# 4205 SIDE SCAN SYSTEM
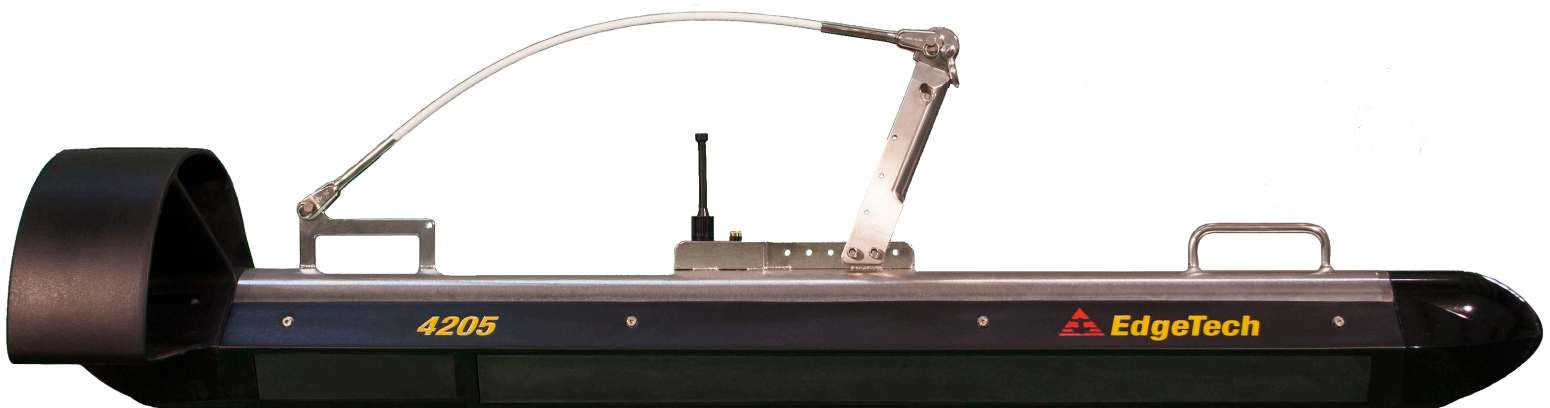
## USER HARDWARE MANUAL

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# ATTENTION – READ THIS FIRST!

All personnel involved with the installation, operation, or maintenance of the equipment 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 the use of 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 4205 Side Scan system contains both standard and proprietary hardware. At times, EdgeTech may change the standard components due to their availability or performance improvements. Although the component manufacturers—along with 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 **CUSTOMER SERVICE** with any questions relating to compatibility.

# ABOUT THIS DOCUMENT

We, the employees at EdgeTech, would like to thank you for purchasing a 4205 Side Scan system. At EdgeTech, it is our policy 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 look for ways to continuously improve them. 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 you with information on the setup and use of EdgeTech's 4205. Although this manual encompasses the latest operational features of the 4205, some features may be periodically upgraded. Therefore, the information in this manual is subject to change and should be used for reference only.

## Liability

This content is protected under copyright law, furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by EdgeTech. EdgeTech assumes no responsibility or liability for any errors or inaccuracies that may appear in the informational content contained in this content.

## Revision History

| REVISION | DESCRIPTION | DATE | APPROVAL |
|----------|-------------|------|----------|
| A | Release to Production | 2/19/2019 | TS |
| B | Content Updates | 7/19/2019 | TS |
|  |  |  |  |
|  |  |  |  |

# 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 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 Seller and the directions received for properly identifying items returned under warranty are followed.

iv. The return notice authorizes 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, and 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 be warranted for the remaining portion of the original warranty period only.

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

> **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.

# 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 EdgeTech FTP site. Major software issues, should they occur, 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 on-line 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 **CUSTOMER SERVICE** by telephone, facsimile, or e-mail to report a difficulty, to discuss a problem or to 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

Before 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 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 responsibility of the customer, 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.

Shipper's Oath:

"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 you regarding our products. Your feedback is welcome and a valuable source of information which we use to improve products. Therefore, we encourage you to contact **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<br>West Wareham, MA 02576 |
| **Telephone:** | (508) 291-0057 |
| **Facsimile:** | (508) 291-2491 |
| **24-Hour Emergency**<br>**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 adopting new cutting-edge acoustic technology.

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# 1.0 OVERVIEW

The next-generation 4205 is a versatile side scan sonar system that can be configured for almost any survey application from shallow to deepwater operations. The 4205 utilizes EdgeTech's Full Spectrum® CHIRP technology to provide crisp, high-resolution imagery at ranges up to 50% greater than non-CHIRP systems; thus allowing customers to cover larger areas and save money spent on costly surveys.

In addition to the high-resolution imagery that EdgeTech is known for, the 4205 comes with several new features which make the system even more flexible and powerful in offshore operations. The 4205 is available in either a tri-frequency side-scan sonar configuration or motion tolerant and multi-pulse configuration. The tri-frequency version allows surveyors the option to operate any two frequencies simultaneously from the tri-frequency system. Long-range operations, for example, can be achieved with a selection of 230/540kHz combination. Then, on-demand the system can be changed to a 540/850kHz system for an even higher resolution survey.

The 4205 Motion Tolerant Configuration with Multi-Pulse (MPMT) provides surveyors the ability to operate either at faster survey speeds or in more adverse weather conditions while still obtaining high-quality underwater imagery. This configuration can also be operated in a single pulse high-resolution mode for those operations that require a highly detailed view of the seafloor. In both the SP and MP configurations, the two frequencies are transmitted simultaneously. In the MP configuration, multi-pulse operation doubles the repetition rate. This allows for increased tow speeds of up to 9.6 knots, while still meeting the NOAA and IHO-44S Shallow Water Survey Specification of three pings on a 1-meter cubed target at 100 meters.

In both the Tri-Frequency and Motion Tolerant/Multi-Pulse configurations, towfish and target positioning have been improved with the integration of a more accurate heading sensor that can be coupled with an optional USBL beacon. Additionally, all systems now come with Increased Towfish power to support a wider range of additional third-party sensors. All EdgeTech 4205 systems are comprised of a topside system and a reliable stainless-steel towfish. Topside processors come in a choice of configurations from Portable to Rack Mounted units. The easy-to-use Discover software is supplied with every unit.

Dual-Frequency Sonar Options include 120/410 kHz, 230/540 kHz, and 230/850 kHz, while Tri-Frequency Sonar Options include 120/410/850 kHz and 230/540/850 kHz. In all configurations, the frequencies are transmitted as linearly-swept, wide-band, high energy acoustic pulses. The received echoes are processed into high Signal-to-Noise Ratio (SNR) images that can be directly displayed as shades of gray or one of many varying color palettes on a computer monitor.

The 4205 has a variety of features, including:

- Tri-Frequency Side Scan Sonar
- Motion Tolerant Mode
- Improved Target Positioning
- Crisp, High-Resolution CHIRP images
- Increased Towfish power to support a wider range of additional Third-Party Sensors
- Single-pulse high-resolution mode

## 1.1    4205 Side Scan Sonar System Applications

The 4205 High Definition Tri-Frequency Side Scan Sonar System has many potential applications, including:

- Cable & pipeline surveys
- Geological/geophysical surveys
- Mine countermeasures (MCM)
- Geohazard surveys
- Channel clearance
- Search and recovery
- Archeological surveys

## 1.2    Main System Components

The 4205 High Definition Tri-Frequency Side Scan Sonar System is made up of 3 main components:

- Topside processor (Two types are available: 701-DL, Starmux III and rack-mounted versions of both.)
- Towfish (ten configurations available)
- Tow cable (Available up to 6000 meters in length)

Contact **CUSTOMER SERVICE** for questions about cable types and lengths. For a 4205 system diagram, refer to **FIGURE 3-18**.

### 1.2.1  Topside Processor

Each of the 4205 Topside Processor options provides downlink telemetry to the towfish for sonar control. They also receive up-link side-scan data, sensor data, and status information from the towfish for processing, storage, and display. Each topside processor interfaces with a Towfish over a 10/100BaseT connection, using Asynchronous Digital Subscriber Line (ADSL) modems. There are four types of 4205 topside processor configurations:

- **Starmux III (DL)** [with or without Laptop]
- **4205 Starmux III Rack Mount,** shown in **FIGURE 1-5**.
  - Starmux III and 2U Computer inside a 6U Hardigg Case
  - Keyboard
  - Trackball
  - LCD Monitor
- **701-Digital Link (DL)** [with or without a Laptop].
- **4205 701-DL Rack Mount**, shown in **FIGURE 1-4**.
  - 701-D-Link and 2U Computer inside a 6U Hardigg Case
  - Keyboard
  - Trackball

o   LCD Monitor

The 4205-Portable Topside and 4205-Rack Mount each include a computer with Windows 10 and EdgeTech's Discover Software.

The 701-DL and Starmux III Digital Links are used with a user-supplied computer, running Discover or third-party data acquisition and display software.



*Figure 1-1: Starmux III Digital Link*



*Figure 1-2: 701-DL Digital Link*



*Figure 1-3: Starmux Rackmount with Keyboard, Trackball Mouse, and Display*

*Figure 1-4: 4205-Rack Mount Processor with Keyboard, Trackball, and LCD Monitor*

## 1.2.2  Towfish

The 4205 Towfish comes in standard tow or ROV tow with Multi-Pulse or Tri Frequency Sonar configurations.

| 4205 TRI-FREQUENCY | 4205 MPMT | 4205 TRI-FREQUENCY ROV | 4205 MPMT ROV |
|---|---|---|---|
| 120/410/850 kHz | 120-410 kHz | 120/410/850 kHz | 120-410 kHz |
| 230/540/850 kHz | 230-540 kHz | 230/540/850 kHz | 230-540 kHz |
| | 230-850 kHz | | 230-850 kHz |
| | | | |

*Table 1-1: 4205 Towfish Options*

The towfish contains the sonar transducer arrays and electronics required to transmit and receive sonar signals, to receive the downlink commands from the topside processor, and to provide the uplink side-scan data, sensor data, and status information to the topside processor.

The electronics are contained inside a single sealed housing to which the transducer arrays are attached and connectors accessible. Double O-ring endcaps seal the forward and aft end of the vehicle. Bulkhead connectors for connecting to the transducer arrays are located in the aft endcap. The 6-pin main I/O connector and 8-pin option connector are located on top of the towfish. The Towfish housing also includes two convenient carrying handles.

The towfish interfaces with the topside processor over a 10/100BaseT Ethernet connection using digital subscriber line (ADSL) modems in both the towfish and the processor.

The 4205 Towfish configurations are equipped with a stabilizer tail and a nose weighted for hydrodynamic balance. A towing arm is rigidly mounted to a tow point on the top of the towfish housing adjacent to the tow cable and option connectors. The tow cable safety grip attaches to a tow key on the tow arm, as shown in **FIGURE 1-5**.
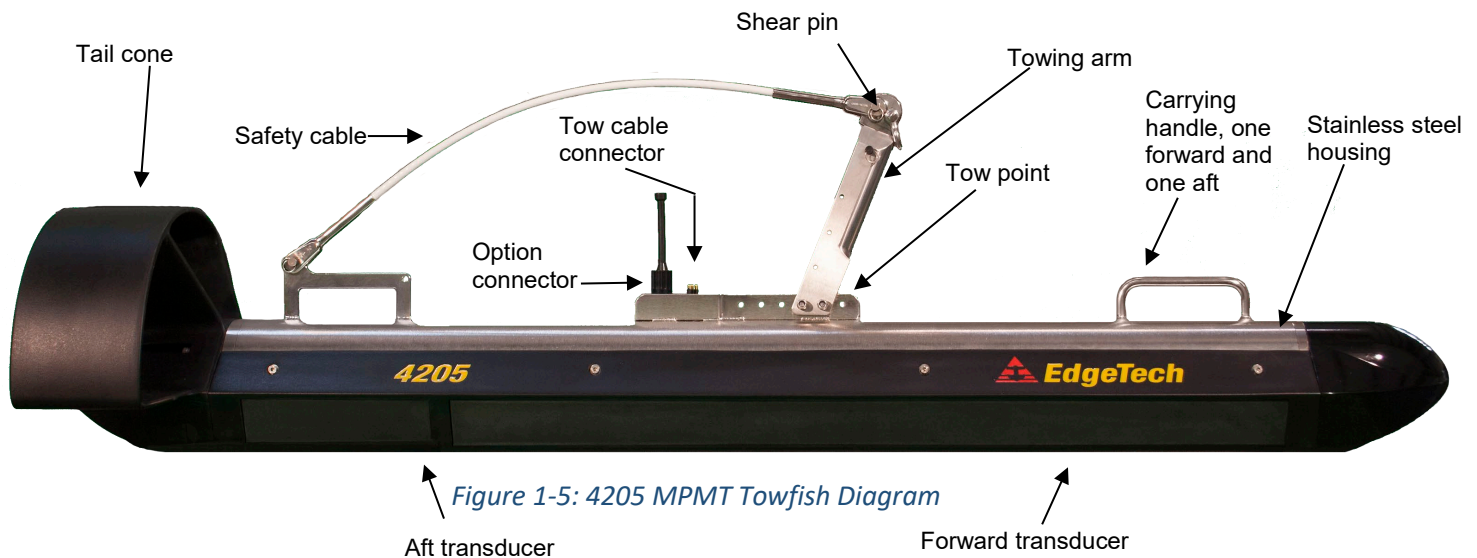


*Figure 1-5: 4205 MPMT Towfish Diagram*

Should you need to reposition the towing arm forward or aft to adjust the balance of the towfish, additional mounting holes are provided on the tow point. The towing arm also includes a safety release mechanism, which causes the shear pin to release the tow key if the towfish hits an obstruction or becomes snagged. Should this happen, the towfish will rotate nose down, and a safety cable, which is attached from the tow point to the stern of the towfish, will pull the towfish, stern first, over the obstruction or through the snag.

Both the Single-Pulse (SP) and Multi-Pulse (MP) configurations of the 4205 High Definition Tri-Frequency Side Scan Sonar System provide simultaneous frequency operation and are designed to accommodate the integration of optional sensors. All configurations provide excellent signal-to-noise performance, resulting in superb data, reliably transmitted digitally over coaxial cables up to 6,000m.

### 1.2.2.1    4205 Tri-Frequency & Single Pulse Towfish

EdgeTech offers a tri-frequency tide Scan Sonar (120/410/850 kHz or 230/540/850 kHz), allowing surveyors the option to operate any two frequencies simultaneously. Long-range operations can be achieved with a selection of 120/410 kHz combination and then, on-demand, the 4205 can be changed to operate at 410/850kHz for a higher resolution survey. Target positioning is improved with the integration of a more accurate heading sensor that can be coupled with an optional USBL beacon.

The 4205 MPMT Towfish is available in the customer's choice of 100/400, 230/850 kHz, and 230/540 kHz operating frequencies. The Towfish includes identical port and starboard transducer arrays, where each includes high, mid, and low frequency transmit/receive elements.

The towfish electronics include separate transmitters and separate receivers. Received sonar signals are digitized and transmitted to the topside processor over an ADSL link, using a coax tow cable up to 6000 meters in length — contact **CUSTOMER SERVICE** for questions concerning cable type vs. lengths.

Operation is in single pulse (SP) mode only, and therefore the maximum Towfish speed that will ensure compliance with the NOAA and IHO-44S Shallow Water Survey Specification of three pings on a 1-meter cubed target with the range set at 100 meters is 4.8 knots.

In Single Pulse, High Definition Mode (HDM), only the forward transducer is used to both transmit and receive acoustic energy. In this mode, a higher resolution image is obtained at the expense of lower tow speeds (for full bottom coverage).

### 1.2.2.2    4205-MPMT Towfish

The 4205-MPMT system enables higher survey speeds while maintaining full-bottom along-track coverage. The towfish includes identical port and starboard forward-mounted and aft-mounted transducer arrays. It is available with a choice of 120/410 kHz, 230/540 kHz, or 230/850 kHz dual linear FM chirp operating frequencies.

The towfish operates in either Multi-Pulse/Motion Tolerant (MP/MT) mode or Single Pulse (High Definition) mode. In MP/MT mode the forward transducer array is used as a transmitter, and the aft array is used as a receiver. The resulting transducer beam pattern shape compensates for motion in the tow vehicle yaw axis while facilitating high-speed operation by transmitting and receiving multiple pulses in the water.

Compared to the SP system, the MP configuration allows two pulses to be in the water during each ping cycle instead of just one. This essentially breaks the sound speed barrier by allowing twice the conventional survey vessel speeds to be used for the same coverage. At conventional survey speeds, twice the data density of an SP configuration can be achieved with an MP-fitted system due to the two pulses. These benefits of MP technology translate into better target detection and classification capabilities. The use of standard chirp technology makes both the SP and MP configurations far less expensive than similar performing high-speed multi-beam systems.

## 1.2.3  Tow Cables

The tow cables are used to both connect and tow the Towfish. They are available in the customer's choice of Kevlar-reinforced, shown in **FIGURE 1-6** or armored styles, and both types can be terminated at both ends or just at the Towfish end depending on customer requirements.

Both cable types include a single conductor and a shield. They also include an MCIL6F female wet-pluggable connector on the towfish end and either an MCIL4M male wet-pluggable connector on the topside processor end or an open termination at this end 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 towfish.

*Figure 1-6: Kevlar Tow Cable*

## 1.3   Optional Equipment

The following optional equipment can be installed and used with the 4205 High Definition Dual-frequency Side Scan Sonar System:

- SGB Compass
- Depressor Wing
- Magnetometer Interface
- Acoustic tracking system
- Pressure sensor
- Responder

> **NOTE:** The option connector provides 28 VDC ± 4% at 2.6 amps maximum.

### 1.3.1  SGB Compass

The 4205 Towfish comes with a standard compass that provides heading, pitch, and roll. The SGB Compass 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.

### 1.3.2  Depressor Wing

The Edgetech Depressor Wing allows the towfish to be towed at greater depths and faster speeds without increasing the length of tow cable in the water. The depressor wing attaches to the top of any 4205 towfish and exerts a downward force on the towfish as it moves through the water, pushing it deeper. The angle of the wing is adjustable to 0°, 5°, or 10° depending on the desired dive angle. Optionally available trim tabs on the back of the wing can be adjusted for fine-tuning its performance, and a safety cable is attached to prevent loss of the wing should it become snagged.

### 1.3.3  Magnetometer Interface

A magnetometer can be specified or supplied and is available from several manufacturers with EdgeTech's optional magnetometer interface. See the appropriate addendum for more information. For Magnetometer Wiring Connections, see FIGURE 2-6 AND FIGURE 2-7.

### 1.3.4  Acoustic Tracking System

A USBL acoustic tracking system, such as an EdgeTech BATS, can be used to provide towfish position continuously. A responder is installed on the towfish, and a ship-mounted hydrophone and deck unit are used to receive and process position data.

### 1.3.5  Pressure Sensor

A stainless-steel pressure sensor can be installed in the towfish to provide towfish depth data. This type of pressure sensor is designed for continuous use in a corrosive liquid environment and is available in a 3000-psi pressure range for the 4205-SP and 4205-MP towfish.

### 1.3.6  Responder

The tracking system deck unit provides a trigger that is input to the topside processor. The topside processor outputs the trigger signal to the towfish by combining the signal with the downlink command and uplink sonar data signals. The towfish will then output the TTL for a customer-supplied responder, as well as trigger out the option connector.

# 2.0 SPECIFICATIONS

The specifications for the standard EdgeTech 4205 High Definition Dual-Frequency Side Scan Sonar System are described below. These may vary depending on customized system orders and should be used as a reference. For detailed information regarding custom systems, refer to the Custom system addendum or contact **EDGETECH CUSTOMER SERVICE** for configuration-specific information.

Specifications of 4205 Dual-Frequency Side Scan Sonar System Main Components:

- **4205 SONAR PERFORMANCE SPECIFICATIONS**

- **TOWFISH SPECIFICATIONS**

- **TABLE 2-2: TOWFISH SPECIFICATIONS**

- **4205 TOPSIDE SPECIFICATIONS**

> **NOTE:** All specifications are subject to change without notice.

## 2.1 4205 Sonar Performance Specifications

| SONAR SPECIFICATIONS | 4205 TRI-FREQUENCY | 4205 MULTI-PULSE/MOTION TOLERANT (MP/MT) AND HIGH DEFINITION MODE | |
|---|---|---|---|
| Frequency | 120/410/850 kHz<br>230/540/850 kHz | 120/410 kHz,<br>230/540 kHz<br>230/850 kHz | |
| Operating Range (meters/side) | 120 kHz: 600m, 230 kHz: 350m, 410 kHz: 200m, 540 kHz: 150m, 850 kHz: 90m | | |
| | TRI-FREQUENCY | MP/MT | HDM |
| Horizontal Beam Width | 120 kHz: 0.7°<br>230 kHz: 0.4°<br>410 kHz: 0.28°<br>540 kHz: 0.26°<br>850 kHz: 0.23° | 120kHz: 0.95°<br>230kHz: 0.63°<br>410kHz: 0.38°<br>540kHz: 0.35°<br>850kHz: 0.30° | 0.7°<br>0.44°<br>0.28°<br>0.26°<br>0.23° |
| | TRI-FREQUENCY | MP/MT | HDM |
| Resolution Along Track | 120 kHz: 2.4m @ 200m<br>230 kHz: 1.2m @ 150m<br>410 kHz: 0.5m @ 100m<br>540 kHz: 0.45m @ 100m<br>850 kHz: 0.20m @ 50m | 120kHz: 3.3m @ 200m<br>230kHz: 1.7m @ 150m<br>410kHz: 0.7m @ 100m<br>540kHz: 0.6m @ 100m<br>850kHz: 0.26m @ 50m | 2.4m @ 200m<br>1.2m @ 150m<br>0.5m @ 100m<br>0.45m @ 100m<br>0.20m @ 50m |
| Resolution Across Track | 120kHz 8cm; 230KHz 3cm; 410kHz 2 cm; 540kHz 1.5cm; 850kHz 1cm | | |
| Vertical Beam Width | 50° | | |
| Depression Angle | Tilted down 25° | | |

*Table 2-1: 4205 Sonar Performance Specifications*

## 2.2   Towfish Specifications

Specifications for the 4205 Towfish are as follows:

| SPECIFICATION | VALUES | |
|---|---|---|
| Size: | Diameter 12 cm (4.75 inches)<br>Length 140 cm (55 inches) | |
| Weight in air: | 52 kg (115 pounds) | |
| Weight in salt water: | 36 kg (80 lb) | |
| Construction: | Stainless steel | |
| Maximum tow cable length: | 6000 m (19,680 ft) Contact EdgeTech for cable type vs. length. | |
| Depth rating: | 2000 m (6560 ft) | |
| Tow cable type: | Coaxial | |
| Shear pin type: | 8 mm (5/16 in.) Delrin rod | |
| Shear force: | 544 kg (1200 lb) | |
| Modulation: | Full-spectrum chirp frequency-modulated pulse with amplitude and phase weighting | |
| Digital link: | 4 Mbits/sec (typical),<br>4 channels of side-scan data plus sensor data | |
| Maximum towing speed while meeting NOAA and IHO-44S specifications of 3 pings on a 1-meter cubed target at 100 meters (4205-SP): | 4.8 knots | |
| Maximum towing speed while meeting NOAA and IHO-44S specifications of 3 pings on a 1-meter cubed target at 100 meters (4205-MP): | HDM<br>4.8 knots | HSM<br>9.6 knots |
| Standard Sensors | Heading, pitch & roll | |
| Maximum safe towing speed: | 12 knots | |
| Operating temperature: | 0–45°C (32–113°F) | |
| Storing temperature: | -20–60°C (-4–140°F) | |
| Heading accuracy: | 0.8° RMS | |
| Pitch and roll accuracy: | 0.2° | |
| Optional sensor port: | (1) Serial – RS 232C, 9600 Baud, Bi-directional & 28VDC +/-4% (Based on Output Load) | |
| Options: | Pressure Sensor, Magnetometer, Integrated USBL Acoustic Tracking System, Built-in Responder Nose, Depressor, Power Loss Pinger and Custom Sensors | |

*Table 2-2: Towfish Specifications*

## 2.3   4205 Topside Specifications

All Topsides run Windows operating systems and come loaded with the Discover Software. General specifications can be found below.

**STARMUX III DIGITAL LINK**



**RACK MOUNT (STARMUX III DL AND 2U COMPUTER IN CASE)**

| | STARMUX III DIGITAL LINK | RACK MOUNT (STARMUX III DL AND 2U COMPUTER IN CASE) |
|---|---|---|
| **Size** | 8.3 cm (3.25 in.) high<br>48.5 cm (19 in.) wide<br>43.2 cm (17 in.) deep | 17.8 cm (7 in.) high<br>43.2 cm (17 in.) wide<br>45.7 cm (19 in.) deep |
| **Weight** | 6.4 kg (14 lb) | 19.5 kg (43 lb) |
| **Case construction** | Aluminum 19-inch rack mount | Aluminum 19-inch rack mount |
| **Shipping Container Type** | Carton | Sealed high impact polyurethane case |
| **Shipping Container Size** | 66 cm (26 in) high<br>66 cm (26) in wide<br>30.5 cm (12 in) deep | 76.2 cm (30 in.) high<br>76.2 cm (30 in.) wide<br>76.2 cm (30 in.) deep |
| **Shipping Weight** | 14.5 Kg (32 lb) | 70.3 kg (155 lb) |
| **Operating Temp.** | 0–40°C (32–104°F) | 0–45°C (32–113°F) |
| **Storage Temp.** | -20–60°C (-4–140°F) | -30–70°C (-22–158°F) |
| **Operating relative humidity** | 0–80% (non-condensing) | 0–95% (non-condensing) |
| **Non-operating storage relative humidity** | | |
| **Input voltage** | 90-264 VAC, 50/60 Hz, 3000 watts max, autosensing | 100-264 VAC, 50/60 Hz, auto-switching |
| **Input power** | ~ 120W | ~ 120 W |
| **Power to Towfish** | | |
| **Processor** | — | Intel Core, I7, 3.6 GHz Quad Core |
| **Memory** | — | 4 GB, 1333 MHz |
| **Data storage** | — | DVD/RW drive<br>1-TB hard drive (data)<br>500-GB hard drive (OS) |
| **Display** | — | 21-inch LCD monitor |
| **Keyboard** | — | High impact industrial keyboard |
| **Pointing device** | — | High impact industrial trackball |
| **External trigger** | | |
| **I/O ports** | (1) Ethernet<br>(1) Trigger | (1) Ethernet<br>(3) RS-232<br>(6) USB 2<br>(2) USB 3<br>(1) Trigger |

*Table 2-3: Starmux Specifications*

**701-DL DIGITAL LINK**



**RACK MOUNT (701-DL AND 2U COMPUTER IN CASE)**

| | | |
|---|---|---|
| **Size** | 8.3 cm (3.25 in.) high<br>48.3 cm (19 in.) wide<br>43.2 cm (17 in.) deep | 17.8 cm (7 in.) high<br>43.2 cm (17 in.) wide<br>45.7 cm (19 in.) deep |
| **Weight** | 6.4 kg (14 lb) | 19.5 kg (43 lb) |
| **Case construction** | Aluminum 19-inch rack mount | Aluminum 19-inch rack mount |
| **Shipping Container Type** | Carton | Sealed high impact polyurethane case |
| **Shipping Container Size** | 61 cm (24 in) high<br>61 cm (24 in wide<br>30.5 cm (12 in) deep | 71.1 cm (28 in.) high<br>66.0 cm (26 in.) wide<br>50.8 cm (20 in.) deep |
| **Shipping Weight** | 11.3 Kg (25 lb) | 47.7 kg (105 lb) |
| **Operating Temp.** | 0–40°C (32–104°F) | 0–45°C (32–113°F) |
| **Storage Temp.** | -20–60°C (-4–140°F) | -30–70°C (-22–158°F) |
| **Operating relative humidity** | 0–80% (non-condensing) | 0–95% (non-condensing) |
| **Non-operating storage relative humidity** | | |
| **Input voltage** | 100-264 VAC, 50/60 Hz, auto-switching | 100-264 VAC, 50/60 Hz, auto-switching |
| **Input power** | ~ 120W | ~ 120 W |
| **Power to Towfish** | | |
| **Processor** | — | Intel Core, I7, 3.6 GHz Quad Core |
| **Memory** | — | 4 GB, 1333 MHz |
| **Data storage** | — | DVD/RW drive<br>1-TB hard drive (data)<br>500-GB hard drive (OS) |
| **Display** | — | 21-inch LCD monitor |
| **Keyboard** | — | High impact industrial keyboard |
| **Pointing device** | — | High impact industrial trackball |
| **External trigger** | | |
| **I/O ports** | (1) Ethernet<br>(1) Trigger | (1) Ethernet<br>(3) RS-232<br>(6) USB 2<br>(2) USB 3<br>(1) Trigger |

*Table 2-4: 701-DL Specification*

## 2.4    Cable Specifications

The tow cables are used to both connect and tow the tow vehicle. Both cable types include a single conductor and a shield. They also include an MCIL6F female wet-pluggable connector on the tow vehicle end and either an MCIL4M male wet-pluggable connector on the topside processor end or an open termination at this end 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. Specifications for the 4205 tow cable options, along with the power cables, are provided in the drawings that follow.

