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**MODEL 8242XS  
ACOUSTIC RELEASE/  
TRANSPONDER/ TANDEM**

***OPERATING AND MAINTENANCE MANUAL***

**MODEL 8242XS  
ACOUSTIC RELEASE/TRANSPONDER**

**REV. C, November 13, 2003**  
P/N MANUL-38241

## **Standard Commercial Warranty**

All equipment manufactured by ORE Offshore is warranted against defective components and workmanship for repair at the plant in Wareham, Massachusetts, free of charge for a period of one year after shipment. Shipping costs are to be borne by the customer. Malfunction due to improper use is not covered in this warranty and ORE Offshore 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 or repairs attempted thereon; (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; and (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 express 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 unexpired portion of the original warranty period only.

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

## Return Procedure

It is necessary to obtain from ORE Offshore a Returned Material Evaluation (RME) number prior to returning equipment. This is to assist tracking and arrival recognition. Follow the procedure listed below when returning U.S. origin goods to prevent delays and additional costs on Returned American Goods.

### New Import Procedure/Returned American Goods

1. All shipments must be accompanied by two copies of your commercial invoice showing value of material and any reason for return.
  - \* Whenever possible, please send copies of original export shipping documents with the consignment.
2. If the value is over \$1,000.00, the following shipper's oath must be sent with the invoices. (This 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, that no drawback, bounty, or allowance has been paid or admitted thereof.*

*Signed \_\_\_\_\_"*
3. If more than one part per consignment, a packing list must also accompany the shipment. It is acceptable to combine the commercial invoice and packing list as long as the contents of each carton are clearly numbered and identified on the commercial invoice.
4. Consign all air freight shipments to ORE Offshore in care of Intercontinental Air Frt., Inc., Logan Int'l Airport, East Boston, Mass. 02128.
5. If the equipment is property of ORE Offshore please insure for full value.
6. Route via Logan International Airport only as the final destination.
7. Mail one invoice, packing list and copy of airway bill to ORE Offshore upon shipment.
8. Please refer to issued Returned Material Evaluation number on all documents and correspondence.
9. Air freight must be prepaid on all returns.

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Top Assembly 8242XS Acoustic Release Transponder  
Figure 1

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# 1. GENERAL INFORMATION

## 1.0 Introduction

This manual describes the ORE Offshore Model 8242XS Acoustic Transponder Releases. The Model 8242XS Acoustic Transponder Releases utilizes ORE Offshore's Binary Acoustic Command System (BACS) and to operate require either the Model 8011AT Acoustic Command/Ranging Transceiver or the Model AMD200 Deck unit. The Model 8242XS can be used to release oceanographic moorings 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 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 command causes the Model 8242XS to disconnect manually from its mooring. The release command 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.

### **DANGER!!**

Applying power to the instrument while it is mechanically loaded may result in release of load and cause serious personal injury.

### **DANGER!!**

When the instrument has a tensile load, careless handling may endanger the user's hands. Exercise extreme caution to prevent serious personal injury.

## 1.2 Specifications

### Mechanical Specifications:

Static load to failure (tested) -	20,000 lbf.	(9072 Kg.)
Recommended maximum static load (working) -	12,000 lbf.	(5443 Kg.)
Design maximum release capability -	12,000 lbf.	(5443 Kg.)
Recommended maximum release requirement -	8,000 lbf.	(3629 Kg.)
Depth rating (working):	19600 ft.	(6000 m.)
Collapse pressure (tested):	26240 ft.	(8000 m.)
Housing O.D.	- 5.12 in.	(13 cm.)
Housing I.D.	- 4.0 in.	(10 cm.)
Overall length	- 37.0 in.	(94 cm.)
Housing length	- 20.0 in.	(51 cm.)
Weight in air	- 80 lb.	(36 Kg.)
Weight in water	- 61 lb.	(28 Kg.)
Material	- Castings	
		Ni Al Bronze ASTM B148 C95800 - Mil-B-24480
	- Wrought	
		Ni Al Bronze ASTM B150 C63200 - Mil-B-24059
	- Fasteners	
		Titanium
Release type	-	spring driven rotary release of compounded levers which can be rearmed externally.

### Acoustic Specifications:

**Commands:**

Sensitivity: 80 dB re 1 uPa.

Signal to noise-spectrum-level ratio:  $\geq 36$  dB re root Hz.

Receiver type: Hard-limited (2000 Hz/330 Hz Bandwidths)

Coding:

General to 8000 series - Binary FSK

Allowed tone pairs (6)

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

Structure: 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.

Pulse width: 22 mSec.

Period: 250 mSec.

Total Command Time: 9 Sec.

Total lock out time: 14 Sec. re beginning

Total command capacity per tone pair: 2000 or 12000  
commands for the 6 tone pairs.

