REVISION HISTORY

Revision Level	Effective Date	Initiator	ECO Number
A	2/1/2012	J.Villegas	ECO-002939
B	2/8/2013	J.Villegas	ECO-002957

Section Number	Description and Justification of Changes
ALL	Release to Production
7.43, 7.44, 7.45	Updated photo with correct bracket orientation. Added section for applying self-fusing tape as a chafe guard. Added towbracket mounting screws to loose part list.

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1 PURPOSE

This document provides detailed work instructions on how to assemble the ADDOSS Towbody (PN 03153) which consists of the Empty Gateway Towbody (PN 03877) and Electronics Assembly PN 03899.

2 SCOPE

This procedure applies to the ADDOSS Gateway Towbody assembly manufactured at Liquid Robotics headquarters.

3 RESPONSIBILITIES

It is the manufacturing technician's responsibility to assemble the towbody as outlined in this document.

4 REFERENCES

- 03153 Assembly Drawing for ADDOSS Towbody
- 03877 Assembly Drawing for GATEWAY TOWBODY, EMPTY
- 03899 ASSM, ADDOSS ELECTRONICS
- 03675 WIRING DIAGRAM for MICROMODEM TOWBODY
- 03524 Cable Drawing for Towbody Micromodem Input
- 03667 Cable Drawing for Towbody Micromodem Output
- 03897 ASSY, ADDOSS TOWCABLE, COMPLIANT W/ SPLIT FLOATS AND WEIGHTS
- 01147 Paint specification, Hard Black

5 REQUIRED MATERIALS AND EQUIPMENT

- Torque driver with setting for up to 60 in-lbs
- Assorted metric bits for torque driver (Phillips, hex)
- 11/16" hex socket for 7/16-20 nut
- 7/16" Wrench or Socket
- Power Driver with M5 Insert bit (M5 screw w/2 nuts) for titanium inserts
- Super Glue Loctite 414 (PN 02632)
- 3M DP460 Scotch-weld Adhesive (PN 00958)
- Isopropyl alcohol
- Teflon Thread Sealing Tape (PN 01433)
- Silicone Grease Dow Corning 111 (PN 01379)
- Super-Glue 414 Loctite (PN 02632)
- Thread-locking compound 243 Loctite (PN 01434)
- Silicone Spray (PN 01857)

6 SAFETY REQUIREMENTS

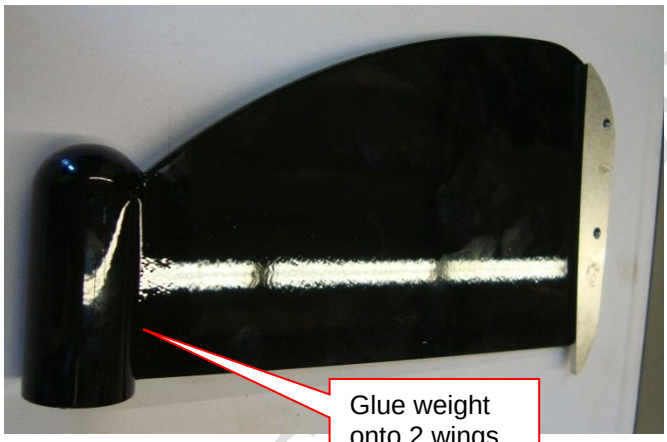
Electrostatic sensitive devices installed on the PCBA. Handle with care

7 PROCEDURE

7.1 Pre-Paint Operations

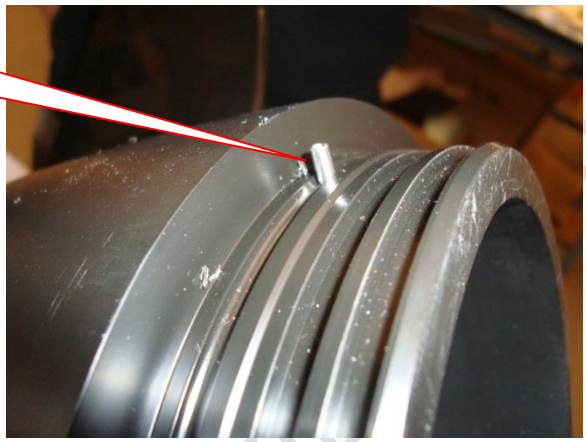
7.1.1 Roughen bonding surfaces and then apply 3M DP460 Adhesive (PN 00958) into the groove of (2X) Tail Weight (PN 03168) and then attach the weight onto the end of (2X) Wings (PN 03138). Wipe excess and allow to cure.

7.1.2 For each towbody being assembled, send the (2X) Wings and (2X) Weighted Wings out to paint in Hard Black per Spec 01147. Mask threaded holes on the end of the brass weights prior to paint.



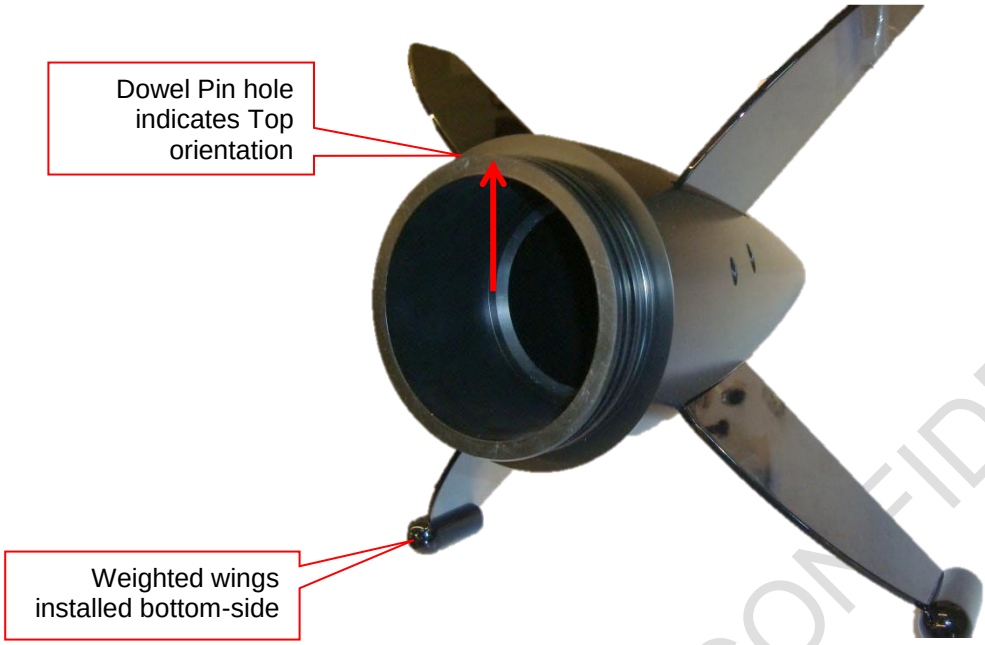
7.1.3 Bond (4X) M5X15X1mm Flat Fender SS Washers (PN 02552-05) on the underside of the Transducer Section Lid (PN 03170) at the locations shown using 3M DP460 Adhesive. Wipe excess and allow to cure. If washers are added pre-paint, mask holes prior to paint. Send out to paint topside in Hard Black per Spec 01147

7.2 On the tail section cone (PN 03137, insert M3X10 SS Dowel Pin (PN 02526-03-010) into the dowel pin hole. Note: If needed, clean dowel pin hole with a 3mm drill bit, but DO NOT BREAK TRHU.

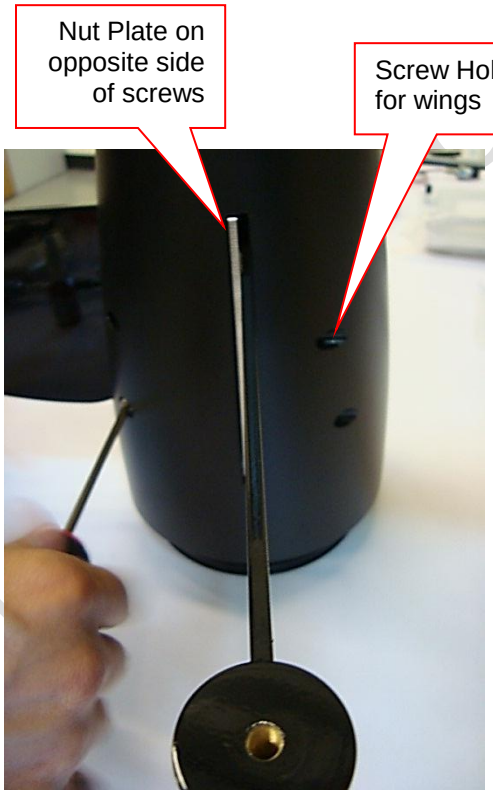


7.3 Apply a small amount of Super Glue Loctite 414 (PN 02632) to tack on the (4X) Fin Nut Plate (PN 02875) onto the right side of each wing to align the holes on each part. This operation allows for ease of assembly, and is not required or meant to not be a completely permanent bond.

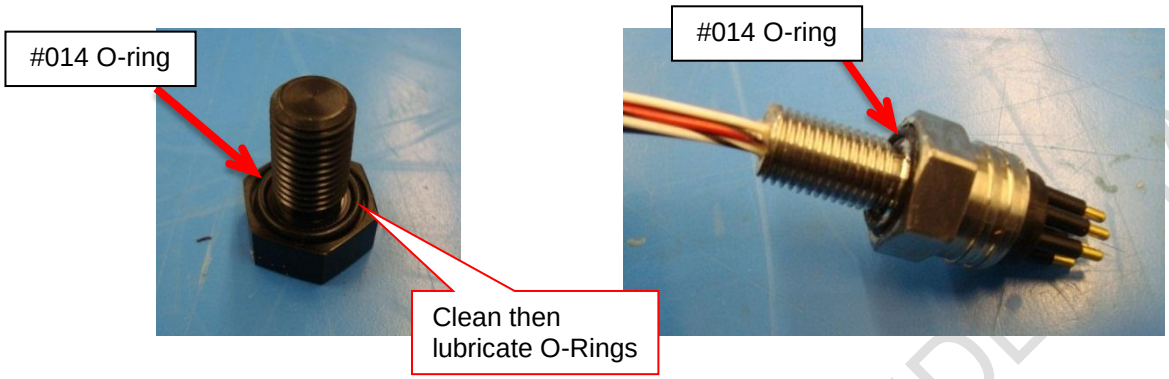
7.4 The following orientation represents the location of each type of fin.



7.5 Insert each wing into the appropriate slot with the nut plate on the opposite side of the screw holes and fasten with (8X, 2 each) SHCS M5x16 SS Screw (PN 02517-05-016). Apply Loctite 243 prior to installation and torque to 30 in-lbs.



