Marine Sonic Technology

[A Brand of ATLAS North America]

Sea Scan® ARC Explorer™ Manual

V4.2.1

ATLAS NORTH AMERICA

A company of the ATLAS ELEKTRONIK Group

This product was designed and developed by a team of engineers at ATLAS North America.

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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.

Integral to our success, and to the Sea Scan® ARC (Adaptive Resolution Chirp) Explorer™ towed system, is Sea Scan® Survey, 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.

The ARC Explorer features the latest, proprietary technology, Adaptive Chirp. This high-tech design extends ranges up to 50% further, minimizes power consumption, and is more accurate and informative. With its modular, anodized-billet aluminum housing, stainless steel integrated brackets, and durable polymer attachments, the Sea Scan® ARC Explorer towfish features a built-in variable-angle tow point for ultimate flexibility and field-replaceable transducers.

> TIP: Underlined words are defined in the Glossary.

> TIP: Cautions, notate any action that could damage equipment or cause a loss of data

> TIP: Warnings, draw attention to anything that could result in injury or death to the operator

1.1   Advisories

> **CAUTION:** Turn off power before disconnecting any component. Disconnecting the components without turning off the power may cause a sudden pulse of current or voltage that can damage the internal components.

> **CAUTION:** Electrostatic-sensitive devices can be damaged by excessive levels of voltage and/or current. To protect these devices, bring the device and everything that comes in contact with it to ground potential by providing a conductive surface and discharge paths.

THE SEA SCAN$^{\circledR}$ TOWFISH IS BUILT FOR A MARINE ENVIRONMENT, BUT SOME COMPONENTS ARE SENSITIVE TO MOISTURE AND CORROSION. THEREFORE, THE FOLLOWING PRECAUTIONS MUST BE FOLLOWED:

- NEVER attach the connectors when the power is on.

- Ensure that the connectors are CLEAN AND DRY before they are mated to one another.

- When finished for the day, rinse the system with clean, fresh water.

1.2   Minimium System Requirments

Sea Scan Survey requires the following capabilities.

Operating System	Windows XP, Vista, 7, 8, 8.1, or 10
Hard drive space	100 MB base + 2.5 GB charts + data storage
Available RAM	1 GB minimum; 2 GB recommended
Processor Speed	1.8 GHz or better
Other Features	Ethernet & USB 2.0 port
Screen Resolution	1024 x 768 minimum or higher

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.

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
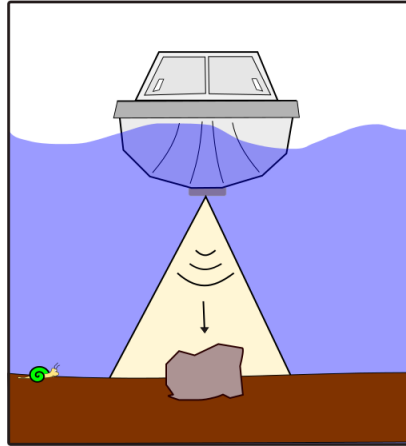
Figure 1: The transducer sends out a pulse
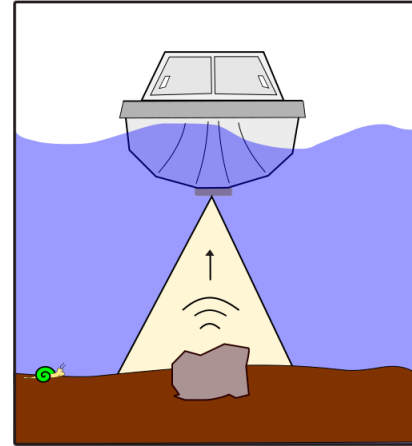
Figure 2: The pulse bounces off the object

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 most common side-scan systems are towed behind a surface vessel and comprise three elements: the control unit containing the software, the towfish with transducers mounted on each side, and the cable that connects the towfish to the surface vessel that follows a track or course through the water. 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 moves 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

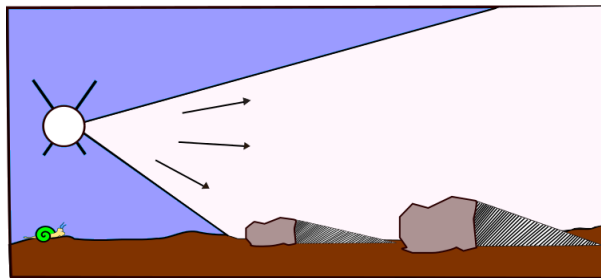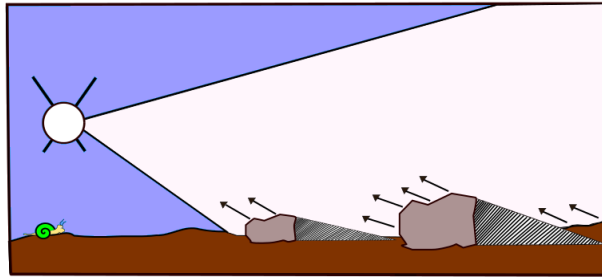Sea Scan Survey listens for a short amount of time, which is determined by the range; then it pings again, thus beginning a new cycle.The returning echoes from one pulse are displayed on the sonar window or waterfall as one single line, with dark and light portions of that line representing strong or 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.
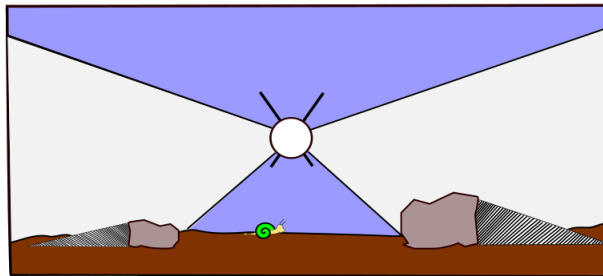
Figure 5: The transducers return info about their side of the system

In between the transducer beams is the system's track immediately below the towfish. 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.
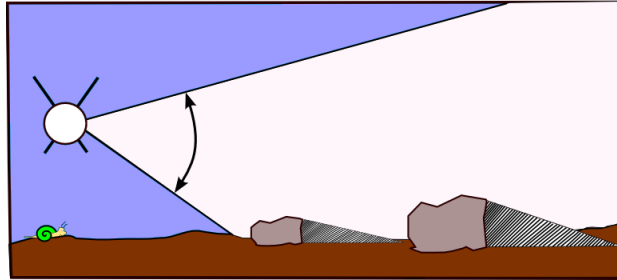
Figure 6: The vertical beam angle

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.
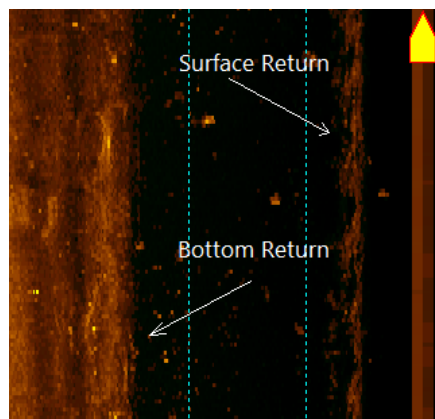
Figure 8: Surface and bottom returns in the waterfall

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.
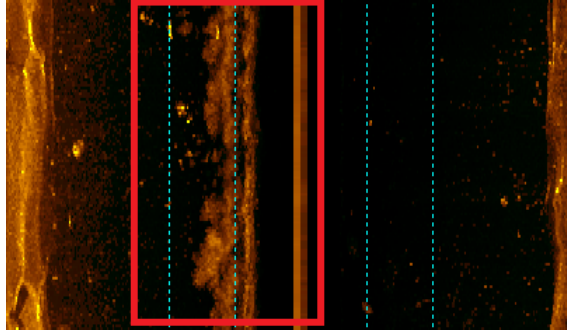
Figure 9: The effects of prop wash

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.
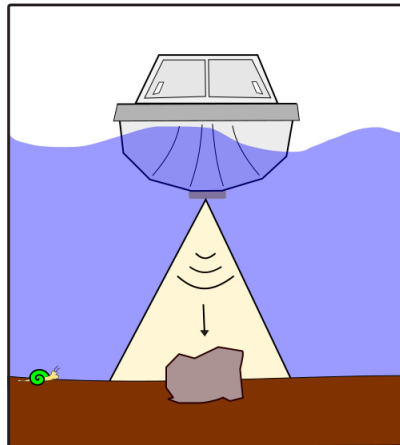
Figure 10: A rock viewed from directly above

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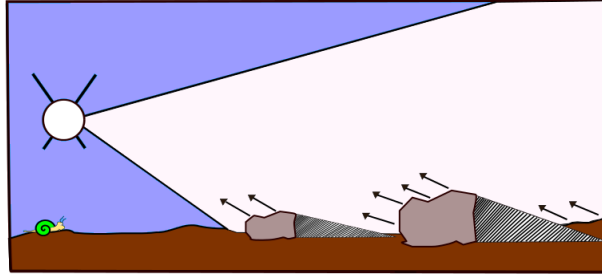
Figure 11: When viewed from an angle, the rocks produce shadows

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.
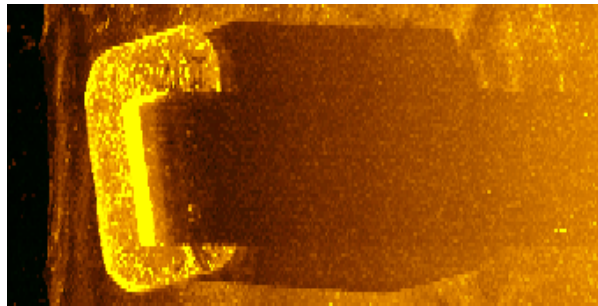
Figure 12: A sonar shadow