### 2.4.1   Kevlar Tow Cable Specifications

For more information on Kevlar Tow Cables, contact EDGETECH CUSTOMER SERVICE.

| SPECIFICATION | VALUE |
|---|---|
| Construction | Polyurethane, Kevlar, PVC, Tinned Copper |
| Weight In Air | 30 kg / 305 m (66 lbs / 1000 ft) |
| Weight in Seawater | 7.8 kg / 305 m (17.3 lbs / 1000 ft) |
| Specific Gravity | 1.45 g/cc |
| Strength Member: | Aramid Braid Minimum Break 1134 kg (2500 lbs) |
| Minimum Bend Radius (Dynamic) | 25.4 cm (10.0 in) |
| Capacitance | 30 pF/ft nominal |
| Impedance | 50 Ω |
| Velocity of Propagation | 66% nominal |

*Table 2-5: Kevlar Tow Cable Specifications*

### 2.4.2   Armored Tow Cable Specifications

For more information on Armored Tow Cables, contact EDGETECH CUSTOMER SERVICE

| SPECIFICATION | VALUE |
|---|---|
| Construction | Steel Armored |
| Grip Type | PMI (wet end) |
| Weight In Air | 469 kg/km (315 lb/kft) |
| Weight in Seawater | 397 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 | 1,900 VDC |
| DC Resistance | 9.8 Ω/km (9.8 Ω/kft) <br> 6.9 Ω/km (6.9 Ω/kft) |

*Table 2-6: Armored Tow Cable Specifications*

## 2.5    Mechanical Drawings

Mechanical Drawing of the towfish and tow cable connections are provided on the following pages:
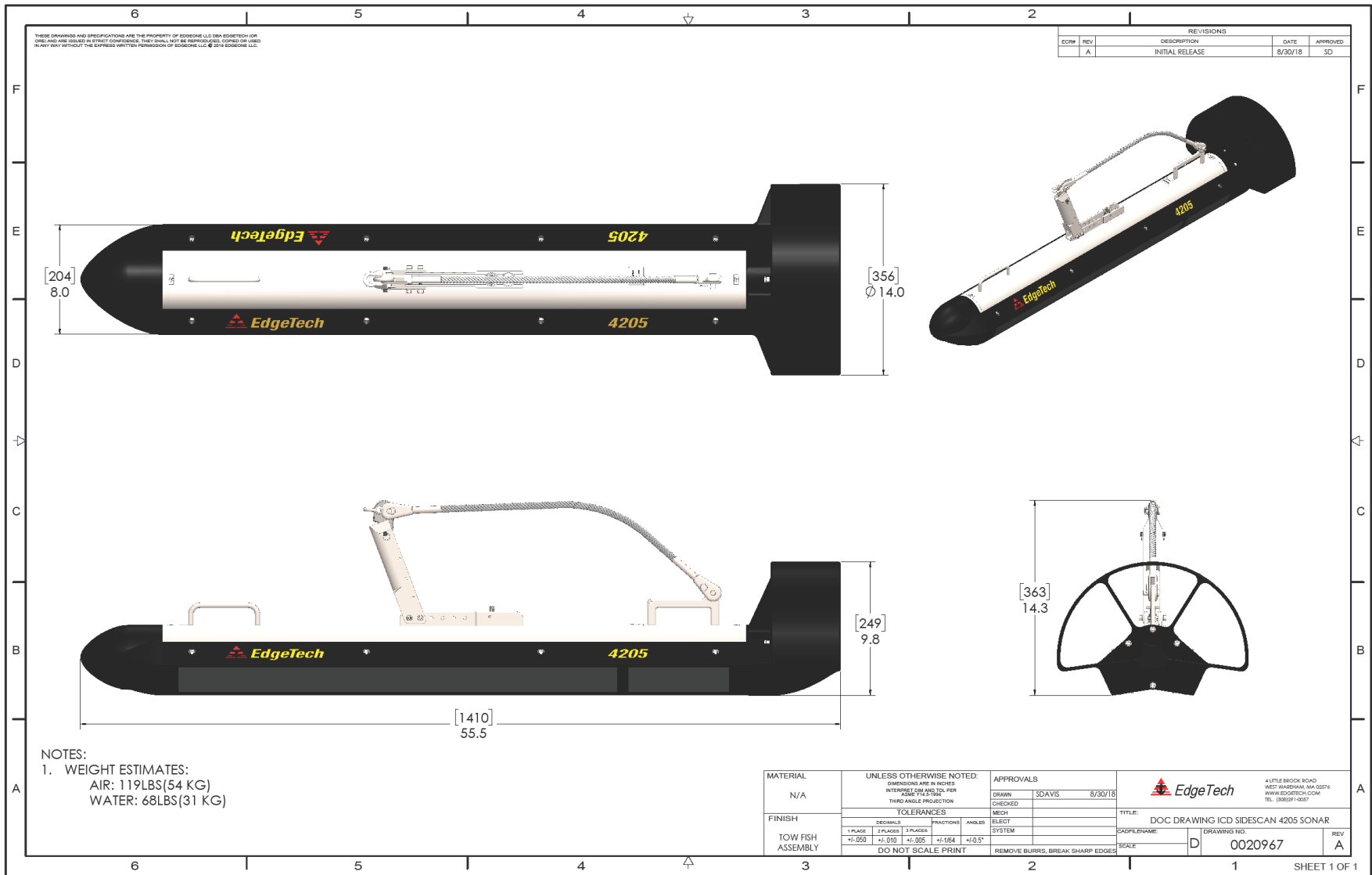
*Figure 2-1: 4205 Towfish ICD – 0020967*
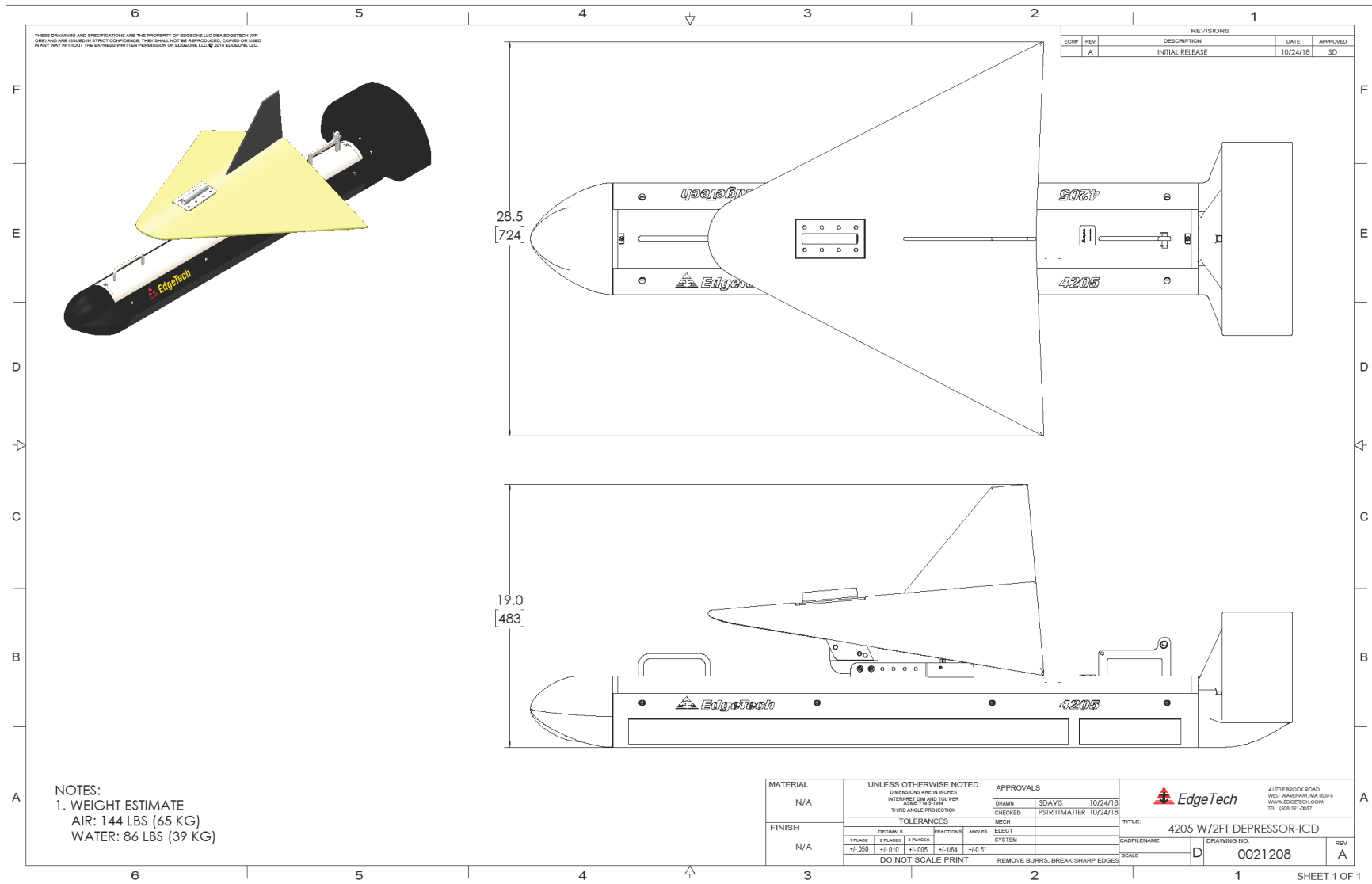
*Figure 2-2: 4205 with 2Ft Depressor – 0021208*
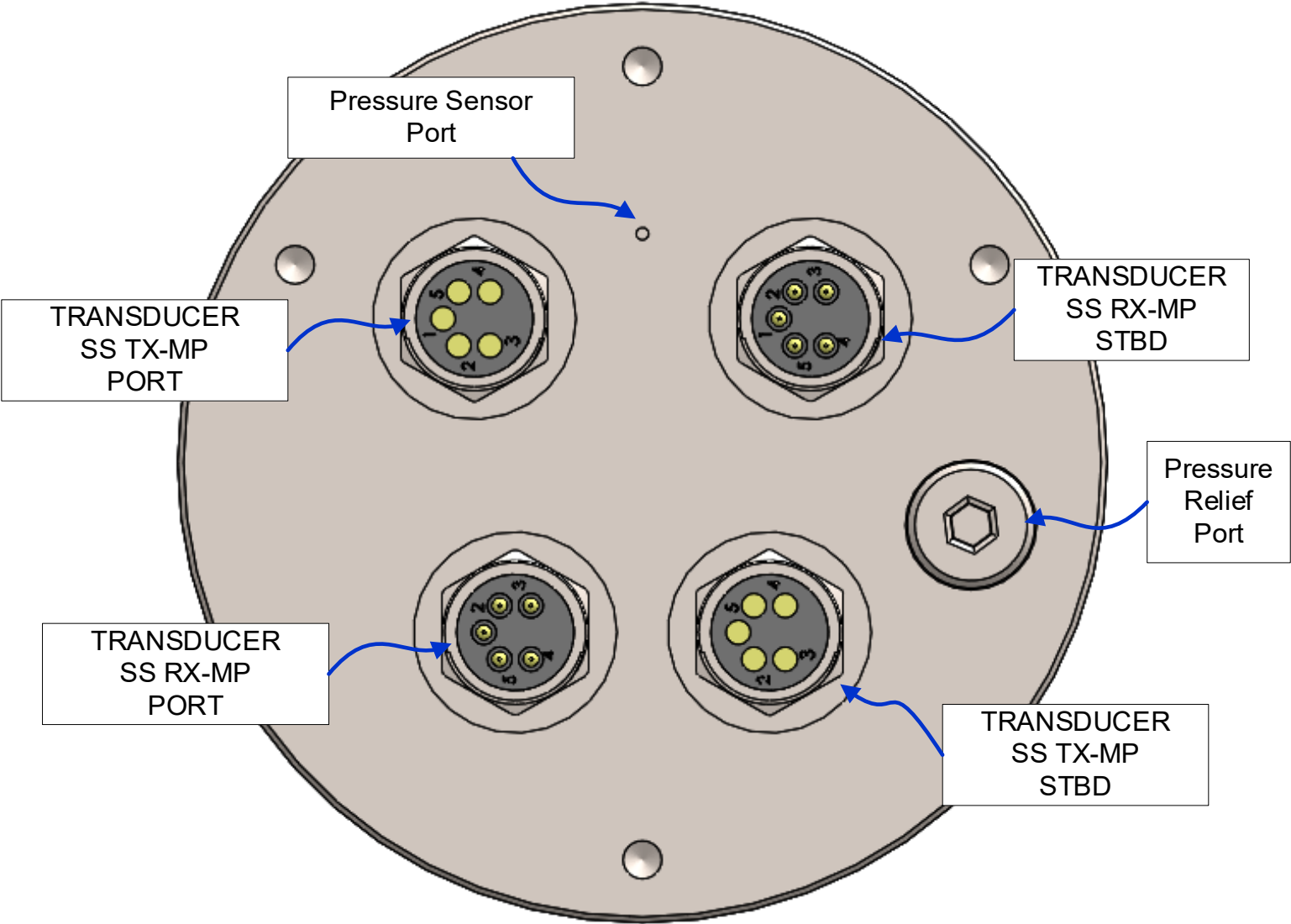
*Figure 2-3: 4205 MPMT Towfish Endcap Connections*
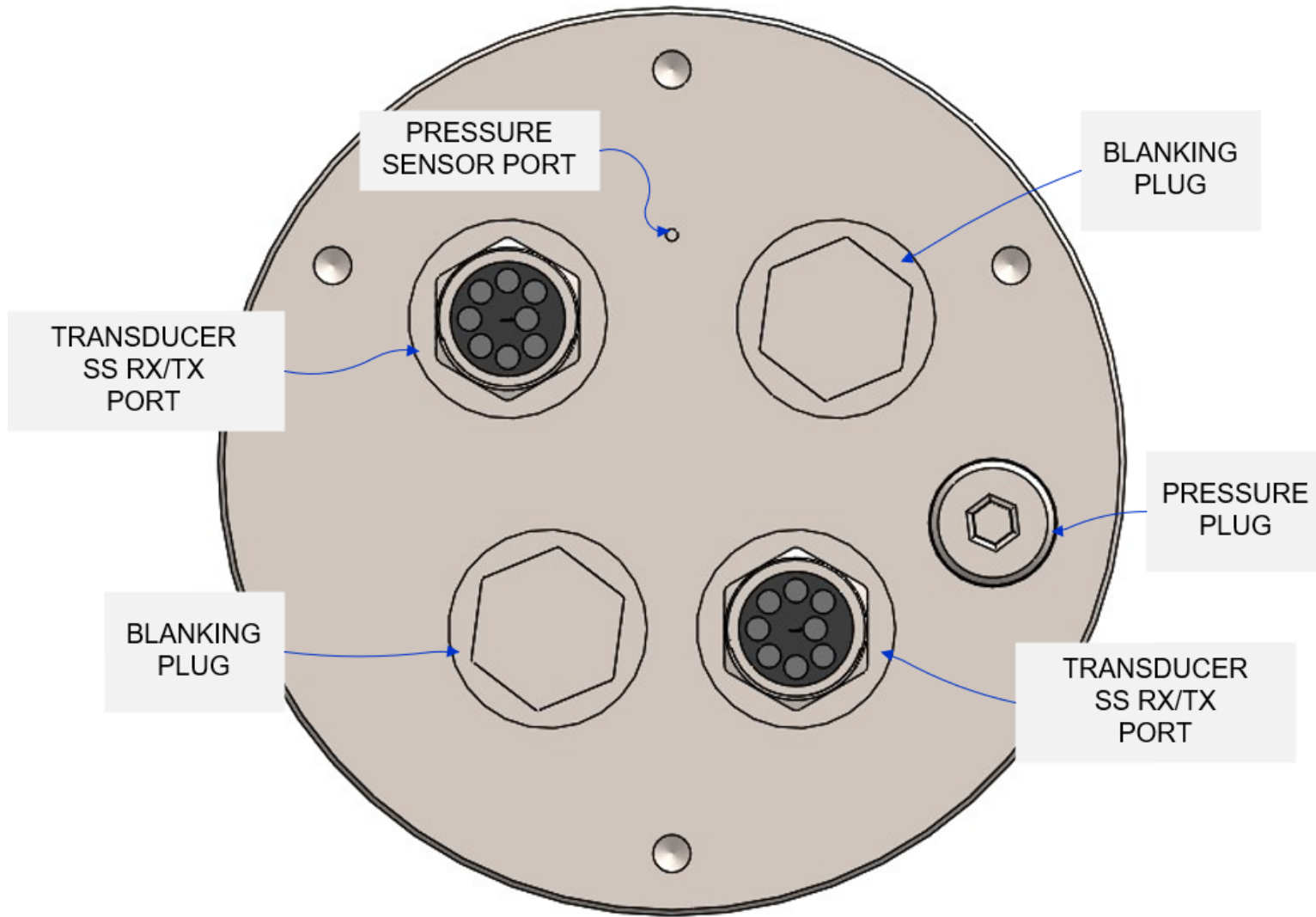
*Figure 2-4: 4205 MPMT Tri-Frequency Endcap Connections*
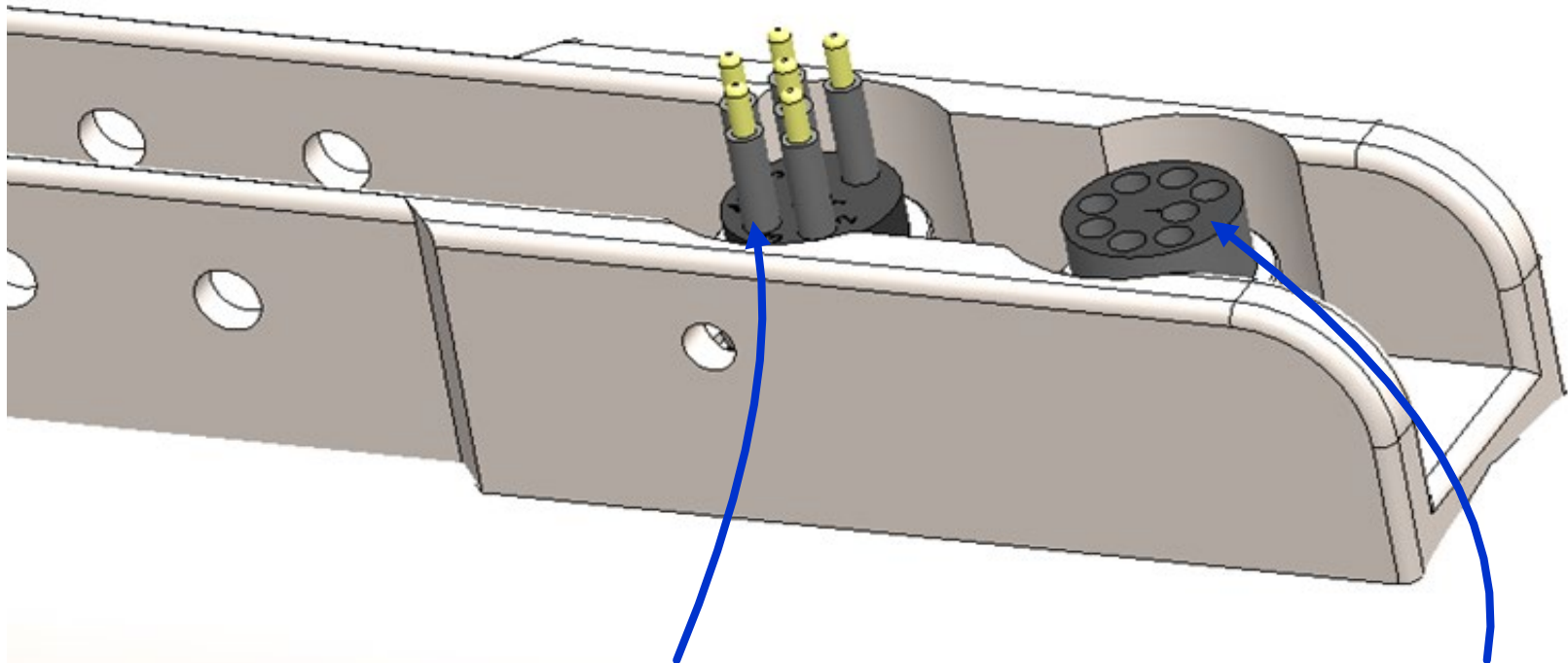
TOW CABLE CONNECTOR

MAGNETOMETER  CONNECTOR

*Figure 2-5: Tow Cable Connections*

TOW CABLE CONNECTIONS:

Pin 1 : 0VDC
PIN 2: 400VDC+Telemetry Data

MAGNETOMETER  CONNECTIONS:

Pin 1 : 28VDC +/-4%
PIN 2: Return/RS-232 GND
PIN 3: Side-Scan TX to Mag (RS232)
PIN 4: Side-Scan RX from Mag TX(RS-232)
PIN 5: Return/RS-232 GND
PIN 6: TRIG-MAG
PIN 7: 27VDC
PIN 8: GND
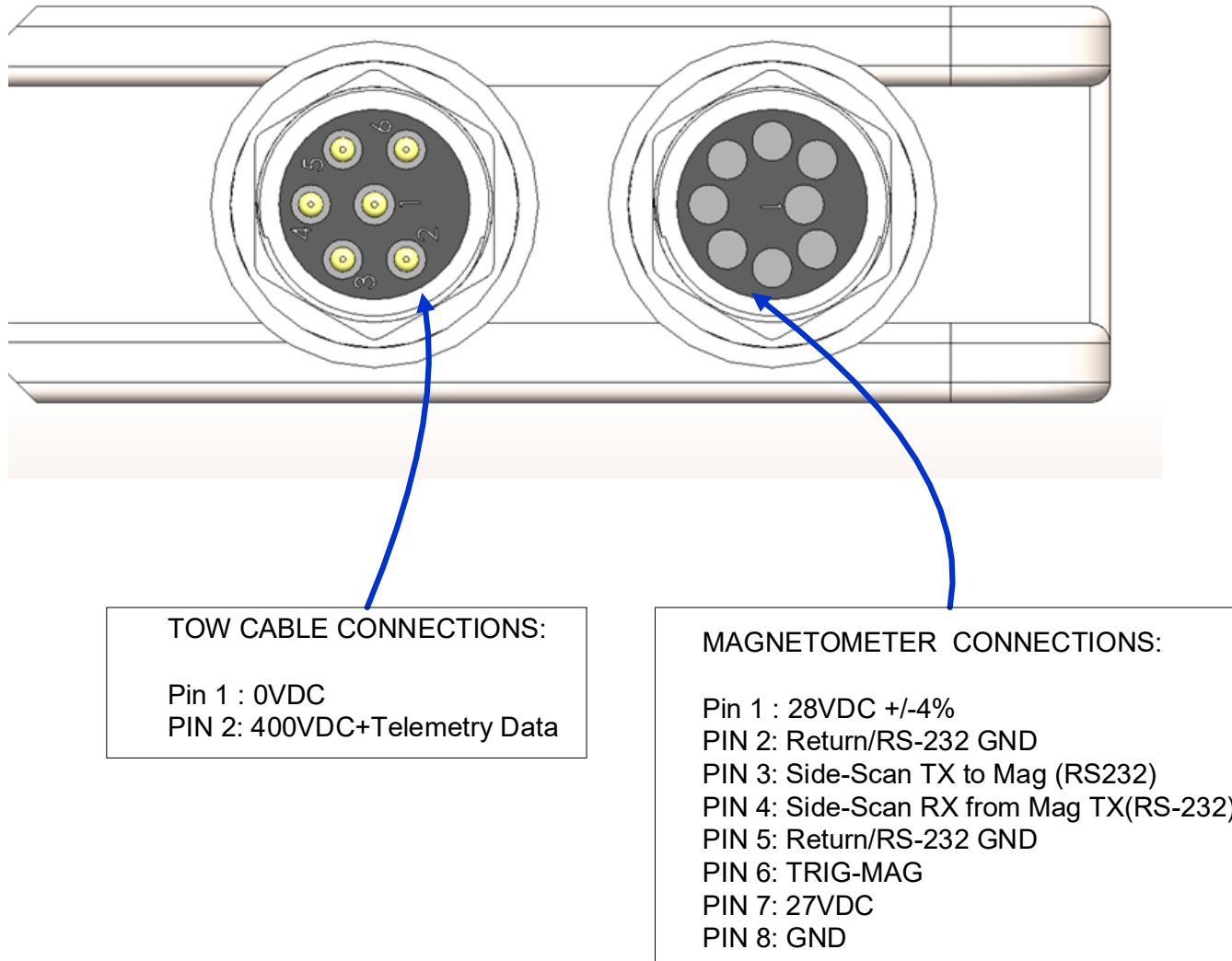
*Figure 2-6: 4205 MPMT and Tri-Frequency Tow Cable Connections with Pinouts*
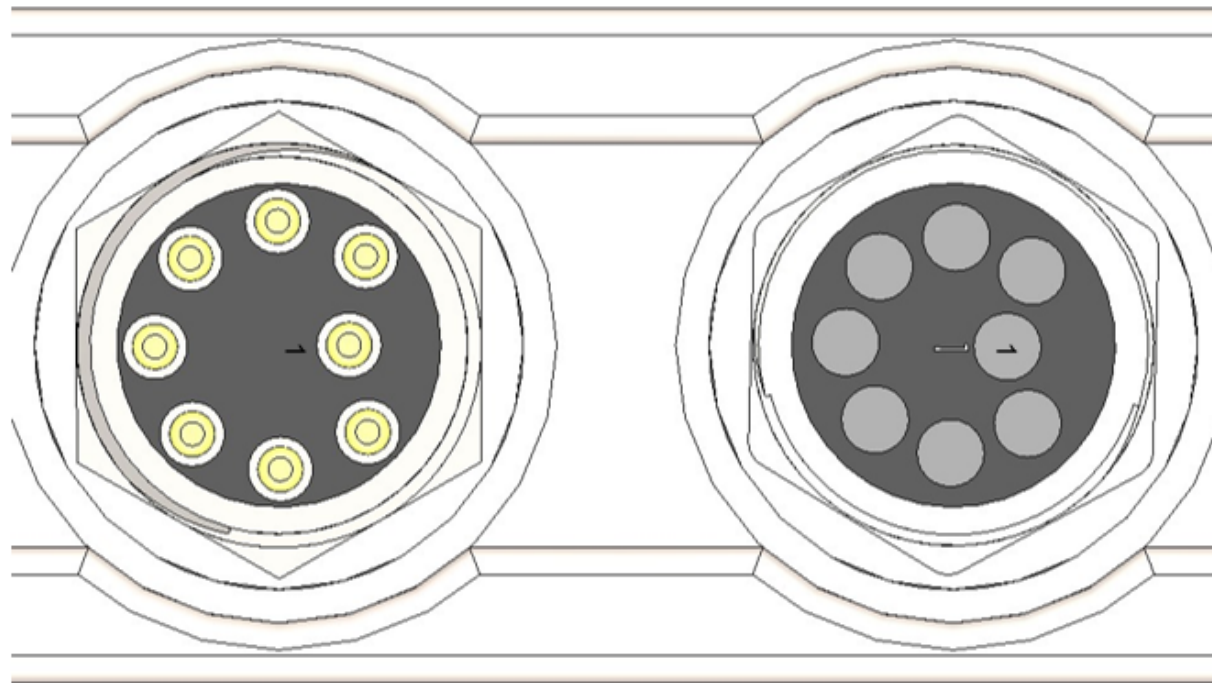
TOW/ROV CONNECTIONS

PIN 1 : 400 VDC RTN
PIN 2 : 400 VDC +Telemetry
PIN 3 : 48 VDC RTN
PIN 4 : 48 VDC
PIN 5 : Ethernet TX+
PIN 6 : Ethernet TX-
PIN 7 : Ethernet RX+
PIN 8 : Ethernet RX-

MAGNETOMETER CONNECTIONS

PIN 1 : 28 VDC ± 4 %
PIN 2 : RETURN/RS-232 GND
PIN 3 : Side Scan TX to Mag (RS-232)
PIN 4 : Side Scan RX to Mag (RS-232)
PIN 5 : RETURN/RS-232 GND
PIN 6 : TRIGGER MAG
PIN 7 : 28 VDC ± 4 %
PIN 8 : GND

*Figure 2-7: 4205 MPMT and Tri-Frequency ROV Tow Cable Connections with Pinouts.*

# 3.0  TECHNICAL DESCRIPTIONS

Before attempting to operate the 4205 System, EdgeTech recommends becoming acquainted with how its various components work and interact. This section provides technical descriptions, diagrams, and photographs to help you better understand the inner workings of your highly-specialized sonar system.