Standard Command Functions:

Release

Disable Transponder

Enable Transponder

**Transponder:**

Sensitivity - 80 dB re 1 uPa.

Signal to noise-spectrum-level ratio:  $\geq 44$  dB re root Hz for jitter  
<  $\pm 0.5$  mSec. (3 Sigman). Jitter =  $\pm 0.1$  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. @ 1 m.

Reply pulse width: 10 mSec

Turnaround time delay: 12.5 mSec standard.

Lockout time: 1.0 Sec.

**Environmental:**

Temperature operating: -10 deg. C to +40 deg. C.

storage: -20 deg. C to +85 deg. C.

## 2. INSTALLATION AND OPERATION

### **DANGER!!**

Applying power to the instrument while it is mechanically loaded may result in release of load and cause serious personal injury.

### **DANGER!!**

When the instrument has a tensile load, careless handling may endanger the user's hands. Exercise extreme caution to prevent serious personal injury.

### **2.1 Introduction:**

This section contains the information relative to the basic set up and operation of the Model 8242X acoustic release. 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.

### **2.2. Housing and Release Preparation and Care:**

Disassembly Procedure: Access to Internal Components. Access to any portion of the electronics or mechanical assemblies is achieved simply by removing the total of five sets of titanium hardware holding the upper and clevis end caps in place. See figures 1 and 2.

The internal pressure of the unit is not atmospheric. The 8242XS releases are shipped with 10PSIA (-5PSI gage) 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.

**DANGER!!**

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.

**DISASSEMBLY:**

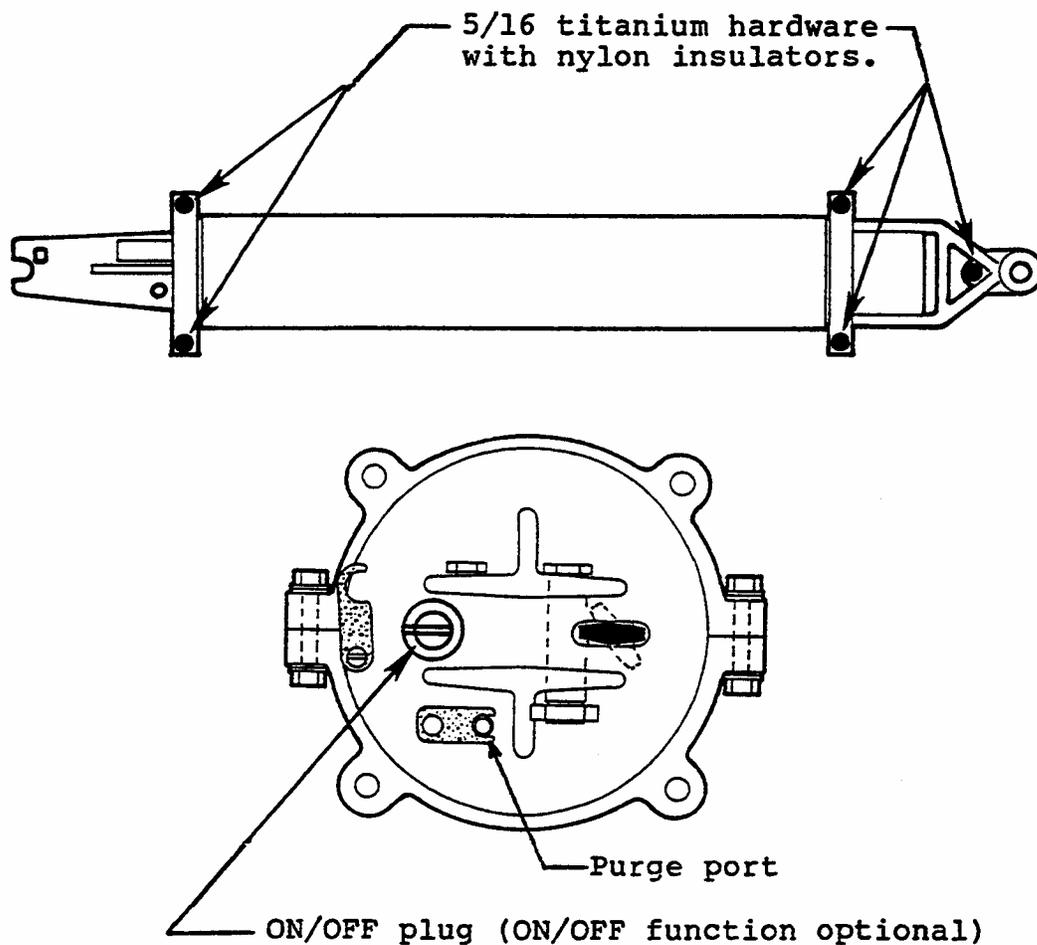


Figure 2. Disassembly.

