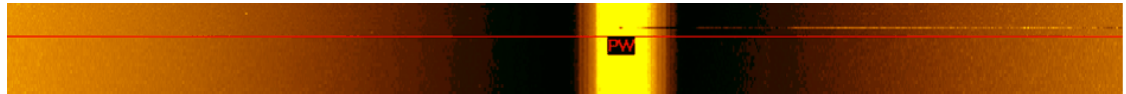
If power is interrupted to the transducers for any reason, you will see a **Yellow** signal line across the *waterfall* display window and the accompanying letters **DL** in the center of the *water column*. These letters indicate that communication was momentarily lost to the transducers; that is, you have experienced a momentary "data loss."
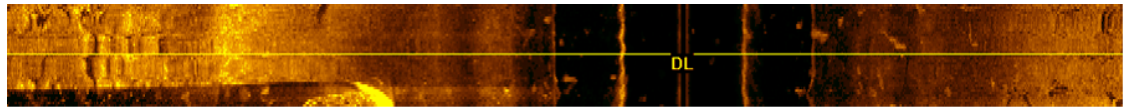
Sea Scan Survey also alerts you in the *waterfall* display when you change *transducer frequency*. You will see a deep **blue** line and the letters **FS** (for *frequency* switch) in the center of the water column at the point in the data when you made the change. These indicators in the record are convenient ways of reminding you of transients or changes you made during the survey.
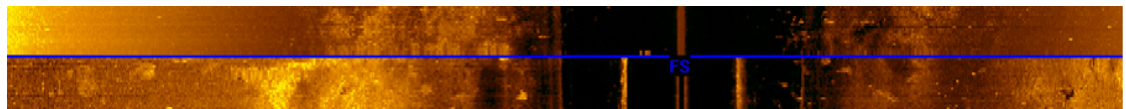
In-Depth Discussion

The discussion in this section is intended for experienced *SONAR* operators or for those working to improve their skills. Here you will find a greater level of detail about Sea Scan Survey features as well as tips that can improve the data-gathering process. Refer to the earlier chapter, <u>Buttons and Menus</u>|10|, for explanations on the use of the buttons and menus; those are <u>not</u> repeated here.

Overview

Sea Scan Survey uses a computer with the Windows© operating system for data display and system control. The Sea Scan Survey program allows an operator to control the *SONAR* data-collection process, view, analyze, and save the *SONAR* image with all related navigational information. The program also features a sophisticated integrated Navigation Plotter to plot location and estimated *swath* coverage.

Sea Scan Survey can be configured for different operating requirements. The operating and display parameters are saved in the system registry and are displayed graphically in the toolbar and information window.

The basic function of the software is to display the *SONAR* image on the screen. Each time the *SONAR transducer pings*, the reflection data is recorded and incremented as horizontal lines on the *waterfall* display screen.

As the *towfish* passes over the seafloor, it continuously transmits *pings* perpendicular to the direction the boat is traveling, which are reflected back to the *towfish transducers* by objects on the bottom and in the water column, the area immediately beneath the *towfish*. Sea Scan Survey interprets the returns on each ping and starts to build a seafloor image as the reflection data is added line by line. The data is recorded directly to a streaming data file. The application then reads and indexes the streaming data file in real time. After the data is indexed, it is displayed in the *waterfall* display. Only a small segment of data can be viewed in the *SONAR waterfall* at a time.

Move forward and backward through the data and control the particular segment of data being displayed by using the **<u>Rewind</u>**|66|, **<u>Stop</u>**|66|, **<u>Fast_Forward</u>**|66|, or **<u>Jump-To</u>**|66| buttons in the *waterfall* toolbar.

Sea Scan Survey features a wide-dynamic-range data-collection system. The *TVG* is software controllable and can be set during data collection and during post-processing

Search Methodology

A standard search involves several stages—from pre-cruise planning to site feature identification. The instructions in this manual assume that you have defined a search area, planned search *lanes*[151], set up, and deployed the *towfish*. We recommend the following scenario:

Site/Feature Location

The initial stage of the search involves finding a site/feature location. You may already have a marked *L/L* position. In that case it should be a simple matter to locate the site. Otherwise, the search area should be methodically scanned in a straight, predetermined search pattern, as exemplified in the following figure.
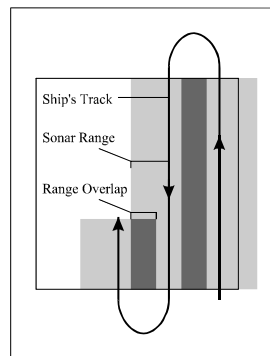
■ **Figure 6. A Recommended Search and Survey Pattern**

Tip	**For comprehensive coverage, overlap successive lanes in a search area. The projected swath coverage lines off the bow can aid in assuring lane overlap.**

Towfish Frequency and Range

The table below can serve as a guide for basic starting *range* and frequency for differing seafloor topologies.

- **Table 1. Suggested Frequency and Range Settings for Coverage of a Search Area (all ranges listed in meters/feet)**

Frequency (kHz)	Average Maximum Range	Typical Range	Target Size
150	400 / 1312	200 / 656	10 / 33
300	200 / 656	100 / 328	5 / 16
600	75 / 246	30 / 98	1.5 / 5
900	40 / 131	25 / 82	1.2 / 4
1200	25 / 82	10 / 33	0.5 / 1.6
1800	15 / 49	7.5 / 25	0.3 / 1.0

All maximum ranges are those detectable by the *SONAR* system at the listed frequency. These are typical, but conservative maximum ranges that are attainable with the particular *SONAR* frequency in salt water with a soft, silt bottom. Longer ranges may be attainable in fresh water or in harder bottoms such as sand or gravel. Some factors that affect the maximum *range* of the *SONAR* are bottom type, water salinity, water depth, water temperature, particulates, electromagnetic *noise*[151], and acoustic *noise*.

The typical *ranges* listed are those at which each *frequency* is most frequently used. The target size is the smallest target size that will be positively identifiable at that *range* and *frequency* of *SONAR*. Much smaller objects can easily be detected; however, targets smaller than those listed will be more difficult to identify positively.

Startup and Operation

Place the computer in a dry location on the towing vessel where there is optimal visibility and communication to the boat's pilot. Set the Sea Scan Survey *range* according to the table above. A wide setting will enable you to scan a large area of the seafloor. A shorter range will allow smaller targets to be imaged at the expense of coverage area.

The search *range* defines the search *lane* spacing and the *range overlap*[151]. Bottom terrain, site characteristics (such as size and composition), and *SONAR* record interpretation should be considered when setting the initial search *swath*

width. In the Plotter Window, ensure that <Draw Swath> is enabled and that you have enabled the Map-Bearing tool on the Plotter toolbar. With these features, you will be able to overlap the search lanes more precisely.

Start the search pattern. You can monitor the progress of the search because the survey vessel's position and the estimated *swath* coverage are shown on the Sea Scan Survey Navigation Plotter. Place the computer so that the incoming data can be seen easily, thus allowing you to observe the search pattern and the incoming data simultaneously.

When you see a feature of particular interest in the *SONAR* record, mark it on the Sea Scan Survey Navigation Plotter as a *waypoint* or *marker* or double click in the *waterfall* display window the target of interest you wish to designate as a *marker*. Then, if possible, throw a weighted acoustic target attached to a buoy with marine line. The buoy will serve as a visual *marker* for the pilot when returning to the site. The acoustic target will show up in the image and allow the *SONAR* operator to tell the boat pilot the buoy position relative to the target.

Tip | **The buoy may drift in high currents, so weights are advisable. Also, the line connecting the buoy and anchor must be long enough for the anchor to reach the bottom; otherwise, the buoy could drift or sink.**

When the navigational information is available, each *SONAR* record line can be associated with *L/L* and *swath* coverage. Thus, any feature in the *SONAR* record can be associated with a known *L/L* position and location within the *swath*. The *L/L* position for the selected feature in the *SONAR* record is logged in the *marker* list. Nonetheless, as a matter of good log keeping, also write the site *latitude* and *longitude* position in a logbook.

Site/Feature Identification

Now that you have the site location, you can adjust Sea Scan Survey to capture the target of interest at a higher resolution.

Tip | **The smaller the range, the better the axial and transverse resolution will be.**

1. Set the *Sea Scan Survey swath range* to a shorter setting. The target will appear larger and have greater resolution.

   Sea Scan Survey can provide very high-resolution imaging when the 600-kHz-and-above *towfish* is set at a range of 40 meters or less.

2. Make a closer pass of the feature.

    The *towfish* should not pass directly over the target of interest on the seafloor; rather, it should pass to one side of the target.

Slant range measurement taken with Length tool (note green length line)
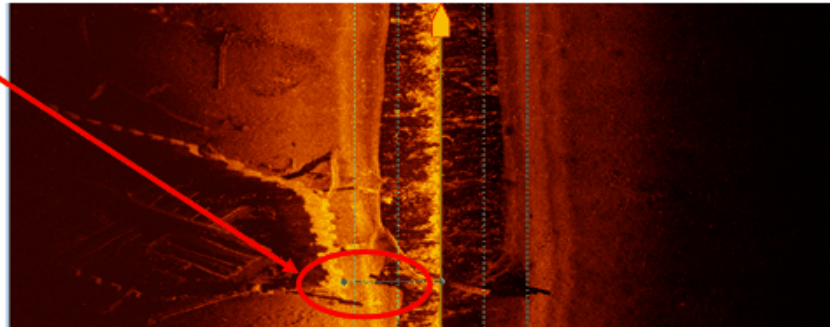
    Guide the ship's pilot so that the target of interest will appear on either the left or right side of the *SONAR* record. This is easily accomplished because the boat icon will be visible in the *waterfall* display in relation to the *SONAR* channels (as shown above).

3. Mark the target for future review. For ease of sorting later, assign a classification and color in the **Marker Management Window** to each entry, along with a distinctive name and description.

Safety

Sea Scan Survey is a simple system to operate. However, the simplicity of operation does not diminish the danger of operation. Any action that involves towing a device at the end of a cable at sea has an inherent danger involved. Many of the problems that occur at sea can be averted with common sense, good boat handling, and experience.

Warning | DO NOT LET THE OPERATION OF SEA SCAN SURVEY PUT YOUR BOAT OR YOUR CREW IN A POSITION OF DANGER.

