

MODEL BRT6000 BURNWIRE RELEASE / TRANSPONDER

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.

HARDWARE VARIATIONS AND COMPATIBILITY

The MODEL BRT6000 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 time of delivery. Upgrades will be made available when these features are implemented.

Contact [EdgeTech Customer Service](#) with any questions relating to compatibility.

ABOUT THIS DOCUMENT

We, the employees at EdgeTech, would like to thank you for purchasing BRT6000. 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 to continuously look for ways to 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 the user with information on the setup and use of EdgeTech's BRT6000. Although this manual encompasses the latest operational features of the BRT6000, some features may be periodically upgraded. Therefore, the information in this manual is subject to change and should be used for reference only.

Liability

EdgeTech has made every effort to document the BRT6000 in this manual accurately and completely. However, EdgeTech assumes no liability for errors or for any damages that result from the use of this manual or the equipment it documents. EdgeTech reserves the right to upgrade features of this equipment, and to make changes to this manual, without notice at any time.

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.*

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.

RETURNED MATERIAL AUTHORIZATION

Prior to returning any equipment to EdgeTech, a Returned Material Authorization (RMA) number must be obtained. The RMA will help us identify your equipment when it arrives at our receiving dock and track the equipment while it is at our facility. The material should be shipped to the address provided in the *EdgeTech Customer Service* section. Please refer to the RMA number on all documents and correspondences as well.

All returned materials must be shipped prepaid. Freight collect shipments will not be accepted. EdgeTech will pay freight charges on materials going back to the customer after they have been evaluated and/or repaired.

CAUTION!

If your product is a portable topside, never attempt to fit it 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 if used in this manner.

The following steps apply only to material being returned from outside the Continental United States. Follow them carefully to prevent delays and additional costs.

1. All shipments must be accompanied by three copies of your proforma invoice, showing the value of the material and the reason for its return. If the reason is for repair, it must be clearly stated in order to move through customs quickly and without duties being charged. Whenever possible, please send copies of original export shipping documents with the consignment.
2. If the value of the equipment is over \$1000, the following Shipper's oath must be sent with the invoice. This oath can be typed on the invoice, or on a separate letterhead:

"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 _____

3. If there is more than one item per consignment, a packing list must accompany the shipment. It is acceptable to combine the proforma invoice and packing list as long as the contents of each carton are clearly numbered and identified on the invoice.
4. Small items can be shipped prepaid directly to EdgeTech by FedEx, DHL, UPS, Airborne, etc.
5. If the equipment is the property of EdgeTech (formerly EG&G Marine Instruments Division), please insure for full value.
6. Fax one invoice, packing list, and a copy of the airway bill to EdgeTech upon shipment.

CUSTOMER SERVICE

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

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

E-mail: service@edgetech.com

Mail: 4 Little Brook Road
West Wareham, MA 02576

Telephone: (508) 291-0057

Facsimile: (508) 291-2491

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

For more information please go to www.EdgeTech.com.

COMPANY BACKGROUND

EdgeTech (formerly EG&G Marine Instruments) traces its history in underwater data acquisition and processing back to 1966. EdgeTech has designed, developed and manufactured products, instruments and systems for the acquisition of underwater data, including marine, estuarine, and coastal applications for over 45 years.

The company has responded to the needs of the scientific, Naval, and offshore communities by providing 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 has also consistently anticipated and responded to future needs through an active research and development program. Current efforts are focused on the application of cutting edge CHIRP and acoustic technology.

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SECTION 1: OVERVIEW

This manual describes the EdgeTech Model Burn Wire Release / Transponder. This system utilizes EdgeTech's Binary Acoustic Command System (BACS) and to operate it requires either the Model 8011AT/8011M Acoustic Command/Ranging Transceiver or the Model AMD200 Deck unit. The BRT6000 can be used to release oceanographic moorings and bottom frames or can be used for long baseline transponder navigation. In addition to these typical applications there are a number of specialized uses for these systems, such as controlling the opening and closing valves in underwater systems and as emergency recovery systems.

The Binary Acoustic Command System (BACS) provides 12,000 possible command codes. The releases have an enable/disable command for controlling the transponder function as a standard feature. When disabled the transponder will not reply when interrogated. The Release commands will cause the BRT6000 to apply a voltage to the appropriate burn wire output pins on the bulkhead connector. The release commands can be sent and will cause a release whether the system is enabled or disabled. The enable and disable function only controls the transponder section.