## 3.1  Towfish Technical Description

The circuit boards for the 4205 Towfish include the following components:

| COMPONENT | DESCRIPTION |
|---|---|
| **Power Distribution** | Inputs 400 VDC power on J1 from the topside processor over the coaxial tow distribution cable. It filters Towfish power from the frequency-shift-keyed (FSK) responder trigger, ADSL downlink command, and uplink data signals. The command signals are input, and the data signals are output on J2. |
| **ADSL Modem** | Converts the downlink command ADSL signals that it receives from the topside processor via J2 from the power distribution board into ethernet 10/100BaseT signals. These signals then output on J1 to the CPU board.<br><br>ADSL Modem converts the uplink ethernet 10/100BaseT-based data signals from the CPU board into ADSL uplink data signals. These signals are output on J2 to Power Distribution board for transmission to Topside Processor.<br><br>ADSL Modem also outputs the FSK responder trigger signals on J5 to the sonar interface board and the optional responder board.<br><br>+12 and -12 VDC power is input on J8 from the Power Distribution board. |
| **SIM2XA/SIM2** | Provides transmit/receive function for side scan transducer arrays, allowing them to be used simultaneously as acoustic transmitters and as acoustic receivers. SIM2XA are used in MPMT systems, and SIM2 are used in tri-frequency systems. |
| **Power Amplifier** | There are four identical power amplifier boards, one for each of the port high (SSH) and low (SSL) frequency transmit signals, and one for each of the starboard high and low frequency transmit signals.<br><br>+48 VDC inputs from the Power Distribution board and amplified outputs are output to the SIM2XA to drive transducer arrays.<br><br>On/off control signals, along with the low level transmit signals, are input from the Sonar Interface board. |
| **CPU** | Runs an embedded version of the Windows 7 embedded OS and includes 8-GB flash memory with C and D partitions. The C partition contains the operating system, and the D partition contains the sonar software. The CPU board inputs downlink commands from the topside processor over the ethernet connection on J1 with the |

| COMPONENT | DESCRIPTION |
|---|---|
| | ADSL modem board, while it outputs the uplink sonar data to the topside processor over the same connection. In addition to these functions, the CPU provides the chirp matched filter processing, power up diagnostic self-tests, and pointing device and keyboard inputs for factory test.<br><br>The COM3 serial port of the CPU board interfaces with an optional magnetometer, and the COM1 interfaces with the compass. +12 VDC power is input from the Power Distribution board. |
| Sonar Interface | Converts the digital chirp high and low frequency transmits signals into corresponding, low-level analog signals. These signals are output to the power amplifier boards. Signals from an optional pressure sensor and an internal temperature sensor, the FSK responder trigger signals and the digitized received sonar signals from the SAIBU are received thru A to D converters which are digitized and sent to the topside receiver thru the CPU to modem interface. |
| Compass | Provides heading, pitch, and roll outputs to the USB port. The electrical interface between the compass and the CPU board is thru a micro USB connector (Compass side) and a right-angle USB 2.0 connector (CPU side). |
| Optional Responder | Inputs a responder trigger internally from the Towfish or the Topside Processor. When triggered, the responder board drives up to 200 watts of power into an acoustic transducer mounted in the Towfish nose. Transmit frequencies are 24 to 28 kHz chirp or 27-kHz CW. |

*Table 3-1: 4205 Towfish Chassis Components*
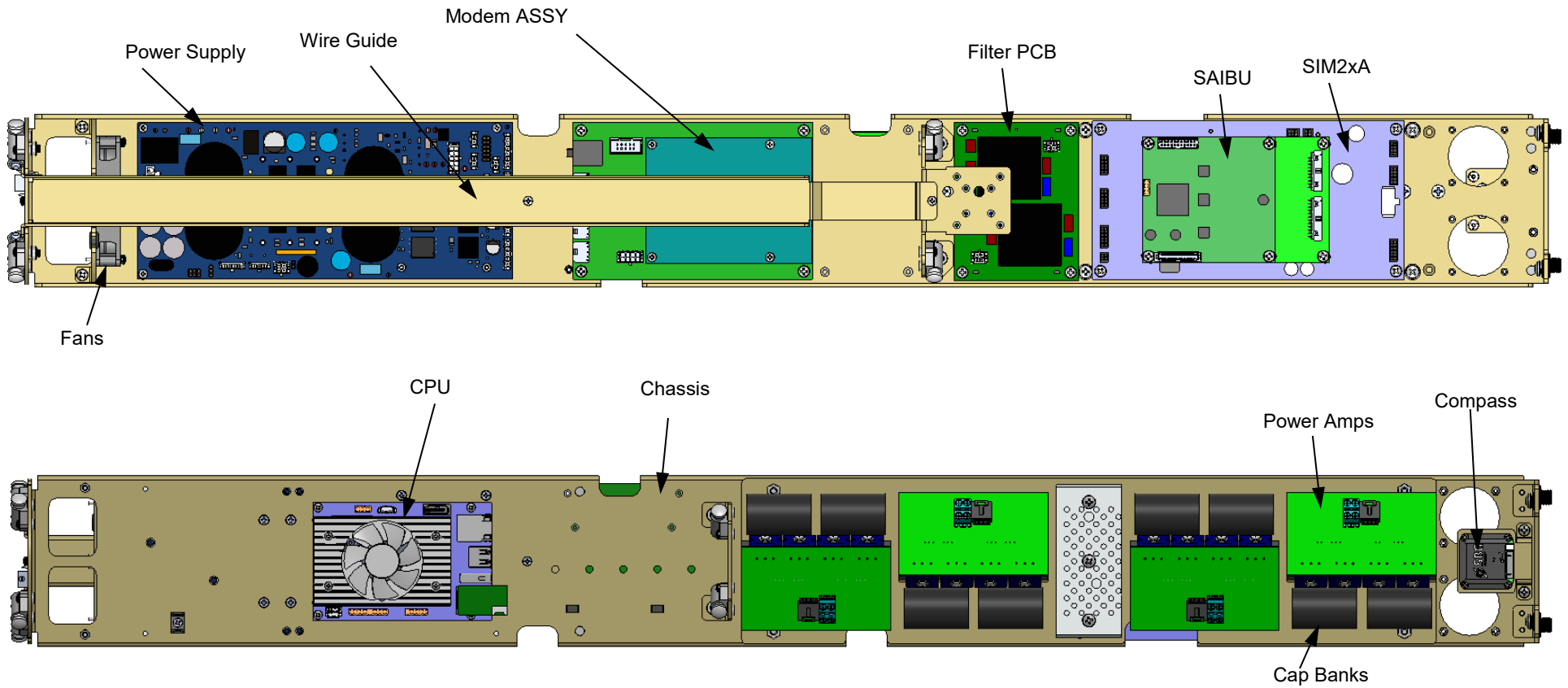
*Figure 3-1: 4205 Towfish MPMT Electronics Chassis*
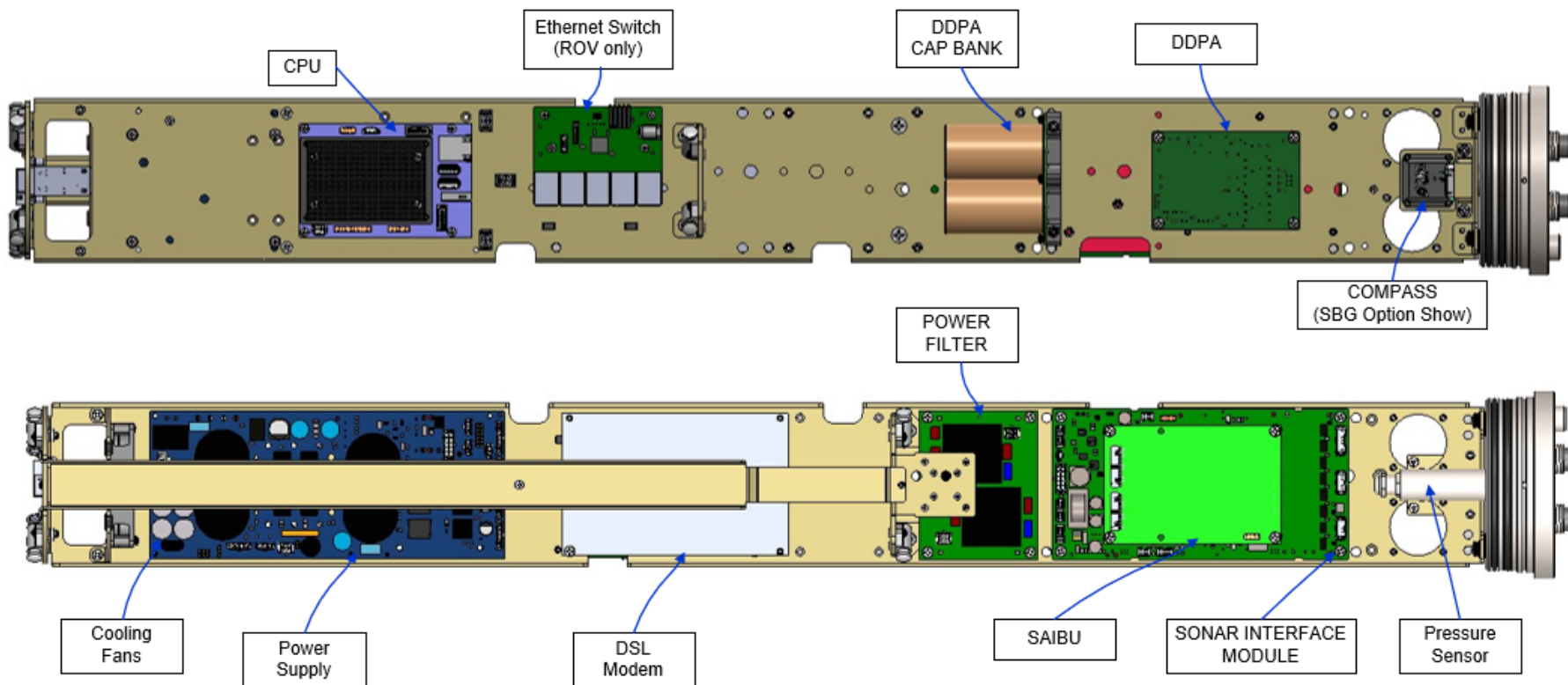
*Figure 3-2: 4205 Towfish Tri-frequency Electronics Chassis*

## 3.2 Starmux III Technical Description

The main hardware elements in the Starmux III Digital Link include the following components and circuit boards:

| COMPONENT | DESCRIPTION |
|---|---|
| **Sea Cable Interface** | The sea cable interface consists of the sea cable connector (P2 on the rear panel of STARMUX III) and a common mode choke. The common-mode choke is connected in series between the FSIU (J6) and the sea connector on the rear panel (P2). |
| **12 VDC Power Supply** | The 12 VDC power supply (PS2) receives AC power from the power entry module to generate +12 VDC that is used to power the ADSL Modem. |
| **375 VDC Power Supply** | The 375 VDC power supply (PS1) receives AC power from the power entry module to generate +375 VDC. The 375 VDC Power is output to the FSIU. The PS1 power supply also provides a 24 VDC power output to power the digital and analog circuits located within the FSIU. |
| **Power Entry** | The power entry module filters the AC power and connects it to the +12 and 375 VDC power supply through the front panel power switch. |
| **ADSL Modem** | The ADSL Modem board converts the uplink data ADSL signals received from the tow vehicle and input on the ADSL connector from the FSIU into ethernet 10/100/1000BaseT signals which are output to the 4200/2000 topside processor. Similarly, the ADSL Modem board converts the downlink ethernet 10/100/1000BaseT based command signals from the 4200/2000 topside processor into the ADSL downlink command signals which are output on the ADSL connector to the FSIU for transmission to the tow vehicle through the sea cable interface (FSIC). The ADSL modem also provides the status for power applied to the modem, status of the ADSL communication link and the Ethernet LAN connection. +12 VDC power is input on the DC connector from the +12 VDSC power supply. |
| **FSIU** | The FSIU board mounts to the STARMUX III chassis. The FSIU connects between the sea cable interface (FSIC) and the ADSL modem in the STARMUX III chassis. The FSIU board inputs +24 VDC on J3 from the PS1 (24VDC) output to power the digital and analog circuitry. The FSIU board also inputs 375 VDC power from PS1. The 375 VDC power is output to the tow vehicle on J6 combined with the frequency-shift-keyed (FSK) responder trigger signal input from J1 and the ADSL downlink command and uplink data signals from J9. The ADSL command signals are input, and the data signals are output on J9. The FSIU also provides the current sense output (J7) and the fish power ON status output (J4) which drives the fish power indicator on the front panel. |

*Table 3-2: Starmux III Components*
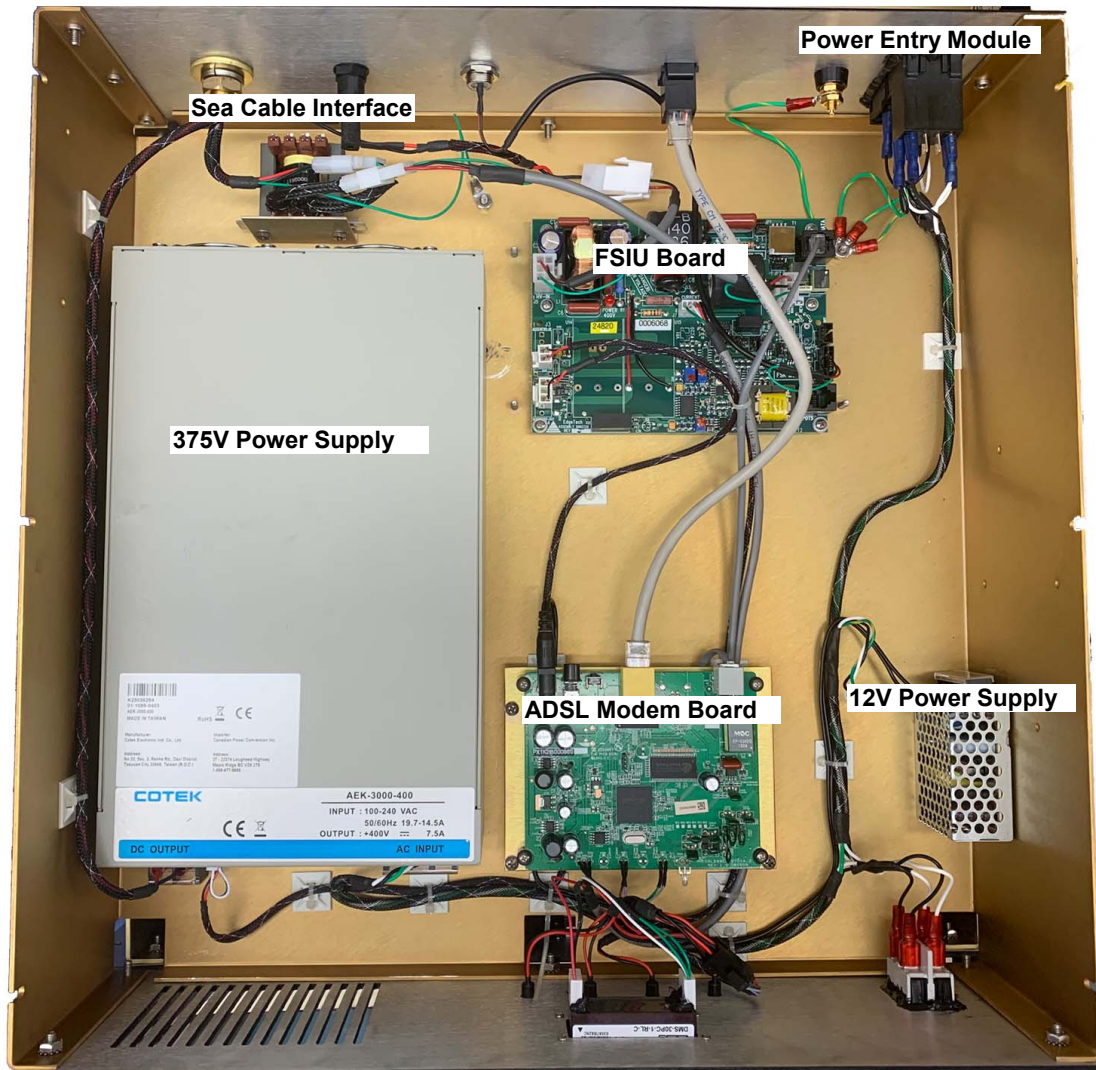
*Figure 3-3: Starmux III Internal Components (Sea Cable and FSIU Housings Removed)*
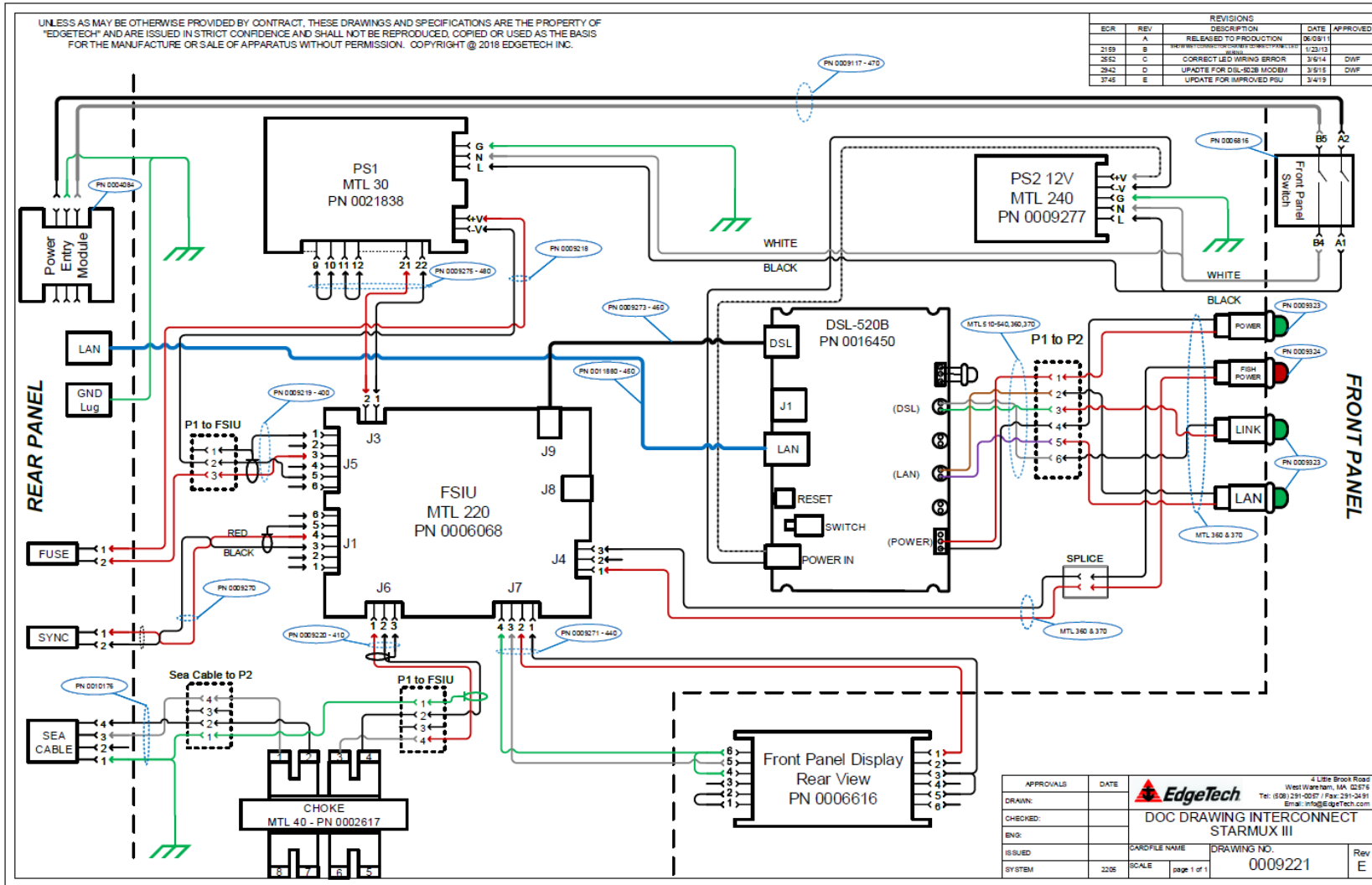
*Figure 3-4: Starmux III Internal Wiring Diagram*

## 3.3 701-DL Technical Description

The main hardware elements in the 701-DL Digital Link include the following components and circuit boards:

| COMPONENT | DESCRIPTION |
|---|---|
| **AC Power** | 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. Do not use the same AC power source as one being used to power the electric motors on the survey vessel, such as pumps and winches. |
| **Power Entry Module** | Filters the AC power and connects it to the 24 VDC power supply through the front panel power switch. |
| **Power Board** | Inputs +24 VDC on J1 from the 24 VDC Power Supply and generate the 400 VDC Towfish power. This is output to the Towfish on J13, combined with the frequency shift keyed (FSK) responder trigger signal input on J10, and the ADSL downlink command and uplink data signals. The command signals are input, and the data signals are output on J14.<br><br>Also includes +5, +12, and +15 VDC power supplies, where +12 VDC is output on J4 to the fan and J6 to the ADSL Modem board. |
| **24 VDC Power Supply** | Inputs AC power from the power entry module to generate +24 VDC that is output to the power board. |
| **ADSL Modem** | Converts the uplink data ADSL signals that it receives from the Towfish via the ADSL connector from the Power board into Ethernet 10/100BaseT signals. These signals are then output to the user-supplied computer.<br><br>The ADSL Modem board converts the downlink Ethernet 10/100BaseT-based command signals from the user-supplied computer into the ADSL downlink command signals. These command signals then output on the ADSL connector to the power board for transmission to the Towfish.<br><br>The ADSL Modem board also serves as an Ethernet switch to provide Ethernet connections on J1 to the user-supplied computer, J4 to the Net Burner board on the power board. This configuration places these devices on the same LAN. +12 VDC power is input on the DC connector from the power board. |
| **Net Burner** | Mounts and connects directly to the power board to provide power board diagnostics, Towfish power control, positive and negative trigger edge selection, and sensor monitoring. An Ethernet connection to the Net Burner board is provided on J3 from the ADSL Modem board. Power is input from the power board. |