User Settings

A number of settings are available to you for modifying the user interface. Select those that are comfortable for your level of expertise or your operational requirements. These are discussed below.

SONAR Interface

When you turn on the *SONAR*, the *transducers* automatically communicate their settings to the Sea Scan Survey software. The program then resets itself accordingly based on that intercommunication and presents that information in an easy-to-read display on the computer screen. The sophisticated communication process requires no user intervention; it communicates seamlessly among the *SONAR*, topside box, GPS, depth sounder, or any other connected equipment. That information also is immediately accessible in the display area or in convenient drop-down menus.

SONAR Display

The *SONAR* display has been designed for optimal viewing and data interpretation. The underline waterfall display 13 consumes the majority of the computer screen because this is your primary workspace. Here, you can access all the tools and menus you require—adjusting color, zooming in on an area of interest, checking *marker*s, adjusting the *frequency*, or monitoring *SOG*, to name a few. As soon as Sea Scan Survey initiates and *SONAR* is activated, the *waterfall* display will begin to build a line-by-line image of the seafloor that you can enhance to identify targets or collect data. Using the various tools and capabilities of the software that are presented to you in the display area, you can direct the operation, collect and notate targets of interest, and accrue data for immediate or later review. The entire process is easy and convenient.

You also will see here indicators of system performance; that is, power application to the *transducers*, changes in *frequency*, and data loss to the *towfish*.   These indicators reflect a transient when the SOG correction is on:

PW: Power has reached the *transducers* and they are pinging.
FS: The transducer frequency has been changed.
DL: A data loss lasting 1.0001 to 1.9999 seconds has occurred, most likely caused by telemetry problems to the towfish.

Color

Sea Scan Survey has a set of predefined color scales. The color choice can have a dramatic effect on your interpretation of the *SONAR* image data, as different colors bring out different features in the *SONAR* record.

> *Tip*
>
> **Try various color scales for your *SONAR* record interpretation until you are comfortable with one particular color scale. However, bronze, gold, or brown are the most popular choices because the eye senses a greater contrast differential between neighboring shades without losing a sense of color continuity.**

Selecting a Color

As discussed earlier, **Image Adjustment Settings** under the **Tools** [21] pull-down window, is where you choose the color of the data in the *waterfall* display. Alternatively, right click anywhere in the *waterfall* display and a pop-up window will appear; there, select **Image Adjustment Settings**. That window will open and you can access and change the Palette settings.

Inverting a Color

Any of the colors may be inverted such that the high-*intensity* returns become dark and the low-*intensity* returns become light. This has been the display setting for traditional *SONAR* systems since they applied black ink for acoustic returns onto light-brownish or white paper. The higher the *intensity* of the acoustic return, the more black ink was used. Because of the dark-ink-on-light-paper process, a *SONAR* operator had to reverse the natural *intensity* visualization. In the normal mode (as opposed to the inverted mode), any high-*intensity* returns are brighter than the darker background. This provides a view of the seafloor analogous to illuminating the dark seafloor with light and viewing from above. Objects appear brighter than the background and *shadows* are black.   In the inverted mode, objects are darker than the background and *shadows* are white or light.

Moving through the Data

Scrolling

As discussed earlier, the *SONAR* image is recorded directly into a streaming data file. The indexed data is then displayed in the *SONAR waterfall* display in sequence and at 1x forward when the file starts. Not all the data can be displayed concurrently because of screen size limitations, but with the **Rewind** [66], **Stop** [66], **Fast Forward** [66], and **Jump-To** [66] buttons on the *waterfall* toolbar, you can scroll at your desired speed backward or forward through all the data, much the same way that you might speed through a video tape to a particular location or scene.

> *Tip* | **To return to a target of interest in the display window, use your *markers* to shortcut the search. These bring you to the exact location in the data.**

Home State

The **Home** [66] button at the top of the *waterfall* toolbar indicates that the newest *SONAR* line or latest data is immediately visible on the screen. When you scroll, the newest *SONAR* line is no longer immediately visible in the *waterfall* display. Thus, the *waterfall* data window is no longer in the **Home** state. The background behind the current displayed time in the upper left corner of the toolbar will be **green** when the data is in the *Home state* [151].   The background of the current

displayed time will flash **red** in the Sea Scan Survey toolbar to indicate that the newest data is not immediately visible. In the review mode, the background will be white.

Jump-To Tool

The **Jump-To** [66] tool in the *waterfall* toolbar provides quick access to a particular point in the seafloor survey based on survey hours, minutes, and seconds (as indicated by the Elapsed Time [65] indicator at the top left of the *waterfall* toolbar). Type in the time and the *waterfall* display will return to that point. An invalid entry will be ignored.

Channel

Sea Scan Survey uses the "data down" direction [62] when streaming the *transducer* data onto the *waterfall* display; thus, the latest data is at the top of the display and the oldest incoming data is at the bottom. The left and right *channels* are on the left and right sides of the *waterfall* display, respectively. You may set Sea Scan Survey to display either the left *channel* only, the right *channel* only, or both the left and right *channel*s simultaneously in the *waterfall* display.

> *Tip*
>
> **Sea Scan Survey automatically collects information from both channels if both transducers are on, even though the *waterfall* display might be set to display only one channel. Thus, you can review the data from the other channel at any time.**

Depending on the operating requirements, you may want to view both *channel*s at standard axial resolution or only one of the *channel*s at double the axial resolution. When viewing only one of the *channel*s, you have twice as many horizontal pixels on the screen. Thus, for any given *range*, twice the axial resolution may be displayed on the screen since you are displaying only one *channel;* bear in mind, however, that the image will be distorted (stretched) in the axial direction.

Measurements

Height

The height [69] of a feature in the *SONAR* image can be measured if there is discernible *shadow* [151] behind the feature. Shadows are extremely important in locating objects as well as in their analysis, so attention must be paid to *shadow* position, shape, and strength in the *waterfall* display when on a search-and-recovery mission. The *shadows* cast by objects are a function of the angle at which the *SONAR* beam strikes objects as well as the shape of the objects casting them. Thus, detailed inspection of the shape of a *shadow* is

helpful in determining the nature of the object. The location of a *shadow* relative to the object creating it is also an important feature of the object. *Shadows* that touch the object imply that the object is touching the seafloor. *Shadows* that are separated from their corresponding object imply that the object is above the seafloor. Also, a *shadow* that reaches out beyond the edge of the image implies an object with a height that is near or above the altitude of the towfish.

Defining the geometry of the *towfish*, the object, and the object's *shadow* is the means for measuring an object's height, as exemplified in Figure 7.

The Sea Scan Survey software has automated this object height-measurement process.
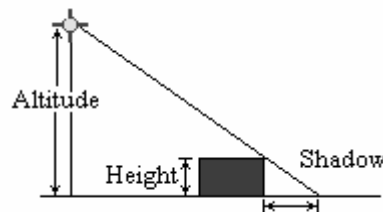
- **Figure 7. Object Height Calculation**

An accurate height measurement requires that the object cast a visible acoustic *shadow*.   This may be a problem in some situations, such as the object's proximity to the *transducer*. Further, the end of the *shadow* must be visible on the *SONAR* record line. The height calculation assumes an ideal geometry. That is, the acoustic path from the *transducer* to the top of the object to the end of the *shadow* is assumed to be straight and the seafloor is assumed to be level.

The first assumption of a straight acoustic path is valid, considering that conditions where you see the acoustic path "bend" are not common at the operating depths and *ranges* of Sea Scan Survey.   However, the second assumption of a level seafloor typically is not the case.   Thus, you must compensate based on your knowledge of the seafloor level.   The acoustic *shadow* for an object upslope of the *transducer* will be abnormally shortened. Similarly, the acoustic *shadow* for an object downslope of the *transducer* will be abnormally lengthened.

Length

The Sea Scan Survey *waterfall* **Length** [67] tool allows you to measure any feature in the *SONAR* image data with the mouse pointer. The length is presented as a total length, which is a combination of horizontal (axial) and vertical (transverse) lengths. The lengths are measured using the <u>user-specified length units</u> [89]. The

range and *ping* separation distance for each *SONAR* record line is sufficient to calculate the length of features in the *SONAR* record accurately.

A right click while the **Length** tool is active will place a dot by your pointer. The length will be updated while you move the mouse pointer from the first anchor point to set the last one. When you are finished with that tool, click on the **Length** tool button to deactivate it.

Measuring the transverse length depends completely on the *apparent SOG* [52] because the apparent *SOG* (the *SOG* provided by a GPS or estimated by the vessel's pilot) determines the *ping* separation distance. Typically, the apparent *SOG* matches the true *SOG*. In this situation the *SONAR* image has a constant 1:1 aspect ratio because the *ping* separation distances are valid. However, if the apparent and true *SOGs* were not matched, the transverse length would be inaccurate because the *ping* separation distance would be inaccurate.

The extent of the error would depend entirely on the disparity between the apparent *SOG* and the true *SOG*. For example, if the apparent *SOG* was set at 3.6 knots and the true *SOG* was 4.0 knots, there would be a 10% error. Thus, the *ping* separation distance also would be off by 10%. In fact, the pings would be 10% too short because many *SONAR* software programs base their calculations on the boat's moving at 3.6 knots rather than the 4.0 knots the towing vessel was actually moving. Thus, the *transducers* would not *ping* fast enough to maintain the 1:1 aspect ratio for the *SONAR* image, so the under-sampling would foreshorten targets and the transverse length in the given example would be 10% too short. To account for this under-sampling situation, the Sea Scan Survey *SONAR waterfall* display corrects for the *SOG* on a *ping*-by-*ping* basis.

Area

The **Area** [68] button in the *waterfall* toolbar allows you to measure the area of a feature by tracing the outline of the *SONAR waterfall* image with the mouse pointer. The area is measured in units that you set in the **Units** [89] window. The *range* and *ping* separation distance for each *SONAR* record line is sufficient to calculate the area of targets in the *SONAR* record.

As with **Length**, measuring area depends completely on the *apparent SOG* [52], which determines the *ping* separation distance. Thus, if the apparent *SOG* did not match the true *SOG*, the transverse length would be inaccurate because the *ping* separation distance was inaccurate. Here, also, the extent of the error would depend entirely on the disparity between the apparent *SOG* and the true *SOG*. Therefore, Sea Scan Survey will do *SOG* corrections on a ping-per-ping basis, avoiding transverse length inaccuracies.