SECTION 2: SPECIFICATIONS

2.1 Mechanical

Mechanical specifications for the BRT6000 are as follows:

Depth Rating (working):	19,600 ft. (6,000 m.)
Housing O.D.:	4.960 in. (12.60 cm.)
Housing I. D.:	24.5 in. (62.23 cm.)
Overall Length:	18.0 in. (45.72 cm.)
Housing Length:	7075 Aluminum Hard Anodized

2.2 Commands

Command specifications for the unit are as follows:

Sensitivity:	80 dB re 1 uPa
SNR:	> or = 36 dB re root Hz
Receiver type:	Hard-limited (2000 Hz/330 Hz Bandwidths)
Coding:	General to 8000 series – Binary FSK
<i>Allowed Tone Pairs:</i>	Six

PAIR NO	"0"	"1"
1	9.5 kHz	9.9 kHz
2	9.5	10.3
3	9.5	10.7
4	9.9	10.3
5	9.9	10.7
6	10.3	10.7

<i>Structure:</i>	Two successive 8 bit words with a 5 sec. interval between them. Each word comprised of 8 bits from a 16 bit command. The 16 bit command is a 15, 11 block cyclic code with an overall parity bit appended to the end to form a 16, 11 code with a minimum Hamming distance of 4 bits. Additionally, two transitions are required within each word, and no repetitions of words are allowed in a command.
<i>Pulse Width:</i>	22 mSec.
<i>Period:</i>	250 mSec.
<i>Total Command Time:</i>	9 Sec.
<i>Total Lockout Time:</i>	14 Sec. re Beginning
<i>Total Command Capacity per Tone Pair:</i>	2000 or 12000 commands for six tone pairs
<i>Standard Functions:</i>	Release 1, Release 2, Disable Transponder, Enable Transponder, Option 1 (aborts both release 1 & 2)

2.3 Transponder

Transponder specifications for the BRT6000 are listed below:

Sensitivity:	- 80 dB re 1 uPa.
SNR:	> or = 44 dB re root Hz for jitter < +/- 0.5 mSec. (3 Sigman). Jitter = +/- 0.1 mSec. for noise-free field.
Interrogate Frequency:	9 or 11 kHz (Standard)
Post-Filter Bandwidth:	330 Hz.
Minimum Interrogate Pulse Width:	5 mSec.
Reply Frequency:	Default 12 kHz (switch selectable)
Reply Source Level:	190 dB re 1 uPa. @ m.
Reply Pulse Width:	10 mSec standard
Turnaround Time Delay:	12.5 mSec Standard
Lockout Time:	1.0 Sec

2.4 Environmental

The environmental specifications for the unit are:

Temperature:

-10 deg. C to +40 deg. C (operating)

-20 deg. C to +85 deg. C (storage)

SECTION 3: SETUP AND ACTIVATION

This section contains the information relative to the basic set up and operation of the Model BRT6000 Burn Wire Release Transponder. The user is referred to the specific information sheet that shipped with the unit, for details of his specific equipment. This sheet includes commands, and transponder frequencies for the particular release.

3.1 Housing and Release Preparation and Care

Access to any portion of the electronics or mechanical assemblies is achieved simply by removing the two Kynar closure rods which hold in the end caps. To remove the rods simply grasp either end of the rod and slide the rod out.



Figure 3-1: End Cap

The internal pressure of the unit is not atmospheric. The BRT6000 systems are shipped with 12PSIA (-3PSIG) of dry nitrogen. This reduces moisture in the housing and helps to seat the O-rings. Equalization of pressure by removal of the purge port plug will be necessary to gain entry into the instrument.

WARNING!

If the underwater unit has been deployed, there is the possibility of leakage and internal pressurization of the housing. If the housing is pressurized, be sure to exercise extreme caution when relieving the pressure. The resulting violent motion of some parts can result in serious personal injury.

3.1.1 Disassembly

Equalize pressure by removing the purge port plug. Remove the Kynar retaining rods. By using the groove in the transducer end cap to hold on to carefully pull the transducer end cap out of the housing. If necessary a rubber coated tool can be used in the notch to pry the end cap up slightly.



Figure 3-2: Closure rod gland, rod removed

Disable the power supply by disconnecting the connector from the battery pack to the main board. Then disconnect the transducer cable.

