



Marine Sonic Technology
[A Brand of ATLAS North America]

Sea Scan Survey Operations Manual

V5.1.0

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Doc: 2FT1-OPS

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Section 4 Glossary

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1 Introduction

Marine Sonic Technology is a well-established and highly-respected resource for individuals and organizations that perform search and recoveries; bottom surveys; ship hull inspections; port and homeland security; bridge, pier, pipeline, and harbor inspections; vertical structure imaging; and environmental surveys and research. Our sophisticated computer-based side-scan sonar systems effectively provide real-time, detailed, and accurate underwater imaging.

Sea Scan Survey, is our premier software package providing exciting features that make collection and review of sonar data easy and highly efficient. The software features an integrated waterfall display designed to maximize the effective computer screen viewing area. The waterfall display has a complete tool set that allows range, length, height, and area measurements, all of which can be executed in real time or during post-processing operations.

In addition to measurement tools, Sea Scan Survey software provides an adjustable magnification zoom tool and a target marking tool. Added features include an advanced target marking system for instant access to any real-time marking point during either the on-water or post-processing operation. Other windows are available during data collection and post processing that allow additional data perspectives. These include an A-Mode view of the sonar data, a data status window that shows range delay, ping rate, Speed over Ground (SOG), Course over Ground (COG), heading, Latitude/Longitude (L/L), and depth at a glance. The software includes a full feature navigation plotter to show swath coverage, marked targets, and vector chart maps. Sea Scan Survey also has an advanced graphical user interface that provides a variety of ways to maximum usage of the computer display.

1.1 Minimum System Requirements

Sea Scan Survey requires the following capabilities.

Operating System	Vista, 7, 8, 8.1, or 10	
Hard drive space	2.6 GB Installation Survey Data Storage up to 1 GB / Hour	
Available RAM		
Survey Time	2 Channel Sonar	4 Channel Sonar
< 12 hrs	2 GB	6 GB
> 24 hrs	6 GB	6 GB
Processor Speed	1.8 GHz or better	
Other Features	Ethernet & USB 2.0 port	
Screen Resolution	1024 x 768 minimum or higher*	

Note: A higher resolution wide screen monitor makes viewing the different data windows easier without sacrificing the size of the waterfall view.

1.2 Contact Information

The Marine Sonic Technology Sea Scan® hardware and software are thoroughly checked before shipping. Any alteration of our products after shipment automatically voids the warranty. In case of question regarding these issues, contact Marine Sonic Technology at the following address:

Atlas North America / Marine Sonic Technology
120 Newsome Drive Suite H
PO Box 1309
Yorktown, VA 23692-1309

For technical support:

Visit our website at <http://www.marinesonic.com>.

Call 1.800.447.4804

International callers, please use: +1.804.693.9602

Customer Support at Marine Sonic Technology also welcomes your questions, comments, and corrections about this manual. In any correspondence, we would appreciate the publication name, publication version, equipment designations, document page or figure number, and your comments. Please send your communication to the above address.

1.3 Updating Procedures

Marine Sonic Technology engineers continually review and improve upon the company's hardware, firmware, and software procedures and capabilities. Revisions and updates may be frequent and can significantly streamline operation. Contact Marine Sonic Technology Customer Service to inquire about updates, patches, and notices or visit the Marine Sonic Technology website at www.marinesonic.com.

1.3.1 Change Log

V5.1.0 August 2017

Features

- * All Left / Right Indicators now correctly state PORT & STARBOARD (STBD)

Bug Fixes

- * Improved software reliability
- * Improved tool functions for dealing with different ranges in the new Scout MkII system
- * The Save Clip feature in the Event Window now functions the same as the Tools->Save Clip feature. Allowing the user to set the clip length desired for the recording
- * Improved SOG Correction Function

V5.0.0 May 2017

Features

- * Added ARC Explorer 300 kHz functionality
 - * The Sonar Control Panel Frequency Lock button is now disabled when operating a 300kHz ARC Explorer system.
- * Changed the RX Sonar Interface name to Scout System
- * Reconfigured the status bars:
 - * Added a bar for Left Frequency, Range, and Range Delay; Right Frequency, Range and Range delay on both Waterfall View status bars.
 - * Properly displays separate range and range delays per channel for sonar's that support this capability.

Bug Fixes

- *

V4.10.0 March 2017

Features

- * Added the slave signal statistics
- * Added Scout info to the Extended Status Window under the advanced settings.

Bug Fixes

- * The settable clip dialog box was missing
- * Changed the display settings of the main window status bar so that it is viewable on 1024 x 768 resolution displays

V4.9.0 February 2017

Features

- * Added User Settable Clip lengths.
- * Currently the user can only set the Clip length from 1 second to 24 hours at a specific point in a file. In the future, this can be expanded to allow the user to select a start and end time or a clip length to get the desired settings they want.
- * Added User Setting for adjusting the clip length of *.sds files after a survey has been completed
- * Added Alarms and Warnings to the GUI for:
 - * Depth
 - * Altitude
 - * Roll
 - * Pitch

Bug Fixes

- * Fixed an issue with the XTF headers. The headers will now display the correct number of channels and channel frequency in the *.xtf files.

V4.7.1 November 2016

Features

- * Improved COM port detection to include names of port types

Bug Fixes

- * Fixed a logic error in the parsing of the compass data in the ARC Explorer driver as it would stop parsing string until a power cycle at random times.

V4.7.0 January 2016

Features

- *

Bug Fixes

- * Fixed a logic error in the parsing of the compass data in the ARC Explorer driver as it would stop parsing string until a power cycle at random times.

V4.6.0 November 2015

Features

- * Added SDS Data Output feature accessible in the Settings window.

Bug Fixes

- * Fixed some memory related bugs.
- * Fixed the improper storage of ARC Explorer auxiliary NMEA data.

2 Introduction to Side Scan Sonar

2.1 General Sonar Overview

Sonar is a coined word derived from the phrase, Sound Navigation And Ranging. Sonar generally refers to a system that uses acoustical (sound) energy transmitted through water. At the heart of that system is the transducer, the device that converts electrical energy to sound and vice versa and is responsible for generating the sound pulse. A receiving transducer is used to receive the echo that “bounces” off objects encountered along its path

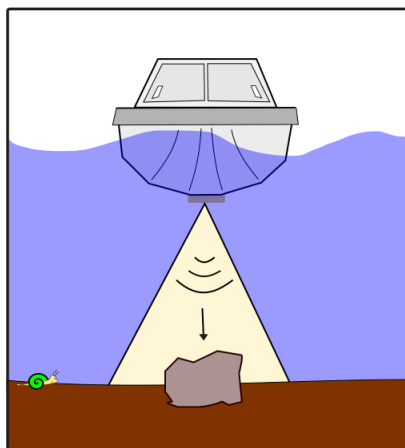


Figure 1: The transducer sends out a pulse

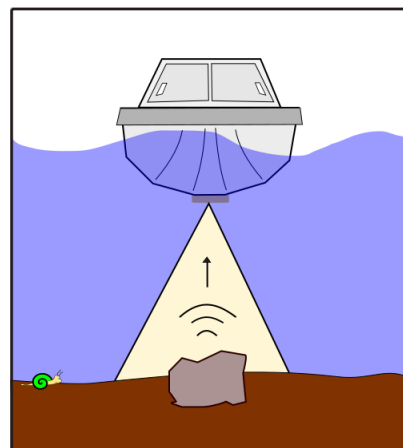


Figure 2: The pulse bounces off the object

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.

2.2 How Side Scan Sonar Works

Because of their flexibility, side-scan systems can be used in many applications, some of which involve highly sophisticated remotely operated vehicles (ROVs), autonomous underwater vehicles (AUVs) or a towed system. The images they create can be used for many applications such as geologic studies, locating sunken objects, ensuring that the waterway is clear and safe for shipping, and many more.

The transducer assembly moves on a steady course and at a constant depth through the water. As it is moving through the water, the assembly emits sound pulses at precise and regulated intervals.

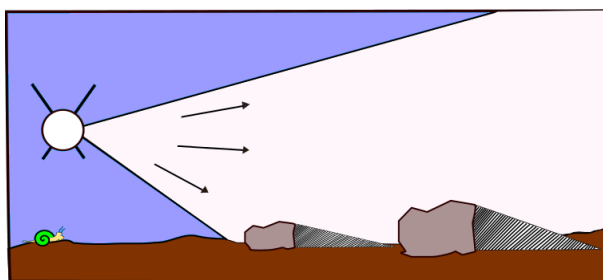


Figure 3: The system emits precise sound pulses

The system receives the returning echoes from the water column and seafloor shortly after emitting a pulse.

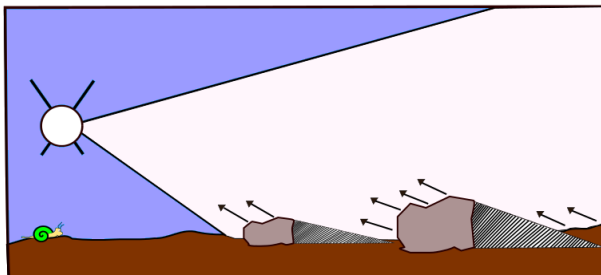


Figure 4: The system picks up the returning echoes

The returning echoes from one pulse are displayed on the sonar window or waterfall 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. The resulting accumulated lines then form a coherent picture of the seafloor.

The two transducers provide information unique to their particular side of the system platform.

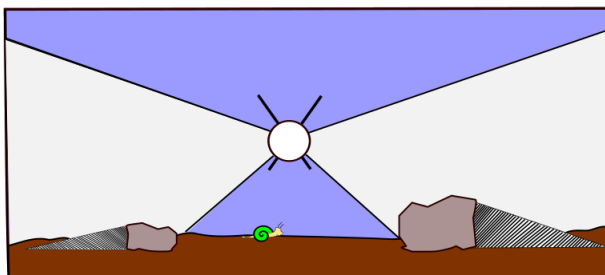


Figure 5: The transducers return info about their side of the system

In between the transducer beams is the system's track. That center display or water column loosely relates to the platform'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 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 system is positioned just above the seafloor bottom. The transducers continuously 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.

The quality of the sonar data will depend on operator and the data-gathering process, which involves vessel course, tow speed, system 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.

2.2.1 How to Read Sonar Data

2.2.1.1 Sonar Beam

Vertical Beam Angle

How wide the beam angle is; it is measured from the sea bottom to the top of the sound that was projected from the transducer.

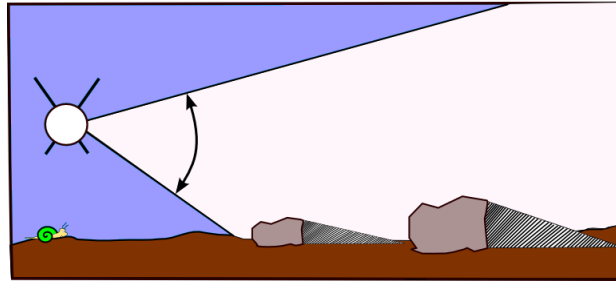


Figure 6: The vertical beam angle

Horizontal Beam Width

The width of the sound wave determines the expanse of the area covered horizontally, and the speed of the boat determines the ping spacing. The slower the vessel moves, the more overlapping coverage that will be obtained. This approach yields more data for a higher quality image.



Figure 7: The horizontal beam width

2.2.1.2 Surface and Bottom Returns

Two distinct returns should be noted.

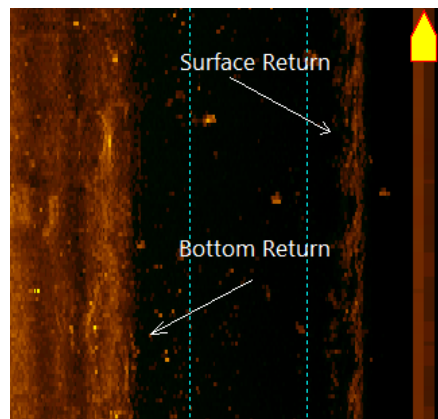


Figure 8: Surface and bottom returns in the waterfall

First Bottom Return: This is the initial data from the point where the sound meets the seabed.

First Surface Return: This is the first data from the point where the meets the water's surface. As in the picture, this is usually a wavy, sparse, non-solid return, which appears mainly in shallow scanning situations. In deeper water, the sound beam will not reach the surface.

2.2.1.3 Prop Wash

Prop Wash shows in the waterfall when the churning waves and air bubbles produced by the ship's propellers are picked up in the transducer's beam.

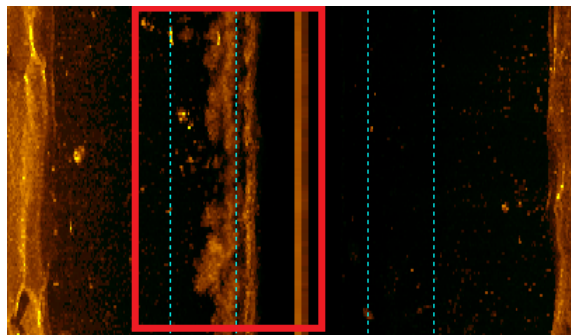


Figure 9: The effects of prop wash

This problem occurs mainly when a towed system is in shallow water. In deeper water, the transducer's beam should be out of the propeller's wash, and the picture quality will improve. A shallow-water solution to this problem is to tow the system ahead of the propeller from either the front or sides of the ship.

2.2.1.4 Shadows

Shadows are produced when the sound waves transmitted from the sonar don't bounce off anything, so there's no signal to return to the transducer.

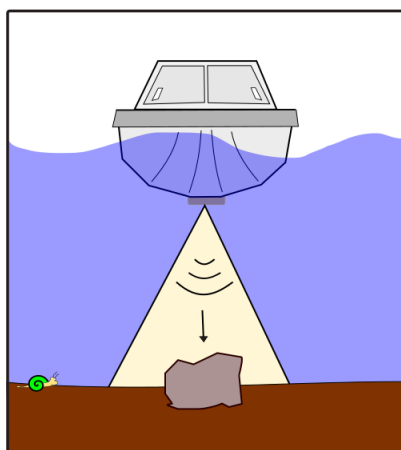


Figure 10: A rock viewed from directly above

Depth sounders bounce their signals straight down, so the rock in this image is viewed only from the top down.

However, just as the sun reveals shadows, sonar shadows are produced by the absence of sound.

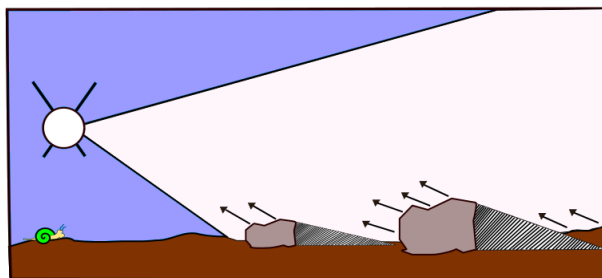


Figure 11: When viewed from an angle, the rocks produce shadows

In Figure 11 left, the shadow area has nothing there to return a sound. Thus a shadow is created. Just as with a sun-created shadow, the height of an object determines the length of the shadow.

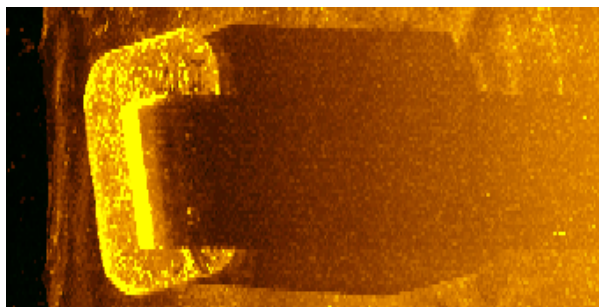


Figure 12: A sonar shadow

This shadow example in In Figure 12 is an image of a bridge pylon. In this image you can see the large base as a rounded corner rectangle. In the center is the pillar. The shadow shows that the base of the pylon's height can be measured. The center pillar goes up out of the water, thus the shadow extends to the end of the sonar's range.