NOTE: In some releases the cable from the electronics to the transducer is short (12 inches (30 cm.)). To prevent parting the cable, always remove the top

(transducer) end cap first, and disconnect the transducer from the electronics.  
**CAUTION:** High voltage is present at this connector when the unit transmits reply bursts.

The disassembly procedure is as follows:

Equalize pressure by removing the purge port plug. Remove the three titanium bolts from the top cage-clamp assembly. With a soft mallet, tap the cages free of the end cap (two 1/2-inch diameter spreader rods are loose and will fall free of the cage as it is disassembled). Draw the transducer end cap out of the housing. Disable the power supply by disconnecting the connector from the battery pack to the main board. Then disconnect the transducer cable. Remove the two titanium bolts from the lower clamp assembly. With a soft mallet, tap the clamps free of the end cap. Carefully slide the release electronics assembly out of the housing. Take care not to scratch the O-ring surfaces. See figure 3

**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.

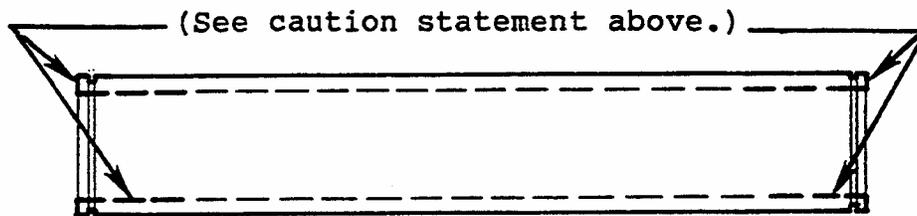


Figure 3.

**Assembly:**

Clevis End cap 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 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). See figures 4, 5, and 6.

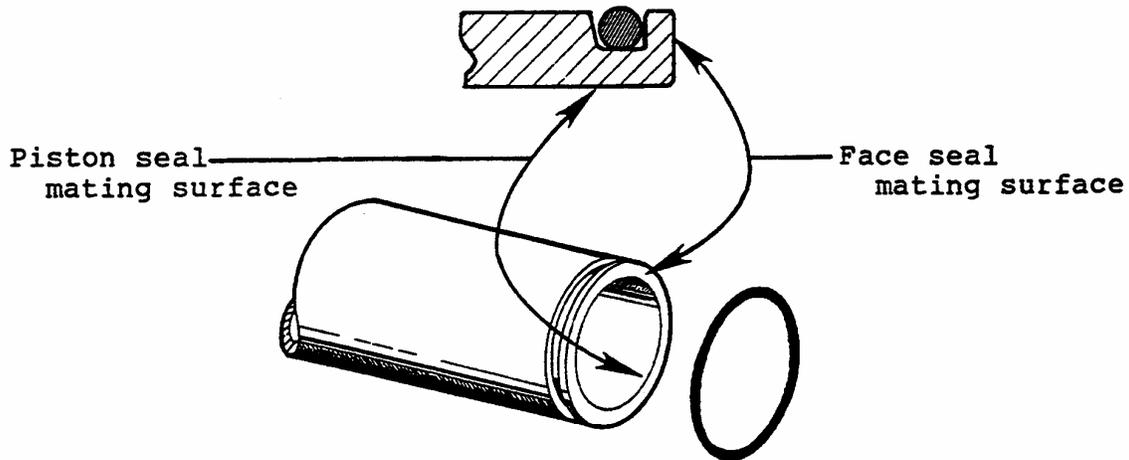


Figure 4

**CAUTION:**

Excess lubricant between seals may cause excessive hydraulic pressure between O-rings and result in improper seating. A light coating is all that is required.