*Table 3-3: 701-DL Components*
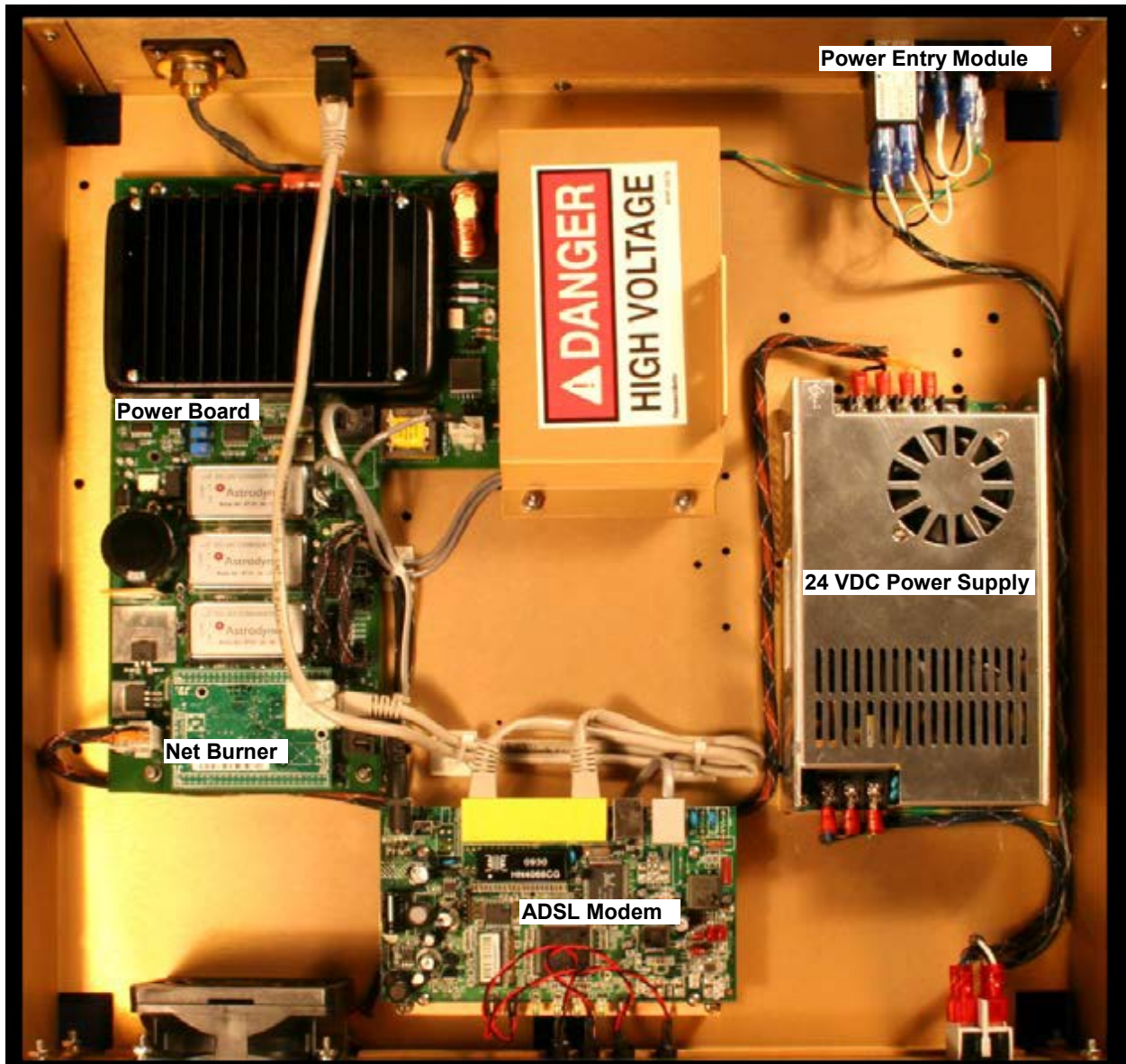
*Figure 3-5: 701-DL Internal Components*
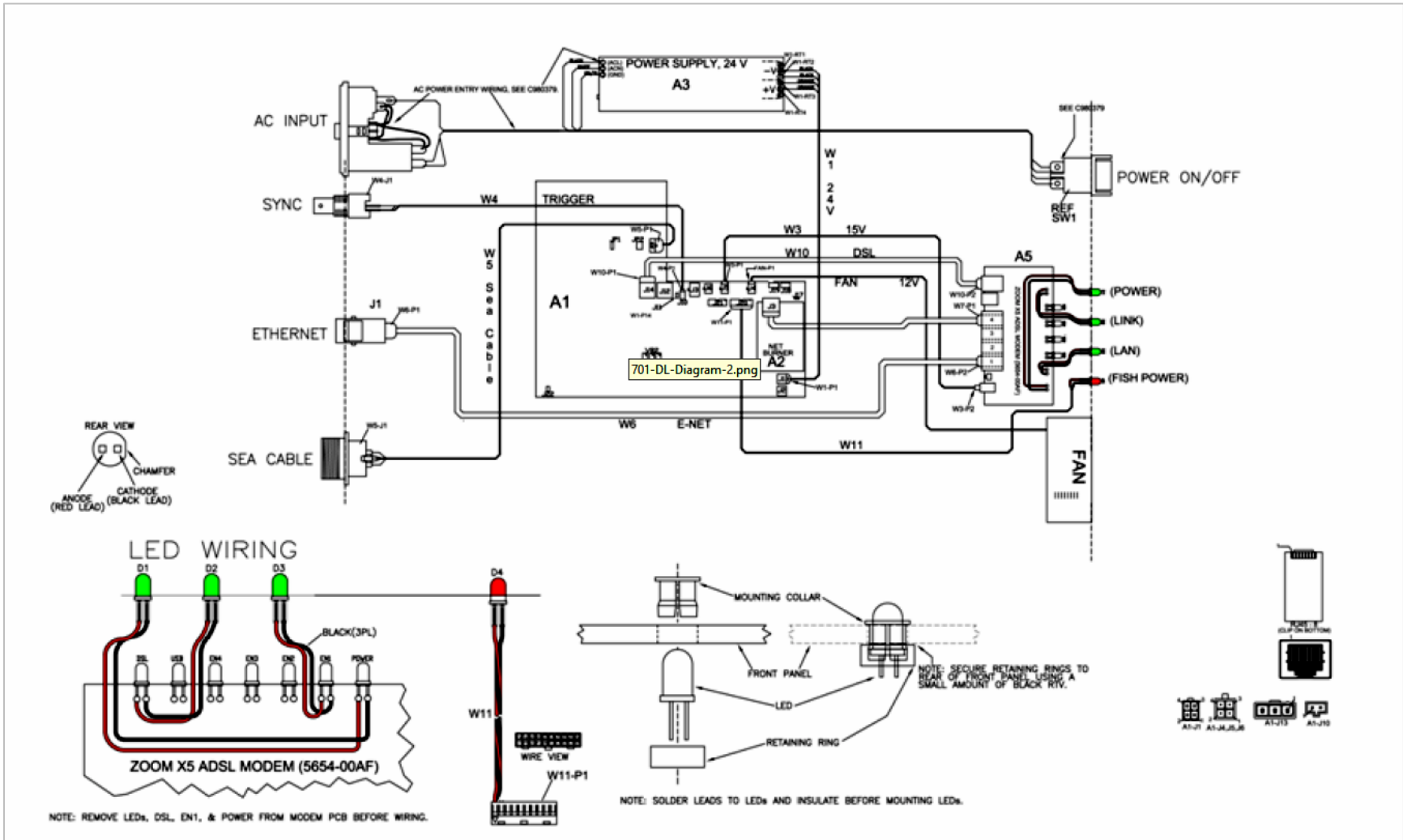
*Figure 3-6: 701-DL Internal Wiring Diagram*

## 3.4    Controls, Indicators, and Connections

The subsections below show the controls, indicators, and connections for the three 4205 topside options.

### 3.4.1  Starmux III Controls, Indicators and Connections

The Starmux III (digital link) controls, indicators, and connections are described below:

| FRONT PANEL | |
|---|---|
| **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 is establishing 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 is, and the side-scan sonar is on. |
| **PWR Indicator Light** | Green indicator. Illuminated when the STARMUX Digital Link is on. |
| BACK PANEL | |
| **Line VAC Connector** | Connection for AC power cord. |
| **Line Power Switch** | Rocker switch. Switches AC power to the POWER switch on the front panel of the STARMUX III Digital Link. |
| **AC Fuse** | AC fuse |
| **GND Lug** | Electrical grounding lug. |
| **Data Connector** | RJ-45 Standard Ethernet connection for connecting to the external topside processor. |
| **Sync Connector** | Provides input connection for a TTL external trigger that is sent to the towfish. |
| **Fuse 2.5A** | Provides overcurrent protection to FSIU circuitry with a maximum of 2.5A and 500V DC. Additional 5x20mm fuses are provided. |
| **Sea Cable Connector** | SubConn MCBH4F female connector to sea cable going out to tow vehicle. |

*Table 3-4: Starmux II Controls, Indicators and Connections*

> **NOTE:** The STARMUX III 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. To prevent this from happening, only use a designated, uninterrupted power source.

DL's (digital link) controls, indicators, and connections are labeled below:
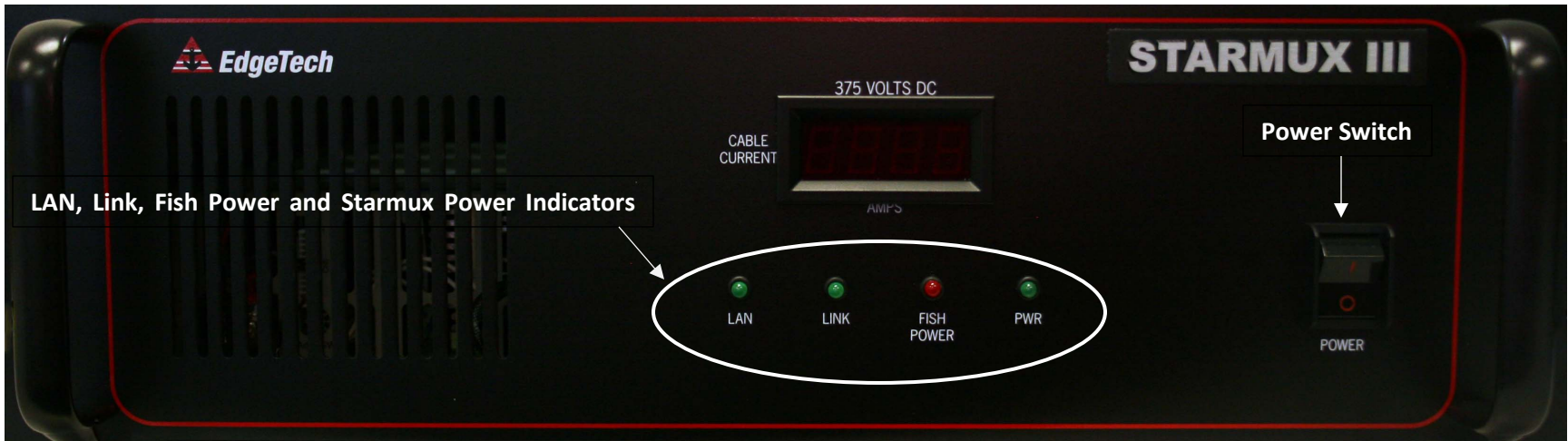
*Figure 3-7 Starmux III Front Panel*



*Figure 3-8: Starmux III Back Panel*

### 3.4.2 Starmux III-4205 Rack Mount Controls, Indicators, and Connections

The 4205-Rack Mount (Starmux and 2U-CPU Combo) controls, indicators, and connections are described below:

| FRONT PANEL | |
|---|---|
| Starmux III Power Switch | Rocker switch. Turns the STARMUX Digital Link on or off. The rear line powe 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 is establishing 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 is, and the side-scan sonar is on. |
| PWR Indicator Light | Green indicator. Illuminated when the STARMUX Digital Link is on. |
| **BACK PANEL** | |
| Line VAC Connector | Connection for 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 | AC Fuse |
| Grounding Lug | Grounding lug. |
| Data Connector | RJ-45 Standard Ethernet connection for connecting to the external topside processor. |
| Sync Connector | Provides input connection for a TTL external trigger that is sent to the towfish. |
| Fuse 2.5A | Provides overcurrent protection to FSIU circuitry with a maximum of 2.5A and 500V DC. Additional 5x20mm fuses are provided. |
| Sea Cable Connector | SubConn MCBH4F female connector to sea cable going out to tow vehicle. |
| | |
| **FRONT PANEL COMPUTER** | |
| USB Connectors | (6) USB connectors. Four on the back panel and two on the front. Located on CPU. |
| DVD Drive | DVD\RW drive. |
| **BACK PANEL COMPUTER** | |
| Line VAC Connector | CEE-type AC input connector. Connects to 100-264 VAC, 50/60 Hz power. |
| Power Switch | Rocker switch. Turns the 2U-CPU computer on or off. |
| USB Connectors | (6) USB connectors. Four on the back panel and two on the front. Located on CPU. |
| Ethernet Connector | RJ-45 connector. Provides a 10/100BaseT Ethernet connection. Located on CPU and 701-DL. |
| 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. Located on CPU. |

| FRONT PANEL | |
|---|---|
| **COM-3 Connector** | DB-9 female connector. RS-232 serial port that can be used to connect to the navigation system. Located on CPU. |

*Table 3-5: Starmux III Rack Mount Controls, Indicators and Connections*

*Figure 3-9: 4205 Rack Mount Topside Processor Front Panel*

*Figure 3-10: 4205 Starmux III Rack Mount Topside Processor Rear Panel*

*TOPSIDE PROCESSOR WITH DISCOVER 4205 SIDE SCAN SOFTWARE*



Keyboard

Track Ball

*TOPSIDE PROCESOR*

Armored tow cable

Safety grip

Tow key

Safety cable

Aft shackle

Forward shackle

Shear pin
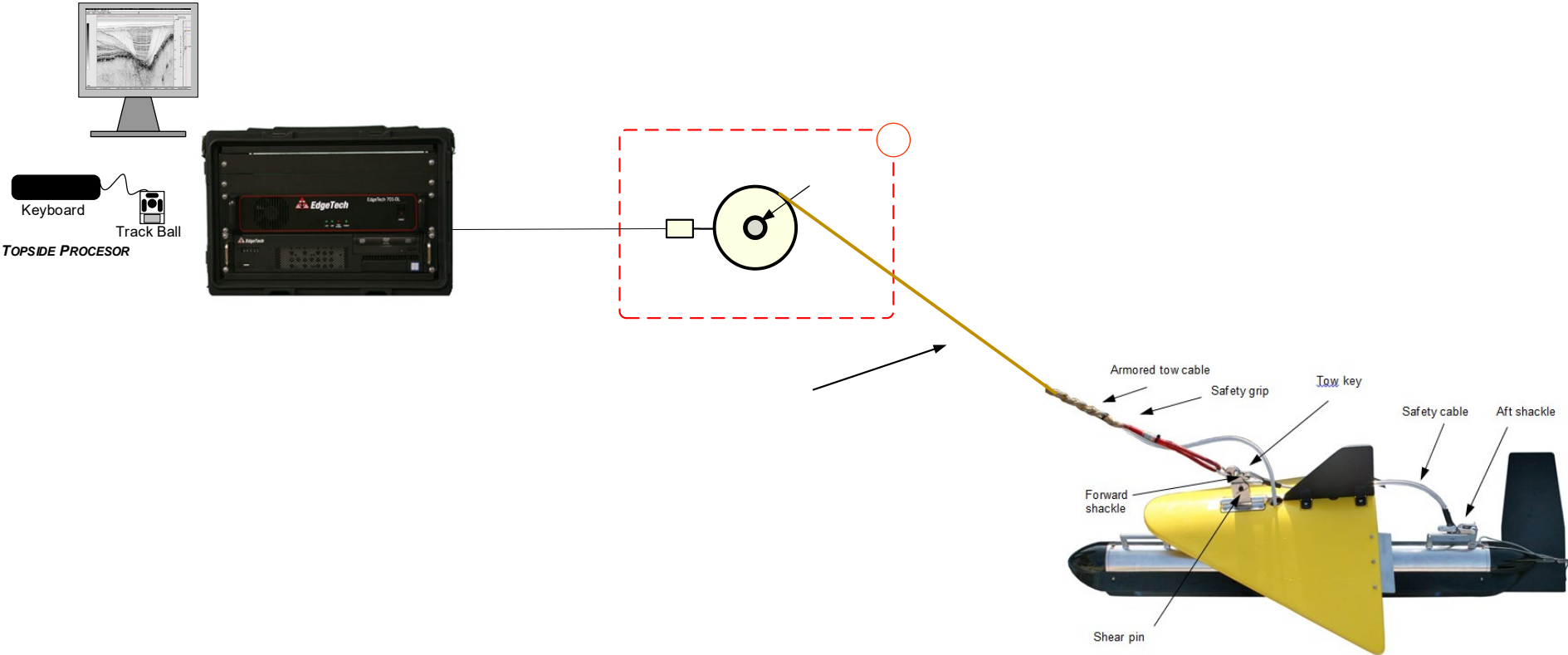
*Figure 3-11: 4205 System Diagram*

GPS

Model 4460A BATS Desktop
(Broadband Acoustic Tracking System)

WT. 95 lbs. [43 kg] W/ PC, Keyboard, Display & Enclosure

PC

DISPLAY

KEY PAD

Motion Reference Unit (Optional)

Corrected navigation to LapTop

Trigger from BATS

EdgeTech

Model 4205 Topside Processor

DT MODEL #DT30300HLW
ELECTRO-HYDRAULIC SIDE SCAN SONAR
TOW WINCH

3500m X .45 Double armored Coax. Tow cable

(Optional) Kevlar reinforced Cable .35in. X 100m
(used for shallow water Tow, Deck, or Test)

MODEL 4113C-DT DECK CABLE X 50Ft.

C980434 2 FT Depressor Wing Kit (Optional)

A-FRAME
(With lifting hardware including hydraulic jacks)

Magnetometer Interface for 3rd Party

Directional Multibeacon Transponder/Responder (in Nose)

Model 4205 MP Dual Mode/Dual Frequency Towfish
(Pressure/Depth Sensor Installed)

HYDROPHONE MODEL 4213C-B (17-30 kHz)

*Figure 3-12: Example of 4205 Rack Mount System with the Directional Multi-Beacon Transponder/Responder used with the EdgeTech USBL BATS*
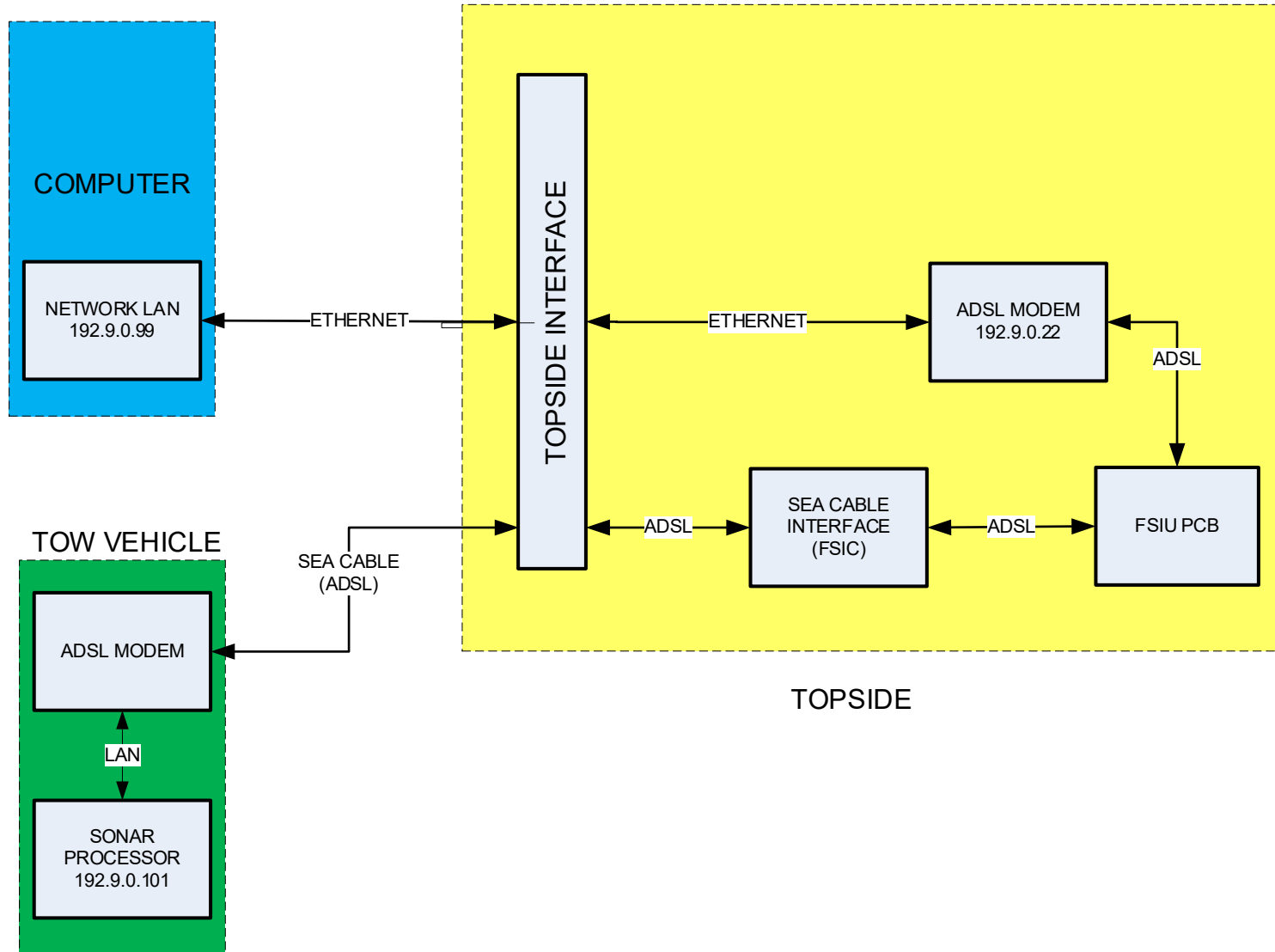
*Figure 3-13: 4205 Starmux III Topside Block Diagram*

### 3.4.3 701-DL Controls, Indicators, and Connections

The 701-DL's (digital link) controls, indicators, and connections are described below:

| FRONT PANEL | |
|---|---|
| Power Switch | This rocker switch turns the 701-DL Link on or off. |
| LAN Indicator Light | Green indicator. Flashes continuously when an Ethernet connection is established. |
| LINK Indicator Light | Green indicator. Flashes while the 701-DL Digital Link is establishing a reliable communications link with the Towfish. Illuminates continuously when a reliable communications link with the Towfish is established. |
| Fish Power Indicator Light | Red Indicator. Illuminated when the 701-DL Digital Link is on, and the tow vehicle is properly connected to it. |
| PWR Indicator Light | Green indicator. Illuminated when the 701-DL Digital Link is on. |
| **BACK PANEL** | |
| Line VAC Connector | Connection for AC power cord. |
| Line Power Switch | Rocker switch. Switches AC power to POWER switch on the front panel of the 701-DL Digital Link. |
| AC Fuse | AC power fuse. |
| Data Connector | RJ-45 Standard Ethernet connection for connecting to the external topside processor. |
| Sync Connector | Provides input connection for a TTL external trigger that is sent to the towfish. |
| Sea Cable Connector | SubConn MCBH4F female connector to sea cable going out to tow vehicle. |

*Table 3-6: 701-DL Controls, Indicators, and Connections*

---

**NOTE:** The 701-DL will automatically switch off power to the towfish if the two remain disconnected for an extended period. The power will also shut off if an overcurrent or undercurrent condition exists. To reactivate the power to the towfish, turn the POWER switch off and then on again.

LAN, LINK, FISH POWER and POWER Status indicator lights

POWER switch
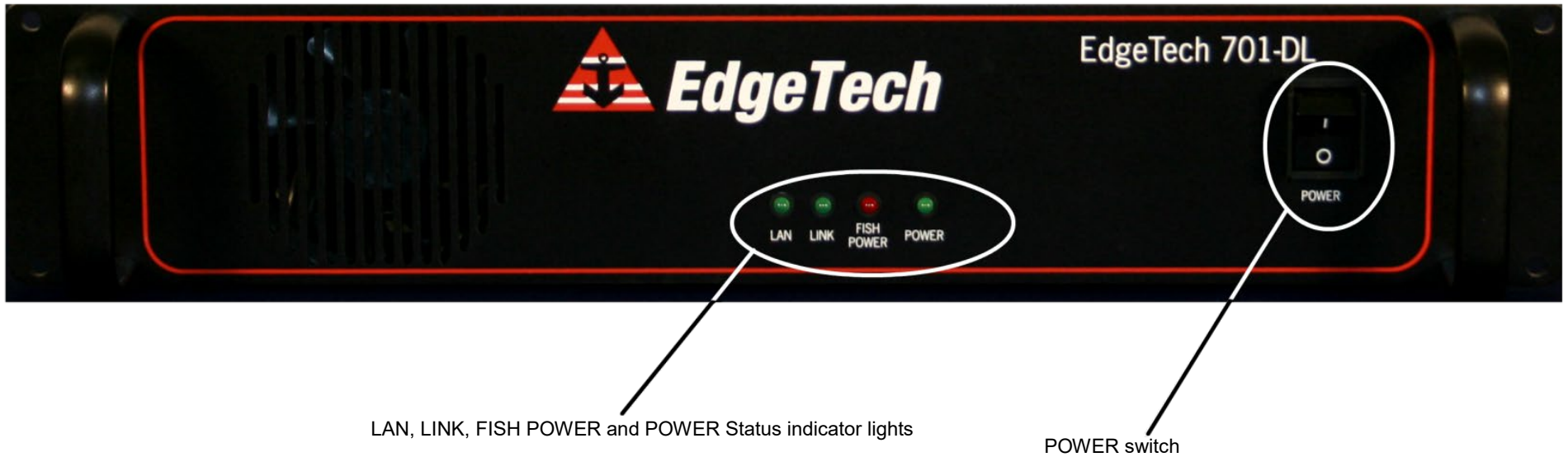
*Figure 3-14: 701-DL Front and Back Panels*



LINE VAC connector, Line Power Switch, and AC Fuse

SYNC connector

DATA connector

SEA CABLE connector
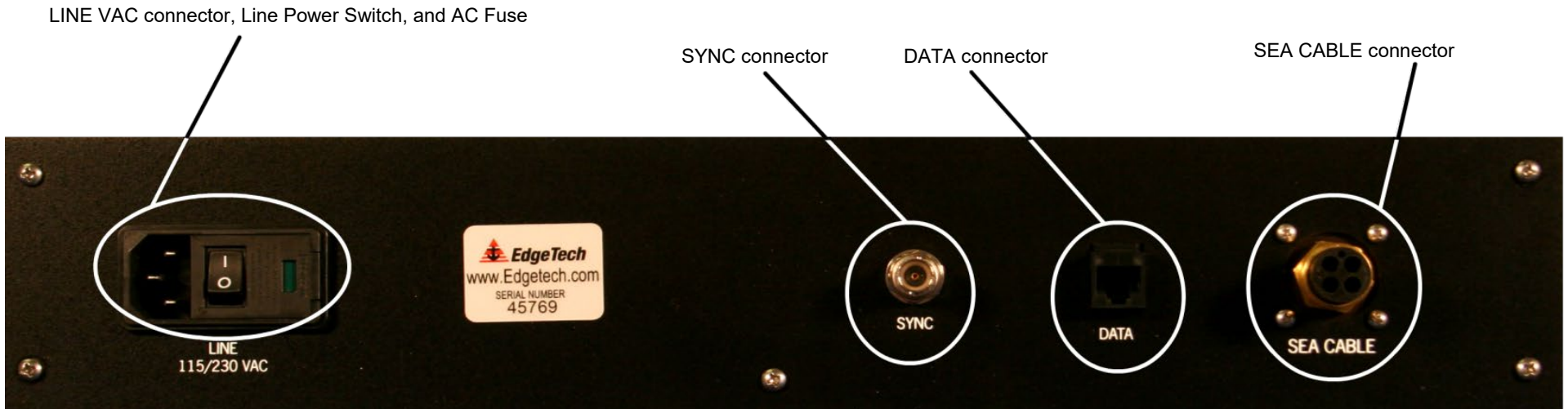
*Figure 3-15: 701-DL Front and Back Panels*

### 3.4.4  701-DL 4205-Rack Mount Controls, Indicators, and Connections

The 4205-Rack Mount (701-DL and 2U-CPU Combo) controls, indicators, and connections are described below:

| FRONT PANEL 701-DL | |
| --- | --- |
| Power Switch | Rocker switch. Turns the 701-DL Link on or off. |
| LAN Indicator Light | Green indicator. Flashes continuously when an Ethernet connection is established. |
| LINK Indicator Light | Green indicator. Flashes while the 701-DL Digital Link is establishing a reliable communications link with the Towfish. Illuminates continuously when a reliable communications link with the Towfish is established. |
| Fish Power Indicator Light | Red Indicator. Illuminated when the 701-DL Digital Link is on, and the tow vehicle is properly connected to it. |
| PWR Indicator Light | Green indicator. Illuminated when the 701-DL Digital Link is on. |
| **BACK PANEL 701-DL** | |
| Line VAC Connector | Connection for AC power cord. |
| Line Power Switch | Rocker switch. Switches AC power to POWER switch on the front panel of the 701-DL Digital Link. |
| AC Fuse | AC power fuse. |
| Data Connector | RJ-45 Standard Ethernet connection for connecting to the external topside processor. |
| Sync Connector | Provides input connection for a TTL external trigger that is sent to the towfish. |
| Sea Cable Connector | SubConn MCBH4F female connector to sea cable going out to tow vehicle. |
| **FRONT PANEL COMPUTER** | |
| USB Connectors | (2) USB connectors. Four on the back panel and two on the front. Located on CPU. |
| DVD Drive | DVD\RW drive. |
| **BACK PANEL COMPUTER** | |
| Line VAC Connector | CEE-type AC input connector. Connects to 100-264 VAC, 50/60 Hz power. |
| Power Switch | Rocker switch. Turns the 2U-CPU computer on or off. |
| USB Connectors | (6) USB connectors. Four on the back panel and two on the front. Located on CPU. |

| FRONT PANEL 701-DL | |
|---|---|
| Ethernet Connector | RJ-45 connector. Provides a 10/100BaseT Ethernet connection. Located on CPU and 701-DL. |
| 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. Located on CPU. |
| COM-3 Connector | DB-9 female connector. RS-232 serial port that can be used to connect to the navigation system. Located on CPU. |