3 Sea Scan Survey

3.1 Software Overview

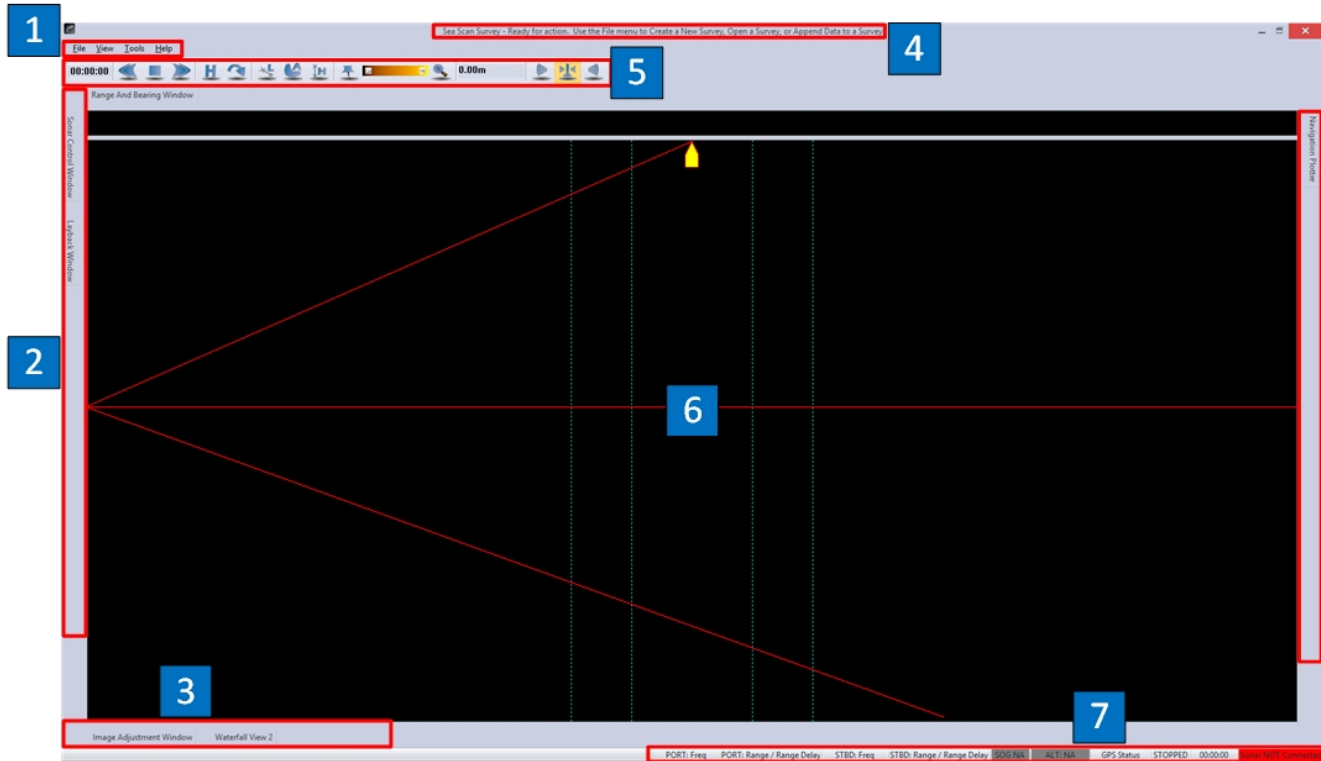


Figure 13: The Sea Scan Work Area

1. Menu Bar: Contains normal Windows-based menus.
2. Left, Top, Bottom, and Right Docking Areas: Sea Scan Survey Windows can dock here.
3. Tool Definitions: Displays what tool is selected and important information regarding it, if needed.
4. Caption Bar: Displays the name of the current Survey and its mode.
5. Waterfall Toolbar: Used to control the waterfall's sonar data.
6. Waterfall: The workspace where the sonar data is displayed.
7. Status Bar: Displays the current status of the Survey and the Sonar.

3.2 Sonar Data View

3.2.1 Overview

Sea Scan Survey includes two sonar views: Waterfall View 1 and the Waterfall View 2. The Waterfall View 1 is always visible and is the center focus of the application. The docking window system built into Sea Scan Survey allows the Waterfall View 1 to always utilize the most space available. The Waterfall View 2 is similar in function to the Waterfall View 1 however it is a docking window.

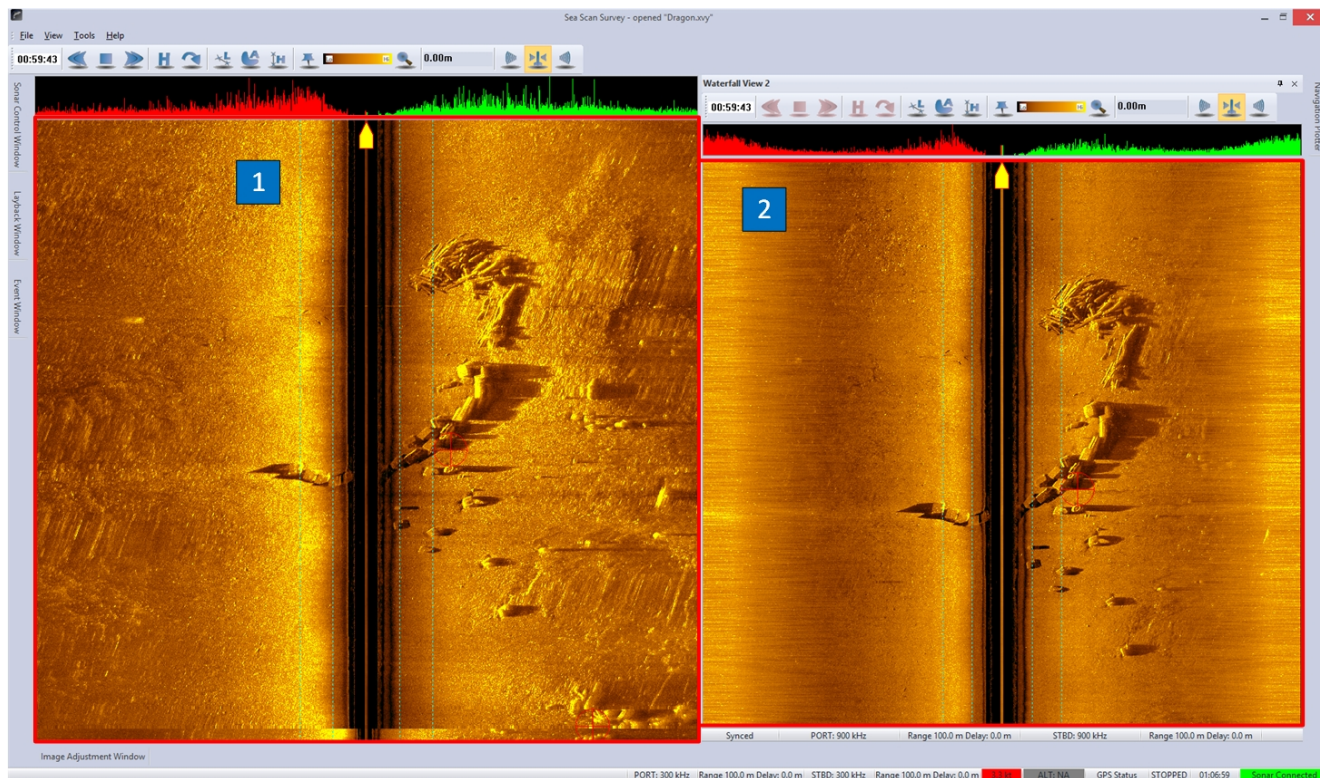


Figure 14: Data View

1. Waterfall View 1 Area: Contains the View 1 Data View which consists of the Waterfall View 1, A-Mode View, and the Waterfall View 1 Toolbar.
2. Waterfall View 2 Window: Dockable window that contains the Waterfall View 2 which consists of the Waterfall View 2, A-Mode View, Waterfall View 2 Toolbar, and Waterfall View 2 Status Bar.

Each Data View has separate settings accessible from the Settings window. Right clicking on the associated Waterfall will show a pop up menu, shown below, that allows quick access to the settings as well. In addition to the quick access to the Waterfall View settings (Image Adjustment Settings, Waterfall Settings, and Zoom Settings) the menu also allows quick access to the Sonar Interface, NMEA Data Input, Alarm, Unit and Zoom Settings.

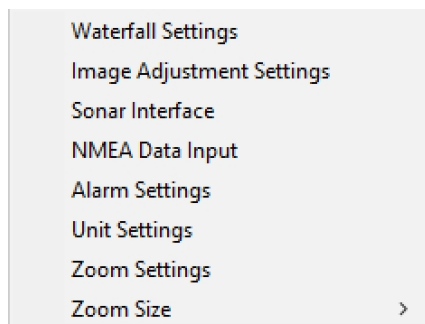


Figure 15: Sonar Data View Right Click Pop-up Menu

3.2.2 Waterfall View 1

Waterfall View 1 is always visible. It contains:

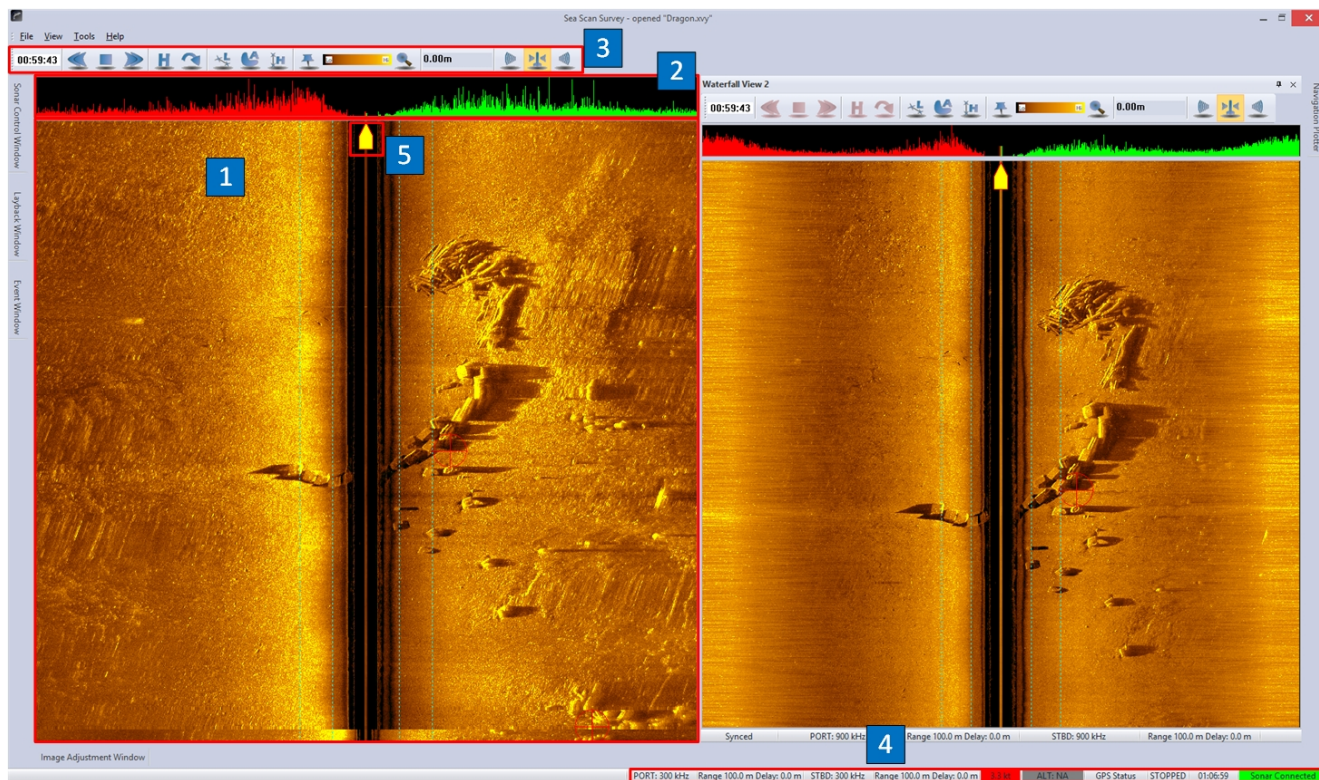


Figure 16: Waterfall View 1 Area

1. Sonar Data Waterfall View : The workspace where the sonar data is displayed.
2. A-Mode: Shows one ping worth of data. Displays echo intensity over time of the current ping (pointed to by the yellow boat icon in the waterfall). Echo intensity is on the vertical axis and time/range is on the horizontal axis. The Red colored data is the left channel and the Green colored data is the right channel.
3. Waterfall View 1 Toolbar: Allows the user to control and change the mode of interaction with the Sonar Data Waterfall.
4. Waterfall View 1 Status Bar: Port Channel Frequency, Port Channel Range & Range Delay, STBD Channel Frequency, STBD Channel Range & Range Delay, SOG, Sonar Altitude, GPS Accuracy Status, Waterfall Speed and Direction, Total Survey Time, and Sonar Hardware Status.

Note: The Waterfall View 1 Status Bar will always be located in this position.

5. Waterfall Boat: Shows the current data point that the Waterfall View 1, Waterfall View 2 (when synchronized), Dockable Windows, Status Bar and A-Mode displays.

3.2.3 Waterfall View 2

The Waterfall View 2 is a dockable window. It is only visible when docked or when not hiding. Like the other dockable windows it can be detached and moved to an secondary monitor. The Waterfall View 2 window contains an independent version of the components that the Waterfall View 1 features. These components are:

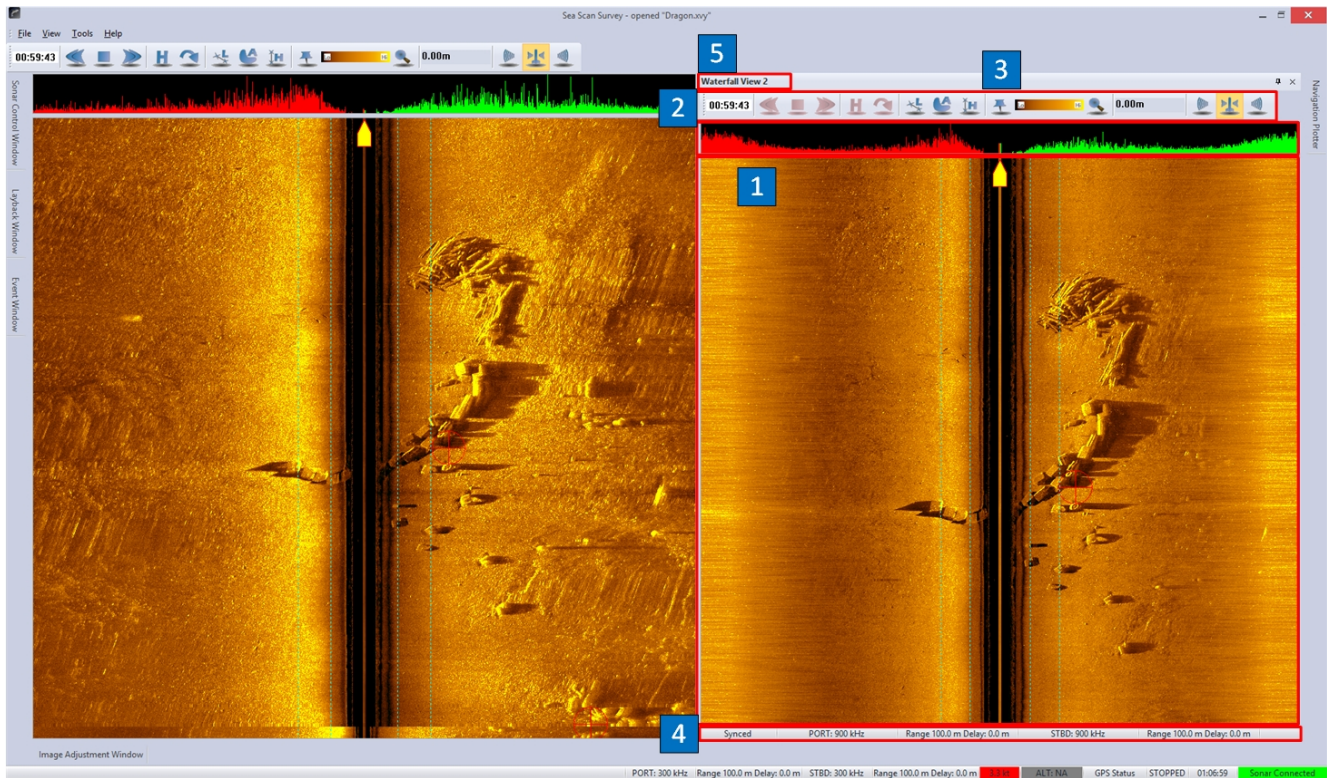


Figure 17: Waterfall View 2 Window

1. Sonar Data Waterfall View: The workspace where the sonar data is displayed.
2. A-Mode: Shows one ping's worth of data. Displays echo intensity over time of the current ping (pointed to by the yellow boat icon in the waterfall). Echo intensity is on the vertical axis and time/range is on the horizontal axis. The Red colored data is the left channel and the Green colored data is the right channel.
3. Waterfall View 2 Toolbar: Allows the user to control and change the mode of interaction with the Sonar Data Waterfall.
4. Waterfall View 2 Status Bar: Synced with Waterfall View 1 Status (or Survey time if the two windows are not synchronized), Port Channel Frequency, Port Channel Range & Range Delay, STBD Channel Frequency, STBD Channel Range & Range Delay.
5. Caption Bar: Waterfall View 2 title.

3.2.3.1 Synchronization With The Waterfall View 1

Waterfall View 2 is capable of being synchronized with Waterfall View 1. When the two waterfall views are synchronized, they will display sonar data at the same survey time.

Waterfall View 2 can be configured to be independent of the Waterfall View 1. Waterfall View 2 shows the synchronization state in the Waterfall View 2's status bar. It will read Synchronized when synchronized with the Waterfall View 1 and Not Synchronized when not synchronized with Waterfall View 1.

When the Waterfall View 2 is Not Synchronized with the Waterfall View 1 it can independently show data at any time in a survey.