NOTE: *The cable from the electronics to the transducer is short (12 inches (30 cm.) or less). To prevent parting the cable, always remove the top (transducer) end cap first, and disconnect the transducer from the electronics.*

WARNING!

High voltage is present at this connector when the unit transmits reply bursts.

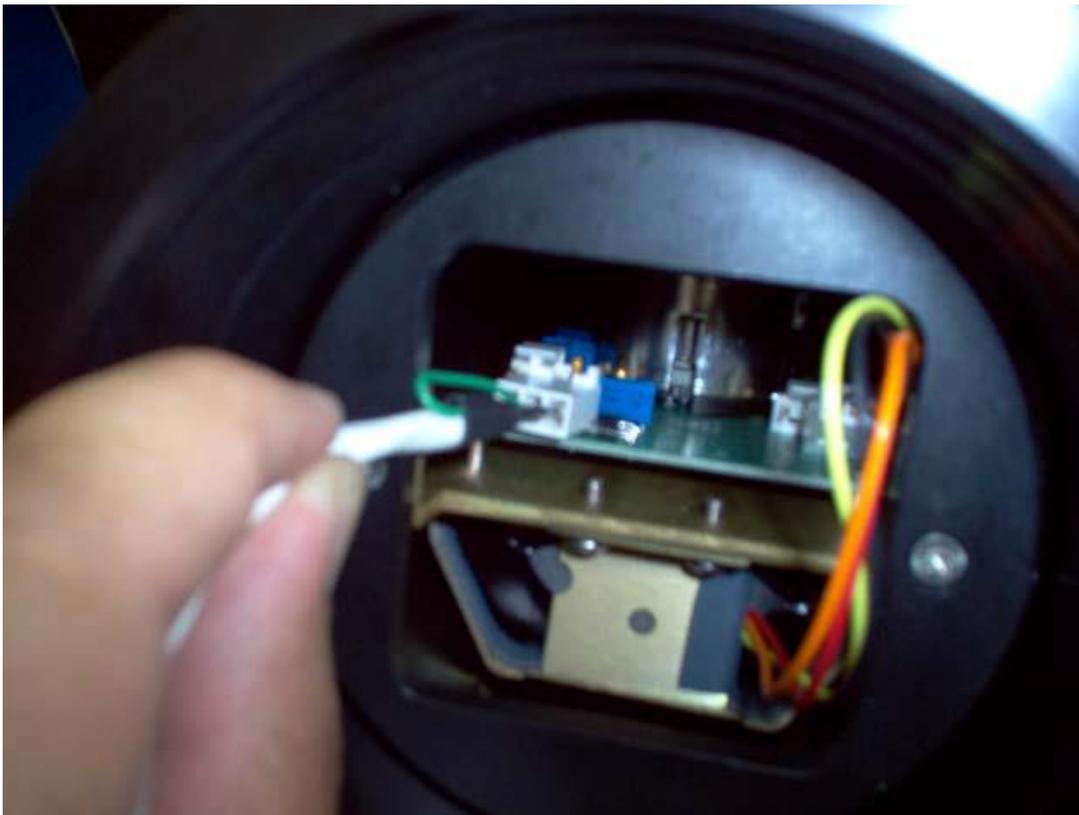


Figure 3-3: Disconnecting Power

Carefully slide the electronics assembly out of the housing by pulling on the other end cap. Take care not to scratch the O-ring surfaces. See [Figure 3-1](#).

CAUTION!

The ends and bore of the housing are O-ring seating surfaces. They must be protected while the unit is disassembled. Any scratches will impair the performance of the O-rings and may result in leaks.

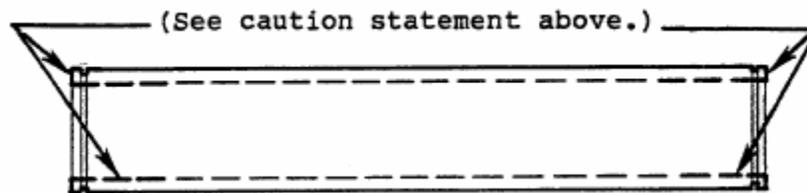


Figure 3-4: Housing O-ring surfaces, see caution statement

3.1.2 Assembly

Prepare the sealing surfaces for assembly by cleaning with a lint-free towel or swab, moistened if needed with alcohol. Inspect for scratches or nicks which will impair the O-ring efficiency. Apply a Very light coat of O-ring lubricant (i.e., Dow Corning 4 Compound) to the piston surface (inside housing where the O-ring makes contact) to aid sliding insertion of the piston seal. Inspect the O-rings for damage or manufacturing flaws such as tears, dimples or inclusions in the rubber. Lightly coat the O-rings with O-ring lubricant. Protect O-rings when stretching them over large diameters (i.e., cover diameter. with plastic sleeve).