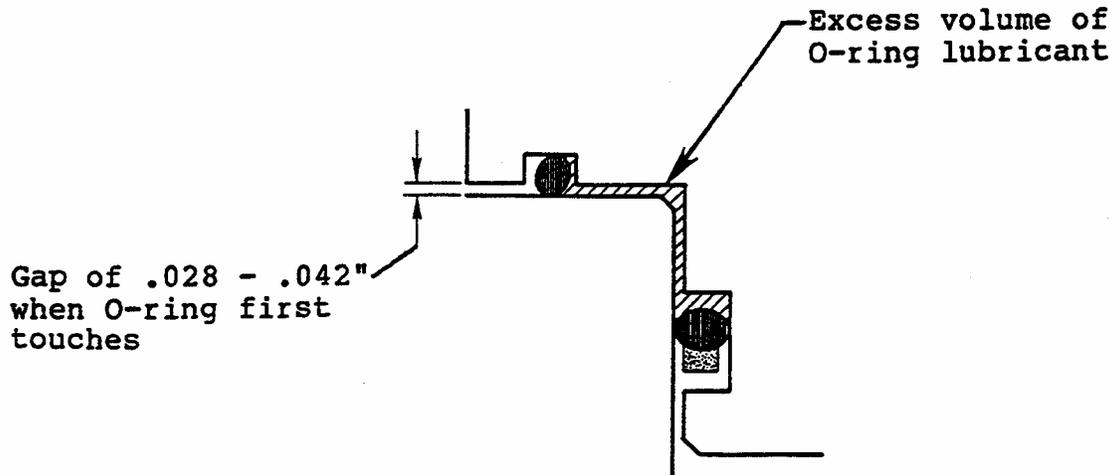


Figure 5

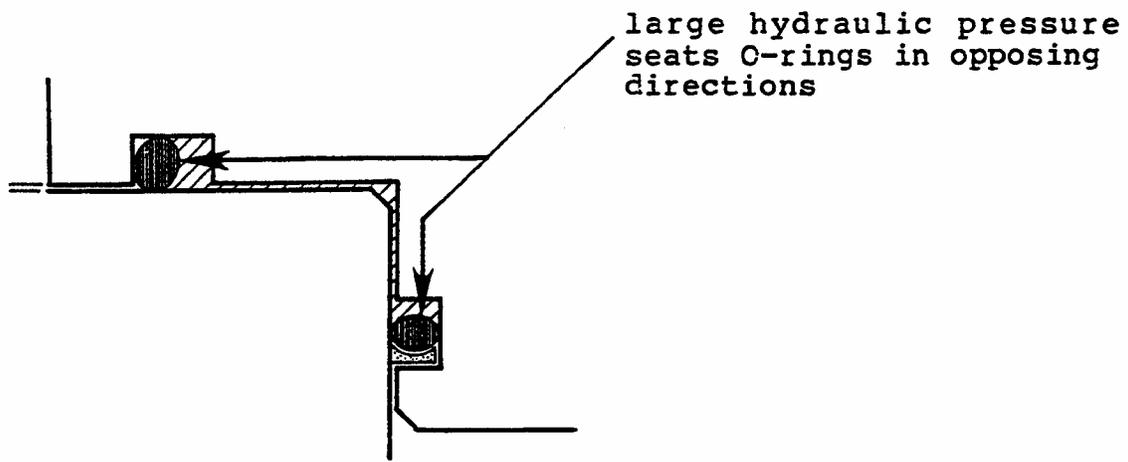


Figure 6.

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.

When the end cap flange mates against the housing, be sure the O-ring is properly seated in the groove and is not crushed outside the groove between the end cap and housing.

The end cap is secured to the housing by gently starting one of the clamps onto the 15-degree tapered flanges. After both sides of the clamp have been started, seat the clamp with progressively sharper taps using a soft mallet.

The clamping hardware includes 5/16" titanium nuts, bolts and washers. See figure 7.

NOTE:

Also included are nylon shoulder washers which are essential and must be positioned between the titanium and bronze to prevent damaging galvanic corrosion of the bronze, as shown in the diagram below.

