

2050-DSS SIDE SCAN AND SUB-BOTTOM SYSTEM

USER HARDWARE MANUAL

0024048 REV B

11/30/2022



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ATTENTION – READ THIS FIRST!

All personnel involved with the equipment installation, operation, or maintenance described in this manual should read and understand the warnings and cautions provided below.

CAUTION! This equipment contains devices that are extremely sensitive to static electricity. Therefore, extreme care should be taken when handling them. Normal handling precautions involve using anti-static protection materials and grounding straps for personnel.

WARNING! High voltage may be present in all parts of the system. Therefore, use caution when the electronics are removed from their containers for servicing.

CAUTION! Operation with improper line voltage may cause serious damage to the equipment. Always ensure that the proper line voltage is used.

Warnings, Cautions, and Notes

Where applicable, warnings, cautions, and notes are provided in this manual as follows:

WARNING! Identifies a potential hazard that could cause injury or death.

CAUTION! Identifies a potential hazard that could damage equipment or data.

NOTE: Recommendations or general information that is particular to the material being presented.

HARDWARE VARIATIONS AND COMPATIBILITY

The 2050-DSS Side Scan and Sub-Bottom System contains both standard and proprietary hardware. EdgeTech may change the standard components due to their availability or performance improvements. Although the component manufacturers and their models and styles may change from unit to unit, replacement parts will generally be interchangeable.

EdgeTech will make every effort to see that replacement components are interchangeable and use the same software drivers (if applicable). At times, however, direct replacements may not exist. When this happens, EdgeTech will provide the necessary drivers with the replacement part, if applicable.

EdgeTech may also change certain hardware per customer requirements. Therefore, portions of this manual, such as parts lists and test features, are subject to change. These sections should be used for reference only. When changes are made that affect system operation, they will be explicitly noted. Also, some options and features may not be active in the customer's unit at the time of delivery. Upgrades will be made available when these features are implemented.

Contact [EDGE TECH CUSTOMER SERVICE](#) with any questions relating to compatibility.

ABOUT THIS DOCUMENT

We, the employees at EdgeTech, would like to thank you for purchasing a 2050-DSS Side Scan and Sub-Bottom System. At EdgeTech, our policy is to provide high-quality, cost-effective products and support services that meet or exceed your requirements. We also strive to deliver them on time and to look for ways to improve them continuously. We take pride in the products we manufacture and want you to be entirely satisfied with your equipment.

Purpose of this Manual

The purpose of this manual is to provide the user with information on the setup and use of EdgeTech's 2050-DSS Side Scan and Sub-Bottom System. Although this manual encompasses the latest operational features of the 2050-DSS Side Scan and Sub-Bottom System, some features may be periodically upgraded. Therefore, the information in this manual is subject to change and should be used for reference only.

Liability

EdgeTech has made every effort to document the 2050-DSS Side Scan and Sub-Bottom System in this manual accurately and completely. However, EdgeTech assumes no liability for errors or any damages resulting from the use of this manual or the equipment it documents. EdgeTech reserves the right to upgrade features of this equipment and to make changes to this manual without notice at any time.

Revision History

REVISION	DESCRIPTION	DATE	APPROVAL
A	Release to Customers	5/25/2021	DWF
B	Starmux IV, Pipeliner Feature, Macrium Updates	11/30/2022	BS

WARRANTY STATEMENT

All equipment manufactured by EdgeTech is warranted against defective components and workmanship for a period of one year after shipment. Warranty repair will be done by EdgeTech free of charge.

Shipping costs are to be borne by the customer. Malfunction due to improper use is not covered in the warranty, and EdgeTech disclaims any liability for consequential damage resulting from defects in the performance of the equipment. No product is warranted as being fit for a particular purpose, and there is no warranty of merchantability. This warranty applies only if:

- i. The items are used solely under the operating conditions and in the manner recommended in the Seller's instruction manual, specifications, or other literature.
- ii. The items have not been misused or abused in any manner, nor have repairs been attempted thereon without the approval of EdgeTech Customer Service.
- iii. Written notice of the failure within the warranty period is forwarded to the Seller, and the directions received for properly identifying items returned under warranty are followed.
- iv. The return notice authorizes the Seller to examine and disassemble returned products to the extent Seller deems necessary to ascertain the cause for failure.

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

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

CAUTION! If your product is a portable topside, never attempt to ship it in its Storm Case™ alone. Shipping portable topsides without an exterior shipping crate will void the warranty.

SOFTWARE SERVICE OVERVIEW

EdgeTech provides software services free of charge. This software agreement does not address customer-specified modifications or enhancements. These services may be ordered separately. Furthermore, EdgeTech software upgrades are meant for the sole use of EdgeTech customers. Any reproduction of EdgeTech-supplied software or file sharing is strictly prohibited.

Software Updates and Enhancements

EdgeTech customers can download new software releases with all modifications and enhancements from the [EDGE TECH WEBSITE](#). Should major software issues occur, they will be reported directly to the customer. New software releases consist of the following:

- Software enhancements that are not on the price list
- Software fixes and changes
- Product integration
- Documentation updates to online help
- Tests for compatibility with other modules

Software patches consist of software that has undergone the following:

- Minor software enhancements
- Software fixes and changes

EdgeTech customers are entitled to contact [EDGE TECH CUSTOMER SERVICE](#) by telephone, facsimile, or e-mail to report a difficulty, discuss a problem, or receive advice on the best way to perform a task. When contacted, EdgeTech Customer Service will do the following:

- Respond within 24 hours via Telephone, Facsimile, and E-mail Support
- Immediately attend to serious problems affecting operations
- Attempt to find an immediate workaround

RETURNED MATERIAL AUTHORIZATION

Prior to returning any equipment to EdgeTech, a Returned Material Authorization (RMA) Number must be obtained from **CUSTOMER SERVICE**.

RMA Purpose

The RMA Number identifies returned equipment when it arrives at our receiving dock and enables tracking while at our facility. Refer to the RMA number on all documentation and correspondences.

All returned materials must be shipped prepaid. Freight collect shipments will not be accepted. All equipment should be adequately insured for shipping, but equipment belonging to EdgeTech must be insured for full value.

If there is more than one item per consignment, include a packing with the shipment. An invoice can double as a packing slip only when the contents are clearly numbered and identified on the invoice.

CAUTION! Never attempt to ship a Portable Topside in its Storm Case™ alone. Although rugged, these cases are not intended to be used as shipping containers, and the delicate internal components could be damaged. Shipping in this manner will void any warranties.

NOTE: All shipping charges shall be the customer's responsibility unless under warranty, as EdgeTech will pay for return shipping.

NOTE: For International Shipments valued over \$1000, the following Shipper's oath must be sent with the invoice.

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

Signed _____

CUSTOMER SERVICE

Customer service personnel at EdgeTech are always eager to hear from users of our products. Your feedback is welcome and a valuable source of information that we use to improve these products continually. Therefore, we encourage you to contact EdgeTech Customer Service to offer any suggestions or to request technical support:

NOTE: Please have your system Model and Serial Number available when contacting Customer Service.

E-mail: service@edgetech.com

Mail: 4 Little Brook Road
West Wareham, MA 02576

Telephone: (508) 291-0057

Facsimile: (508) 291-2491

**24-Hour Emergency
Technical Support Line:** (508) 942-8043

For more information, please go to WWW.EDGETECH.COM.

COMPANY BACKGROUND

EdgeTech (formerly EG&G Marine Instruments) traces its history in underwater data acquisition and processing back to 1966. EdgeTech has designed, developed, and manufactured products, instruments, and systems — for the acquisition of underwater data, including marine, estuarine, and coastal applications — for over 50 years.

EdgeTech responds to the needs of the scientific, naval, and offshore communities by providing industry-leading equipment — such as sub-bottom profilers, side scan sonar, acoustic releases, USBL positioning systems, and bathymetric systems — that have become standards in the industry.

EdgeTech consistently anticipates and responds to future needs with an active research and development program. Current efforts are focused on adapting new cutting-edge acoustic technology.

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1.0 OVERVIEW

The EdgeTech 2050-DSS (Deep Side Scan Sonar and Sub-Bottom Profiler) is a fully integrated tri-frequency side scan and sub-bottom system that is particularly useful in conducting high-resolution sub-bottom surveys close to the seabed. The system's hydrodynamic towfish configuration options are currently a 2-16 kHz sub-bottom profiler that utilizes a polyvinylidene fluoride (PVDF) panel receiver hydrophone that provides excellent sub-bottom receive sensitivity and directivity. The 2050-DSS system comes with either a 120/410/850 kHz or a 230/540/850 kHz side scan sonar array using EdgeTech's proven CHIRP technology to provide crisp, high-resolution side scan imagery. The system is controlled, data is collected and processed by a topside Starmux IV Digital link and an EdgeTech Discover Software enabled computer. The 2050-DSS can be integrated with auxiliary sensors such as a magnetometer, depth sensor, altitude sensor, and a USBL responder. The system can also be integrated with an ROV (Remotely Operated Vehicle) with a mounting kit.

1.1 Key Features

Fully Integrated Turn-Key System: The system comes delivered to customer specifications with minimal setup and configuration.

Tri-Frequency Side Scan Sonar: The standard 2050-DSS configurations are either a 120/410/850 kHz or 230/540/850 kHz array that can operate any two frequencies simultaneously. The system frequency choice can be reconfigured instantly, allowing the operator to react and optimize range and resolutions to changing survey conditions and to use the system in multiple roles.

Sub-Bottom Profiler: The 2050-DSS system has enhanced sub-bottom profiling capabilities with a low-frequency transducer and a PVDF receiver. Mounted within the system is a single 2-16 kHz transducer that provides improved directionality and the ability to focus power where needed. The PVDF receive panel provides 2D directionality and improved sensitivity over simple line arrays.

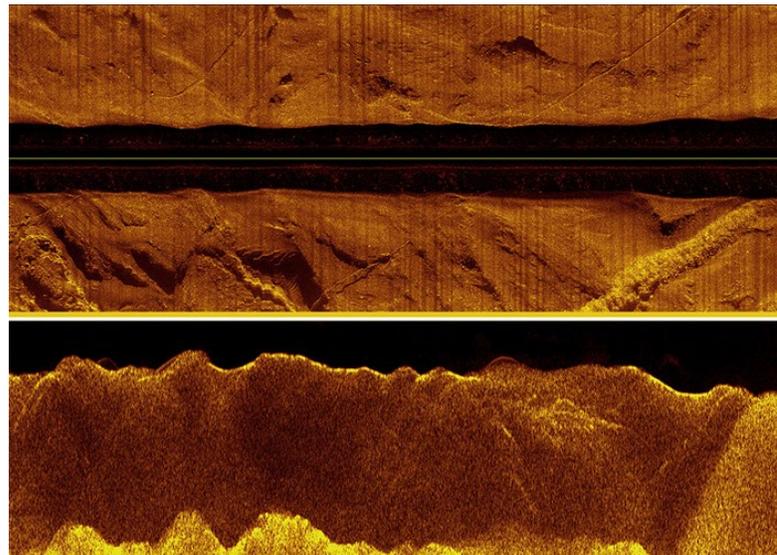


Figure 1-1: 2050-DSS Side Scan and Sub Bottom Imagery Displayed in Discover

Pipeliner Mode: In conventional Sub-Bottom configurations, two hydrophone arrays are mounted parallel in the Along-Track direction, which gives a narrow along-track beamwidth and a wider across-track beamwidth. In these Sub-Bottom systems, the surveyor had to manually switch the vehicle's hydrophone position to achieve the wide Fore/Aft beam configuration suitable for pipeline detection.

In EdgeTech's new pipeline detection configuration, a single transverse hydrophone sensor gives a wide along-track beamwidth, accentuating the pipeline's parabola

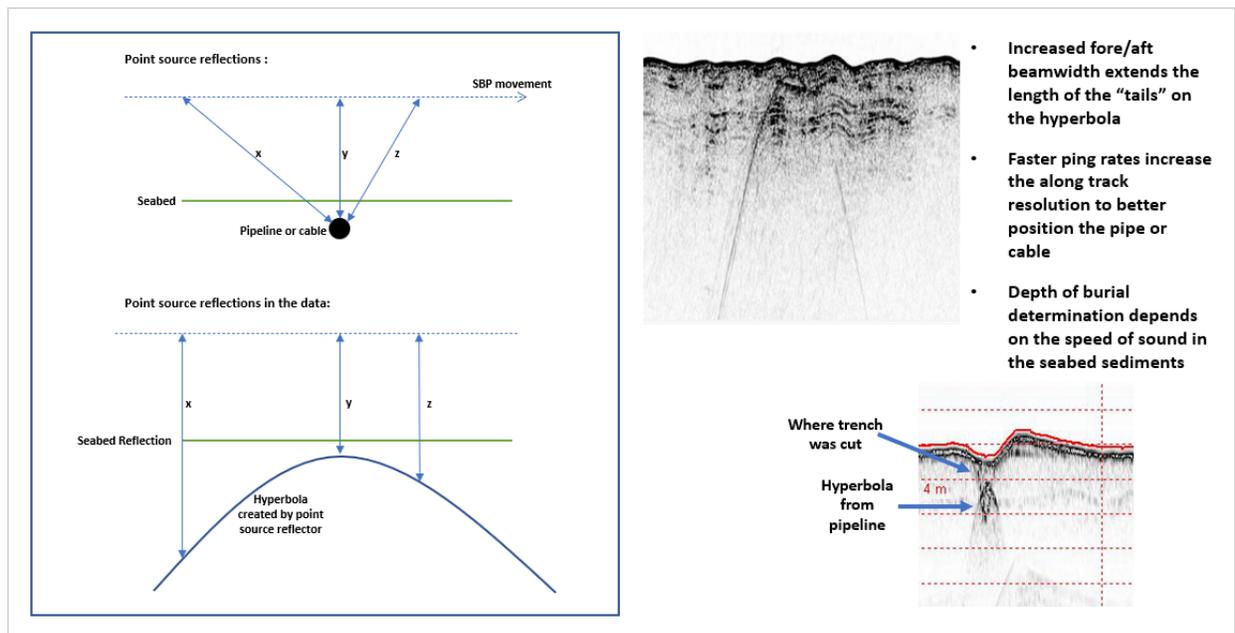


Figure 1-2: Interpretation: Pipeline and Cable Detection

The 2050 Sub-Bottom Profiler has a unique “Pipeliner Mode” feature that utilizes the parabolic acoustic shape created by the smaller narrow receive PVDF panel, that is wide in the Along Track Direction (parallel to the direction of travel and running Fore/Aft) and narrow in the Across Track Direction (normal to the direction of travel and running Port/Starboard). When approaching a buried cable or pipe (normal incidence), the wide Fore/Aft looking beam (Pipeliner mode) provides the ability to detect the object at greater ranges. As the 2050 continues to approach the object, not only does signal strength increase, but the acoustic travel time will decrease. When plotted, the increasing strength and decreasing travel time creates a parabolic shape that reaches an apex when the distance between the 2050 and the object is minimized. The object creates the second parabolic leg as the 2050 moves away. Multiple passes can further refine the position and triangulation.

Pipeline, cable detection, and Depth-of-burial (DOB) surveys seek to visually identify the signature hyperbolas, indicating a cylindrical object at the cross point between the cable route and the survey track. Narrow-beam systems may miss target pipes or cables in heterogeneous environments because they are focused on a single return as opposed to the graphically “increasing/decreasing” shape that visually highlights the path leading to and away from the target

EdgeTech's Discover Sub-Bottom software allows the surveyor to automatically switch between the 2050's dual apertures when switching to a transmit pulse designed to provide a very high ping rate (up to 30 Hz) for better detection and measurement of the shallow buried pipe/cable.

The Pipeline Mode feature of the 2050 can also detect boulders, UXO, buried hazards, or other debris for site clearance and route surveys.

The echo data's diffraction hyperbolas are generated by running survey lines perpendicular to the pipe/cable crossings. Multiple crossings might be necessary to meet the survey requirement of Along-Track data density. Higher pipeline position accuracy is achieved by having the sonar close to the seafloor (2-5m).

Configuring a 2050 system to Pipeliner Mode is a software configuration with no hardware modifications or changes required. Detailed Instructions on configuring the 2050 sonar subsystem to this mode are found in the *Configure the 2050 to Pipeline Mode* section of the [DISCOVER 2050 SOFTWARE MANUAL](#).

Reflection Coefficient Calculation: Discover 2050 Software can calculate reflection coefficients that aid in bottom sediment classification. The configuration procedure to do this adjusts the system gain constant so that the reflection coefficient provides an estimate of the ratio between the pressure amplitude of the pulse striking the seafloor and the amplitude of the reflected pulse. These values can then be compared with the known values of the local seafloor to classify the composition of the surveyed area.

Detailed instructions on reflection coefficient calculation are found in the *Configure the Reflection Coefficient* section of the [DISCOVER 2050 SOFTWARE MANUAL](#).

Digital Telemetry Over a Single Coaxial Armored Tow Cable: The topside processor interfaces with the towfish over an armored 10/100BaseT cable connection, using asynchronous digital subscriber line (ADSL) modems.

Deep Water Operations: The system is rugged and rated to a depth of 2,000 meters. An optional Edgetech armored cable provides digital telemetry over a single coaxial-type cable up to 6,000 meters in total length.

Additional Payload Options: The 2050-DSS can be integrated with magnetometers, depth sensors, altitude sensors, and a USBL responder.

ROV Mounting Option: The system components can be mounted on a ROV with a mounting kit.

1.2 Applications

Applications for the 2050-DSS Combined Side Scan Sonar and Sub-Bottom Profiling System are many, a few of which are the following:

- Cable and Pipeline Surveys
- Geological/Geophysical Surveys
- Sediment Classification
- Pre/Post Dredging Surveys
- Archeological Surveys
- Scour/Erosion Investigation
- Marine Construction Surveys

1.3 Main System Components

The 2050-DSS Combined Side Scan Sonar and Sub-Bottom Profiling System consists of a rack-mounted Starmux IV topside digital link, an attached computer with EdgeTech's Discover 2050 software installed, an armored tow cable, and the 2050-DSS Tow Vehicle.

1.3.1 2050-DSS Tow Vehicle

The 2050-DSS is a hydrodynamic towfish designed to accommodate multiple system payloads. The sonar electronics are contained inside a single housing where side-scan transducer arrays and sub-bottom transducers are attached. The towfish comes standard with either a 120/410/850 kHz and 2-16 kHz sub-bottom profiler with PVDF receiver or a 230/540/850 kHz tri-frequency side-scan sonar configuration and 2-16 kHz sub-bottom profiler with PVDF receiver.



Figure 1-3: 2050-DSS Towfish Side View



Figure 1-4: 2050-DSS Towfish Forward View



Figure 1-5: 2050-DSS Towfish Aft View

1.3.2 2050-DSS Starmux IV Topside

The Starmux IV digital telemetry topside can be purchased independently or rack-mounted with an Edgetech Windows 2U Computer with EdgeTech's Discover 2050 software installed. The computer and Starmux IV provide power and communications to the towfish, control the various sonars and sensors on the vehicle, provide sonar and sensor displays, and collect and store data. This system is operated by a standard keyboard, trackball mouse, and a single widescreen video display. Additional displays are available as an option. Customers can use their computers with Discover 2050 installed as well.



Figure 1-6: Case Mounted Starmux IV and EdgeTech

1.3.3 Tow and Test Cables

The 2050 Towfish is connected and towed by a rigid bridle, an armored tow cable, and a vessel's winch. The towfish interfaces with the topside processor over the coaxial tow cable using asymmetric digital subscriber line (ADSL) modems in both the towfish and the Starmux IV telemetry system. Customers can purchase EdgeTech armored tow and test cables or provide their own.



Figure 1-7: Test Cable

1.4 Optional Equipment

1.4.1 ROV Mounting Kit

The 2050-DSS sub-bottom transducers can be mounted to a customer's ROV. This kit includes the hardware and cabling to do so.

1.4.2 Magnetometer

A magnetometer can be specified or supplied by several manufacturers with Edgetech's optional magnetometer interface. Consult your Edgetech Sales Representative or [CUSTOMER SERVICE](#) to discuss the best magnetometer option.



Figure 1-8: 2050-DSS Magnetometer Interface

1.4.3 USBL Responder Beacon

An ultra-short baseline (USBL) beacon provides underwater acoustic positioning of the 2050-DSS Towfish. Edgetech does offer USBL products that can be found on the [USBL NAVIGATION AND POSITIONING SECTION](#) of our website. Consult your Edgetech Sales Representative or [CUSTOMER SERVICE](#) to discuss the best beacon option.

1.4.4 Pressure Sensor

A stainless-steel pressure sensor is installed in the towfish to provide towfish depth data. This pressure sensor is designed for continuous use in a corrosive liquid environment and is available in a 3000-psi pressure range.