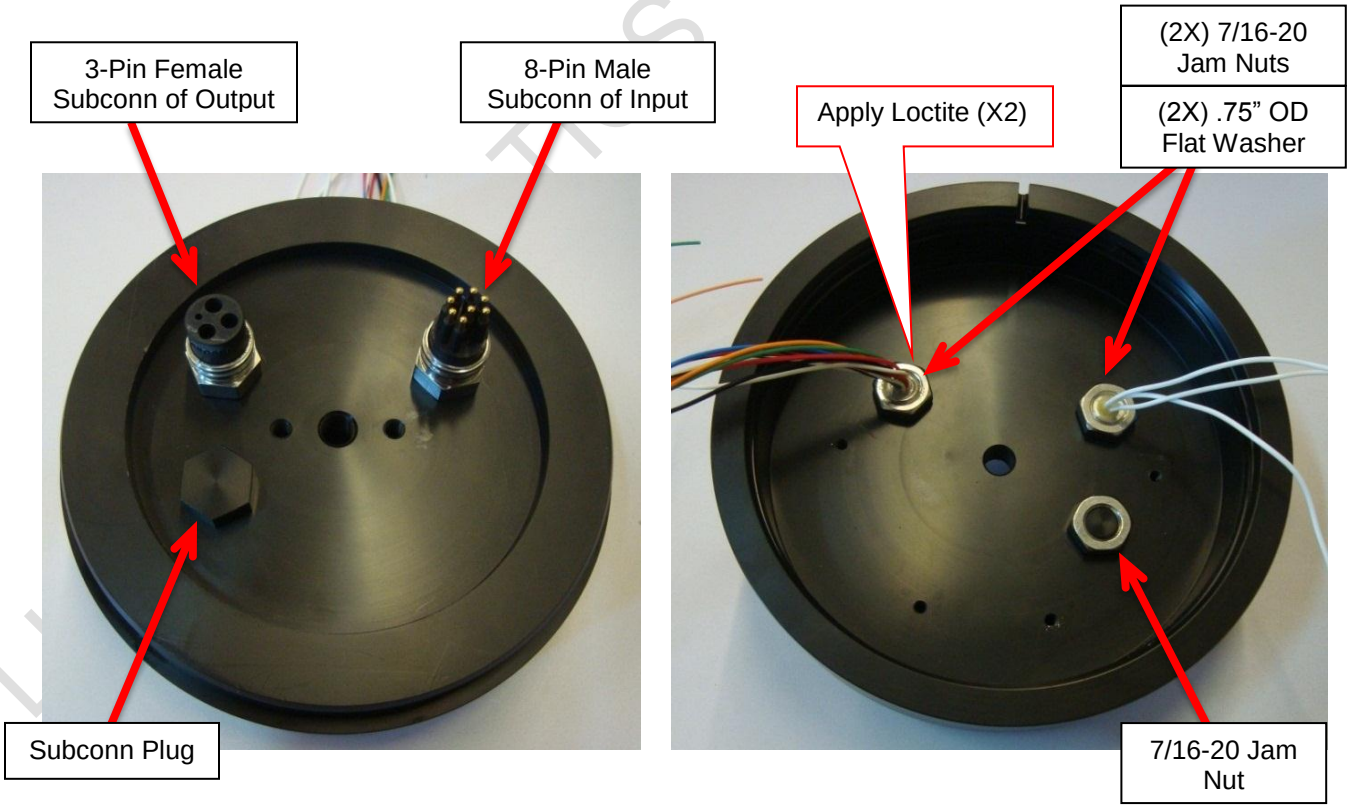
7.6 Clean (3X) #014 O-Rings (PN 02522-014) and mating surfaces of Subconn Plug (PN 01250), 3-Pin Female Subconn of Micromodem Output Cable (PN 03667), and 8-Pin Male Subconn of Micromodem Input Cable (PN 03524) with isopropyl alcohol and then lubricate O-Rings with Dow Corning 111 (PN 01379).



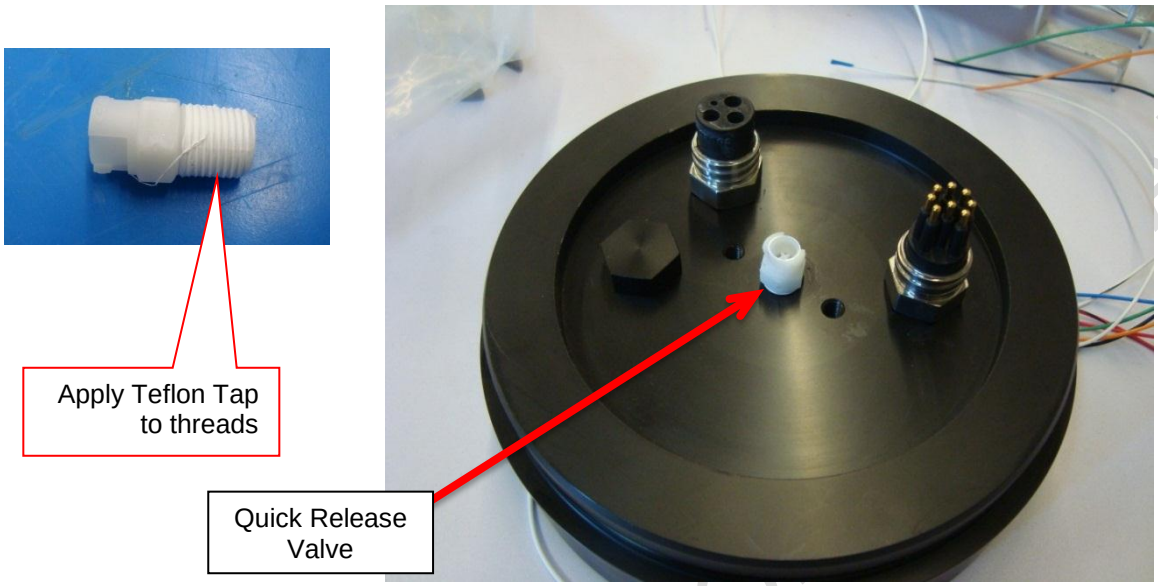
7.7 Install the Subconn Plug and the two Cable Assemblies with O-Rings into the Tail Section Bulkhead (PN 03134) in the locations shown below.

7.8 Fasten the Subconn Plug in place using (1X) 7/16-20 Jam Nut (PN 02580). Torque to 36 in-lbs.

7.9 Fasten the Cable Assembly bulkhead connectors in place using (2X) 75" OD Flat Washers (PN 02581) and (2X) 7/16-20 Jam Nuts (PN 02580). Apply Loctite 243 (PN 01434) prior to installation and torque to 36 in-lbs.

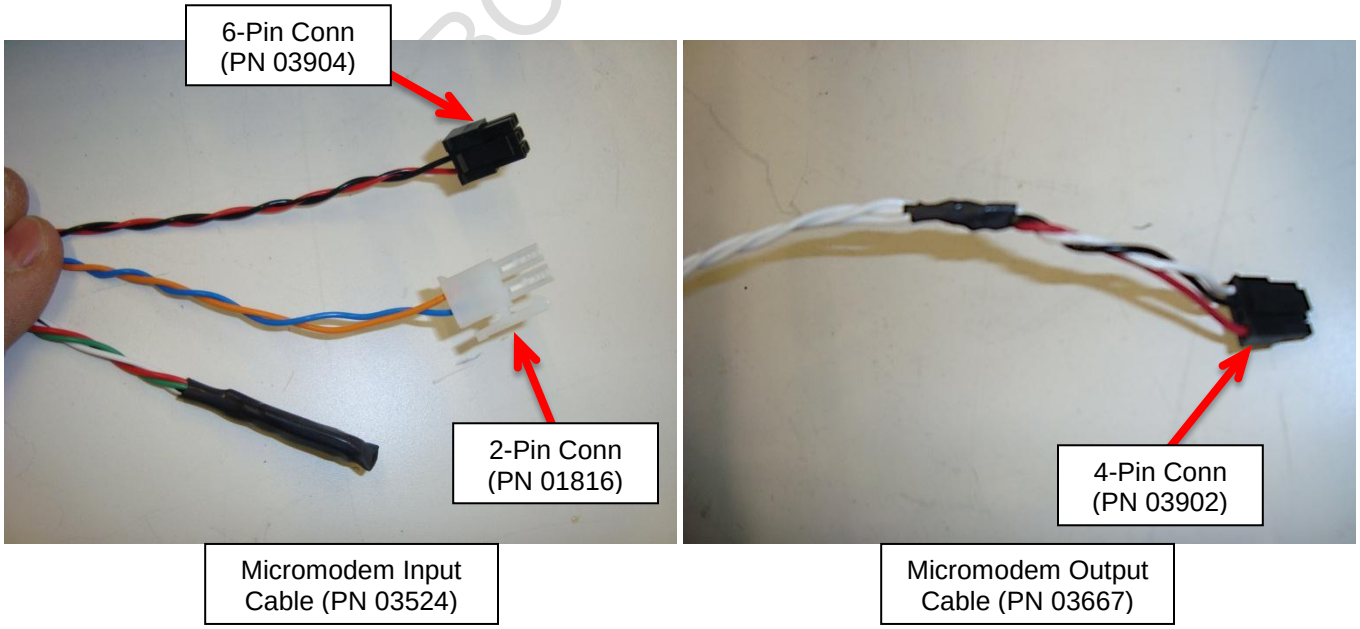


7.10 Apply 2 to 3 wraps of Teflon Tape (PN 01433) to the threads of the Quick Release Valve (PN 00855) and install it into the tail section bulkhead. Torque until near flush.

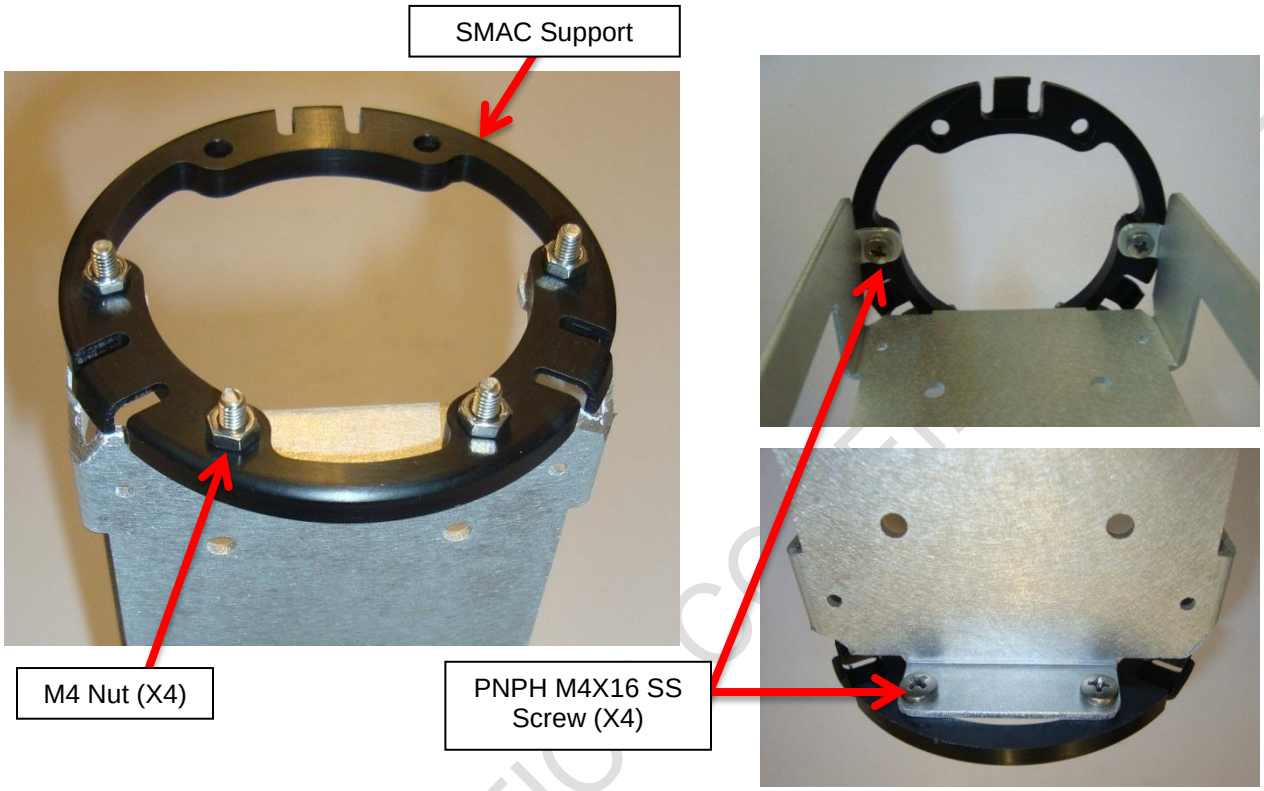


7.11 Referring to the cable drawing of each part, add the following connectors to the Tail Section Bulkhead cable assemblies as required. Verify the required wire twisting and pin-outs are as per the drawings.