- Synchronized Behavior

- Waterfall View 1 controls Waterfall View 2 scrolling.
- Waterfall View 2 Toolbar waterfall speed buttons are disabled.
- Jumping to an event from the Event Window or Waterfall View 1 Jump Tool will cause the Waterfall View 2 to show the event (because the Waterfall View 1 shows the event).
- Waterfall View 2 Caption Bar reads Synchronized.
- Synchronized behavior is useful for:
 - Viewing all 4 channels of data from a Sea Scan ARC system that supports 4 channel simultaneous data collection.
 - Sharing the Waterfall data on different monitors.
 - Analyzing incoming data with the zoom, length, height, or area tools while new data is being shown in the Waterfall View 1.
- Unsynchronized Behavior
 - Waterfall View 2 is totally independent of the Waterfall View 1. The Waterfall View 2 Toolbar waterfall speed buttons are enabled.
 - Jumping to an event from the Event Window has no effect.
 - Creating a new marker in the Waterfall View 1 will cause the Waterfall View 2 to jump to the new marked event if the Waterfall View 2 is configured to Jump To New Marker Event in the Waterfall View 2's Waterfall Settings.
 - Waterfall View 2 Caption Bar reads Not Synchronized.
- Unsynchronized behavior is useful for:
 - Watching newly recorded data in a separate window while analyzing and classifying data independently in the other Data View.

3.2.3.2 Docking Positions

The Waterfall View 2 can be docked in a side by side configuration with the Waterfall View 1. This is useful for data analysis and classification.

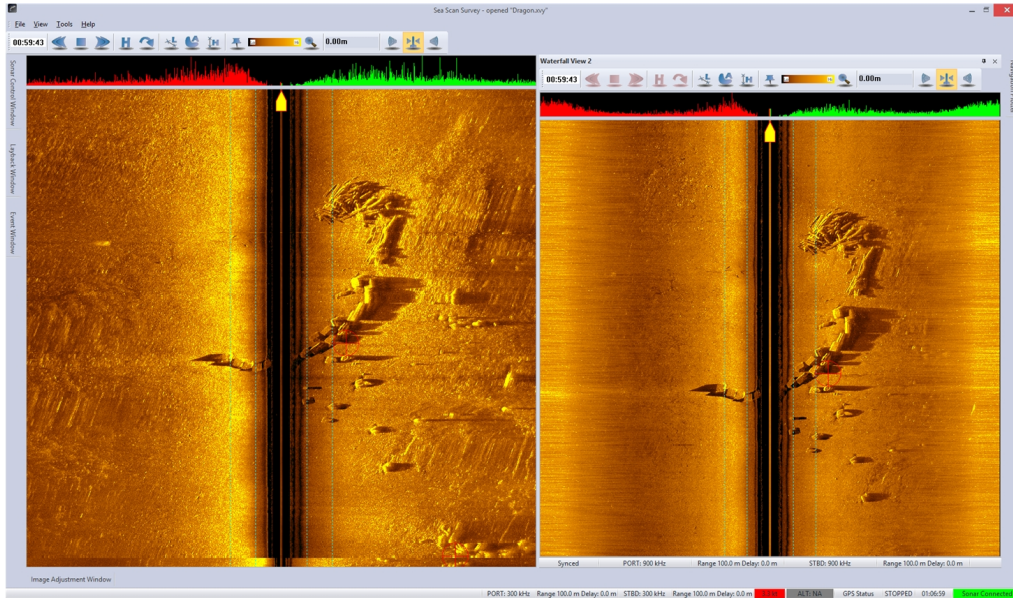


Figure 18: Side by Side Docking of Waterfall View 1 and View 2

Alternatively the Waterfall View 2 can be docked in a top and bottom configuration. This is useful for view 4 channel simultaneous data.

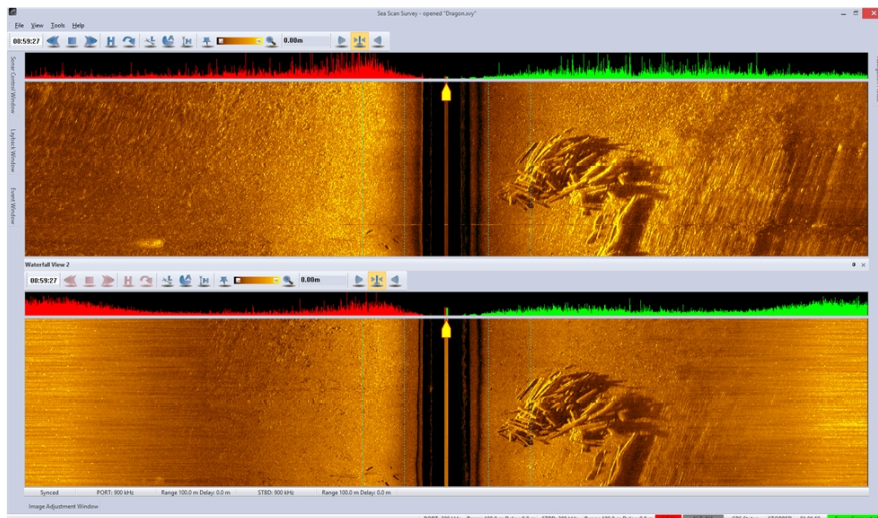


Figure 19: Top and Bottom Docking of Waterfall View 1 and View 2

The Waterfall View 2 can also be undocked and moved to a separate monitor just like the other windows in Sea Scan Survey.

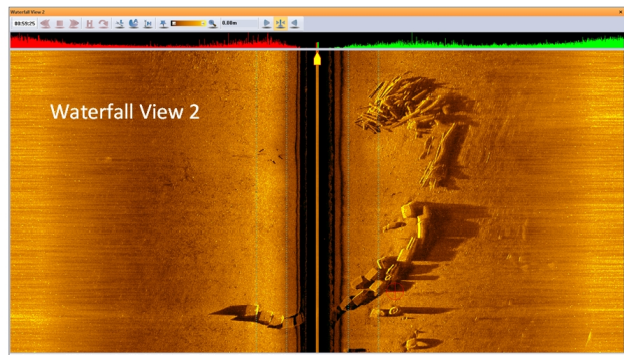
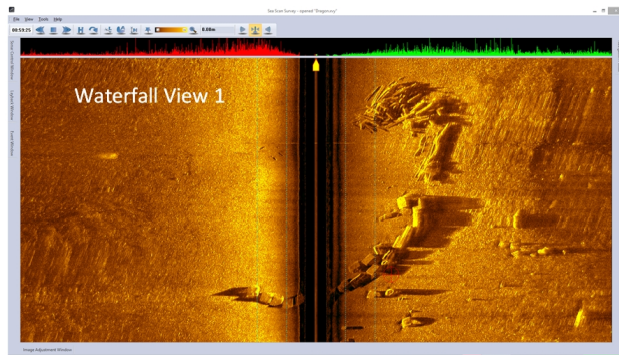


Figure 20: Waterfall View 2 Separated from Sea Scan Survey

3.2.4 Mouse Cursor Modes

The mouse cursor in the water changes functions depending on the currently selected Waterfall Tool.

Mode	Left Single Click	Left Double Click	Right Click
Default - no tools selected	Shows the current range from the center.	NA	Shows the Waterfall Pop Up Menu
Marker Tool Selected	Shows the current geo-position of the mouse cursor. Also shows the current location in the Navigation Plotter.	Creates a Marker Event at the cursor location.	Cancel selected tool
Length Tool Selected	Sets the start or end point for the length measurement.	NA	Cancel selected tool
Height Tool Selected	Sets the first bottom return, start of shadow or end of shadow for the height measurement.	NA	Cancel selected tool
Area Tool Selected	Sets a point in the outline of the shape that is to be measured.	Sets the last point in the shape that is to be measured and performs the area measurement.	Cancel selected tool
Zoom Tool Selected	Shows the Magnifier at the current cursor location.	NA	Cancel selected tool

Any tool can be deselected by pressing the <Esc> key on the keyboard. When no tool is selected in the toolbar the default tool is active.

3.2.5 Navigating Through The Data

The position in the waterfall data is shown by the time in the Waterfall Toolbar. This time is called Elapsed Survey Time. At the beginning of the survey it is 00:00:00 (Hours:Minutes:Seconds). As the survey accumulates data the elapsed survey time increases.



Figure 21: Waterfall Toolbar

Navigating through the sonar data is accomplished either by scrolling or by jumping.

Scrolling

Scrolling allows the user to move the waterfall linearly in the forward and reverse directions. The table below describes the different methods to scroll through the data.

Keyboard	Up Arrow	Moves the waterfall forward by 1 ping.
	Down Arrow	Moves the waterfall backward by 1 ping.
	Page Up	Increases the waterfall speed by 1.
	Page Down	Decreases the waterfall speed by 1.
	Page End	Stops the waterfall.
Mouse	Scroll Wheel	Causes the waterfall to scroll in the direction of the wheel movement. When the scroll wheel is stopped the waterfall slows down gradually (called momentum).
Waterfall Toolbar	Fast Forward Button	Increases the waterfall speed by 1.
	Rewind Button	Decreases the waterfall speed by 1.
	Stop Button	Stops the waterfall.

Jumping

Jumping allows the user to quickly go to any point in the sonar data instantly. The table below describes the different methods of jumping.

Waterfall Toolbar	Jump Tool	Specify a survey time to jump to. The survey time can be found on the left most side of the Waterfall Toolbar.
Marker Event Window	Jump To Button	Jumps to the currently selected marker event.
	Click on Snapshot Image	Jumps to the currently selected marker event.
Layback Event Window	Jump To Button	Jumps to the currently selected layback event.

3.2.6 Waterfall Settings

The Waterfall Settings change how the Sonar Data Waterfall displays data. Both Data Views have separate Waterfall Settings (1 & 2 in the picture below). The differences will be noted in the text below.

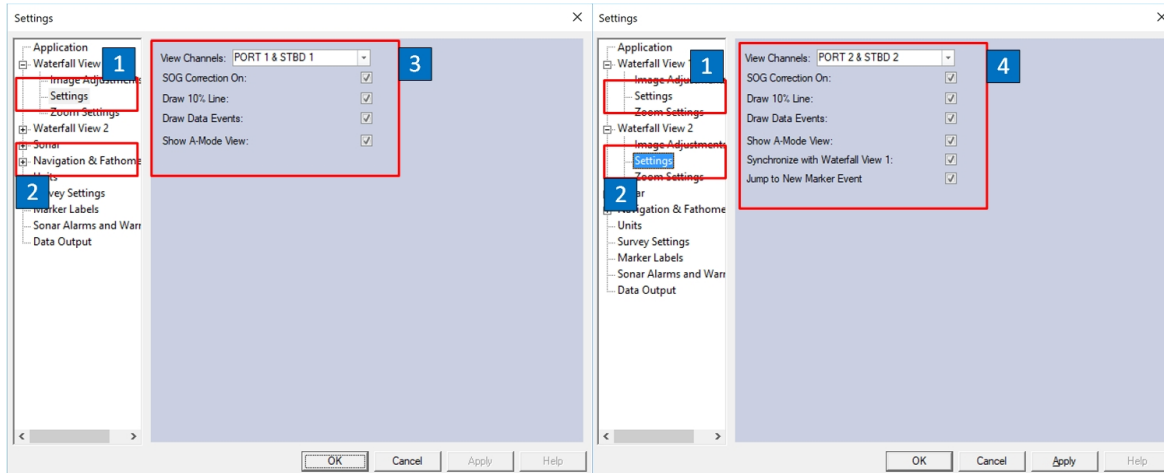


Figure 22: View 1 & View 2 Waterfall Settings

In the picture above, sections 3 and 4 contains the waterfall settings. Please see the Waterfall Settings description in the Settings section of this document for more information.

1. Waterfall View 1: Waterfall Settings: Option to view and edit the Waterfall View 1 Waterfall Settings.
2. Waterfall View 2: Waterfall Settings: Option to view and edit the Waterfall View 2 Waterfall Settings.
3. Waterfall View 1: Settings Page: Allows all of the waterfall settings to be adjusted.
4. Waterfall View 2: Settings Page: Allows all of the waterfall settings to be adjusted.

3.3 Buttons and Menu

3.3.1 Waterfall Toolbar

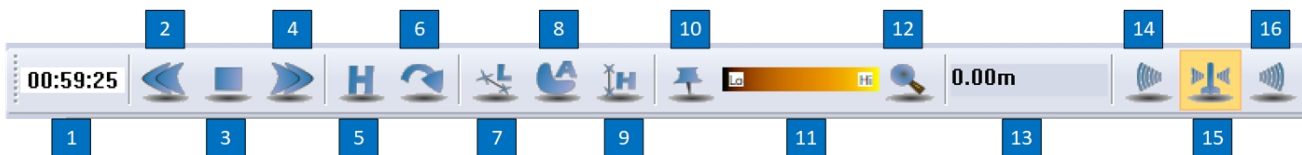


Figure 23: The Waterfall Toolbar

1. Elapsed Time Indicator: The running clock at the top of the waterfall displays the amount of elapsed time from the start of the file to the current time. A green background indicates that the data is current; a red background indicates the opposite. The background will be white when reviewing data.
2. Rewind Button: This button decreases the waterfall view speed. The more you click this button, the faster the display will run backward. <Page Down> is hot-keyed to this button.
3. Stop Button: This button halts the waterfall. <End> is hot-keyed to this button.
4. Fast-Forward Button: This button increases the waterfall view speed. The more you click this button, the faster the display will run forward. <Page Up> is hot-keyed to this button.
5. Home Button: This button immediately moves the waterfall to the most current data.
6. Jump-To Button: This button opens the Jump-To Window to select a time to "Jump To".

7. Length Tool: This button pauses the waterfall, allowing the user to measure the length between two points. First click to start the measurement, and then click at the end. The length will be displayed in the Measurement Readout on the Waterfall Toolbar.
8. Area Tool: This button pauses the waterfall, allowing the user to measure the area between a series of points. First click to start and then click around the object or area. Click the first point to close the area's polygon and calculate the area; double clicking will also create a closing line between the last point and the first point.
9. Height Tool: This button pauses the waterfall, allowing the user to measure the height of shadows off an object. First click the first bottom return, then click the end of the object that caused the shadow, then click the end of the shadow. The measurement will be calculated and shown in the Measurement Readout.
10. Marker Tool: This tool allows the user to double click on the waterfall to create Marker Events.
11. Palette Control: This tool displays the current palette color; the color can be changed in the Image Adjustments Window. Clicking on the palette control will invert the current color selection.
12. Zoom Tool: Select this tool to turn the mouse into a magnifying glass to zoom in on certain objects of the waterfall. The zoom strength can be changed by right clicking the waterfall, selecting Zoom Size, and selecting the power you want.
13. Measurement Readout: This number shows the last measurement taken with the Length, Height, and Area tools.
14. Port Transducer Channel: Select this to show only data from the port transducer on the waterfall.
15. Both Transducer Channels: Select this to show data from both transducers on the waterfall.
16. STBD Transducer Channel: Select this to show only data from the STBD transducer on the waterfall.

TIP: The <ESC> button on your keyboard (or right click on the mouse/touchpad), can be used as a hot-key to deactivate any selected tool.

3.3.2 Status Bar

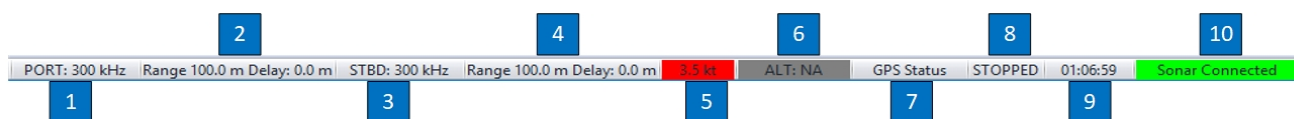


Figure 24: The Status Bar

1. PORT Frequency: This area displays the current frequency of the Port Channel in the Waterfall.
2. Range / Range Delay: This area displays the current Range and Range Delay for the Port Channel in the Waterfall.
3. STBD Frequency: This area displays the current frequency of the STBD Channel in the Waterfall.
4. Range / Range Delay: This area displays the current Range and Range Delay for the STBD Channel in the Waterfall.
5. Speed Over Ground: This area displays the current Speed Over Ground (SOG).
6. Altitude: This area displays the system's current height off of the bottom.

- a. This feature requires that the system's altitude data is being sent to the Embedded System or that the Altitude Sensor is installed and configured in the Towed System.

7. GPS Status: This area displays the Current GPS data.

8. Waterfall Scroll Speed: This area displays the current waterfall scroll speed.

9. Total Survey Time: This area displays the total time of the Survey.

10. Sonar Connection Status: This area displays whether the sonar is connected and communicating.

3.3.3 Main Menu

3.3.3.1 File Menu

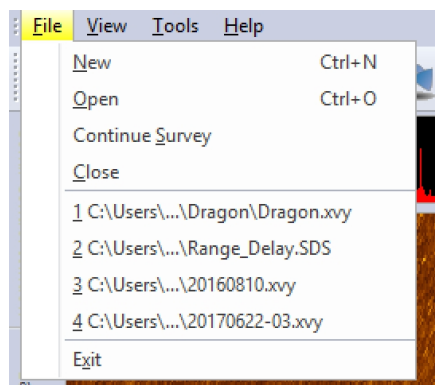


Figure 25: Help Menu

- New: Lets the user create a new survey by opening the <Begin a New Survey> wizard.
- Open: Opens an existing survey for review.
- Continue Survey: Opens a previous survey and allows the user to append new data to it.
- Close: Closes the current open survey.
- Middle Section: Lists recent surveys worked on and, if selected, will open them for review.
- Exit: Closes the Sea Scan Survey program.