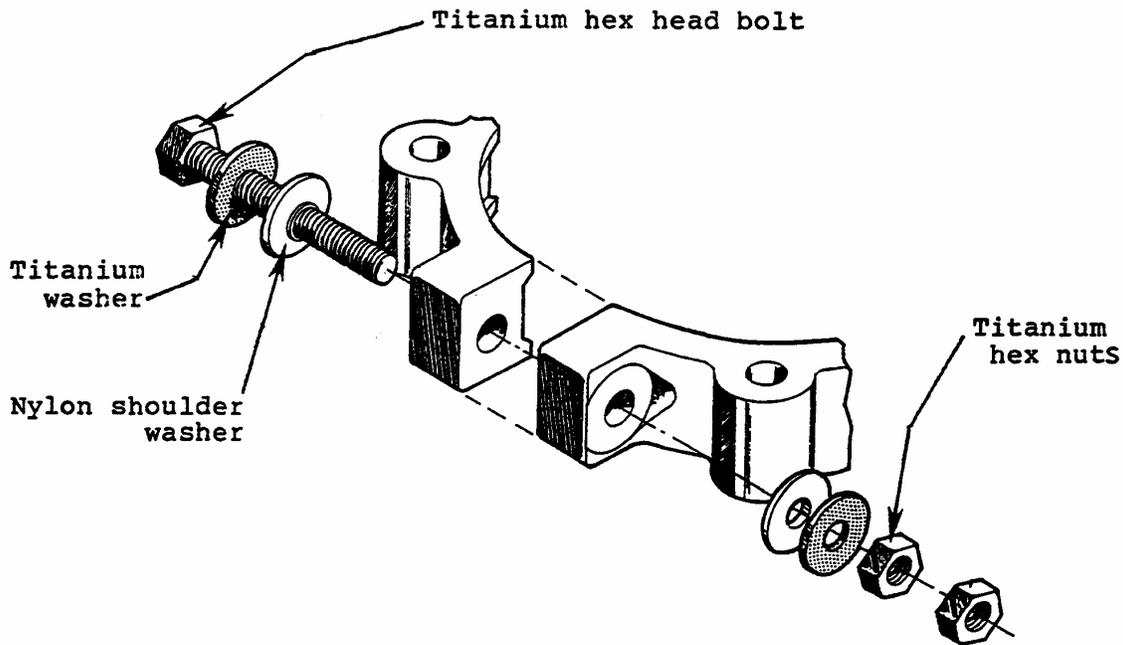


Figure 7.

Continue tapping all parts of both clamps with the soft mallet until no further tightening of the hardware is possible. Use a torque wrench if available and torque all five of the titanium fasteners to between 175 and 200 in. lbs. (200-230 centimeter kilograms).

**Top End Cap Assembly:**

Observe the same O-ring preparation procedures as for the clevis end cap. Connect the transducer lead. Connect battery pack connector to the main board.

Clamp the top end cap cage assembly onto the housing, using the same technique with the soft mallet as was used for the clevis end cap. Include both of the 1/2 inch spreaders when assembling the cage. See figure 8.

**CAUTION!!**

The instrument's load capacity is less than 1/10 the rated load if the two 1/2 in. (1.27 cm.) diameter x 4 in. (10 cm.) spreaders are not included in the cage. The horizontal members of the cage must form a complete "box" and not just two parallel sides as shown in the following diagram.

**Note 3 sets of 5/16" titanium hardware with nylon shoulder washers between titanium and bronze.**

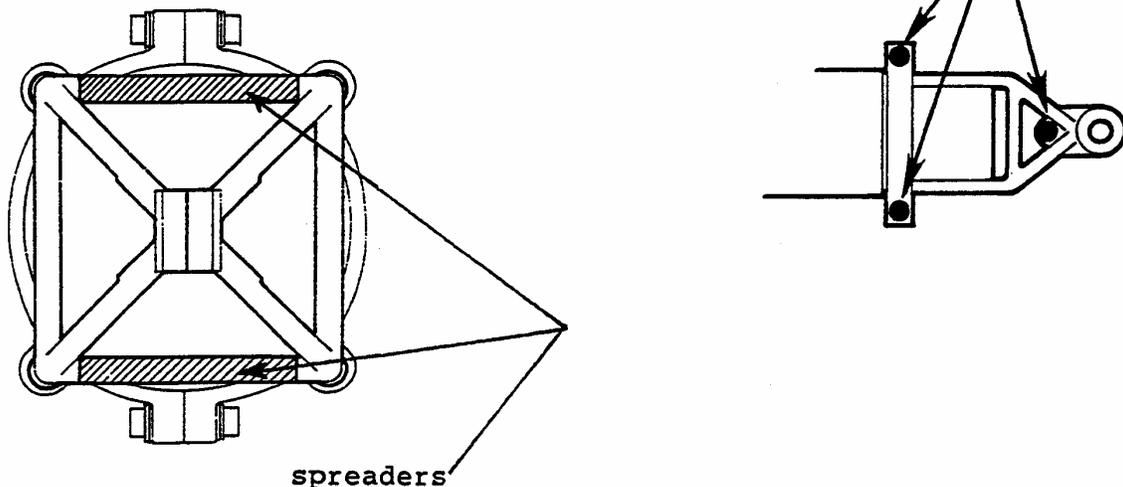


Figure 8.

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.

**Leak Detection and Condensation Prevention**

ORE 8242XS releases are provided with a 3/8-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 -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 -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.

**Arming the Instrument:**

The release mechanism is easily armed using only the slotted arming tool that is provided with the system. See figure 9. No disassembly is required even after multiple firings (except for battery replacement).

The external moving components of the release mechanism include the following:

- Primary release hook,
- Slotted release latch,
- T-shaped release shaft.

The instrument is easily armed by:

- a. capturing the anchor link in the hook,
- b. capturing the end of the hook behind the latch while passing the slot in the latch down over the shaft,
- c. rotating the shaft (using the arming wrench) until the internal mechanism “clicks” and holds position **DO NOT FORCE THE MECHANISM FURTHER THAN NEEDED** (approximately 40 inch pounds torque is required to rotate the shaft 30 degrees clockwise).

d. NOTE: Following rotation of the shaft the release mechanism is armed. Do not attempt reverse rotation with the arming tool. Forced reverse rotation will jeopardize optimum performance.