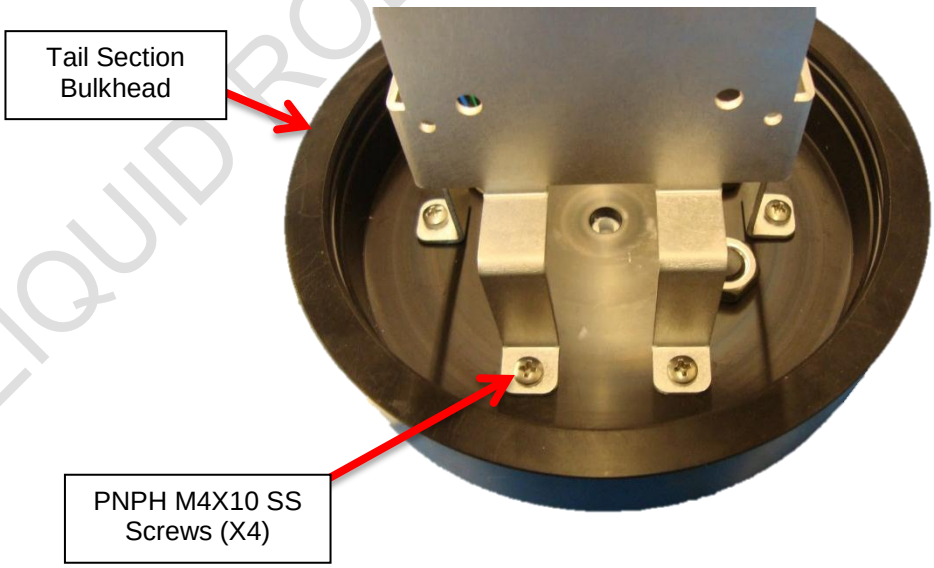
- On the Micromodem Input Cable (PN 03524), attach 6-pin connector (PN 03904) to JP2 wires and attach 2-pin connector (PN 01816) to the J2 wires.
- On the Micromodem Output Cable (PN 03667), attach 4-pin latch connector (PN 03902).



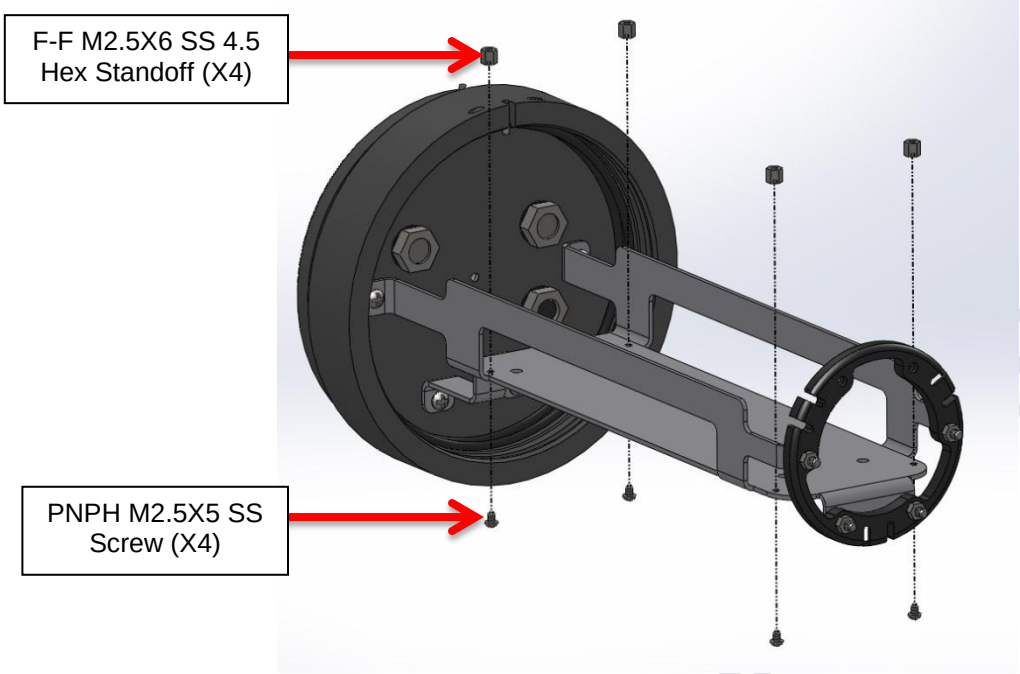
7.12 Install SMAC Support (PN 01243) onto the end of the Electronics Chassis (PN 03231) using (4X) PNPH M4X16 SS Screws (PN 02516-04-016) installed from the inside of the chassis and (4X) M4 nuts (PN 02587-04) on the outside of the bracket. Torque to 8 in-lbs.



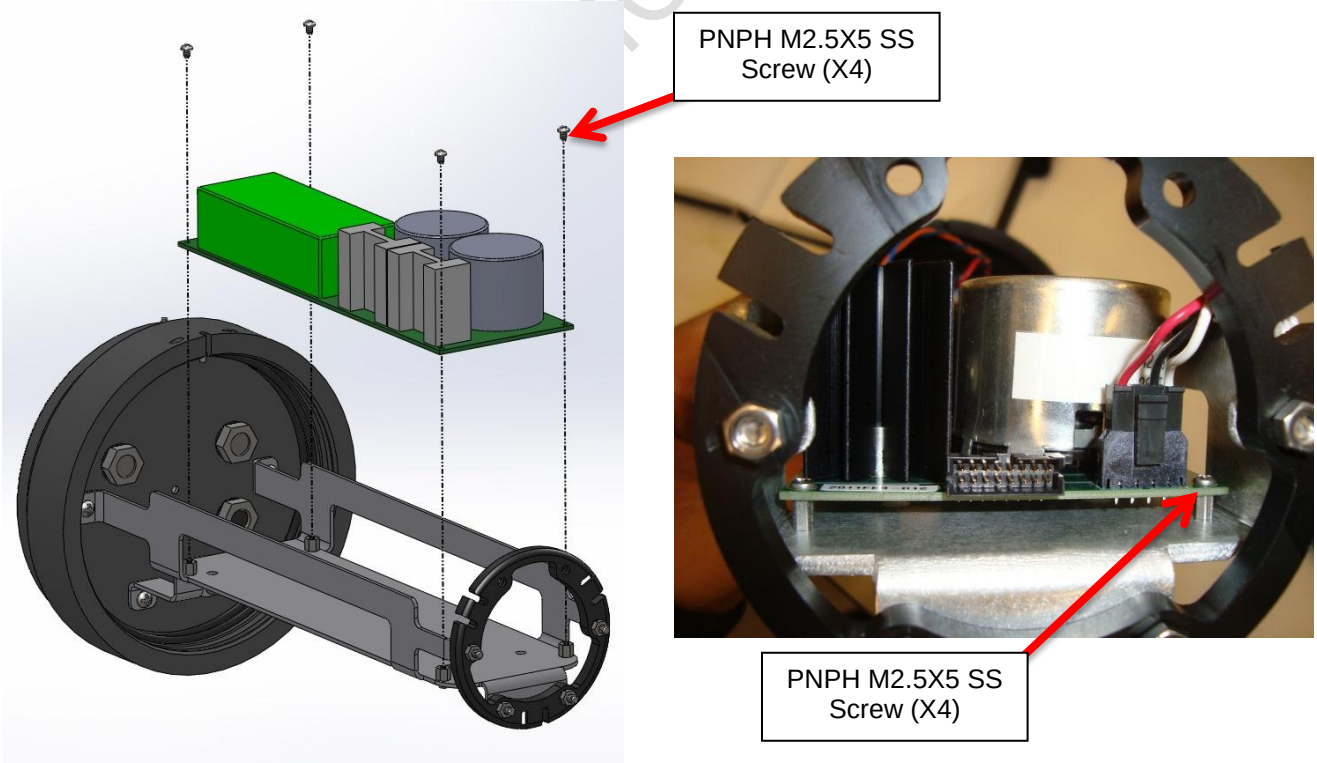
7.13 Attach the front end of the electronics chassis to the tail section bulkhead using (4X) PNPH M4X10 SS Screws (PN 02516-04-010). Torque to 8 in-lbs.



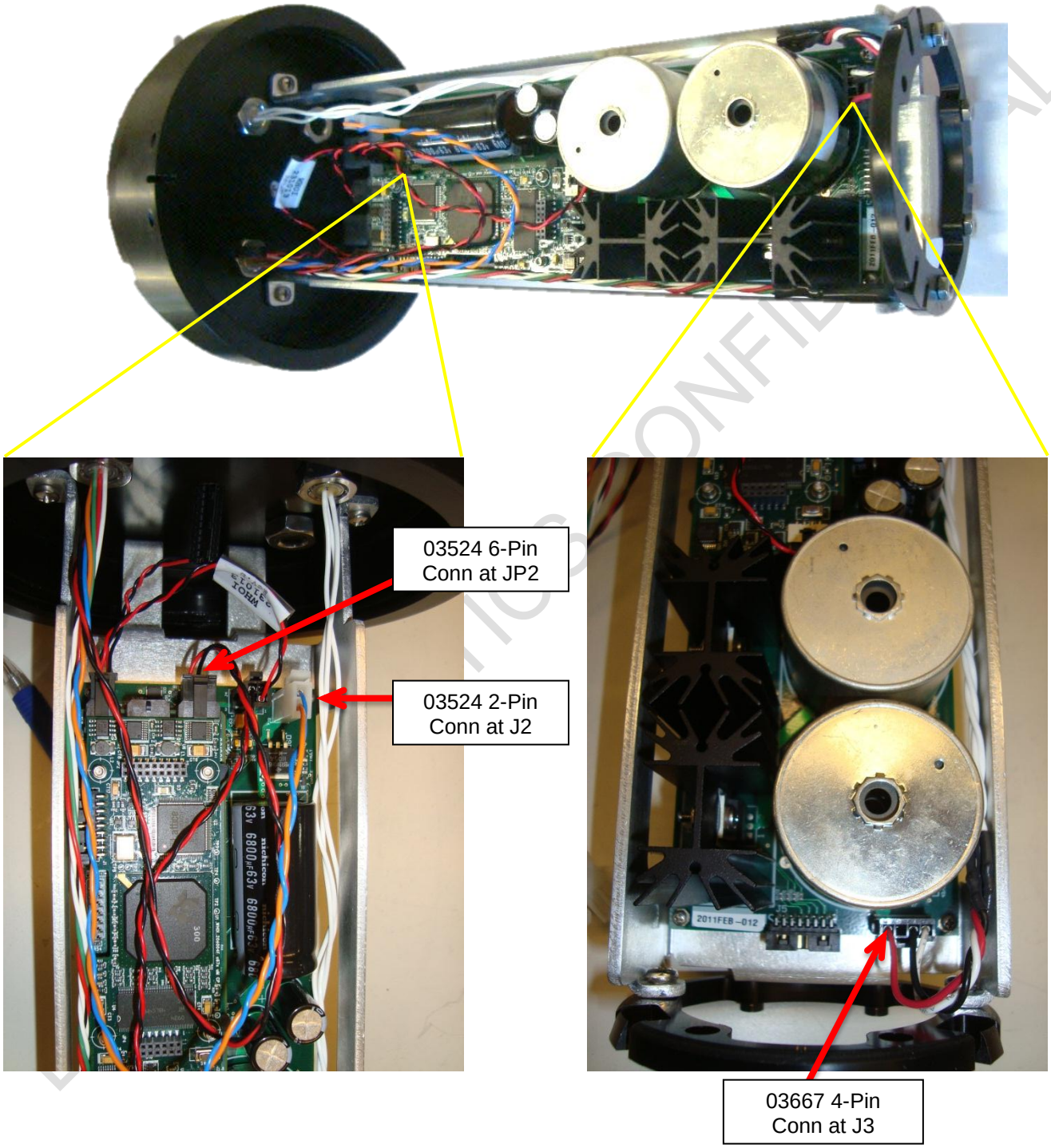
7.14 Install (4X) F-F M2.5X6 SS 4.5 Hex Standoffs (PN 04334-06) using (4X) PNPH M2.5X5 SS Screw (PN 02712). Apply Loctite 243 and torque to 6 in-lbs.



7.15 Install WHOI Modem (PN 03142) onto the chassis using (4X) PNPH M2.5X5 SS Screw (PN 02712). Apply Loctite 243 prior to installation and torque to 6 in-lbs.