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   System Quick Start

3.1   Step by Step

This is a Quick-Start guide for our Sea Scan® ARC Explorer system. This guide is for users who want to get started quickly or for those who have operated the system previously but need a quick refresher. For more detailed system information, please refer to the other parts of this manual.
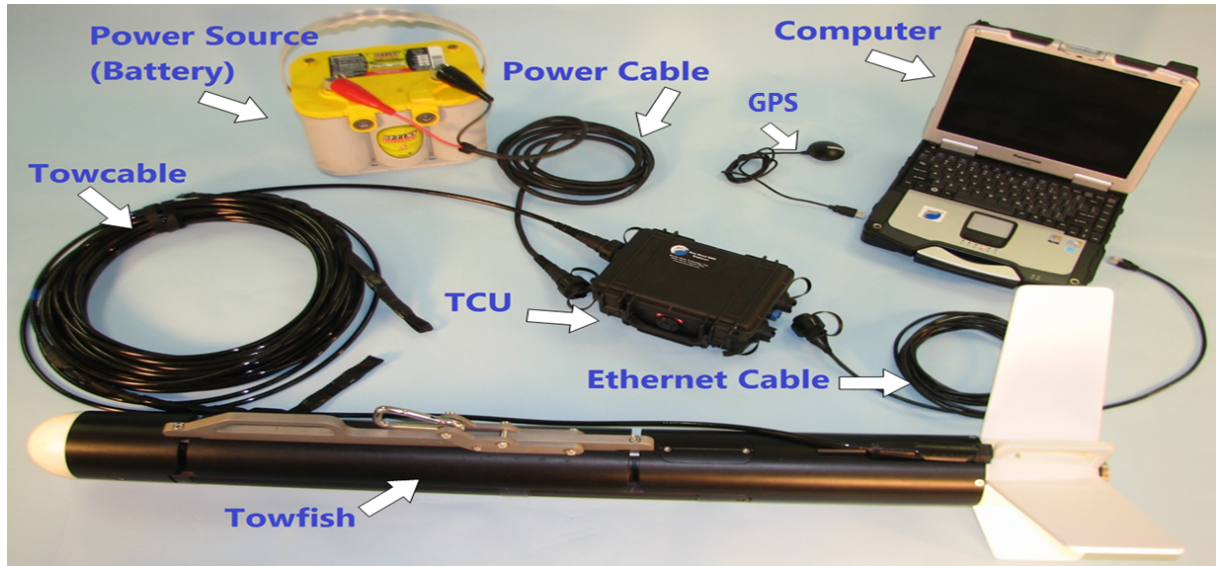
Figure 13: ARC Explorer System

3.1.1   System Components

Verify that you have all of the following system components:

- Windows XP, 7, or 8, 10 based PC
- Topside Communications Unit (TCU)
- All four Back Fins
- Power Cable
- Power Source
- Tow Cable
- Towfish with Transducers
- USB Cable
- Network Cable (connects PC to TCU)
- USB Global Positioning System (GPS)

3.1.2   Software and Driver Installation

Sea Scan ARC Explorer is a self-contained side-scan sonar system. The software controls the collection of the sonar imagery and navigational input and displays the information on the computer screen. It allows you to control the sonar data collection process, review, analyze, and save the sonar image along with the markers and waypoints. The towfish ping rate and sonar signal processing also are controlled by the software, and the software automatically communicates with the towfish to determine status and configuration.

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

1. Insert the included flash drive into your computer.

2. Select Open Files in a Folder. If Windows doesn't offer you options for opening, use Windows Explorer to find the Flash Drive.

3. Locate the Sea Scan ARC Explorer Towed System software folder and select the "Install Sea Scan Survey Basic.exe".

4. You will be asked where to install the software; the default folders should be fine for most users.

5. You will be asked to install Drivers and Charts. Select "Yes" and install them accordingly.

> **CAUTION:** Do not connect any devices before installing the software, as they will slow the installation process.

3.1.3   Towfish Setup

> **CAUTION:** Do not plug or unplug the towcable if TCU power is ON!

- Verify that the Topside Communications Unit (TCU) power is off!

- Verify that the wet-mate connector is clean and plug it in.

> **TIP:** Occasionally clean out the connector with a silicone-based spray (a bottle comes with the system's kit).

- Verify that the fins are correctly installed and that the locking bolt is tight.

- Plug the tow cable into the TCU.

- Plug the tow cable into the towfish connector.
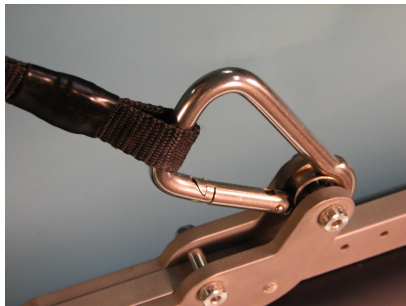
Figure 14: Towcable Rigged to Towrail & Breakaway
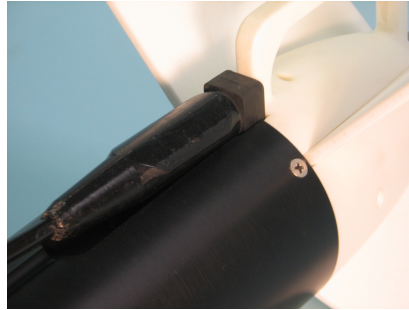
Figure 15: Towcable Connected to sonar

3.1.4   Topside Communications Unit (TCU)

Figure 16: Topside Communications Unit

- Plug the TCU into the compluter using the provided Network cable.
- Connect the power cable to the power source.

CAUTION: Do not plut of unplug the towcable if the TCU power is ON!

- Plug the power cable into the TCU.
- Plug the power cable into the TCU.
- Power on the TCU by pressing the power button.
- Wait for the TCU's green network LED to turn on.
- Wait for the PC network to configure. This should be less than 30 seconds on Windows 8, 7, and Vista. On Windows XP it may take over 1 minute. The network icon in the taskbar notification area will indicate the network status.

Windows 7, 8, 10

Not Connected	Connected
	OR
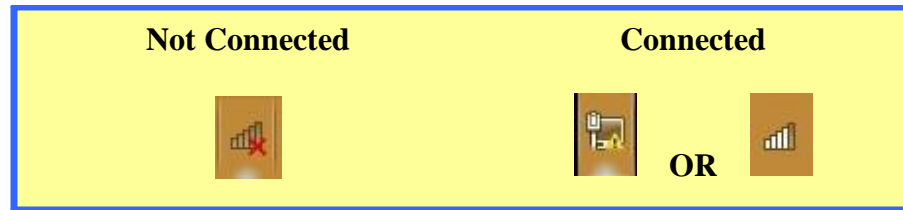
- Open "Sea Scan Survey," turn on the TCU, and follow steps a to d to verify that it shows in the software's sonar Interface Manager:

   a. Right click on the waterfall (the black area in the middle of the computer screen).

   b. Click <Sonar Interface> on the pop-up menu.

   c. Select <ARC Explorer>, select "Start," click it.

   d. At the bottom right, the sonar Status should change from red to yellow, then green, and read "SONAR Connected."

> **TIP:** If the sonar status remains red, please refer to troubleshooting reference at the end of this manual.

If the sonar status remains red, please refer to the Quick Troubleshooting Reference at the end of this manual or to the "Sea Scan® Survey" software manual on the installation disk before you proceed!

3.1.5 Your First Survey

- Click on <File> at the top-left of "Sea Scan Survey."

- Select <New> from the drop-down menu. This will open the New Survey window.
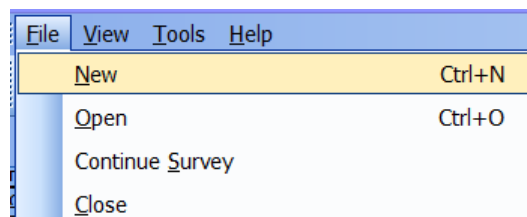
Figure 17: Creating a New Survey

- In the box "Enter Name for," type the name of the survey.

> TIP: Make the name meaningful so that it can be easily found later.

- Add a description of the survey.
- Click the <OK> button at the top right of the <Begin a New Survey> window.

> **CAUTION:** The survey is now created, but you must turn the sonar ON by performing the following steps to begin collecting data.

- Move the mouse cursor over the <Sonar Control Window> tab on the left side of the "Sea Scan Survey" software.

- If using a dual-frequency sonar, verify that the correct frequency is selected. Keep in mind, however, that higher frequencies have higher resolution but less range, and lower frequencies have lower resolution but more range.

- Under "Sonar Power," click the <On> button to begin collecting data.
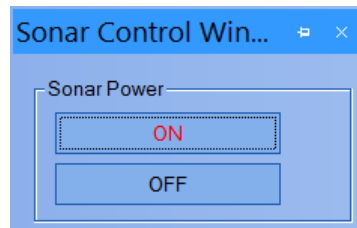
Figure 18: SONAR Power ON

3.1.5.1 The Global Position System (GPS)

- Plug the GPS into the computer.

- in "Sea Scan Survey," click <Tools>, click <Settings>, select <Navigation and Fathometer> and then select <NMEA Data Input> from the list that appears in the pop-up menu.

- Under Available Ports, click the port to which your GPS is connected.

- Click the <Add> button; then click <OK>.

3.1.6 Performing a Rub Check

Perform a Rub Check by rubbing your hand along the transducers to verify that Sea Scan Survey shows a narrow strike across the left and right sides of the waterfall display, respectfully, as shown in the following picture.
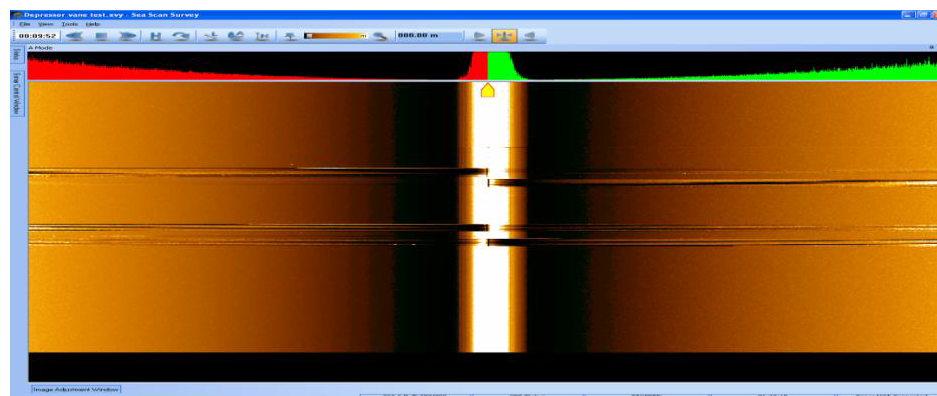
Rub Check Performed

TIP: Use dry fingers, a crumpled piece of paper, or (preferred method) a burst of compressed air for more effective rub checks.

> TIP: If you have a dual-frequency towfish, the rub check must be done separately for each frequency.

3.1.7   Packing Up

3.1.7.1   Software

- In Sea Scan Survey, open the sonar Control Window and turn the power <Off>.

- You can close the software at this point. This action will close the survey, which will be stored on your computer's hard drive in the "My Sonar Data" folder.

3.1.7.2   Hardware

> **CAUTION:** Turn off the TCU BEFORE unplugging the towfish! Failure to do so can result in a damaged towfish or TCU!

- Disconnect the power cable from the power source and then from the TCU.

- Disconnect the tow cable from the towfish.

> **CAUTION:** Verify that the connectors are dry. If water is inside the connector, a quick blow of air from either a can of compressed air or a spray of WD-40™ should be sufficient to avoid corrosion.

- Disconnect the towfish cable from the TCU.

- Disconnect the Ethernet cable from the TCU and then the computer.

- Put on any connector covers on the ends of the system cables.

- Be sure to rinse anything that came in contact with salt water with clean fresh water before storing the system.