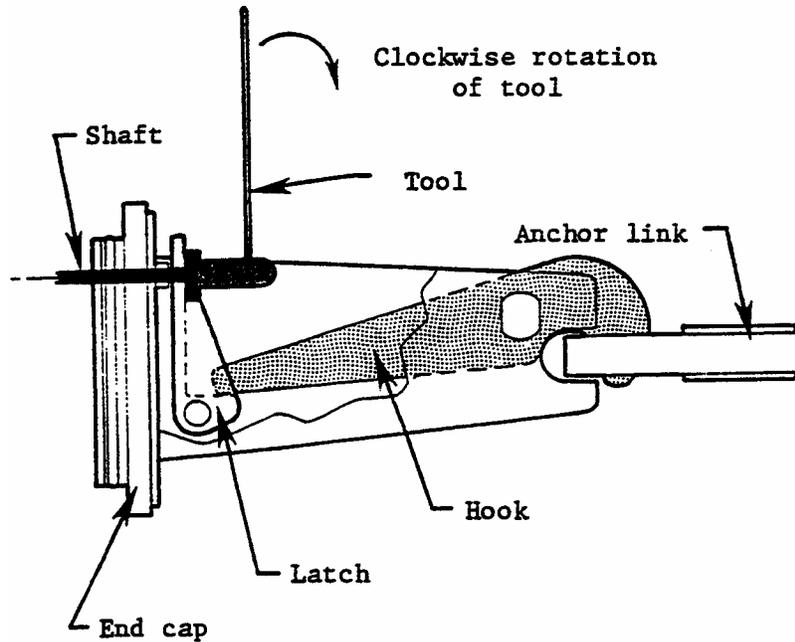


Figure 9.

The Model 8242XS release is designed to be used with a standard 5/8 inch shackle (maximum .77 inch (1.9 cm.) pin diameter and minimum 1.06 inch (2.7 cm.) opening).

**NOTE**

It is essential that the nickel-aluminum bronze material be isolated from any dissimilar metal. Because of this, the instrument is supplied with a disposable anchor link with nylon insulating bushings. This link or its equivalent must be used to prevent harmful galvanic corrosion between dissimilar metals.

### **3.0 Release Function:**

After the command to release has been decoded, the power supply is switched on to the motor. The internal coil spring is released by the motor and provides torque to the t-shaped release shaft. When the t-shaped end of the shaft turns and aligns with the slot in the latch, a release will occur. The shaft carries the mooring tension along its axis with support via two thrust washers at the top (inside end) of the shaft. The torque created by the spring needs to overcome the friction between the shaft and the latch. Because the torque generated by the spring is a fixed quantity, the electrical current requirement of the motor is purely a function of the size of the spring. The central design parameter of the mechanical release assembly is the size (magnitude) of the spring force. The effective battery life is based on the minimum voltage required to release the spring and the maximum release capability is defined by the mooring tension frictional force that the spring must overcome.

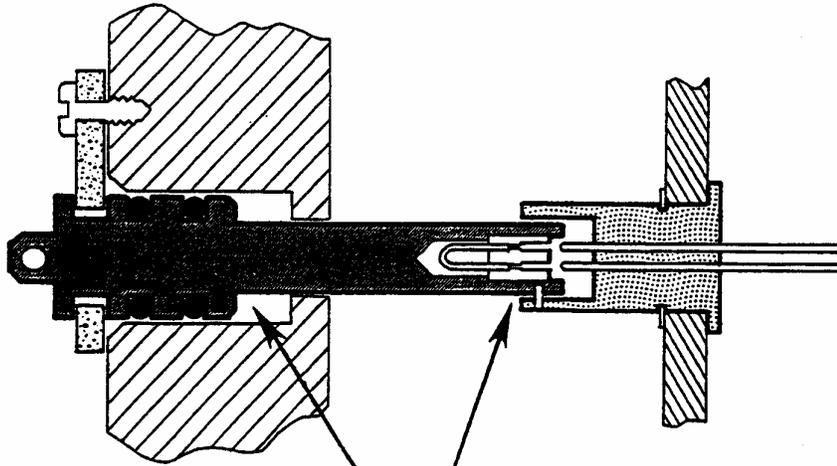
#### **Release Latch Inspection** (following high load in-air releases):

It should be routine practice after any release (air or water) to inspect the release latch and release latch pin for flatness. In the absence of the damping effect of water or if very high loads are released, the hook latch and release link exhibits significant dynamics. When testing the release in air, the hook and latch will strike one another. Slight bending of the latch or latch pin (a few thousandths of an inch) may occur. Bending greater than .002-inch in the latch or pin will impair the release performance and may warrant replacement of the bent part. To prevent binding during in-air tests, bond a 3/8-inch thick by 2-inch long strip of rubber to the hook. This will absorb the shock of impact when the latch strikes the hook. This is only necessary if a heavy load will be used for the test.