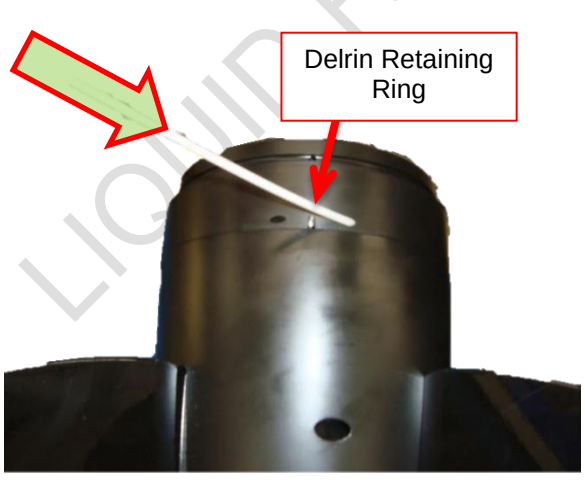
7.16 Referring to Wire Diagram PN 03675, connect bulkhead cables to the WHOI. Route any loose wires neatly within the chassis.

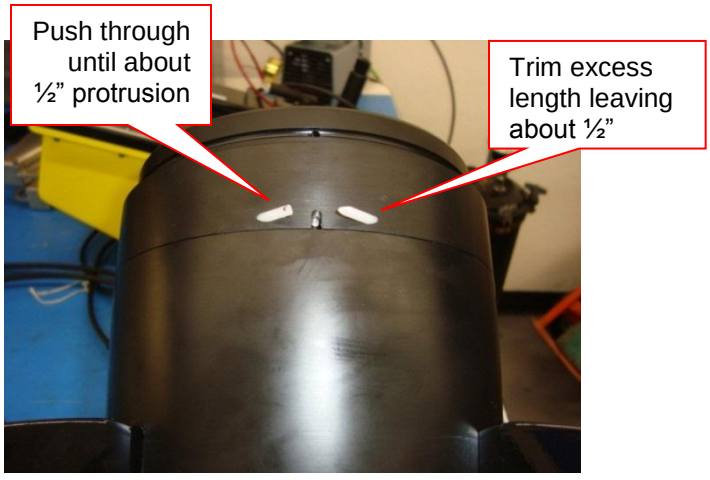


7.17 Install (2X) #253 O-Ring (02522-253) onto the tail section cone. Clean mating surfaces and O-rings with isopropyl alcohol then lubricate with Dow Corning 111 prior to installation.

7.18 Insert the electronics chassis assembly into the tail section cone with the slot on the bulkhead aligned with the dowel pin on the tail cone. Close tightly together. To ensure fitment, apply a vacuum pressure within the vessel and then press the items together.

7.19 Insert Delrin Retaining Ring (PN 02818) into the bulkhead and push through until it protrudes from the exit hole to seal the two sections together. Cut off excess material leaving at least ½ inch on each end.

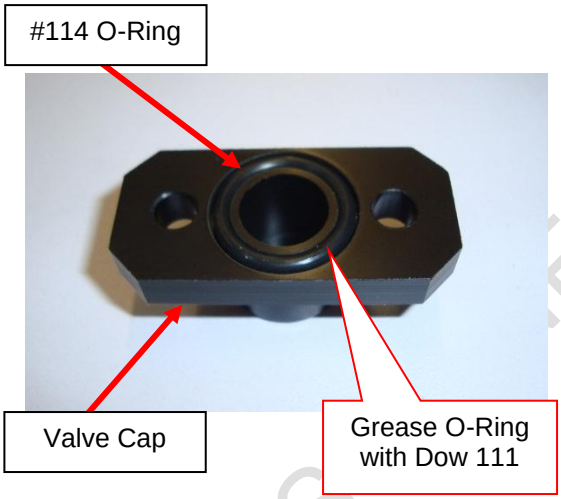


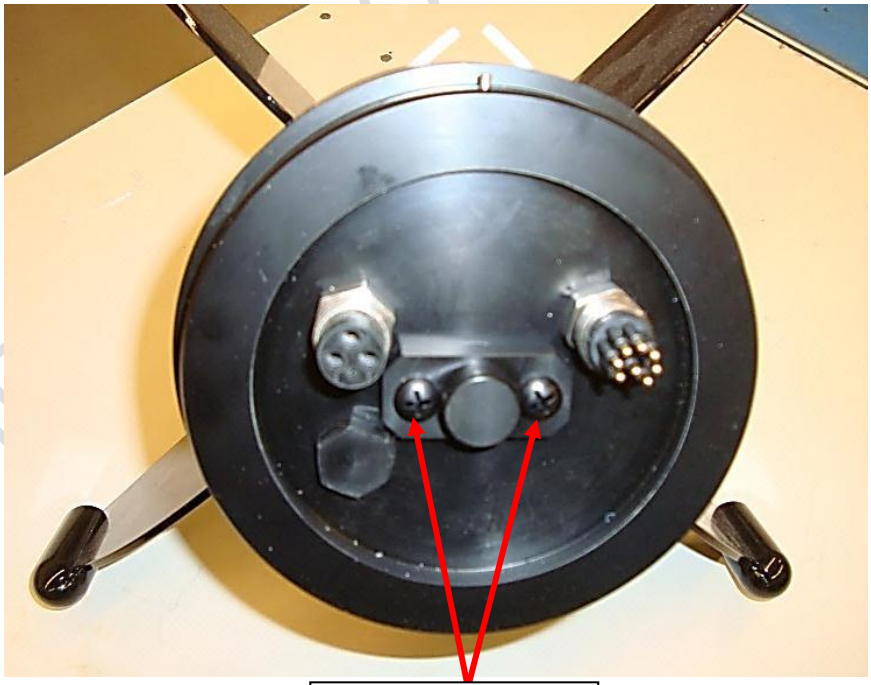


7.20 Pressure test the tail dry section at 7 – 7.5 PSI for an overnight period. Be sure to de-pressurize the vessel before shipping.

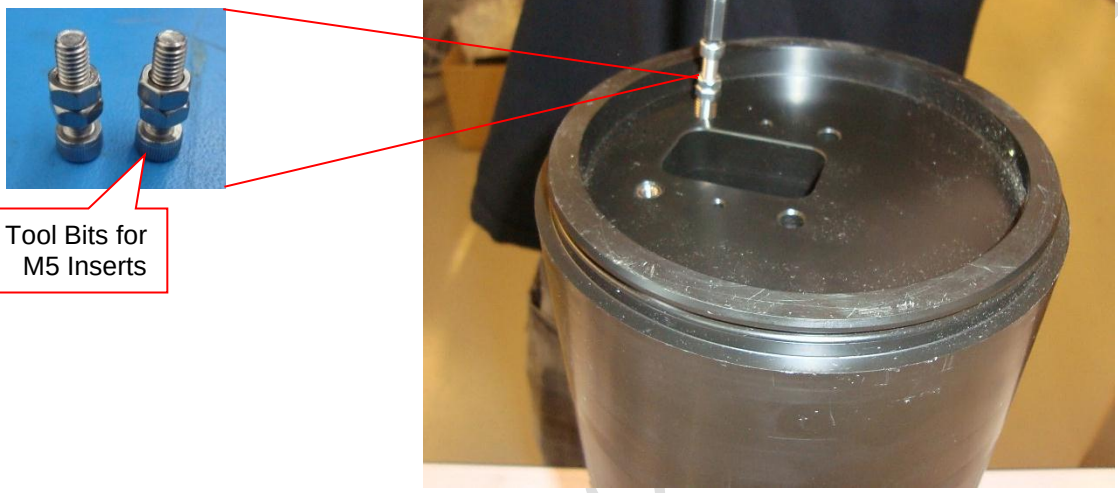
7.21 Clean #114 O-Ring (02522-114) and O-Ring groove on Valve Cap (PN01478) with isopropyl alcohol. Lubricate with O-Ring with Dow Corning 111 and install into groove.

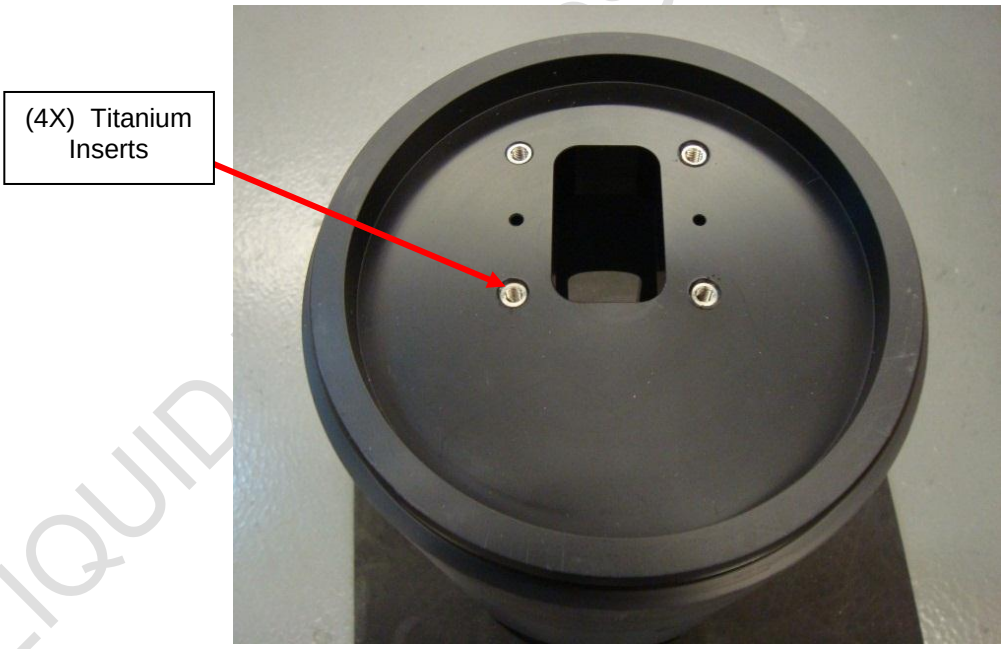
7.22 After the pressure seal has been confirmed, de-pressurize by bleeding out all gas and then install the Valve Cap with O-Ring using (2X) PNPH M6X16 Black nylon Screws (PN 0224-06-016). Torque to screws to 14 in-lbs.



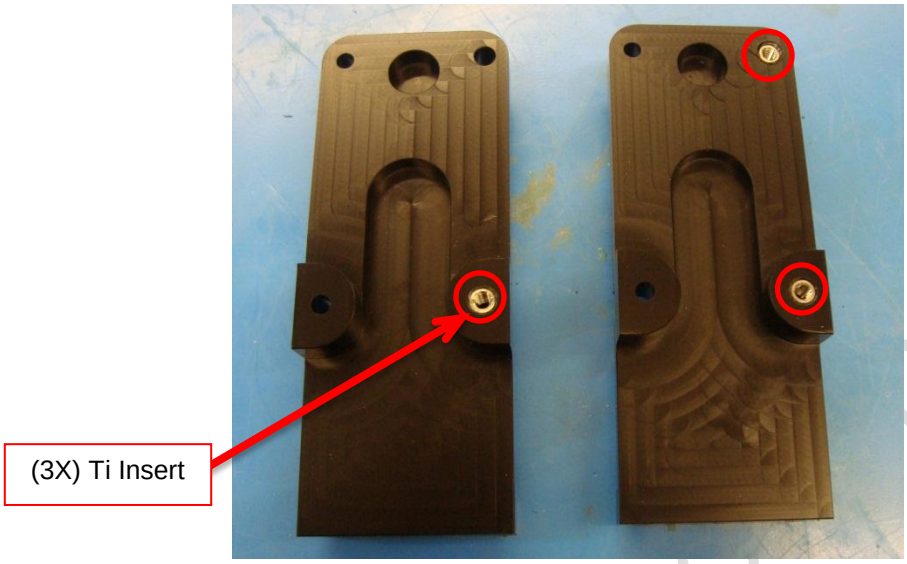


7.23 Using a Power Driver with an M5 screw and two securely tightened nuts as the insertion tool, install flush to surface (4X) Self-Tapping 5mmX0.8 ID Titanium Inserts (PN 00068) into the counter-bored holes on the front of the transducer body section (PN 03146). Note it is recommended to create multiple insertion tools for use since each bit will heat up after each insertion.