4   ARC Explorer System Hardware

4.1   Topside Communications Unit (TCU)

Marine Sonic Technology has designed the Topside Communications Unit (TCU) for ease of use. The unit housing is sealed and made of rugged plastic. All connectors are water resistant. Indicator lights are on the front of the unit to indicate power to the unit, communication with the network, and communication with the towfish. Internal circuit boards seamlessly communicate with all attached components, and an internal power supply provides the voltage for the towfish.

Figure 19: Topside Communications Unit (TCU)

CAUTION: Do not plug or unplug the tow cable if the power is on to the topside communication unit.

TIP: Make sure the connector's O-Rings are in their proper place and that they are free of debris and dirt. If you happen to lose an O-Ring, extra ones come with the system, including in the connector's cap.

4.1.1   Front Panel Lights

4.1.1.1   Power Button and Lights
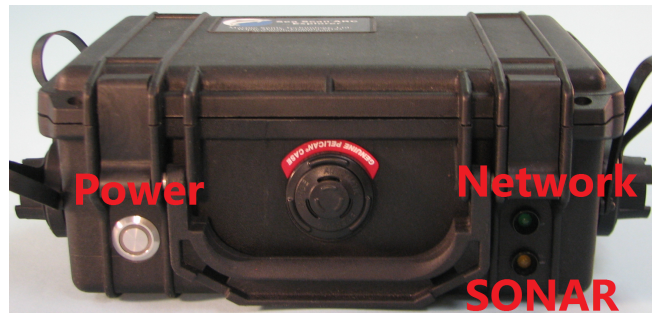
Figure 20: Topside Communications Unit (TCU) Front View Lights

Power Button	
No Light	The power is off.
Dim Blue	CPU is booting; if it stays dimmed, the TCU power is on, but the TCU's processor is not starting. Even if the TCU is turned off, it still draws power.
Bright Blue	Power is on.

Network Status	
Off	The network configuration has Not Completed. Possibly the Ethernet connector isn't connected properly.
Blinking	It has a connection and is communicating with it.
Solid	It is waiting for a connection.

Activity	
Off	No activity has been detected.
Blinking	It is actively communicating.

4.1.2   Connections to the TCU

4.1.2.1   Power

Figure 21: Topside Communications Unit (TCU) Left View

The ARC Explorer system is powered by either AC or DC. Each power source has a separate power cable; the cables are provided with the system.

- If covered, remove the cover, then plug the power cable into the TCU power connector.
- Connect the receiver end to the power source.
- Verify that the power light is off before proceeding.

> **WARNING:** Do not plug in the remaining hardware with the power on.

> **CAUTION:** The power is being drawn from the source at all times, regardless of whether TCU power is on.

4.1.2.2 Tow Cable

- Verify that the covers of both the TCU end of the cable and the TCU towfish connection are clean and clear of debris.
- Verify that the TCU power is off.
- Plug the tow cable into the TCU.

4.1.2.3 Ethernet

Figure 22: Topside Communications Unit (TCU) Right View

The PC connects to the TCU by means of an Ethernet connection. Verify that the connector is clean and clear of debris, then plug the TCU Ethernet cable into the TCU.

The ARC Explorer system will include an accessory and USB connection. These two connections are not yet used.

4.1.3   Connection to a PC

4.1.3.1   Ethernet

The TCU connects to the PC by means of an Ethernet connection. Verify that the the connections are clean and clear of debris, and plug the TCU Ethernet cable into the PC.

4.1.3.2   USB

The ARC Explorer system will include a USB connection, but the connector is not used at this time.

4.1.3.3   Accessory

The ARC Explorer system will include an accessory connection, but the connector is not used at this time.

4.2   Towfish

4.2.1   Tail Assembly

4.2.1.1   Fin Removal

The tail assembly stores the fins of the system and is the access point to the system's inner electronics. Remove the fins by loosening the large bolt at the end of the towfish. The fins slide in and out easily.

To install the fins, simply slide them into place using a backward rocking motion. After the fins are in place, simply tighten the bolt at the end to secure them.

Figure 23: Towfish Tail Assembly

4.2.1.2   Tail Assembly Removal

The entire tail assembly can be removed for maintenance. We recommend performing regular maintenance once every six months. Also check the zinc every three to six months depending on the amount of use.

TIP: The zinc is used to reduce the corrosion of the surrounding metals.

To remove the assembly, remove the three screws (two on the top and one on the bottom) that are right next to the tail assembly. Then just pull the assembly off.

Figure 24: Towfish Tail Assembly Secure Screw

4.2.2   Towcable Connector

The towcable wet end connector is a wet-mate connector. Make sure it is clean and clear of debris. A spray of silicone-based lubricant can be used to clean off any debris and displace the water; it can also be used to make the connector easier to seat.

Figure 25: Towfish towcable wet-mate connection

4.2.3   Variable-Angle Towrail

The Variable-Angle Towrail is designed to allow the towfish user to change the angle of the sonar beam. This capability allows for greater flexibility and the ability to examine static structures such as vertical pilings, walls, etc., or concave surfaces such as ship hulls, barges, drilling platforms, artificial reefs, etc.
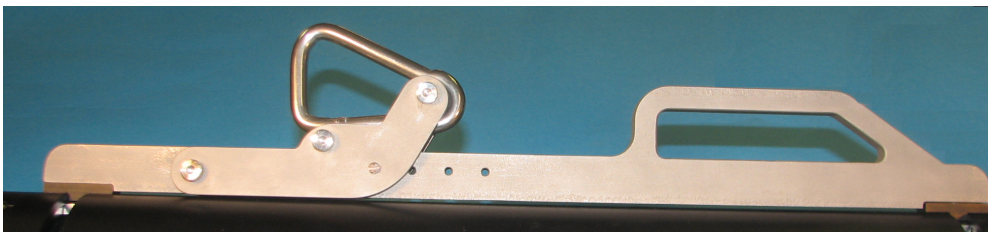

Figure 26: Towrail side view

This new ability to "aim" the sonar beam at vertical structures requires a different approach when operating the towfish. It will also require some advance planning and practice.
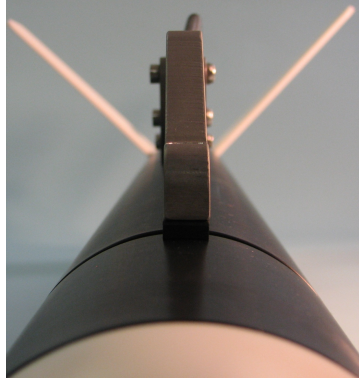

Figure 27: Towrail in the centered position

TIP: Practice using the towfish at the normal angle before attempting a more complex survey.

The following procedures are recommended when using a different tow angle:

- Tow from the bow (forward point of the vessel) to avoid prop wash (propeller turbulence). Midship is an alternative, but the bow is preferred.

- Allow only enough cable for the towfish to run at about 1- to 2 feet (30- to 61 cm) below the surface of the water.

- The towfish distance should be at approximately 10% standoff from the vertical surface.

- Set the range in the software for the water depth.

- Start with an angle of approximately 40° to 45°.

- Closely observe the "grazing angle", the percentage of deviation from straight on at which the sonar beam strikes the vertical or concave surface you are investigating.

4.2.3.1 Adjustment Procedure

Adjusting the Variable-Angle Towrail is an easy process.

- Loosen the two screws located at the top of the towrail. The screws are captive, back them out until they stop. Do not attempt to further back the screw out once it has stopped.
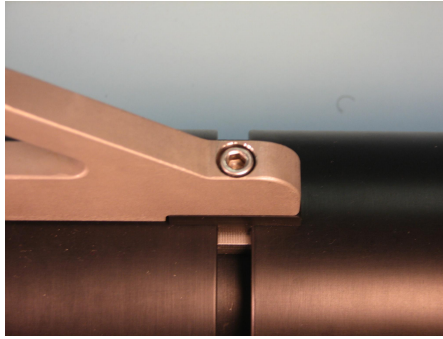
Figure 28: Towrail adjustment screw

- Next, grab both ends of the towrail and slide it left (starboard side) or right (port side).
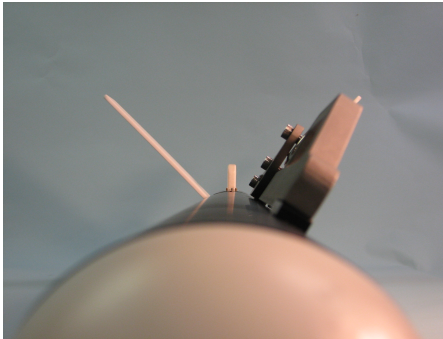
Figure 29: Towrail in an Angled Position

- When you reach the desired angle, tighten both screws.

4.2.3.2   Zeroing Procedure

To return the towfish to normal center, follow this procedure.

- Follow the adjustment procedure back to the marked 0 position.
- Lift the towfish by the rigged towcable while checking the roll measurement on the Sea Scan®Survey program to determine if it is at the correct angle.
- Adjust the rail by the appropriate amount to set the center, rechecking with the above method until 0 is found.

4.2.4   Tranducers

The field-changeable transducers help make the ARC Explorer unique and unequaled in customization. The system arrives with a single towfish and a pair of transducers, but multiple sets of transducers are available and allow customization of the towfish, however needed. For example, one side can be set at 600/1200 kHz and the other at 900/1800 kHz, etc. This system can fit almost any side-scan sonar need.

To remove the transducers, simply loosen the rear bolt with the provided wrench.

Figure 30: Screw removal to access a transducer

Using the thumb grooves, grab the transducer with both hands, lifting the back of the transducer out first and then sliding the front out from under the spacer lip. The back is where the transducer connects to the towfish body, so it might need a good pull to come loose.
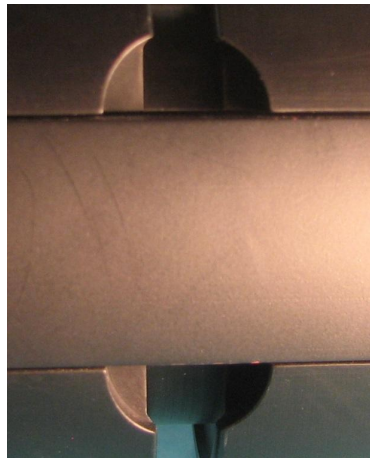

Figure 31: Thumb grooves for transducer removal

At this time, double check that both of the transducer connectors are clean and clear of debris and that the O-Ring is in its proper place.
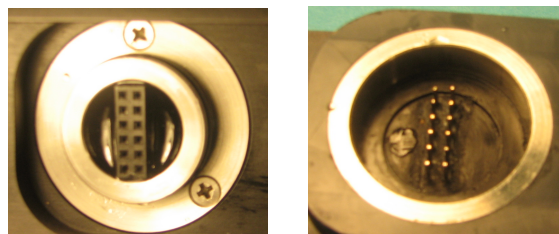

Figure 32: Towfish transducer connection & Transducer Connection

To insert the transducer, simply reverse the removal process.