1.4.5 SBG AHRS

The SBG AHRS (Attitude and Heading Reference System) option offers a light-weight sensor (45 grams) that includes: a MEMS-based Inertial Measurement Unit (IMU) that integrates three gyroscopes, three magnetometers, and three accelerometers, and an Ellipse-AHRS running an extended Kalman filter (EKF) that provides accurate orientation data in both static and dynamic conditions. See the [SBG AHRS USAGE](#) section of this manual for more details on this altitude and heading reference system.

2.0 SPECIFICATIONS

Specifications for the 2050-DSS Side Scan and Sub-Bottom System Components are provided in the following subsections.

2.1 2050-DSS Tow Vehicle Specifications

2.1.1 2050-DSS Towfish Physical Specifications

SPECIFICATION	VALUES
Size (L x W x H)	149 cm x 78.7 cm x 83.8 cm (58.7 in x 31 in x 33 in)
Weight in air	151 Kg (322 lbs)
Weight in saltwater	71 Kg (156 lbs)
Construction	Polyester Resin, E-Glass, Delrin, Stainless Steel, Anodized Aluminum, and Polyurethane.
Maximum tow cable length	6000 meters
Depth rating	2000 meters
Tow cable type	0.45 coaxial double-armor
Digital link	ADSL
Standard Internal Sensor	3000 PSI Pressure Sensor
Maximum safe towing speed	12 kts
Operating temperature	0 – 45°C (32–113°F)
Storing temperature	-20 – 60°C (-4–140°F)
Pitch and roll accuracy	Indicative use only.
Optional sensor ports	External Trigger input/output, Beacon power/trigger output, Magnetometer power/serial
Options	Magnetometer, Pressure Sensor

Table 2-1: 2050-DSS Towfish Specifications

2.1.2 2050-DSS Sonar Specifications

SPECIFICATIONS	VALUES	
Side Scan Frequencies:	<u>120 kHz/410 kHz/850 kHz</u>	<u>230 kHz/540 kHz/850 kHz</u>
Side Scan Operating Range (meter/side):	120 kHz: 600 meters/side 410 kHz: 200 meters/side 850 kHz: 900 meters/side	230 kHz: 350 meters/side 540 kHz: 150 meters/side 850 kHz: 90 meters/side
Side Scan Horizontal Beam Width (2-Way) and Along Track Resolution:	120 kHz: 0.70° / 1.2 m @ 100 m 410 kHz: 0.28° / 0.50 m @ 100m 850 kHz: 0.23° / 0.20 m @ 50 m	230 kHz: 0.44° / 0.80 m @ 100 m 540 kHz: 0.26° / 0.45 m @ 100 m 850 kHz: 0.23° / 0.20 m @ 50 m
Side Scan Resolution Across Track:	8 cm @ 120 kHz 2 cm @ 410 kHz 1cm @ 850 kHz	3cm @ 230 kHz 1.5cm @ 540 kHz 1cm @ 850 kHz
Vertical Beam Width	50°	50°
Sub-Bottom Frequency:	2-16 kHz	2-16 kHz
Sub-Bottom Resolution	6-10 cm	6-10 cm
Sub-Bottom Receiver	PVDF	PVDF
Sub-Bottom Penetration Through Coarse Sand	6 meters	6 meters
Sub-Bottom Penetration Through Clay	80 meters	80 meters

Table 2-2: 2050-DSS Sonar Specifications

2.2 Starmux IV Topside Specifications



STARMUX IV DIGITAL LINK



RACK MOUNT (STARMUX IV DL AND 2U COMPUTER IN 6U CASE)

Size	13.2 cm (5.2 in.) high 48.2 cm (19 in.) wide 50.5.2 cm (20 in.) deep	76.2 cm (30 in.) high 76.2 cm (30 in.) wide 64.9 cm (23.37 in.) deep
Weight	10.4 kg (23 lb.)	70.31 kg (155 lb.)
Case Construction	Aluminum 19-inch rack mount	PVC
Shipping Container Type	Carton	Sealed high-impact polyurethane case
Shipping Container Size	66 cm (26 in) high 66 cm (26 in) wide 30.5 cm (12 in) deep	76.2 cm (30 in.) high 76.2 cm (30 in.) wide 76.2 cm (30 in.) deep
Shipping Weight	14.5 Kg (32 lb.)	70.3 kg (155 lb.)
Operating Temp.	0–45°C (32–113°F)	0–45°C (32–113°F)
Storage Temp.	-10–60°C (14–140°F)	-10–60°C (14–140°F)
Operating relative humidity	5–90% (non-condensing)	5–90% (non-condensing)
Non-operating storage relative humidity	5-90%	5-90%
Input voltage	100-264 VAC, 50/60 Hz, auto-switching	100-264 VAC, 50/60 Hz, auto-switching
Input power	400 W Maximum	400 W Maximum
Voltage to Towfish	400 VDC	400 VDC
Processor	—	Intel Core, I7, 3.6 GHz Quad-Core
Memory	—	4 GB, 1333 MHz
Data storage	—	DVD/RW drive 1-TB hard drive (data) 500-GB hard drive (OS)
Display	—	23.6-inch LCD monitor
Keyboard & Pointing device		High-impact keyboard & trackball
I/O ports	(1) Ethernet (1) FSK Trigger	(3) Ethernet (4) RS-232 (2) USB 2 (6) USB 3 (1) FSK Trigger

Table 2-3: Starmux IV Specifications

2.3 Tow Cable Specifications

Armored tow cables are used to connect and tow the vehicle. Different lengths are available and include a single conductor and a shield. The cable is terminated by an MCIL6F female wet-pluggable connector on the tow vehicle end and either an MCIL4M male wet-pluggable connector for connection to the topside processor or an open termination for direct connection to the slip rings of a winch. A cable grip is included for attaching the tow cable to the towing arm of the tow vehicle.

2.3.1 Armored Tow Cable Specifications

EdgeTech currently offers three types of armored tow cables for use with the 2050-DSS system. Contact [EDGE TECH CUSTOMER SERVICE](#) for further details and options.

SPECIFICATION	VALUE
Construction	Steel Armored
Grip Type	PMI (wet end)
Cable Diameter	17.4 mm (0.68 in)
Weight In Air	1030 kg/km (693 lb/kft)
Weight in Seawater	823 kg/km (553 lb/kft)
Specific Gravity	5.2
Breaking Strength	178 kN (40,000 lbf)
Maximum Working Load	44 kN (10,000 lbf)
Minimum Bend Radius	36 cm (14 in.)
Voltage Rating	3,000 VDC
DC Loop Resistance	6.7 Ω /km (2.1 Ω /kft) Total

Table 2-4: Armored Cable A309183 Specifications

SPECIFICATION	VALUE
Construction	Steel Armored
Grip Type	PMI (wet end)
Cable Diameter	11.4 mm (0.45 in)
Weight In Air	469 kg/km (315 lb/kft)
Weight in Seawater	379 kg/km (255 lb/kft)
Specific Gravity	5.4
Breaking Strength	71.2 kN (16,000 lbf)
Maximum Working Load	17.8 kN (4,000 lbf)
Minimum Bend Radius	23 cm (9 in.)
Voltage Rating	1900 VDC
DC Loop Resistance	16.7 Ω /km (5.1 Ω /kft)

Table 2-5: Armored Cable A392799 Specifications

SPECIFICATION	VALUE
Construction	Steel Armored
Grip Type	PMI (wet end)
Cable Diameter	8.2mm (0.32 in)
Weight In Air	266 kg/km (179 lb/kft)
Weight in Seawater	222 kg/km (149 lb/kft)
Specific Gravity	6.2
Breaking Strength	42.7 kN (9,600 lbf)
Maximum Working Load	17.1 kN (3.844 lbf)
Minimum Bend Radius	18 cm (7.1 in.)
Voltage Rating	1200 VDC
DC Loop Resistance	33.5 Ω /km (10.2 Ω /kft)

Table 2-6: Armored Cable A320327 Specifications

2.4 2050-DSS Mechanical Drawings

2.4.1 2050-DSS Towfish Mechanical Drawing

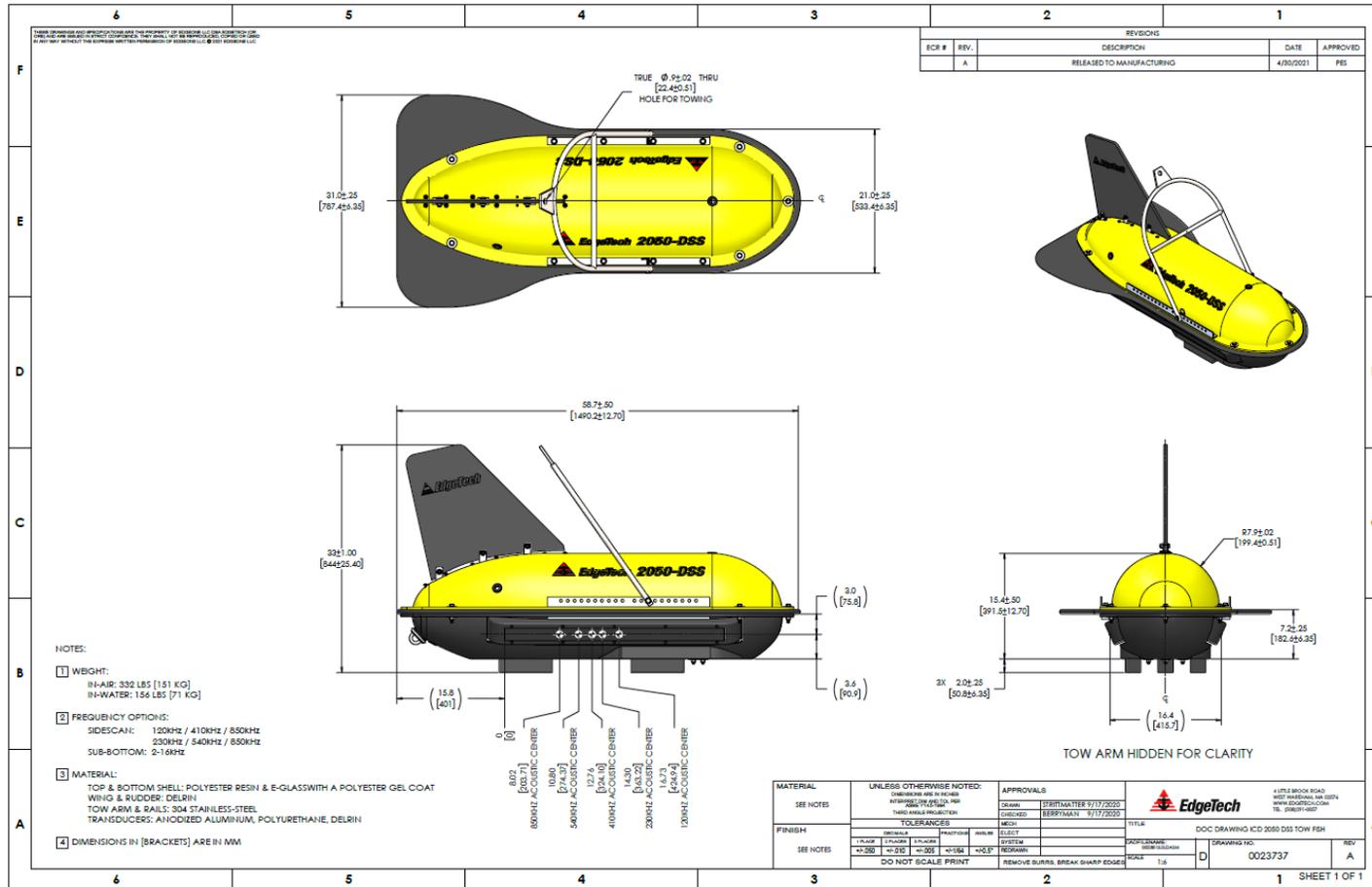


Figure 2-1: 2050-DSS Towfish Drawing (0023737)-Click Image For Embedded PDF

2.4.3 2050-DSS Sub Bottom Transducer Drawing

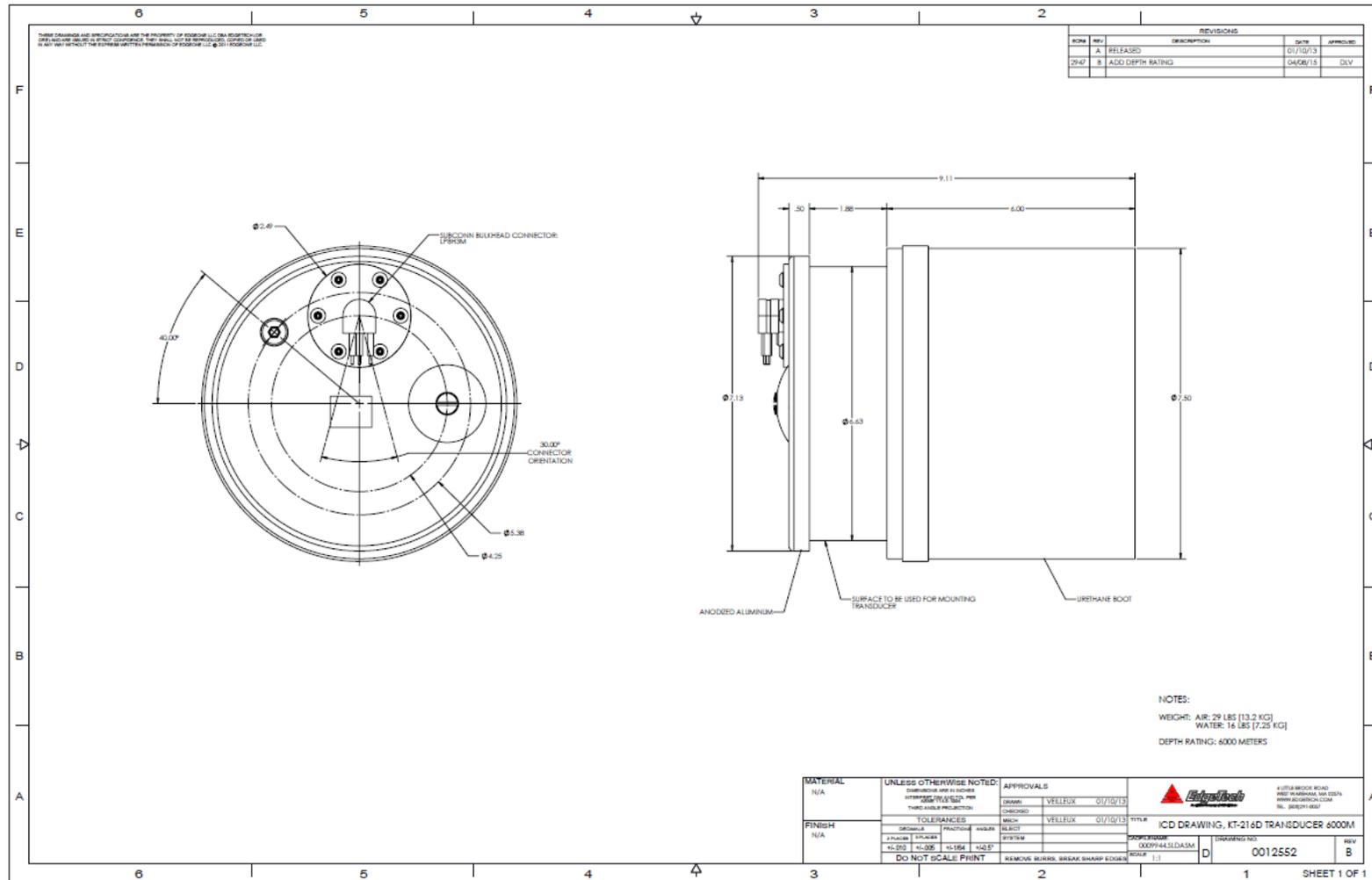


Figure 2-3: 2050-DSS KT-216D Transducer Drawing (0012552)-Click Image for Embedded PDF

2.4.5 2050-DSS Side Scan Transducer Drawing

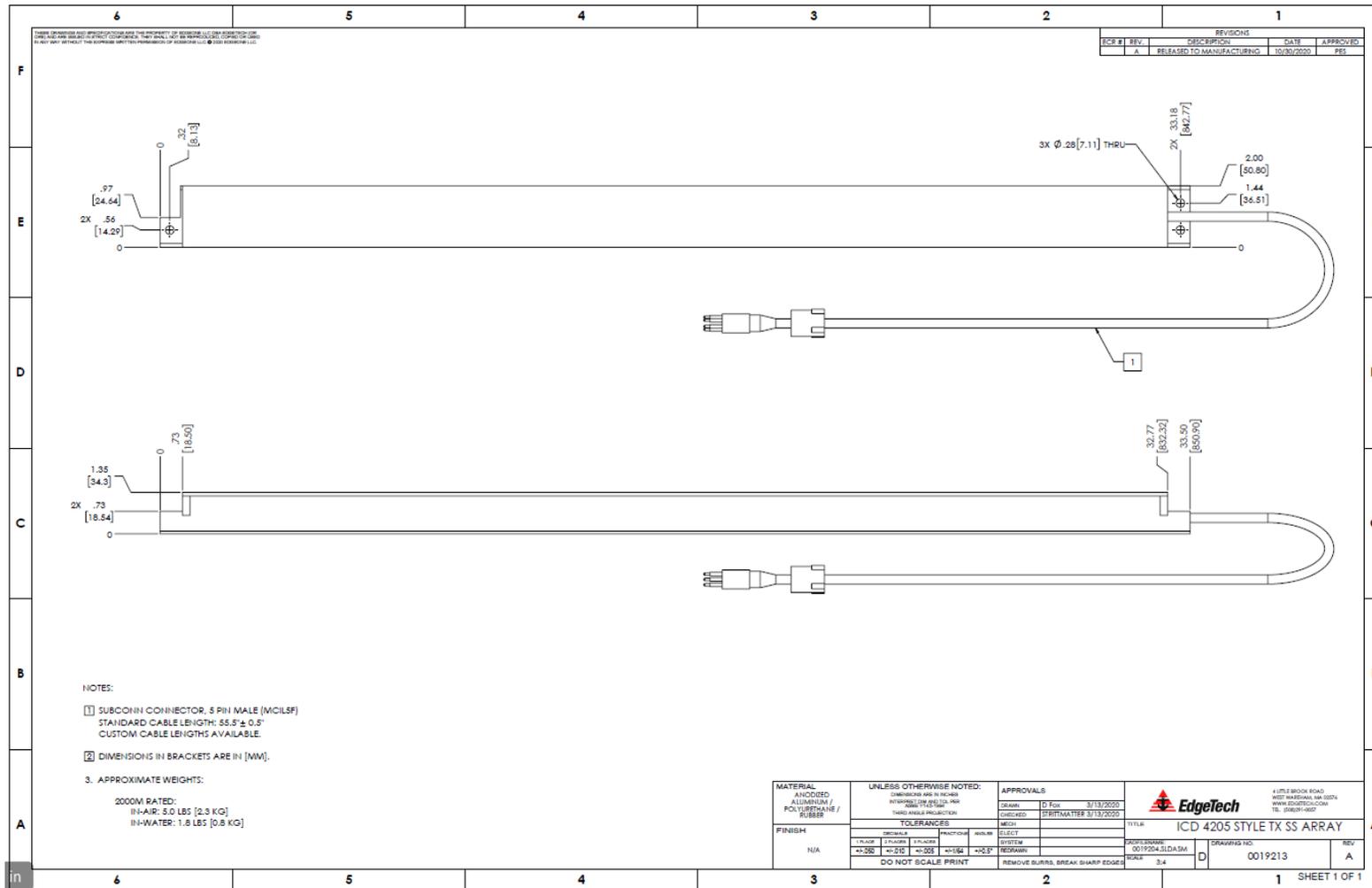


Figure 2-5: 2050-DSS Side Scan Array Drawing (0019213)