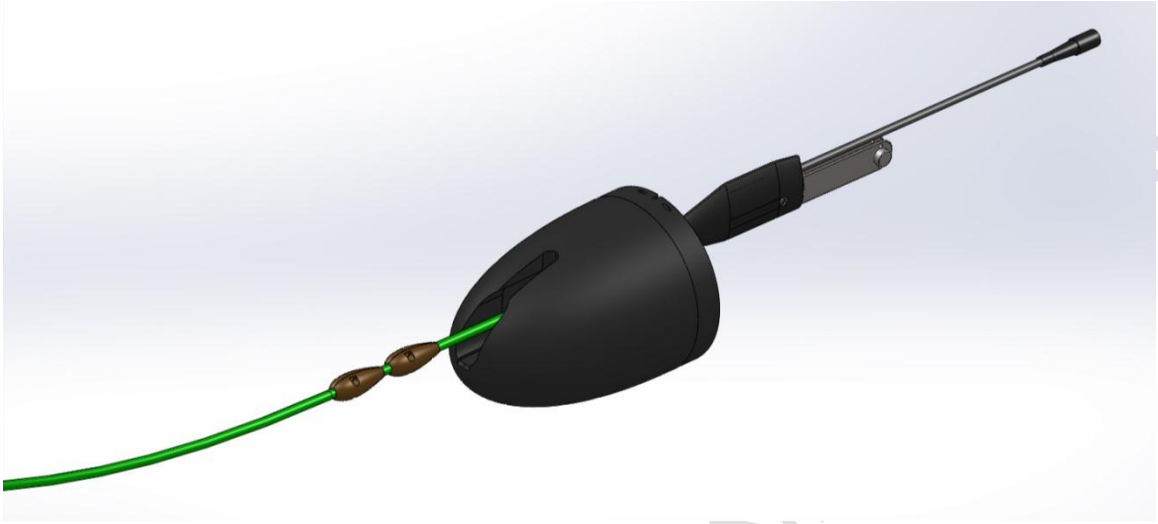


7.24 Install (2X) Titanium inserts (PN 00068) into each of the lower right hole locations on each of the (2X) Towlink Arms (PN 01858), and (1X) insert into the upper right hole location on one of the Towlink Arms. Use a power driver with M5 insertion bit and install inserts until flush with surface.

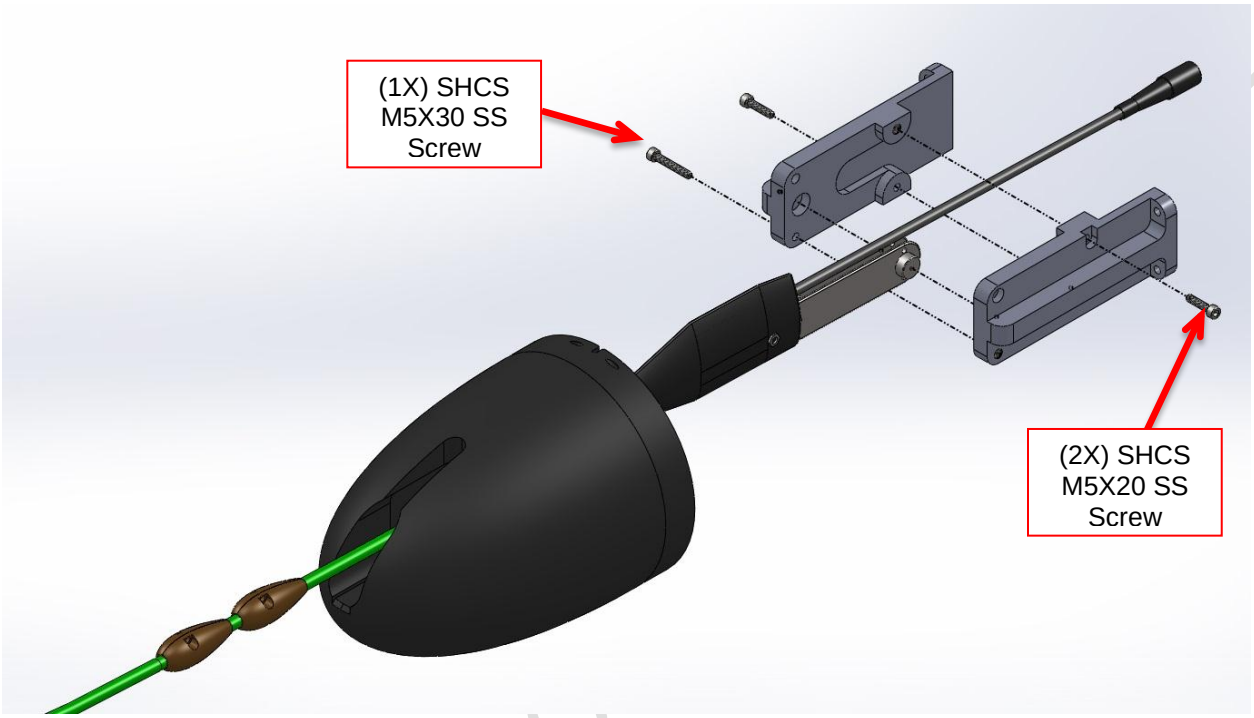


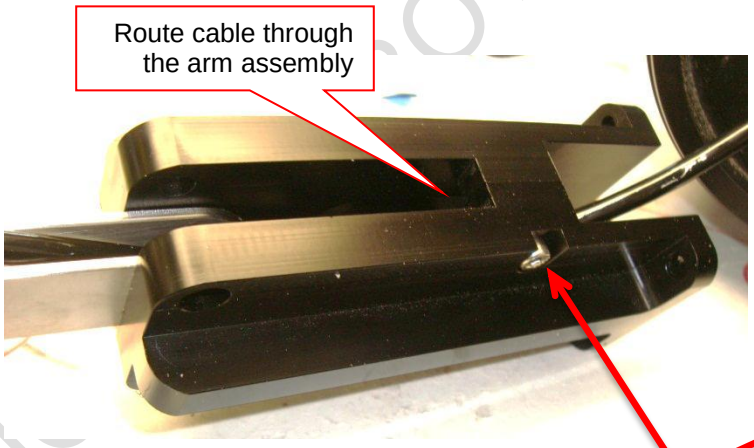
7.25 Install (2X) M3X8 SS Dowel Pin (PN 02526-03-008) into each of the bottom locations of the two towlink arms (PN 01858).

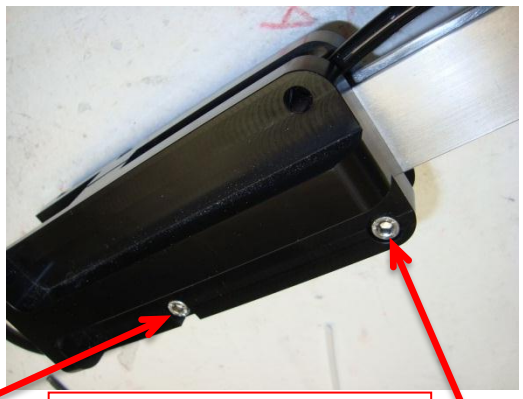
7.26 Insert the Towbody female subconn end of the Tow Cable (PN 03897) through the Nose Cone Fairing (PN 03150).



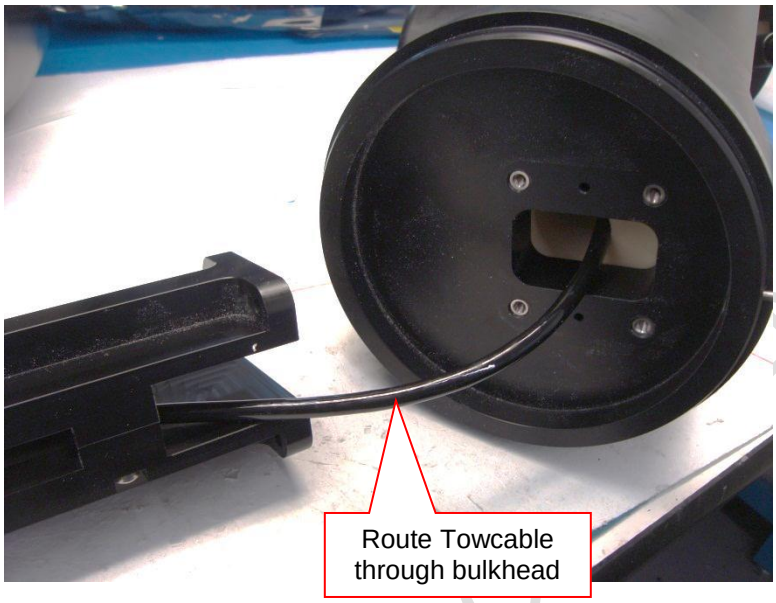
7.27 Attach the Towlink Arms to the pivot of the Towcable. Fasten using (2X) SHCS M5X20 SS Screw (PN 02517-05-020) onto each side of the towlink arm and torque to 30 in-lbs. Install (1X) SHCS M5X30 SS Screw (PN 02517-05-030) into the forward insert of the towlink arm and torque to 12 in-lbs (Note: This torque may be adjust by the end customer later on.).

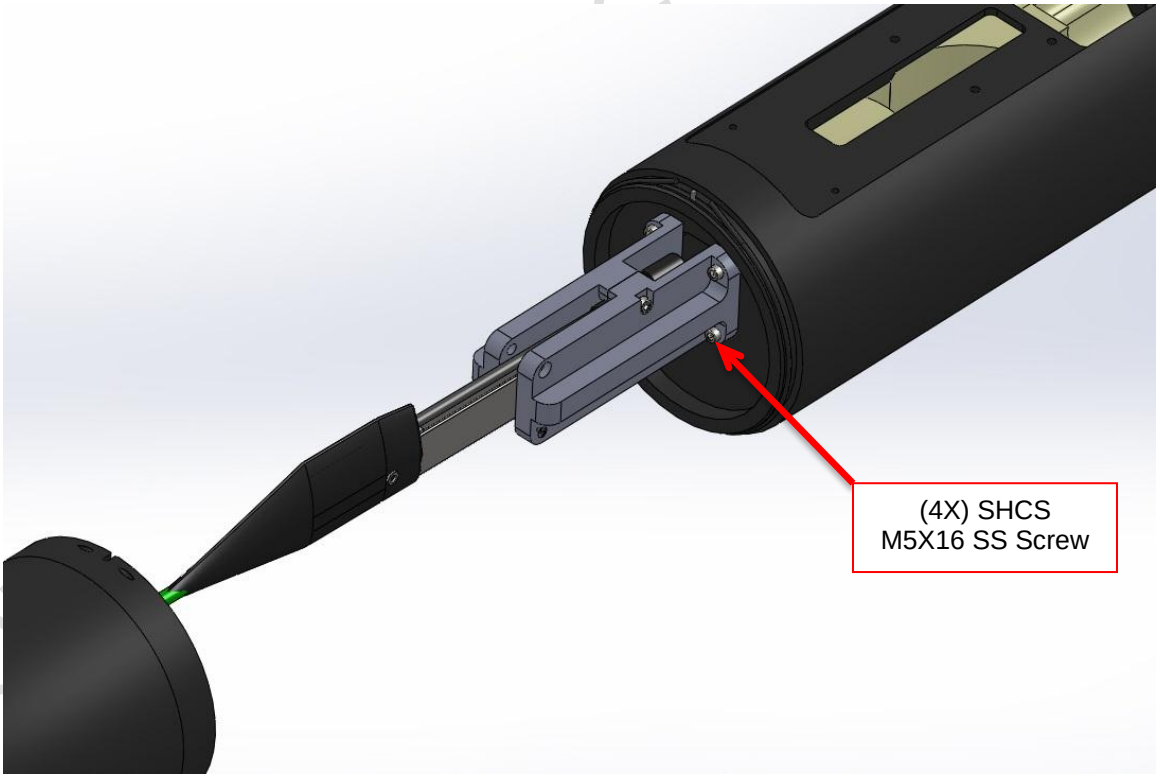




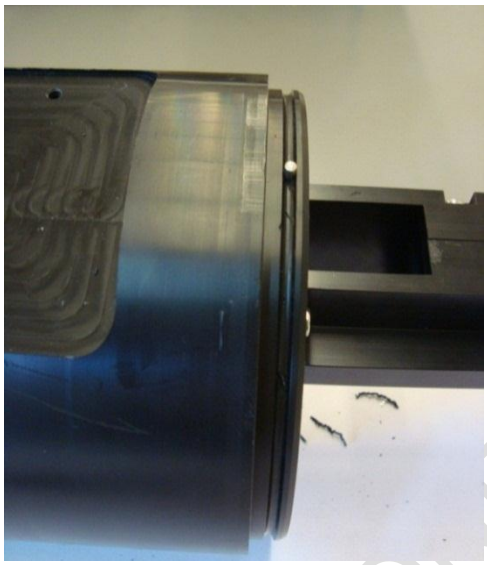


7.28 Route the Towcable subconn into the Transducer Section Bulkhead, and then fasten the towlink arms to the Transducer Section Bulkhead using (4X) SHCS M5X16 SS Screw (PN 02517-05-016) and torque to 24 in-lbs.