Units

A consistent set of units for distance, depth, and speed is used throughout the entire Sea Scan Survey program. You can select from among these units for the particular situation from the **View** pull-down menu, then **Settings**, and the **Units** window. Click the arrows to the side of each category to view the choices.

Small Ranges: Feet, Meters, Yards

Long Ranges: Kilometers, Meters, Miles, Nautical Miles

Depth: Feet, Meters

Tip   Fathoms is no longer featured as an option in Sea Scan Survey.

Velocity: Feet per Second, Kilometers per Hour, Knots, Meters per Second, Miles per Hour

Location Type: Lat/Long Decimal Degrees
Lat/Long Decimal Minutes
Lat/Long Decimal Seconds
UTM

Location Significant Digits: 1–8

Click **<OK>** and the new units you selected will be saved. The program now will redisplay all length, speed, and location information using the new units. These will remain the default units until you change them or until the Plotter measurement is less than one-half the long-range unit setting. Then the measurements automatically default to the short-range settings, thereby giving more precise readings in your short-range search.

SONAR Control

Sea Scan Survey has been designed to give easy access to the important parameters you require during an operation. These parameters affect the quality and quantity of data collected and processed, so you can make changes to these at any time during data collection. These changes become effective immediately.

Power

Turn the power 49 on to start the data collection process. Power will be supplied to the *transducers* immediately. As the *transducers ping*, the incoming data is recorded and displayed in the data window, where you will see a **red** line and the letters **PW** in the center of the water column.

Range

The ***Range*** [51] buttons on the **SONAR Control Window** reveal the current *range* settings along with left and right arrows to decrement or increment the *range*. In addition to these buttons, there is a range window where you can click the arrow to view a dropdown menu and select from among those ranges listed. The listed ranges are in increments of 5 of the currently selected short-range units.
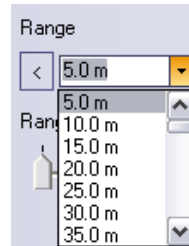
Range Delay

The ***Range Delay*** [51] slider on the **SONAR Control Window** permits you to set this function. The slider moves from 0% (left) to 100% (right) of the current range. When you change *ranges*, the *SONAR* interface will attempt to use the same *range* delay that you set; thus, the slider will adjust automatically to fit the new scale.

> *Tip*
>
> **The shorter ranges allow very high resolution imaging at close ranges with a high-frequency transducer. The long ranges may be used with lower-frequency *SONAR* transducers to cover large areas while in a search pattern.**

The most common use for *range delay* is to remove the *water column*, whereby the section of the *SONAR* record that displays the acoustic returns is removed in the *channel* immediately beneath the *towfish*. Typically, you are not interested in the acoustic returns produced as the *SONAR* beam passes through the *water column*. Thus, set the *range delay* to the same distance as the *towfish* distance from the bottom to "ignore" any acoustic returns as the *SONAR* beam passes through the *water column*. The Sea Scan Survey software will then start collecting the acoustic returns when the *SONAR* beam reaches the *range delay* that you have set.

The other use for the *range delay* is to extend the view of the *SONAR*, but for a specific *range*. For example, you may want to view the area from 75 to 175 meters but are not particularly interested in the first 1 to 74 meters. With 0 (no) *range delay*, you would lose resolution at a *range* of 200 meters and you would collect data for everything from 0 to 200 meters. However, if you were to

set the *range* to 100 meters and the *range* delay to 75 meters, you could focus on the area of interest at a higher resolution because of the shorter *range*.

Frequency

Depending on the operating requirements, you may want to use either the low- or high-frequency *transducers*, if available. The low-*frequency transducers* provide a lower axial resolution but the sound travels farther than does the sound from the high-*frequency transducers*. Likewise, although not able to extend as far, the high-*frequency transducers* will provide very high-resolution imaging at closer *range*. You even have the option of selectively choosing separate *frequencies* for each *transducer*.

You will see a deep **blue** line and the letters ***FS*** 50 (for *frequency* switch) in the center of the *water column* at the point in the data when you make a frequency change. You also have the option of selecting **None** in the dropdown list. Just recall that if no *transducers* are selected, the system cannot collect data.

Speed Control

The Sea Scan Survey software maintains a constant 1:1 aspect ratio for the *SONAR* image. This is possible by setting the *ping* rate based on the current *range* and the *SOG*. The spacing of each vertical line on the screen is equivalent to a known distance for each of the *ranges*. Sea Scan Survey sets the *transducers* to *ping* at these interval distances, so the resulting image has a 1:1 aspect ratio. The time between each of these known distance intervals depends on the *SOG*. The time interval is set based on apparent speed. When a discrepancy appears between the current *SOG* and range, Sea Scan Survey will make *SOG* corrections on a ping-by-ping basis.

Using an accurate estimate of the vessel's *SOG*, you can determine the time interval between each *ping* event. An externally supplied *SOG* is used to set the software's internal apparent speed automatically. When the *SOG* information is not available externally, you can manually match the apparent speed to the vessel's actual *SOG* to maintain the constant 1:1 aspect ratio for the image.

Depress the **Manual** or **Auto** SOG buttons 52 on the **SONAR Control Window**. If you set for **Manual** control, the software will no longer seek the *SOG* from the external navigation source. You can now manually control the apparent speed, which in turn controls the *ping* rate.

If you decrement the apparent speed below the true speed, the seafloor will be under-sampled and targets will be compressed in the transverse axis. This occurs because the *transducers* do not *ping* frequently enough to maintain the 1:1

aspect ratio. Similarly, incrementing the apparent speed above the true speed results in over-sampling and elongated targets in the transverse axis. That is, the *transducers ping* too frequently to maintain the 1:1 aspect ratio.

The *SOG* box will be **red** when you over-speed from the current *SOG* setting. This serves as a warning to adjust the speed or change the range.

The *ping* rate that is shown in the **SONAR Control Window** is the current rate based on *range* settings and the *SOG*.

> *Tip*
>
> **Over-sampling is useful in some instances, as when setting the Image Adjustment settings. In that case, the fast data scrolling allows you better monitoring of the effect on the *SONAR* image as the Image Adjustment settings are changed.**

Image Adjustment

Gain

The Sea Scan Survey *transducers* produce a very specifically defined *acoustic signal* [151]. Viewed from above, the signal is very narrow; viewed from the side the signal is wide. This shape of acoustic sound allows the *transducer* to view a very narrow section perpendicular to its path of motion. As the out-going acoustic signal travels through the water, the signal strength at the wave front weakens by a variety of influences, such as absorption by the water, wave-front spreading, and *scattering* [151]. These are known physical effects of acoustic energy traveling through a *"lossy" medium* [151]. As a result, the amount of energy available to reflect from an object reduces as the outgoing acoustic wave travels away from the source. That is, the reflection from a distant object is not as strong as that from a like object closer to the *transducer* (source of the acoustic wave).

However, for *SONAR* record display and interpretation, you may want a constant level for the background echo-return *intensity*. Therefore, Marine Sonic Technology, Ltd. has implemented a data algorithm system that digitizes a large dynamic range to counterbalance the degradation of signal strength as the sound wave travels through the water. Digitizing a signal with a large dynamic range allows the data to be adjusted during data collection and post-processing without the normal data loss incurred if *TVG* were applied before digitization.

The amount of *gain* required to counterbalance the signal attenuation losses is strongly proportional to, but not entirely dependent on, *range*. *Range* may be thought of as time because it takes a known time for a signal to return from any given *range*. Therefore, you can give a target 150 meters away the same echo strength as a like target at 50 meters away by adjusting the *gain*. Using the *gain*

controls in the **Image Adjustment Window** 59 , you can define the amount of *gain* applied to the raw echo returns at specific *ranges* (time intervals).

> ***Tip*** **Different seafloor conditions and target characteristics can result in vastly different attenuation levels at a given range, so always set the Image Adjustment settings for the current operating environment.**

The following figure illustrates graphically the signal processing approach.
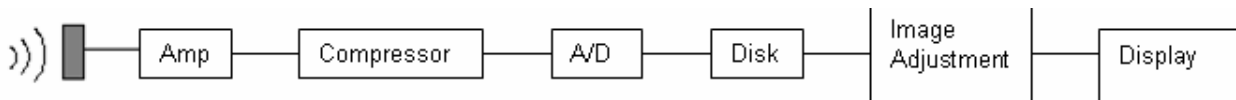
- **Figure 8. The Signal Processing Procedure**

As shown in Figure 8 above, the *transducer* receives the acoustic signal that was reflected off the seafloor and any objects there. The *transducer* converts this acoustic signal, which is mechanical energy, into an analog electrical signal that is then amplified, then digitized.

You can approach the image adjustment process in three ways. You can permit the software to apply a calculated amount of *gain* compensation. The software sets the *gain* settings automatically to optimal settings for the current operating environment. The automatic *gain* process adjusts the amount of *gain* at each point in the active *range* until it has determined that the *gain* settings are at optimal levels. It does this by evaluating the *intensity* of the background signal in the active *range*.

The software adjusts the *gain* settings such that there is a constant background level throughout the entire active *range*, although the outcome depends on the current operating environment. The automatic *gain* process samples the current *SONAR* record line. First, it determines the *intensity* of the background in the active *range*. Then it determines the required *gain* adjustment change to bring the background level to an optimal level. The *gain* is then adjusted. If the *gain* settings adjust automatically, you will not be able to adjust the *gain* settings manually.

The second approach is to adjust the three sliders manually. Each slider represents a specific type of correction.

Spreading slider:	Corrects for the spreading loss of the *SONAR* beam (0 to 100)
Absorption slider:	Corrects for absorption losses (0 to 100)
Offset slider:	Offsets the data in the positive or negative direction

(+100 to –100)

The slider corrections you enter are inserted into the general *SONAR* equation—

$$Intensity = A\text{Log}10(r) + Br + C, \text{ where}$$

r = the *range* in meters,
A = Spreading slider value,
B = Absorption slider value, and
C = Offset slider value.

The gain is thus adjusted accordingly.

The third approach is to view the raw data without any correction or adjustments. Click on the check box in the **Image Adjustment Settings** window at **Settings** in the **Tools** pull-down window to disable any system correction to the incoming data. Most users will not have a need for this option.