2.4.6 2050-DSS Test Cable Drawing

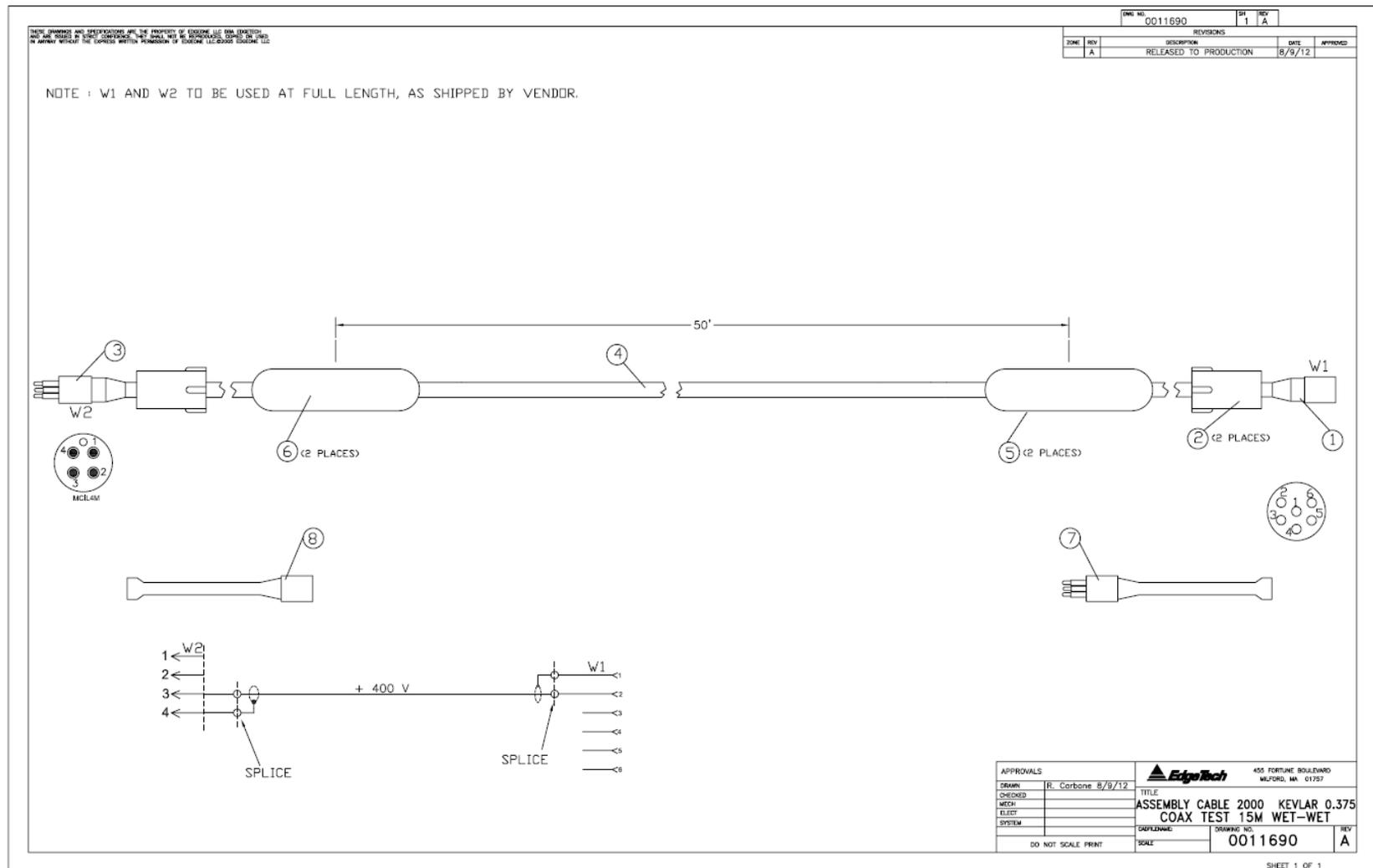


Figure 2-6: Test Cable (0011690)

2.4.7 2050-DSS Starmux IV Topside Digital Link Drawings

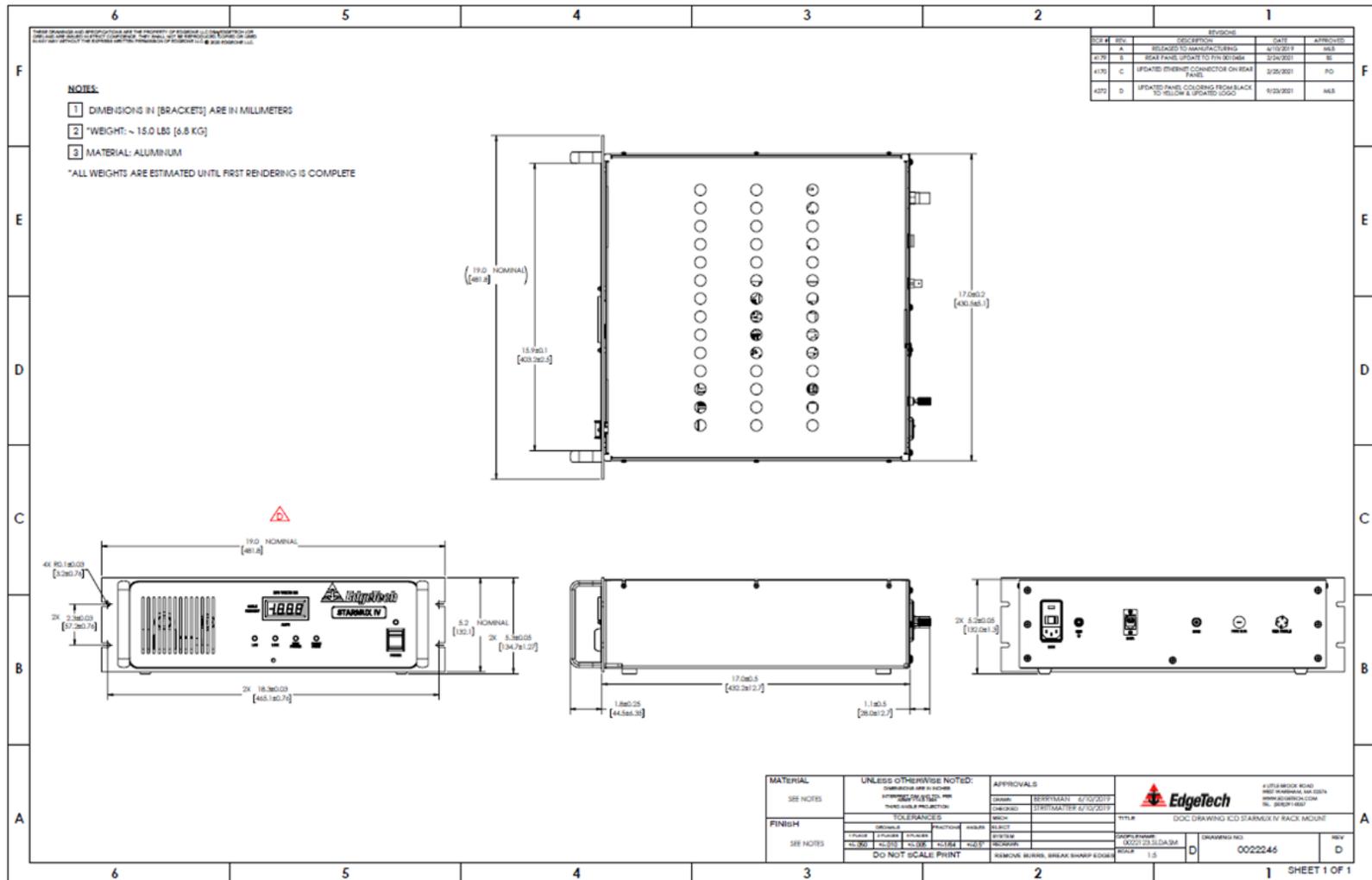


Figure 2-7: Starmux IV ICD (0022246)- Click Image For Embedded PDF

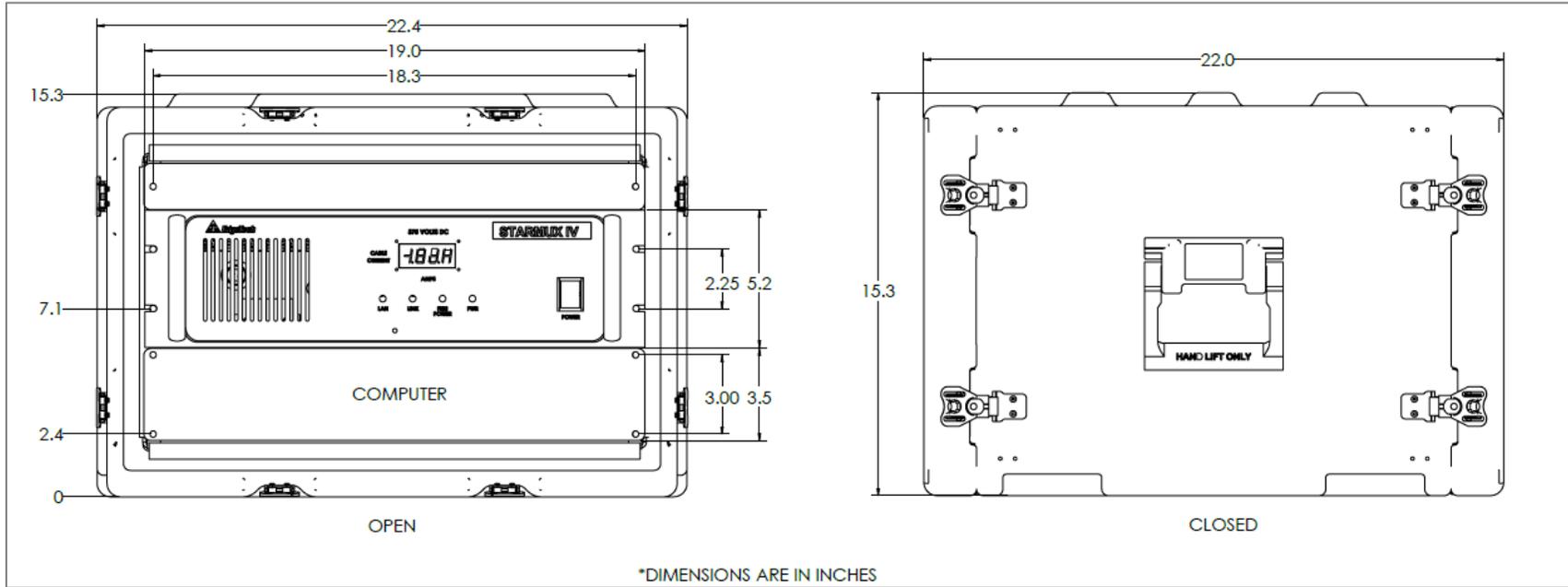


Figure 2-8: 2050-DSS Rack Mounted Option

3.0 TECHNICAL DESCRIPTION

This section describes the 2050-DSS Side Scan and Sub-Bottom System's internal components and explains their function. Diagrams and labeled photographs are provided.

3.1 2050-DSS Tow Vehicle Technical Description

The 2050-DSS Tow Vehicle is designed to support a default configuration of one vertically oriented sub-bottom transducer, a PVDF sub-bottom receiver, port and starboard side scan sonar transducer arrays, and an internal sonar processor. The towfish receives power and data from a tow cable connected to the Starmux IV topside on a survey vessel. Sonar signal is generated by the transducers, received by the transducers, or in the case of a sub-bottom signal received by the PVDF receiver. The signal is then amplified, digitized, and combined with towfish sensor data before being sent to the Starmux IV and Discover Application on the attached topside computer. The internal bottle provides connection ports for an optional magnetometer, pressure sensor, and FSK Responder Trigger.

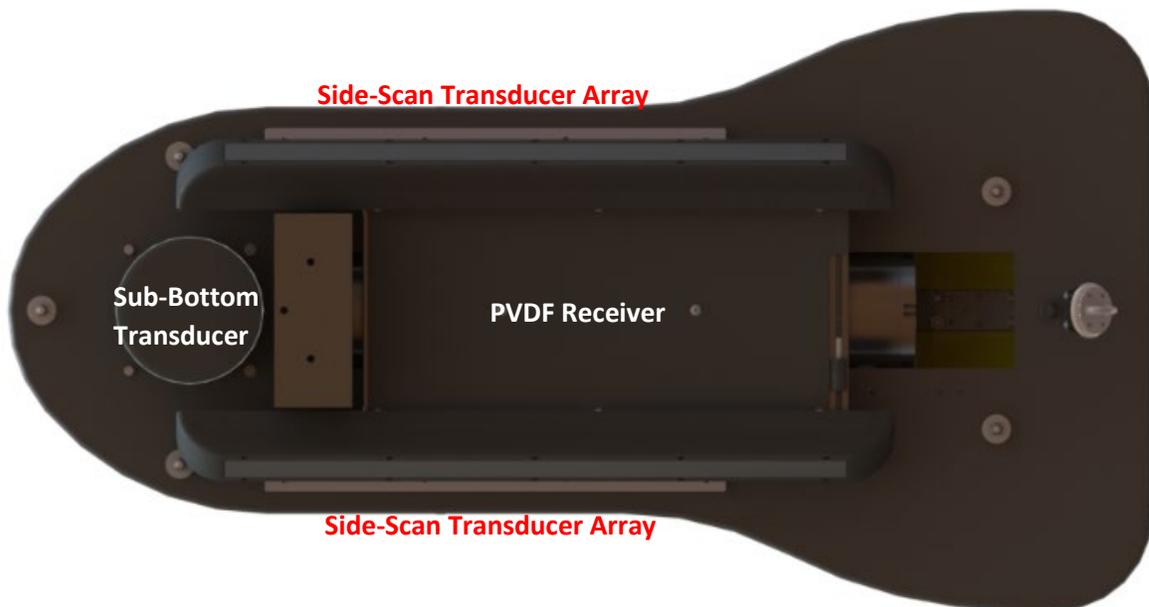


Figure 3-1: Bottom View of 2050-DSS Towfish

3.1.1 2050-DSS Towfish System Diagram

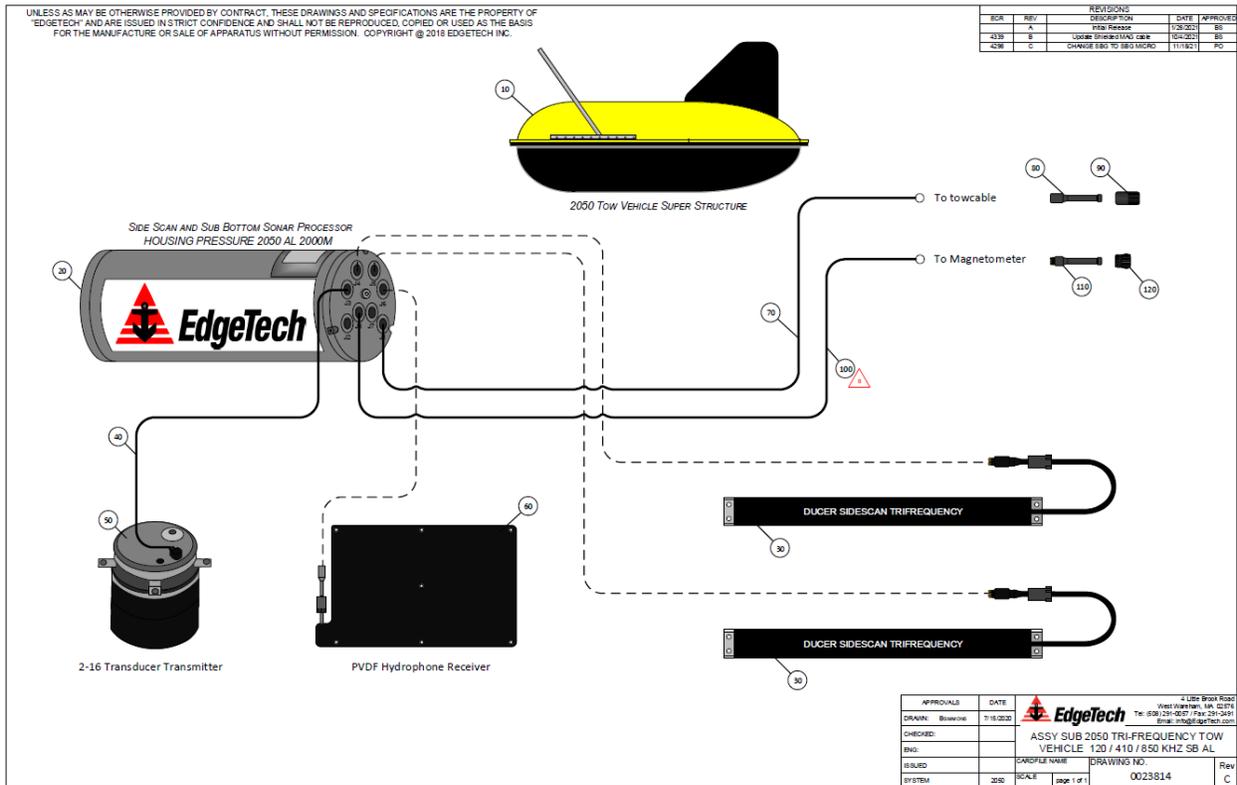


Figure 3-2: 2050-DSS Towfish System Diagram

3.1.2 2050-DSS Sonar Processor Diagram

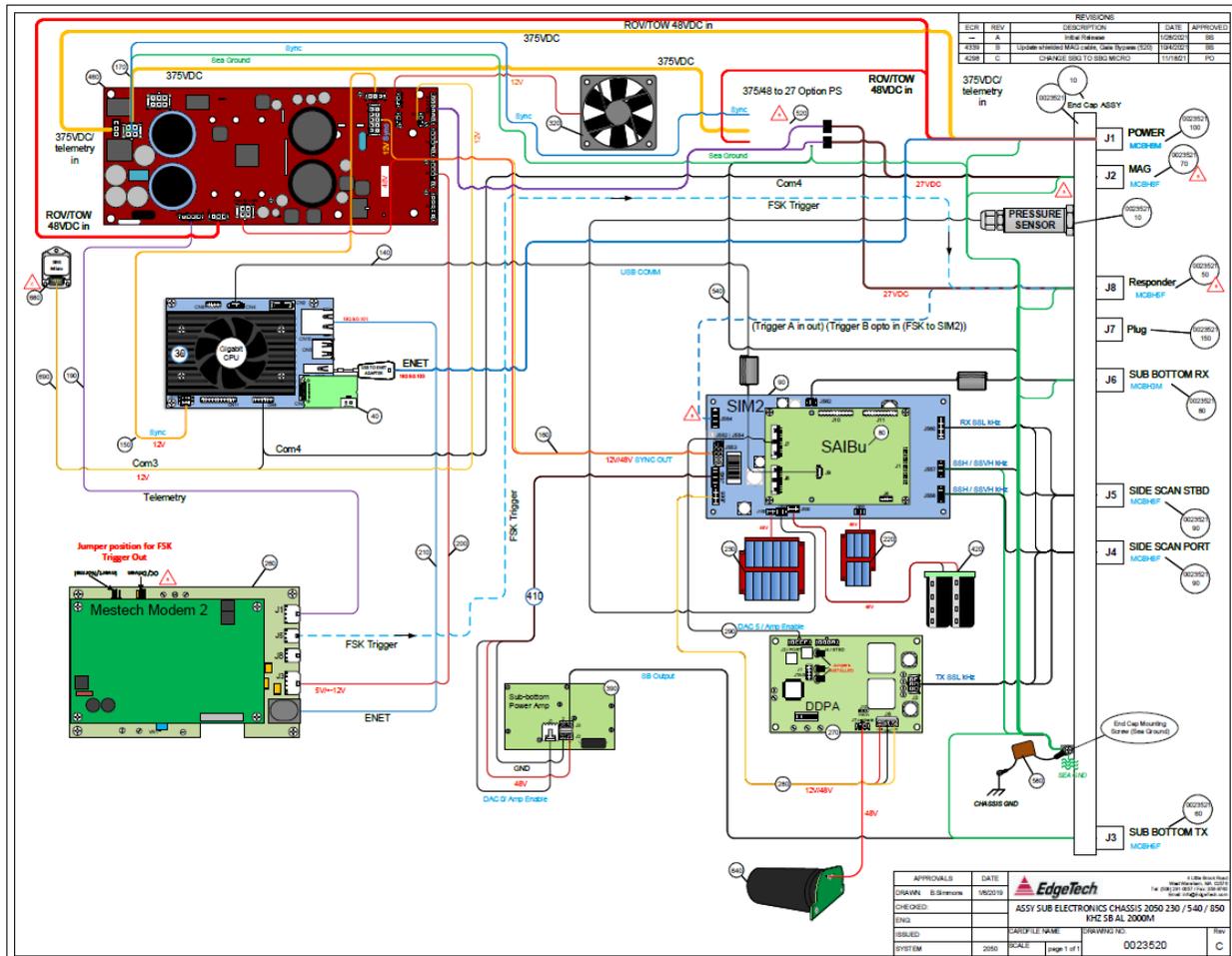


Figure 3-3: 2050-DSS Sonar Processor Diagram (0023520)