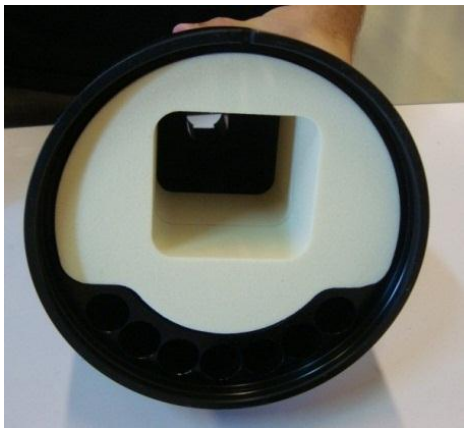




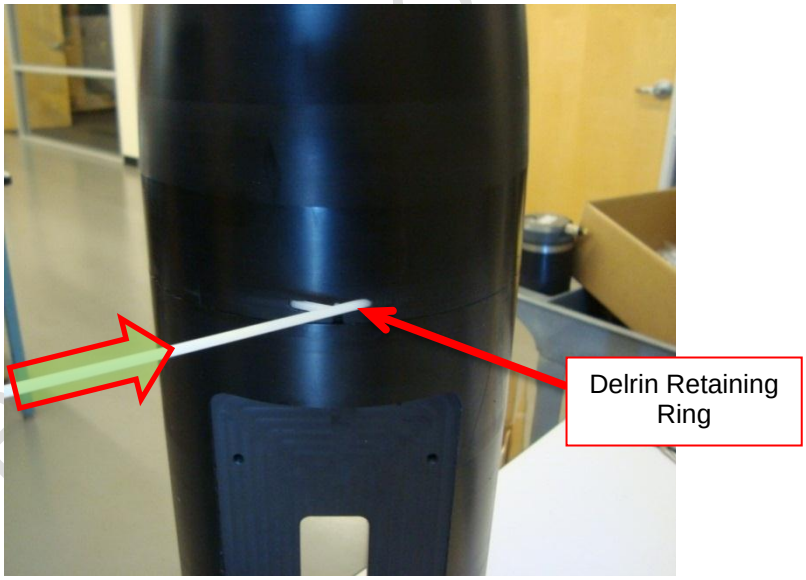
7.29 Insert M3X10 SS Dowel Pin (PN 02526-03-010) into the forward ring on the transducer body section. Note: If needed, clean the dowel pin hole with a 3mm drill bit.



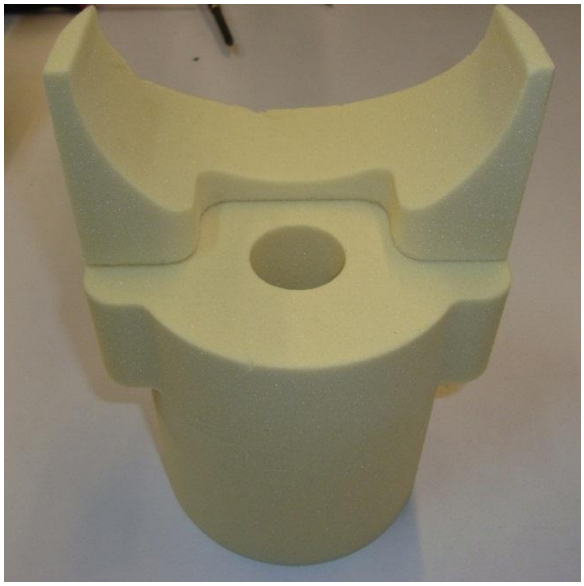
7.30 Insert foam (PN 03172) into the nose section fairing (PN 03150).

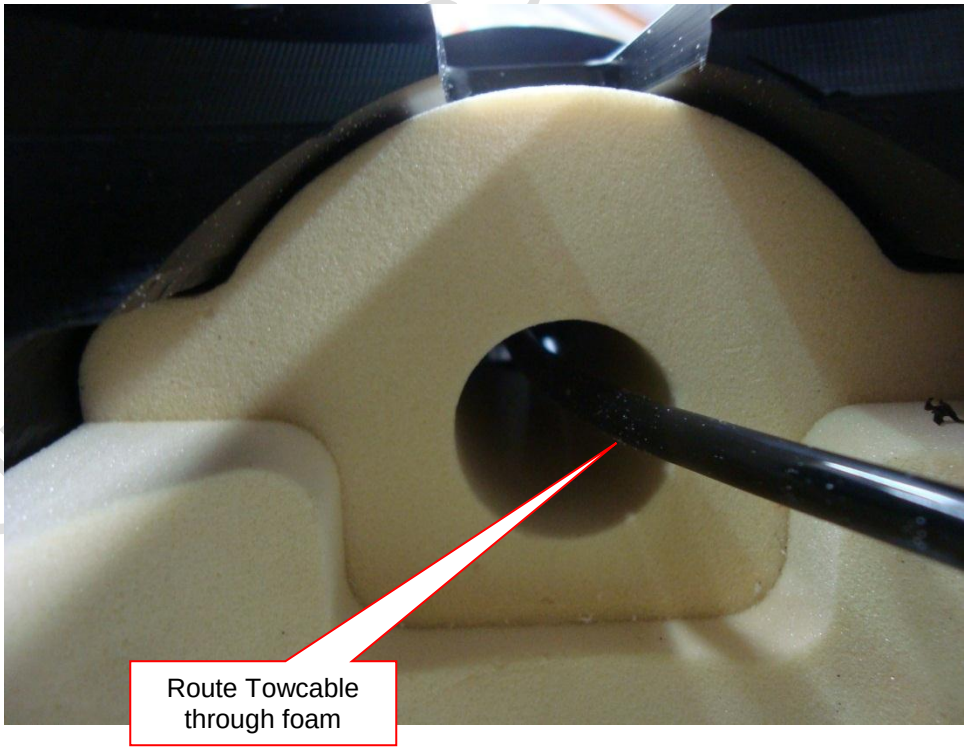


7.31 Align the dowel pin on the transducer body section with the slot on the nose section fairing and connect the two sections. Make sure both sections are completely flush. Insert Delrin Retaining Ring (PN 02818) into the bulkhead and push through until it protrudes from the exit hole to seal the two sections together. Cut off excess material leaving about ½ inch on each end.

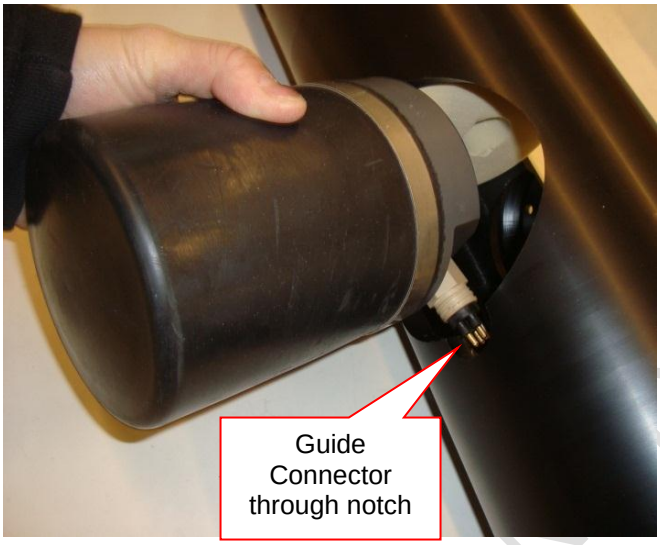


7.32 Insert Forward Transducer Section Foam (PN 03520) and place at the front end of the Transducer housing. Route the towcable through the center hole.

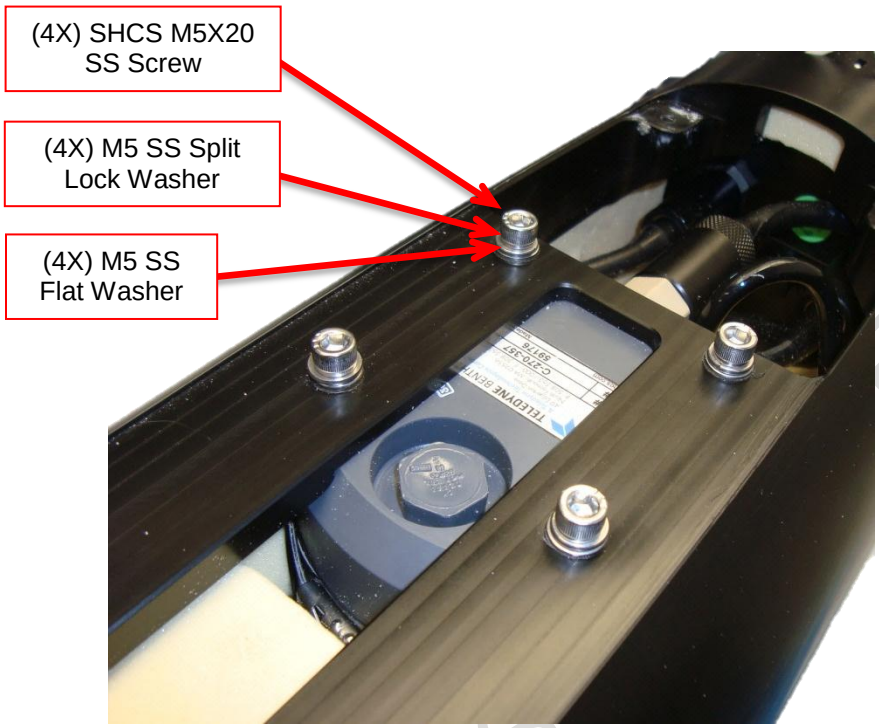




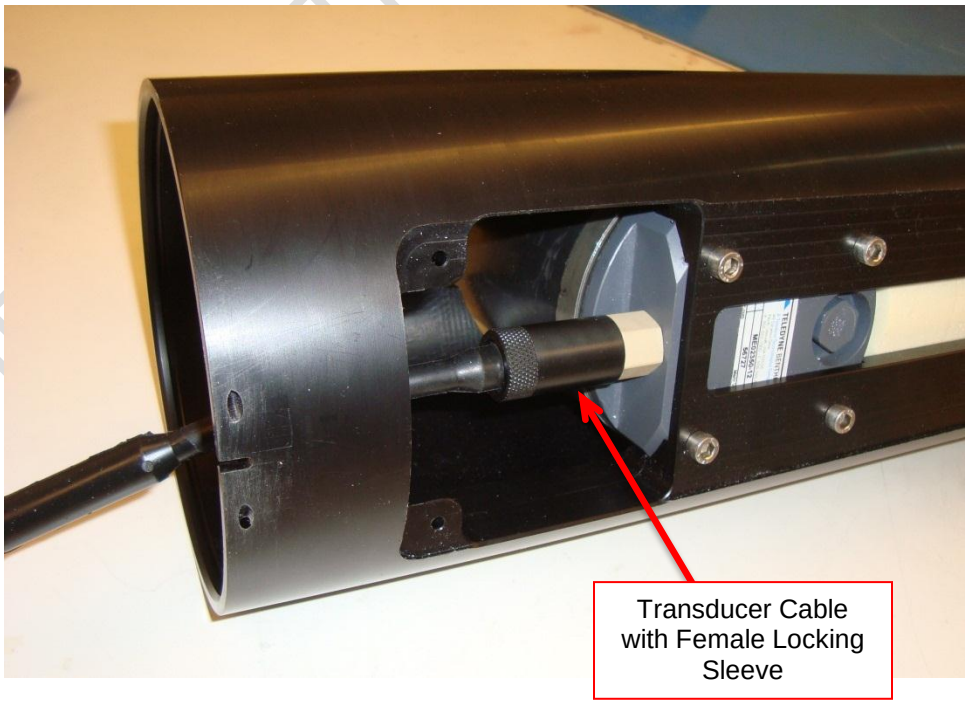
7.33 Install Transducer (PN 03147) into the housing. Guide the connector through the notch in the housing and route the towcable along the right side of the Transducer.