TIP: Always use the cover for the transducer connector.

4.2.5   Tow Fish Safety Release

An important feature during any operation is the ability to extract the tow fish if it has become snagged in debris or imbedded into the seafloor. The safety release mechanism is designed to engage during such a situation. When the tow fish nose gets so stuck in the seafloor or debris that a strong pull on the tow cable has no effect, the brass shear pin will break, transferring the pull to the safety release mechanism on the rear of the tow fish rail. This action shifts the towing angle toward the tail fin section, causing the tow fish to pull up tail first. Generally, by shifting the angle of pull aft, the tow fish's nose can be extracted out of the debris or seafloor.

Figure 33: Safety Release Mechanism

4.2.5.1   Shear Pin

The brass shear pin is an often overlooked, but quite vital part of the tow fish configuration. Chafe from the tow point on the shear pin during operation can considerably wear the shear pin down and weaken it. Regular inspections of this shear pin should be made, especially after any impact with the bottom or even more frequently if the operating conditions are rough (heavy seas, strong current). During periods of heavy use, this pin will wear and eventually need replacement. Spare shear pins can be found in your system's accessory kit.

Figure 34: Worn Shear Pin in Need of Replacement

4.2.6   Tow Fish Accessories

The Sea Scan ARC Explorer's modular tow fish was designed with integrated accessory capabilities in mind. These accessories can be purchased with your system or added as they are needed.

4.2.6.1   Depressor Wing

The depressor wing will allow you to operate at greater depths without the need to add large amounts of weight to the tow cable or tow fish. The depressor is designed to exert a downward hydrodynamic force on the tow fish when being pulled through the water. This force has the same effect as adding the equivalent weight to the tow fish. The standard depressor has been configured to operate in conjunction with the keel weight for maximum depth performance and stability. With this accessory combination the tow fish can be operated at depths over 100 meters.

Figure 35: Depressor Wing

4.2.6.1.1 Depressor Installation

The depressor wing attaches directly to your ARC Explorer tow fish. The depressor wing will replace your existing tow rail. The wing can be easily removed, if needed, and the depressor wing's tow rail can be used without reinstalling the factory tow rail. The depressor wing's tow rail maintains the full function of the forward handle and the variable-angle adjustments when the wing is removed.

Figure 36: Sea Scan ARC Explorer Tow Fish with a Depressor Wing and Keel Weight

4.2.6.1.1.1 Tools

The tools required to install your depressor wing were included with your system's accessory kit.

- 5/32" Hex Key Driver
- 3/16" Hex Key Driver
- 5/16" Nut Driver
- 7/16" Nut Driver
- Flat Head Screw Driver

4.2.6.1.1.2 Factory Tow Rail Removal

- In order to remove the factory tow rail one of the transducers must be removed. Using a 5/32" hex key driver remove one of the transducers, for details refer to the Transducers section of the manual.
- Using a 3/16" hex key driver loosen both tow rail screws, for details refer to the Variable Angle Tow Rail Adjustment Procedure section of the manual.
- Slide the tow rail down the angle adjustment grooves and out of the empty transducer slot.

- The Tow Fish Safety Release must be removed from the factory tow rail and installed on the depressor tow rail. Using a 5/32" hex key driver and a 7/16" nut driver remove the rear safety release screw.

Figure 37: Safety Release Rear Screw Removal

- Using a flat head screw driver and a 5/16" nut driver remove the brass shear pin. Inspect the brass shear pin and replace if necessary.
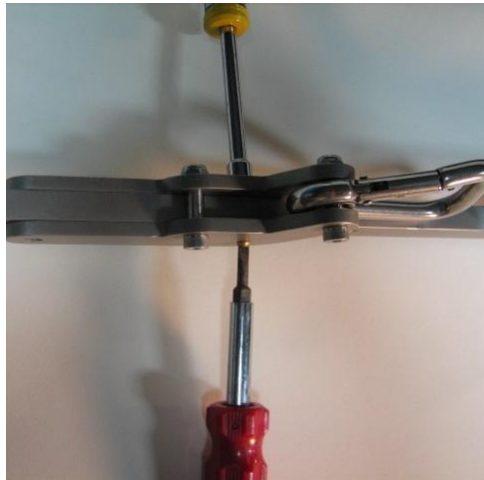

Figure 38: Safety Release Shear Pin Removal

- Remove the tow fish safety release.

Figure 39: Safety Release Ready to Remove

4.2.6.1.1.3 Installing the Depressor

- Install an angle adjustment decal forward of front tow fish angle adjustment groove. Align the decal's center mark with the tow fish top center index mark.
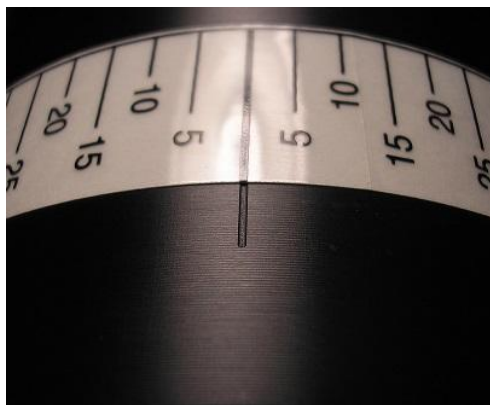
Figure 40: Angle Adjustment Decal Installation

- Loosen both depressor tow rail nuts by hand until they stop and align them with the tow fish angle adjustment grooves. Slide the nuts along with the depressor tow rail assembly into the angle adjustment grooves, one at a time, until they are just engaged. Once both nuts are engaged evenly slide the depressor tow rail to the top and align the tow rail with the top center index marks.

Figure 41: Tow Rail Nut Aligned with the Tow Fish Angle Adjustment Groove

- Using a 3/16" hex key driver tighten the rear tow rail screw.

Figure 42: Tighten the Rear Tow Rail Screw

- Using a 5/32" hex key driver remove the lower rear depressor wing tow rail screw.

Figure 43: Remove the Lower Rear Depressor Wing Tow Rail Screw

- Lift the back of the depressor wing up, rotating it toward the front of the tow fish until it stops. This will allow access to the forward tow rail screw. Ensure alignment with the front top center index marks and tighten the forward tow rail screw using a 3/16" hex key driver.

WARNING: Hold the wing assembly up during the next steps to prevent it from falling, possibly causing personal injury.
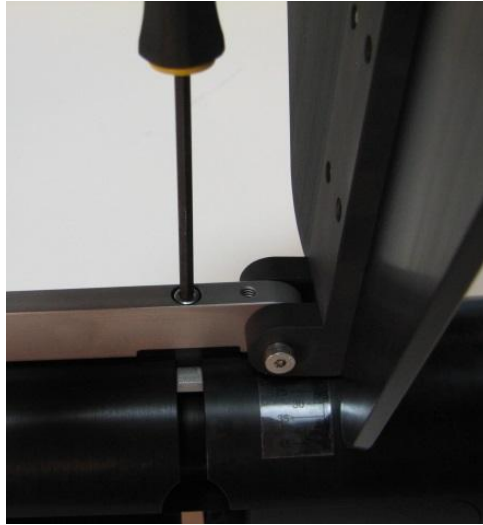

Figure 44: Lift the Wing and Tighten the Front Tow Rail Screw

- Reinstall the Tow Fish Safety Release on the tow rail in the third position from the rear. Follow the removal procedure in reverse order.

Figure 45: Reinstall the Tow Fish Safety Release

- Rotate the depressor wing down and reinstall the lower rear depressor wing tow rail screw using a 5/32" hex key driver.

Figure 46: Install the Lower Rear Depressor Wing Tow Rail Screw

- Using a 5/32" hex key driver reinstall the removed transducer, for details refer to the Transducers section of the manual.

- Install four large fins into the tail assembly. Two additional large fins were provided with your depressor kit.

- Your depressor is ready to use. Follow the tow fish set up procedures to finish preparing your tow fish for deployment. Prior to deploying the tow fish read over the depressor operation section of the manual.

4.2.6.1.1.4 Depressor Adjustment

The depressor has been configured to operate in conjunction with the keel weight for maximum depth performance and stability. The depressor and keel weight are capable of applying 60lbs to over 150lbs of weight on the cable dependent on speed. The modularity of the ARC Explorer tow fish design will allow you to reconfigure the hardware to best meet your operational weight and depth requirements. Please refer to the following procedures for reconfiguring your tow fish.

- The best method for reducing the weight on the cable is to remove the depressor and operate with just the keel weight. This will eliminate the more dynamic loading. This reduces the cable load to about 40lbs. Make sure to adjust the tow point for proper balance in water after removing the depressor.

- The depressor angle can also be adjusted to reduce the weight on the cable. This is accomplished by replacing the angle adjustment brackets on the depressor with a smaller size one. Angle adjustment brackets are available for purchase as an optional kit. Follow these procedures for adjusting the depressor angle.

- Using a 5/32" hex key driver remove the lower and upper rear depressor wing tow rail screws.
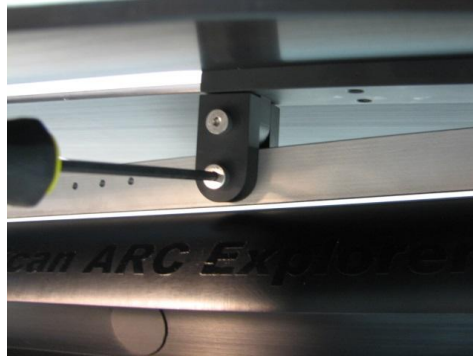
Figure 47: Remove the Lower and Upper Rear Depressor Wing Tow Rail Screw

- Remove the angle adjustment bracket and replace it with a smaller bracket. Reinstall the lower and upper rear depressor wing tow rail screws using a 5/32" hex key driver.

- Check and adjust the tow fish balance in water after removing the depressor. Ensure to perform this step while towing the the tow fish at the desired speed and use the Sea Scan Survey Software to verify the pitch and roll.

4.2.6.1.1.5 Depressor Removal

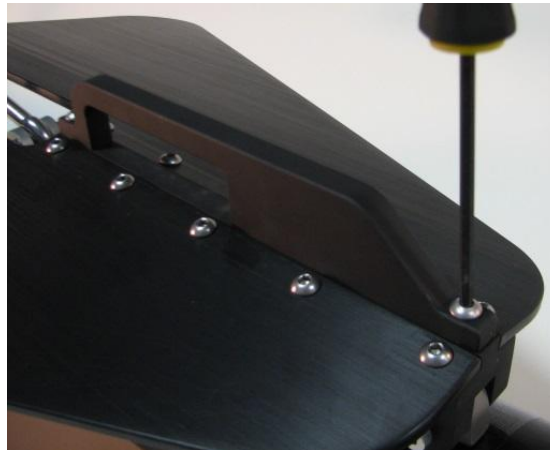- Using a 5/32" hex key driver remove the two depressor wing handle screws.