3.1.3 2050-DSS Sonar Processor Endcap Diagram

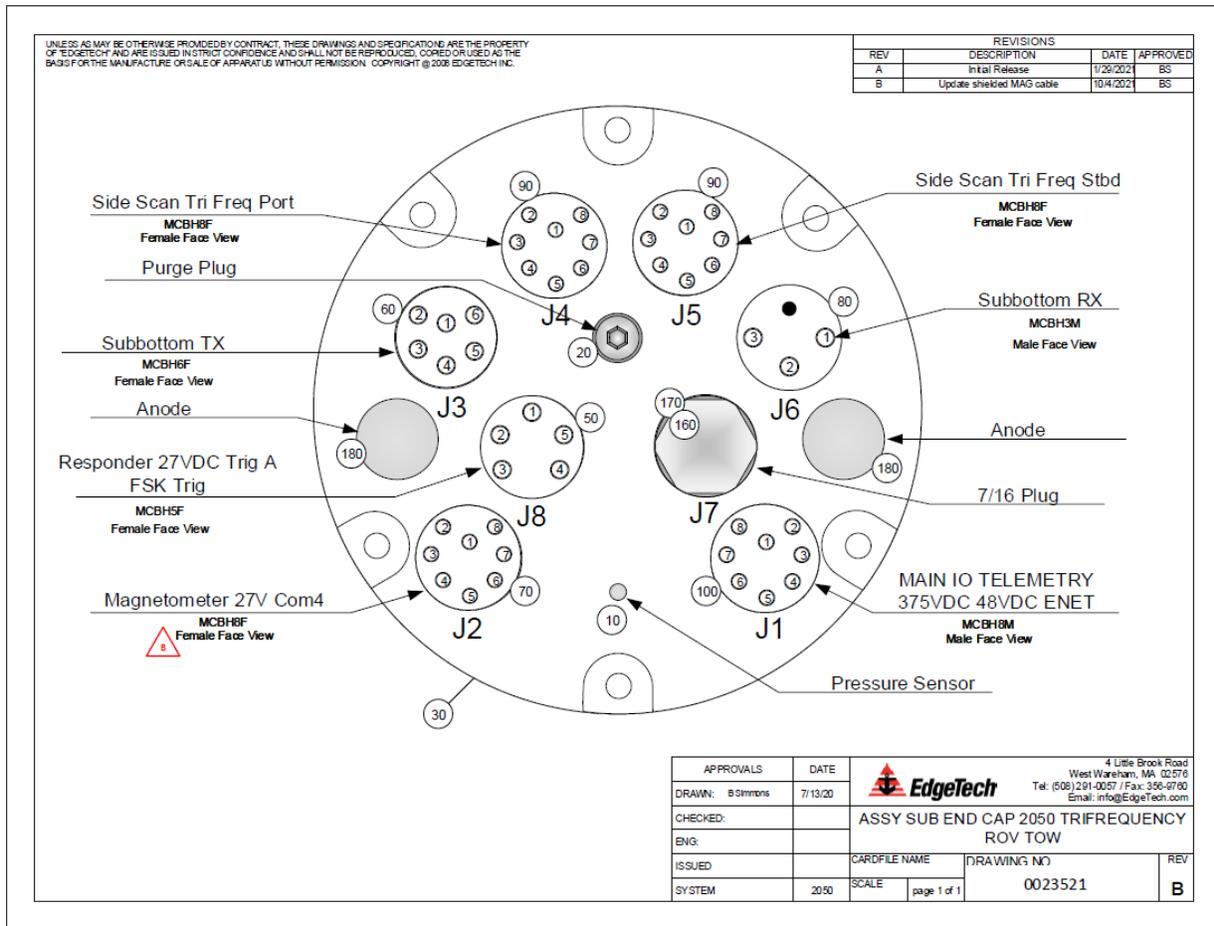


Figure 3-4: Sonar Processor Endcap Diagram (0023521)

3.1.4 2050-DSS Main I/O Interface (J1)

The 2050 Tow fish Electronics Bottle has a TOW/ROV Main I/O connection. The system is designed to run on the standard 375VDC with telemetry powered from a standard EdgeTech topside. The Main I/O also has connections to be powered from an ROV. The Main power is 48VDC. The power required is 150 Watts, which can sustain a voltage drop of no more than 5VDC during transmit cycles. The main I/O ethernet address is 192.9.0.103, 255.255.255.0, at a link rate of 10/100. The Ethernet wiring is to the T568B standard for 10BaseT/100BaseT. The Main I/O to tow cable adapter provided with the tow fish is EdgeTech PN# 0002915.

CONNECTOR J1 (MCBH8M)	DEFAULT WIRING
1	0 VDC (375V RTN)(Tow cable)
2	+375 VDC (Tow cable)
3	0 VDC (48V RTN)
4	+48 VDC
5	Ethernet (Transmit+)
6	Ethernet (Transmit-)
7	Ethernet (Receive+)
8	Ethernet (Receive-)

Table 3-1: Main I/O Interface Cable Pin Outs

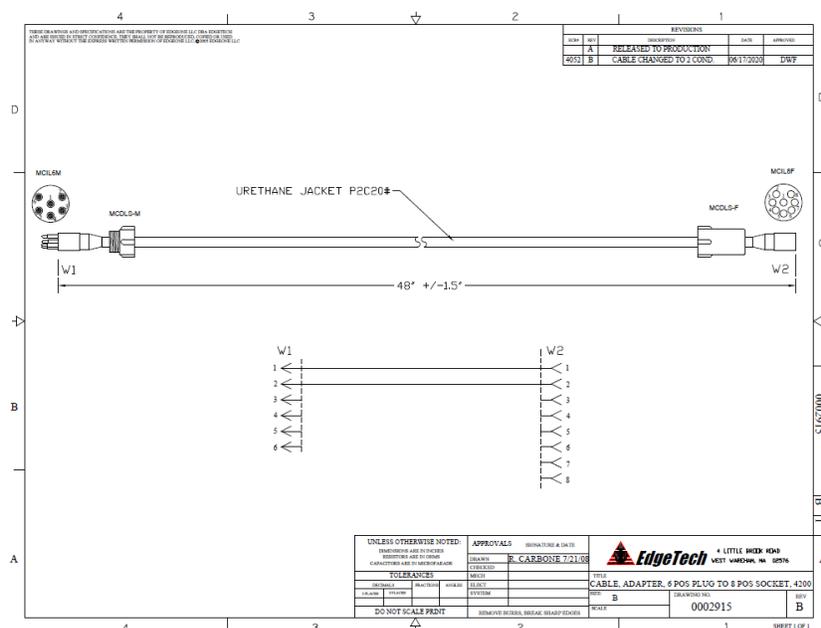


Figure 3-5: Tow Cable to Electronic Bottle Diagram (0002915)

3.1.5 2050-DSS Magnetometer I/O Interface (J2)

The 2050 has an interface for a magnetometer. The bulkhead is wired to the 2050 bottles RS232 serial COM port. The wiring for the bulkhead is listed in the table below. The standard interface cable is EdgeTech PN# 0007367.

CONNECTOR J2 (MCBH8F)	DEFAULT WIRING
1	+27 VDC
2	0 VDC
3	COM 4 RS 232 IN
4	COM 4 RS 232 OUT
5	GND, RS232
6	N/C
7	N/C
8	N/C

Table 3-2: Magnetometer Interface Cable Pin Outs

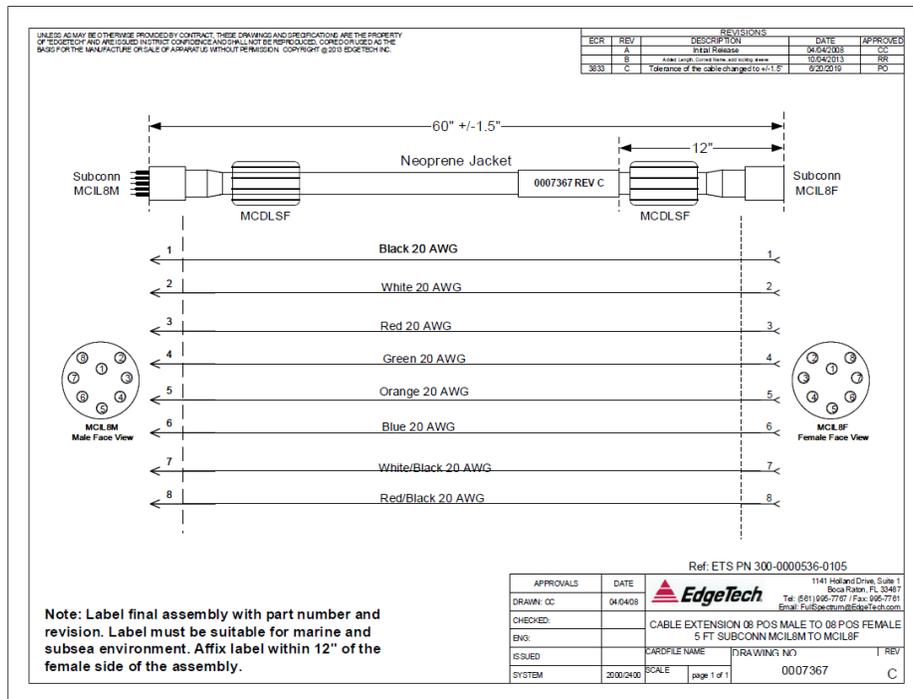


Figure 3-6: Magnetometer Interface Cable Diagram (0007367)

3.1.6 2050-DSS Responder I/O Interface (J8)

The 2050 has an interface for an external beacon/responder. The bulkhead is wired to the 2050 bottle's external sync, which is input from the topside "SYNC" BNC connector. The standard latency for the trigger to pass through the system from the topside to output from the tow fish is approximately 4ms. The wiring for the bulkhead is listed in the table below. EdgeTech has options for different cables available for interfacing to various devices. This connector can also be configured using Discover software to be used as an external trigger input or output to sync the sonar system with other devices. Contact [EDGE TECH CUSTOMER SERVICE](#) for details.

CONNECTOR J8 (MCBH5F)	DEFAULT WIRING
1	+27VDC
2	0 VDC
3	TRIGGER GND
4	TRIGGER A IN/OUT
5	FSK TRIGGER OUT (Responder)

Table 3-3: Responder IO Pin Outs

3.2 2050-DSS Starmux IV Topside Technical Description

Edgetech topside digital links provide power to the towfish while acting as a digital link between the towfish and a topside computer with EdgeTech's Discover application installed on it. Discover provides the ability to monitor and control towfish systems and process and record sonar data. The digital link also provides input connections for supporting survey equipment, navigation devices, and a trigger.

Edgetech topside rack-mount configurations include a configured computer with a display, trackball mouse, keyboard, and digital link, all housed in a rugged case. The computer has a Windows® operating system and Edgetech's Discover 2050 Software Application installed and configured for use. An additional display can be purchased and connected with the system if required.

3.2.1 Starmux IV Control, Indicator, and Connection Configurations

Starmux IV configuration front and rear panel pictures with marked control, indicator, and connections are provided below, along with tables describing them.

3.2.1.1 Starmux IV Controls, Indicators, and Connections

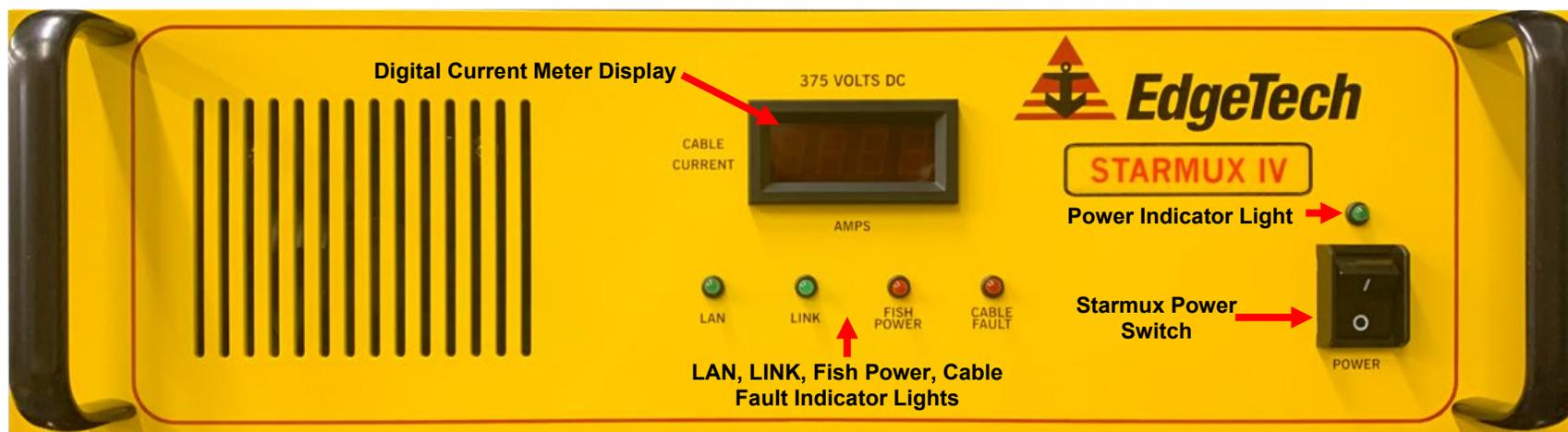


Figure 3-7: Starmux IV Front and Rear Panel Controls, Indicators, and Connections

FRONT PANEL STARMUX IV	
Starmux IV Power Switch	Rocker switch. Turns the Starmux Digital Link on or off. The rear line power switch needs to be turned on for this switch to function.
LAN Indicator Light	Green indicator. Flashes continuously when an Ethernet connection is established.
LINK Indicator Light	Green indicator. Flashes while the Starmux Digital Link establishes a reliable communications link with the side-scan sonar. Illuminates continuously when a reliable communications link with the sonar is established.
Fish Power Indicator Light	Red indicator. Illuminated when the Starmux Digital Link and the side-scan sonar are on.
Cable Fault Indicator Light	Red indicator. Blinks 1Hz rate for missing cable or 3Hz rate for excessive current or shorted cable.
Power Indicator Light	Green indicator. Illuminates several seconds after the start.
Digital Current Meter Display	Displays the Starmux's current output.
REAR PANEL STARMUX IV	
Line VAC Connector	Connection for the AC power cord.
Line Power Switch	Rocker switch. Switches AC power to the POWER switch on the front panel of the Starmux Digital Link.
AC Fuse	5A Fuse (PN# 0003728)
Grounding Lug	Electrical grounding lug for sea ground.
Network Ethernet Connector (1)	RJ-45 Standard Ethernet connection for connecting to the external topside processor.
FSK Sync Connector	BNC Input data connector for an FSK beacon external trigger. See this manual's CONNECTING THE STARMUX IV TO THE COMPUTER section for instructions.
Sea Cable Connector	Sub Conn MCBH4F female connector to sea cable going out to tow vehicle.
FUSE 2.5A	The newest models do not require this fuse. This connector may be capped or not exist at all.

Table 3-4: Starmux IV Front and Rear Panel Controls, Indicators, and Connection Descriptions

3.2.1.2 Starmux IV and EdgeTech 2U Computer Controls, Indicators, and Connections

The Starmux IV and EdgeTech 2U computer are mounted in a rugged 6U case. Components can be removed and rack-mounted if desired. The Starmux IV and Computer controls, indicators, and connectors are described in [TABLE 3-4](#) and [TABLE 3-5](#), respectively.



Figure 3-8: Labeled Front Panels of Starmux IV Rackmount

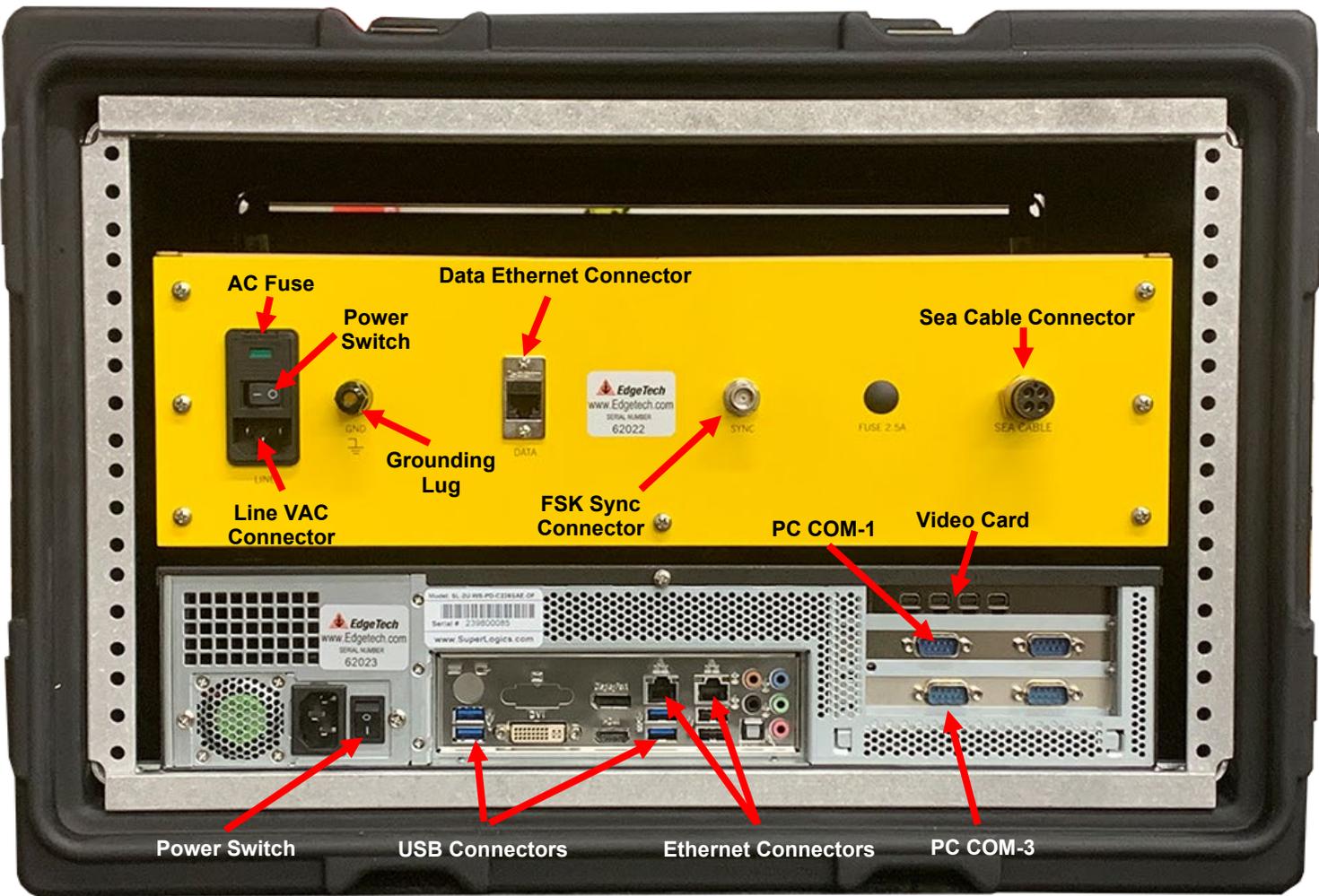


Figure 3-9: Labeled Rear Panels of Starmux IV Rackmount

FRONT PANEL COMPUTER	
CPU Power & Reset	Computer Power and Reset Switches and Indicators.
USB Connectors	(2) USB 3.0 connectors.
DVD Drive	DVD\RW drive.
REAR PANEL COMPUTER	
Line VAC Connector	NEMA-5-15P to IEC Type C13 AC input connector.
Power Switch	Rocker switch. Turns the 2U-CPU computer on or off.
USB Connectors	(4) Blue USB 3.0 connectors and (2) USB 2.0 connectors.
Ethernet Connectors	RJ-45 Ethernet connector
Video card	Video card with 4 Mini DP (Display) Connectors. Provides video display to the monitor.
COM-1 NAV Connector	DB-9 female connector. RS-232 serial port that connects to the navigation system when the Starmux IV is not used.
COM-3 Connector	DB-9 female connector. General-purpose RS-232 serial port.

Table 3-5: EdgeTech 2U Computer Controls, Indicators, and Connections Descriptions

NOTE: The Starmux IV Digital Link will automatically switch off power in the event of an extreme overcurrent. To reactivate the power, turn the power switch off and then on again. Only use a designated, uninterrupted power source to prevent this from happening.

4.0 SETUP AND ACTIVATION

EdgeTech designed the 2050-DSS Side Scan and Sub-Bottom System to be easily set up and activated for operation. Instructions for this process are provided in the subsections to follow.

4.1 Unpacking and Inspection

Before unpacking the system components, inspect the shipping containers for any damage. Report any damage to the carrier and to EdgeTech.

If the shipping containers appear free of damage, carefully unpack the components and inspect them for damage as well. Also, check the packing list, verifying that all the items on the list are included. Again, if any damage is found, report it to the carrier and to EdgeTech. If any items are missing, immediately contact [EDGE TECH CUSTOMER SERVICE](#). Do not install or operate any equipment that appears to be damaged.

Although the items shipped will vary depending on customer requirements and optional products ordered, the 2050-DSS Side Scan and Sub-Bottom System typically includes the items listed below.

- 2050-DSS Tow Vehicle
- Starmux IV Digital Link and Edgetech 2U Computer Rack Mounted Topside
- AC Power Cord
- Ethernet Patch Cable
- Towfish Accessories Kit
- Memory Stick(s) with Manuals, Discover 2050, and Recovery Software

After unpacking the system components, store the shipping containers, including any packing materials, in a safe place for later use. When transporting or storing the system, pack all items in their original shipping containers the same way they were originally shipped. Store the system in a dry environment when not in use.

4.2 Power Requirements

The power requirements for the 2050 topside processors are 100–264 VAC, 50/60 Hz, and is auto-switching.