Sea Scan Survey also displays the latest *SONAR* record line in A-mode [59]. This viewing mode provides a strong visual reference of the acoustic returns on a single *SONAR* record line. This "bar chart" view displays the acoustic return *intensity* in the vertical axis versus *range* in the horizontal axis.

The vertical lines along the horizontal axis represent the *intensity* of the acoustic returns at the respective positions along the *SONAR* record line. In other words, a short vertical line represents a low-*intensity* acoustic return. Likewise, a long vertical line represents a high-*intensity* acoustic return.

The A-mode view of the signal response provides an accurate visual reference for the effect of the *TVG* on the raw signal. Changes to any of the image adjustment parameters can be monitored by watching the immediate effect on the signal response.

The boat icon that is displayed in the *waterfall* display window is a helpful means for correlating the A-mode data in relation to location. The icon can be dragged to a new sampling point in the *water column*, if desired.

> *Tip*   **Any changes to the *TVG* can be redone as many times as you like.**

Navigation and Fathometer Interface

The available communication ports are listed in the NMEA Data [83] Input window at **S ettings** in the **Tools** pull-down window. In addition to selecting the appropriate port

for your operation, you can set the *baud* rate here at which to collect data. A baud rate of 4800 is the NMEA standard.

The NMEA Data Input window also affords access to the Test Communication window⟨83⟩, which provides vital information about the NMEA strings that permit marine instruments to transmit and receive information. The NMEA communication port settings are saved automatically in the system registry.

Sea Scan Survey reads the following NMEA standard strings for the *GPS* interface:

> RMC, GGA, GLL, VTG, HDT, HDG, DPT, DBT, DBS, DBK, and ZDA.

Sea Scan Survey uses the following information out of each string:

> RMC: Latitude, Longitude, SOG, COG, and GPS signal type
> GGA: Latitude, Longitude, HDOP, and GPS signal type
> GLL: Latitude, Longitude, and GPS signal type
> VTG: SOG, COG
> HDT: Heading
> HDG: Heading
> DPT: Altitude, Depth to Sensor (Offset)
> DBT: Water Depth
> DBS: Water Depth
> DBK: Water Depth
> ZDA: Time (allows the system time to be set by satellite time)

Tip | **Check the RMC and HDG strings if the towfish heading does not match that of COG.**

The *SONAR* can be operated without a GPS attached; however, to ensure the minimum usefulness of the equipment, we require *latitude*, *longitude*, *SOG*, and *COG* data. Heading, water depth, and time add to system functionality.

Any <u>one</u> of the following minimum NMEA strings will enable the minimum set of data:

> (1) RMC
> (2) GGA, VTG
> (3) GLL, VTG

Any additional strings to the above three combinations will add redundancy and/or extra information.

Navigation Plotter

The **Navigation Plotter** 43 display window presents a map-coordinate Plotter grid and tracks the direction of the towing vessel and the area covered by the *SONAR*. The Plotter always shows the scale of the coverage area in the window as a bar in the top right corner that ranges from zero (at the top) to the maximum area (in kilometers, meters, miles, or nautical miles, depending on which units you select). Geo-referenced *latitudes* are always shown in degrees at the left of the Plotter window below the *latitude* grid lines (if available); geo-referenced *longitudes* are at the bottom of the window (if available). North is always at the top of the Plotter window. The geo-referenced charts in the background on the Plotter display window can be de-selected if they slow computer function.

The towing vessel is represented by a **Yellow** icon that is always oriented according to the boat's heading, if available.

The *swath* astern of the vessel is displayed to show the *SONAR*'s estimated coverage when the boat is under way. The *SONAR swath* displays the actual *SONAR* data, giving the operator an elementary real-time mosaic of the coverage area. The boat's track is a black line. The default time for the Plotter track is 10 minutes; the software overwrites all older Plotter track data; however, all *markers* and *waypoints* that you have inserted are saved automatically. They will show on the **Navigation Plotter Window** as dots.

To obtain information about each dot, click the mouse cursor on any *marker* or *waypoint* in the Plotter window and that target's preview image, name, classification, etc. appear in a box next to the mouse cursor. In addition, that *marker* or *waypoint* will be highlighted in the docking ***Marker* Management Window**. These *markers* or *waypoints* are sequentially numbered and labeled with location information, any classification and color you assign, and type (*marker* or *waypoint*). The information on each *marker* or *waypoint* becomes part of the survey record unless you delete the *marker* or *waypoint*.

You can manually change the coverage history for the Plotter at **Tools**, **Settings**, **Navigation & Fathometer**, **Plotter**; however, longer coverage times may slow the software. The coverage history, shown in survey time of hours:minutes:seconds (as indicated by the Elapsed Time 65 indicator at the top left of the *waterfall* toolbar), is how far back in time you want to see the coverage. The default amount of coverage history time is 10 minutes.

You can measure length between two points on the **Navigation Plotter**. The length for the distance measurement is displayed at the top right of the **Navigation Plotter Window**. The measurement will update every time the current position changes or until you select another action that makes use of the window.

Layout

The **Navigation Plotter** has two default functions: the **Center/Pan**, accessed by a left double click in the Plotter window, and **Marker/Waypoint Information**, accessed by a single left click in the Plotter window.

The **Navigation Plotter** toolbar ⌐47⌐ at the top of the Plotter window consists of controls that allow instant and easy access to Plotter actions that change the various Plotter parameters. The operational tools include **Length**, **Waypoint**, **Map-Bearing Line**, and **Automatic Center**. The display tools are **Zoom In**, **Zoom Out**, **Zoom To**, **Clear Navigation**, and the **Readout** area for the operational tools.

Boundary Conditions

The Sea Scan Survey **Navigation Plotter** ⌐43⌐ can determine the ship's position worldwide. When the boundary coordinates are changed, the track points must be redrawn. This drawing speed is limited both by computer speed and coverage history. The time is specified in survey hours:minutes:seconds (as indicated by the Elapsed Time ⌐65⌐ indicator at the top left of the *waterfall* toolbar). The default amount for both boat track and coverage history is 10 minutes.

If the boundary coordinates are changed, only the amount of data equal to the coverage history will be redrawn. That is, if the coverage history is set to 30 seconds, only the latest 30 seconds will be redrawn.

To view more data, increase the amount of coverage history. If you press the button on the toolbar to clear the navigation Plotter, the data will be drawn up to the coverage history amount. The cleared data is still in the history, just not visible. Thus, no data is lost.

Zoom

1. Select the **Zoom-To Tool** on the **Navigation Plotter** toolbar to select a section in the Plotter window that you wish to see more closely. Then drag the mouse pointer over the area. The area will be enlarged based on the default Zoom percentage you have set.

2. Another approach is to select the **Zoom-In** button on the **Navigation Plotter** toolbar to select a section of the Plotter that you wish to see more closely. Each click zooms in 5%. Hold down the button and, every 1/5th of a second, the zoom advances another 5%.

3. Select the **Zoom-Out** button in the **Navigation Plotter** toolbar to expand the Plotter viewing area. Each click zooms out 5%. Hold down the button and,

every 1/5th of a second, the zoom retreats another 5%.

Center/Pan

With a double left click, the default **Center/Pan** function will center the Plotter on an area you designate in the Plotter grid.

Automatic Center

Select the **Auto Center** button in the **Navigation Plotter** toolbar to center the Plotter on the towing vessel when the boat has gone off the edge of the Plotter grid. In this case the Plotter dimensions are not changed; the Plotter simply re-centers the boat track. If this tool is activated and the operator causes the boat to go off the Plotter by using the **Center/Pan** function, **Zoom In,** or **Zoom Out**, or by adjusting the center location in the **Navigation Plotter** settings, Sea Scan Survey will automatically re-center the boat, thus overriding the operator's action.

Length

You can use the mouse pointer to measure the length of any object in the *waterfall* display window with or without the **Zoom** feature. Depress the **Length** button, then create initial and ending points at the feature with the mouse pointer. The measurement will appear in the *waterfall* toolbar.

You can also measure lengths in the **Navigation Plotter Window** by clicking on the Plotter length button. Click on a starting point in the Plotter window, then on the ending point. The measurement will appear at the top right of the Plotter toolbar.

Map-Bearing Line

The map-bearing line on the **Navigation Plotter** toolbar is a convenient tool for revealing the boat's heading and projected path. The parallel lines to each side show the swath, which is helpful when performing a <u>search and survey pattern</u> 115.

Clear Navigation

This tool allows the operator to clear all the navigation data in the **Navigation Plotter Window** except for the survey timeframe specified in the coverage history edit box. This coverage history can be accessed and modified at **Tools**, **Settings**, **Navigation & Fathometer**, then **Plotter**.

Markers and Waypoints

Markers

Markers are invaluable for identifying targets of interest during a survey. When you mark a target in the *waterfall* display, Sea Scan Survey takes a snapshot of the image, sequentially numbers the *marker*, and notes location information. That information becomes part of a *marker/waypoint* list in the **Marker Management Window** 54, where you can change the *marker* name, assign a color relating to a classification, or add descriptive information about the target at any time. Click on the *marker* snapshot or its information in the **Marker Management Window** and you will see a flashing **green** box around the target in the *waterfall* display. The image area of that snapshot will be at the default zoom size that was set in the **Zoom Settings** window. In addition, the software will highlight the marker information in **gray** in the **Marker Management Window**.

To view relevant information on each *marker*, access the docking **Marker Management Window,** where you can see a preview image of each *marker*, the name, any classification you have assigned, etc. Alternatively, right click on the *marker* in the Plotter window 43 and a pop-up box will appear with a snapshot and related information.

Waypoints

Waypoints are useful for marking navigational positions in a survey route. These *waypoints* are especially practical for identifying predefined sites and survey routes. As you identify more *waypoints* during a survey operation, the list will accrue and be available in the **Marker Management Window** 54. The coordinates will be shown there, although no snapshot will be visible. You can select a *waypoint* in the **Marker Management Window** at any time and it will be highlighted in the **Navigation Plotter Window** 43 if that window is visible. Alternatively, right click on the *waypoint* in the Plotter window and a pop-up box will appear with information about that *waypoint*.

The number of each *waypoint* is used automatically to create a unique identifier string. The identifier string name can be changed at any time. The sequentially numbered *waypoints* you insert will be listed in the **Marker Management Window** and become part of the survey record until you delete them. You can change the name of the *waypoints* and insert descriptive details at any time.