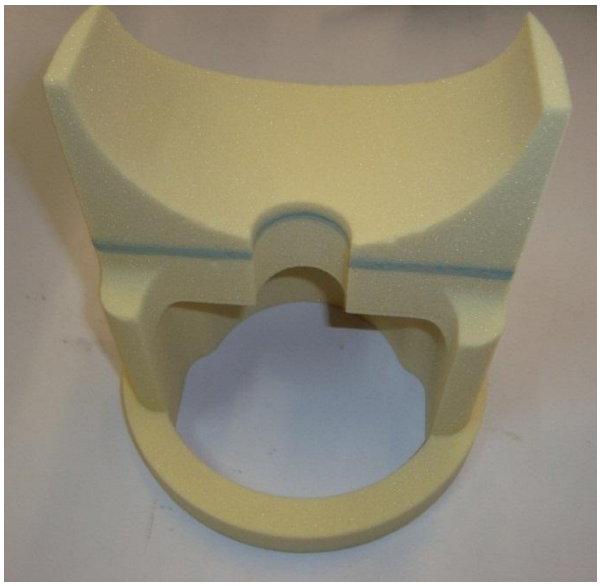
7.34 Fasten the Transducer to the body using (4X) SHCS M5X20 SS Screws (PN 02517-05-020) with (4X) M5 SS Split Lock Washer (PN 02543-05) and (4X) M5 SS Flat Washer (PN 02548-05). Torque to 24 in-lbs.

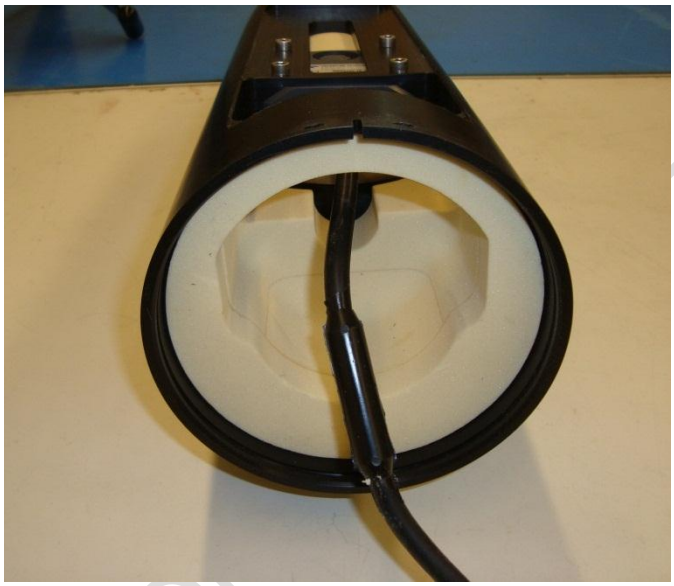


7.35 Apply Silicone Spray Lubricant (PN 01857) to mating surfaces and then connect 3-Pin Cable to Transducer and then hand-tighten Female Locking Sleeve (PN 02667).

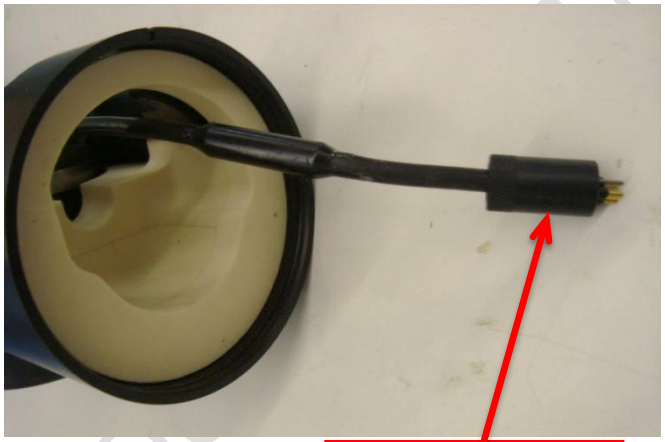


7.36 Insert Rear Transducer Section Foam (PN 03521) at the back end of the Transducer housing.

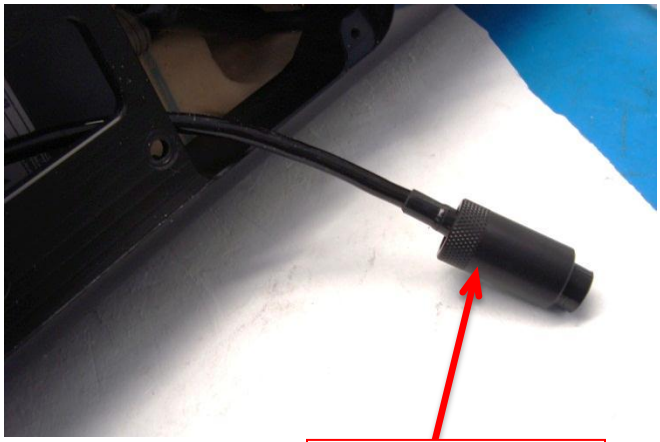




7.37 Attach (2X) Female Locking Sleeve with Retaining Ring (PN 02667) to the male end of the Transducer cable and the female end of the Towcable.

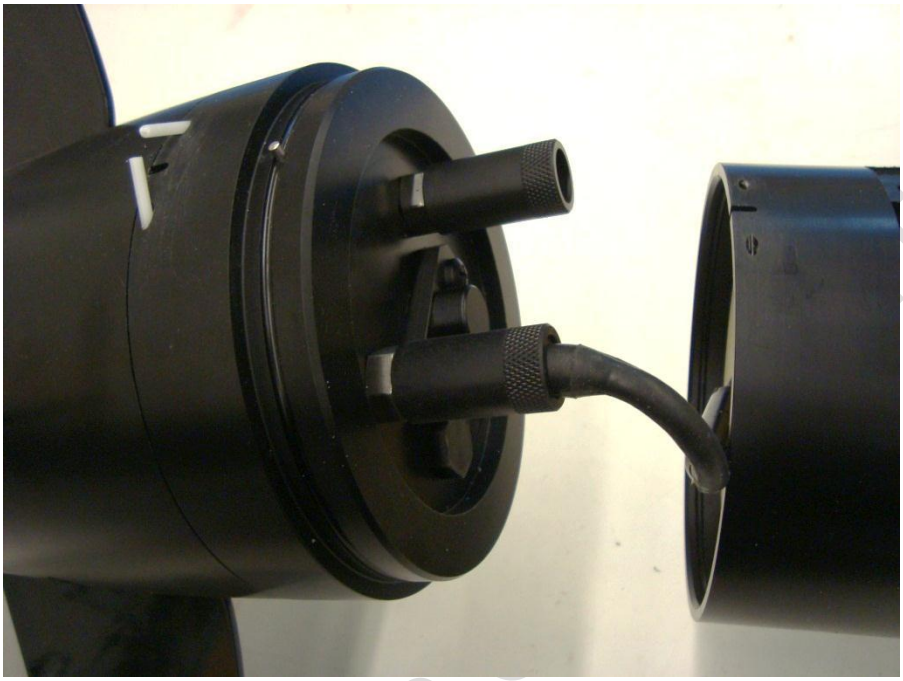


Transducer Cable with Female Locking Sleeve

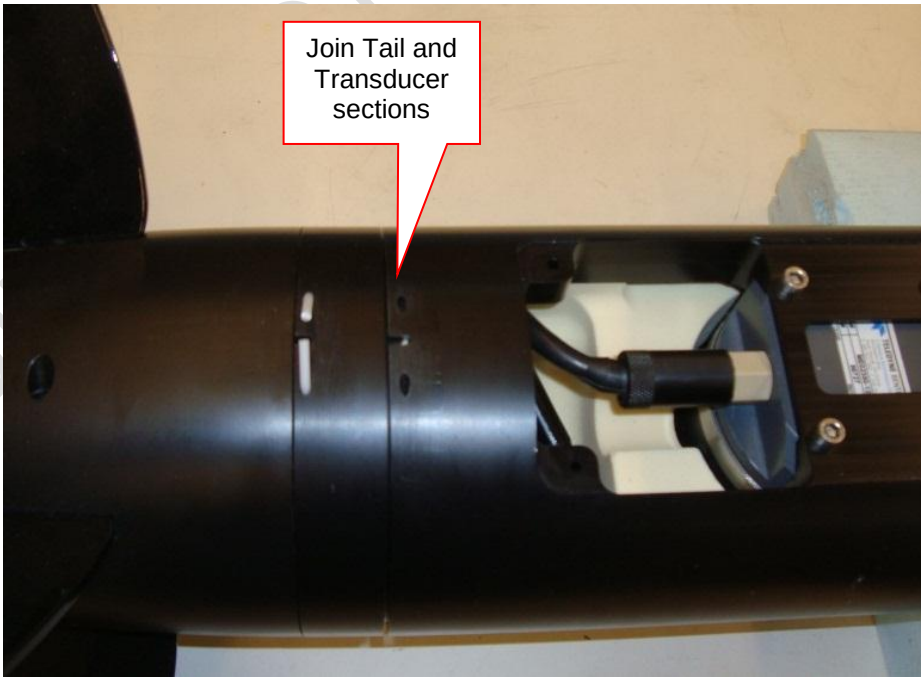


Towcable Cable with Female Locking Sleeve

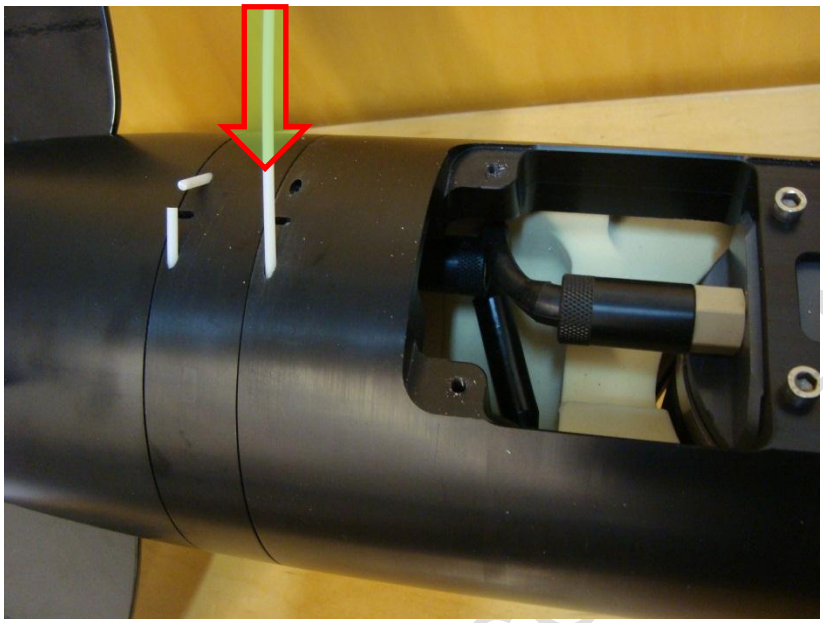
7.38 Apply Silicone Spray Lubricant (PN 01857) to mating surfaces and then connect the 3-Pin Transducer cable to the Tail Section Bulkhead and then hand-tighten Female Locking Sleeve (PN 02667).