3.3.3.2 View Menu

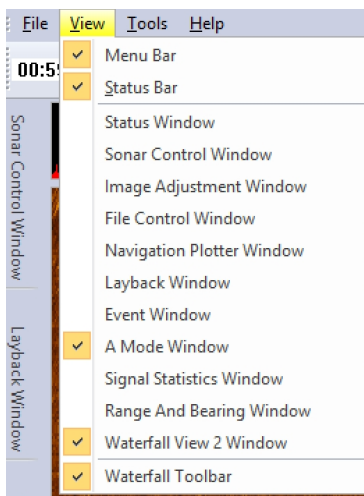


Figure 26: The View Menu

The View Menu lets the user close or open some of the Bars and Windows of the Sea Scan Survey program. A check mark inside a gray box will appear next to a Bar or Window that is currently open. View Menu Items without a check next to it are not open.

3.3.3.3 Tools Menu

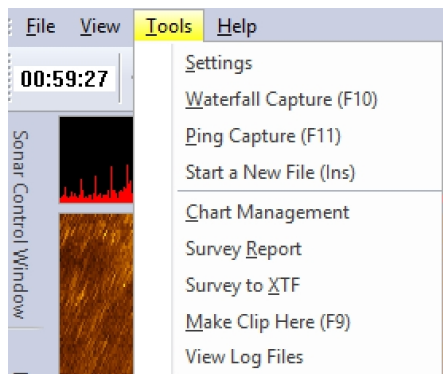


Figure 27: Tools Menu

- **Settings:** Opens the Settings Window, allowing for changes to be made to the Sea Scan Survey settings. (See also the section dedicated to the Settings Window.)
- **Waterfall Capture:** Takes a snapshot of the current waterfall and opens a save window allowing for the file to be named.
- **Ping Capture:** Saves the ping data as a CSV file. Opens a save window allowing for the file to be named.
- **Start a New File:** Will start a new SDS file for the Survey. It will automatically name the file in the current convention.
- **Chart Management:** Opens the Chart Management window. (See Configuring the Electronic Charts for more information.)
- **Survey Report:** Creates a Survey Report as an HTML file that can be used to print out all the important information of the current survey. This supports the inclusion of your company's logo. (See also the section dedicated to the Survey Report.)
- **Survey to XTF:** Allows for conversion of the Survey into an XTF format.
- **Make Clip Here:** Allows the user to save a small SDS clip of data. Opens a save window allowing for the file to be named.
- **View Log Files:** Opens the Marine Sonic Software Log File Folder. This is located at C:\ProgramData\MSTL \. The log files are useful for troubleshooting purposes.

TIP: The data inside the parenthesis represents a button that can be used as a hot-key instead of the Tool Menu.

3.3.3.3.1 Survey to XTF

The eXtended Triton Format (XTF) is a Triton Imaging, Inc. file format for recording various types of hydrographic survey data. The XTF format allows for importing of the Marine Sonic sonar data into third party software such as; SonarWiz, Hypack, Classphi, etc. This is typically used for mosaicing of the side scan sonar data and combined with other sensor data.

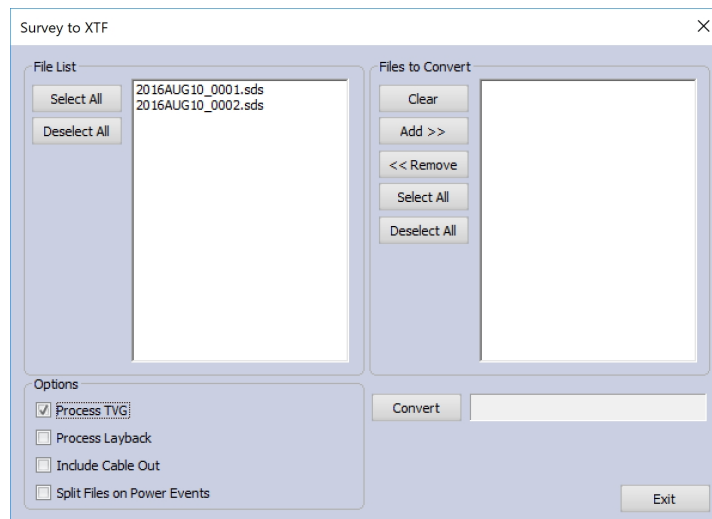


Figure 28: Survey to XTF Pop-up Window

The Survey to XTF pop-up window allows the user to select any or all of the SDS files to be converted to the XTF format.

3.3.3.3.2 Make Clip Here

The user can make a clip of any survey in order to show just a set amount of time in a file. This feature is started by either selecting the "Make Clip Here" option in the Tools drop down menu or by hitting the <F9> key.

Note: The clip will have a center time of the current waterfall location. The start and end times will be half of the clip length.

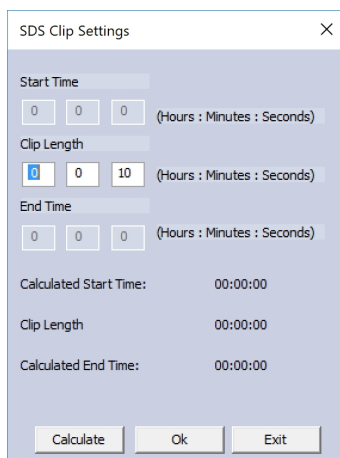


Figure 29: SDS Clip Settings Default Window

The user can change the length of the Clip by editing the boxes.

Selecting the <Calculate> button will show the Clip Start Time, Total Clip Length and, the Clip End Time:

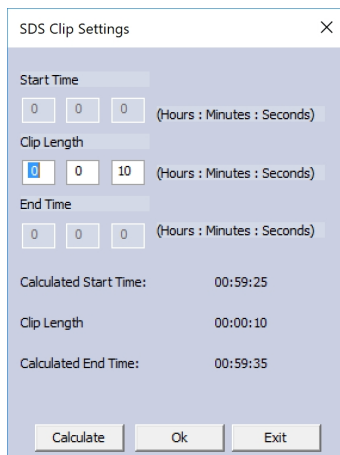


Figure 30: SDS Clip Settings Calculated Results

Once, the expected clip length is set. The user selects <Ok> and the pop-up window to save the new SDS file is shown.

Note: If the user selects a clip length that places the start time less than zero or the end time greater than the survey length, the clip will be truncated to start at the 0:00 or stop at the end of the survey.

3.3.3.4 Help Menu

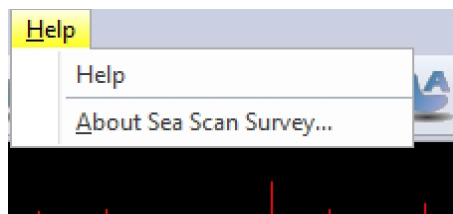


Figure 31: Help Menu

- Help: Opens the Sea Scan Survey Manual as a Help File for the user.
- About Sea Scan Survey...: Opens a window that displays Sea Scan Survey information as well as company information about Marine Sonic Technology

3.3.4 Windows

3.3.4.1 Navigation Plotter

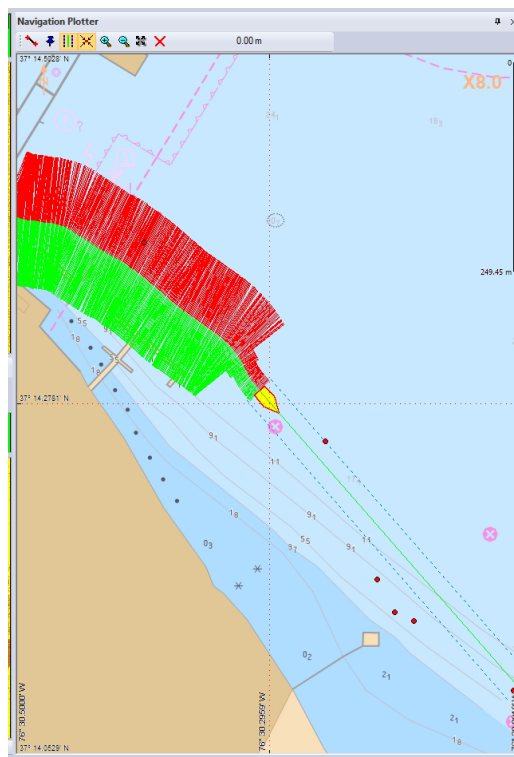


Figure 32: The Navigation Plotter

The Navigation Plotter Window uses GPS data to display the current location of the surface vessel. The boat is represented by an icon that is pointed in the direction of the course or heading (if the heading is available and if the boat icon option has been selected in the Plotter Settings window).

3.3.4.1.1 Using the Plotter

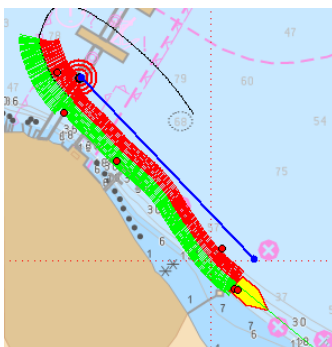


Figure 33: The swath coverage during an operation

The sonar swath is displayed to show the estimated coverage. The coverage for the port channel is shown in red, and the swath coverage for the starboard channel is shown in green. The boat's path is displayed with a black line. The Plotter will not draw a swath when the sonar is off or if that option has been deselected. 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.

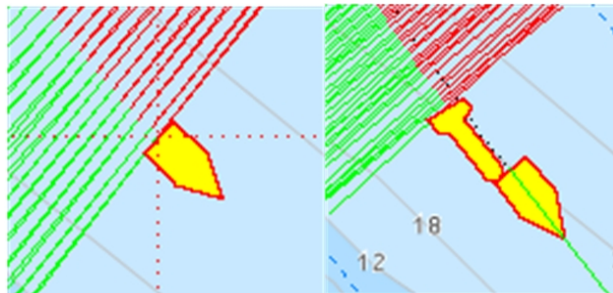


Figure 34: No Layback Set & Layback Set

If a Layback Event has been created, the Plotter will also show a towfish and the swath data will no longer show from the back of the boat, but rather from the back of the towfish icon. The position of the towfish icon relative to the boat will depend on the current entered data.

Waypoints and Marker Events appear as dots on the Plotter window. When selected, they will be surrounded by a bulls-eye.

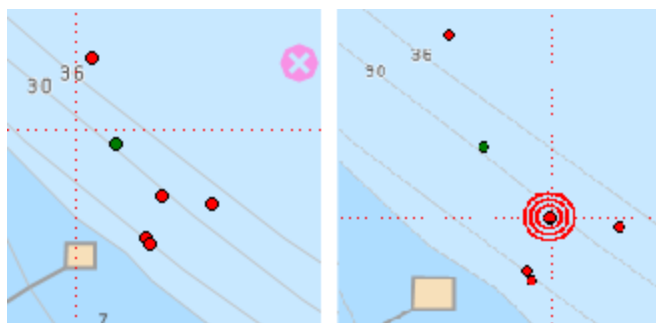


Figure 35: Plotter points unselected (left) and selected (right)

When a Waypoint or Marker is selected on the Plotter, a small tool tip will pop up giving its details. The Marker Events Window will contain a preview image, waypoints will not.

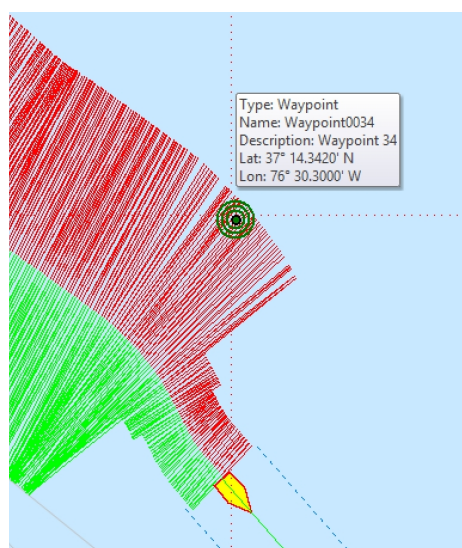


Figure 36: A waypoint and its details on the Navigation Plotter

TIP: The color of the marker bull's eye correlates with the priority of the marker (high, medium, etc.). Waypoints will always have a green bull's eye.

3.3.4.1.1.1 Plotter Toolbar

The Plotter has its own toolbar. This toolbar is used to manipulate the Plotter window, gather data, and set waypoints.

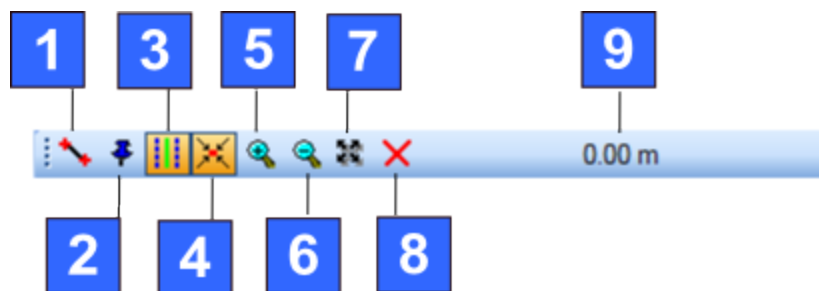


Figure 37: The Navigation Plotter toolbar

1. Length Tool: Click once to set the start point, click a second time to set the end point. A line will be drawn between them and the distance will show at number 9 above, which is the Measured Distance area.
2. Waypoint: Click to set a waypoint on the Plotter. Click to select the tool, double click to set a waypoint.
3. Map-Bearing Line: Click to turn on/off the map-bearing lines of the boat.

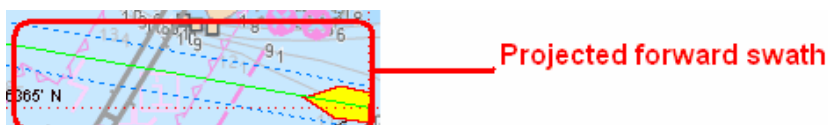


Figure 38: The projected forward swath when the Map-Bearing Line is engaged

4. Auto Center: Select or deselect this to set the map to center or not center on the boat.
5. Zoom In: Click to zoom the Plotter in 5%.
6. Zoom Out: Click to zoom the Potter out 5%.
7. Zoom to Selection: Click 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.
8. Clear Data: Click to clear all the navigation data in the display and start displaying new data.
9. Measured Distance: This area displays the measured distance of the Length Tool.

3.3.4.2 Sonar Control

The Sonar Control Window is only for use with the Marine Sonic Towed sonar systems. The explanations below detail the options and uses of the five different groups.

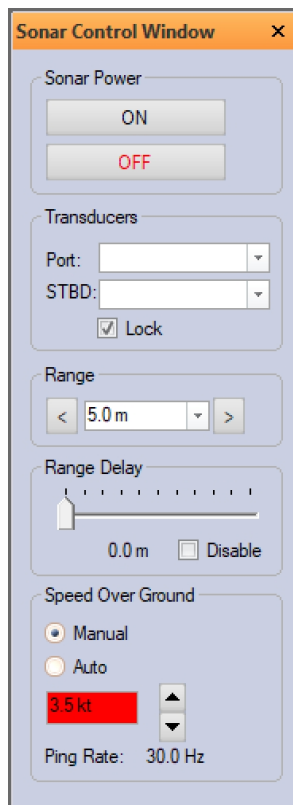


Figure 39: The Sonar Control Window

Sonar Power

- On Button: Turns the Sonar Power on; the sonar will now collect data.
- Off Button: Turns the Sonar Power off and stops data collection.

Transducers

- Select the frequency here to use on the sonar system.
 - The drop-down menu will indicate the available frequencies, (with the serial number of the transducer in parenthesis), and a "none" option which allows the operator to turn an individual channel off during a survey.
 - If you have a single-frequency transducer, only one option will show.

Note: If no options appear here, please consult the Troubleshooting section of this guide.

- The Lock check box will set both frequencies to the same frequency. If one is changed, both are changed. It should be left checked by most users.
 - The Lock check box will be grayed out for an ARC Explorer single frequency systems.

Range

- Change the range of the sonar here. Click the arrows to the left or right or select the drop-down arrow from inside the box to select a frequency of your choice.

Range Delay

- This setting removes the water column. Range delay removes the acoustic returns for the amount of range desired.

• **CAUTION:** If using this option to remove the water column, the towfish no longer shows in the waterfall; without that feedback to the boat operator, the towfish may hit bottom.

Speed Over Ground

- The Speed-Over-Ground group of selections lets you set the SOG to either manual or automatic. The speed box will change to yellow and then red as the speed becomes greater than what is recommended for the frequency and range. Most users should select Automatic.

3.3.4.3 Status

The Status Window shows important status information of the program. It is grouped into seven unique sections.

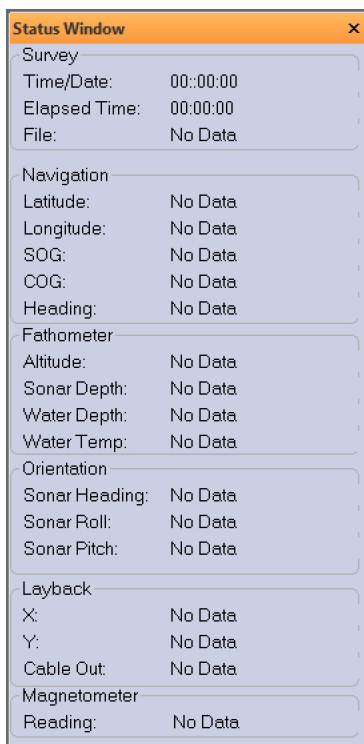


Figure 40: Status Window

Survey

- Shows the current time and date of the survey.
- Shows the current Elapsed Time of the survey.
- Shows the current SDS file being read or recorded to.