Adding Markers and Waypoints

Markers may be added by selecting a feature in the *SONAR waterfall* and double clicking on it. It will then show as a dot in the **Navigation Plotter Window** 43 and

will be listed sequentially in the **Marker Management Window** 54 .

Waypoints may be added by depressing the ***Waypoint*** button in the Plotter toolbar, then double clicking at a location in the Plotter with the mouse pointer; it will show as a dot in the **Navigation Plotter Window**. The software will also assign location information to that waypoint; that information can be viewed by clicking on the waypoint in the ***Marker*** **Management Window.** Alternatively, right click on the *waypoint* in the **Plotter Window** and a pop-up box will appear with information about it.   *Waypoint L/L* can also be manually entered in the ***Marker*** **Management Window** and the *waypoint* will become part of the list there.

The ***Marker/Waypoint*** **Information** function can help the operator select the closest *waypoint* or *marker* in the Plotter window. The information will then appear in the ***Marker*** **Management Window**.

<div style="border: 2px solid blue;">

Tip **Although *waypoints* and *markers* have similar functional capabilities, they should be treated completely separately. The *waypoint* buttons in the Navigation Plotter toolbar only affect the *waypoints* in the Plotter; the marker buttons in the Navigation Plotter toolbar only affect the *markers* in the Plotter.**

</div>

Editing Markers and Waypoints

A *marker* or *waypoint* can be edited anytime in the **Marker Management Window** 54 . That is, you can change the name there, add descriptive details, or assign a classification. Another approach is to click on the *marker* or *waypoint* in the **Navigation Plotter window** 43 ; then right click and a pop-up box will appear. In that box, you can elect to edit or delete the *marker* or *waypoint* you just added.

Managing Markers and Waypoints

The **Marker Management Window** 54 gives you access to all the *marker*s and *waypoints* you set during an operation. The snapshots next to each *marker* in that window are convenient ways to remind you about targets of interest during the *SONAR* run. You can click on any *waypoint* or *marker* and the **Navigation Plotter** 43 window will show you that location. You will also be returned to the *marker* target of interest in the *waterfall* display, where a flashing **green** rectangle will show the location. In addition, you can click your mouse pointer over any dot in the Plotter window and see the preview image, name, and any classification you have assigned that object in the ***Marker*** **Management Window**.

You may collect a significant number of *marker*s or *waypoints* during an operation. These become part of the survey files, such that you can re-open any

survey and search for a particular *marker* or *waypoint* simply by clicking on the *marker* or *waypoint* in the list on the **Marker** **Management** window. Sea Scan Survey will retrieve that information and present it in the *waterfall* display window.

It may be convenient to classify the nature of the *marker*s or *waypoints* (as one of various typical targets) and to sort them accordingly. To apply this function, go to **Tools**, **Settings**, then **Marker Labels** 91 . At that window, you can change the designations for each color category. In addition, you can assign a user-changeable symbol and color to the *marker*s or *waypoints* for classification. Thus, the most relevant *marker*s or *waypoints* might be assigned a particular color.

Deleting Markers and Waypoints

If you have identified more *marker*s or *waypoints* than you wish to retain, you can remove them at any time.

To delete a *marker* or *waypoint*, click on the <**Delete Marker**> button to the right of the **Marker Management Window** 54 . When you click on this button and highlight the *marker* or *waypoint* you wish to delete, you will be prompted to confirm this action. Click <**Yes**> to proceed with the deletion.

Caution | ANY MARKERS OR WAYPOINTS THAT YOU REMOVE ARE DELETED <u>PERMANENTLY</u>. THIS ACTION CANNOT BE UNDONE.

Managing a Survey

Because a survey operation is expected to involve a large amount of raw data collected during a search, plus *waypoint* information, snapshots of targets of interest, and *marker* s, Sea Scan Survey has an automated system for collecting and organizing all this data into files that are a reasonable size. The raw data packets accrue sequentially at a rate of 1 hour per file; that is, as one file becomes filled according to the time constraint of the system, a new file opens and begins receiving the continuously arriving data packets. The software will attach new files as needed—up to the point where the operator exits the survey. The *waypoint* information, snapshots, and *markers* are stored separately but are recalled as part of the survey in which they were collected. This entire operation is behind the scenes, requiring the operator to do nothing but collect data.

Subsequently, all the information for a survey that is packaged together is available for easy review at any time, making survey management a totally seamless process.

About Surveys

When an operator clicks on <**Open** ⌷15⌷> in the <**File** ⌷13⌷> Sea Scan Survey pull-down menu, a choice is required: to open a survey or to open a file. The survey is the entire packet of related information gathered for each *SONAR* investigation. The survey can be searched for *marker*s or *waypoints* simply by calling up the targets of interest from the **Marker Management Window** ⌷54⌷.

Survey Folder Organization

The key to organizing and keeping survey folders accessible is to name each distinctly. This opportunity is available in the **Begin a New Survey** ⌷14⌷ window when starting a new survey; of course, an operator can rename a survey at a later time.

Another important action is to add a detailed description in the **Begin a New Survey** window. Ample space has been provided for this purpose. When numerous *SONAR* runs have been done, such information will be invaluable in determining which survey to revisit.

Making a New Survey

A new survey will start as soon as the operator completes the information in the **Begin a New Survey** ⌷14⌷ window and clicks <**OK**>. Sea Scan Survey will be ready to receive data and to organize it for optimal storage and review.

Adding New Data to a Survey

Perhaps an operator has performed a survey, then wishes to append more data to it because of new information or a later siting. The operator <u>can</u> do so simply by opening the pre-existing survey; this is accomplished by selecting **File**, then **Continue Survey** ⌷16⌷. The program will immediately open new files to receive the latest information and attach the latest data at the end of the prior survey's files. The operator need do nothing more than continue the correct pre-existing survey.

Opening a Survey for Review

Multiple files can be opened concurrently for review or further analysis. Upon selection of the appropriate files, Sea Scan Survey groups these files in a new temporary survey file. This new temporary survey is deleted when the files or the

Sea Scan Survey application is closed.

Exporting a Survey

An option is available to export the survey as an _xtf_ 36 . Click on this option in the **T ools** pull-down menu to export the current open survey to a user-specified location. You will be prompted to process the image data. Select your preference. The exported file will open in your web browser.

The file that opens in the web browser will contain the Marine Sonic Technology, Ltd. logo in the top left corner. This logo can be changed to that of your organization in one of three ways:

For a one-time change:

1. Open the picture file in the report folder.

2. In image-processing software and resize the file to a square of approximately 200–300 pixels.

3. Export the file with the following name: _report_logo.jpg._

For a permanent change, edit the HTML file (see screenshot below):

1. Open the text editor using Notepad or Wordpad. These can be found by clicking on
    <**Start**> at the left of the Windows© bar at the bottom of your screen, then on

    <**All Programs**>, <**Accessories**> in the list of programs available on your computer, and finally on <**Notepad**> or <**Wordpad**>.

2. Once in Notepad or Wordpad, open the survey report folder.

3. In the File Name box, type the following: _report.html_ (nothing will show while you are performing this step).

4. In the list, "Survey Report Summary," which is a comment, look for _report_logo.jpg._

5. Delete _report_logo.jpg._ You will be left with <_img.src_>.

6. Replace that deleted file with your logo, sized to a square (approximately 200 –300 pixels) and saved as a _.jpg._

<u>Send the logo as is to Marine Sonic Technology, Ltd.</u> Personnel there will convert the logo for you and do any resizing necessary for optimal fit.

Tip

You can export the raw process data by clicking the selection box in the Image Adjustment window. Doing so converts the logarithmic information into linear data for third-party software outputs.

Troubleshooting

Software Issues

Software Manager Shows "Failed to Synchronize the Data Stream"

Sea Scan Survey

⚠️ Simple Topside Box Sonar Interface: Failed to synchronize the data stream.

    OK
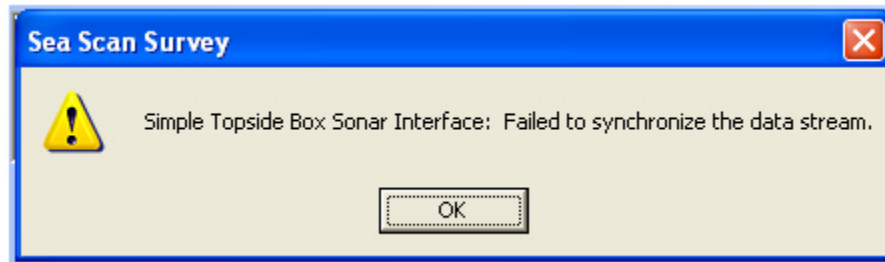
Symptom: The software successfully connected to the topside box; however, the towfish is not communicating. Check the following:

Check cables
(tow cable,
pigtail, and deck
cable if using a
winch)

Fails to synchronize the data stream

Turn off the
topside box,
then turn it back
on

Check for water
in the
connectors
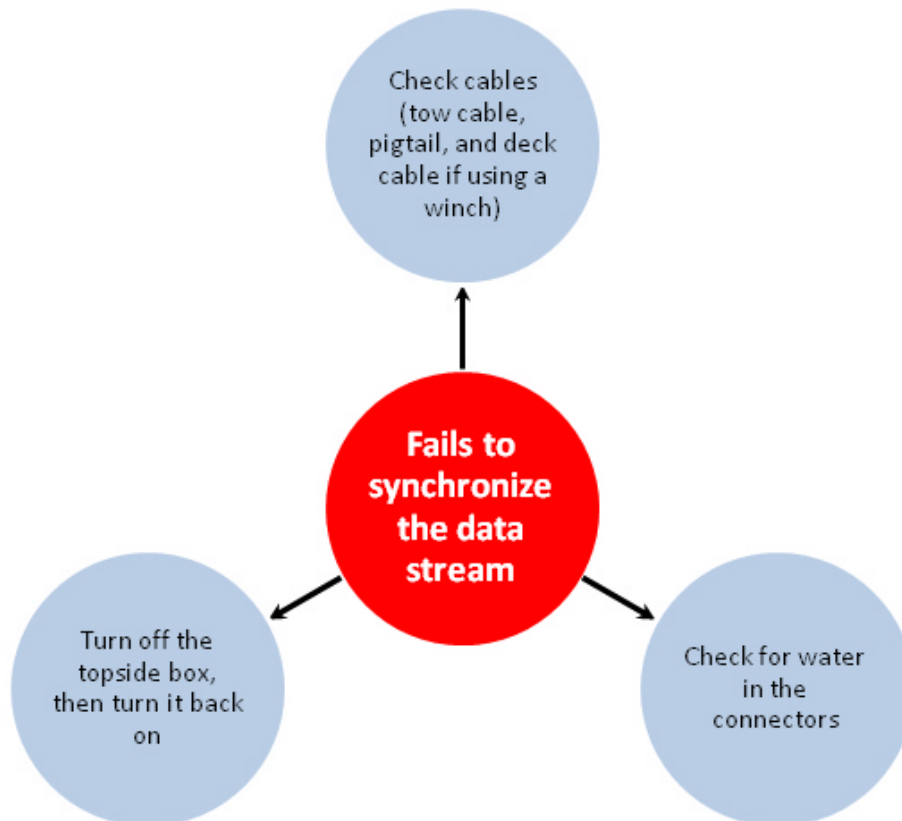
Software Manager Shows "Failed to Connect"

Sea Scan Survey

⚠ Simple Topside Box Sonar Interface: Failed to connect.