Slip the electronics into the housing. After the electronics is in the housing and before the transducer end cap is inserted, connect the transducer cable and then the battery.

CAUTION!

Do not pinch or damage wires when inserting assembly into the housing. There are large diameter plates in the electronics assembly which will not allow clearance for cables or connectors.

Slip the electronics into the housing. After the electronics is in the housing and before the transducer end cap is inserted, connect the transducer cable and then the battery.

CAUTION!

Do not pinch or damage wires when inserting assembly into the housing. There are large diameter plates in the electronics assembly which will not allow clearance for cables or connectors.

Carefully press the piston seal into the housing. The backup O-ring is properly aligned if it enters the housing before the O-ring while the curved side of the backup ring faces the O-ring.

The end cap is secured to the housing by gently inserting the Polyethylene retaining rods into the grooves designed for them. Slide the rod all the way through until it protrudes from the other end of the groove.

Observe the same O-ring preparation procedures for the transducer end cap as for the electronics end cap. Connect the transducer lead then connect the battery pack connector to the main board before inserting the end cap. Use the same procedure to install the retaining rod.

If the user elects to perform an air acoustic test, it should be performed at this point, before purging. It is advisable to perform an air acoustic test before purging.

CAUTION!

Do not exceed -5 PSIG while purging the housing. An excess vacuum can damage batteries.

3.2 Leak Detection and Condensation Prevention

EdgeTech's BRT6000 systems are provided with a 5/16-inch diameter purging port in the bottom end cap. The recommended procedure for preparation of the instrument atmosphere is as follows:

After checking that all other ports are sealed, draw a near 12 PSIA (-3 PSIG) vacuum via the purging port. Verify with a gauge that the release holds the vacuum. Backfill with dry nitrogen then draw a near 12 PSIA (-3 PSIG) vacuum. Quickly insert the purging plug before the -3 PSIG vacuum is lost. If the environment where the release was assembled was very humid then repeat the purging procedure 2 to 4 times before replacing the plug, to remove all moisture.

NOTE: *It is essential that the aluminum housing material be isolated from any dissimilar metal that it may be mounted to.*

SECTION 4: FUNCTIONS & TESTS

This section describes how to use the unit's release and status reply functions, as well as how to perform acoustic air testing.

4.1 Release Function

When the appropriate command is decoded the system will apply the power from the battery stack to the correct pin for that command. Release command 1 applies voltage to pin 2 of the end cap connector. Release command 2 applies voltage to pin 3 of the end cap connector. Pin 1 of the end cap connector is ground.

4.2 Acoustic Air Tests

Always perform an air acoustic test of the commands and interrogate the instrument after assembling to assure proper working order. Every time the instrument is powered up, prior to deployment it is recommended that a complete air acoustic test be performed. Place the speaker or transducer about 6 to 12 inches from the underwater unit transducer when sending commands. The position of the transducers relative to one another may need to be adjusted to allow commands to get through in air. Ranges will not be accurate in air; these systems are designed to operate in water. The speed of sound in air can cause errors in command decoding and prevents accurate ranging however the systems can be tested in air. Test all functions of the system by sending each command and verifying that the state changes according to the command including status reply.

4.3 Status Reply

Upon receiving a valid command the instrument will return a series of pings which are an indication of the status of the tilt sense switch. The tilt switch is considered horizontal or "upright" when the housing is lying in a horizontal position with the end cap connector in the 6 O'clock location (down). The 2 possible status replies are:

- Upright: 15 pings at a 1 second rate.
- Tilted: 7 pings at a 1 second rate.

SECTION 5: REPLACEMENT PARTS

The following sub-sections explain some of the part replacement procedures and considerations for the unit.

5.1 Battery Replacement

These releases are high performance instruments and it is presumed that they are employed to recover high value oceanographic instruments and data. For this reason extreme care must be exercised in choosing replacement batteries. EdgeTech makes considerable effort to test various batteries and to provide control of the manufacture of replacement batteries for its equipment. The user should exercise extreme care in selecting replacement battery packs. The particular manufacturer's cell discharge characteristics and repeatability should be known.