4.2.1 Use of an Uninterrupted Power Supply

The AC power source should be continuously free of high amplitude, high-frequency transients, as this type of interference could degrade performance or damage the equipment. An uninterrupted power supply (UPS) with power surge protection is recommended for powering the equipment. However, whether a UPS is used, do not use the same AC power source as one being used to power electric motors

on the survey vessel, such as pumps and winches. Also, do not use switching-type battery chargers or DC-to-AC converters with square wave outputs.

4.2.2 Change to a Non-US Power Plug

An AC power cord is provided for connecting the deck unit to a standard U.S. 3-pronged outlet. For non-U.S. power outlets, users can modify this cord by cutting off the 3-pronged plug and attaching the appropriate plug.

AC POWER CORD WIRE COLOR	FUNCTION
Black	AC line
White	AC neutral
Green	Earth ground

Table 4-1: AC Power Wiring Wire Colors for Conversion

4.3 Topside Processor Placement

The Starmux IV Rack Mount Topside should be located and set up in a dry, sheltered area that is protected from weather and water spray. The unit also requires an environment where the temperature is consistently between 0°C and 40°C (32°F and 104°F). Furthermore, avoid areas of direct sunlight, especially in tropical environments, as heat buildup could damage the equipment, and glare could hinder the user's ability to see LCDs, digital displays, and status indicator lights. The processor's location should also allow users to communicate directly with the deck crew that is handling the towfish. Secure the topside processor in place, using tie-downs if necessary, near the required AC power source. Also, ensure that there is ample room behind the rack for connecting the cables. Support the components inside the rack using appropriate mounting brackets and secure the front panels using standard 19-inch rack front panel mounting hardware.

4.4 Connecting the System Components

All the system components, including optional components, such as a printer or additional displays, connect to the topside processor.

The Starmux IV Topside digital link and computer are connected by an ethernet cable, as shown in [FIGURE 4-1](#).

NOTE The ethernet cable must be plugged into the right side ethernet port on the computer and any one of the Ethernet data ports on the Starmux IV.



Figure 4-1: Starmux IV and Computer Connected By Ethernet Cable

4.4.1 Connecting and Attaching the Tow Cable to the Towfish

- A tow winch with a slip ring should be used with the tow cable to tow the vehicle.
- The armored tow cable termination should be connected via a D-Ring to the shackle at the top of the towfish bridle.
- The cable from the termination should be managed down and secured to the bridle arm with cable ties. Be sure to provide enough slack in the data line so as not to be load-bearing.
- The termination cable should be connected to the towfish extension cable.

4.4.2 Connecting the Tow Cable to the Starmux IV

WARNING! Do not connect the tow cable to the topside processor before connecting it to the towfish. Injury or death can occur if the exposed connector on the tow cable is energized. Always connect the tow cable to the towfish first.

The tow cable connector is connected to the Sea Cable port on the rear panel of the Starmux IV.

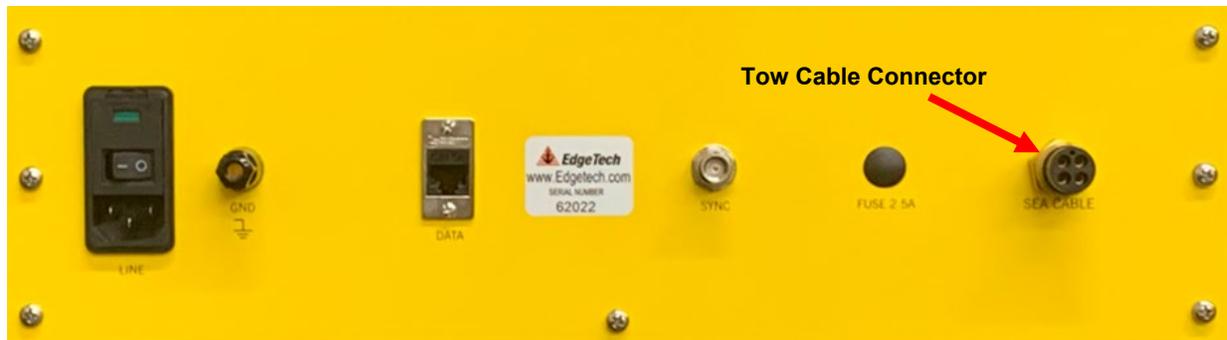


Figure 4-2: Starmux IV Sea Cable Connector

4.4.3 Connecting the Starmux IV to the Computer

4.4.3.1 Connecting to the Starmux IV DL

Refer to this manual's subsection [STARMUX IV CONTROLS, INDICATORS, AND CONNECTIONS](#) for the location of the connectors while performing the steps below:

1. Verify that the Starmux IV DL is not connected to AC power.
2. Verify that the tow cable is properly connected and attached to the towfish, and then connect the tow cable to the Sea Cable Connector on the rear panel of the Starmux IV.
3. Connect the Ethernet patch cable to the DATA 1 Connector of the Starmux IV Digital Link and the computer's ethernet connector. If it is an EdgeTech 2U, connect to the right-side Ethernet Connector. Any Category 5 Ethernet patch cable can be used as long as it doesn't exceed 100 feet in length.
4. If not preconfigured by EdgeTech, set the IP address of your computer to 192.9.0.nnn, where nnn is any integer from 1 to 100. The factory default is an IP address of 192.9.0.101 and a port setting of 1700. Several IP addresses are used by the system, reserved, or should not be used. See the [TCP/IP ADDRESS SETTINGS SECTION](#) of this manual for the IP list and details.
5. If a navigation system is used, connect the navigation system output to an available serial communications port on the computer.
6. If an external source is used to trigger the Starmux IV Digital Link, connect this source's trigger output to the FSK connector.
 - The Starmux IV comes standard with a FSK (Frequency Shift Keyed) Trigger BNC Connector on the rear panel, which connects with a USBL (Ultra-Short Baseline Beacon) navigation and positioning system like the [EDGETECH BATS SYSTEM](#). This provides a precise position

of the vehicle, which can help make better towfish and sonar deployment and configuration decisions. This trigger does not directly control the sonar subsystems in any way. The triggering pulse must be set at a ten-millisecond pulse rate or greater, or the trigger will not work

- 1 PPS is currently not supported.

7. Connect the AC power cord to the Line VAC connector and the AC power source.

4.4.3.2 Connecting to the 2050 Rack Mount with Starmux IV DL

Refer to this manual's subsection **STARMUX IV CONTROLS, INDICATORS, AND CONNECTIONS** for the location of the connectors while performing the steps below:

1. Verify that the 2050 Rack Mount is not connected to AC power.
2. Verify that the tow cable is properly connected and attached to the towfish, and then connect the tow cable to the Sea Cable connector on the rear panel of the Starmux IV.
3. Verify that an Ethernet patch cable is connected to the DATA 1 Connector of the Starmux IV Digital Link and the computer's ethernet connector. If it is an EdgeTech 2U, it should be connected to the right-side Ethernet Connector.
4. Connect the LCD monitor to the back-panel Video Card Connector of the computer.
5. Connect the trackball to a back-panel USB Connector of the computer.
6. Connect the keyboard to a back-panel USB Connector of the computer.
7. If a navigation system is used, connect the navigation system output to the COM 1 Serial Port Connector on the computer's back panel.
8. If an external source is used to trigger the Starmux IV Digital Link, connect this source's trigger output to the FSK connector.
 - The Starmux IV comes standard with a FSK (Frequency Shift Keyed) Trigger BNC connection on the rear panel, which connects with a USBL (Ultra-Short Baseline Beacon) navigation and positioning system like the **EDGETECH BATS SYSTEM**. This provides a precise position of the towfish, which can help make better towfish and sonar deployment and configuration decisions. This trigger does not directly control the sonar subsystems in any way. The triggering pulse must be set at a ten-millisecond pulse rate or greater, or the trigger will not work
 - 1 PPS is currently not supported by the Starmux IV.
9. Connect the AC power cord for 2U Processor and Starmux IIV to the VAC connector and AC power source.
10. Connect an AC power cord to the LCD monitor and the AC power source.

4.4.4 Navigation Interface

Navigation devices are installed by physically connecting the device to the serial communications port of the computer that is attached to the digital link and has EdgeTech's Discover software installed on it. If it is an EdgeTech computer, serial port COM1 has been configured to accept this connection. If this is not an EdgeTech configured computer, the port can be configured in Discover by going to the Top Menu, selecting *Configuration*, and then *Serial Ports* from the dropdown menu. You then enable the port, specify the port on the computer, and the baud rate. The GPS device's manufacturer will provide the baud rate in their user's manual. Refer to the **DISCOVER 2050 SOFTWARE MANUAL** for more configuration details.

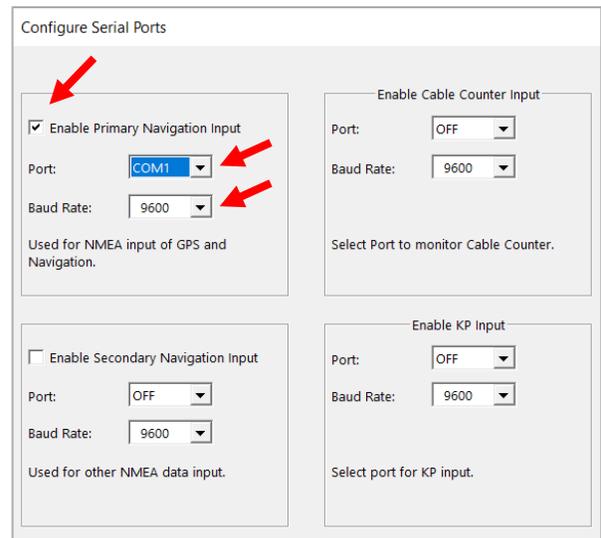


Figure 4-3: Discover Serial Port Configuration

The 2050 Sonar System accepts all standard National Marine Electronics Association (NMEA) 0183 message sentence formats from a connected global positioning system (GPS) or integrated navigation system.

4.4.5 TCP/IP Address Settings

The 2050-DSS system includes many Ethernet devices connected to a common local area network (LAN). Each device has a factory-set TCP/IP address, which does not require changing under normal circumstances. Should any of these devices be replaced or upgraded, the TCP/IP addresses may need to be reconfigured.

A data connection between the computer and the Starmux IV topside processors is made by configuring the computer's network interface card IPv4 address. This will be preconfigured if you have purchased the topside with an EdgeTech computer. If you are connecting a computer not preconfigured by EdgeTech, you must manually set the IPv4 address of your computer to *192.9.0.nnn*, where *nnn* is any integer from 1 to 100, except for the reserved IP numbers of other components listed in the **2050-DSS FACTORY INSTALLED COMPONENT IP ADDRESS TABLE**. Use the reserved IP address if the device to be installed is in the IP list. The only other field in the Windows Manual IP settings to be populated is the Subnet Mask, which should be set to *255.255.255.0*. You do not need to populate the Default Gateway. In addition, the Obtain DNS Server Address Automatically radio button is automatically selected by Windows, so the Preferred DNS Server and Alternative DNS Server fields do not need to be populated.

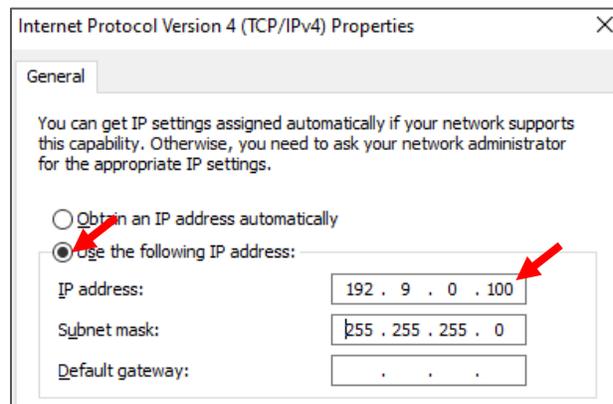


Figure 4-4: Windows Manual IP Properties Window

DEVICE	TCP/IP ADDRESS
Topside Modem	192.9.0.22 (Starmux IV)
Towfish Modem	192.9.0.33
Topside CPU Wired LAN	192.9.0.99
Towfish CPU	192.9.0.101
Towfish CPU (ROV Option)	192.9.0.103
IP Range Not Recommended	192.9.0.104-192.9.0.224
IP Range Not Recommended	192.9.0.226-192.9.0.255

Table 4-2: 2050-DSS Factory Installed Component IP Addresses

4.5 System Activation

WARNING! Never power up the Starmux IV with the tow cable disconnected from the tow vehicle. The electric shock is great and severe enough to cause serious injury or death. This also applies to post-recovery, as disconnecting the towfish while the power is still on could result in bodily injury or death.

To activate the Starmux IV Digital Link System:

1. Turn **ON** the computer and launch the Discover application.
2. Turn on the line power switch on the rear panel of the Starmux IV Digital Link. This switch can be left in the **ON** position at all times if desired.
3. Turn **ON** the power switch on the front panel.
4. The PWR light should illuminate immediately. The Fish PWR indicator light will illuminate a few moments afterward. The LAN indicator light will flash continuously to indicate network activity. The LINK indicator light will flash until a reliable communications link with the Towfish is established and then illuminate continuously when the link is completed. Also, the **NET Radio** Indicator Tab in the lower control panel of the Discover application UI should display the following:

NET: ON when the link is fully established and recognized by Discover software

4.6 Performing System Pre-Deployment Testing

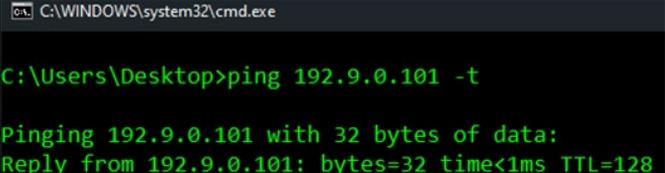
It is good practice to test that the subsea processor is active and error-free, followed by a test of each sonar subsystem before deployment. Instructions on how to do so are provided in the manual sections below.

4.6.1 Testing the Sonar Processor

Testing the Sonar processor involves performing a network ping test to ensure connectivity between the topside and the sonar processor. Then using Windows® Remote Desktop-remoting into the processor's computer and checking the SONAR.EXE application for errors. Enable the sonar processor in Web Relay before performing any test.

To perform the network ping test.

1. Open the Windows® command prompt on the topside computer.
2. Type **PING 192.9.0.101 -t** into the prompt. This sends a ping command to the towfish.



```

C:\WINDOWS\system32\cmd.exe

C:\Users\Desktop>ping 192.9.0.101 -t

Pinging 192.9.0.101 with 32 bytes of data:
Reply from 192.9.0.101: bytes=32 time<1ms TTL=128
  
```

Figure 4-5: Command Prompt Ping Test

- If you want to stop the ping command at any point, press <Ctrl>c on your keyboard.
- If you receive a response, then there is an active connection.
- If a “request timed out” message is displayed, there is an issue with the network connection.
- Close the Command Prompt Application when complete. If successful, proceed to remoting to the sonar processor for the next test.

To remotely connect to the Sonar Processor in the Towfish.

1. Locate and launch Window's Remote Desktop Application on the connected Topside Computer.
2. Once launched and connected to the Processor's computer, look for an open Sonar.exe window on the upper left side of the remote desktop display (see [FIGURE 4-6](#)). Check to be sure the Self Test Value is listed as OK. If an error is displayed, try restarting the system, and if an error is still shown, contact [CUSTOMER SERVICE](#) for support.



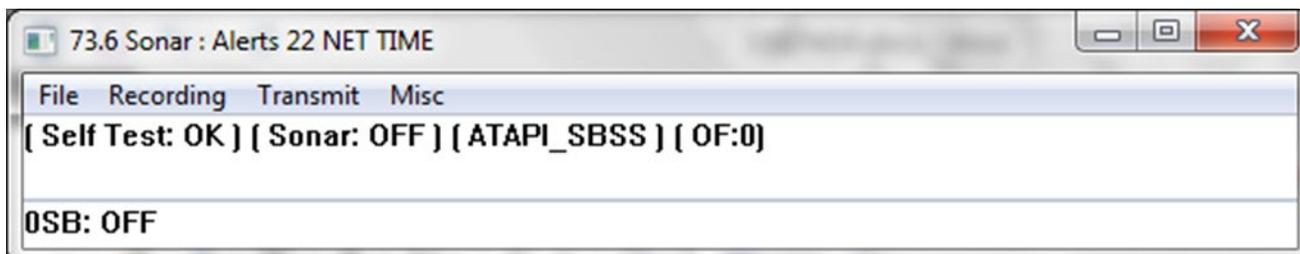


Figure 4-6: Sonar.exe Successful Self-Test

- Return to the topside computer's display and view Discover to ensure that the NET value in the Status Indicator bar (FIGURE 4-7) is displaying NET: ON. If it is listed as OFF or an ERROR is displayed, contact **CUSTOMER SERVICE** for support. If both tests are successful, the sonar processor is ready for operations, and subsystems can now be tested.



Figure 4-7: Status Indicator Bar- NET: ON

4.6.2 Performing Sub-Bottom Pre-Deployment Checks

Pre-deployment checks should be performed *before* the Tow Vehicle is deployed and *after* the system is activated. Pre-Deployment checks involve:

- Listening for the transmitted pulses from the Transducers on the Tow Vehicle
- Tapping the fiberglass shell with a hand or, gently, with a screwdriver handle near the PVDF panel while observing the Sub-Bottom Waterfall Display in Discover, ensuring it plays back and navigation is present. The Sub-Bottom Display Window is displayed in FIGURE 4-8 below, and the results of a tap test are shown in FIGURE 4-12.

NOTE: See the **DISCOVER 2050 SOFTWARE MANUAL** for detailed software information.

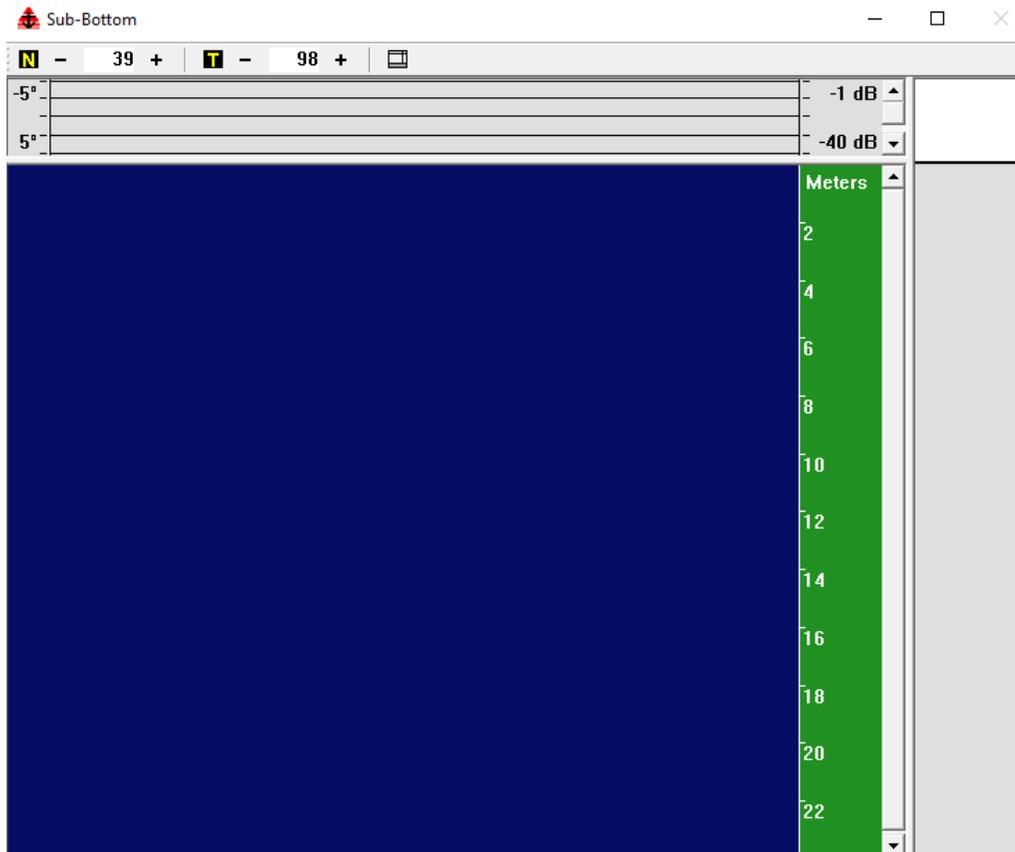


Figure 4-8: Discover 2050 Sub-Bottom Display Window

To perform the pre-deployment checks:

1. Follow the instructions in the **SYSTEM ACTIVATION** section of this manual and activate the Sub-Bottom amplifiers in Web Relay.
2. Run a Tap Test – Navigate to the Sub-Bottom Control Tab, shown in **FIGURE 4-9**.