Figure 48: Remove the Depressor Handle Screws

- Using a 5/32" hex key driver remove the two depressor wing tow rail screws.
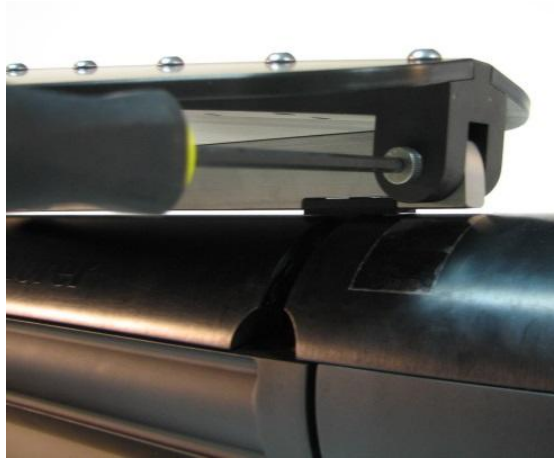
Figure 49: Remove the Depressor Tow Rail Screws

- Using a 5/32" hex key driver install the depressor wing handle on the top of the tow rail.

Figure 50:Install the Depressor Wing Handle

4.2.6.1.2 Depressor Operation

Using the tow fish with the depressor wing will require some changes from the normal methods of operation. The load applied by the depressor wing is speed dependent. As the tow speed is increased the pull force is increased. This does not mean that the faster you go the deeper you can operate the tow fish. The drag force that causes the fish to lift up will also increase with speed. This increased drag force will reduce the effective weight that the depressor wing adds to the cable. The depressor wing is most effective with speeds ranging from 2 to 4 knots.

WARNING: The depressor wing is capable of applying over 100lbs of force on the cable. To ensure safe operation please read over and abide by the following precautions:

- Inspect all tow cable strain reliefs for proper attachment and wear and replace as necessary.

- Inspect the boat strain relief attachment line for wear and ensure that it is adequately rated.

- Ensure that the boat is adequately rated for the additional load that will be added by the depressor wing.

- Ensure that the boat is as stationary as possible during deployment and recovery. Any flow over the depressor will induce an additional load on the cable. Use extreme caution when deploying and recovering in areas with fast moving current.

- The maximum suggested tow speed for the tow fish with the depressor attached is 5 knots.

4.2.6.2   Keel Weight

The keel weight attaches to the bottom of the tow fish and provides an integrated and easily handled solution for adding weight to the tow fish. The keel weight is designed to increase the weight of the tow fish by 14lbs while minimizing the added drag. This will allow you to operate the tow fish at greater depths with less cable being deployed.

Figure 51: ARC Explorer Tow Fish Keel Weight

4.2.6.2.1 Installing the Keel weight

To install the keel weight on your tow fish you will need the following tools and parts that were supplied with the system.

- Screw Driver

- Tow Fish Shipping Case (This helps hold the tow fish while it is upside down.)

Complete the following steps to install your keel weight.

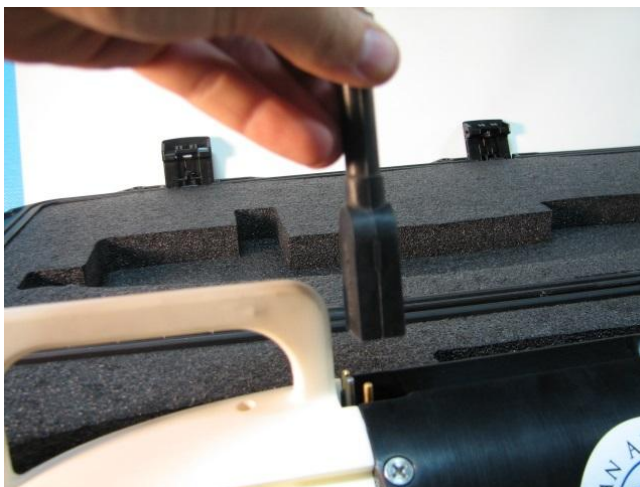- Remove the tow cable protective plug.

Figure 52: Remove the Tow Cable Protective Plug

- Place the tow fish upside down in it's shipping case. Place the the tow fish against one side of the cut out to help stabilize it.

Figure 53: Place the Tow Fish Upside Down in the Case

- Place a keel weight screw in each tow rail nut as shown.

Figure 54: Install the Nut on the Screw

- Install one tow rail nut in each angle adjustment groove through the openings at the transducers. Slide both nut and screw assemblies to the center of the tow fish.

Figure 55: Install the Tow Rail Nut

- Remove the screws leaving the tow rail nuts centered in the tow fish.
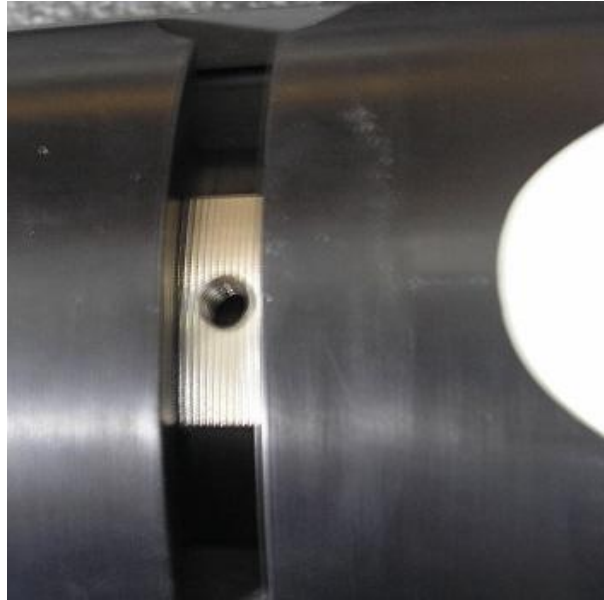
Figure 56: Remove the Screw

- Place the keel weight on the tow fish and start to install the screws by hand. You may have to shift the keel around to get the screws started.

Figure 57: Place the Keel Weight on the Tow Fish

- Center the keel weight on the tow fish and tighten the screws.

Figure 58: Center the Keel and Tighten the Screws

- Your keel weight is ready to use. Follow the tow fish set up procedures to finish preparing your tow fish for deployment.

4.2.6.3   Auxiliary Interface Ports

The Arc Explorer tow fish is equipped with two auxiliary interface ports. These ports provide an integrated interface for add-on sensors such as altimeters and depth sensors. The sensors are designed to be field installable/swappable, similar to the transducers. All ARC Explorer tow fish are equipped with these auxiliary ports from the factory, although older systems may require a factory hardware upgrade to enable them.
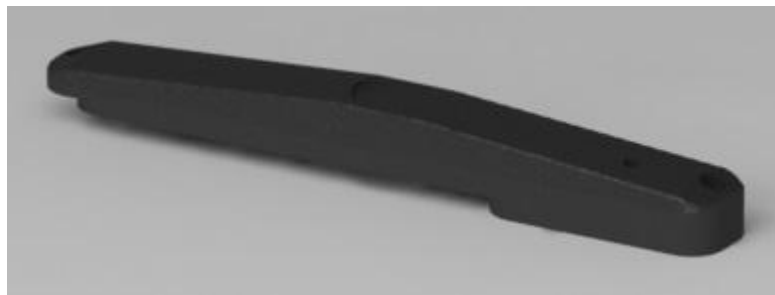

Figure 59: Altimeter and Depth Sensor Auxiliary

4.2.6.3.1 Hardware Identification

To identify whether your tow fish is "hardware ready" follow the proceeding steps:

- Locate the serial number decal on the top of the tow fish or underneath the port transducer

- Locate the "PN:7ARC1-x" field on the decal. If the "x" is a number greater than "3" (EX: PN:7ARC1-3) then your tow fish is hardware ready and you may order or install your auxiliary sensor. If the "x" is a number less than "3" then your tow fish will require a factory hardware upgrade. For information on obtaining a hardware upgrade please contact us.

Figure 60: Top and Port Serial Number Decal

To identify whether your tow fish has had the factory hardware upgrade follow the proceeding steps:

- Locate the top or bottom auxiliary port cover.

Figure 61: Top Auxiliary Port Cover

- If the auxiliary port cover is labeled "Auxiliary Port" than the factory hardware upgrade has been completed. If you are still unsure or have questions about the hardware upgrade please feel free to contact us.
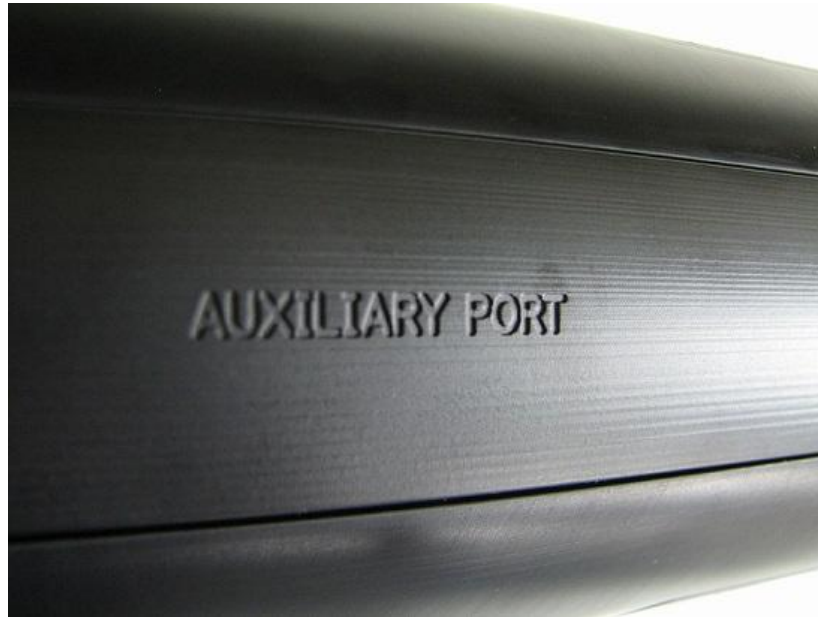

Figure 62: Auxiliary Port Label

4.2.6.3.2 Removing the Auxiliary Port Cover

Prior to installing an auxiliary sensor you will need to remove one of the auxiliary port covers. To identify which auxiliary port cover you need to remove please refer to the installation instructions for your specific device. The removal instructions are the same for both auxiliary port covers.

To remove the auxiliary port cover on your tow fish you will need the following tools and supplies that were supplied with the system and auxiliary sensor.