OK
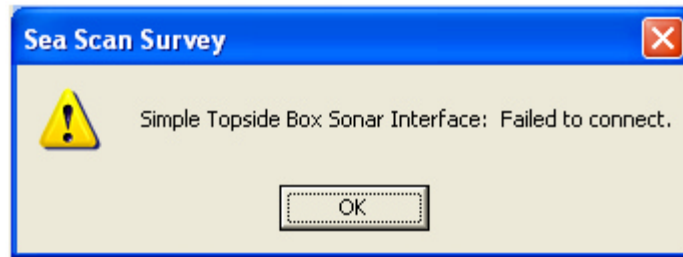
Symptom: The software cannot connect to the topside box. Check the following:

- Make sure no other copy of Sea Scan Survey or other software is accessing the topside box.

- Ensure that cables are properly connected. Check the following:

Make sure the USB cable is plugged in and secure

Sea Scan Survey fails to communicate with the topside box

Unplug the topside box, then plug it back into the computer

Make sure the connectors are clean and free of moisture
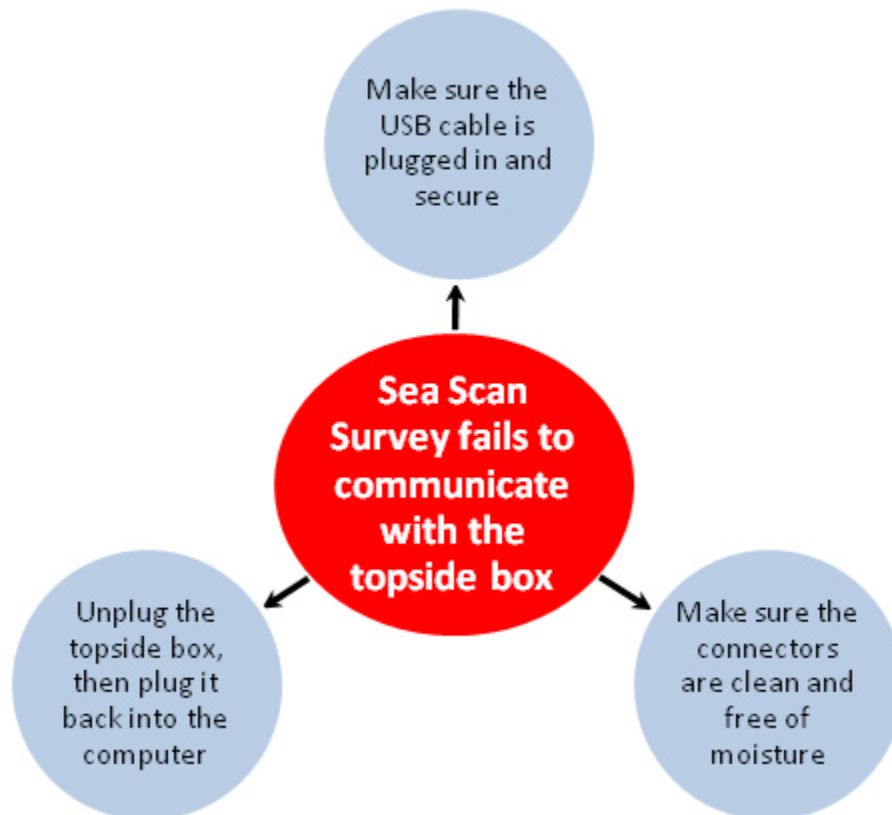
SONAR Not Connected

Symptom: There is no *SONAR* signal or incoming data when Sea Scan Survey is open and the towfish is deployed. Check to see whether the *SONAR* manager is connected. If it is, check the following:

Step 1
Turn the topside box off, then turn on again. Also, disconnect and reconnect the towfish.

Step 2
Check for water or moisture in the towfish connector

The towfish does not respond to commands

Step 3
Make sure the driver is installed for the Simple Topside Unit

Step 4
Unplug the USB connector, then plug it back in

Step 5
Close Sea Scan Survey & restart it
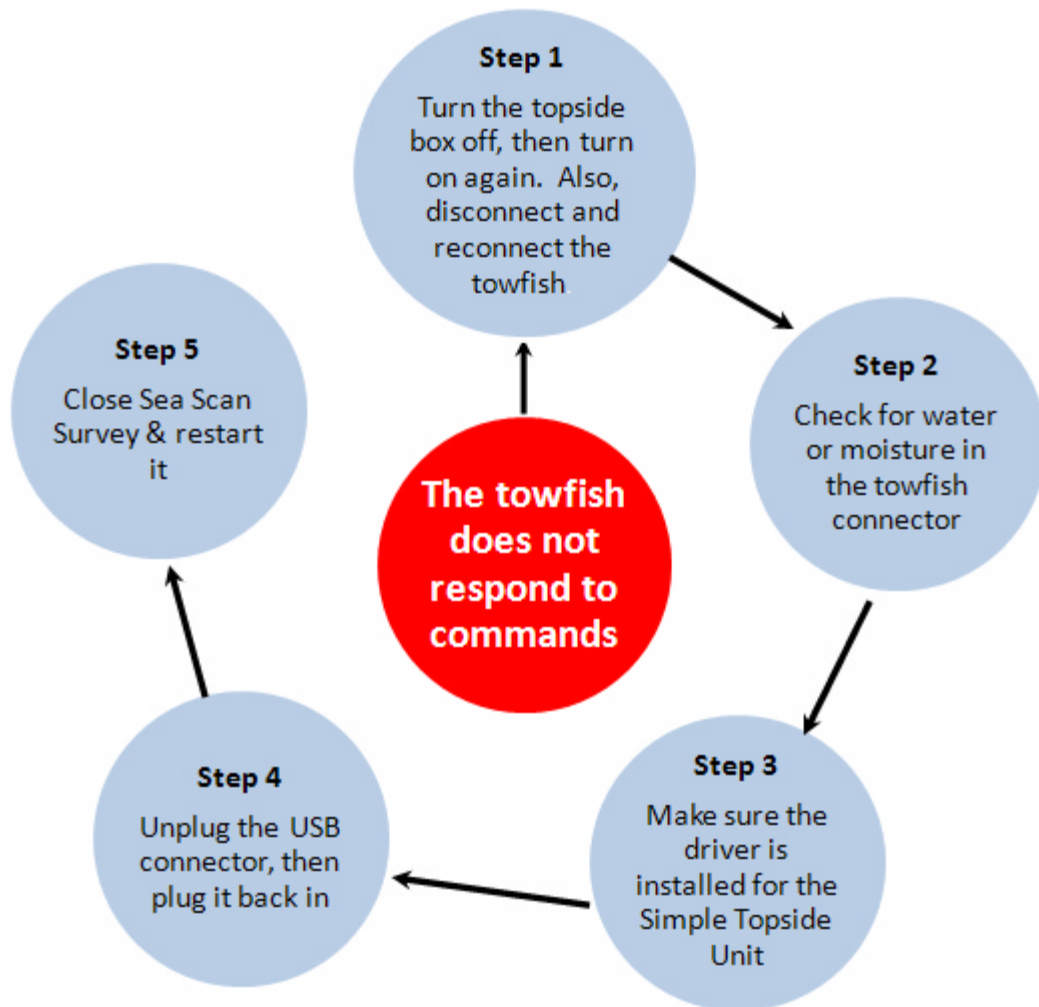
Interface Does Not Start or the Wrong Interface Starts
Symptoms:

- The *SONAR* is not connected.

- The data does not show in the *waterfall* when Sea Scan Survey is open and the towfish is deployed.

- A rub check does not show in the *waterfall*.

- Instead of showing your correct position in latitude and longitude, the system indicates a zero (0) latitude and zero (0) longitude.