Navigation

- Shows the current Latitude.
- Shows the current Longitude.
- Shows the current Speed Over Ground (SOG).
- Shows the current Course Over Ground (COG).

- Shows the current Heading.

Fathometer

- Shows the towfish's current Altitude in the water.
 - Turns **Yellow** when the Altitude Warning Threshold is met
 - Turns **Red** when the Altitude Alarm Threshold is met
- Shows the towfish's current Depth in the water.
 - Turns **Yellow** when the Depth Warning Threshold is met
 - Turns **Red** when the Depth Alarm Threshold is met
- Shows the total Water Depth.

Orientation

- Shows the Sonar's Magnetic Heading.
- Shows the towfish's Roll (left to right rotation).
 - Turns **Red** when the Roll Alarm Threshold is met
- Shows the towfish's Pitch (front to back rotation).
 - Turns **Red** when the Pitch Alarm Threshold is met

Layback

- Shows the X offset of the towfish from the navigation source.
- Shows the Y offset of the towfish from the navigation source.
- Shows the amount of Cable that is out.

Magnetometer

- Shows the current Magnetometer reading.

3.3.4.4 Signal Statistics

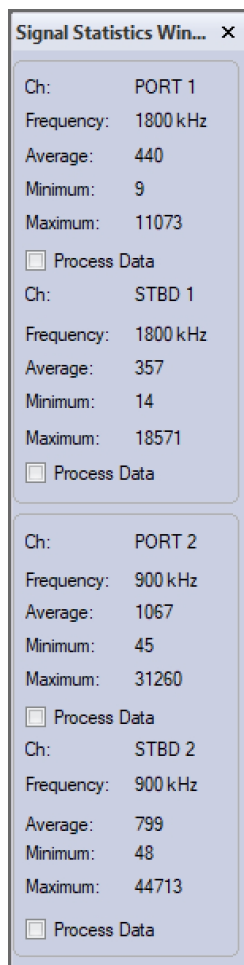


Figure 41: The Signal Statistics Window

The Signal Statistics Window provides the Average, Minimum, and Maximum strengths of the ping for the all sonar channels that are enabled. The channel mapping of the transducer is indicated in the channel field as either PORT 1, STBD 1, PORT 2 or STBD 2. The frequency for each channel is also provided for each sonar channel enabled. The Statistics shown are for where the boat icon on the waterfall is pointing to. Check the <Process Data> check box and the software will process the data and find the minimum ping strength as well.

3.3.4.5 A-Mode



Figure 42: A-Mode Window

The A-Mode Window uses the boat icon as the ping selector to display a graph of the concurrent ping information. Red and Green correspond to the Port and STBD sides of the waterfall. 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 on the vertical axis. The units are arbitrary, but

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

3.3.4.6 Image Adjustment

The Image Adjustment Window allows for manual adjustment of the incoming data to clarify the images seen in the waterfall display. The window has separate sliders where the gain (signal amplifier) can be adjusted separately for each channel. The time-varied gain (TVG) in the system is automatic unless you deselect that function in the Settings Window. Please note that there are two image adjustment windows. One is for the Data View in Waterfall View 1 and one is for the Data View in Waterfall View 2. Select one by clicking on the Waterfall View 1 or Waterfall View 2 tabs in the upper right of the Image Adjustment Window.

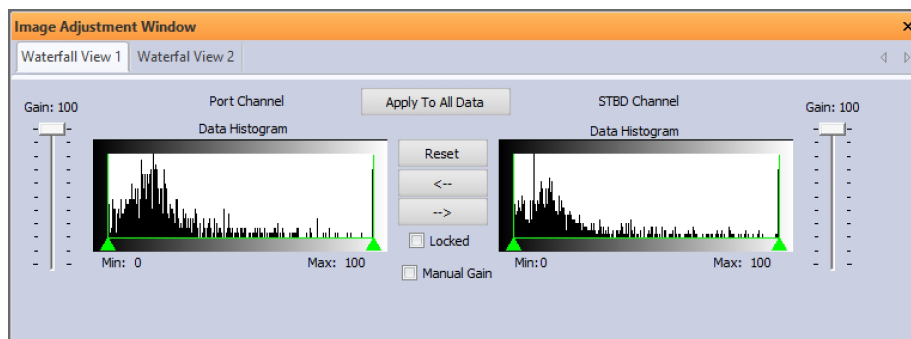


Figure 43: The Image Adjustment Window

3.3.4.6.1 Using the Image Adjustment Window

The Gain sliders on each side of the Image Adjustment Window go from 0 (bottom) at the lowest to 100 (top) at the highest. The sliders let the user manually adjust the gain (signal amplification) to each channel (Port and Starboard) separately.

The Data Histogram permits the user to specify how the data will appear in the currently selected color palette. Simply adjust the sliders (Min, Max) under each channel's histogram in the Image Adjustment Window.

3.3.4.7 Settings

The Settings Window contains many different pages for adjusting the settings of the Sea Scan Survey software. Access the Settings Menu by selecting <Tools> and then <Settings>. Alternatively, access it by right clicking on the waterfall and selecting one of the settings options.

TIP: For some windows, users can right click to access the unique settings pages.

3.3.4.7.1 Application

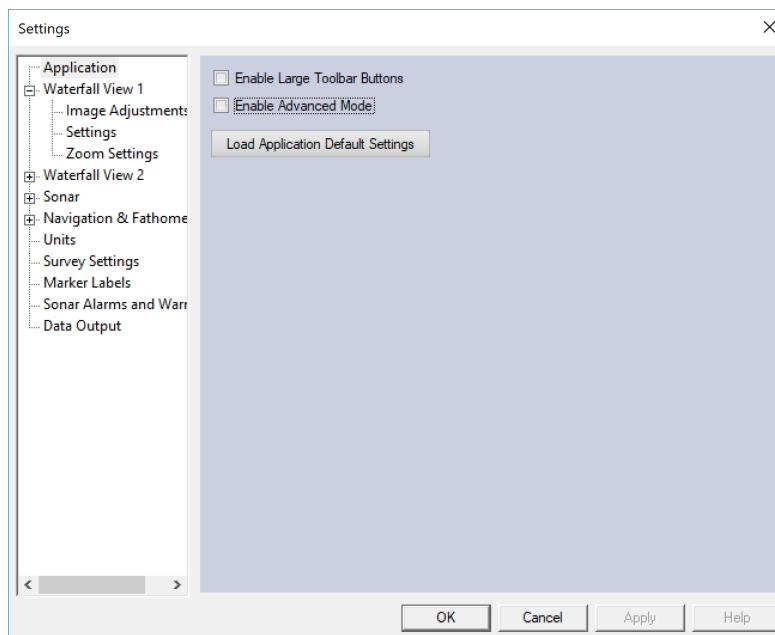


Figure 44: Application Settings Window

The Application window contains a option for enlarging the waterfall display toolbar buttons.

Click the check box to significantly enlarge the waterfall display toolbar buttons; the remainder of the workspace area will remain the same.

Uncheck to return the waterfall toolbar buttons to default size.

3.3.4.7.2 Waterfall View 1& 2

The Waterfall Settings affect the way Waterfall Views 1 and 2 Display looks and behaves. There is a separate set of settings for the Waterfall View 1 and Waterfall View 2 Data Views (includes the Waterfall and A-Mode Displays).

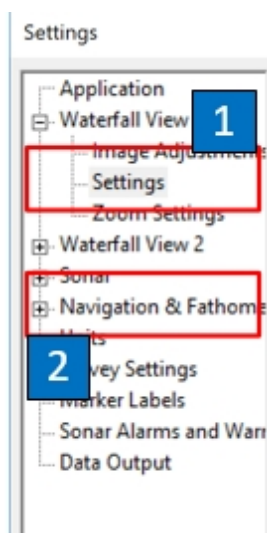


Figure 45: Settings Page Selection Tree

1. Waterfall View 1 Settings: Contains the settings page selections for Waterfall View 1.

2. Waterfall View 2 Settings: Contains the settings page selections for Waterfall View 2.

3.3.4.7.2.1 Image Adjustment Settings

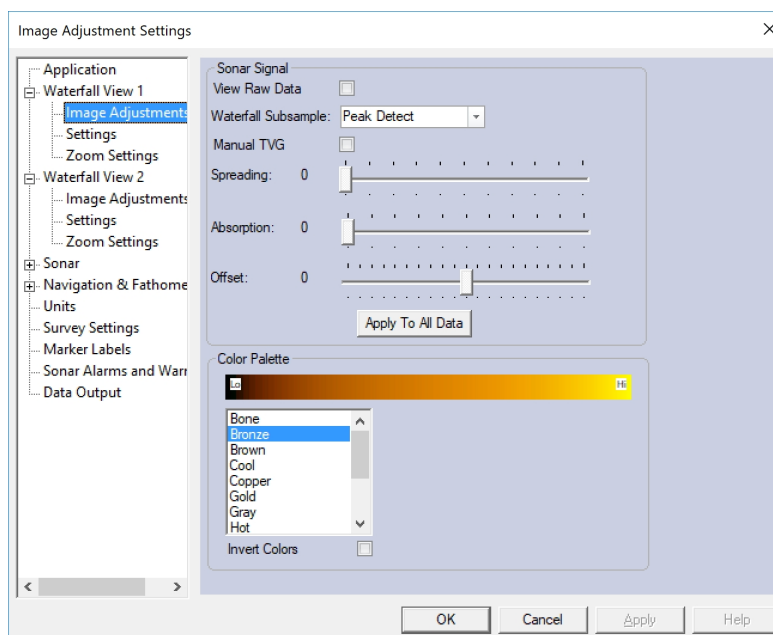


Figure 46: Access to Image Adjustment Settings

The Image Adjustment Window setting page gives the user access to settings options to change the appearance of the waterfall data.

- View Raw Data turns off the software-adjusted data.
- Waterfall Subsample permits the user to condense the data into a subsample if a sample size is larger than the pixel width of the displayable area. That is, the Waterfall Subsample will take either the Average of the samples or the Peak (highest) sample. The default is the Peak sample and is used for the most detailed image.
- Manual TVG allows the user to turn off the Time-Variance Gain and to manually adjust the gain. Click in the <Manual TVG> box for access to the sliders.
- Apply To All Data sets the manually adjusted TVG uniformly for all incoming data.
- Color Palette allows the user to invert its direction from the default setting of lowest on the left and highest on the right for the waterfall. From the list, select the background color scheme for the waterfall data.

3.3.4.7.2.2 Waterfall Settings

This Waterfall Settings page lets the user change the waterfall settings. These settings changed how the waterfall displays data and its behavior.

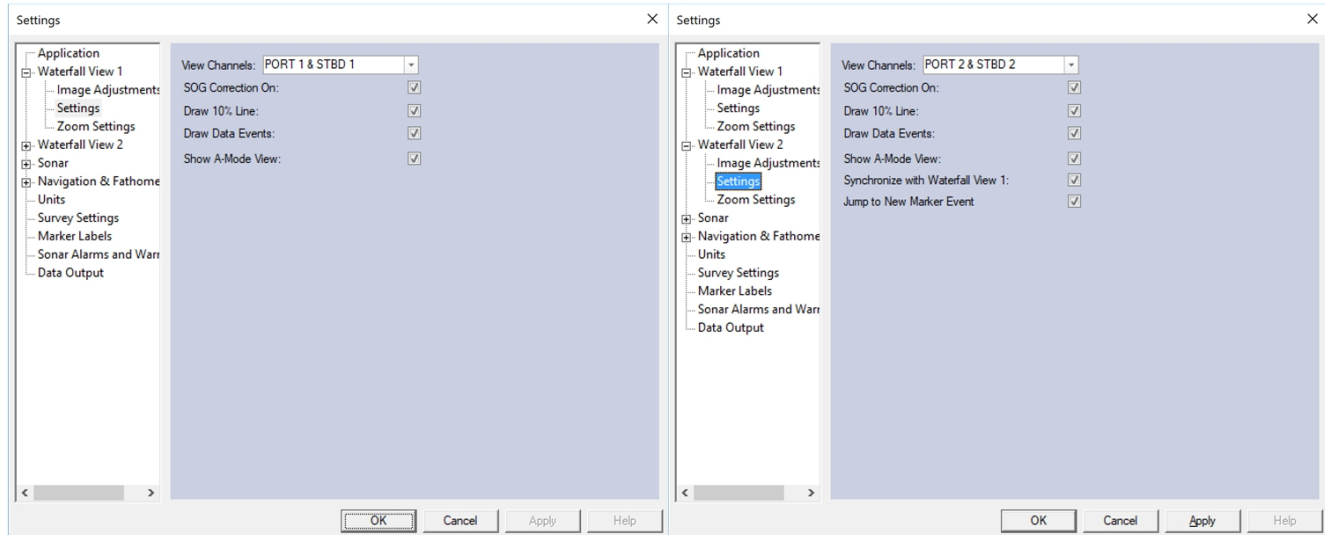


Figure 47: Waterfall View 1 & 2 Waterfall Settings

- View Channels - Configures the Waterfall to configure which channels to view in the selected waterfall.
 - Automatically Select - Will display whatever channels are available in the sonar data on the selected waterfall.
 - § This setting should be used in system's such as ARC Explorer and HDS.
 - § With 2 - channel sonar system's such as ARC Explorer, HDS, Scout Lite or, Single Frequency MkII; using this option in both the View 1 and View 2 Waterfalls will have the waterfall's show the same data.
 - § With 4 - channel sonar system's such as the ARC Scout and Dual Frequency Scout MkII; this option will display:
 - Port 1 & STBD 1 data in the View 1 Waterfall view, Port 2 & STBD 2 data in the View 2 window when all four channels are operating
 - When only 2 - channels are operating the data will be duplicated in both the View 1 and View 2 Waterfall windows.
 - PORT 1 & STBD 1 - Configures the Waterfall to only display the Port and STBD channels in the selected Waterfall window.
 - § 2 - channel sonar system's such as ARC Explorer, HDS, Scout Lite or, Single Frequency MkII; only use the Port and Starboard channels. This setting will function the same as the Automatically Select option listed above.
 - § 4 - channel sonar system's such as the ARC Scout and Dual Frequency Scout MkII, will only display the channels mapped as Port 1 and STBD 1 in their respective application settings. If these channels are disabled during a mission then the waterfall will NOT display any data.
 - PORT 2 & STBD 2 - Configures the Waterfall to only display the Port 2 and STBD 2 channels in the selected Waterfall window.
 - § 2 - channel sonar system's such as ARC Explorer, HDS, Scout Lite or, Single Frequency MkII; do NOT have a Port 2 or STBD 2 channels. A waterfall with this option selected will NOT display any data.

§ 4 - channel sonar system's such as the ARC Scout and Dual Frequency Scout MkII, will only display the channels mapped as Port 2 and STBD 2 in their respective application settings. If these channels are disabled during a mission then the waterfall will NOT display any data.

- SOG Correction On - Turns on and off the real time Speed Over Ground correction in the waterfall.
- Draw 10% Line - This option displays the 10% and 20% lines on the waterfall window.
 - These lines show help the operator maintain the proper height off the bottom for the sonar to achieve the maximum range of the sonar.
- Draw Data Events - Shows and Hides the Data Events in the waterfall. These events are color-coded lines or circles. They indicate special parts of the data such as a marked event , layback event, frequency change, etc.
- Show A-Mode View - Shows and Hides the A-Mode view that is at the top of the Waterfall.
- Synchronize with the Waterfall View 1 - Waterfall View 2 Only. Synchronizes the Waterfall View 2 with the Waterfall View 1. Enabling this feature cause the Waterfall View 2 to show the same data as the Waterfall View 1. The Waterfall View 2's scrolling controls will be disabled.
- Jump to New Marker Event - Waterfall View 2 Only. Causes the Waterfall View 2 to jump to a new marker event when it is made in the Waterfall View 1. Only applicable when the Waterfall View 2 is NOT synchronized with the Waterfall View 1.

3.3.4.7.2.3 Zoom Settings

This Zoom Settings Window settings page lets the user change the settings of the Zoom tool.

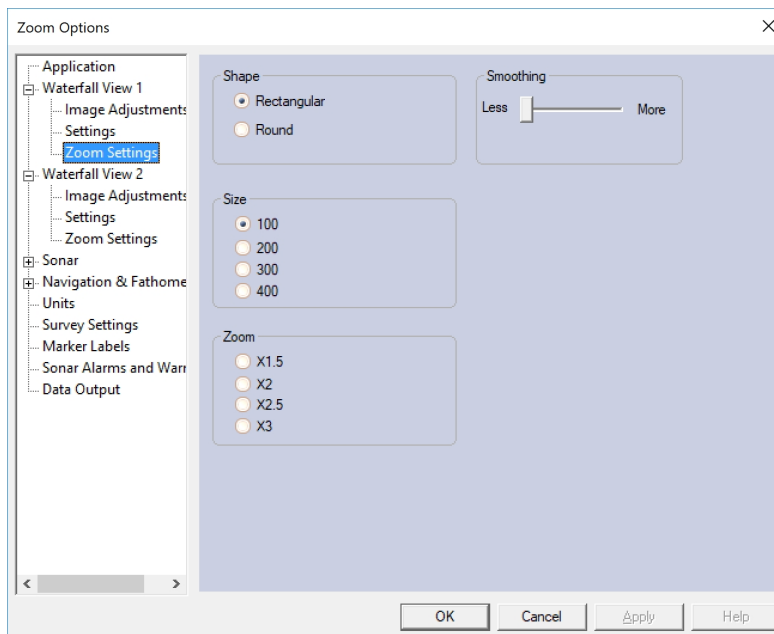


Figure 48: The Zoom Settings Window

- The Shape changes it between a rectangle or circle.
- The Size changes the size of the zoom tool in pixels.
- The Zoom tool will change the power of the zoom.