- 3/32" Hex Key Driver (Supplied with auxiliary sensor)
- 5/32" Hex Key Driver
- 1/4-20 Screw 2ea. (Supplied with auxiliary sensor)

Complete the following steps to remove the auxiliary port cover.

- Using the 3/32" and 5/32" Hex Key Driver remove the two auxiliary port cover screws. Retain the screws for use with the auxiliary sensor or to reinstall the auxiliary port cover.

Figure 63: Auxiliary Port Cover Screw Removal

- Thread the supplied 1/4-20 screws into the empty auxiliary port cover screw holes by hand until they just stop. They will not fully seat into the auxiliary port cover. Do not over tighten or damage to the auxiliary port cover sealing surface or tow fish may occur.

Figure 64: Insert Removal Screw

- Grab the exposed portion of the 1/4-20 screws and pull evenly to remove the auxiliary port cover.
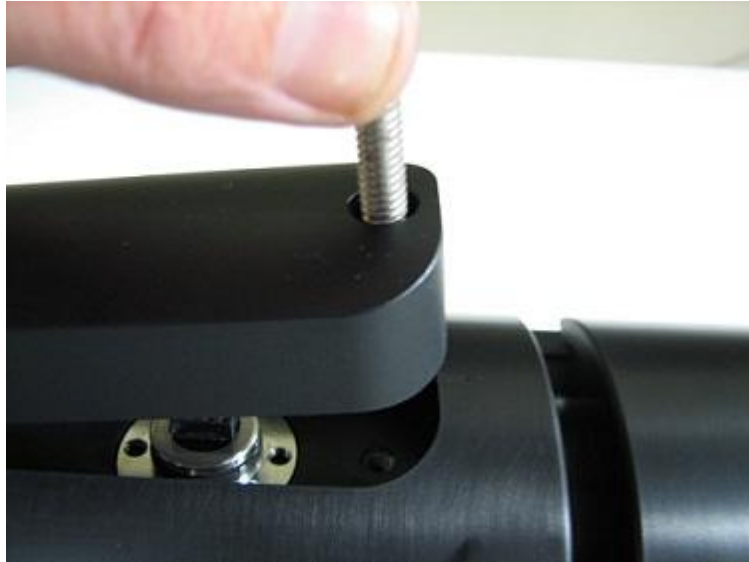
Figure 65: Remove the Auxiliary Port Cover

- Inspect o-rings and mating surfaces for contamination, damage or corrosion prior to installing or reinstalling your sensor.
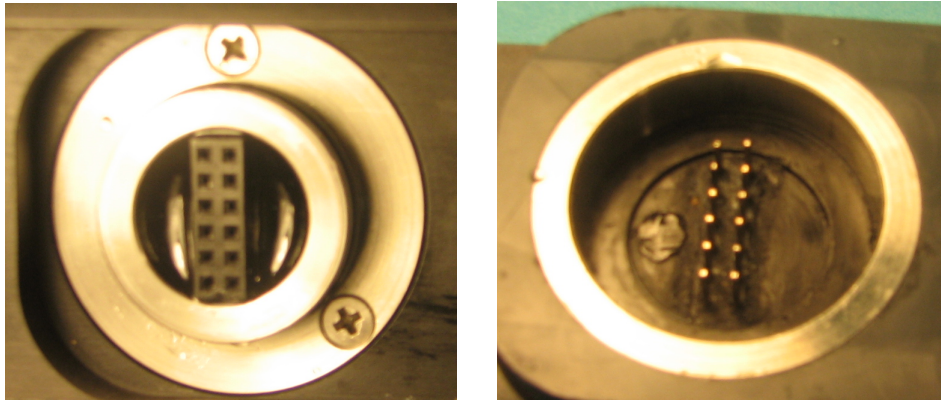

Figure 66: Towfish Auxiliary Connection & Auxiliary Sensor Connectors

4.2.6.3.3 Depth Sensor and Altimeter

To install the depth sensor or altimeter/depth sensor on your tow fish you will need the following tools and supplies that were supplied with the system and auxiliary sensor.

- 3/32" Hex Key Driver (Supplied with auxiliary sensor)
- 5/32" Hex Key Driver
- Auxiliary port cover screws
- Depth sensor or altimeter/depth sensor

Complete the following steps to install your auxiliary sensor.

- Using the 3/32" and 5/32" Hex Key Driver remove the bottom auxiliary port cover. For details refer to the Removing the Auxiliary Port Cover section of the manual.

- Inspect o-rings and mating surfaces for contamination, damage or corrosion prior to installing or reinstalling your sensor.
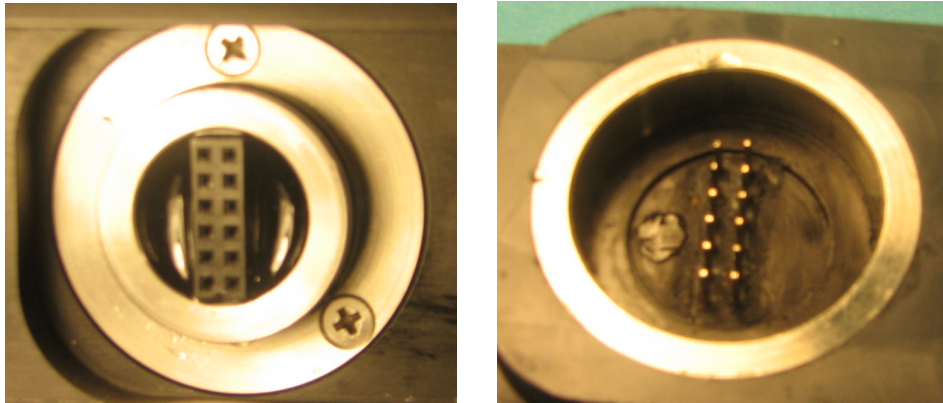

Figure 67: Towfish Auxiliary Connection & Auxiliary Sensor Connectors

- Install the auxiliary sensor into the bottom auxiliary port.

Figure 68: Install the Auxiliary Sensor

- While holding the auxiliary sensor in place, reinstall the auxiliary port cover screws using the 3/32" and 5/32" Hex Key Driver.

Figure 69: Install the Auxiliary Sensor Screws

- Your auxiliary sensor is now ready to use. Refer to the auxiliary port software operation section of this manual for more information.

CAUTION: The depth sensor port contains a high resolution pressure sensor that converts water pressure into depth data. Care must be taken to ensure the reliability and accuracy of you sensor. Do not place any objects into the sensor port or permanent damage to the sensor may occur. Ensure to flush the sensor with fresh water after each use and allow to dry.

**Figure 70: Protect the Depth Sensor Port**

4.2.6.3.3.1 Software Operation

The Depth Sensor and Altimeter auxiliary device integrates with Sea Scan Survey automatically. The device is detected when the ARC Explorer Towfish automatically when starting the ARC

Explorer Interface driver.

The Depth Sensor will need to be zeroed out each time it is used. This ensures that the depth sensor adjusts for ambient air pressure which can vary from day to day and at different locations due to elevation and the weather. To zero the depth sensor open the Sonar Interface Advanced Settings:

Open the Sonar Interface settings page by selecting Tools->Settings from the main menu. Select Sonar->Interface. Then click on the Advanced Settings Button.
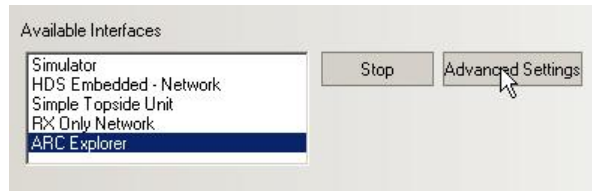
Click on the Zero Pressure Reading Button. This offset is stored in the arc_sonar.ini file and will be used every time the ARC Explorer interface driver is started.
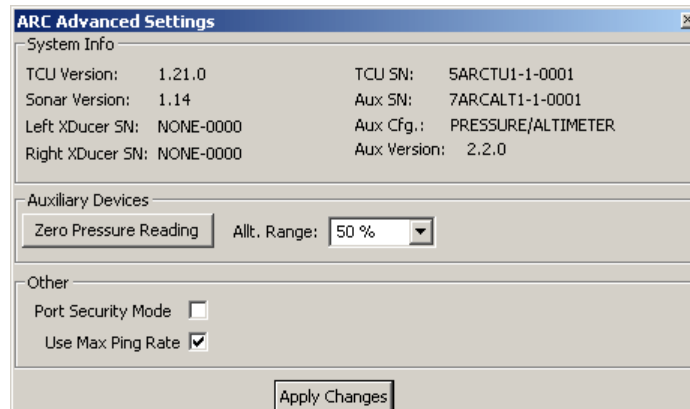

Figure 71: Sea Scan ARC Explorer Interface Advanced Settings Window

The Altimeter range is set automatically to be a percentage of the Side Scan Sonar range. By default it is set to 50% of the Side Scan Sonar range. The percentage can be set in the Sea Scan ARC Explorer Interface Advanced Settings window as shown above. To select a different range percentage for the altimeter use the Alt. Range pull down box and then click the Apply Changes button.
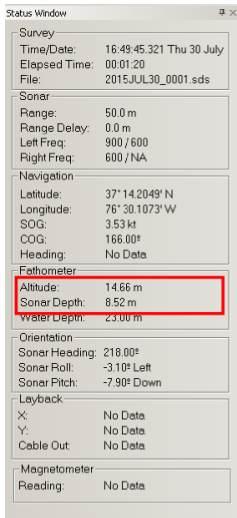
The data is displayed in the Status Window as Sonar Depth and Altitude. The Water Depth data is from an external echo sounder that is connected to the computer that Sea Scan Survey is running on. Below is a screen shot of the Status Window with the Sonar Depth and Altitude Highlighted.