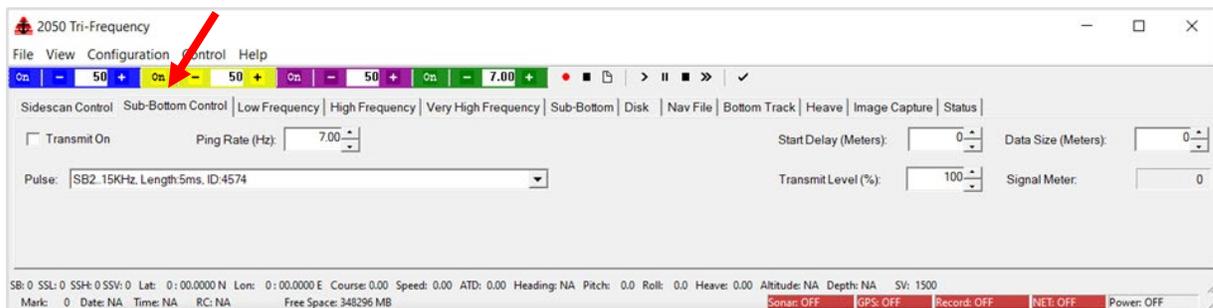


Figure 4-9: The Sub-Bottom Control Tab

3. In the Sub-Bottom Control Tab, select a Transmit Pulse using the “Pulse” dropdown. Set “Transmit Level (%)” to “100”. Select the “Transmit On” checkbox. Verify that you can hear the system

transmitting. The transducers should begin transmitting (at 100%), and received data should begin scrolling on the Waterfall Display in Discover's Sub-Bottom display, from right to left.

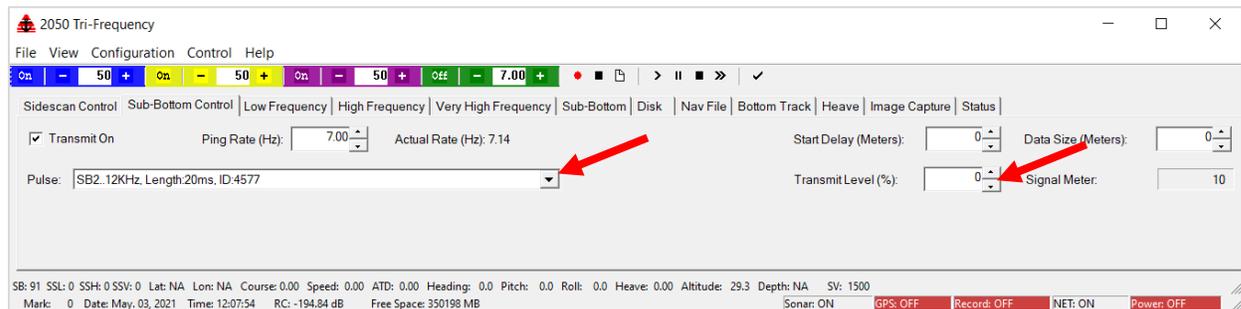


Figure 4-10: Sub-Bottom Control Tab-Pulse and Transmit Level Called Out

4. In the Sub-Bottom Control Tab, select a Transmit Pulse using the “Pulse” dropdown. Set “Transmit Level (%)” to “0”. Verify that you can hear the system transmitting. The transducers should begin transmitting (at 0%), and received data should begin scrolling on the Waterfall Display in Discover Sub-Bottom, from right to left.
5. In the Sub-Bottom Display Window Shortcut Toolbar, set Gain to either 0 or -3 dB, and then click Normalize Gain Button.

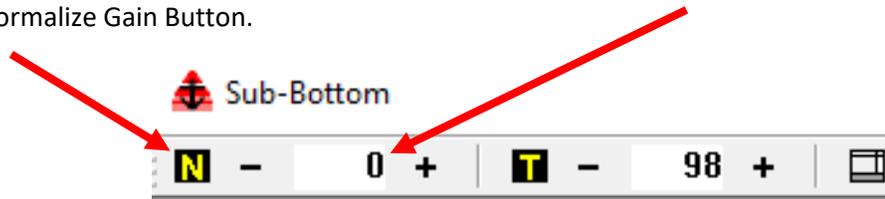


Figure 4-11: Sub-Bottom Shortcut Toolbar- Range Text Field and Normalize Gain Button Called Out

6. Tap the underside of the tow vehicle near the PVDF receiver with the handle of a screwdriver while observing the Sub-Bottom Waterfall Display in Discover.

Streaks or noise spikes should be visible in the Waterfall Display, as shown in **FIGURE 4-12**. This verifies the receive channel is operating.

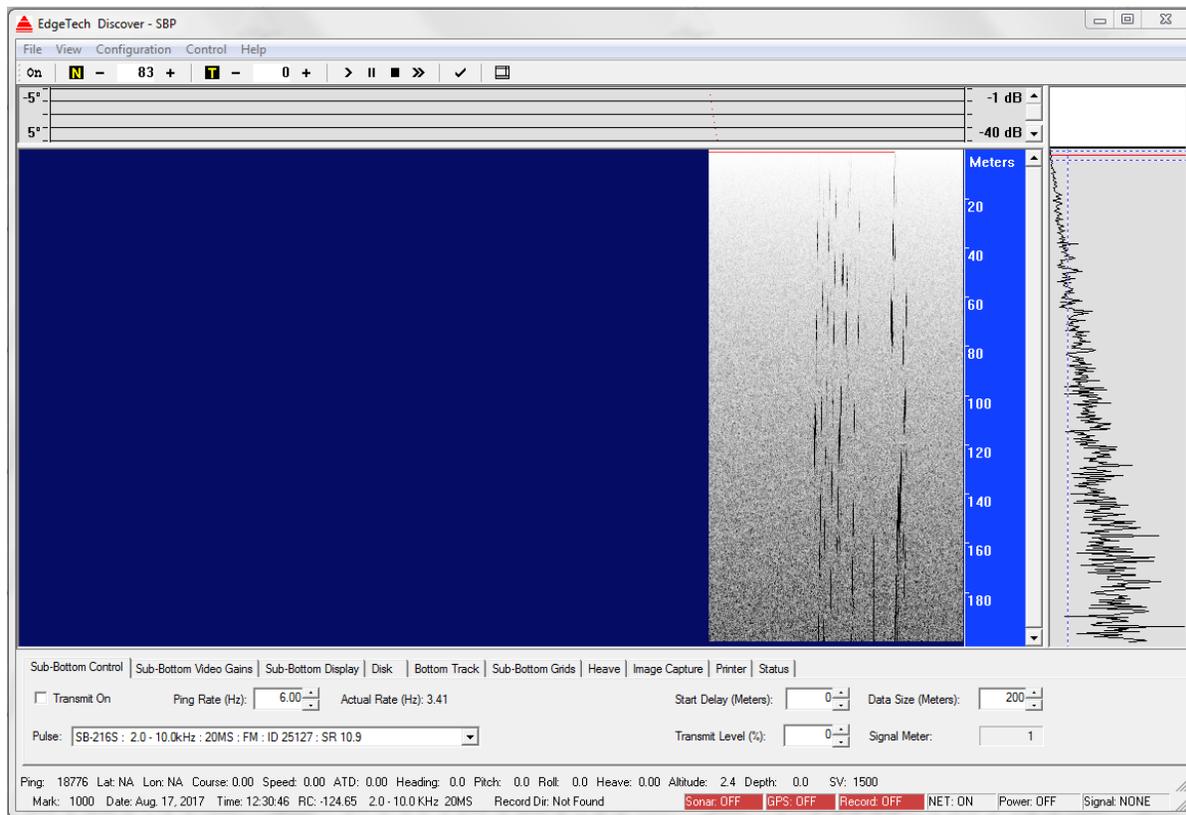


Figure 4-12: Sub-Bottom Display Tap Test Results

4.7 SBG AHRS Usage

Historical EdgeTech Towfish compasses have been pure magnetic field measuring devices that provide a heading relative to magnetic North. The intent was to provide the operator with towfish heading, pitch, and roll data to know how the towfish's motion impacted data collection quality. This information was suitable for this task but not ideal for processing raw data because of the inaccuracies caused by local magnetic declination and the variable magnetic influences of materials in the towfish, towfish equipment, tow vessel hull construction, the environment, and targets themselves. Our suggestion to overcome these issues is to use course-made-good to process and mosaic side scan data and accurately position targets.

The introduction of the 2050-DSS has given us an opportunity to improve the heading sensor's performance by fitting a MEMS-based inertial motion sensor unit that combines data from a built-in gyroscope, accelerometer, and magnetic field sensors using a Kalman filter. The incorporation of rate-gyro data means that the relative heading is much more stable. Overall, the sensor provides a more reliable output that is less susceptible to short-term magnetic field variations. The absolute heading is still reliant on magnetic field measurement and is subject to some of the limitations outlined above.

Care still needs to be taken if using the AHRS data for mosaicking or target positioning, as there may be external magnetic fields that are not being adequately allowed for.

EdgeTech AHRS Verification Procedures

This sensor's factory acceptance and verification tests are run at a magnetically quiet site. They include running hard iron and soft iron compensations once the sensor is installed in the towfish, followed by verification to check the accuracy of the output relative to true north. In order to accommodate these tests, a fixture is used that in conjunction with the stable sensor output, allows any misalignments between the mounted sensor and the towfish longitudinal axis to be measured. The resultant offset is applied as a correction in the sensor software as part of the AHRS verification procedure. Each towfish is accompanied by an AHRS verification certificate, which confirms that the towfish AHRS meets specifications.

Customer Options For Applying Magnetic Declination

The sensor unit that provides the heading has the ability to take a local latitude and longitude and apply a local magnetic declination adjustment to the heading measurements, thus providing true north measurements as outputs. Edgetech offers two options to configure this, with the first being preferred as there are fewer potential points of error.

1. The latitude and longitude that lie on one of the agonic lines (zero magnetic declination) will be entered prior to shipping the system. This means that effectively no magnetic declination will be applied to the raw heading data, such that any magnetic declination corrections can be applied in post-processing.
2. Alternatively, the user can enter local latitude, longitude, and date, for the area in which they are operating and apply magnetic declination before outputting heading data from the sensor. This method requires that the user run the Ellipse Calibration Application on the towfish to enter and save each new site's settings. If the user incorrectly applies the settings or simply forgets to do this and leaves the settings from a previous site, the heading measurements will be incorrect. If this option is chosen, please contact [EDGE TECH CUSTOMER SERVICE](#) for support and instructions.

4.8 Tow Vehicle Bridle Removal, Adjustment, and Installation

The 2050-DSS is delivered with a tow bridle that provides for towing the vehicle with an armored tow cable behind a vessel. The tow bridle can be tilted forward, back, or removed for shipping in storage. It is delivered in a default position, providing a flat and stable tow in typical conditions. If conditions differ, the bridle's mounting position can be changed on the mounting rails to accommodate. Instructions to remove, adjust and install the bridle are provided below.

4.8.1 Tow Bridle Removal

The Tow Bridle is attached to the 2050-DSS Vehicle with two bolt, washer, nut, and split ring hardware assemblies on the port and starboard sides of the vehicle. The tow vehicle's power and data cable are run up the starboard side of the vehicle and bridle arm and is lashed to the arm with cable ties. To remove the bridle, unfasten the power and data cable from the bridle and unthread the hardware sets on the port and starboard sides of the vehicle.

REQUIRED TOOLS

Tools:

- 9/16" Crescent or Adjustable Wrench
- 9/16" Crescent, Adjustable Wrench or Socket Wrench with 9/16" Socket
- Cutting Plyers
- Needle-Nose Plyers

Table 4-3: 2050-DSS Tow Bridle Removal Tools

Instructions:

1. Unfasten or cut the [3] cable ties securing the power and data cable to the starboard bridle arm and bridle mounting rail.

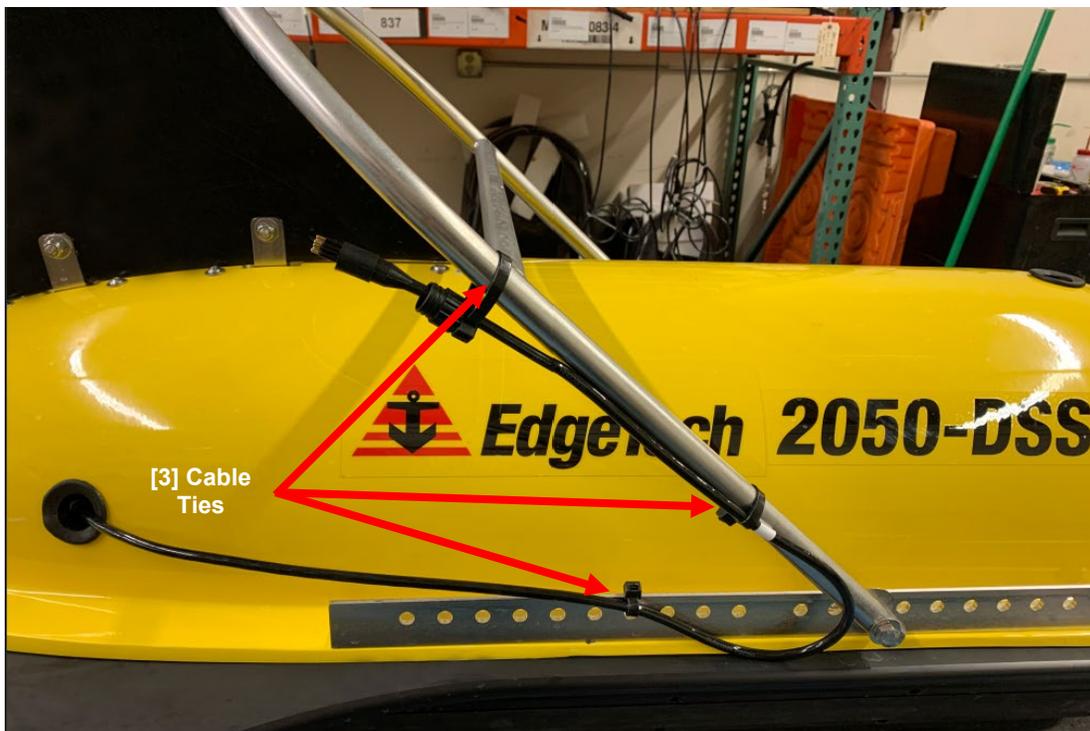


Figure 4-13: 2050-DSS Starboard Bridle Power and Data Cable Cable-Tie Locations

2. Remove the [2] split rings using needle nose plyers.

3. Unthread the [2] 3/8" hex nuts, [2] 3/8" bolts, [4] 3/8" standard washers, and [2] 3/8" fender flat washers using the 9/16 Wrenches.
4. Retain all hardware except cable ties. Those should be replaced when reinstalled.

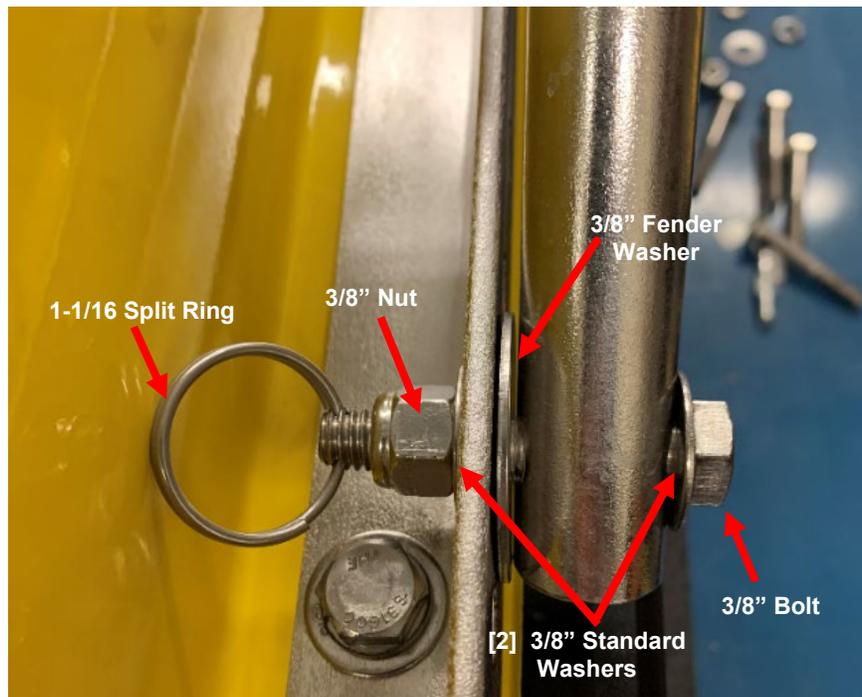


Figure 4-14: Tow Bridle Arm Removal Hardware

4.8.2 Tow Bridle Adjustment

The bridle is shipped in a default position that should accommodate typical towing parameters. If they are changed for any reason, the bridle's position can be altered to correct the vehicle's pitch and provide proper sensor orientation and stability. Moving the bridle position forward will result in a nose-up positive pitch position. Moving the bridle aft will result in a nose-down negative pitch correction.

Instructions:

The bridle is adjusted by removing the bridle and reinstalling it to a more suitable hole position on the tow bridle mounting rails. Instructions for bridle removal are found in the [TOW BRIDLE REMOVAL INSTRUCTIONS](#) above, and reinstalled using the [TOW BRIDLE INSTALLATION INSTRUCTIONS](#) below.

4.8.3 Tow Bridle Installation

The tow bridle is attached to the 2050-DSS Vehicle with two Bolt, washer, nut, and split ring hardware sets on the port and starboard side of the vehicle. The tow vehicle's power and data cable also runs up the starboard side of the vehicle and bridle arm and is lashed to the arm and rail with cable ties. To install

the tow bridle lift and position the bridle at the default hole position, fasten using hardware, run the power and data cable up the starboard bridle arm and lash the cable to the tow bridle arm and mounting rail using cable ties.

REQUIRED TOOLS AND HARDWARE

Tools:

- 9/16" Crescent or Adjustable Wrench
- 9/16" Crescent, Adjustable Wrench of Socket Wrench with 9/16" Socket

Hardware:

- 3 Cable Ties
- [2] 3/8" Hex Bolts
- [2] 3/8" Nuts
- [4] 3/8" Standard Flat Washers
- [2] Washers 3/8" Fender Flat Washers
- [2] 1-1/16" Split Rings

Table 4-4: 2050-DSS Tow Bridle Installation Tools and Hardware

Instructions:

1. Position the detached bridle so that both ends are outside the port and starboard mounting rails at the same point. The default position is 7-8 mounting rail holes from the forward end of the vehicle.



Figure 4-15: Tow Fish Bridle Mounting Bracket Positioning

2. Install both sets of bridle mounting hardware. Thread 3/8" bolts through 3/8" washers and mounting rail. Install 3/8" nut and tighten assembly using 9/16" wrenches. Secure 1-1/16" split ring with each hardware set.

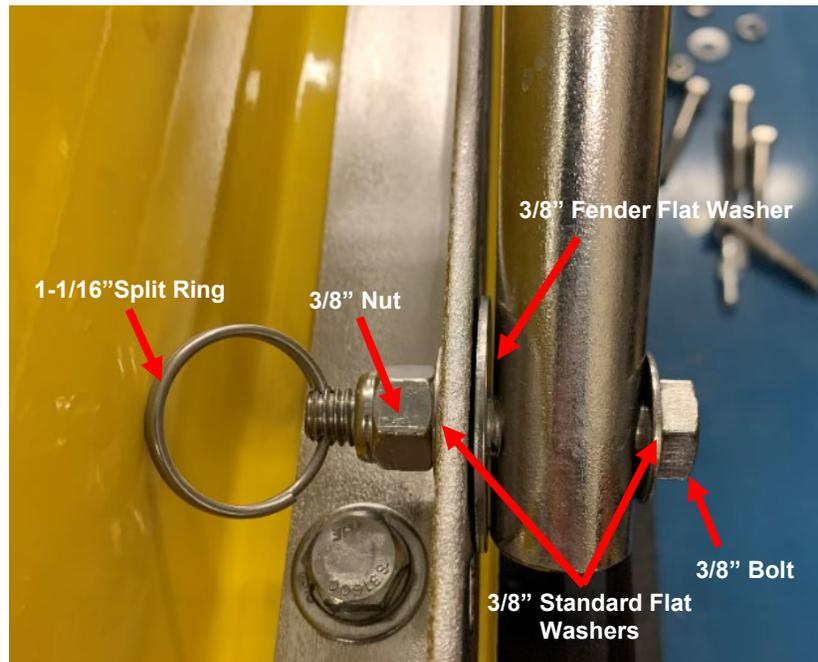


Figure 4-16: Tow Bridle Arm Removal Hardware

3. Run the power and data cable up and along the starboard bridle arm. Secure with three cable ties. One tie should be lashed through a mounting rail hole, one on the lower bridle arm, and one lashed upper bridle arm above the horizontal support. Leave enough slack in the cable between the bridle and horizontal support cable ties to rotate the tow arm, and never pull on the cable.