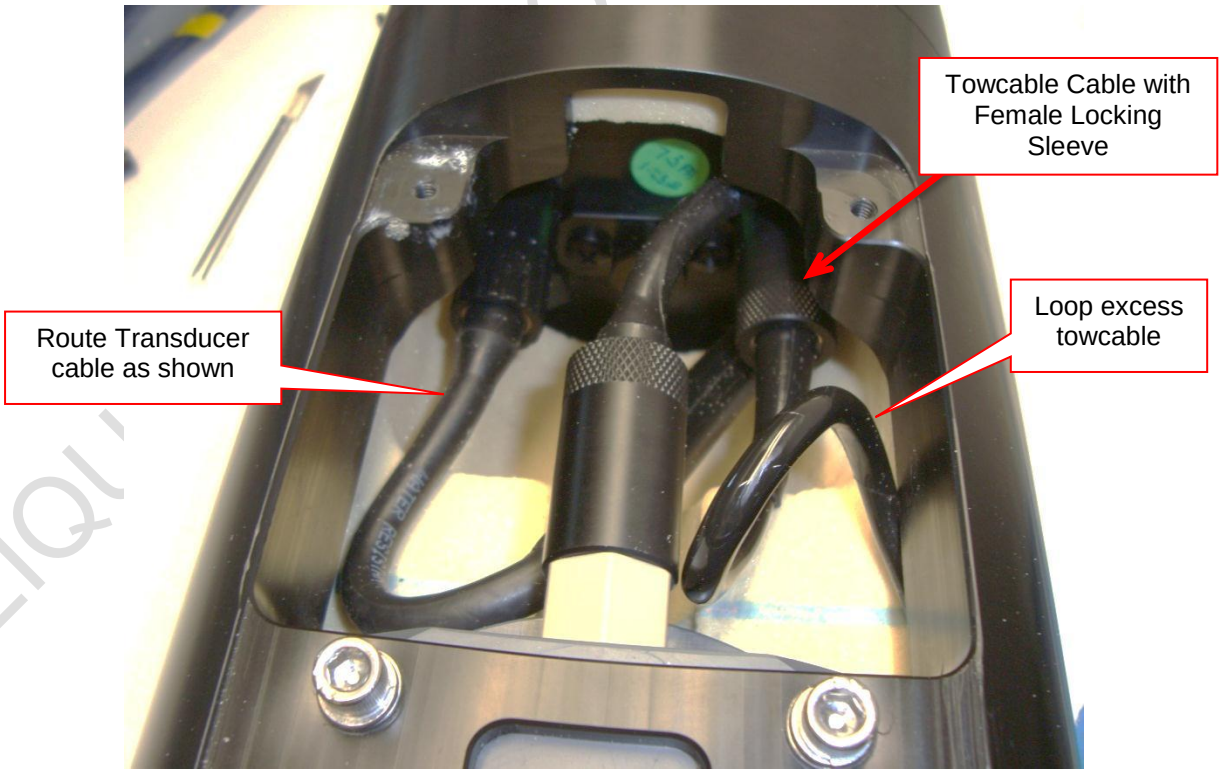
7.39 Align the dowel pin on the tail section with the slot on the transducer body section and connect the two sections. Route the cable in the available space within the compartment. Make sure both sections are completely flush.



7.40 Insert Delrin Retaining Ring (PN 02818) into the bulkhead and push through until it protrudes from the exit hole to seal the two sections together. Cut off excess material leaving about ½ inch on each end.



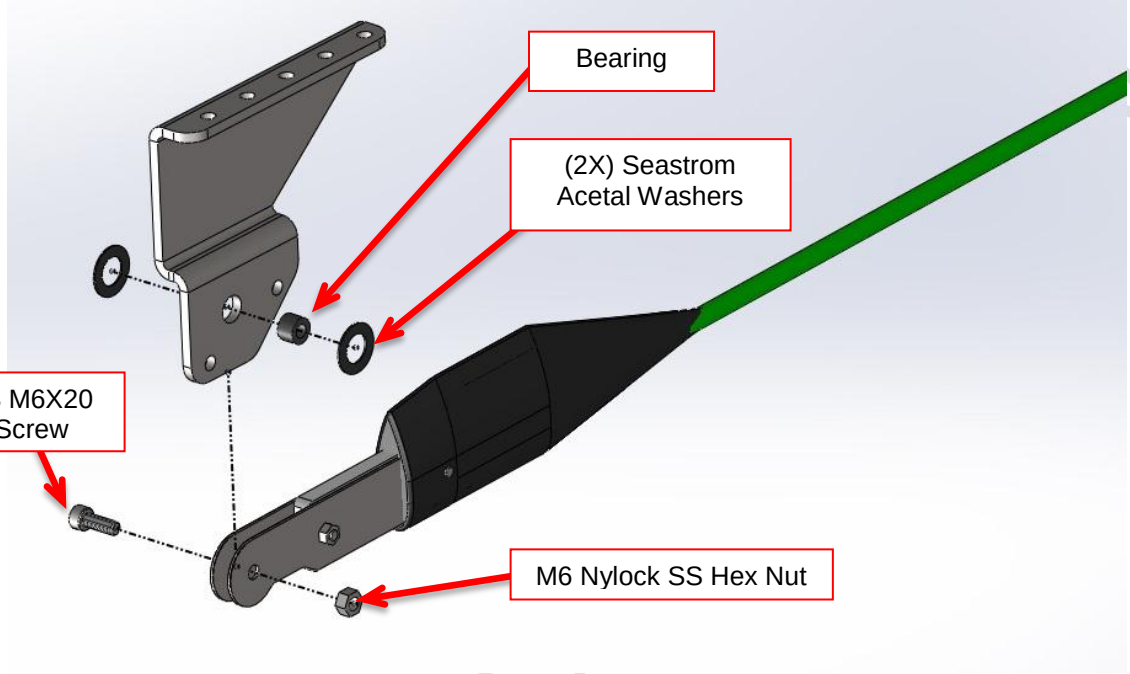
7.41 Apply Silicone Spray Lubricant to mating surfaces and then connect 8-Pin Towcable and then hand-tighten Female Locking Sleeve. Route and loop each cable as shown.

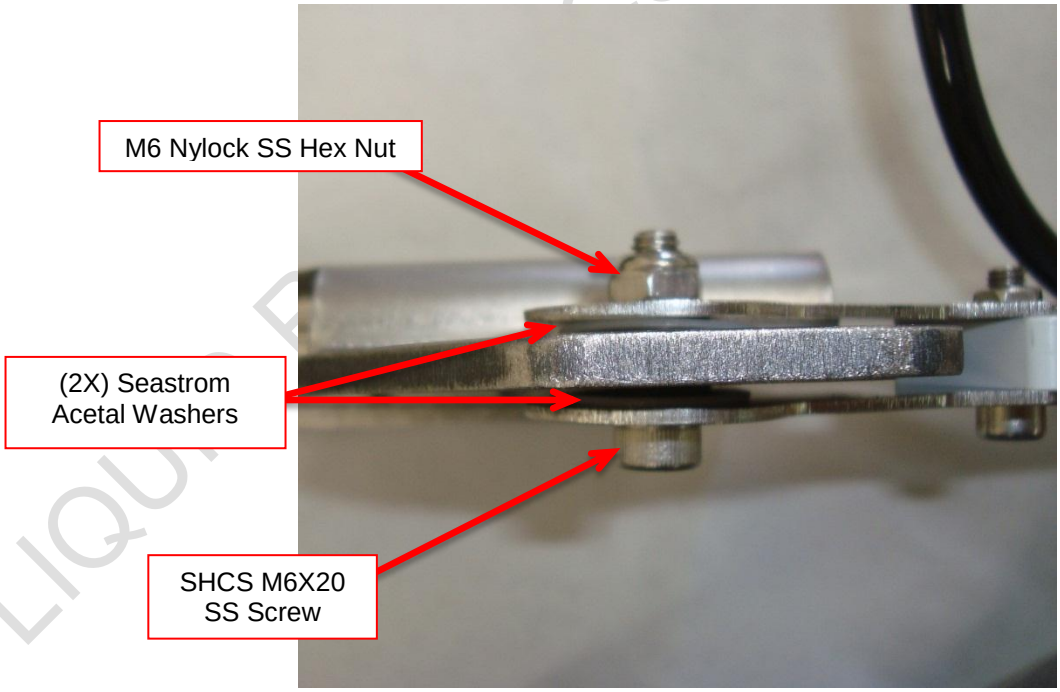


7.42 Install Transducer Section Lid (PN 03170) and fasten using (4X) PNPH M5X10 SS Screw (PN 02516-05-010). Torque to 24 in-lbs.

7.43 On the Towcable Assembly (PN 03897) attach the Tow Bracket (PN 01331) to the umbilical male subconn end of the cable assembly in the orientation shown below.

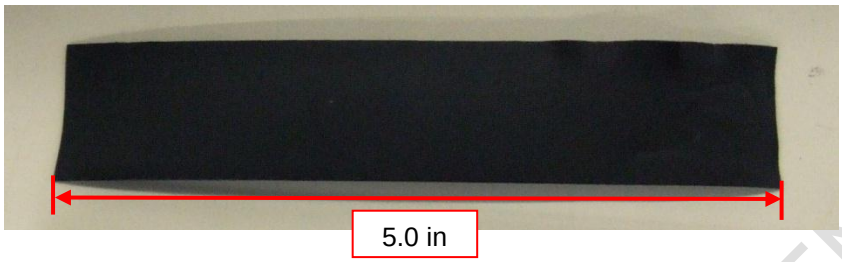
7.44 Insert Bearing (PN 01127) through the hole in the Tow Bracket and place (2X) Seastrom .875" OD, .50" ID Acetal Washers (PN 02706) on each side of the bracket. Insert the bracket with washers into the towlink and fasten using a SHCS M6X20 SS Screw (PN 02517-06-020) with a M6 Nylock SS Hex Nut (PN 02661-06). Torque to 20 in-lbs.



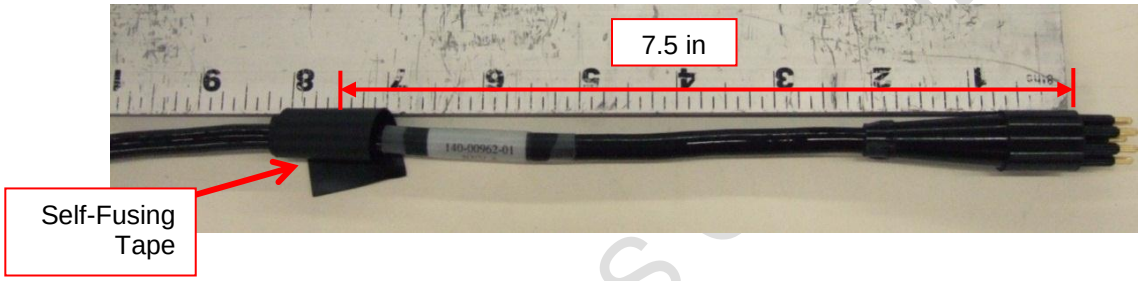


7.45 Confirm that the Self-Fusing Tape chafe guard is installed onto male whip per Towcable Drawing 03897

7.45.1 To add a chafe guard on the towcable (PN 03897), cut approximately 5” of self-fusing tape (PN 02993).



7.45.2 Wrap self-fusing tape around towcable whip centered at 7.5” from the end face of the sub-con. Taper each end for a total length of 1.25-1.5”.



7.46 The following parts are to be shipped loose in a separate bag with the towbody:

Part Number	Description	Qty
02517-06-035	SCREW, SHCS, 316 SS, M6x1, 35mm	2
02581	WASHER, FLAT, 300 SS, 0.75" OD, 0.45" ID, 0.03" THK	1
02814	ROD, BRASS, 0.75IN	7
03159	THREAD ROD, TAIL SECTION, ADDOSS TOW BODY	4
03171	TRIM WEIGHT, TAIL SECTION, ADDOSS TOWBODY	8
03225	TAIL WEIGHT, END CAP, LARGE	2
03871	TAIL WEIGHT, END CAP, SMALL	2
03878	FOAM BALLAST, NOSE CONE, ADDOSS TOWBODY	7
03900	TAIL WEIGHT, END CAP, ABS	2