### **4 ON/OFF Option**

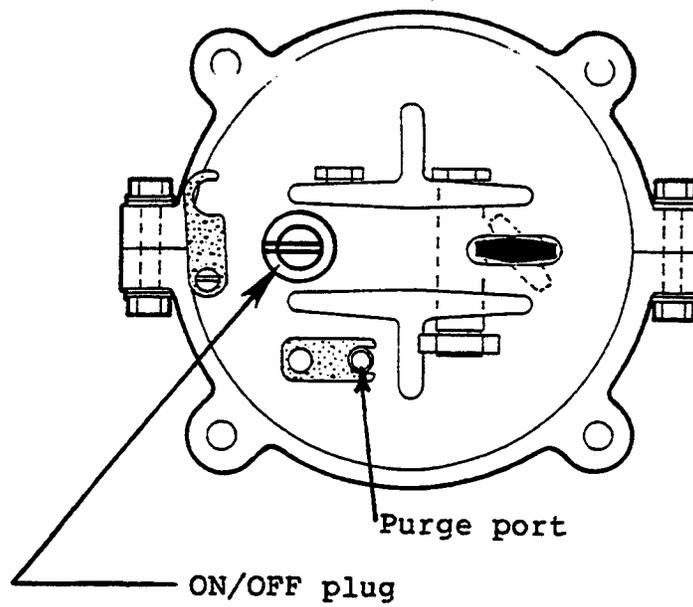
When the On/Off Option is included, the instrument may be fully prepared and sealed before powering the electronics. The power supply is an open loop until the on/off port plug is fully inserted. The on/off port plug is a keyed four-pin plug that closes the power supply circuit when it engages the connector inside the instrument. Proper alignment of the plug is with the 1/8-inch milled slot in the top of the plug pointed away from the center of the end cap. See Figure 11.

Note the plug is approximately flush with the end cap when the instrument is powered on (and the glass epoxy retainer is wrapped around the .19-inch diameter stub.) See figures 12 and 13.



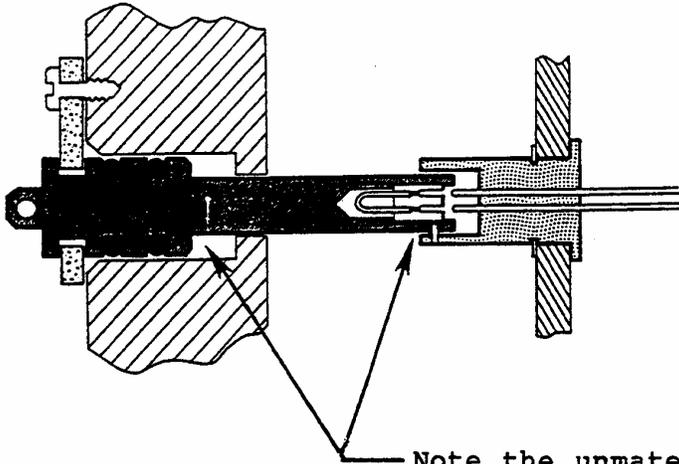
—Test port ON/OFF plug.  
 Note proper alignment of the "keyed" plug  
 which is necessary to engage the plug fully.

Figure 10



Purge port  
 ON/OFF plug

Figure 11



Note the unmated "off" configuration of the plug connector (with both O-rings fully engaged and glass epoxy retainer in last slot in plug).

Figure 12

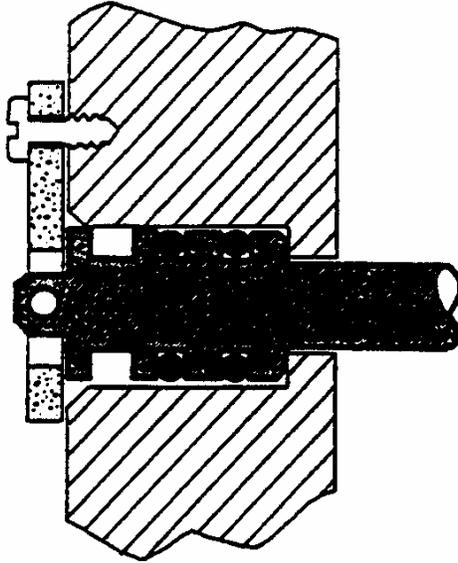


Figure 13

## **5. Air Acoustic 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, repeat the air acoustic test to assure proper engagement of the On/Off plug. 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 changed according to the command including status reply.

## **6. 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 and release sense switches. The 4 possible status replies are:

Upright and Not released: 15 pings at a 2 second rate.

Tilted and Not released: 7 pings at a 2 second rate.

Upright and released: 15 pings at a 1 second rate.