STEP 1
Open the *SONAR* Manager settings

STEP 2
Click the **STOP** button

STEP 3
Select the Simple Topside Unit

STEP 4
Click the **START button**

STEP 5
Confirm that SONAR now is connected

The Interface doesn't start or isn't the correct one
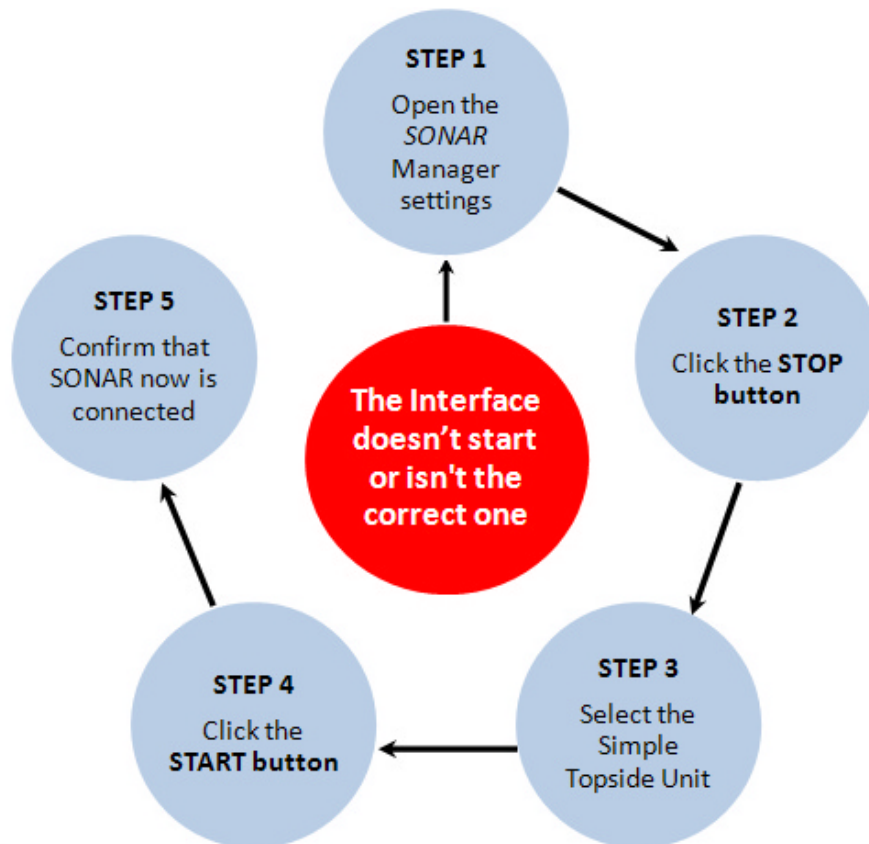
Incorrect Drivers Installed or Drivers Missing
Symptoms:

- A box pops up indicating that the Topside Box failed to initialize.

- The Topside Box does not appear on the list of Available Interfaces.
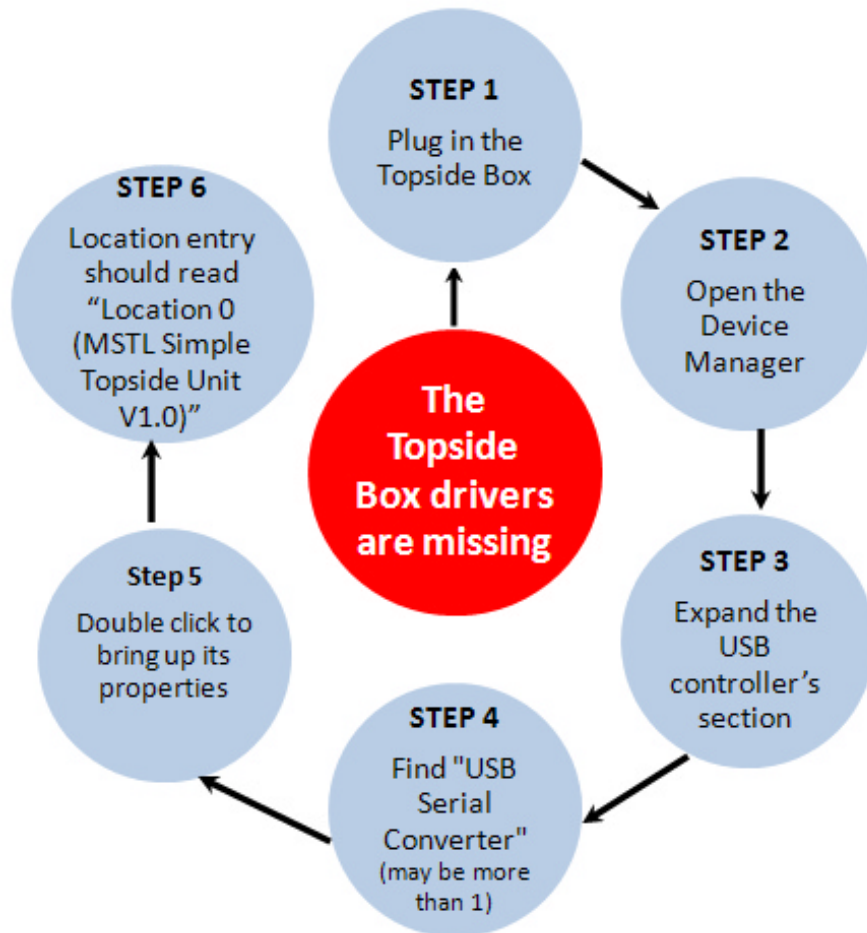
If Steps 1–6 do not resolve the problem, you may have to install the Towed System drivers. Then reboot the computer. After rebooting, follow the above steps and see if "Location 0 (MSTL Standard Topside Unit V1.0)" now appears.

No GPS Data Is Being Received

Symptom: No positioning information (*L/L*, maps, etc.) is showing. Check the following:

- Is the GPS plugged in?

- If you are using a USB port for the GPS, is the driver installed?

- Is another application accessing the GPS? If so, close other applications that may use the GPS, including the test application that comes with the USB GPS.

STEP 1

Open the Device Manager

No GPS data

(GPS status)

STEP 2

Expand the ports (COM & LPT)

STEP 3

Find "Prolific USB-to Serial Com Port"

STEP 4

If it does not exist, then install the GPS drivers
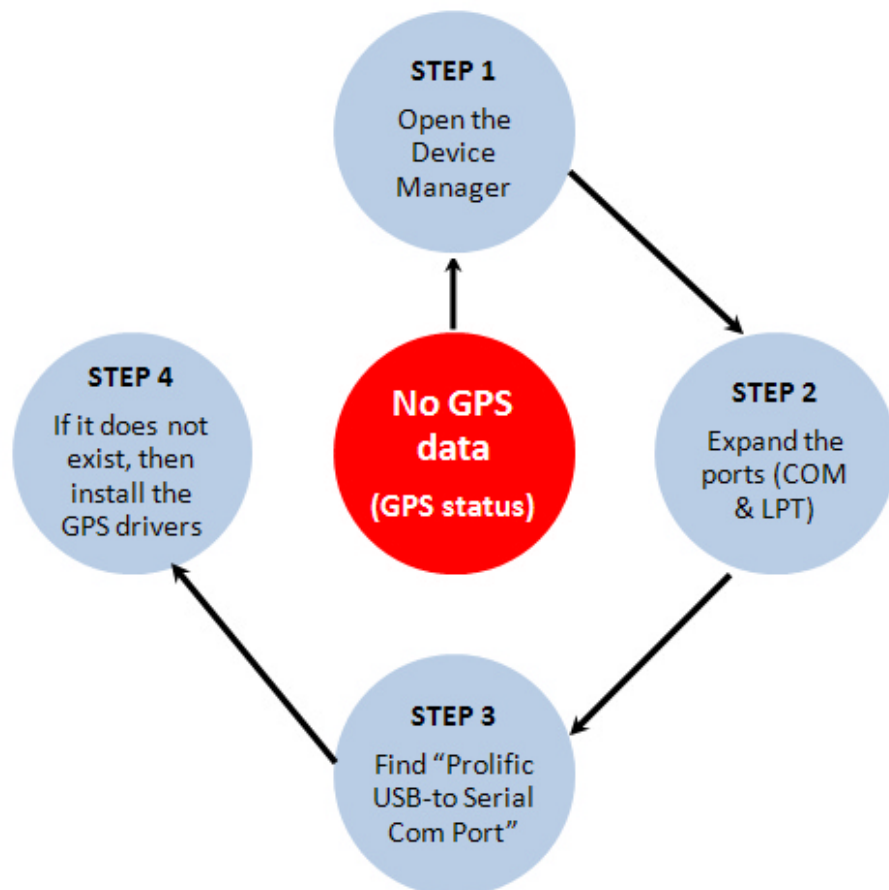
- Is Sea Scan Survey connected to the GPS?   Check the following:

STEP 1

Go to NMEA Data Input Settings

No GPS data

(Sea Scan Survey Status)

STEP 2

Click on the Test button to see if strings are coming in

STEP 3

If no strings, pick a different port from the Available Ports list box

STEP 4

If using a USB GPS, <USB> will show in the list of available ports
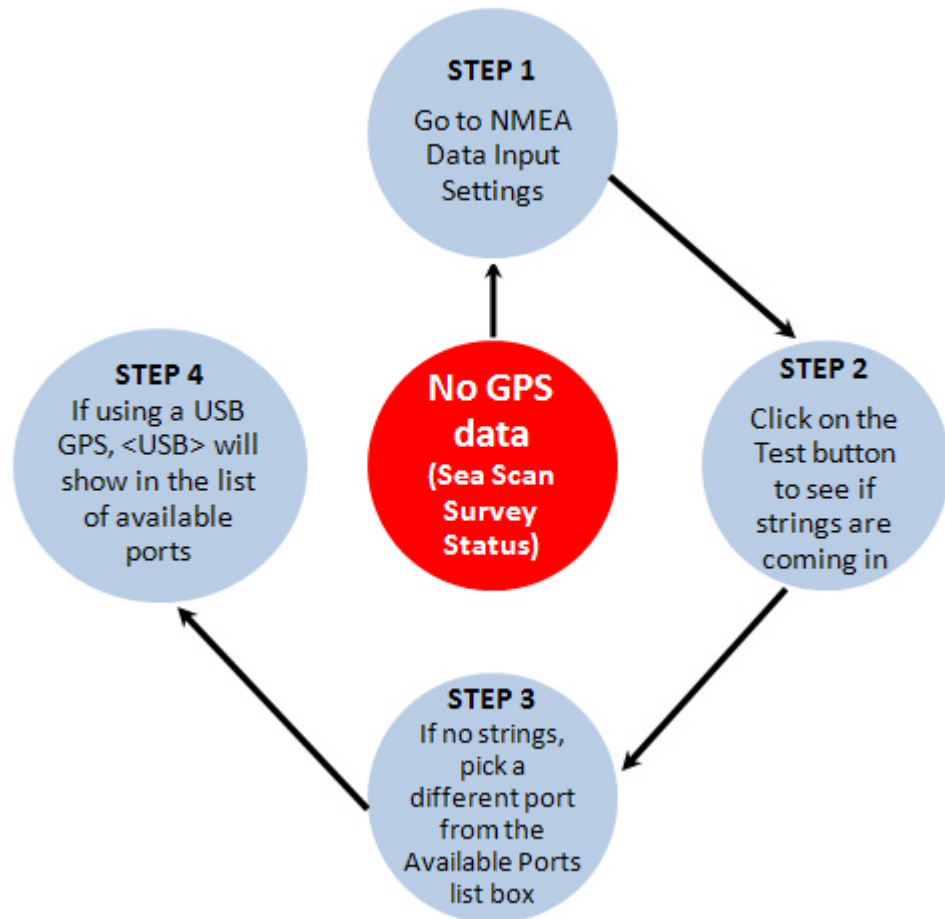
If the GPS is under the Open Ports list and/or if the strings are coming in but it is not clear there is data in them, then—
1. The GPS may not have a good satellite signal or
2. The GPS may not be configured to transmit the correct NMEA sentences

Caution

When using a USB GPS, the COM port number will change if you plug the CPS into a different USB port than before. Sea Scan Survey saves the settings; however, if the COM port number changes, then it will not open the GPS when Sea Scan Survey starts next time.