The date of manufacture and the history of shipping and storage should be known if not controlled; batteries should not be used if the use by date has passed. Cleanliness and careful inspection techniques should be employed when assembling the batteries into welded packs. Careful attention should be paid to purging the housing so as not to leave air or moisture inside before storage or deployment.

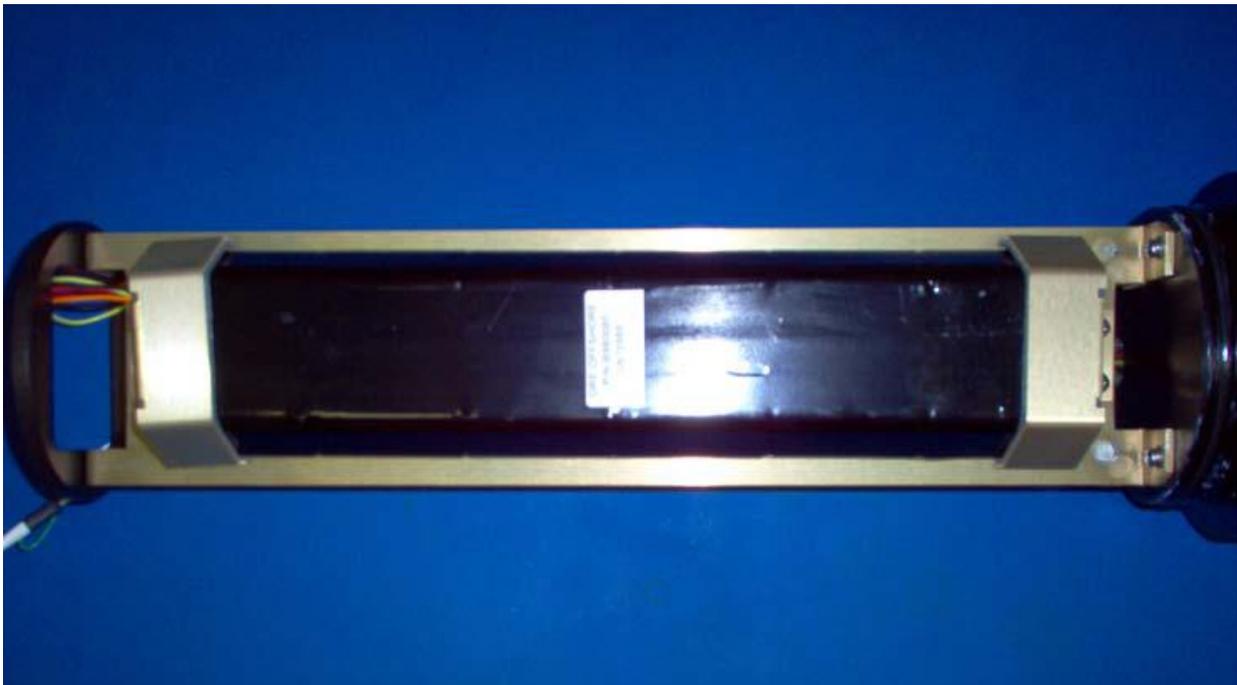


Figure 5-1: Replacing the Battery

5.1.1 Battery Replacement Procedure

To replace the battery, remove the electronics chassis from the housing according to the disassembly procedure. Make sure that the battery connector is disconnected from the board and remove the brackets which hold the battery pack to the aluminum plate.

Discard the old battery. Install the new battery and replace the brackets which hold it in. Route the battery connection in such a way that it will not be crushed when assembling the electronics in to the housing. After replacing the batteries, the user is advised to perform an air acoustic check of the release. Assemble the electronic chassis in the release housing.

It is recommended that a Tie Wrap be added around the middle of the battery pack to help support it when the system is on its side. The tie wrap should go around the battery pack and the aluminum plate but not around the board. The tie wrap should be placed so that it goes around the battery pack where it will be on the internal cells not at a joint between them.

5.2 Anode Replacement

The Zinc anode which is mounted on the end cap of the system is there to protect the aluminum housing and end caps from corrosion. It is important to replace this anode after each long term deployment or after a significant size reduction when used for short term deployments. Be sure to include the plastic washer and grease the stud when installing the anode.

NOTE: For questions about replacement parts or other inquiries about the system, contact [EdgeTech Customer Service](#).