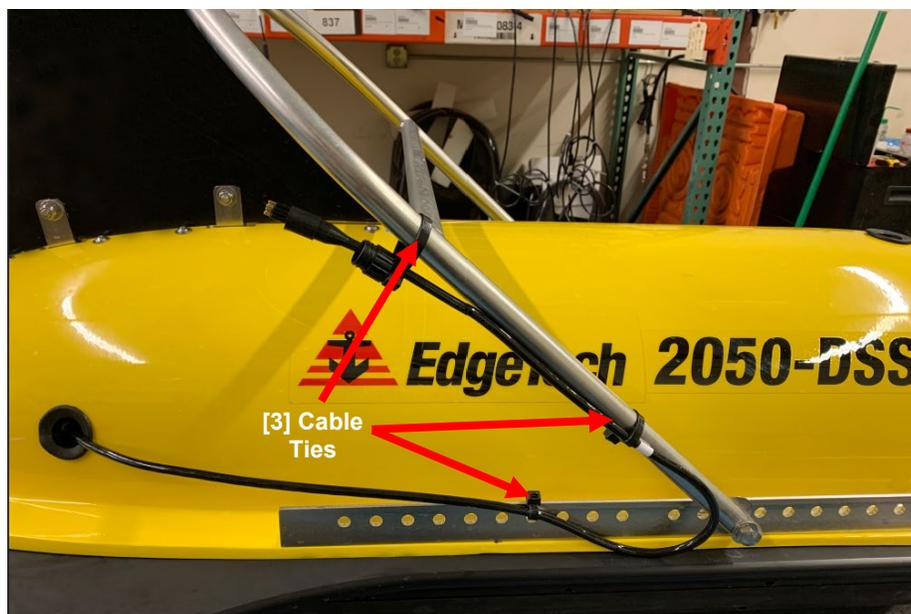


Figure 4-17: 2050-DSS Starboard Bridle Power and Data Cable Cable-Tie Locations

4.9 Towfish Deployment

The 2050-DSS is ruggedly built, but care is needed to deploy the system and get the best survey results. This involves carefully lowering it to an ideal survey depth, utilizing and monitoring the Discover Bottom Tracking feature to avoid striking the bottom, and carefully recovering and disconnecting the towfish when the survey is completed.

The 2050-DSS tow vehicle can be towed using the armored tow cable purchased with the vehicle. The towfish end of the cable should be secured to the bridle shackle with the cable grip, and the tow cable is then run down along a towfish bridle arm to the connector, where both ends are mated. Cable ties should be used to secure the cable to the bridle arm giving the tow cable enough slack between the shackle and connector to prevent the endpoints from being pulled loose. Load-bearing cables can be used by attaching them to a bridle shackle.



Figure 4-18: 2050-DSS Tow Cable and Grip Bridle Attachment

To deploy the Towfish:

CAUTION! The deployment instructions below are only meant as a general guide. Due to varying conditions, exact deployment methods will change, and it is up to the end-user to modify their deployment procedure to match the conditions they are working under.

CAUTION! When lowering the towfish in an area where the bottom topography is unknown, take care not to strike the bottom or a submerged object. Otherwise, damage to the Towfish may occur. Carefully monitor towfish altitude always during the survey. Failure to do so could result in the towfish hitting bottom or becoming snagged.

CAUTION! Do not tow the towfish too close to the survey vessel. Towing in this manner can cause the Towfish to be pulled in against the ship's hull due to the low pressure of the propeller wash and the effect of the water flowing by the hull. In addition, sonar reflections from the hull may be evident in the records.

CAUTION! Do not tow the towfish with the nose angled up or down. Doing so can degrade the sonar imagery. Verify that the Towfish is as level as possible when towing it.

NOTE: For detailed towing characteristics for many tow cable types and lengths, along with towfish speeds, with or without a depressor, refer to the **TOWFISH LAYBACK CHARTS** provided in this manual.

NOTE: For detailed information about the Discover software, including recording data, refer to the **DISCOVER 2050-DSS SOFTWARE MANUAL**.



Figure 4-19: 2050-DSS Towfish Deployment

1. With the survey vessel underway at up to two knots, slowly and carefully lower the towfish into the water, well away from the propeller. Do not let the Towfish strike the hull of the survey vessel.
2. Lower the towfish to a depth of about three meters or just below the propeller wash.
3. Set the range for each frequency in the control window shortcut toolbar in Discover.
4. Normalize gain and TVG by clicking on the shortcut toolbar N and T buttons on both active side-scan display windows in Discover.
5. Click the Bottom Track tab in the Lower Control panel, shown below.

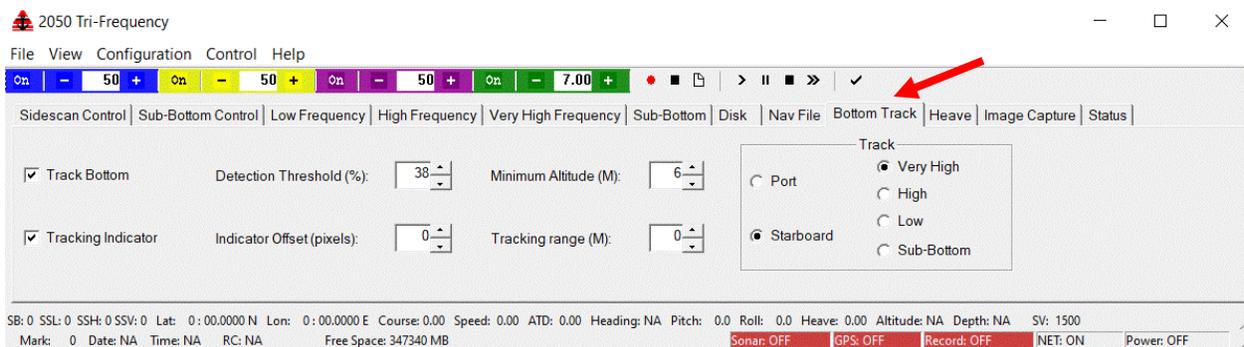


Figure 4-20: Bottom Track Tab

6. In the Bottom Track Tab, make the required settings to track the bottom and note the towfish altitude in the Altitude display. Lower the towfish such that its altitude is 10–15% of the range

selection. Refer to the [DISCOVER 2050-DSS SOFTWARE MANUAL](#) for details on the bottom tracking setup.

7. Increase the survey vessel speed to the desired survey speed and adjust the amount of cable out such that the altitude of the towfish remains at 10–15% of the range selection.
8. If a pressure sensor is installed, verify that the Pressure display indication is working.
9. Secure the tow cable to the survey vessel.
10. Begin recording data.

4.10 Towfish Layback Charts

The following towfish layback charts are provided to assist in towing. Please consider the following points if they are used:

- The standard 2050 towfish currently supports depths no greater than 2000 meters.
- The results listed in these tables are calculated using the Woods Hole WHOI cable program with best-estimated parameters for vehicle weight and buoyancy and cable weight and stiffness. EdgeTech disclaims any liability for consequential damage resulting from using the data in the tables.
- An error of +/-5% applies to all predicted depth and tension values. In some but not all cases, there is a local minimum in max cable tension as a function of speed occurring at roughly 4 kts and is not an error. As a result of the lift and drag summed over the entire catenary curve, some tension is relieved for slow-speed cases relative to the at-rest case or higher-speed cases.
- A combination of too much cable paid out, and too slow a tow speed will exceed the maximum vehicle depth. Conversely, too much cable paid out, and too fast a tow speed will result in exceeding the tow cable's max working load. Consult the charts for specific examples.

4.10.1 Cable A320327 Layback Chart

2050-DSS WITH CABLE A320327 (MAX. WORKING LOAD = 17.1 KN)				
Cable Paid Out (m)	Speed (kts)	Speed (m/s)	Depth Achieved (m)	Max Cable Tension (N)
500	2.00	1.03	404	2,065
500	4.00	2.06	219	1,873
500	6.00	3.09	141	2,117
500	8.00	4.12	103	2,688
1,000	2.00	1.03	718	2,790
1,000	4.00	2.06	376	2,466
1,000	6.00	3.09	246	2,945
1,000	8.00	4.12	182	3,946
2,000	2.00	1.03	1,307	4,164
2,000	4.00	2.06	688	3,648
2,000	6.00	3.09	457	4,602
2,000	8.00	4.12	341	6,464
4,000	2.00	1.03	2,466*	6,873
4,000	4.00	2.06	1,313	6,012
4,000	6.00	3.09	879	7,915
4,000	8.00	4.12	659	11,499

*Max depth rating of 2,000m exceeded

Table 4-5: Cable A320327 Layback Chart

4.10.2 Cable A302799 Layback Chart

2050-DSS WITH CABLE A302799 (MAX. WORKING LOAD = 17.8 KN)				
Cable Paid Out (m)	Speed (kts)	Speed (m/s)	Depth Achieved (m)	Max Cable Tension (N)
500	2.00	1.03	349	2,605
500	4.00	2.06	181	2,841
500	6.00	3.09	118	4,133
500	8.00	4.12	87	6,230
1,000	2.00	1.03	627	3,841
1,000	4.00	2.06	326	4,451
1,000	6.00	3.09	216	7,023
1,000	8.00	4.12	161	11,071
2,000	2.00	1.03	1,174	6,280
2,000	4.00	2.06	617	7,669
2,000	6.00	3.09	412	12,803
2,000	8.00	4.12	309	20,757**
4,000	2.00	1.03	2,263*	11,150
4,000	4.00	2.06	1,199	14,105
4,000	6.00	3.09	805	24,366**
4,000	8.00	4.12	605	40,136**
*Max depth rating of 2,000m exceeded				
**Max working load of 17.8 kN exceeded				

Table 4-6: Cable A302799 Layback Chart

4.10.3 Cable A309183 Layback Chart

2050-DSS WITH CABLE A309183 (MAX. WORKING LOAD = 44.0 KN)				
Cable Paid Out (m)	Speed (kts)	Speed (m/s)	Depth Achieved (m)	Max Cable Tension (N)
500	2.00	1.03	400	4,551
500	4.00	2.06	228	4,393
500	6.00	3.09	153	6,044
500	8.00	4.12	115	8,984
1,000	2.00	1.03	761	7,672
1,000	4.00	2.06	431	7,504
1,000	6.00	3.09	292	10,826
1,000	8.00	4.12	220	16,575
2,000	2.00	1.03	1,475	13,864
2,000	4.00	2.06	836	13,725
2,000	6.00	3.09	569	20,391
2,000	8.00	4.12	429	31,760
4,000	2.00	1.03	2,899*	26,223
4,000	4.00	2.06	1,648	26,167
4,000	6.00	3.09	1,124	39,525
4,000	8.00	4.12	849	62,146**
*Max depth rating of 2,000m exceeded				
**Max working load of 44.0 kN exceeded				

Table 4-7: Cable A309183 Layback Chart

5.0 MAINTENANCE

The 2050-DSS Side Scan and Sub-Bottom System is ruggedly designed and built and therefore requires little maintenance. However, to ensure long-lasting, reliable service, some periodic maintenance is recommended.

Maintenance of the system should be performed regularly. Most of the maintenance is performed after each deployment and recovery cycle.

5.1 Cleaning the Tow Vehicle and Cable After Use

After retrieving the tow vehicle from the water, use a hose to wash it down, along with the tow cable, with clean freshwater. Thoroughly spray the transducers and the hydrophone arrays from underneath the tow vehicle and remove any buildup of debris that may have been trapped inside. Inspect the inside of the tow vehicle, especially the transducers, the hydrophone arrays, and the cables, for any damage and any loose connectors. Also, inspect the tow cable and the connectors on each end.

After washing down the tow vehicle, clean the transducers and hydrophone arrays using a mild, non-abrasive detergent and water. Do not use any abrasive detergents or ammonia-based cleaners. After cleaning, thoroughly spray the transducers and hydrophones again with fresh water.

5.2 Inspecting and Cleaning the Underwater Connectors

Regularly inspect the contacts on each underwater connector's pins on the tow vehicle's connector and the tow cable connector for corrosion or oxidation. To remove any oxidation, rub the contacts lightly with an 800 grit emery cloth cut into strips equal to or less than the width of a contact. A pencil eraser can also be used for this purpose. The female sockets can be cleaned using a cotton swab and rubbing alcohol. A .22 caliber bore brush with only nylon bristles can be used to remove light oxidation.

To extend the life and increase the connectors' reliability, apply a thin film of silicone dielectric grease, such as Novagard G624 general purpose silicone grease or an equivalent, to the entire surface of each male pin. A small amount of grease should also be applied to the opening of each female socket.

NOTE: Remember to always install dummy connectors on the tow cable's connector and the Tow Vehicle's tow cable connector.

5.3 Tail Rudder Removal and Installation

The tail rudder can be removed if the towfish needs to be stored or shipped in a more confined space. To do so, unthread the three bolt assemblies securing the three tail rudder brackets to the tow vehicle.



Figure 5-1: 2050-DSS Tail Rudder [3] Bolt Hardware Assembly Locations

REQUIRED TOOLS AND HARDWARE

Tools:

- 1/2" Crescent or Adjustable Wrench
- 1/2" Crescent, Adjustable Wrench or Socket Wrench with 1/2" Socket

Hardware:

- [3] 5/16" Bolts
- [3] 5/16" Nuts
- [6] 5/16 Washers

Table 5-1: Tail Rudder Removal and Installation Tools and Hardware

Removal Instructions:

1. Unthread the three tail rudder 5/16" bolt, 5/16" nut, and 5/16" washer hardware assemblies using [2] 1/2" inch wrenches.
2. Carefully lift the tail clear of the vehicle's [3] rudder mounting brackets. Store rudder and retain all hardware for reassembly.

Installation Instructions:

1. Gently set the fin on the aft end of the vehicle within the [3] rudder mounting brackets, orienting the rudder bolt holes to match the corresponding bracket bolt holes.
2. Thread the three tail rudder 5/16" bolt, 5/16" nut, and 5/16" washer assemblies using [2] 1/2" wrenches. Tighten until snug.

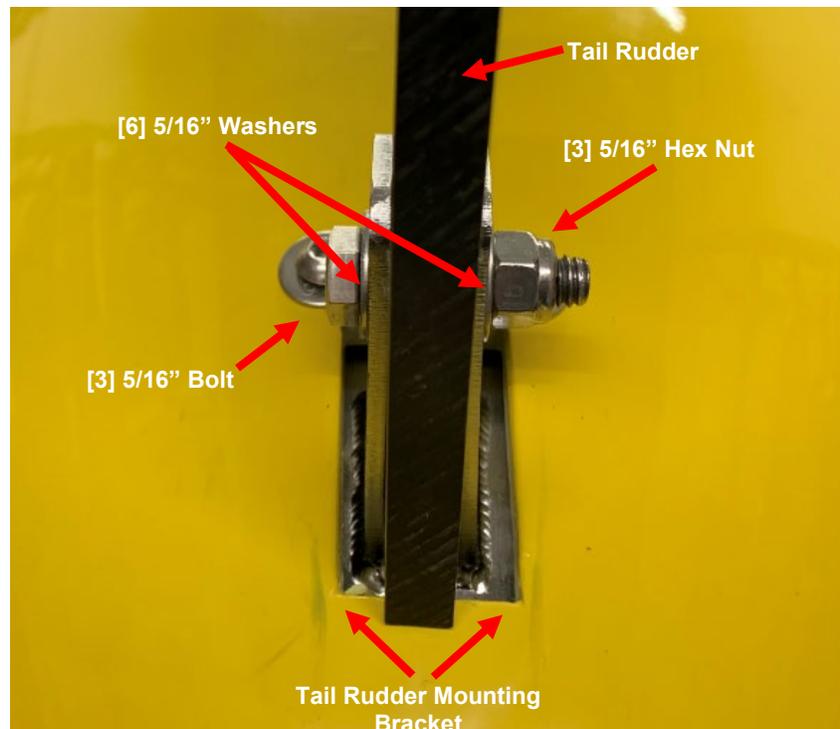


Figure 5-2: Tail Rudder Bolt Hardware

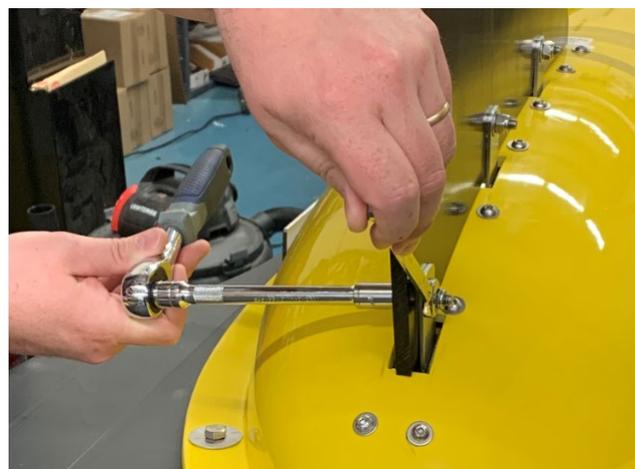


Figure 5-3: Tail Rudder Bolt Hardware Disassembly

5.4 Storage

When not in use, all the 2050-DSS system components should be packed in their original shipping containers, in the same way they were originally shipped and stored in a dry area.

5.5 Opening the 2050-DSS Towfish

The procedures below describe how to open the 2050-DSS Tow Vehicle. Generally, there is little to no reason to open the vehicle other than to inspect or send the electronic bottle or transducer in for service. However, should you need to disassemble the tow vehicle for any reason, contact **EDGETECH CUSTOMER SERVICE** before any attempts to disassemble the vehicle to preserve the product's warranty.

Accessing the tow vehicle's sonar processor and sub-bottom transducer involves removing the tow vehicle's tow bridle and upper-shell, removing and installing the bottles, and installing the upper shell and tow vehicle bridle when complete. Bridle removal and installation instructions are found in **THE TOW VEHICLE BRIDLE REMOVAL, ADJUSTMENT, AND INSTALLATION** section of this manual. Thirteen bolt hardware assemblies secure the upper vehicle shell. Five of the assemblies, three forward and two aft, include a larger washer to protect the vehicle shell from scratching. The eight bolt assemblies located port and starboard secure the bridle mounting rails to the vehicle as well. All hardware should be removed and retained to open, service, and seal the vehicle when complete.

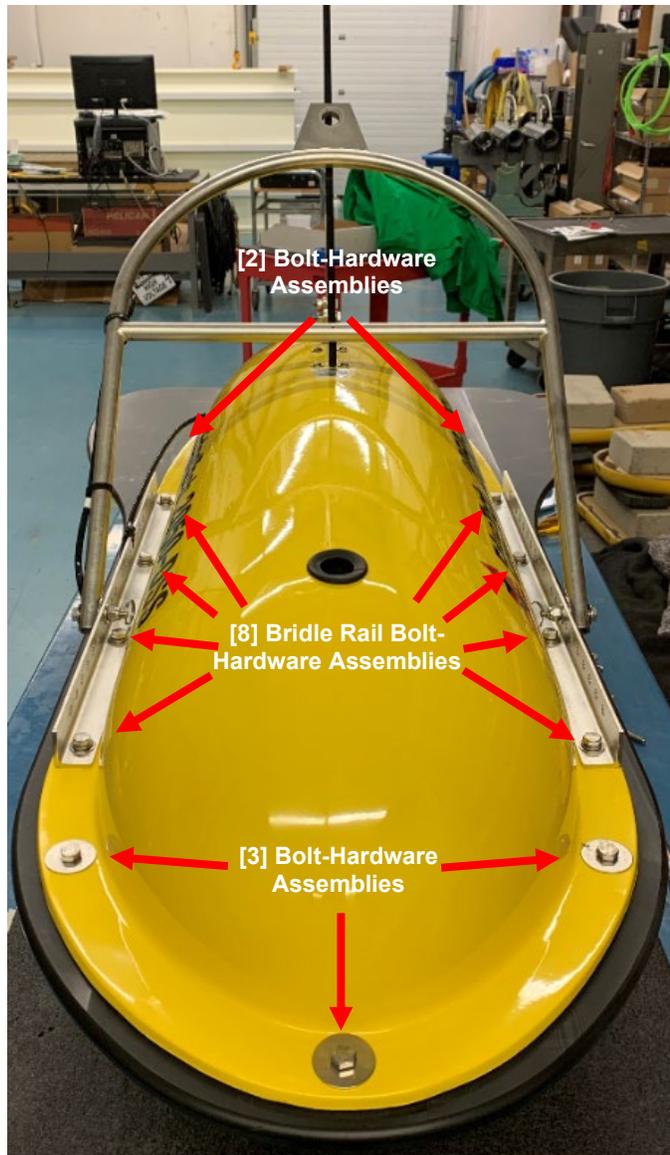


Figure 5-4: 2050-DSS Upper-Shell Disassembly [13] Bolt-Hardware Locations

REQUIRED TOOLS AND HARDWARE

Tools:

- 9/16" Crescent or Adjustable Wrench
- 9/16" Crescent, Adjustable Wrench or Socket Wrench with 9/16" Socket
- Cutting Pliers

Hardware:

- [13] 3/8" Bolts
- [13] 3/8" Nuts
- [13] 3/8" Split Lock-Washers
- [8] 3/8" Standard Flat Washers
- [10] Fender Flat Washers

Table 5-2: Upper-Shell Disassembly and Assembly Tools and Hardware

WARNING! Power down the system and disconnect the cable from Starmux IV. Injury or death can occur if the exposed connector on the tow cable is energized. Always connect the tow cable to the towfish first.