Hardware Issues

The Simple Topside Unit Does Not Power Up

Symptom: The unit does not respond when it is hooked up to a computer running a Sea Scan® HDS-compliant side-scan *SONAR* program and to a towfish with transducers.

The Simple Topside Unit does not respond

Check connectors:
- Confirm that the power cable is connected to the box
- Check that the leads are connected to a working power source (battery)

Check fuses for adequate supply voltage:
- Verify battery voltage by using the supplied multi-meter to measure at least 9 V
- Measure under load (see Tip below)

Check for part failure:
- Disconnect all but the power cable
- If the fuse blows now, contact MSTL for a replacement unit

Tip   Measure the battery under load, as a battery with no load may measure incorrectly. First, disconnect the tow cable, then power up the Standard Topside Unit. This approach should sufficiently load the power supply.

The Towfish Does Not Communicate

Symptom: No data comes in after the towfish is deployed.   Check the following:

- Check the output fuse by using the supplied multimeter to measure the continuity (see the supplied multimeter guide).

- Check for the causes of any blown fuses.

The output fuse is blown or the connection is intermittent

Water may have gotten into the connector:
- Power down the system
- Liberally apply WD-40 in the towfish AND tow cable connectors to displace any moisture inside the connectors
- Shake out the excess WD-40

The fuse may be too warn
- Replace fuse with a new one that has the same rating

Check for part failure:
- If the output fuse blows when the towfish is connected, the pigtail, tow cable, or towfish may be damaged
- Use the supplied multimeter to determine the location of the damage
- If you cannot determine the damage point, contact MSTL for assistance

Revisions

Revision History

Version	Comments	Issue Date
1.0.0	Initial release	August 2007
2.0.0	New capabilities added to the software	January 2008
2.1.0	New capabilities added to the software	November 2008
2.3.0	New capabilities added to the software	December 2009
2.4.0	New capabilities added to the software	April 2010
2.5.0	Minor corrections and additions.	July 2011

Glossary of Acronyms and Terms

absorption	The diminishment of the returning pulse caused by the impact of the acoustic signal against objects, materials, or the sea bottom
acoustic shadow	Literally, the shadow an object on the bottom casts to its side in relation to the transducer; the transducer must "see" this entire shadow so that the height of that object can be calculated
acoustic signal	The fan of sound emitted from the transducer
active SONAR	A system that transmits an acoustic signal through the water that reflects off objects, then is returned
angle of incidence	The angle at which a straight-line SONAR pulse hits an object
AUV	Autonomous Underwater Vehicle
axial layback	The offset distance from the position of the towfish to the navigation antenna
backscatter	Unwanted echoes
baud rate	A unit for measuring data transmission speed, where one unit equals 1 bit per second
beam spreading	The widening angle of a SONAR beam as it moves farther from the transmitter
bmp	Bitmap, a graphic file format commonly used in Microsoft Windows© applications
Bow	The front section of a boat or other vessel
buffer	To load, as in loading a file. Also, pulling information from a file and putting it into memory
CD	compact disk
channel	Another term used to describe the transducer acoustic track from either side of the towfish that appears in the SONAR window. The left channel refers to the left (port) transducer track; the right channel refers to the (starboard) track.

COG	Course Over Ground; also known as Course Made Good
color look-up table	A way of mapping data by assigning an artificial color
contrast stretching	An operation that remaps the color look-up table based on the lower and upper threshold limits the operator elects from the histogram
csv	Comma-Separated Values; in computers, a CSV file contains the values in a table as a series of ASCII text lines organized so that each column value is separated by a comma from the next column's value and each row starts a new line. A CSV file is a way to collect the data from any table so that it can be conveyed as input to another table-oriented application such as a relational database or spreadsheet application.
decibel	The unit of sound intensity used to describe the strength of transmitted and received underwater sound
DL	Data Loss
dongle	Commonly used term that refers to an encryption key
ENC	Electronic Navigation Chart
EULA	End User License Agreement
ETE	Estimated Time Enroute
fathometer	An acoustic device that measures the current water depth
FAQ	Frequently Asked Questions
frequency	The number of sound waves that pass any specific point in one second
FS	Frequency Switch
gain	Amplification of a signal
Gaussian smoothing	A widely used effect in graphics software, typically to reduce image noise. It is a spatial low-pass filter that reduces the sharpness of image detail
GB	GigaByte (1,000,000,000 Bytes)

geotiff	A high-resolution format that transfers readily to other geographic applications
GHz	GigaHertz (1,000,000,000 Hertz)
GIS	Geographic Information Services
GMT	Greenwich Mean Time
GPS	Global Positioning System
Hertz	A unit of measure representing one cycle per second
HDS	High-Definition SONAR
histogram	A graph that displays the number of each color in a range
home state	The indicator to the operator that the newest SONAR line is immediately visible on the screen
HTML	hypertext markup language, a set of tags and the rules for using them in developing hypertext documents
hydrophone	An instrument that transforms an underwater sound wave into an electrical signal
intensity	The strength of the returning acoustic signal
interference	Erroneous signals caused by acoustic or electronic sources
L/L	Latitude/Longitude
latitude	An imaginary horizontal line joining points on the Earth's surface that are all of equal distance north or south of the equator
lane	The straight track the surface vessel follows while towing the towfish
lateral layback	The offset distance to the left (port) or (starboard) between the navigation antenna and the towfish
layback	The surface distance between the navigation antenna and the towfish
longitude	The angular distance east or west of the prime meridian that stretches from the North Pole to the South Pole and passes through Greenwich, England

lossy medium	The physical degradation of an acoustic signal as a result of such conditions as absorption by the water, wave-front spreading, or scattering
LUT	Look-Up Table
magnetometer	An external device that measures the current total magnetic field
marker	A target of interest the operator can tag in the SONAR window; the target might be a feature on the bottom or an target of interest
MB	MegaByte (1,000,000 Bytes)
MRU	Most Recently Used
nadir	A point along the swath that is directly beneath the towfish; a location in the acoustic pulse
NMEA	The National Marine Electronics Association
NMEA Protocol 0183	A standardized protocol that allows marine instruments to transmit and receive depth information. This communication is based on a block transmission or groups of NMEA 0183 sentences, which are transmitted over the serial cable. Each sentence has a header that uniquely identifies the source of the data and the information contained in the data string.
NOAA	National Oceanic and Atmospheric Administration
noise	Extraneous acoustic sound or electrical waveforms that interfere with the SONAR signal
null point	The location of the antenna of the external navigation device
OTG	Over The Ground
overlap	The bottom area covered more than once as the towfish travels a predetermined pattern or grid
PC	Personal Computer
ping	A single pulse of a SONAR system
pitch	Rotation around the side-to-side axis
Plotter	A software module that shows track position and swath coverage

port	The left side of an object or ship
projector	An device that transforms electrical signals into sound waves
pulse length	The length of time that a SONAR unit is transmitting one pulse
PW	Power
RAM	Random Access Memory
range	The maximum distance from the transducers that the SONAR signal can detect usable signals
range delay	The distance (or range) the Sea Scan Survey software is told to delay after pinging before it starts to look at acoustic returns
range marker	A scale reference line shown in the SONAR window
reflectivity	The strength of the SONAR return off an object or material
RGB	Red/Green/Blue
roll	Rotation around the front-to-back axis
ROV	Remotely Operated Vehicle
sea clutter	The reflections from the sea surface (waves, bubbles, wakes, etc.)
scattering	The diffusion of a SONAR beam in many directions because of sea conditions; as a result, the amount of energy available to reflect off an object reduces as the outgoing acoustic wave travels away from the source
SDS	SONAR data stream
shadow	The area that the sound wave cannot reach behind an object because of the object's protrusion above the sea floor; used to determine the height of the submerged object
side-scan SONAR	An acoustic imaging device used to provide wide-area, large-scale images of the bottom of a body of water
signal statistic	Statistical information on a ping, typically an average, minimum, or maximum level

slant range	The straight-line distance from the towfish to an object at any given location
SOG	Speed Over Ground
SONAR	SOund Navigation And Ranging
starboard	The right side of an object or ship
swath	The total side-to-side coverage of the SONAR signal on each sweep of the seabed; also called a line
topside processor	The control unit an operator uses on the towing vessel to collect and observe the incoming data from the transducers
towfish	The device that is towed through the water on which the transducers are mounted
transducer	The projector and hydrophone that make up an active SONAR system
true range (ground range)	The horizontal distance from the towfish to the object or bottom location
TVG	Time-Varied Gain; a process where amplifier gain is changed based on time and matched with returning signals between outgoing pulses of the side-scan SONAR
.sds	SONAR Data Stream, the extension that the software attaches to the names of data files
USB	Universal Serial Bus
UTM	Universal Transverse Mercator, a coordinate mapping system that maps to a grid rather than to latitude/longitude
Universal Length Unit	A standard for measurement of areas in user-specified units
water column	The track along the bottom immediately beneath the towfish; this track provides supplementary information to the operator, such as the altitude of the towfish relative to the water's depth or the presence of sea clutter
waterfall	A term used to describe a display that puts the newest data at the top and scrolls the data down like a waterfall

wavelength	The distance between acoustic waves
waypoint	A position of interest made and displayed on the navigation Plotter
WVS	World Vector Shoreline
XTE	Cross-Track Error
xtf	eXtended Triton Format. The most commonly used format for SONAR information in the hydrographic survey industry
.xvy	The extension that the software attaches to the names of survey files
yaw	Rotation around the vertical axis

Contact and Support Information

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Additional documentation can be found on our Sea Scan HDS Documentation page which can be found by going to our web site and following the links:

Downloads -> Sea Scan HDS -> Documents

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