*Table 3-7: 701-DL Rack Mount Controls, Indicators and Connections*
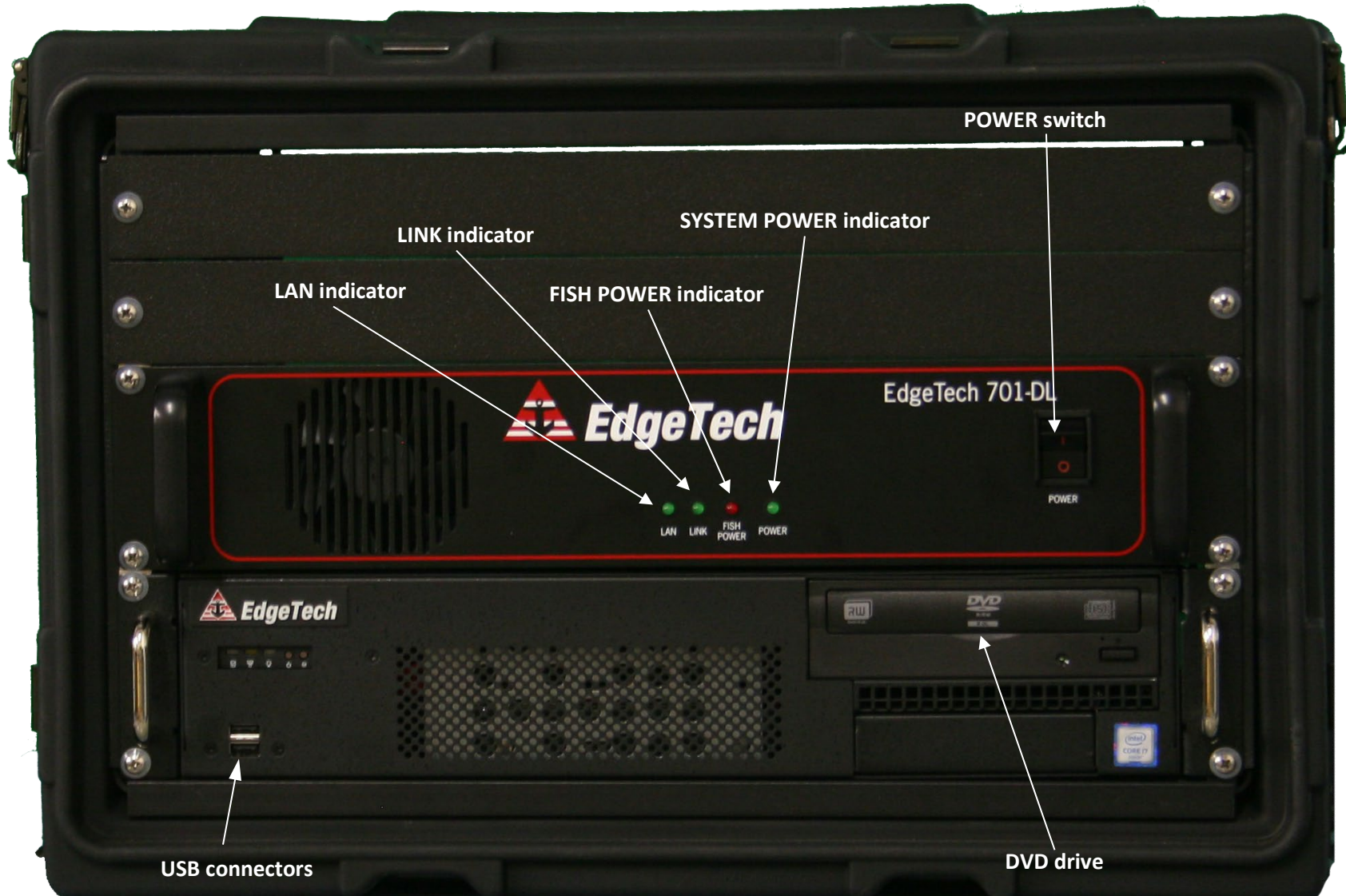
*Figure 3-16: 4205 Rack Mount Topside Processor Front Panel*
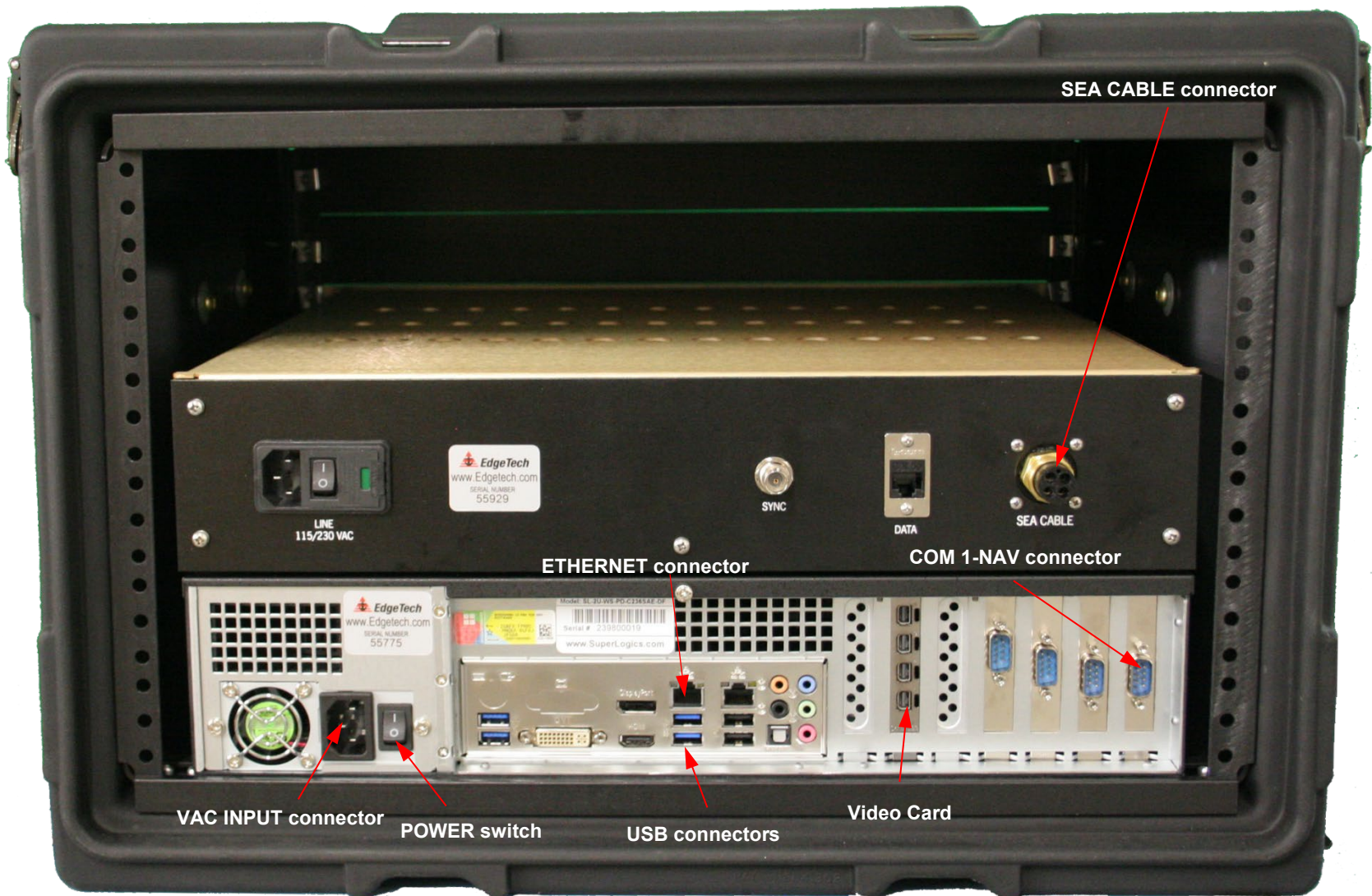
*Figure 3-17: 4205 Rack Mount Topside Processor Rear Panel*

TOPSIDE PROCESSOR WITH DISCOVER 4205 SIDE SCAN SOFTWARE



Keyboard

Track Ball

TOPSIDE PROCESOR

Armored tow cable

Safety grip

Tow key

Safety cable

Aft shackle

Forward shackle

Shear pin

*Figure 3-18: 4205 System Diagram*
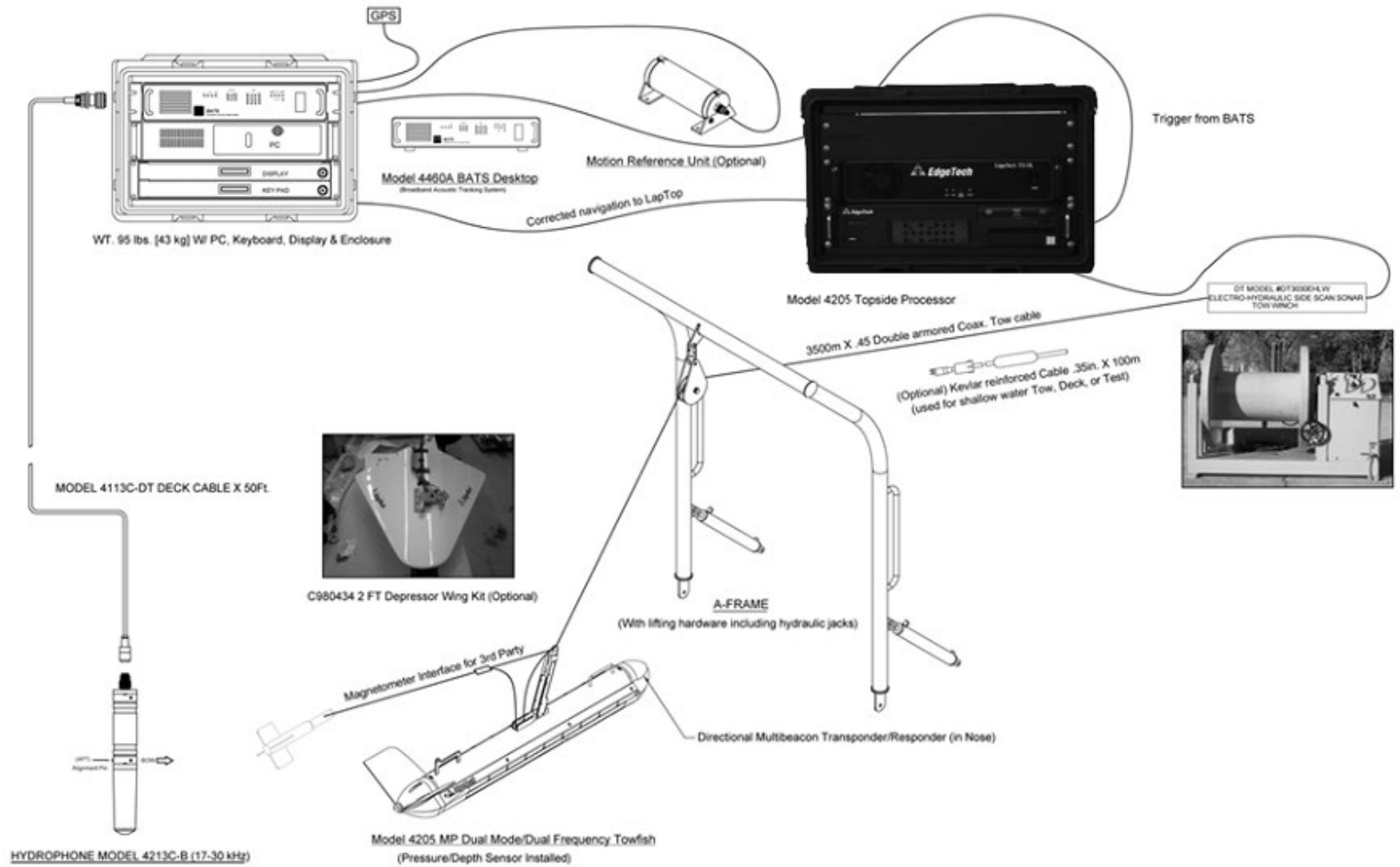
*Figure 3-19: Example of 4205 Rack Mount System with the Directional Multi-Beacon Transponder/Responder used with the EdgeTech USBL BATS*
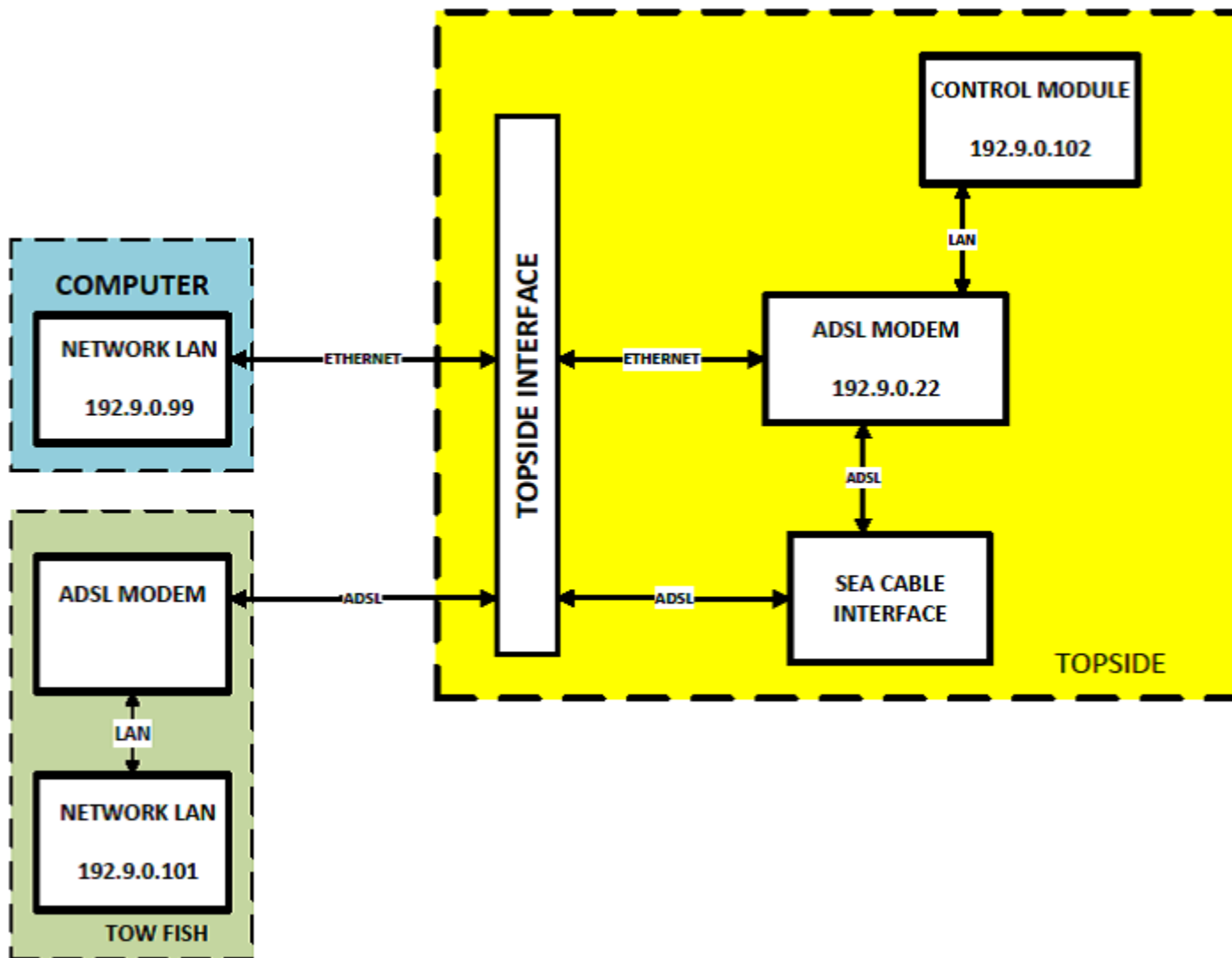
*Figure 3-20: 4205 Topside Block Diagram*

# 4.0 SETUP AND ACTIVATION

The Setup and test of the EdgeTech 4205 High Definition Dual-Frequency Side Scan Sonar System encompass unpacking, inspecting, and connecting the system components. These connections include not only the power and tow cables, but also any optional equipment such as printers; navigation systems, and external sonar systems.

This section also explains how to activate and test the system using the EdgeTech Discover software, along with providing instructions for deployment and recovery of the Towfish. For detailed information about Discover, refer to the corresponding manuals.

## 4.1 Unpacking and Inspection

The towfish is shipped in a wooden crate. 4205-Rack Mount Topside Processors are shipped in a reusable heavy-duty transport case, while the 701-DL Digital Links is each shipped in heavy-duty shipping cartons. Supplied set-up cables and documentation are shipped in heavy-duty shipping cartons.

Before unpacking the system components, inspect the shipping containers for any damage. Report any damage to the carrier and **CUSTOMER SERVICE.** If the shipping containers appear free of damage, carefully unpack the components and inspect them individually for damage. If any damage is found, report it to the carrier and EdgeTech. Also, check the packing list to verify that all the items on the list are included. If any items are missing, immediately contact EdgeTech.

---

**CAUTION!**

**DO NOT** install or operate any equipment that appears to be damaged.

---

Although the items shipped will vary depending on the customer requirements, the 4205 High Definition Dual-frequency Side Scan Sonar System typically includes, at a minimum, the items listed below for each Topside Processor:

### 4.1.1 Starmux III-Digital Link Systems

- Starmux III-DL Digital Link
- 4205 Towfish
- AC power cord
- Ethernet patch cable
- Towfish Accessories Kit

### 4.1.2 4205 Rack Mount System

- Starmux III Digital Link with a 2U Computer with a Case

- 4205 Towfish
- AC power cord
- Ethernet patch cable
- Towfish Accessories Kit

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

### 4.1.3  701-Digital Link Systems

- 701-DL Digital Link
- 4205 Towfish
- AC power cord
- Ethernet patch cable
- Towfish Accessories Kit

### 4.1.4  4205 Rack Mount System

- 701-DL Digital Link with a 2U Computer with a Case
- 4205 Towfish
- AC power cord
- Ethernet patch cable
- Towfish Accessories Kit

After unpacking the system components, safely store the shipping containers, including any packing materials, for later use. When transporting or storing the system, pack all items in their original shipping containers, and in 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 4205 Topside processors is 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  Navigation Interface

The 4205 High Definition Dual-frequency Side Scan Sonar System accepts all standard National Marine Electronics Association (NEMA) 0183 message sentence formats from a connected global positioning system (GPS) or integrated navigation system.

## 4.4  Topside Processor Placement

The 4205 Rack Mount Topside Processor with the Digital Link (Starmux III or 701-DL) should be located and set up in a dry, sheltered area that is protected from weather and water spray. Both units also require an environment where the temperature is consistently between 0°C and 40°C (32°F and 104°F).

In all cases, however, 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 the LCD and status indicators. The location of the processor 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. When mounting a 4205 Rack Mount Topside Processor or Digital Link in a 19-inch rack, 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.

## 4.5    TCP/IP Address Settings

The 4205 high Definition Dual-frequency Side Scan Sonar System includes many Ethernet devices connected on a common local area network (LAN). Each of these devices has a factory set TCP/IP address, which under normal circumstances does not require changing.

Should any of these devices be replaced, or if upgrades are later installed, the TCP/IP addresses may need to be reconfigured. Also, any computer that is to be connected to the 701-DL Digital Link must have its IP address set to 192.9.0.nnn, where nnn is any integer from 1 to 100—except for the following reserved addresses:

- 192.9.0.22 – Topside ADSL Modem
- 192.9.0.101 – Tow Vehicle CPU
- 192.9.0.102 – Topside Netburner (only used with 701-DL power PCB)

The factory IP address setting of the wired Ethernet connection for the laptop or 2U Rack Mount computer included with the 701DL is 192.9.0.99,

For a list of the topside processor Ethernet devices and their TCP/IP addresses, refer to TABLE **4-2** (below) and for the Towfish, to TABLE **4-3** (below).

| DEVICE | TCP/IP ADDRESS |
|---|---|
| Net Burner board | 192.9.0.102 |
| ASDL Modem board | 192.9.0.22 |

*Table 4-2: Topside Processor Ethernet Devices TCP/IP Addresses*

| DEVICE | TCP/IP ADDRESS |
|---|---|
| CPU board | 192.9.0.101 |

*Table 4-3: Towfish Ethernet Device IP Address*

## 4.6    Connecting the System Components

All the system components, including optional components, such as a printer, navigation system, and external sonar systems, connect to the topside processor. An example of a fully connected system is shown in the connection diagram in FIGURE **4-1**.

> **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.

### 4.6.1  Connect and Attach the Tow Cable to the Towfish
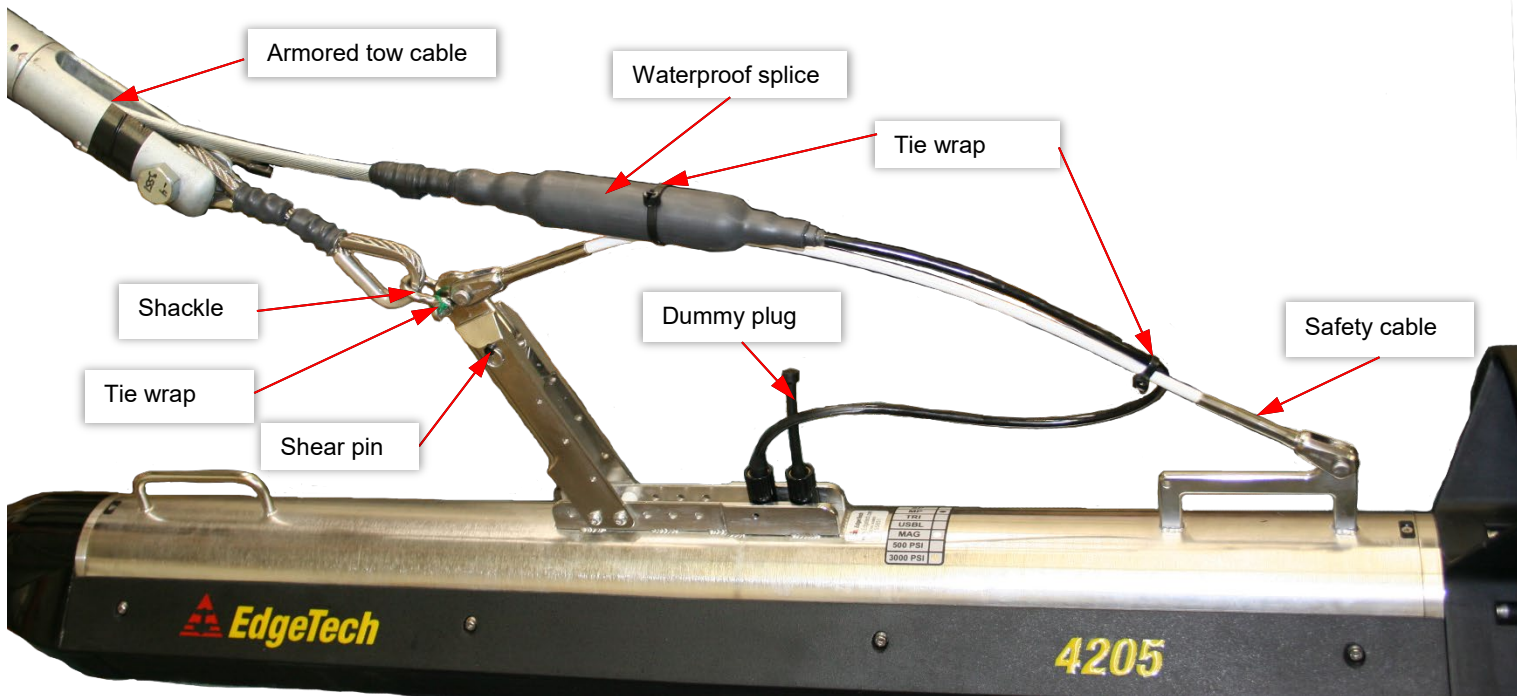


*Figure 4-1: 4205 Towfish with Armored Tow Cable*

1. Verify that the tow cable is not connected to the topside processor.

2. Attach the tail cone to the towfish and secure with four hex socket bolts provided.

3. Verify that the tow cable connector on the towfish and the female mating connector on the tow cable are free of corrosion or dirt. If dirty, clean with an alcohol wipe.

4. Apply a thin film of silicone grease to the pins of the tow cable connector on the towfish.

5. Mate the connectors by pressing them firmly together. Do not wiggle the connectors.

6. Secure the connector locking sleeve.

7. Attach the loop of the safety grip to the shackle on the towing arm and secure the shackle bolt with seizing wire or a tie wrap.

8. For **Armored** tow cable, attach the waterproof splice to the side of the tow arm with a zip tie. Attach the coupling cable thimble to the tow arm key shackle and the other end of the coupling cable to PMI grip. Secure PMI grip with seizing wire or zip ties and cotter pin.

   For **Kevlar** tow cables, insert the tow cable splice into the recess in the tow arm, and secure the splice with two tie-wraps for which holes in the towing arm are provided.

9. Verify that the dummy plug is installed on the option connector if not used.

## 4.6.2  Installing a Depressor Wing and Connecting the Tow Cable

Please see MANUAL ADDENDUM (0021771) DEPRESSOR WING for wing installation and cable connection instructions. Once completed, continue to CONNECTING TO THE TOPSIDE.

## 4.6.3  Connecting to the Topside

The subsections below describe how to connect the towfish to the topside. Please skip ahead to the appropriate subsection depending on your configuration.

### 4.6.3.1  Connecting to the Starmux III DL

Refer to subsection STARMUX III CONTROLS, INDICATORS AND CONNECTIONS for the location of the connectors while performing the steps below:

1. Verify that the Starmux III 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.

3. Connect the Ethernet patch cable to the DATA connector of the Starmux III Digital Link and to the ethernet connector of the computer (2U, Getac Semirugged or user-supplied). This cable may be extended up to 100 feet using a Category 5 Ethernet crossover or straight patch cable.

4. Set the IP address of your computer to 192.9.0.nnn, where nnn is any integer from 1 to 100, except for 192.9.0.22, 192.9.0.225, 192.9.0.101, and 192.9.0.102 which are reserved.

5. If a navigation system will be used, connect the navigation system output to an available serial communications port.

6. If an external source will be used to trigger the Starmux III Digital Link, connect the trigger output of this source to the SYNC connector.

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

### 4.6.3.2  Connecting to the 4205 Rack Mount with Starmux III DL

Refer to subsection STARMUX III-4205 RACK MOUNT CONTROLS, INDICATORS, AND CONNECTIONS for the location of the connectors while performing the steps below:

1. Verify that the 4205 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.

3. Connect the LCD monitor to the MONITOR connector.

4. Connect the trackball to a back-panel USB connector.

5. Connect the keyboard to a back-panel USB connector.

6. If a navigation system will be used, connect the navigation system output to the COM 1 connector.

7. If an external source will be used to trigger the Stamux III with 2U CPU, connect the trigger output of this source to the EXT TRIG connector.

8. Connect AC power cord for 2U Processor and Starmux III to VAC INPUT connector and AC power source.

9. Connect an AC power cord to the LCD monitor and the AC power source.

### 4.6.3.3    Connecting to the 701-DL

Refer to subsection **701-DL CONTROLS, INDICATORS, AND CONNECTIONS** for the location of the connectors while performing the steps below:

1. Verify that the 701-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.

3. Connect the Ethernet patch cable to the DATA connector of the 701-DL Digital Link and to the Ethernet connector of the computer (2U, Getac Semirugged or user-supplied). This cable may be extended up to 100 feet using a Category 5 Ethernet crossover or straight patch cable.

4. Set the IP address of your computer to 192.9.0.nnn, where nnn is any integer from 1 to 100, except for 192.9.0.22, 192.9.0.225, 192.9.0.101, and 192.9.0.102 which are reserved.

5. If a navigation system will be used, connect the navigation system output to an available serial communications port.

6. If an external source will be used to trigger the 701-DL Digital Link, connect the trigger output of this source to the SYNC connector.

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

### 4.6.3.4    Connecting to the 4205 Rack Mount with 701-DL

Refer to subsection **701-DL 4205-RACK MOUNT CONTROLS, INDICATORS, AND CONNECTIONS**  for the location of the connectors while performing the steps below:

8. Verify that the 4205 Rack Mount is not connected to AC power.

9. Verify that the tow cable is properly connected and attached to the towfish, and then connect the tow cable to the SEA CABLE connector.