Upper-Shell Disassembly Instructions:

1. Shut down the system and disconnect the cable from the tow cable or test cable. The system should never be powered during this process.
2. Remove the vehicle's tow bridle as instructed in the **TOW BRIDLE REMOVAL** section of this manual.
3. Unthread the [8] 3/8" bolts, [8] 3/8" split-lock washers, [8] 3/8" standard flat washers of the eight bolt-hardware assemblies from the [2] threaded tow plates securing the tow bridle mounting rails and upper and lower-shells using the 9/16" wrenches.
4. Remove the [2] tow bridle mounting rails from the vehicle. Note their orientation for installation.
5. Unthread the [5] 3/8" hex nuts, [5] 3/8" bolts, [5] 3/8" split-lock washers, [10] 3/8" fender flat washers of the five bolt-hardware assemblies securing the upper-shell using the 9/16" wrenches.
6. Push the power and data cable through the hole it emerges from in the upper-shell.

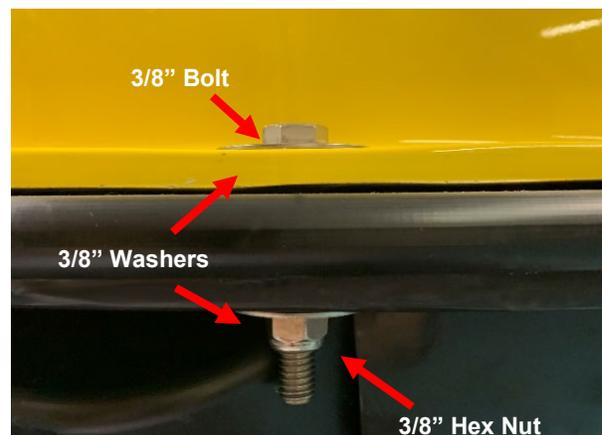


Figure 5-6: 2050-DSS Bolt Hardware Assembly



Figure 5-5: 2050-DSS Bolt Hardware Disassembly

7. Carefully lift the upper-shell from the vehicle and set it aside. If the rudder is attached, do not lay the shell down on it as it is not designed to bear the upper shell's weight.
8. The inner-tow vehicle should now be exposed and ready for service.

Upper-Shell Assembly Instructions:

1. Carefully lift the upper-shell and place it on the lower shell lining it up the wing and 13-bolt holes while threading the power and data cable through the starboard hole in the upper-shell.
2. Set the [2] bridle mounting rails on the tow vehicle over the eight mounting holes they were removed from. The mounting rail risers should be oriented toward the outside of the vehicle.
3. Insert the [8] 3/8" bolts through the [8] 3/8" split-lock washers, the [8] 3/8" standard flat washers, the [2] bridle mounting rails, and the upper and lower shells. Align the [2] threaded tow plates under the lower shell flange and thread the [8] 3/8" bolts into the tow plate using the 9/16" wrenches.
4. Insert the [5] 3/8" bolts through the [5] 3/8" split-lock washers, the [5] 3/8" fender washers, and the upper and lower shells. Thread the [5] 3/8" hex nuts and [5] 3/8" fender washers onto the [5] 3/8" bolts securing the top shell using the 9/16" wrenches.
5. Reinstall the tow vehicle bridle as described in the **TOW BRIDLE INSTALLATION** section of this manual.

5.6 Sonar Processor Removal and Installation

The horizontally mounted sonar processor can be removed by opening the top cover of the tow vehicle, disconnecting the cabling, removing the two bottle clamps by unthreading the four hex bolt assemblies securing it, and lifting the processor bottle out of the tow vehicle.

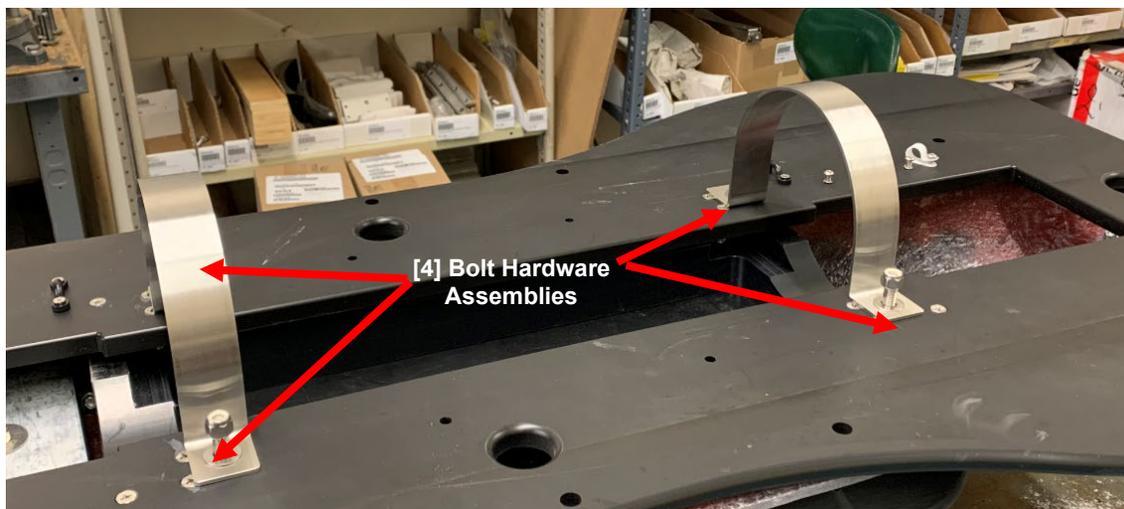


Figure 5-7: 2050-DSS Sonar Processor Mounting Assembly

REQUIRED TOOLS AND HARDWARE

Tools:

- 9/16" Crescent or Adjustable Wrench
- 9/16" Crescent, Adjustable Wrench or Socket Wrench with x" Socket
- Cutting Pliers

Hardware:

- [4] 3/8" Standard Flat Washers
- [4] 3/8" Hex Nuts
- [2] Bottle Clamps
- [2] Rubber Strips

Table 5-3: Sonar Processor Installation and Removal Tools and Hardware

WARNING! Power down the system and disconnect the cable from Starmux IV. Injury or death can occur if the exposed connector on the tow cable is energized. Always connect the tow cable to the tow vehicle first.

Sonar Processor Removal Instructions

1. Power down the 2050-DSS system and disconnect the tow vehicle power and data cable.
2. Remove tow vehicle's upper-shell. See the [OPENING THE 2050-DSS TOWFISH](#) section of this manual for detailed instructions.
3. Note the installed roll position of the horizontally installed processor endcap and any cabling configurations necessary for re-installation.
4. Unplug all cabling from the processor end cap connectors or the connectors of the attached electronics. Install dummy plugs into connectors where needed.
5. Remove the [2] Bottle Clamps by removing the [2] rubber strips and unthreading the [4] nut and washer assemblies using the 9/16" wrenches. The bolts cannot be removed.
6. Carefully lift the electronics bottle from the tow vehicle.

Sonar Processor Installation Instructions

1. Remove tow vehicle's upper-shell. See the [OPENING THE 2050-DSS TOWFISH](#) section of this manual for detailed instructions.
2. Carefully set the electronics bottle back in place, positioning it in the roll position noted when removing the sonar processor bottle.
3. Install the [2] Bottle Clamps by replacing the [2] rubber strips and threading the [4] nut and washer assemblies using the 9/16" wrenches.
4. Plug in all cabling.
5. Install the tow vehicle's upper-shell

5.7 Sub-Bottom Transducer Removal and Installation

The sub-bottom transducer can be removed by removing the top cover of the towfish, unplugging the power and data cable from the bottle, removing the worm/hose-clamps that secures the transducer to the mounting brackets, and lifting the transducer from the towfish.

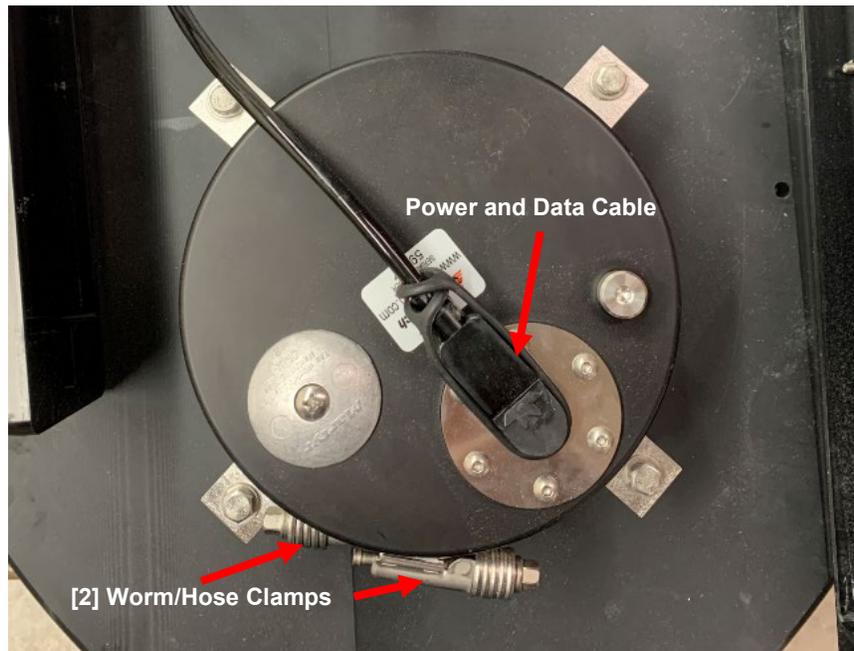


Figure 5-8: 2050-DSS Vertically Mounted Sub-Bottom Transducer Removal and Installation

REQUIRED TOOLS AND HARDWARE

Tools:

- Flathead Screwdriver

Hardware:

- 7.5" Worm/Hose Clamps

Table 5-4: Sub-Bottom Transducer Removal and Installation Tools and Hardware

WARNING! Power down the system and disconnect the cable from Starmux IV. Injury or death can occur if the exposed connector on the tow cable is energized. Always connect the tow cable to the towfish first.

Removal Instructions:

1. Power down the 2050-DSS system and disconnect the tow vehicle power and data cable.
2. Remove towfish upper-shell. See the **OPENING THE 2050-DSS TOWFISH** section of this manual for detailed instructions.

3. Unplug the cable from the sub-bottom transducer or unplug the cable from the endcap.
4. Note the installed roll position of the sub-bottom transducer endcap and any cabling configurations necessary for re-installation
5. Using the flathead screwdriver, unthread the worm clamp screw releasing the worm clamps from the vertically installed transducer and [4] transducer mounting brackets. Remove [2] loose worm/hose clamps.
6. Carefully lift the transducer from the towfish.

Installation Instructions:

1. Carefully place the transducer between the forward mounts in the interior of the vehicle.
2. Reinstall the two worm/hose clamps over the transducer mounts and transducer body. One should be higher than the other and not overlapping. Tighten with a screwdriver until snug.
3. Plug the cable back into the sub-bottom transducer or endcap.



Figure 5-9: 2050-DSS Sub Bottom Transducer Clamp and Mount Orientations

5.8 Operating System Restoration

The following section outlines the procedures for backing up and restoring the system drive. EdgeTech currently uses Macrium Reflect as system restoration software.

CAUTION! All data will be lost upon restoring the system to factory settings. Be sure to backup all data before performing the procedure below.

NOTE: A mouse may be needed to operate the Macrium Reflect UI.

1. Before Powering on the topside, insert the USB3 flash drive into a blue USB3 port.
2. Power on the topside and press the **F**** key. **F**** will be different depending on what you are booting.
 - a. If the Topside is a rack mount, Press **F11**.
 - b. If the Topside is a laptop, Press **F10**.
3. Under the **Boot Manager**. Use the up/down arrows to select the flash drive **Corsair Voyager 3.0**.
4. Wait for **Macrium Reflect** to boot, and then select the **Existing Backup** tabs.
5. Under the **Image** tab, select **Edit**

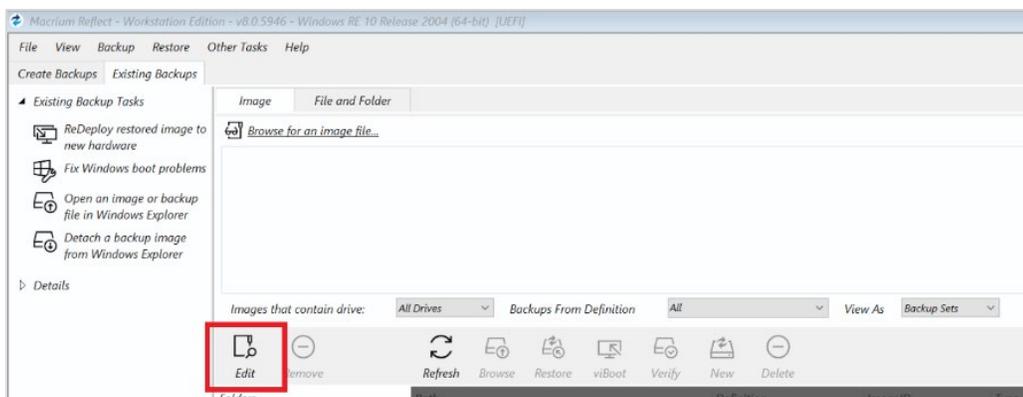


Figure 5-10: Restoration Edit Image Selection

6. **Browse** for the backup folder located on the **0020475_Rev_** drive. The folder should have the following format **XXXX_SNSSSSS**. Once the folder has been selected, click **OK** and then **OK**.

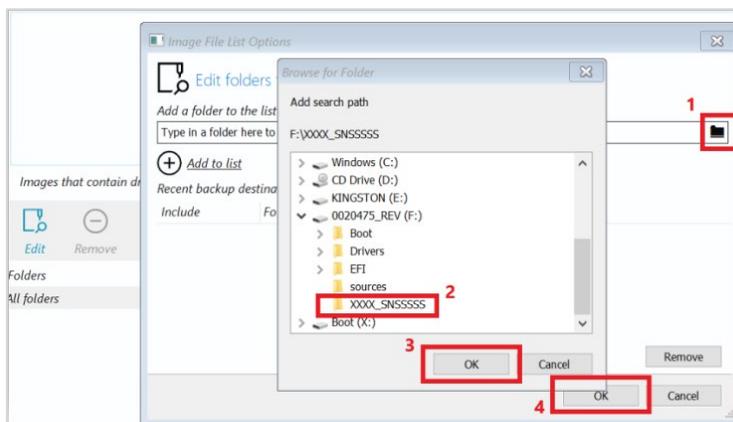


Figure 5-11: Restoration- Add Search Path Confirmation Buttons

7. You should now see that the restore file has been populated in the window. Next, click on **Restore**.

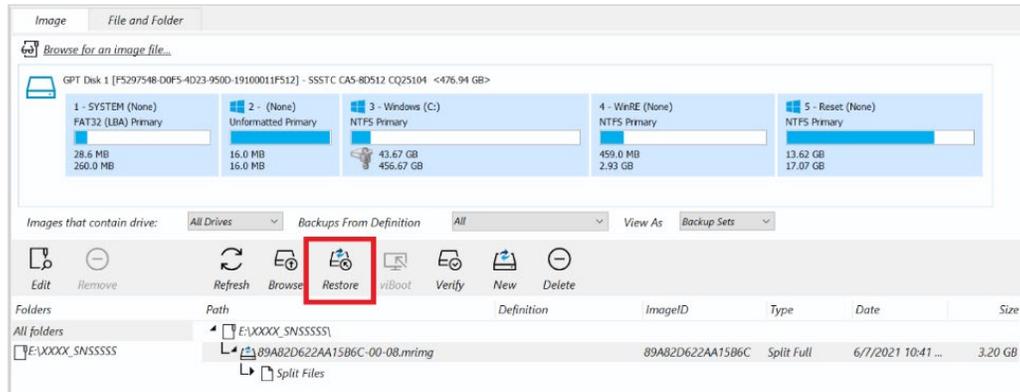


Figure 5-12: Restoration Restore Button

8. On the next window, Select **Next**, followed by **Finish**.
9. A window will open, warning you that everything will be overwritten. Click on the **Check Box** to approve and then click **Continue** on this window.

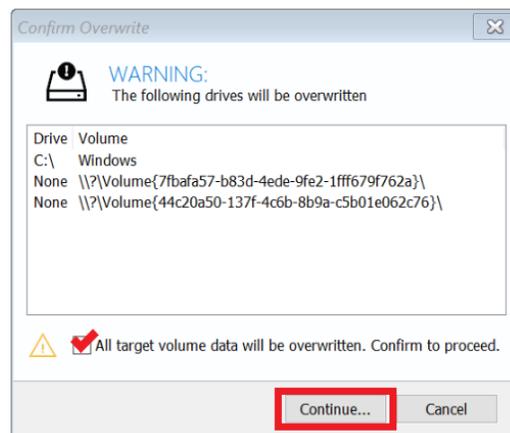


Figure 5-13: Restoration-Confirm Overwrite Continue Button

10. The restoring process should take 2-4 minutes to complete. Once it is finished, click the red button on the bottom left of the screen  and select **Shutdown** and then **Okay**.
11. Remove the USB3 flash drive and turn the power to the topside back on to verify the image has been restored successfully

6.0 TROUBLESHOOTING

6.1 Starmux IV Troubleshooting

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
The green PWR indicator does not illuminate when the unit is turned on.	The POWER switch in the front or rear of the unit is not turned ON .	Verify that both POWER switches are ON .
	No AC power.	Verify that the Starmux IV is connected to AC power. Check the AC power source. Verify that the fuse is good.
	The rear panel VAC 5-amp fuse is bad.	Check the fuse for continuity. Replace if necessary.
The green LAN indicator does not illuminate when the unit is turned on.	There is no connection between the digital link and the external topside processor.	Check the LAN connections between the STARMUX IV unit and the topside processor.
	The indicator is dark.	Open the unit and check the indicator LED and wiring.
The green LINK indicator on the Starmux IV continues to flash after several minutes, and no LINK is established.	The tow cable between the digital link and the tow vehicle is disconnected or faulty.	Check connections and tow cable.
	The modem settings on the digital link are incorrect.	Contact CUSTOMER SERVICE
	The towfish is faulty.	Check using a different towfish.
The DISCOVER survey software (if used on external topside) reports, "Cannot ping Towfish."	LAN cable disconnected.	Check the LAN cable connection.
	The tow cable is disconnected.	Check the tow cable connection.
	The modem settings are incorrect.	Please contact CUSTOMER SERVICE for modem settings.
	The modem is disconnected internally within the digital link.	Check all connections to the modem are correct per the wiring diagram.
	Improper settings in Discover Software (if used on external topside).	Check that under "Configuration" pull-down "Network," the displayed address is 192.9.0.101 with "Port" set to 1700.
	The tow vehicle is faulty.	Verify the tow vehicle using a different digital link. Verify the digital link with a different tow vehicle.

Table 6-1: Starmux IV Troubleshooting Table

A.0 KITS

0023926 REV B ASSY TOP KIT ACCESSORY 2050			
Mtl	Part	Description	Qty
10	0018843	ANODE SPHERICAL SEGMENT 1.875 INCH DIA X 0.35 INCH LENGTH MODIFIED ALUMINUM	4
20	0024195	O-RING BUNA-N 70 2-251 STANDARD ROUND BLACK	4
30	0024196	O-RING BUNA-N 90 8-251 BACKUP PARBAK ROUND BLACK	4
40	0006340	PLUG PRESSURE UNIVERSAL DOUBLE SEAL SS ETS 350-0000608-0300	1
50	0008049	O-RING 3-902 N1490-90	5
60	0008050	O-RING 5-058 N1490-90	5
70	0005849	LUBRICANT GREASE SILICONE	1
80	0005848	LUBRICANT AQUA SHIELD	1
90	0010685	LUBRICANT O-RING SUPER	1
100	0004065	CONN LOCKING SLEEVE CIRCULAR FEMALE BLACK MCDLSF	2
110	0003869	CONN DUMMY PLUG WETMATE 06 POS FEMALE CIRCULAR MCD6F	1
120	0006261	PIGTAIL WETMATE FEMALE 06 POS 6FT MCIL6F	1
130	0003539	TIE CABLE 66UV HEAVY 120LBS	12
140	0003246	BAG TOOL 4200 CANVAS	1
150	0019478	LABEL SHEET WHITE MAILING 04 INCH 1.33 INCH / 14	1
160	0023928	DOC TEMPLATE 2050 DSS TOW FISH CONSUMABLES KIT LABEL SET	1

Table 6-2: 2050-DSS Accessory Kit