- The Smoothing slider will adjust the amount of pixel smoothing the zoomed window will undertake.

3.3.4.7.3 Sonar

3.3.4.7.3.1 Resolution

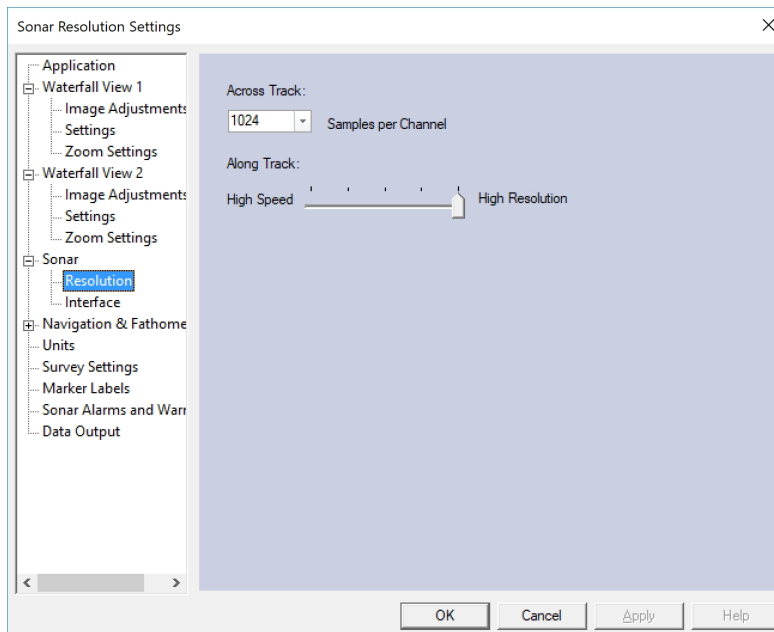


Figure 49: Sonar Resolution Settings

The Sonar Resolution Settings Window settings page allows for the following adjustments:

Across Track: This settings page lets the user make changes to the resolution (level of detail) of the data collected. This option determines how many samples per channel are received.

CAUTION: This change affects the raw data saved to the disk. Lowering the resolution lowers the amount of data saved. This change affects not only the screen, but also the actual raw data that is saved to the disk.

Along Track: This setting affects the ping rate and several aspects of Sonar data collection. First, it controls the virtual width of data or virtual samples per channel. The lower the number of virtual samples per channel, the faster the sonar moves; the opposite is also true.

TIP: A higher resolution requires a slower survey speed. Reduce the resolution to scan an area quickly and find the target, then raise the resolution to get a more detailed image when the target has been found. For general use, keep the slider in the middle.

Note: Changing the Sonar Resolution settings will NOT affect previously recorded data.

3.3.4.7.3.2 Interface

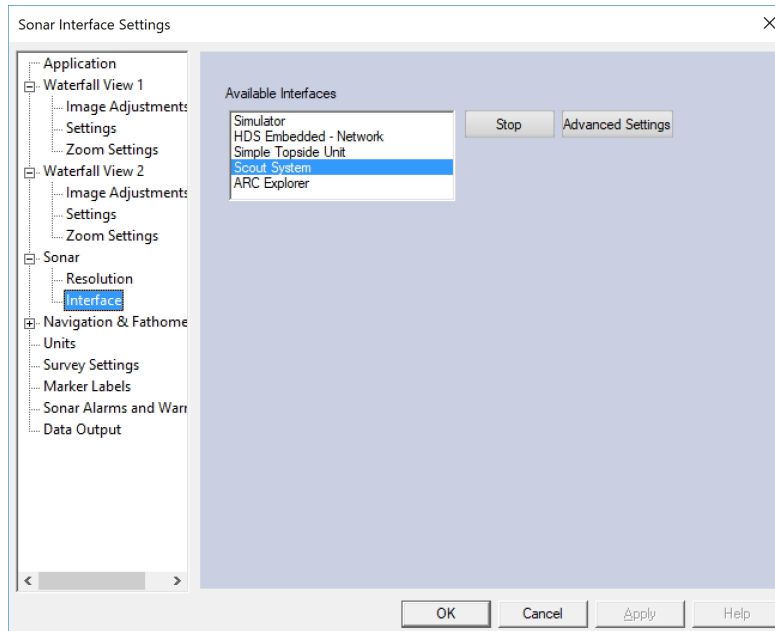


Figure 50: The Interface Settings Window

This Interface Settings window lets the user change Sonar hardware configurations.

- Start/Stop Button: Allows the user to Start or Stop the interface.
- Advanced Settings: Used with the ARC Explorer Interface.

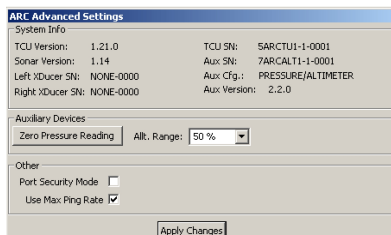


Figure 51: The ARC Advanced Settings Window

- The Advanced Settings Window shows:
 - The TCU's Software Version
 - The Sonar's Software Version
 - The Part Number and Serial Number of the Left and Right Transducers
 - The TCU's Serial Number
 - The Auxiliary's Serial Number (if installed)
 - The Auxiliary's Configuration if installed,
 - § Pressure Sensor
 - § Pressure Sensor and Altimeter
 - The Auxiliary's Software Version

- A method for zeroing out the Auxiliary's Pressure Sensor
- Adjusting the Altimeter's range to a percentage of the Side Scan Sonar's range setting
 - § This is set to 50% by default
- Port Security Mode
 - § This option is disabled by default
- Use Max Ping Rate
 - § This option is enabled by default.
- Simulator: Simulates the side-scan data for training purposes.
- HDS Embedded - Network: Lets the user connect to the HDS Embedded systems.
- Simple Topside Unit: Lets the user connect the software to an HDS hardware configuration.
- Scout System: This Interface is for data steam receive only of sonar data over an Ethernet connection. This setting is used by the embedded system such as:
 - Scout
 - Scout Lite
 - Scout MkII
- ARC Explorer: Lets the user connect the software to an ARC Explorer hardware configuration. This interface has access to the Advanced Settings configuration.

3.3.4.7.4 Navigation and Fathometer

3.3.4.7.4.1 NMEA Data Input

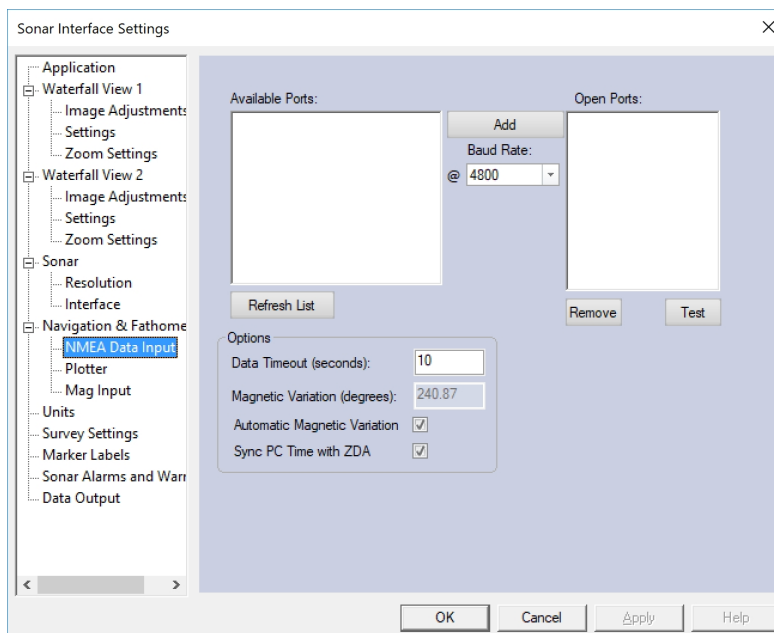


Figure 52: The NMEA Settings Window

The NMEA Data Input settings page lets the user select a GPS unit from a list of available units and to test the connections. A NMEA device and its associated input settings are only required during survey recording. NMEA data cannot be retroactively be added within Sea Scan Survey during data playback.

- The NMEA Data Input settings page lets the user select a GPS unit from a list of available units and to test the connections.
- NMEA Data Strings Accepted/Used by Sea Scan Survey are:
- 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 the COG reading.

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 one of the following minimum NMEA strings will enable the minimum set of data:

- RMC
- GGA, VTG
- GLL, VTG

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

CAUTION: The program only supports the use of a single GPS at a time. Additional units are not advised.

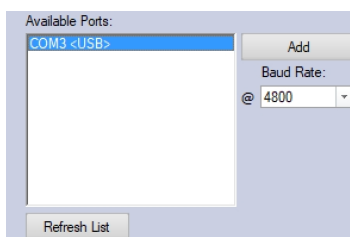


Figure 53: Available changes at the NMEA Data Input Window

Available Ports is used to select an available GPS unit. The GPS unit will show as a COM port with the type of connection next to it. If using the provided GPS unit, it will show up as a USB connection.

- Refresh List: Refreshes the list with newly added hardware.
- Add: Attempts to open the connection to the communications port.

- Baud Rate: Allows the user to change the Baud Rate to whatever speed that particular GPS unit uses. The standard baud rate for GPS units is 4800.

TIP: If you've installed the USB correctly and it's not showing on the list, click the Refresh List button. If it still doesn't show up, please consult the Troubleshooting section of this guide.



Figure 54: Communication Ports Window

- Open Ports: Shows the user which communications port is open; in addition, it allows the user to remove that port or to test the currently selected unit to make sure it is getting good data.
- Remove: It will return to the available ports list (if it is still available).
- Test: It will open up the Test Communications Window, which displays the individual NMEA 0183 strings that Sea Scan® Survey supports

If NMEA data is showing in the *Last ### String*, then the GPS is transferring data. Verify that the data is accurate.

3.3.4.7.4.2 Plotter

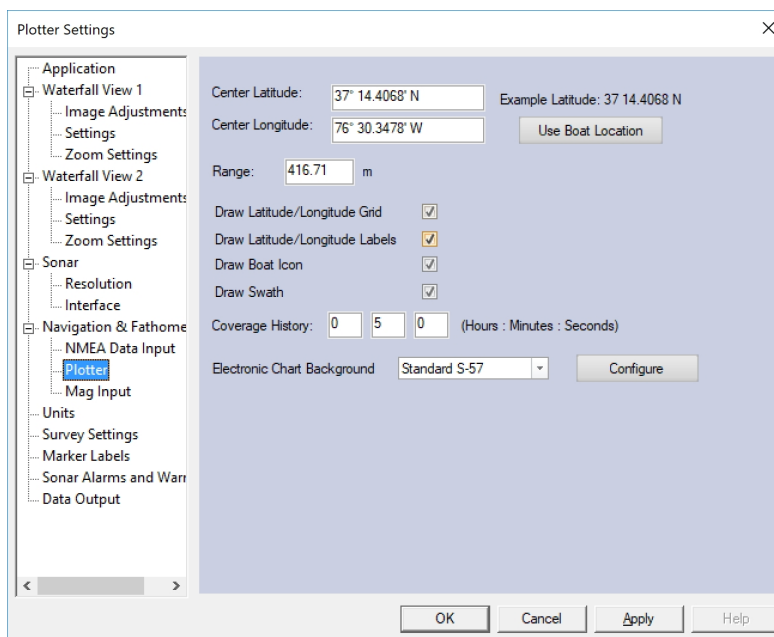


Figure 55: The Plotter Settings Window

The Plotter settings page lets the user make changes that directly affect the Plotter Window.

- Range: Lets the user adjust the range of the plotter's segments.

- Draw Latitude/Longitude Grid: If checked, will draw the latitude and longitude grid lines.
- Draw Latitude/Longitude Labels: If checked, will draw the latitude and longitude labels.
- Draw Boat Icon: If checked, will draw the boat and towfish icons on the plotter.
- Draw Swath: If checked, will draw the red and green swath lines on the plotter.
- Coverage History: An edit box that allows the user to specify how far back in time to see the coverage. The time is in HH:MM:SS format. The default coverage history time is 10 minutes.
- Electronic Chart Background: Turns the digital chart capability on or off. If the charts are available, the user can choose between Standard Electronic Charts (ENC) or Premium ENC Charts.
- Configure: Opens another window which lets the user configure the charts for use.

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.

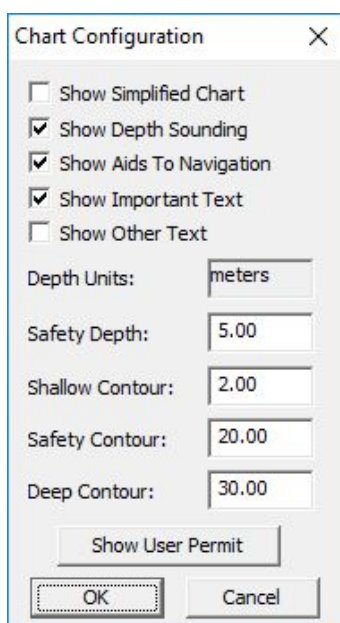


Figure 56: Chart Configuration Window

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) data, and optionally install pre-compiled National Oceanic and Atmospheric Administration (NOAA) 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 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 chart 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,

- 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. For the unlicensed/free charts, this location is typically C:\Program Files\Marine Sonic Technology, Ltd\Sea Scan Survey\USENC\. You can browse to the folder using the <ellipse (...)> button that is at the side.

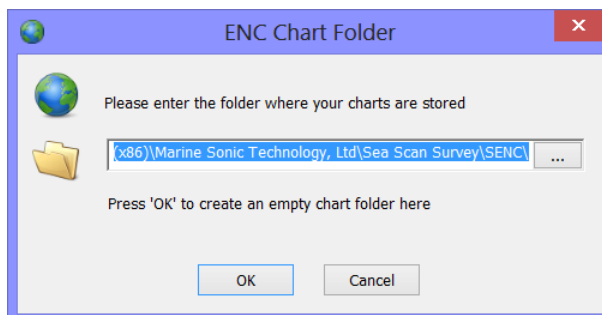


Figure 57: The ENC chart folder

- 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.

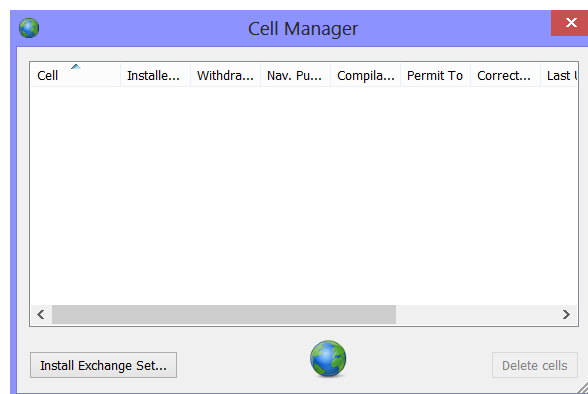


Figure 58: The Cell Manager window

- 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. Otherwise, the program will say "Not a zip archive containing an Exchange Set" below the path.

- Click the <Next> button.

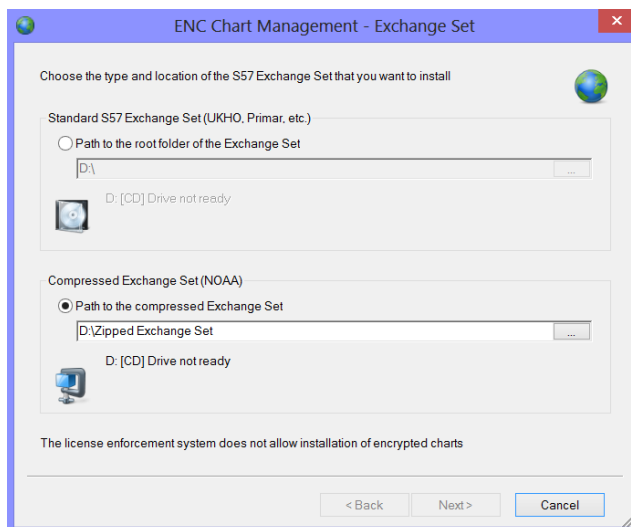


Figure 59: The Exchange Set window

- 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.
- The application will now begin to install the chart sets (this may take several minutes).
- Close the application when the chart sets have been installed.

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.

TIP: When installing or using the licensed charts, the USB security dongle must be plugged into 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, the two major chart providers to choose from are 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 and 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 distributors' lists, as the lists should indicate what formats each chart distributor carries.

The chart catalog is usually a piece of software that allows you to choose charts graphically for your area of interest. Both chart-provider companies offer free downloading of their chart catalogs. When you have downloaded and installed a company's chart catalog, 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-, 3-, 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 the User Permit that is associated with your licensing dongle. The User Permit is a 28-character code made of letters and numbers.

TIP: You should have received a User Permit with the Sea Scan ARC Explorer system; however, if you need to retrieve it, you can use Sea Scan Survey to get it. Do this by opening the Plotter Settings Window.

- 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.
- In the Chart Configuration Window, click on <Show User Permit>. Your permit number will be shown there.