4.2.7   Towing Characteristics

4.2.7.1   Standard Tow Fish Towing Characteristics

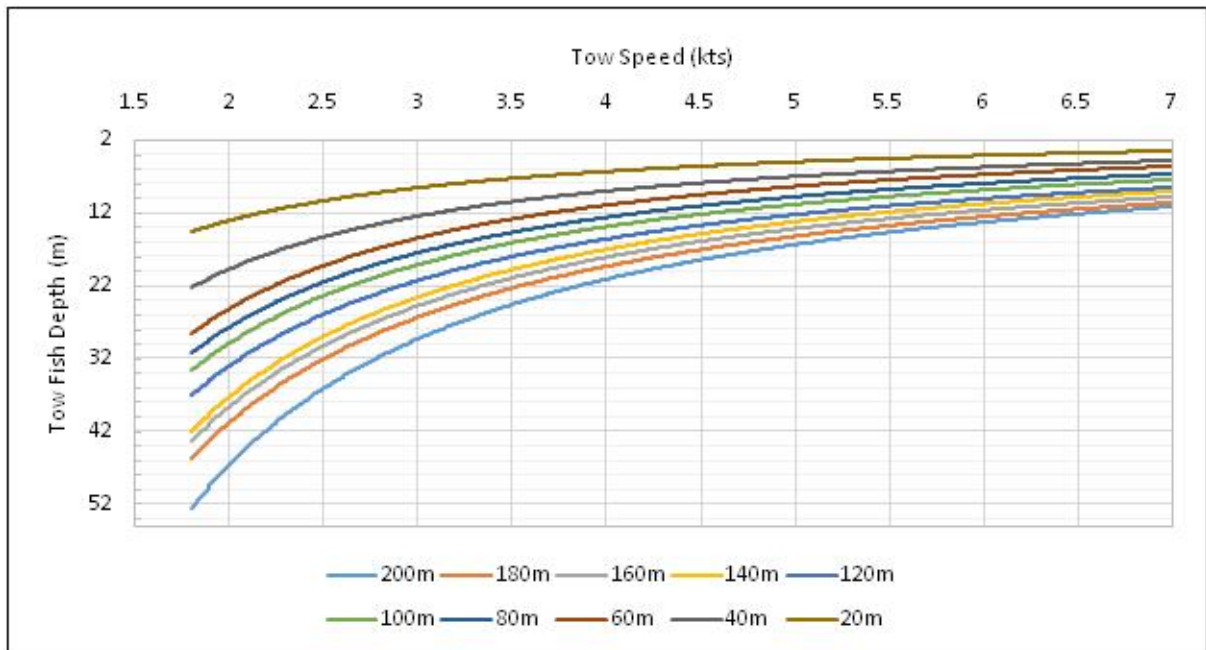**Tow Fish Configuration: Standard**

Figure 72: Tow Fish Depth vs Speed Per Cable Length

4.2.7.2   Depressor and Keel Weight Towing Characteristics

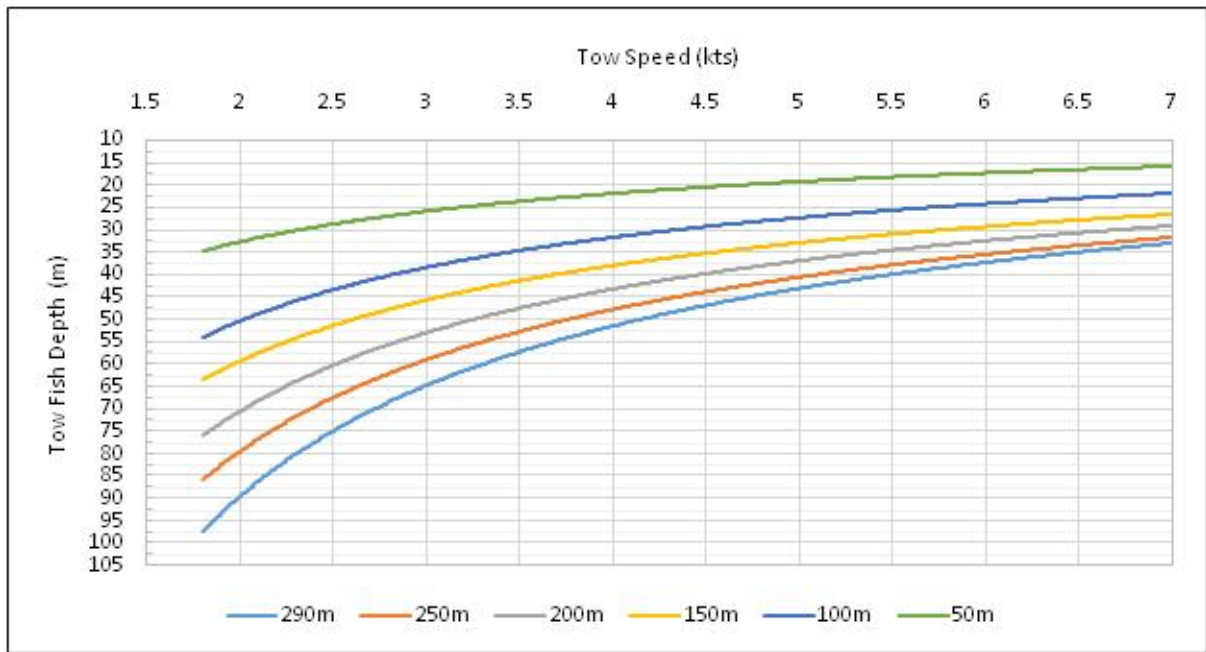**Tow Fish Configuration: Keel Weight and Depressor**

Figure 73: Tow Fish Depth vs Speed Per Cable Length

4.2.7.3   Keel Weight Towing Characteristics
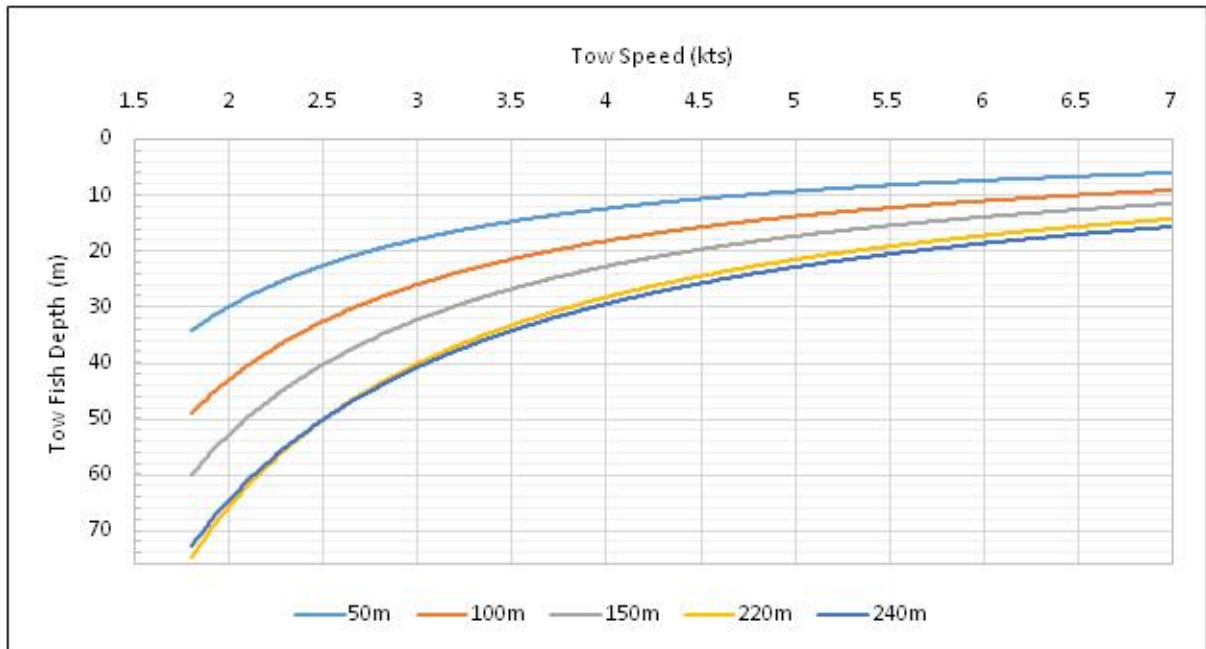
Tow Fish Configuration: Keel Weight

Figure 74: Tow Fish Depth vs Speed Per Cable Length

4.3   Maintenance, Lay-up and Care

WARNING: The TCU is intended only to be opened by Marine Sonic Technology for servicing. It is not intended to be opened by the customer.

To protect the ARC Explorer towfish and ensure its viability every time you require its use, we strongly advise that you follow the cleaning and inspection procedures below before and after every operation.

- Carefully inspect all connectors and ensure that they are absolutely dry. If moisture is evident, blow the connectors dry with compressed air. If compressed air is unavailable, employ a commercially available aero-duster can.

- Use a water-displacing agent (e.g., WD-40™) liberally to lubricate and displace any moisture.

- Inspect the o-ring seals inside each connector and ensure that they are tightly seated and undamaged before and after each use. If necessary, use a spare o-ring from the spare-parts kit or one that is stored in the connector cap.

- Always replace the protective end cap on the towfish connector before storing the towfish.

CAUTION: The towfish connector, towcable, TCU, and the transducers contain o-rings that are required for proper operation. Make sure they are seated, undamaged, and dry before and after use.

NEVER attach the towcable connectors when the power is on.

WARNING: The TCU draws power even when the power is off, so make sure to remove the power cable from the source when the system is not in use.
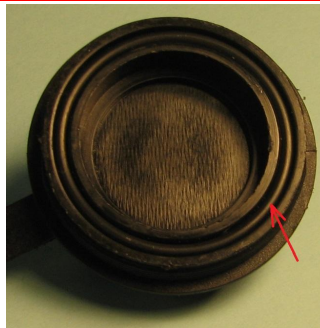

Figure 75: Extra O-Ring inside the Connection Cap

TIP: Spare o-rings are stored in the covers of the connectors.

5   Troubleshooting

The most common Sea Scan® Survey errors are "Cannot Connect to Topside" and "Cannot Connect to sonar." The lights (in different configurations) on the front of the TCU correspond to issues that can be fixed by the user to solve these errors.

> TIP: The proper approach to power cycling the electronic devices is to unplug the power source for at least 10 seconds.

The front lights on the TCU are color coded:

POWER	NETWORK	sonar

Cannot Connect to Topside:

> TIP: If you start the ARC Explorer Driver before the TCU's Network light is on, the system will give this error. The ARC Explorer TCU takes time to establish a connection with the Windows PC due to Windows auto configuration process.

No power light:

1. Check the fuse. Replace if needed (spare fuses come with the accessory kit).

    a. (Please see the Multimeter guide below for the procedure.)

> CAUTION: Sometimes a fuse can appear to be OK. However, always use the multimeter from the included accessory kit to verify its resistance. Using the Resistance/Ohm measurement, verify that it is less than 1 Ohm.

2. Check the battery (should be a minimum of 11 V to power the system).

    a. (Please see the Multimeter guide below for the procedure.)

3. Check that the power cables are seated and connected properly [red = positive (+) and black = negative (-)].

If these steps do not fix the issue, please call ATLAS North America for further troubleshooting steps.

Blinking power light:

1. Check the battery (should be a minimum of 11 V to power the system). (Please see the Multimeter guide below for the procedure.)

2. Check that the power cables are seated and connected properly [red = positive (+) and black = negative (-)].

Dim power light:

1. The processor didn't turn on power to the TCU. If the light continues to stay dim, please call ATLAS North America.

Power light is bright but no network light:

1. Check the network cable.

2. Double check that the Ethernet connection is seated properly in the computer.

TIP: Some computers have lights on the network jack that indicate a proper connection.