10. Connect the LCD monitor to the MONITOR connector.

11. Connect the trackball to a back-panel USB connector.

12. Connect the keyboard to a back-panel USB connector.

13. If a navigation system will be used, connect the navigation system output to the COM 1 connector.

**14.** If an external source will be used to trigger the 4205 701-DL with 2U CPU, connect the trigger output of this source to the EXT TRIG connector.

**15.** Connect AC power cord for 2U Processor and 701DL to VAC INPUT connector and AC power source.

**16.** Connect an AC power cord to the LCD monitor and the AC power source.

# 5.0 ACTIVATION, TEST, AND DEPLOYMENT

After the connections to the topside processor have been completed, the 4205 can be activated. However, a few pre-deployment checks are required before the deployment of the Towfish to verify that the system is operating properly.

When performing the system activation and test, refer to subsection **3.4** for the location and description of the controls and indicators on the topside processor. Also, should the system not activate properly or the pre-deployment checks fail, refer to section **7.0: TROUBLESHOOTING** for assistance on how to isolate and correct the problem.

## 5.1 Activating the Topside

The subsections below describe how to activate each of the three topsides. Please follow the instructions pertinent to your system's configuration.

### 5.1.1 Activating a Starmux III System

To activate the Starmux III Digital Link System:

1.  Turn on the computer and launch the Discover application.

2.  Turn on the line power switch on the back panel of the Starmux III 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 fish power indicator light should illuminate; the LAN indicator light should flash continuously, and the LINK indicator light should flash while a reliable communications link with the towfish is being established and then illuminate continuously when the link is found. Also, the NET Radio Indicator Tab in the lower control panel of the Discover application UI should display:

    NET: ON ..

### 5.1.2 Activating a 701-DL System

To activate the 701-DL Digital Link System:

1.  Turn on the computer and launch the Discover application.

2.  Turn on the line power switch on the back panel of the 701-DL 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 fish power indicator should illuminate; the LAN indicator should flash continuously, and the LINK indicator should flash while a reliable communications link with the towfish is being

established and then illuminate continuously when the link is found. Also, the NET Radio Indicator Tab in the lower control panel of the Discover application UI should display:

NET: ON

## 5.2    Performing Pre-deployment Checks

The pre-deployment checks should be performed after the system is activated and before the towfish is deployed. These checks involve verifying that data can be recorded and played back in Discover; rubbing one's hand on the transducer arrays while observing the sonar display in the Discover Main window; verifying correct heading, pitch, and roll outputs; and zeroing the pressure sensor.

1. Activate your System, using the specific instructions detailed above.

> **CAUTION!** Do not allow the transducer arrays on the towfish to continuously transmit in the air for an extended period, as damage to the transducer arrays could occur.

2. In Discover, click the Towfish Control (4205MPMT) or Sidescan Control (4205 Tri-Frequency) tab in the Lower Control panel, shown in **FIGURE 5-1 AND 5-2**.
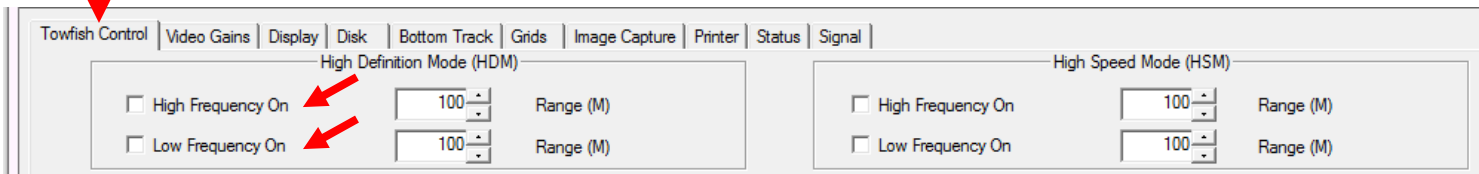


Figure 5-1: Towfish Control Tab in Discover 4205 MPMT
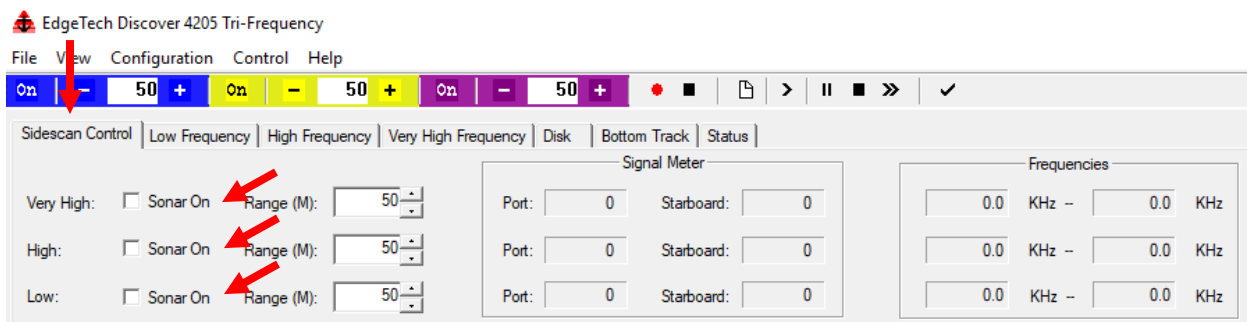


Figure 5-2: Sidescan Control Tab in Discover 4205 Tri-Frequency

3. Select the High Sonar On and Low Sonar On checkboxes for Discover 4205 MPMT, or the Very High Frequency On, High Frequency On and Low Frequency On checkboxes for Discover Tri-Frequency.

4.  Set the ranges for both high and low frequency to at least 100 meters. Click the N and T buttons on the Shortcut Toolbar in Discover to normalize Gain and TVG.

    The transducer arrays on the Towfish should begin transmitting, and data should begin scrolling on the Sonar display in the Discover Main window.

5.  Start recording data and perform pre-deployment test steps 5-7.

6.  After the pre-deployment tests are completed, stop recording and playback the file to assure the data recorded correctly.

7.  Rub the port and starboard transducer arrays from port to starboard to and back to port, while observing the sonar display in the Discover main window.

    You should observe streaks or noise spikes in the waterfall display in the same order as the transducers were rubbed (port-starboard-port).

8.  Verify that the heading, pitch, and roll sensors are working correctly by rotating the Towfish 360 degrees and back, along with tilting and rolling the Towfish while observing the Heading, Pitch, and Roll displays in the Lower Indicator bar in the Discover.

9.  If a pressure sensor is installed, verify that the Pressure display indication is at or nearly zero. The Pressure sensor can be zeroed on deck in Discover, under External Device Controls.

## 5.3   Towfish Deployment

The 4205-SP Towfish can be towed at speeds of up to 4.8 knots while still meeting NOAA and IHO-44S specifications of 3 pings on a 1-meter cubed target at 100 meters range. The 4205-MP Towfish can be towed at speeds of up to 9.6 knots with the same results when operating in HSM.

> **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. Also, carefully monitor Towfish altitude always during the survey. Failure to do so may 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 hull of the ship due to the low pressure of the propeller wash and the effect of the water flowing by the hull. Also, 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 "Towing Characteristics for EdgeTech's 4205 Towfish," Revision 11.

**NOTE:** For detailed information about the Discover software, including how to record data, refer to the Discover 4205 Software Manuals.

**To Deploy the Towfish:**

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. However, if practical, the survey vessel should be put into neutral. 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.

   a. Click the towfish Control tab and select the range for each frequency, shown in **FIGURE 5-1 AND FIGURE 5-2**.

   b. Click the N and T buttons on the Shortcut Toolbar in Discover to normalize gain and TVG

3. Click the Bottom Track Tab in the Lower Control panel, shown in **FIGURE 5-3**.

| Towfish Control | Video Gains | Display | Disk | Bottom Track | Grids | Image Capture | Printer | Status | Signal |

☐ TrackBottom     Detection Threshold (%): [0]     Minimum Altitude (M): [0]     Track

⦿ Port     ○ High

☐ Tracking Indicator     Indicator Offset (pixels): [0]     Tracking range (M): [0]     ○ Starboard     ⦿ Low
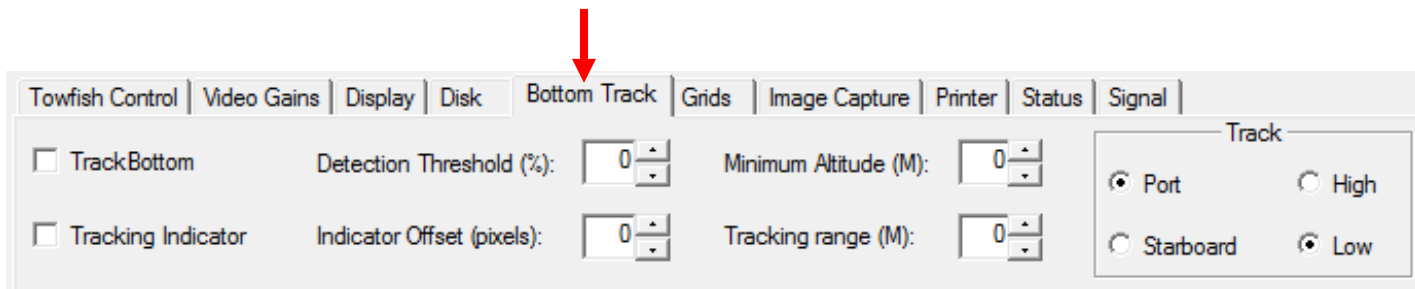
*Figure 5-3: Bottom Track Tab*

4.  On the Bottom Track, Tab makes 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 Software Manual for details on bottom tracking setup.

5.  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.

6.  If a pressure sensor is installed, verify that the Pressure display indication is correct.

7.  Secure the tow cable to the survey vessel.

8.  Begin recording data.

## 5.4 Towfish Recovery

> **CAUTION!** The following procedure is only meant as a general guide. Due to varying condition, exact recovery methods will change, and you must modify your procedure to match the conditions you are working under.

*Figure 5-4: 4205 Towfish with Optional Depressor Wing being Recovered*

To recover the Towfish:

1. Slowly retrieve the tow cable until the towfish is just below the surface.

2. Click the Towfish Control Tab (4205 MPMT) or Sidescan Control Tab (4205 Tri-Frequency) and deselect the High Sonar On and Low Sonar On checkboxes, shown in **FIGURE 5-1 AND FIGURE 5-2**.

3. Slow the survey vessel speed to under two knots.

> **NOTE:** If practical, put the survey vessel in neutral while the Towfish is brought on board.

4. Recover the towfish from the water and carefully lower it on deck.

5. Turn off the Topside Processor.

6. Disconnect the tow cable from the 6-pin male tow cable connector on the towfish. Inspect the connector; clean and lubricate, as necessary.

7. Install the 6-pin female dummy plug on the 6-pin male bulkhead connector on the towfish.

8. Refer to the **MAINTENANCE** section of this manual for instructions on how to clean and inspect the Towfish, the tow cable, and the underwater connectors after use.

# 6.0  MAINTENANCE

The 4205 Side Scan Sonar System is ruggedly designed and built, and therefore requires little maintenance. However, to ensure long-lasting and reliable service, some periodic maintenance is recommended. Perform maintenance on 4205 as often as necessary, depending on use. Most maintenance is performed after each Towfish deployment and recovery.

## 6.1     Inspect and Clean the Towfish and Cable after Use

After recovering the towfish from the water, use a freshwater hose to wash it down, along with the tow cable. Thoroughly spray the transducer arrays and remove any buildup of debris. Inspect the cables and connectors for any damage and check for loose connections. Also, inspect the tow cable and the connectors on each end and install the dummy plug.

After washing down the towfish with fresh water, the transducer arrays can be cleaned if needed using a mild, non-abrasive detergent and freshwater. Do not use any abrasive detergents or ammonia-based cleaners. After cleaning, thoroughly spray the transducer arrays again with fresh water.

## 6.2     Inspect and Clean the Underwater Connectors

Regularly inspect each underwater connector in the towfish and on the tow cable for corrosion or oxidation. To remove any oxidation, rub the contacts lightly with 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 reliability of the connectors, 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 connectors of the tow cable and the Towfish tow cable connector.

## 6.3     Storage

When not in use, all the components of the 4205 System should be packed in their original shipping containers in the same way they were originally shipped. Store equipment in a dry area when not in use.

## 6.4     Recommended Spares

EdgeTech recommends purchasing spare parts at the same time as purchasing the original equipment. Doing so ensures all spares are of the same make and model as the originals installed in the equipment. See **SPARE KITS** and contact **CUSTOMER SERVICE** for a list of recommended items.

# 7.0 TROUBLESHOOTING

By following the instructions in the previous sections and performing regular maintenance, the user should seldom encounter bugs with the 4205 System. If problems do occur, however, this section will help users diagnose and fix simple bugs. It includes basic troubleshooting techniques, along with connector pin-out and wiring information to assist in identifying and correcting possible setup or operational problems.

If you encounter more serious bugs or if the techniques below fail to address the problem, please contact **CUSTOMER SERVICE**.

## 7.1     Restore the Operating System

The Starmux-RM, 4205-RM and 701-DL, Starmux III options can be restored using the supplied USB in the unlikely event of failure.

## 7.2    Disassembling and Reassembling the Towfish

The procedures below describe how to disassemble and reassemble a towfish to access and remove the electronics chassis. The tools required are a 5mm Allen wrench [0020968], Phillips 01 screwdriver [0006970] and plyers [0006968].

> **WARNING!** High Voltages that can cause injury or death are present in the towfish. Turn off the topside processor and disconnect the tow cable before disassembling the towfish.
>
> **CAUTION!** Opening the electronics chassis may void the user's warranty unless preapproved by Edgetech. Contact EdgeTeuch Customer Service before opening the chassis.

### 7.2.1  Disassembling the 4205 Towfish:

1. Place the towfish on a clean, dry, flat surface.
2. Unscrew and remove the [4] mounting screws that secure the tail to the back of the tow vehicle using a 5mm Allen wrench.
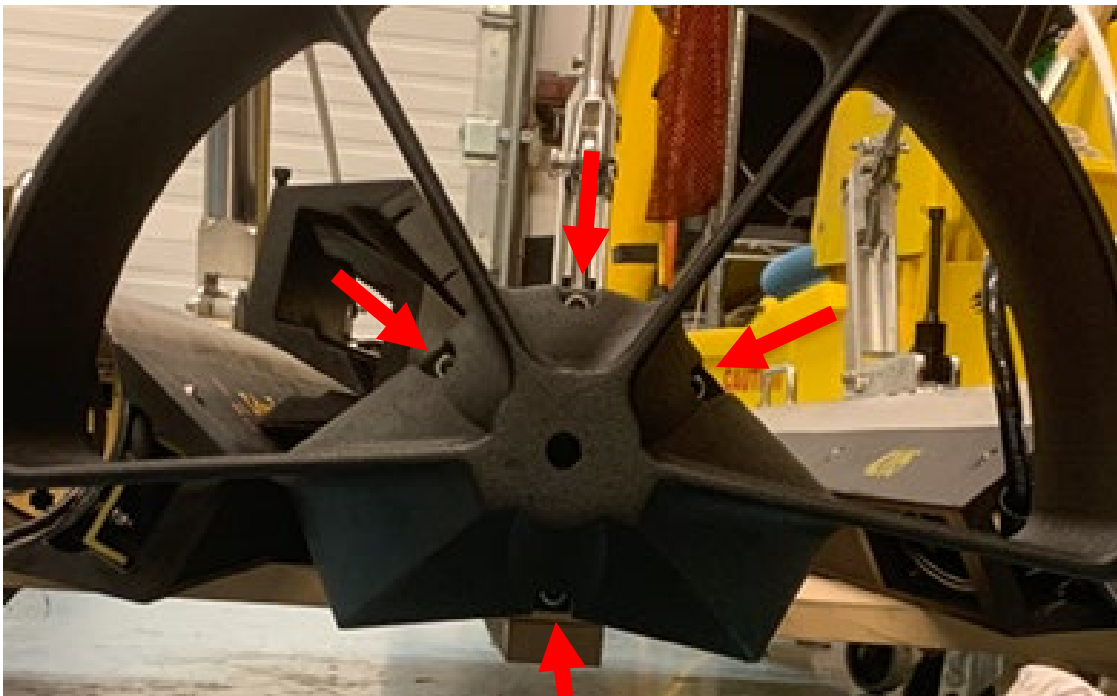
*Figure 7-1: Tailfin Removal*

3. Pull the tail from the vehicle carefully.
4. The aft endcap should now be exposed. Carefully disconnect all of the transducer cables from their connectors.



*Figure 7-2: Aft Endcap Cable Disconnection*

5.  Remove [2] screws and [2]finishing washers from both forward side and aft side of the housing using a Phillips screwdriver.



*Figure 7-3: Side Seal Screw and Washer*

6.  Remove the nylon retaining lines from both forward and aft side of the housing where the finishing screws and washers were removed.  To remove, grip the nylon retaining line with needle nose plyers and pull it completely out of the housing. It may be necessary to push on the endcap for leverage to remove the line. Installing the supplied grip can facilitate this (see STEP 9).
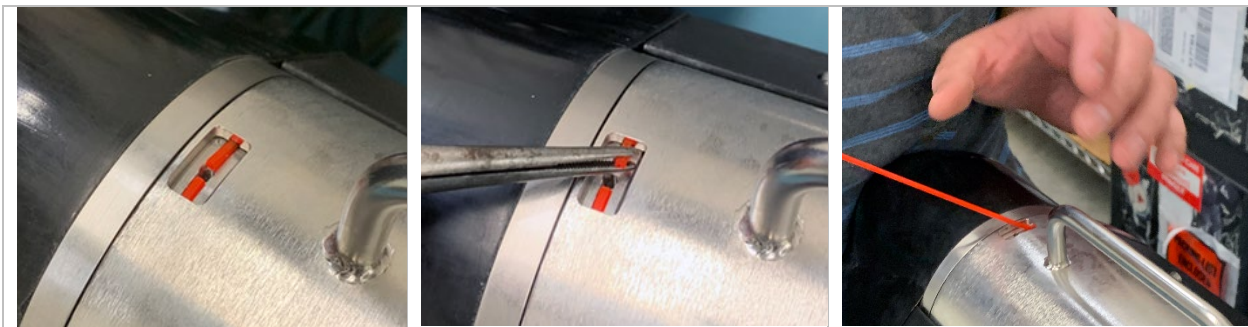


*Figure 7-4: Nylon Retaining Line Removal*

7. Carefully remove the nose cone by pulling it from the vehicle.



*Figure 7-5: Nose Cone Removal*

8. The forward endcap is now exposed. Carefully disconnect all cables from their connectors.
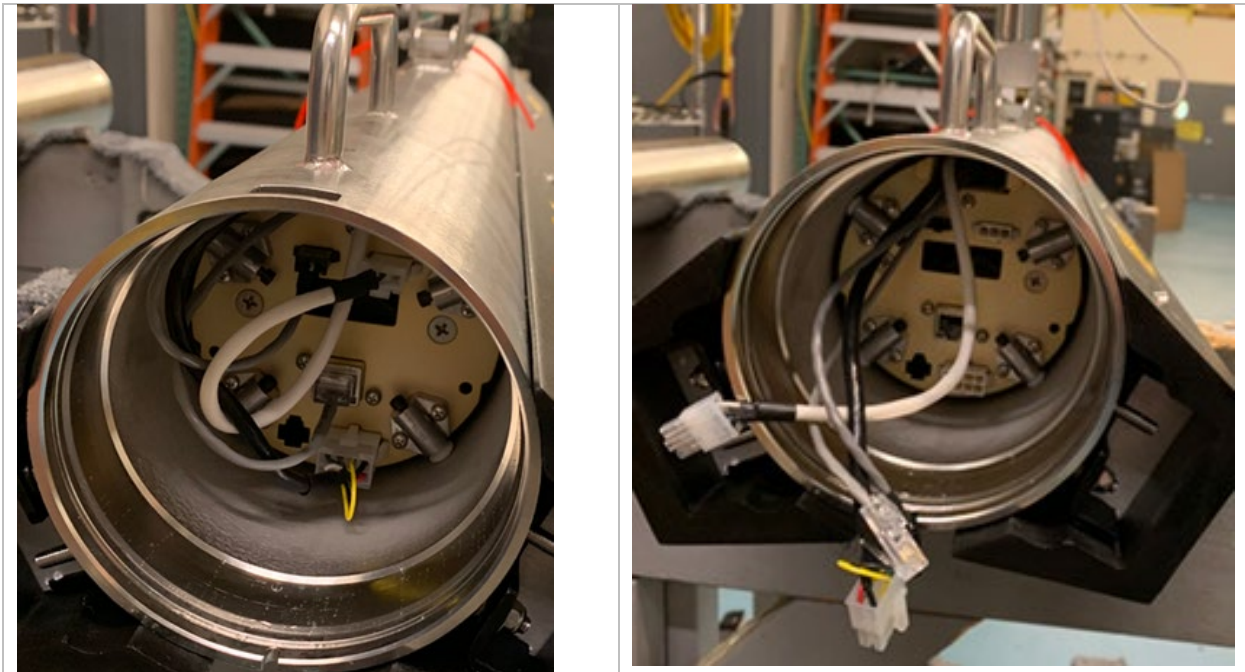


*Figure 7-6: Forward Endcap Cable Disconnections*

9. Attach the Edgetech supplied grip to the aft endcap by threading in the bolts.
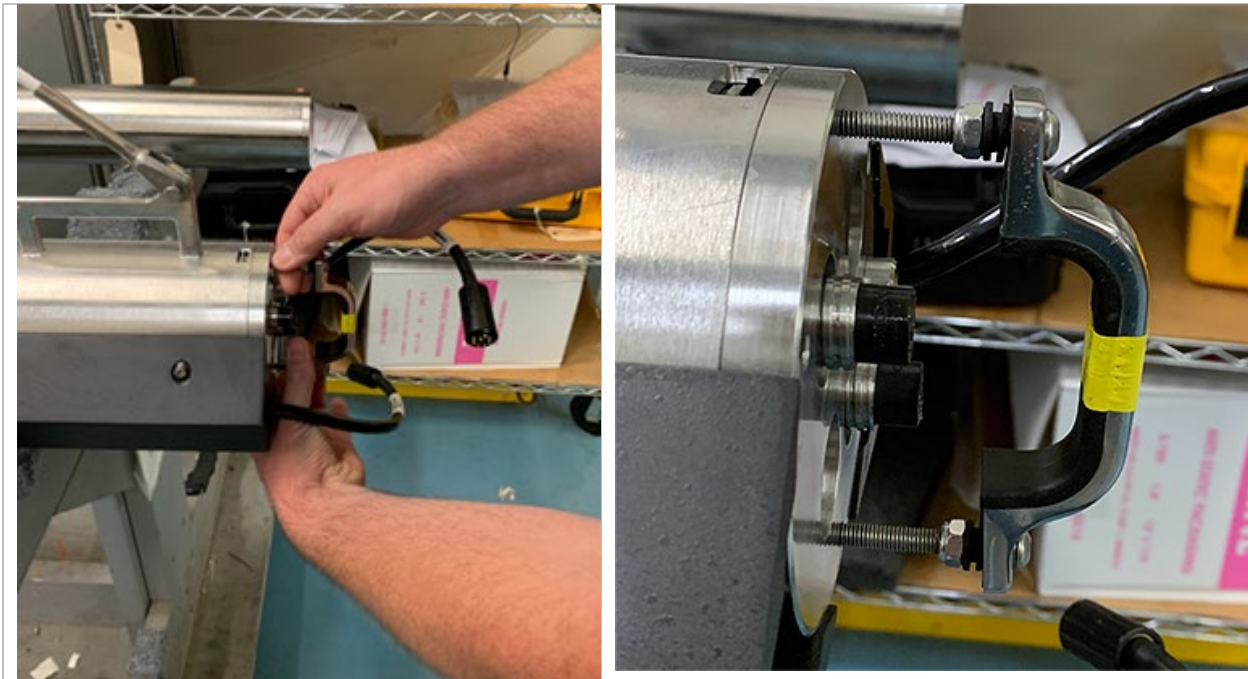

*Figure 7-7: Aft Endcap Grip Handle Installation*

10. Carefully pull the attached supplied grip to remove the electronics chassis from the housing and place it on a clean, dry, flat surface.


*Figure 7-8: Electronics Chassis Removal From Towfish Housing*

## 7.2.2  Assembling the Tow Vehicle

To assemble the tow vehicle, reverse the disassembly procedure.

## 7.3  Standard Compass Calibration (AHRS Compass)

The compass is calibrated at the EdgeTech manufacturing facility and should not require additional calibration. Should the compass in the Towfish lose its calibration for any please contact **CUSTOMER SERVICE** to recalibrate it.

## 7.4  Starmux III Rack Mount (Starmux III DL with 2U CPU) Troubleshooting Guide

This troubleshooting section is for the 701-DL and Computer Combo

| SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| **Blue Power Indicator on 2U CPU does not illuminate** | The POWER switch is not turned on. | Verify that the POWER switch located in rear off CPU is in the on position. |
| | No AC power. | Verify that the 2U CPU is connected to AC power. Check the AC power source. |
| | The indicator is not operating. | Open topside processor and check indicator and wiring. |

*Table 7-1: Starmux III Rack Mount Troubleshooting Chart*

## 7.5  Starmux III Digital Link Troubleshooting Guide

| SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| **The green POWER 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. When using the AC power connector. | Verify that the digital link is connected to AC power. Check the AC power source. Verify that the fuse is good. |
| | 5 amp fuses on rear panel VAC connection are bad. | Check fuses for continuity. Replace if necessary. |
| | The indicator is not operating. | Open the unit and check the indicator LED and wiring. |

| SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| **The green LAN indicator does not illuminate when the unit is turned on.** | The 375VDC 2.5A fuse mounted to the rear panel is bad | Check the fuse for continuity. Replace if necessary. |
| | There is no connection between the digital link and the external topside processor. | Check the LAN connections between the STARMUX III unit and the topside processor. |
| | The indicator is not operating. | Open the unit and check the indicator LED and wiring. |
| **The green LINK indicator flashes when the STARMUX III is turned on. After 1 minute, the flashing should stop, and the indicator should remain lit.** | Tow cable between the digital link and the tow vehicle is disconnected or faulty. | Check connections and tow cable. |
| | Modem settings on the digital link are incorrect. | Contact **CUSTOMER SERVICE** |
| | Tow fish is faulty. | Check the unit using a different tow fish. |
| **The DISCOVER survey software (if used on external topside) reports, "Cannot ping towfish."** | LAN cable disconnected. | Check LAN cable connection. |
| | Tow cable disconnected. | Check the tow cable connection. |
| | Modem settings are incorrect. | Please contact **CUSTOMER SERVICE** for modem settings. |
| | Modem disconnected internally on the digital link. | Check all connections to the modem are correct per the wiring diagram. |
| | Improper settings in DISCOVER (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. |
| | Tow vehicle is faulty. | Verify the tow vehicle using a different digital link. Verify the digital link with a different tow vehicle. |

*Table 7-2: Starmux III Troubleshooting Guide*

## 7.6 4205 Rack Mount (701-DL with 2U CPU) Troubleshooting Guide

This troubleshooting section is for the 701-DL and Computer Combo.

| SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| **Blue Power Indicator on 2U CPU does not illuminate** | The POWER switch is not turned on. | Verify that the POWER switch located in rear off CPU is in the on position. |
| | No AC power. | Verify that the 2U CPU is connected to AC power. Check the AC power source. |
| | The indicator is not operating. | Open topside processor and check indicator and wiring. |

*Table 7-3: 701-DL Rackmount Troubleshooting Chart*

## 7.7 701-DL Digital Link Troubleshooting Guide

| SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| **Green POWER indicator on the topside does not illuminate when the unit is turned on.** | The POWER switch is not turned on. | Verify the POWER switch is on. |
| | No AC power. When using the AC power connector. | Verify that the topside processor is connected to AC power. Check the AC power source. Verify that the fuse is good. |
| | 5 amp Fuses on the rear panel of topside ac connection bad. | Check fuses for continuity. Replace if necessary. |
| | The indicator is not operating. | Open the topside processor and check the indicator and wiring. |
| **Green LAN indicator on the topside does not illuminate when the unit is turned on.** | There is no connection between the topside and the computer. | Check LAN connections between topside and laptop. |
| | The indicator is not operating. | Open the topside processor and check the indicator and wiring. |
| **Green LINK indicator on the topside flashes when the topside is turned on. After 1-minute flashing should stop and indicator should remain lit.** | Tow cable between topside and Towfish is disconnected or faulty. | Check connections and tow cable. |
| | Modem settings on the topside are incorrect. | Refer to APPENDIX C for modem settings. |
| | 4205 Towfish is faulty. | Check topside on different Towfish. |

*Table 7-4: 701-DL Digital Link Troubleshooting Guide.*

## 7.8    Towfish Troubleshooting Guide

The 4205 Towfish is a complex computer-controlled system that requires engineering expertise and the proper test equipment to service. For any service or troubleshooting, please contact **EDGETECH CUSTOMER SERVICE** for updated instructions, drawings, documentation, tools, and guidance. This ensures success and is necessary to maintain the product's warranty.