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 to retrieve the charts. They may also send you the charts on CD's or DVD's. 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 via Sea Scan Survey to access and download the license from the CD's/DVD's the chart distributor sends. No PC-based Installer will support this process.

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

- 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:\ProgramFiles\Marine Sonic Technology, Ltd\Sea Scan Survey\LSENC\) for the licensed charts. You can browse to the folder using the button.
- 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.
- 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.

- 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.
- 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 <ellipse (...)> 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.
- 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 each CD.

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,

- Start by opening the Chart Management application from the <Tools> menu in Sea Scan Survey.
- Choose the unlicensed chart database folder as instructed above. Then, use the mouse to select the charts you wish to delete.
- 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 World Vector Shoreline (WVS) data. This data fills in where there is no S-57 ENC data. It is not nearly as detailed as the S-57 charts; in fact, it generally is just an outline of the shore.

3.3.4.7.4.3 Mag Input

The Mag Input settings page lets the user add magnetometer data to the stream.

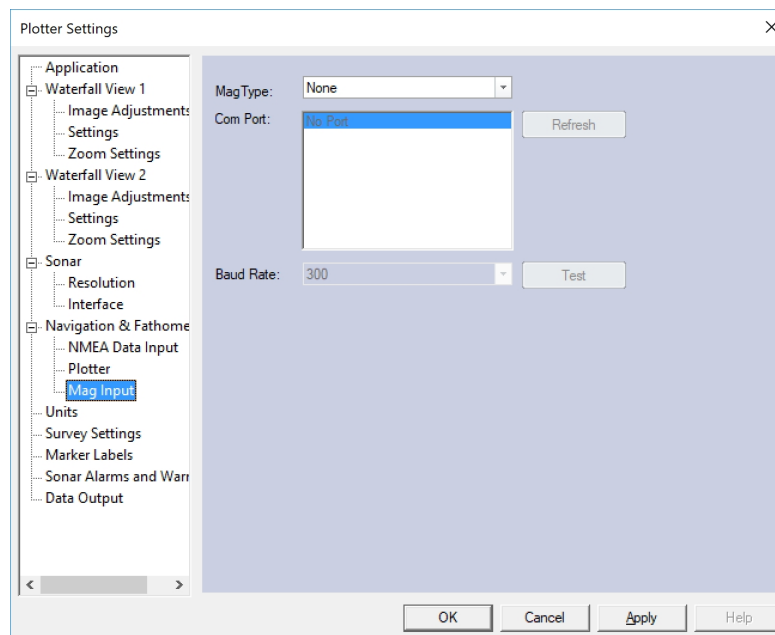


Figure 60: Mag Input Settings

The output will show on the Status Window of Sea Scan Survey.

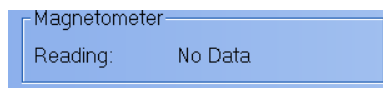


Figure 61: Magnetometer status

- **Mag Type:** Lets the user switch between different sonar systems.
 - Proton4
 - SeaSPY
 - 866
 - 880
 - ASCII
- **Port Number:** Lets the user select which port the magnetometer is connected to.
- **Baud Rate:** Lets the user select the baud rate at which the magnetometer sends and receives information.
- **Refresh:** Refreshes the list of the ports that have a connection.

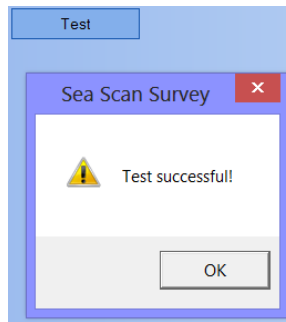


Figure 62: The Test Window

Test: Allows the user to test the connection. It will give a success or failure message. Click on <OK> to close the window.

3.3.4.7.5 Units

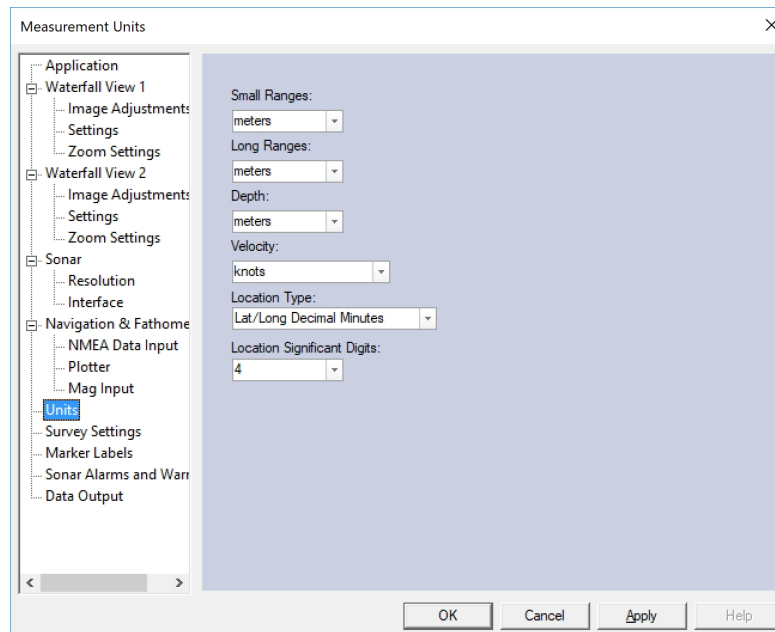


Figure 63: Unit Settings

This settings page allows the user to change the units of the windows.

3.3.4.7.6 Survey Settings

This window presents the survey settings.

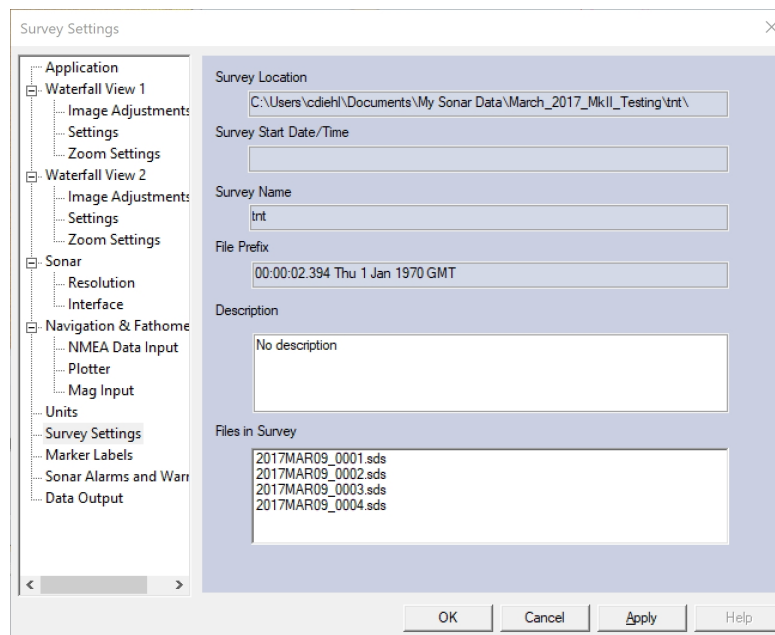


Figure 64: The Survey Settings Window

The un-editable settings are:

- The location on the computer's hard drive of the survey files.
- The Start date and time of the survey.
- The name of the survey.
- The survey file name's prefix.
- A list of all the files in the survey.

Editable setting:

- The user may edit the description of the survey. This is a permanent change to the file that stores the description's information.

3.3.4.7.7 Marker Labels

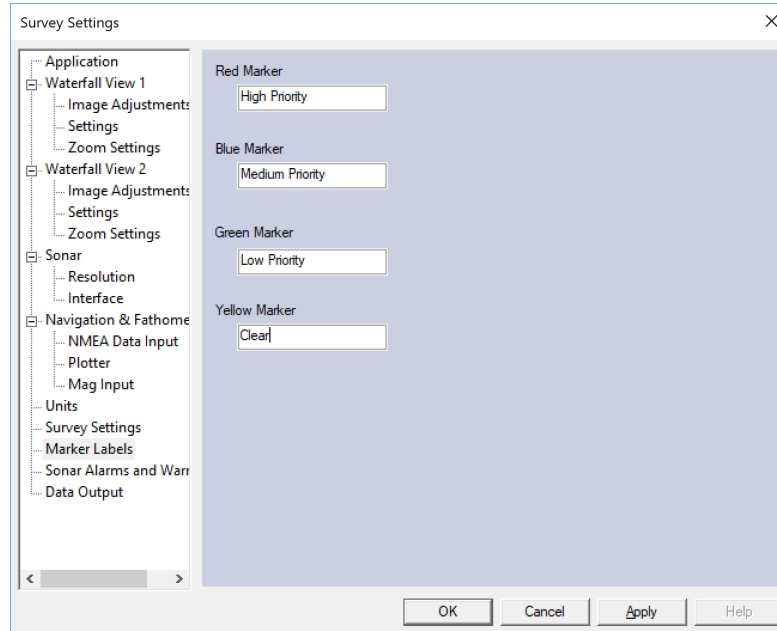


Figure 65: The Marker Labels Window

The Marker Labels Window allows the user to assign priorities to the markers during a survey by designating different colors to the markers. These will remain the default settings until you change them.

3.3.4.7.8 Alarms

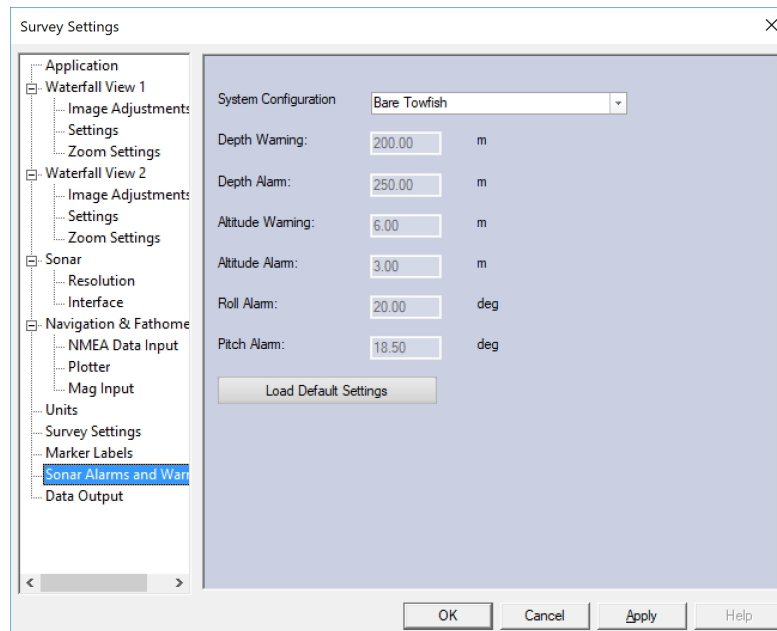


Figure 66: Alarms Settings

- **System Configuration:** The operator can choose between two default settings (Bare Towfish and Towfish with Depressor & Keel Weight), or Custom. The Custom option allows for editing the Warnings and Alarms to any desired value.

- **Depth Warning:** This value sets the depth at which the software will warn the user that the depth warning threshold has been crossed. The warning will remain until either the depth is decreased below the warning threshold or the depth alarm threshold is crossed. This warning is displayed on the Status window as depth highlighted in **YELLOW**.
- **Depth Alarm:** This value sets the depth at which the software will tell the user that the depth alarm threshold has been crossed. The alarm will remain until the depth is decreased below the alarm threshold. This alarm is displayed on the status window as depth highlighted in **RED**.
- **Altitude Warning:** This value sets the altitude at which the software will warn the user that the altitude warning threshold has been crossed. The warning will remain until either the altitude is increased above the warning threshold or the altitude alarm threshold is crossed. This warning is display on the Status window as altitude highlighted in **YELLOW**.
- **Altitude Alarm:** This value sets the altitude at which the software will tell the user that the altitude alarm threshold has been crossed. The alarm will remain until the altitude is increased above the alarm threshold. The alarm is displayed on the status window as altitude highlighted in **RED**.
 - In addition to the status window the waterfall will display a message that indicates that there is a altitude alarm present and that the sonar should increase the altitude or else a crash is inevitable.
- **Roll Alarm:** The alarm threshold for the roll of the sonar (left to right). Exceeding this value will cause the roll on the status window to be highlighted **RED**. The alarm will remain until the roll is decreased below the alarm threshold.
 - The Roll Alarm setting is entered as a magnitude. For example, when 20.00 deg is entered the alarm will trigger at either +20.01 deg or -20.01 deg
- **Pitch Alarm:** The alarm threshold for the pitch of the sonar (front to back). Exceeding this value will cause the pitch readout on the status window to be highlighted **RED**. The alarm will remain until either the pitch is decreased below the alarm threshold.
 - The Pitch Alarm setting is entered as a magnitude. For example, when 18.50 deg is entered, the alarm will trigger at either +18.51 deg or -18.51 deg.

Note: The Waterfall Display of the Altitude Alarm only occurs when Sea Scan Survey is connected to a sonar. In order to enable the pop-up alarm during mission playback, the user will have to set the Sonar Interface to Scout.

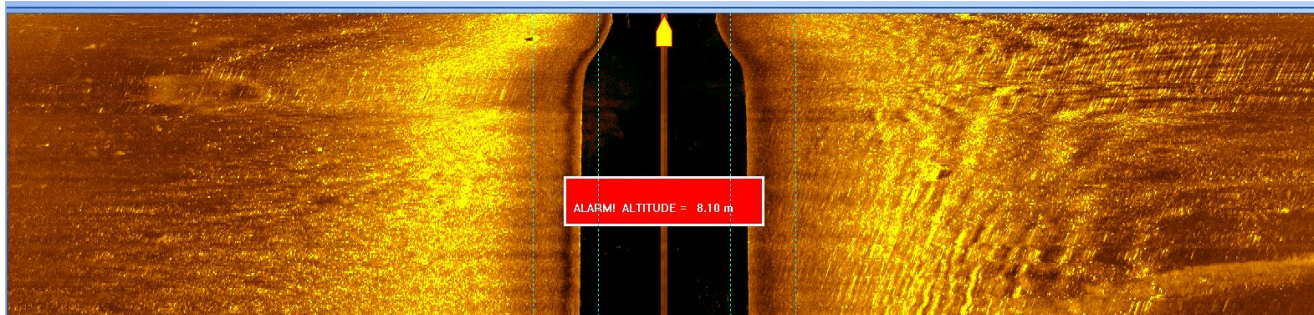


Figure 67: Altitude Alarm Triggered, Waterfall View

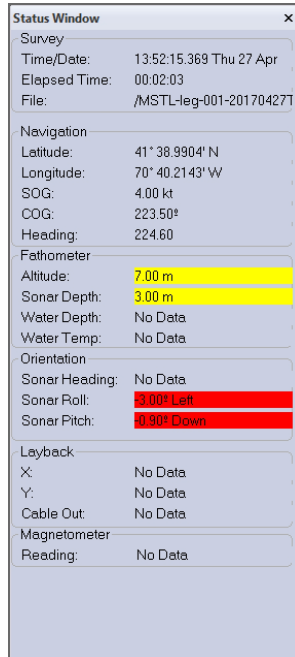


Figure 68: Altitude, Roll & Pitch Alarm Example

3.3.4.7.9 Data Output

The Data Output Settings configure Sea Scan Survey's Data Output feature. The Data Output feature streams the incoming SDS data over a configurable UDP connection. This settings page allows the user to configure the UDP connection and select the SDS data to stream.

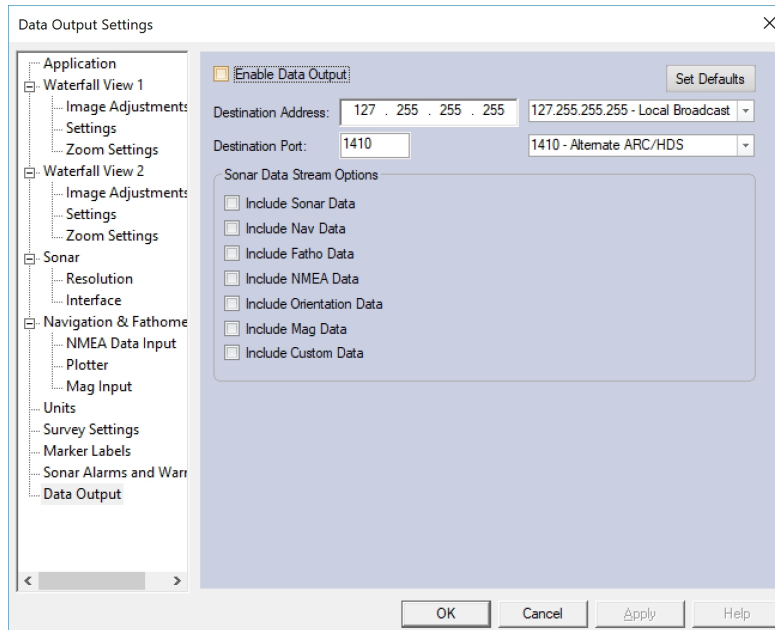


Figure 69: Data Output Settings Page

Setting	Description
Enable Data Output	Turns on and off the data stream being sent out over UDP packets.

Setting	Description
Destination Address:	The network IP address of the computer(s) that the data is sent to. The combo box to the right allows quick selection of broadcast addresses for the networks available on the computer running Sea Scan Survey. Selecting one of these addresses populates the Destination Address box. Alternatively the IP address can be typed in to the Destination Address box as well.
Destination Port:	The UDP/IP port that the data is sent to. The combo box to the right allows quick selection of standard ports in use by Marine Sonic products.
Sonar Data Stream Options	These check boxes allow the user to select the particular data being streamed over the network. Uncheck unused data types to keep from tying up the network with useless data.