Power light and network light are on:

1. Verify that the Windows Network is connected.

2. Check the Network Settings to verify that the IP Address is correct.

3. Check that the firewall is either turned off or that the exception was properly installed by the Sea Scan ARC Explorer Driver.

TIP: The Address for most Windows users should be set for auto detection.

4. If using a static IP address, make sure that the TCU is using a compatible IP address on the same network as the PC.

TIP: For more information on how to set the IP Address of the TCU, please refer to the Set Address function in the help manual for the Topside Detective software.

If these troubleshooting steps do not fix this issue, please call ATLAS North America for further troubleshooting.

Cannot connect to sonar:

1. Stop the ARC Explorer sonar Manager in the Sea Scan Survey software.

2. Turn off the Topside Communications Unit.

CAUTION: Turn off the TCU before continuing. Plugging and unplugging a powered TCU may result in damage.

3. Verify that the towfish wet-met connector is fully mated.

4. Verify that the towfish connection is fully engaged on the TCU.

CAUTION: If using a winch, double check all of the connections for the towfish cable.

5.   Turn the TCU back on.

6.   Wait for the Network light to turn back on. As previously stated, this can take a few minutes, especially on Windows XP PCs with auto-IP assignment.

7.   Start the ARC Explorer sonar Manager in Sea Scan Survey.

8.   If it still does not connect, try the process above again using a different cable. Make sure you stop the ARC Explorer sonar Manager and to TURN OFF the TCU.

9.   If the second cable doesn't work, check for physical damage. If none is detected, please call ATLAS North America.

NAV Not Available:

TIP: An opened Survey (New or Continued) is required for Navigation data to update in the Software.

1.   Check that the GPS is plugged in.
2.   Check that the GPS port is open in Sea Scan Survey.

TIP: It may be necessary to use the Windows Device Manager to determine which port the GPS is using.

3.   Check that the GPS is receiving data at the Test Communications button/window.

    a.   Verify that the GPS is receiving RMC or GGA strings.

Understanding NMEA Strings

NMEA strings are sets of data-separated fields. Each field will represent things like time, latitude, longitude, and errors. Fields are separated by the standard comma (,).

Reading NMEA Strings

An RMC NMEA String will have an A or a V in the second field. An A means it has valid data, and a V means it is searching for data. The third and fifth fields, which contain latitude and longitude information, will usually be empty if a V is present in the second field.

A GGA NMEA String does not contain the A or V field as does the RMC, but the third and fourth fields, which contain latitude and longitude information, will be empty.

b.   If one of the above situations is occurring:

Make sure you are outside so the GPS has access to the satellites.   Common signal obstructions include cloudy conditions and metal enclosures. Another cause may be that the GPS has not been connected in a long time; it can sometimes take a long time to determine its position. Ten minutes is common, but satellite acquisition can take up to 2 hours.

4.   If you are receiving no data from the GPS on the Test Communications Window,

a.   Check that the correct port is being used for the GPS.

b.   Check that the correct baud rate is being used for your particular GPS (The standard is 4800).

5.1   Multimeter

This section will detail how to use the multimeter included with the accessory kit in the Sea Scan ARC Explorer system. A multimeter is an electronic measuring instrument that combines several measurement functions in one unit. We will use it primarily for checking for voltage, current, and resistance.

5.1.1   How to Check Fuses

1.   Set the meter to   .

2.   Place a probe at each connector of the fuse.

3.   If the reading is less than 5   , the fuse is good.

4.   If not, replace the fuse.

5.1.2   How to Check Battery Voltage

1.   Set the meter on V.

2.   Hold the red probe on the plus (+) terminal, then touch the black probe to the negative (-) terminal.

3.   The battery voltage should read 11 to 24 V.

4.   If not, replace or charge the battery.

5.1.3   How to Check for Broken Connections

5.1.3.1   Towcable

1.   Set the multimeter on   .

2.   Hold a prob on one clip, then insert the other probe into each connector at the other end of the cable in the following sequence:

Pin 1.   Red

Pin 2.   Black

Pin 3.   Not Assigned

3. The reading should be close to 0   .

4. If not, replace the power cable.
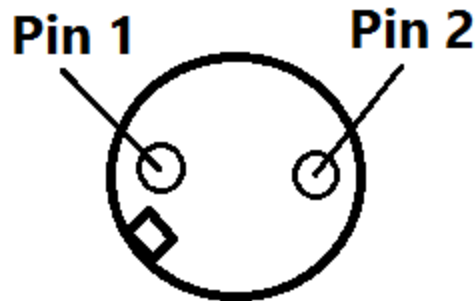

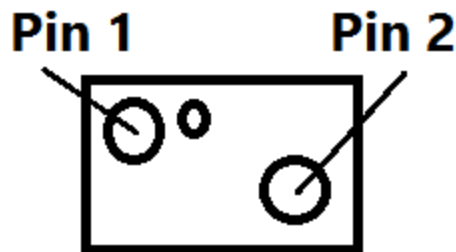**Figure 76: Towcable TCU Connection Pinout**

Figure 77: Towcable Wet-Mate Connector Pinout

5.1.3.2   Power Cable

1. Set the multimeter on   .

2. Touch each of the pins on the other end with the other probe in the following sequence.

Pin 1 -> Pin 2   Pin 2 -> Pin 1

Pin 1 -> Pin 1   Pin 2 -> Pin 2

*Pin 3 is not used.

3. The reading should be close to 0 .

4. If not, contact Marine Sonic Technology, Ltd for repair.
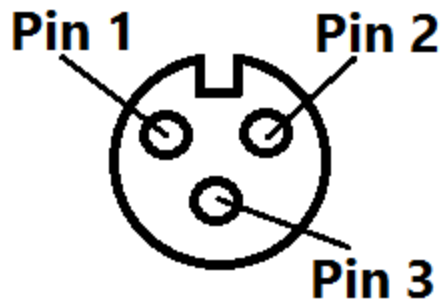
Figure 78: Power Cable TCU Connection Pin Out

6   Revision History

Version	Comments	Issue Date
4.1.0	• Added Sea Scan Survey 4 Channel Waterfall Information (Master / Slave Views). • Added Sea Scan Survey Data Output settings. • Added Depth and Altitude Sensor installation and operation. • Added Auxillary Interface Ports section. • Updated Depressor Wing Information. • Added ARC Explorer Towing Characteristics Section	November 2015
4.0.0	• Added Depressor Wing and Keel Weight Installation. • Added Safety Release Operation. • Updated MST Company Information.	November 2014
3.1.0	• Added PC network information and fixed some formatting issues.	July 2013
3.0.0	• Initial release	April 2013

7   Glossary

absorption	The diminishment of the returning pulse caused by the impact of the acoustic signal against objects, materials, or the sea bottom

acoustic shadow	Literally, the shadow an object on the bottom casts to its side in relation to the transducer; the transducer must "see" this entire shadow so that the height of that object can be calculated
acoustic signal	The fan of sound emitted from the transducer
active sonar	A system that transmits an acoustic signal through the water that reflects off objects, then is returned
angle of incidence	The angle at which a straight-line sonar pulse hits an object
ARC	Adaptive Resolution CHIRP
AUV	Autonomous Underwater Vehicle
axial layback	The offset distance from the position of the towfish to the navigation antenna
backscatter	Reverberation caused generally by sea conditions, bottom roughness, and angle of incidence
baud rate	A unit for measuring data transmission speed, where one unit equals 1 bit per second
beam spreading	The widening angle of a sonar beam as it moves farther from the transmitter
BMP	Bitmap, a graphic file format commonly used in Microsoft Windows© applications
Bow	The front section of a boat or other vessel
buffer	To load, as in loading a file. Also, pulling information from a file and putting it into memory
CD	compact disk
channel	Another term used to describe the transducer track from either side of the towfish that appears in the sonar window. The left channel refers to the left (port) transducer track; the right channel refers to the (starboard) track.
COG	Course Over Ground; also known as Course Made Good
color look-up table	A way of mapping data by assigning an artificial color
contrast stretching	An operation that remaps the color look-up table based on the lower and upper threshold limits the operator elects from the histogram
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
ETE	Estimated Time EnRoute
fathometer	An acoustic device that measures the current water depth
FAQ	Frequently Asked Questions
frequency	The number of sound waves that pass any specific point in one second
gain	Amplification of a signal
GB	GigaByte (1,000,000,000 Bytes)
GHz	GigaHertz (1,000,000,000 Hertz)
GIS	Geographic Information Services
GPS	Global Positioning System
Grazing angle	The percentage of deviation from straight on at which the sonar beam strikes the vertical or concave surface
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
lane	The straight track the surface vessel follows while towing the towfish
lateral layback	The offset distance to the left (port) or (starboard) between the navigation antenna and the towfish

layback (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
MB	MegaByte (1,000,000 Bytes)
MRU	Most Recently Used
nadir	A point along the swath that is directly beneath the towfish; a location in the acoustic pulse
NMEA	The National Marine Electronics Association
NMEA Protocol 0183	A standardized protocol that allows marine instruments to transmit and receive depth information. This communication is based on a block transmission or groups of NMEA 0183 sentences, which are transmitted over the serial cable. Each sentence has a header that uniquely identifies the source of the data and the information contained in the data string.
NOAA	National 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
PC	Personal Computer
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
RAM	Random Access Memory
range	The maximum distance from the transducers that the sonar signal can detect usable signals
range delay	The distance (or range) the Sea Scan software is told to delay after pinging before it starts to look at acoustic returns
range marker	A scale reference line shown in the sonar window
reflectivity	The strength of the sonar return off an object or material
RGB	Red/Green/Blue
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

TCU	Topside Communications Unit
topside processor	The control unit an operator uses on the towing vessel to collect and observe the incoming data from the transducers
towfish	The device that is towed through the water on which the transducers are mounted
transducer	The projector and hydrophone that make up an active sonar system
true range (ground range)	The horizontal distance from the towfish to the object or bottom location
TVG	Time-Varied Gain; a process where amplifier gain is changed based on time and matched with returning signals between outgoing pulses of the side-scan sonar
.sds	sonar Data Stream, the extension that the software attaches to the names of data files
USB	Universal Serial Bus
UTM	Universal Transverse Mercator, a coordinate mapping system that maps to a grid rather than to latitude/longitude
Universal Length Unit	A standard for measurement of areas in user-specified units
water column	The track along the bottom immediately beneath the towfish; this track provides supplementary information to the operator, such as the altitude of the towfish relative to the water's depth or the presence of sea clutter
waterfall	A term used to describe a display that puts the newest data at the top and scrolls the data down like a waterfall
wavelength	The distance between acoustic waves
waypoint	A position of interest made and displayed on the navigation Plotter
WVS	World Vector Shoreline
.xvy	The extension that the software attaches to the names of survey files
XTE	Cross-Track Error

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