The 4205 Towfish is a software-controlled computer system that includes both digital and analog connections between components. Many of the digital connections share and are dependent on the same data and address lines so the failure of one component may cause others to fail.  Therefore, to successfully troubleshoot an issue, it is best to understand the dataflow and methodically test to isolate the problem.

An example methodical test procedure is as follows:

1. Ensure that the system is properly installed with all cables connections mated with connectors.
2. Check that fuses have not blown and that the lines connecting them are to the specified electrical limits. Fuses may fail if a wrong connection has been made during setup. They have also been known to fail for no apparent reason. Always replace fuses with those of the same value. If a fuse fails again within a short time, there are more serious problems within the corresponding unit.
3. Check that the cards installed on the topside electronics are properly seated and that any attached cables are connected, especially if the unit has been in transit. Cards and cables can be checked visually by opening the top cover of the topside. If the problem persists, disengage, and then reengage all PC boards. Do the same for all board cable connections, before going on to any electrical testing.
4. Check the system's calibration. All calibration adjustments are preset at the factory and should not require any modifications in the field unless certain mechanical and/or electrical components are changed, or the adjustments are inadvertently altered. Please contact **EDGETECH CUSTOMER SERVICE** to learn what the default settings are and instructions on how to reset or change them.
5. Ensure that any optional internal or external components aren't causing the problem by disconnecting them from the system.

If the above checks do not identify or remedy the problem, attempt to isolate the failure to one of the major system components: the sonar processor, the modem/power unit, the towfish, or the tow cable.

The following sections provide some specific areas to check and easily identifiable clues to look for in making an educated guess as to the source of the problem. This is only down to the module or PCB level.

### 7.8.1  Required Equipment

Except for the topside processor/power unit, only common laboratory test equipment and tools are required for field troubleshooting. No special equipment is necessary. Typical test equipment includes:

- Digital multi-meter, Fluke, or equivalent
- Oscilloscope
- Hi-pot tester
- Capacitance meter

## 7.8.2  Transmission Verification

The 4205 Towfish differs from older conventional side scan sonars in that the "listen for the clicking noise" test cannot be used to verify sonar transmission. Earlier sonars were driven with a high-powered energy burst that produced a highly audible clicking sound. The 4205 transducers are driven with a low power smooth rising signal that matches the transducer response. Because of this, there is no pronounced clicking noise emanating from the 4205's transducers when they are firing.

Sniffing with an oscilloscope can be used as a substitute to check transducer firing. One way is to attach the scope probe's ground to the towfish body and hold the open probe next to the transducer under test. Set to about 20 to 50mV /Div.

A second method is to connect a several-turn wire loop across the scope probe and move it over the transducer face. Electrical pickup should be noticed on the scope screen at each transmission burst. Remember that the transducers and elements within the transducer may be firing together or in sequence. Make sure that the electrical pickup is not from an adjacent string.

## 7.8.3   Sonar Processor and Data Link

It is assumed that the sonar processor is up and working on completing system test and troubleshooting. Refer to the sonar processor's manual for its troubleshooting and diagnostic information.

The high-speed data must also be up and running so that the topside and sub-sea units are communicating with each other. If the towfish boots up correctly, and passes its internal self-test, there will be a smooth sequence of rising tones going from 2 to 3.9 kHz. A set of tones jumping from 2 to 3 kHz means that self-test has failed.

These tones are generated in the software of the 4205 Towfish and are replicated on the surface when an EdgeTech topside processor is used to access the Towfish computer subsystem using the Remote Desktop application. The Self-Test PASS tones repeat until data linkup has occurred between the Topside Processor, Discover, and the towfish. Self-Test FAIL tones repeat indefinitely.

There will be a diagnostic popup in Discover to acknowledge a successful self-test and linkup. Self-test status will also be displayed on an external video monitor is attached directly to the Towfish's CPU board's VGA connector.

If the topside processor is unavailable, and the towfish is dismantled, an external keyboard, mouse, and video monitor may be connected to the towfish CPU board to provide some diagnostic testing. An external power unit will still be required.

## 7.8.4  Topside Power Unit

Towfish power is supplied either from an individual power/modem unit or from an integrated topside processor. Voltage and current to the towfish are important parameters. They must be within acceptable limits for the towfish to work properly. Check the tow cable output voltage with the system connected and, if possible, the current drain with an inline connection. Cable current should be between 120mA (Idle) and 250mA.

The topside supplies 400VDC through the tow cable. The voltage at the towfish end of the cable must be not less than 300VDC to start the system and not be less than 200V during operation.

## 7.8.5 Command and Data Link

A successful Remote Desktop session can be used to verify the command, and data link are transmitting through the tow cable. Please contact **CUSTOMER SERVICE** and have an EdgeTech technician attempt to connect or provide instructions.

## 7.8.6 Data Link

A good, quick, qualitative test of the data link and towfish electronics is to perform a rub test on each transducer. Set the range to 200 meters for both frequencies and start the system running in HDM mode for both. Set screen gain to +30dB for both frequencies and briskly rub each aft transducer face one at a time. A dark band should appear on the sonar processor screen corresponding to the side rubbed.

Data throughput rates on the uplink (fish to topside) can be critical in getting smooth data from the towfish. Data throughput rate can be checked using EdgeTech supplied utilities at each end of the link.

The SockBlast application is used to test network throughput between the 4205 Towfish and the topside computer. This application is normally kept in C:\EdgeTech\Utilities folder on the topside unit, and D:\EdgeTech\Utilities folder on the Towfish.

Two copies of SockBlast must be run with one installed on the Towfish acting as a server and another running on the topside acting as a client. They connect by entering each others IP addresses in the Address of Remote (server Computer Field).  The SockBlast server installed on the towfish should have the Address off Remote (server Computer field) 192.9.0.99 populated in, as that is the IP address of the topside. The Sockblast client installed on the topside should have the Address off Remote (server Computer field) 192.9.0.101 filled in, as that is the IP address of the towfish.

 **Instructions are as follows:**

**On the Towfish Side**

1. Set the IP address of the server to match the IP address of the desktop computer (192.9.0.99) then press, create server .

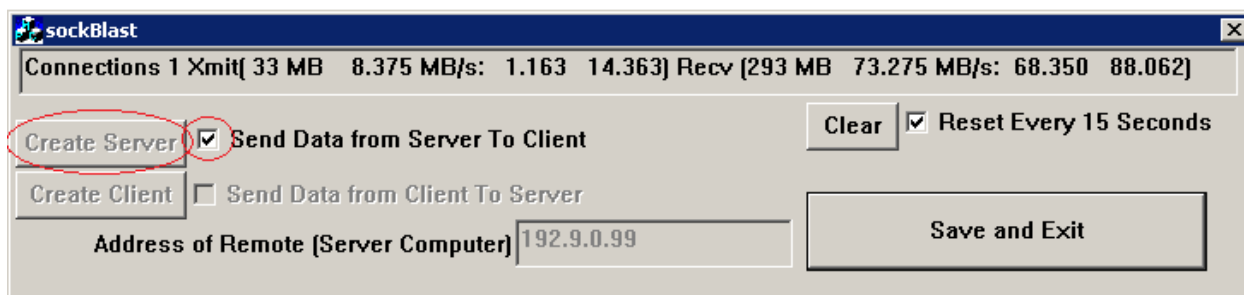2. Check "Send Data from Server to Client" this will start the process of sending data



*Figure 7-9: sockBlast on Towfish Side*

**From Topside Computer**

3. Set the IP Address to 192.9.0.101 then press create client

4. Check the box "Send Data from Client to Server" on the sockBlast running on an embedded computer.
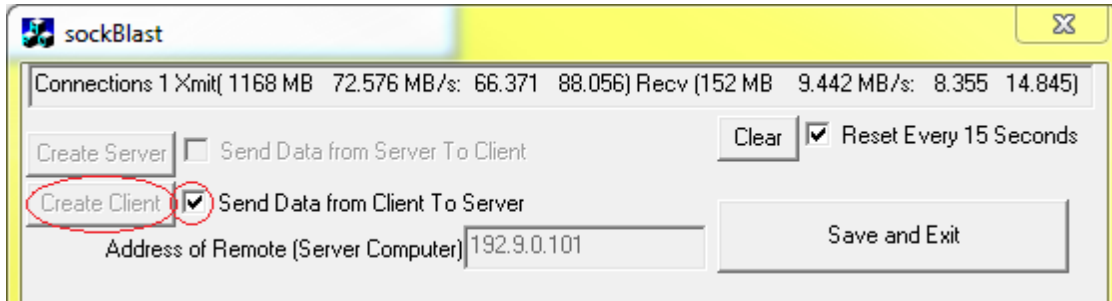


*Figure 7-10: Sockblast Client on Topside Computer*

After pressing the Create buttons to start the server and clients on their respective machines, the two applications hook up, then the Client count on the Towfish should increment from 0 to 1, and the Server count on the topside should increment to 1 as well. This indicates one connection between the two applications.

Check the Server Send Data box on the Towfish. A performance in MB/second will be displayed. This should be more than 0.35Mbyte/s.

> **NOTE:** The program will reset every 15 seconds.

## 7.8.7 Towfish

Before troubleshooting the Towfish, first verify that the command and data links between the towfish and topside are working, as described in **7.8.5 COMMAND AND DATA LINK**.

> **NOTE:** It is recommended that all attempts be made to see if a problem is external to the Towfish before opening it. Also, contact EdgeTech to receive prior approval to open the towfish chassis so as not to risk voiding the warranty.

> **WARNING!** High voltage (400 VDC) is always present in the electronics assembly when powered.

### 7.8.7.1    No Sonar Data

If the sonar display does not scroll, use the 'scope sniffing' approach as outlined in sub-section **7.8.2 TRANSMISSION VERIFICATION** to check transducer firing. If the transducers are firing, and the data link is working, the problem is most likely related to the topside processor and/or data modem.

If the display scrolls but is blank, and the transducers are firing, the problem most likely lies with either or a combination of the Towfish receiver, transducer, and its signal processing circuitry. Establish if the problem is on a single channel or all channels.

If data is absent in all, or individual channels, check the SSB boards. If the problem is with a channel, also check the respective power amplifier and transducer element.

Connect to the towfish using REMOTE DESKTOP 192.9.0.101 login: administrator, password: admin. Sonar application should be running, and there should not be any errors posted to the window.

### 7.8.7.2    Reported Errors

| REPORTED ERROR | INDICATION |
|---|---|
| "**No Sonar Device Found**" | indicates the CPU does not connect to the sonar processor card |
| "**IF_DIAG**" | Indicates the Sonar Processor has detected an error and will not run. Cycle power on Towfish recheck error. If an error is still present, check the cables running to and from the Sonar Interface Card |
| **HM_Sensors**" | Indicates the 48 volts of the operating power supply. If this error is found, check the output of power distribution board in Towfish and the power on the power amps |

*Table 7-5: Reported Errors*

### 7.8.7.3    Other Checks

Periodically check the integrity of the sea ground capacitor attached to the rear bulkhead.

## 7.9    Tow Cable Troubleshooting

Historically, most system problems occur in the tow cable and their connectors. Before proceeding, verify cable continuity from the shipboard end of the cable to the towfish. The presence of a shorted or open wire in a tow cable can be determined by using a multi-meter. An open or shorted wire can be located using the techniques described in the following subsections.

### 7.9.1.1    Shorted Wire

The following procedure may be used to approximate the distance to a single short or a point of high leakage between a conductor pair or from a conductor to a shield.

1.  Disconnect both cable ends.

2.  Short the two connector pins (or wires if un-terminated) of the shorted pair at both ends and measure the total resistance between the ends.

    **R1 + R2 =_____**

3.  Remove the shorts.

4.  Measure the resistance between a shorted pair on one end with an ohmmeter on the Rx1 scale.

    **R1 + Rs =_____**

5.  Measure the resistance from the other end.

    **R2 + Rs =_____**

6.  Add the measurements of **STEP 4** and **STEP 5**. Subtract the measurement of **STEP 2**, and divide the result by 2.

    **Rs =_____**

7.  Subtract the value of 6) from the measured values of 4) and 5).

    **R1 =_____**

    **R2 =_____**

8.  The distance to the short from end #1 is the ratio of (R1/R1+R2) times the total cable length. Recheck from end #2 which is (R2/R1+R2) times the cable length.

### 7.9.1.2    Open Wire

An open wire in a cable is much more difficult to locate than a short circuit. Therefore, a capacitance bridge is recommended. Measuring the capacitance from the open wire to the shield on both ends allows two different capacitance readings to be recorded. This represents a direct ratio related to cable length and distance of break from each end. Before cutting the cable, double-check the same ratio of capacitance using an adjacent good wire in a multi-conductor cable. The capacitance may vary from wire to wire, depending on their separation.

Most breaks occur around the tow cable termination or where a previous repair has been made. A cable break may be found or confirmed by laying out the cable and attaching an Ohmmeter across each end of the open wire. Then, flex the cable first near the termination or repaired section, and then along its entire length until the break is reached. When flexing, the ends of the broken wire may touch, giving a continuity reading on the meter.

### 7.9.1.3     Insulation Resistance Breakdown

Insulation breakdown is the most difficult fault to locate. Cable leakage is not necessarily located near the end of terminations. However, the area near each termination receives the most abuse and is, therefore, subject to suspicion. Successive cutting of the cable end until leakage disappears will prove successful in many cases.

> **CAUTION!** Before cutting the cable for any of the above reasons, a careful visual examination should be made for any signs of physical damage.

With both ends disconnected, the tow cables should measure between 100 Mega-ohms and infinity between conductors with a 500 VDC Megohmmeter. When using a Simpson 260 Multi-meter, all cables wire-to-wire or wire-to-shield should measure infinity.

Any leakage on the multimeter indicates cable leakage.

### 7.9.1.4     Damaged Tow Cable Connector

The towfish has a trip line that prevents the vehicle from hanging up on a snag. When the line trips, the cable connection to the towfish disconnects exposing the high voltage pins to seawater. Pin corrosion will start to occur as long as power is still applied. If the power is not immediately removed, and the cable is not immediately retrieved, and the connector flushed out with freshwater, there may be permanent damage to the connector. This will require cable re-termination.

# A.0 MECHANICAL DRAWINGS

## A.1 Cables

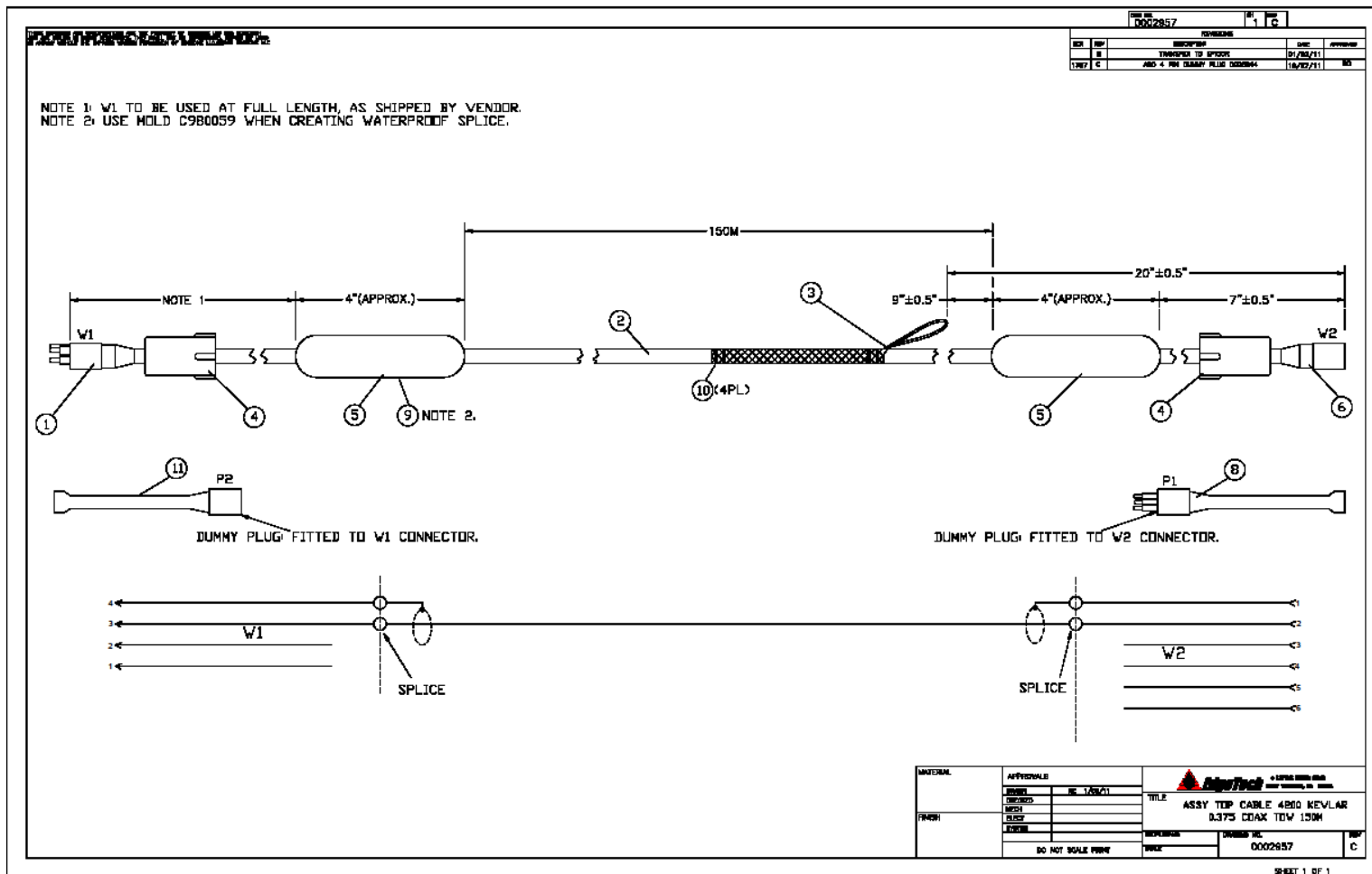Diagrams of the optionally available cables are as follows:



*Figure A-1: Kevlar 150m Reinforced Tow Cable ICD – 0002957*
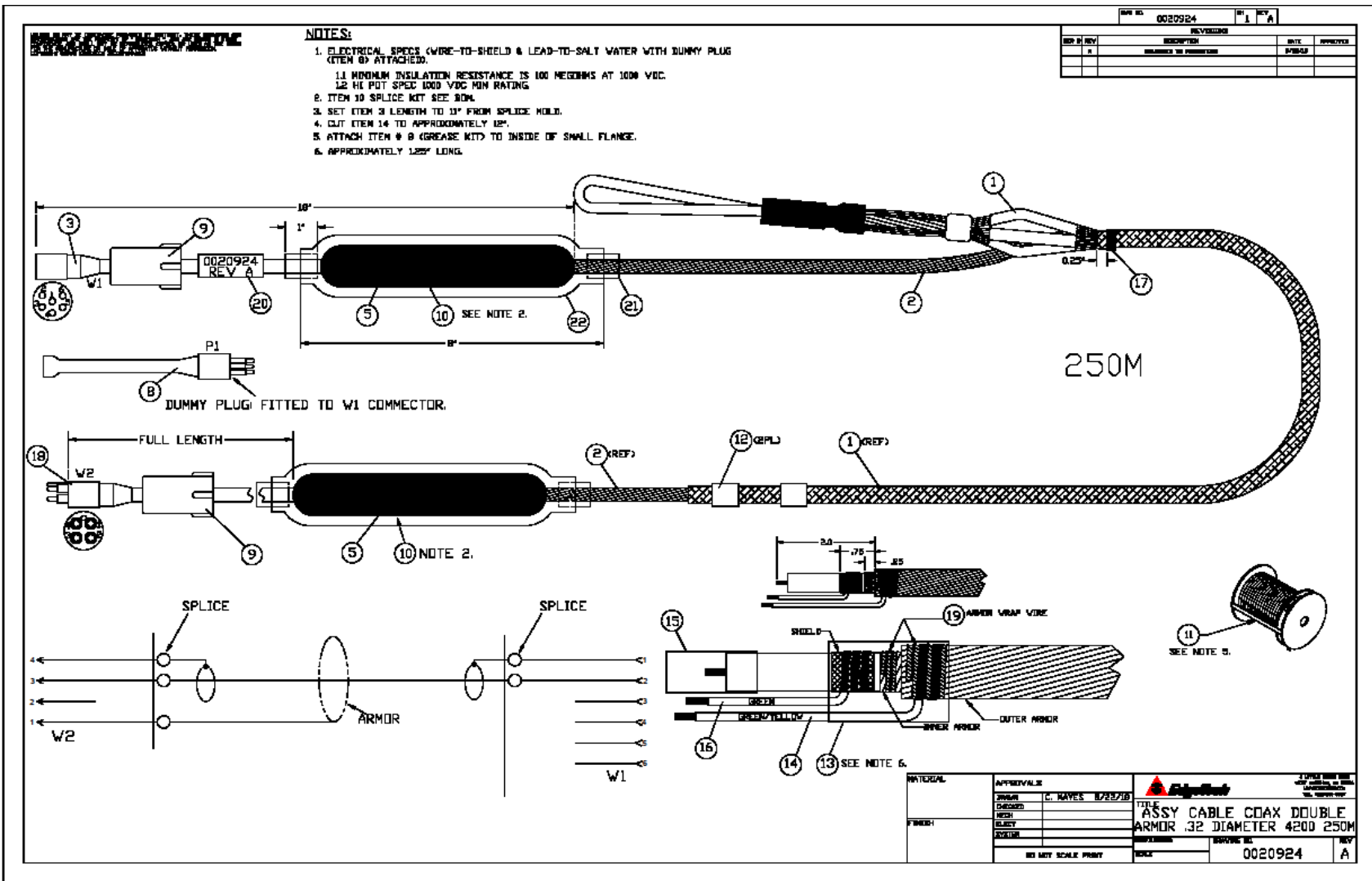
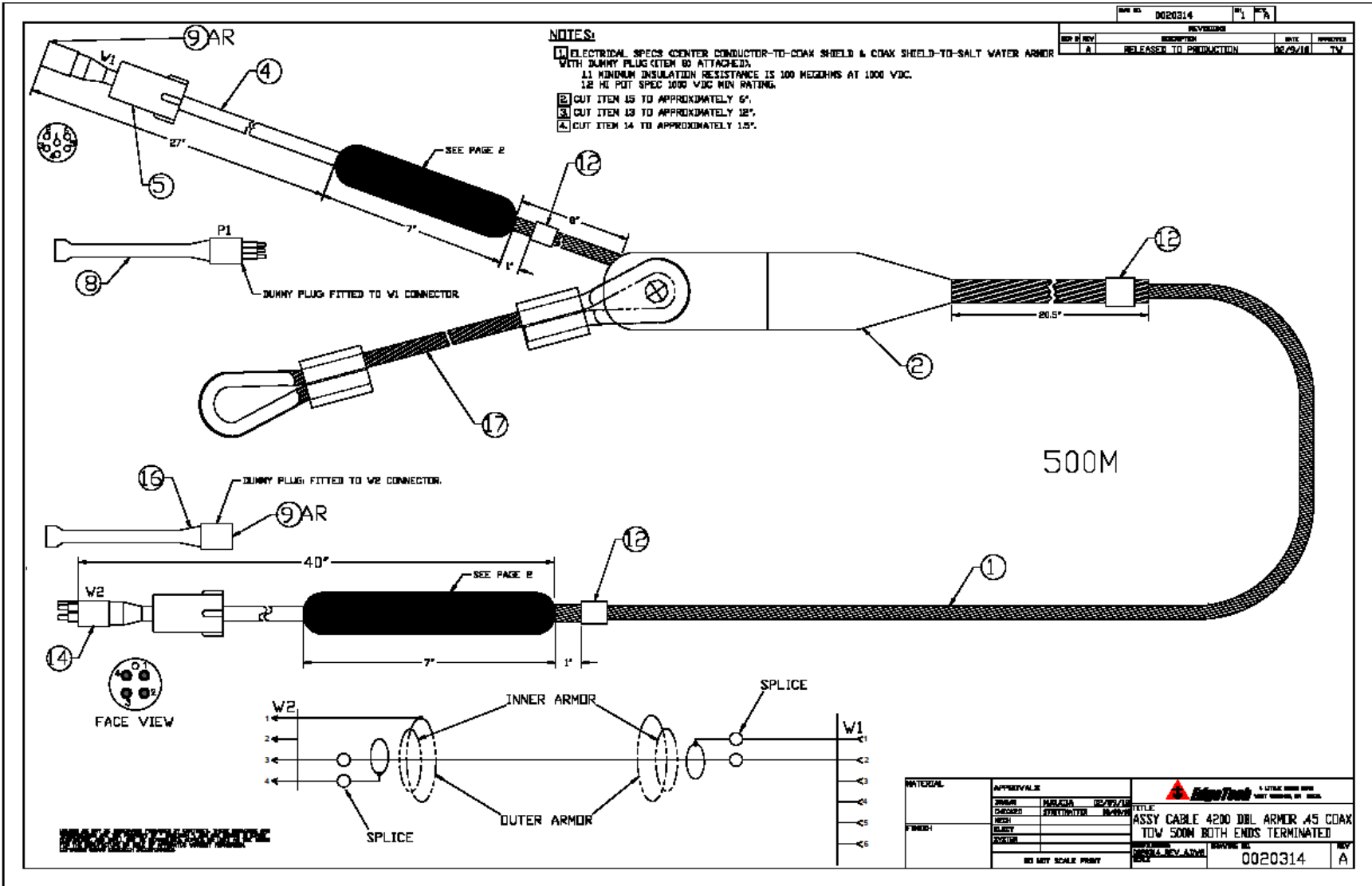*Figure A-2: Armored 250m Tow Cable ICD – 0020924*

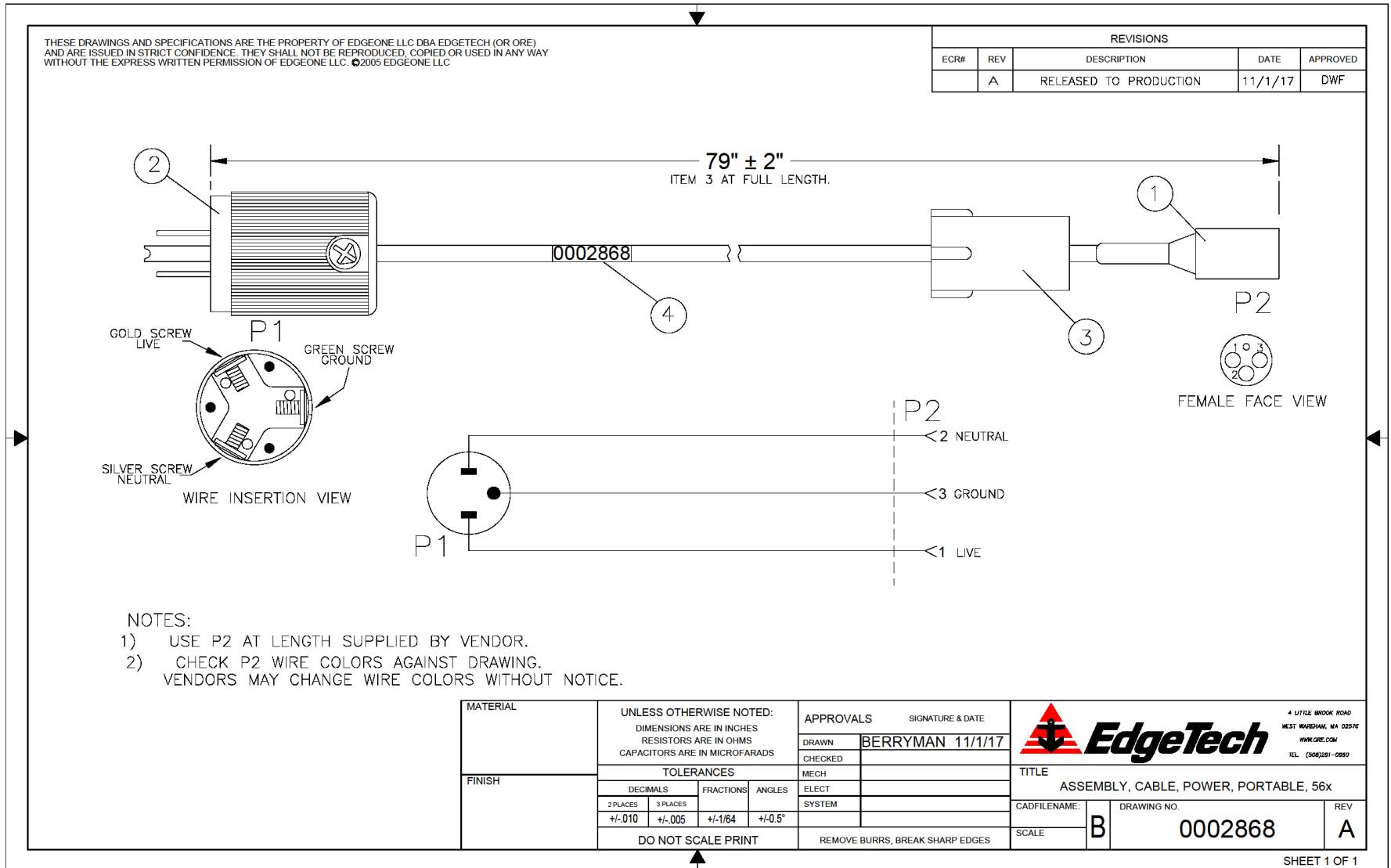*Figure A-3: Armored 500m Tow Cable ICD – 0020314*

Figure A-4: AC Power Cable – 0002868

# B.0 SPARE KITS

This section contains labeled diagrams and Bills of Materials for spares Kits.