By default the all fields are disabled and the boxes unchecked. This means that the Data Output feature is disabled. To enable the output click the Enable Data Output check box and then click the Apply button. If no error messages pop up then the output is enabled.

To stream data Sea Scan Survey must be actively recording data. This means that a new survey must be Created or a survey must be Continued using the File->New or File->Continue Survey menu options. In addition to this a Sonar Interface must be started and connected as data collection in Sea Scan Survey is sonar data centric. This means without sonar data there is no data stream.

In summary to ensure there is a data stream being transmitted:

- Make sure Enable Data Output is checked.
- Make sure the Destination Port and Destination Address are correct.
- Make sure a Sonar Interface is started.
- Make sure Sea Scan Survey is recording data.

The Data Output can be used to send data to other Sea Scan Survey instances running on the same computer or on separate computers. It can also be used to stream data real time to 3rd party software programs such as SonarWiz.Map from Chesapeake Technologies Inc. and Marine Search from Hypack. Marine Sonic Technology also offers useful utilities that take advantage of the Data Output. These include the SDS2DPT application which reads Fathometer data from the data stream and retransmits it as NMEA 0183 formatted DPT strings. These are located in the utilities folder on the USB drive shipped with the system.

3.3.4.8 Layback

Figure 70: The Layback Settings Window

The Layback window allows the user to set the Layback of the towfish. This capability gives an estimate of the towfish location in relation to the boat.

TIP: The offsets are based on the Cartesian coordinate system derived from the location of the GPS unit as (0,0).

Bow: -Y Stern: +Y Port: -X Starboard: +X

X: Relates to the position of the left (port) or right (starboard) side of the boat.

Y: Relates to the front (bow) or back (stern) of the boat in relation to the location of the GPS Unit.

Z: Relates to the distance between the water and the cable's tow point.

Click on the <Worksheet> button to open a very easy way to input this information.

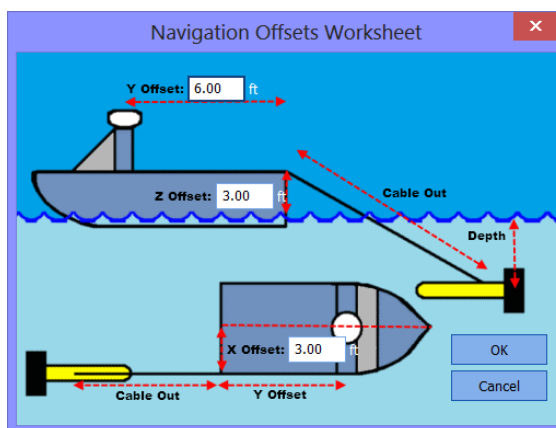


Figure 71: The Layback worksheet

Cable Out refers to the amount of cable that has been released. If a winch shows the amount of line out, use that number. If not, use the best estimate available.

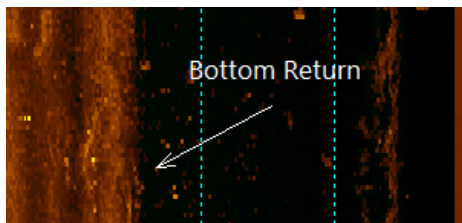


Figure 72: Bottom returns shown in the waterfall

Sonar Depth refers to the height off the bottom. Use the <Get Depth From Waterfall> button to determine this better. Simply click the button and then click the first bottom return.

Click on the <Apply Now> button to add a Layback Event to the Layback Events window. It will also add a towfish to the Plotter window.

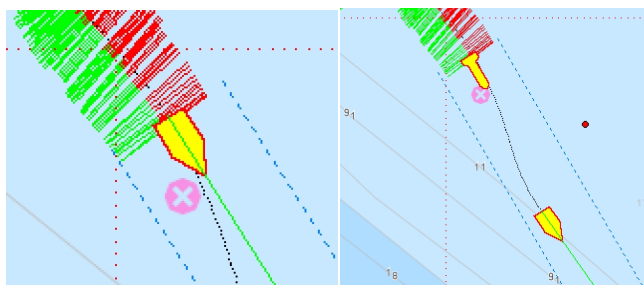


Figure 73: No Layback Set & Layback Set

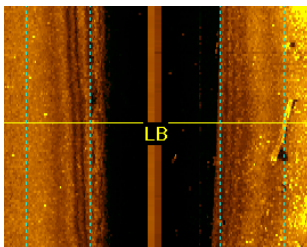


Figure 74: Waterfall with Layback set

Creating a Layback Event will also add a Layback event to the waterfall if Data Events is turned on.

3.3.4.9 Range & Bearing

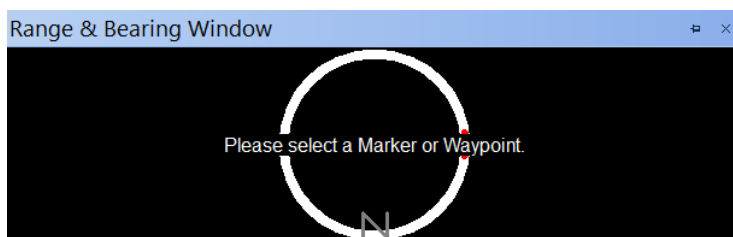


Figure 75: The Range and Bearing Window

The Range and Bearing tool is used to help the boat's driver stay on track to locate a waypoint or marker and to return to it again.

3.3.4.9.1 Understanding the Range & Bearing Tool

The Range and Bearing tool includes boat range and bearing as well as swath range and bearing.

TIP: In keeping with the seafaring standard, port is red and starboard is green.

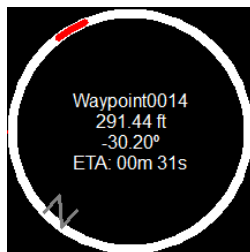


Figure 76: The boat's bearing in the Range and Bearing Window

Boat Range & Bearing: The Boat's Range and Bearing is the center circle. The red line is the target. The boat's range and bearing can be used to direct the boat directly over the target. This can be useful in putting the boat right above a target so that divers, etc, can have easy access to the target.

This also includes the name of the waypoint or marker, the distance directly from the boat to the waypoint, the degrees off based on the boat, and the estimated time of arrival at the current SOG.

Swath Range and Bearing: This is represented as a red (port) or green (starboard) arrow. Instead of detailing the boat's range and bearing to the target, this instead shows the swath's range and bearing to the target.

- The Swath distance shows the gap from the target to the boat and where it will be on the Sonar's swath .
- The Real distance shows the actual range between the Sonar and the location of the waypoint in a straight line.

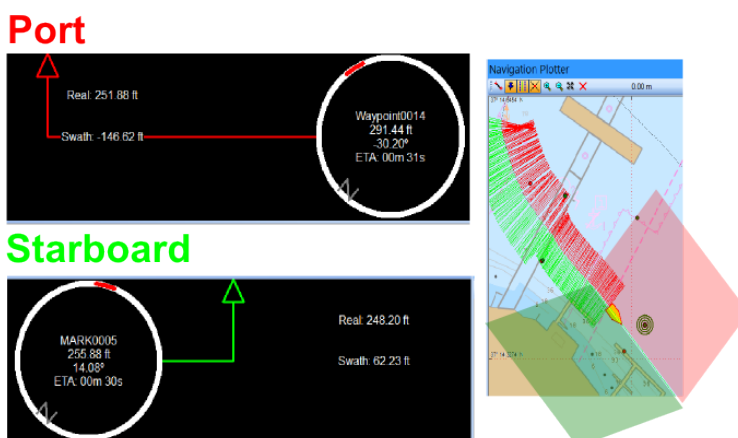


Figure 77: The Port and Starboard bearings in the Range and Bearing Window from the Navigation Plotter

This arrow represents where in the swath the target will show up on the waterfall.

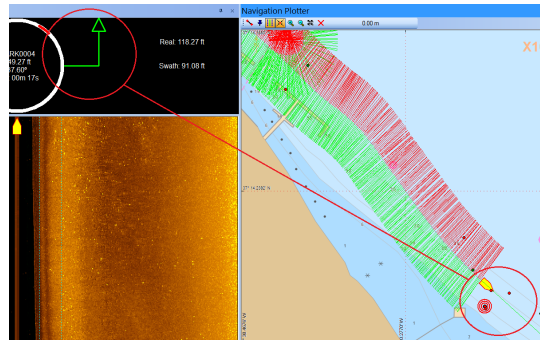


Figure 78: The marker location on the Range and Bearing Window

Here, the Marker is highlighted and showing in the waterfall about one-third of the way to the edge of the starboard side swath.

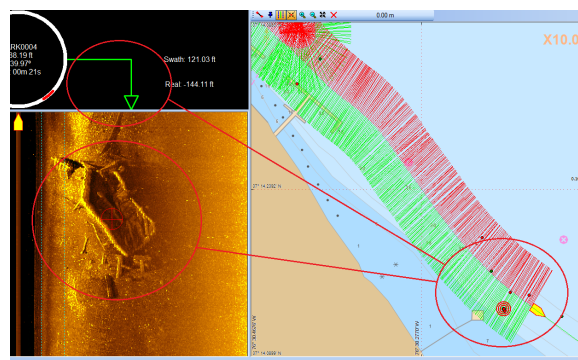


Figure 79: The marker location behind the boat on the Range and Bearing Window

Here, the boat's swath went over the target and the target is now behind the boat. The arrow in the Range and Bearing window corresponds to the waterfall data. The boat icon on the waterfall is the location of the boat on the water compared with the target. The target is slightly behind the boat and in about the center of the swath.

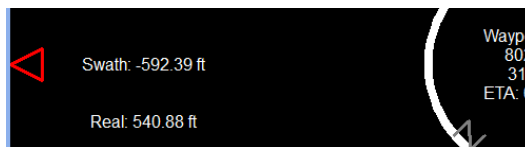


Figure 80: Indication in the Range and Bearing Window when the target is too far to the starboard to show in the waterfall

If the arrow is either on the far port or far starboard, the target will not show up on the waterfall.

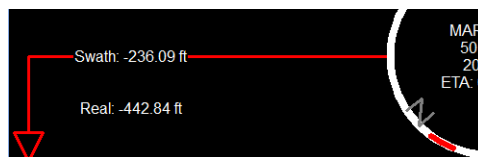


Figure 81: Indication in the Range and Bearing Window when the target is behind the boat

If the target is behind the boat and in the swath range, the arrow will be on the bottom of the Range & Bearing window.

3.3.4.10 Event

3.3.4.10.1 Layback

The Layback Events page shows a list of all the Layback Events that have been created in the Survey.

3.3.4.10.1.1 Using the Layback Events Window

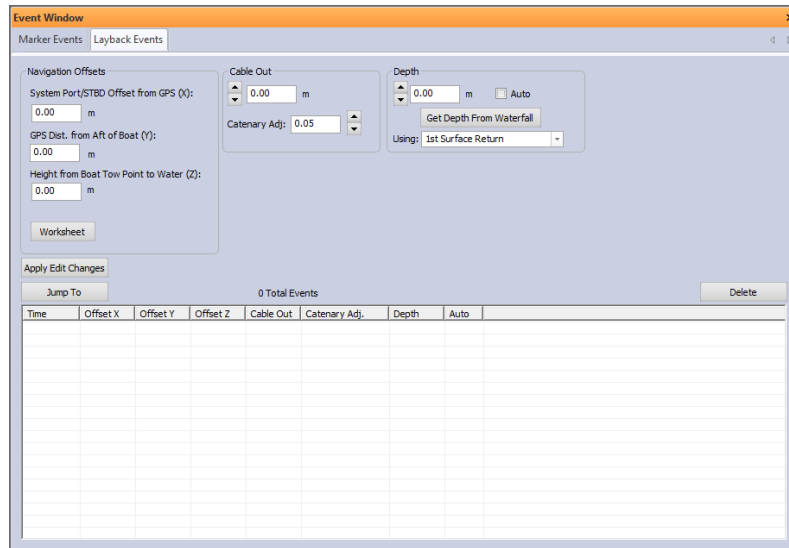


Figure 82: The Events Window

Apply Edit Changes: Select a Layback Event from the list. The input fields will be filled out in relation to the selected Event. A user may change the data in the event and then apply the edited changes.

Jump To: Select a Layback Event from the list. Clicking on the button will cause the waterfall display to jump to the selected Event.

Delete: Permanently deletes the event from the list.

CAUTION: Edits and Deletions are PERMANENT changes. You will not be able to retrieve the changed or deleted information.

3.3.4.10.2 Marker

The Marker Events page shows a list of all the Marker Events that have been created in the Survey.

3.3.4.10.2.1 Using the Marker Events Window

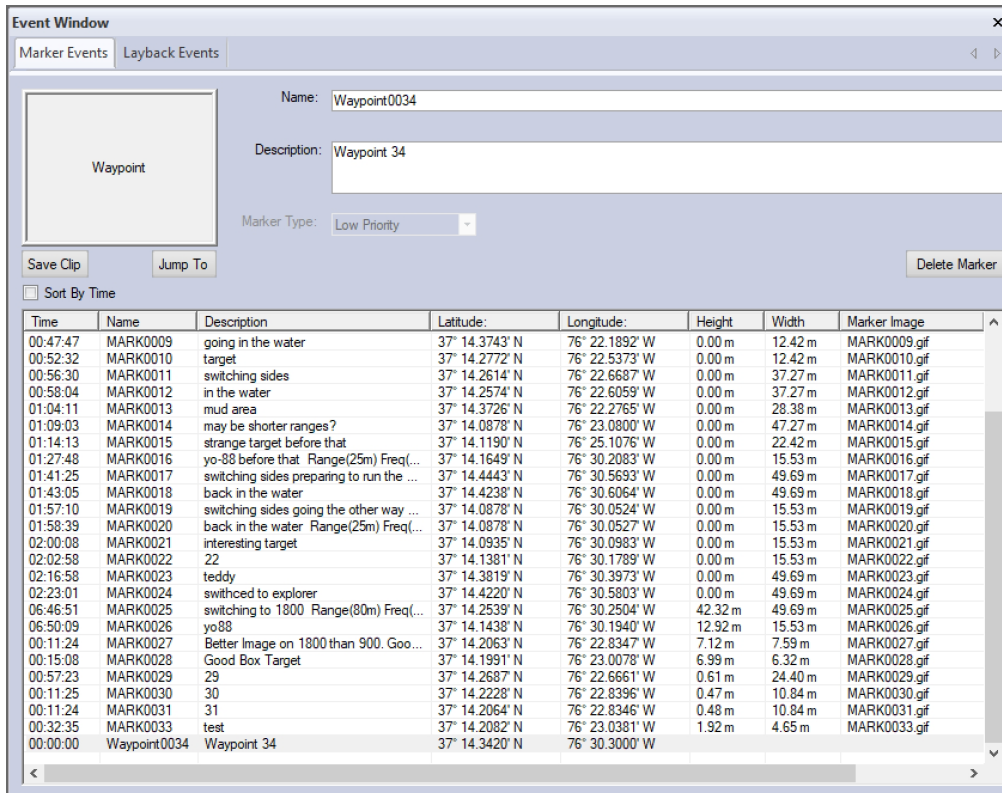


Figure 83: The Marker Events Window

Each Marker, when selected, will show a preview image of the Marker.

1. Name: Displays the name of the marker.
2. Description: Displays the description of the marker.
3. Marker Type: Displays the priority of the marker.
4. Save Clip: Lets the user save a 500-ping Sonar data clip (SDS) of the marker. This is useful for sharing the data and is about 300 MB in size. A window will open and let the user input a personalized name.
5. Jump To: Allows the user to move the waterfall to that selected Marker Event.
6. Sort By Time: Check this to sort the markers by time rather than by name.
7. Delete Marker: Allows the deletion of the selected marker.

CAUTION: The deletion of a Marker Event is permanent and cannot be reversed.

4 Glossary

ARC	Adaptive Resolution CHIRP
AUV	Autonomous Underwater Vehicle
baud rate	A unit for measuring data transmission speed, where one unit equals 1 bit per second
Bow	The front section of a boat or other vessel
channel	Another term used to describe the transducer 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
CPU	Central processing unit
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
EULA	End User License Agreement
fathometer	An acoustic device that measures the current water depth
frequency	The number of sound waves that pass any specific point in one second
gain	Amplification of a signal
GB	Gigabyte (1,000,000,000 Bytes)
GHz	Gigahertz (1,000,000,000 Hertz)
GPS	Global Positioning System
Hertz	A unit of measure representing one cycle per second

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
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
lateral layback	The offset distance to the left (port) or (starboard) between the navigation antenna and the towfish
layback (LB)	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	An item of interest the operator can tag in the Sonar window; the item might be a feature on the bottom or an item of interest
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 Oceanographic 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
ping	A single pulse of a Sonar system
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
pulse width	The horizontal width of the Sonar signal from the transmitter
range	The maximum distance from the transducers that the Sonar signal can detect usable signals
range delay	The distance (or range) the Sea Scan 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
ROV	Remotely Operated Vehicle
sea clutter	The distortion of a reflected Sonar beam that impacts the water's surface
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

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 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
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-Variied 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
.xvy	The extension that the software attaches to the names of survey files
XTE	Cross-Track Error