## B.1    4205 MPMT Spare Kits

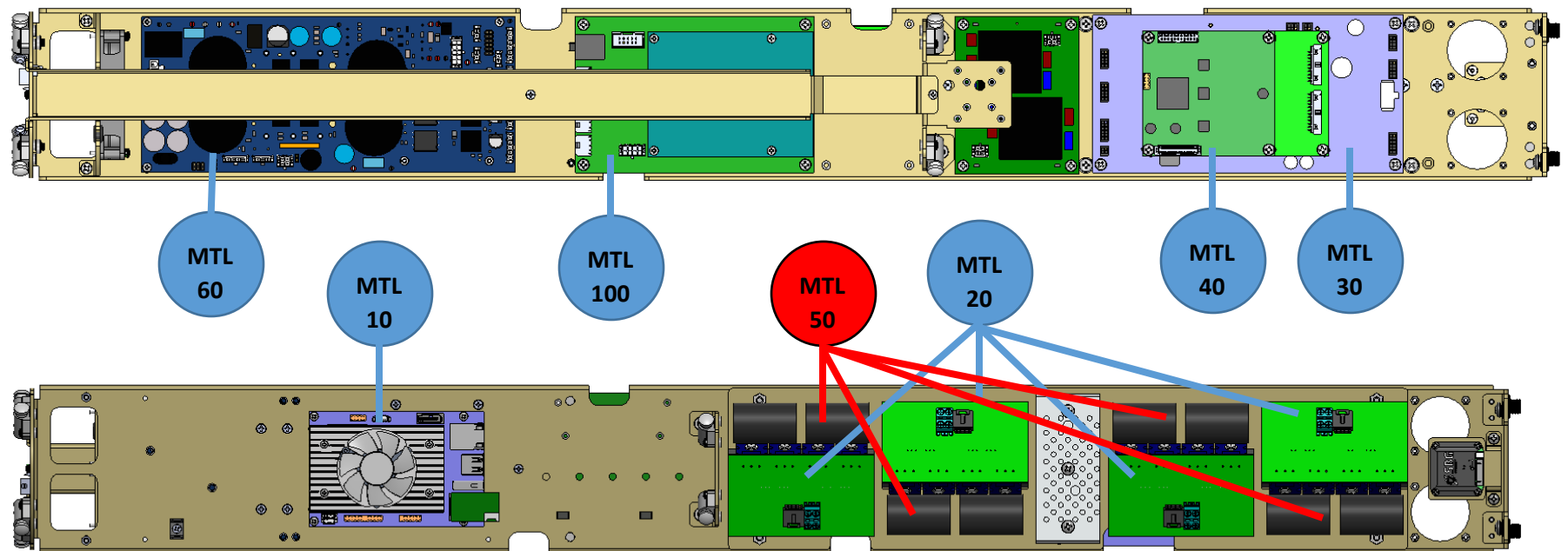Images and BOMs are available on the following pages:



*Figure 7-11: 4205 MPMT Spare Part Drawing*

| 0020596 | | ASSY TOP KIT SPARES 4205 MP 100-400 KHZ TOW FISH | |
|---|---|---|---|
| **MTL** | **Part** | **Description** | **QTY** |
| 10 | 0018349 | ASSY SUB BOARDSET CPU MBT10 E3825 MINI PASSIVE HEATSINK ON GIGABIT USB 3.0 CARRIER | 1 |
| 20 | 0006125 | PCB ASSY POWER AMP ANALOG 4200 LIBERTY ENGINEERING 200-0000040-1000 | 1 |
| 30 | 0021004 | PCB ASSY TOP SIM2XA 4205 120-410 KHZ MP | 1 |
| 40 | 0021101 | PCB ASSY TOP SONAR ACQUISITION INTERFACE BOARD USB AND DUAL LVDS INTERFACE SAIBU 4205 | 1 |
| | | | |
| 50 | 0020326 | ASSY SUB CABLE 4205 CAP BANK LOCAL | 1 |
| 60 | 0021054 | PCB TOP ASSY POWER SUPPLY ANALOG DISTRIBUTION 4205 | 1 |
| 70 | 0020679 | ASSY SUB CABLE 4205 SAIBU TO CPU USB | 1 |
| 80 | 0017144 | MEMORY FLASH GENERIC R-DRIVE IMAGE KONTRON E38XX CPU | 1 |
| 90 | 0020341 | SOFTWARE EDGETECH FOLDER 4205 TOW FISH | 1 |
| 100 | 0021073 | PCB ASSY TOP INTERFACE MESTECH MODEM DSL 4205 | 1 |

*Table 7-6: 4205 MPMT 100-400 kHz Spare Kit*

| 0021218 | | ASSY TOP KIT SPARES 4205 MP 230-850 KHZ TOW FISH | |
|---|---|---|---|
| **MTL** | **Part** | **Description** | **QTY** |
| 10 | 0018349 | ASSY SUB BOARDSET CPU MBT10 E3825 MINI PASSIVE HEATSINK ON GIGABIT USB 3.0 CARRIER | 1 |
| 20 | 0006125 | PCB ASSY POWER AMP ANALOG 4200LIBERTY ENGINEERING 200-0000040-1000" | 1 |
| 30 | 0021217 | PCB ASSY TOP SIM2XA 4205 230-850 KHZ MP | 1 |
| 40 | 0021101 | PCB ASSY TOP SONAR ACQUISITION INTERFACE BOARD USB AND DUAL LVDS INTERFACE SAIBU 4205 | 1 |
| 50 | 0020326 | ASSY SUB CABLE 4205 CAP BANK LOCAL | 1 |
| 60 | 0021054 | PCB TOP ASSY POWER SUPPLY ANALOG DISTRIBUTION 4205 | 1 |
| 70 | 0020679 | ASSY SUB CABLE 4205 SAIBU TO CPU USB | 1 |
| 80 | 0017144 | MEMORY FLASH GENERIC R-DRIVE IMAGE KONTRON E38XX CPU | 1 |
| 90 | 0020341 | SOFTWARE EDGETECH FOLDER 4205 TOW FISH | 1 |
| 100 | 0021073 | PCB ASSY TOP INTERFACE MESTECH MODEM DSL 4205 | 1 |
| 110 | 0006127 | PCB ASSY TOP POWER AMP ANALOG 850 KHZ 4200 VHF | 1 |

*Table 7-7: 4205 MPMT 230-850 kHz Spare Kit*

| 0021509 ASSY TOP KIT SPARES 4205 MP 230-540 KHZ TOW FISH | | | |
|---|---|---|---|
| **MTL** | **Part** | **Description** | **QTY** |
| 10 | 0018349 | ASSY SUB BOARDSET CPU MBT10 E3825 MINI PASSIVE HEATSINK ON GIGABIT USB 3.0 CARRIER | 1 |
| 20 | 0006125 | PCB ASSY POWER AMP ANALOG 4200 LIBERTY ENGINEERING 200-0000040-1000" | 1 |
| 30 | 0021005 | PCB ASSY TOP SIM2XA 4205 230-540 KHZ MP | 1 |
| 40 | 0021101 | PCB ASSY TOP SONAR ACQUISITION INTERFACE BOARD USB AND DUAL LVDS INTERFACE SAIBU 4205 | 1 |
| 50 | 0020326 | ASSY SUB CABLE 4205 CAP BANK LOCAL | 1 |
| 60 | 0021054 | PCB TOP ASSY POWER SUPPLY ANALOG DISTRIBUTION 4205 | 1 |
| 70 | 0020679 | ASSY SUB CABLE 4205 SAIBU TO CPU USB | 1 |
| 80 | 0017144 | MEMORY FLASH GENERIC R-DRIVE IMAGE KONTRON E38XX CPU | 1 |
| 90 | 0020341 | SOFTWARE EDGETECH FOLDER 4205 TOW FISH | 1 |
| 100 | 0021073 | PCB ASSY TOP INTERFACE MESTECH MODEM DSL 4205 | 1 |

*Table 7-8: 4205 MP 230-530 kHz Spare Kit*
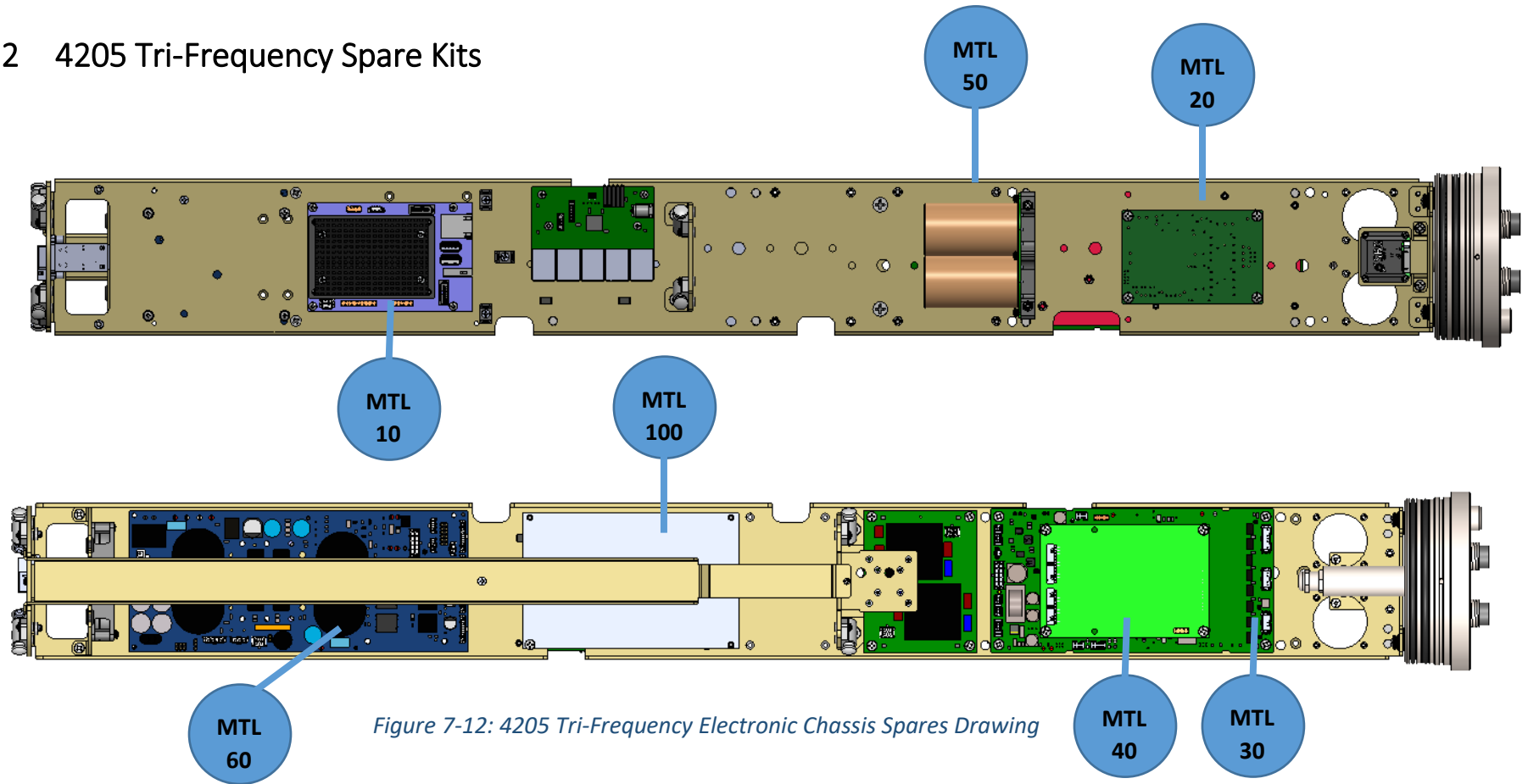
## B.2 4205 Tri-Frequency Spare Kits



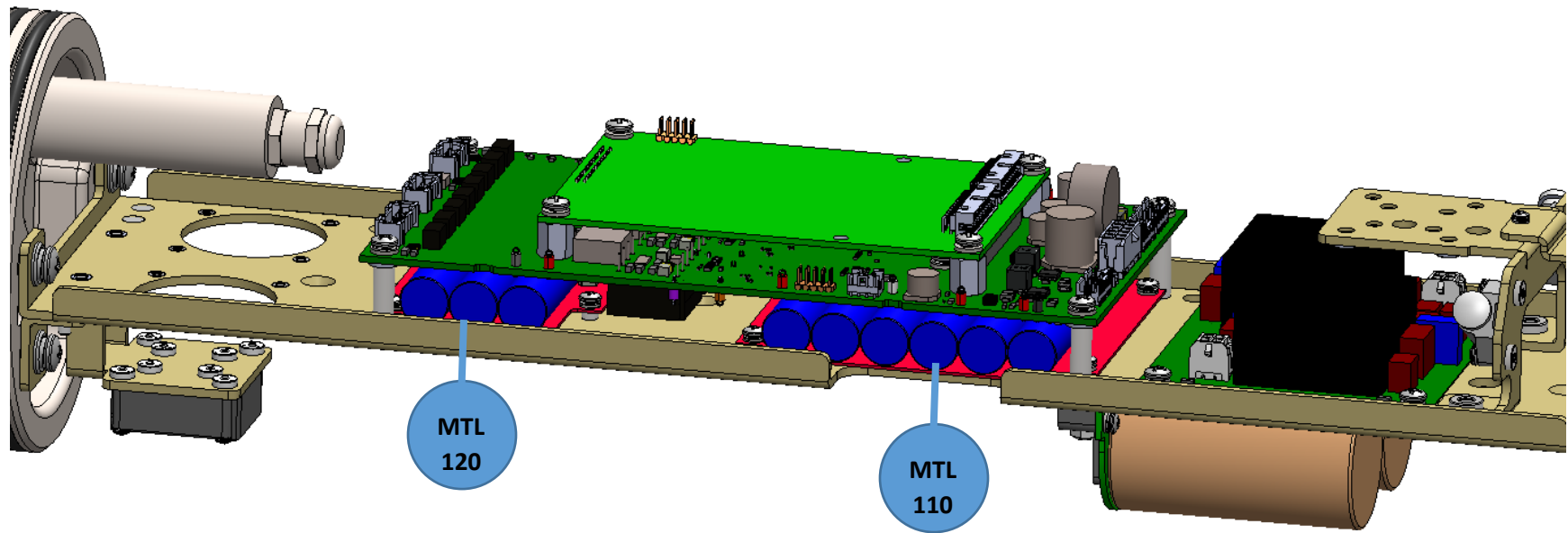*Figure 7-12: 4205 Tri-Frequency Electronic Chassis Spares Drawing*

*Figure 7-13: 4205 Electronic Chassis Tri-Frequency 3-D Drawing*

**0021880 ASSY TOP KIT SPARES 4205 TRIFREQUENCY 120 410 850 KHZ TOW FISH**

| MTL | Part | Description | QTY |
|---|---|---|---|
| 10 | 0018349 | ASSY SUB BOARDSET CPU MBT10 E3825 MINI PASSIVE HEATSINK ON GIGABIT USB 3.0 CARRIER | 1 |
| 20 | 0021843 | PCB ASSY TOP POWER AMP DUAL DIGITAL DDPA 120 KHZ RLJ1669 PASSIVE | 1 |
| 30 | 0021844 | PCB ASSY TOP SONAR INTERFACE MODULE II SIM2 4205 410KHZ - 850KHZ | 1 |
| 40 | 0021101 | PCB ASSY TOP SONAR ACQUISITION INTERFACE BOARD USB AND DUAL LVDS INTERFACE SAIBU 4205 | 1 |
| 50 | 0013139 | PCB ASSY SUB CAPACITOR BANK II AUXILLARY D SHAPE 24000UF 2205 | 1 |
| 60 | 0021054 | PCB TOP ASSY POWER SUPPLY ANALOG DISTRIBUTION 4205 | 1 |
| 70 | 0020679 | ASSY SUB CABLE 4205 SAIBU TO CPU USB | 1 |
| 80 | 0017144 | MEMORY FLASH GENERIC R-DRIVE IMAGE KONTRON E38XX CPU | 1 |
| 90 | 0020341 | SOFTWARE EDGETECH FOLDER 4205 TOW FISH | 1 |
| 100 | 0021073 | PCB ASSY TOP INTERFACE MESTECH MODEM DSL 4205 | 1 |
| 110 | 0012699 | ASSY SUB 2205 STORAGE CAPACITOR 12 SIM 9840UF 63VDC | 1 |
| 120 | 0012536 | ASSY SUB 2205 STORAGE CAPACITOR 06 SIM 4920UF 63VDC | 1 |

*Table 7-9: 4205 Tri-Frequency 120/410/850 Spare Kit*

**0021881 ASSY TOP KIT SPARES 4205 TRIFREQUENCY 120 540 850 KHZ TOW FISH**

| MTL | Part | Description | QTY |
|---|---|---|---|
| 10 | 0018349 | ASSY SUB BOARDSET CPU MBT10 E3825 MINI PASSIVE HEATSINK ON GIGABIT USB 3.0 CARRIER | 1 |
| 20 | 0021843 | PCB ASSY TOP POWER AMP DUAL DIGITAL DDPA 120 KHZ RLJ1669 PASSIVE | 1 |
| 30 | 0021680 | PCB ASSY TOP SONAR INTERFACE MODULE II SIM2 4205 540KHZ - 850KHZ | 1 |
| 40 | 0021101 | PCB ASSY TOP SONAR ACQUISITION INTERFACE BOARD USB AND DUAL LVDS INTERFACE SAIBU 4205 | 1 |
| 50 | 0013139 | PCB ASSY SUB CAPACITOR BANK II AUXILLARY D SHAPE 24000UF 2205 | 1 |
| 60 | 0021054 | PCB TOP ASSY POWER SUPPLY ANALOG DISTRIBUTION 4205 | 1 |
| 70 | 0020679 | ASSY SUB CABLE 4205 SAIBU TO CPU USB | 1 |
| 80 | 0017144 | MEMORY FLASH GENERIC R-DRIVE IMAGE KONTRON E38XX CPU | 1 |
| 90 | 0020341 | SOFTWARE EDGETECH FOLDER 4205 TOW FISH | 1 |
| 100 | 0021073 | PCB ASSY TOP INTERFACE MESTECH MODEM DSL 4205 | 1 |
| 110 | 0012699 | ASSY SUB 2205 STORAGE CAPACITOR 12 SIM 9840UF 63VDC | 1 |
| 120 | 0012536 | ASSY SUB 2205 STORAGE CAPACITOR 06 SIM 4920UF 63VDC | 1 |

*Table 7-10: 4205 Tri-Frequency 120/540/850 Spares Kit*
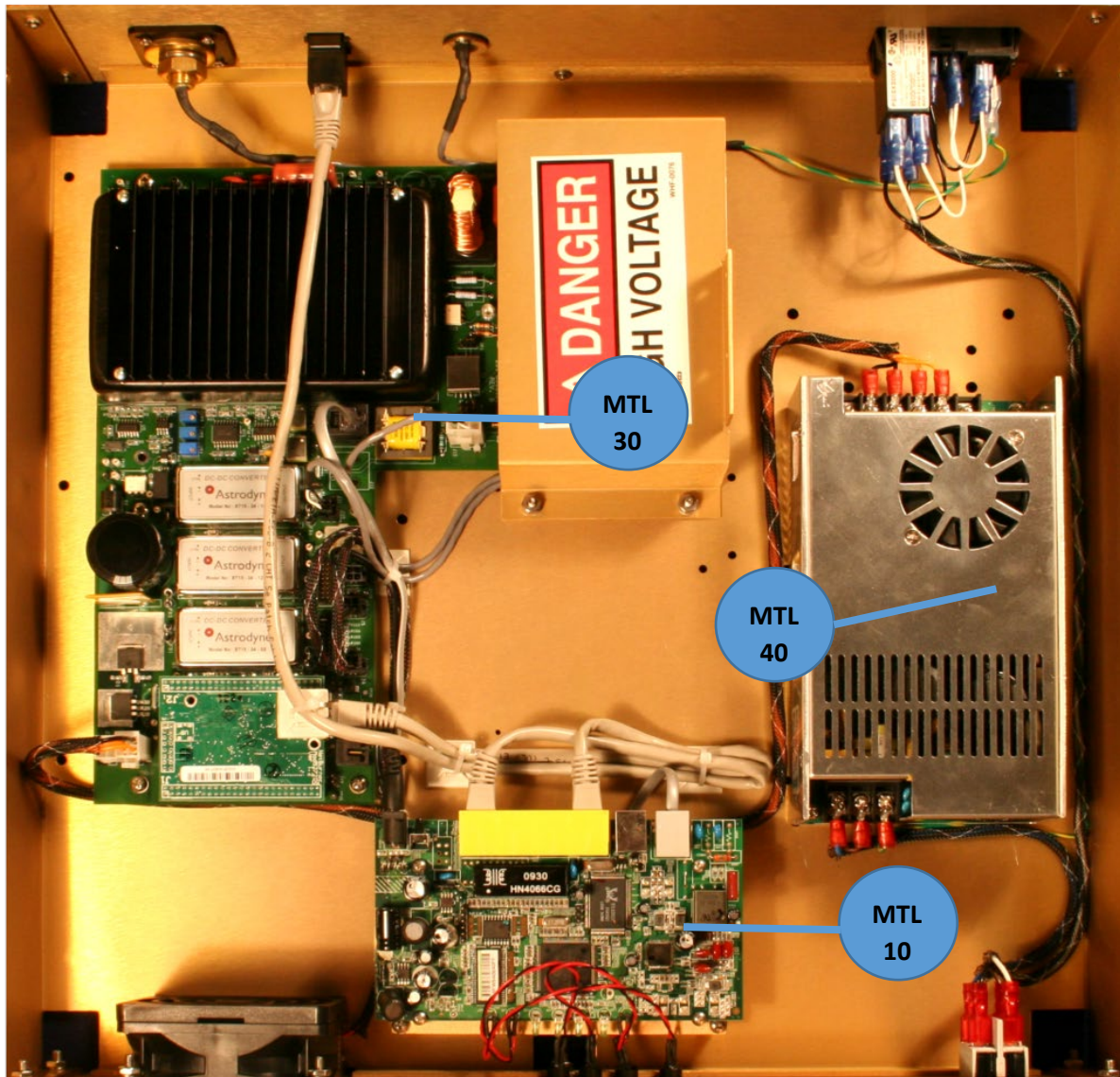
## B.3   701-DL Spare Kit



*Figure 7-14: 701-DL Internal Hardware (Spares)*

| 0003117 | | ASSY SUB 701 DL DIGITAL LINK | |
|---|---|---|---|
| **Part** | **MTL** | **Description** | **Qty** |
| 10 | 0012635 | ASSY SUB MODEM 701 D-LINK DSL | 1 |
| 30 | 0011860 | PCB ASY TOP POWER SUPPLY ANALOG POWER BOARD 4200 P /566 P | 1 |
| 40 | 0006372 | POWER SUPPLY CHASSIS CONVERTER AC-DC 115/230 INPUT 24 OUTPUT | 1 |
| 50 | 0004228 | CORD POWER | 1 |
| 70 | 0003728 | CIRCUIT PROTECT HOLDER FUSE 5X20MM 5A 250V FAST | 5 |

# C.0 TOOL KIT

| 0020480 | | ASSY SUB KIT 4205 HARDWARE/TOOLS | |
|---|---|---|---|
| **Mtl** | **Part** | **Description** | **Qty** |
| 10 | 0005364 | HARDWARE SCREW METRIC MACHINE FLAT HD 82 PHILLIPS M4 0.70MM 10MM 18-8 SS | 2 |
| 20 | 0005367 | HARDWARE SCREW METRIC MACHINE LOW HD SOCKET M5 X 0.80MM HEX 10MM 316 SS | 16 |
| 30 | 0007181 | HARDWARE WASHER METRIC FLAT M5 316 SS | 16 |
| 40 | 0007226 | HARDWARE WASHER METRIC SPLIT LOCK M5 316 SS | 16 |
| 50 | 0005371 | HARDWARE SCREW METRIC MACHINE SOCKET HD 1MM HEX M6 45MM 316 SS | 4 |
| 60 | 0019826 | HARDWARE WASHER METRIC SPLIT LOCK M6 316 SS | 4 |
| 70 | 0007182 | HARDWARE WASHER METRIC FLAT M6 316 SS | 4 |
| 80 | 0020968 | TOOL HEX KEY BALL END T HANDLE 5MM | 1 |
| 90 | 0020969 | TOOL HEX KEY BALL END T HANDLE 4MM | 1 |
| 100 | 0006970 | TOOL SCREWDRIVER PHILLIPS 01 | 1 |
| 110 | 0006968 | TOOL PLIER W/SIDE CUTTERS | 1 |
| 120 | 0019478 | LABEL SHEET WHITE MAILING 04 INCH 1.33 INCH | 1 |
| 130 | 0021213 | DOC TEMPLATE 4205 HARDWARE / TOOLS KIT LABEL SET | 1 |