Tilted and released: 7 pings at a 1 second rate.

## **7. Battery Replacement:**

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.

## **7.1 Battery replacement considerations.**

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. ORE Offshore 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 be no more than one year old when placed in service. Cleanliness and careful inspection techniques should be employed when assembling the batteries into welded packs. Careful attention should be paid to purging the unit so as not to leave air or moisture inside before storage or deployment.

## 8. Parts Lists

The Parts Lists for the Model 8242XS equipment are presented below. The part number is followed by an assembly description. The column labeled "Part Number" is the ORE Offshore part number.

<b>PART #</b>	<b>DESCRIPTION</b>	<b>QTY</b>
<b>A980017</b>	<b>ASSY, TOP, 8242XS</b>	1
B9042-00243	ASSY,LINK,ANCHOR	1
B9042-00235	TOOL,ARMING	1
A4002-00028-2	CRATE,SHIPPING,8241/8242 REL	1
MANUAL-38241	Manual 8242XS Motor Driven	1
<b>C978001</b>	<b>ASSY, TRANSDUCER</b>	1
<b>D980015</b>	<b>ASSY, 8242XS RELEASE</b>	1
D9042-00237-2	HSNG,DEEP,MACH&PNTD,8242,20"LG	1
D9042-00210	WELDMENT,LIFTING SUPPORT	2
C9042-00026	CLAMP,ENDCAP,MACH. HT TREAT	2
24800-B2245	O-RING,BUNA N,70D	2
24800-B2240	O-RING,BUNA N,70D	2
24802-P8240	BACK-UP RING,PARBAK,8-240	2
B9042-00259	ASSY,ANODE,ZINC,2.00 X 1.75	1
22831-18T18	BOLT,HH,5/16-18 X 1.75	1
22831-18T22	BOLT,HH,5/16-18 X 2.25	4
22931-00N01	WASHER,5/16 X 3/4,SHLDR,NYLON	10
22931-00T01	WASHER,5/16IDX3/4ODX5/64T	10
23031-18T00	NUT,HEX,5/16-18,TI	10
3150-6377200-2	BUSHING,INSULATOR,0.07 THK	2
C980014	PCB Top Support	1
C980211	Battery Hold Down Bracket	2
C980012	8242 PCB MTG Bracket	1
A32174-001	Battery	1
51442X	6-32 Flat washer	8
514225	6-32 split lock washer	8
B9042-00209	Spacer, Lifting support	2
<b>C980161-003</b>	<b>ASSY, Electronics Board</b>	1
5100-1907232	Tilt Switch	1
C980102	Bart Board	1
<b>D980014</b>	<b>ASSY, RELEASE MECH</b>	1
C980000	Lower Mounting Plate	1
B980001	Drive Shaft	1
D980003	Pivot Arm	1

C980004	Re-arm Contact Plate	1
C980005	Re-arm Flag	1
D980006	Motor Mounting Plate	1
D980010	Release Arm	1
B980011	Spring	1
C980013	Battery Assy, Mt Plate	1
185116	Motor	1
D9053-00079	END CAP,LOWER,W/CLEVIS,MACH	1
C9042-00212	HOOK,RELEASE,MACHINED	1
B9042-00254	LATCH,RELEASE,LUBRICATED	1
B9042-00040	PIN,CLEVIS HOOK	1
B9042-00041	PIN,RELEASE LATCH	1
24800-B2014	O-RING,BUNA N,70D	2
B9053-00012	PLUG,DUMMY,FOR DIAG. PORT	1
22808-32N11	LATCH,SWITCH ACTUATOR	1
22808-32N11	SCREW,PAN HD,8-32X5/16 NYLON	2
B9042-00207	PLUG,PURGING	1
B9042-00215	PLUG,RETAINER	1
B9042-00222	NUT,CLEVIS HOOK PIN	1
B9042-00234	NUT,RELEASE LATCH PIN	1
24800-B2008	O-RING,BUNA N,70D	2
B9053-00076	SPRING,MAIN,RLSE MECHANISM	1
20707-11SM1	SWITCH SNAP-ACTION SPDT	2
20707-OJS31	ACTUATOR, TANDEM W/LEAF ROLLER	1
21016-13047	HOUSING, CONN, 4 PIN	1
509256	TERMINAL, CRIMP	4
B9053-00109	STANDOFF,MM 1/4-20 X .370	1
22713-THA15	SPACER,RD,MM 1/4-20 X 1.50 A	2
B9053-00089	SPACER,HEX,FF,3/8 X 1"	3
24800-B2110	O-RING,BUNA N,70D	2
24800-B2115	O-RING,BUNA N,70D	1
B9042-00034	RETAINER,O-RING	1
504319	SCREW,SET,8-32 X 3/8	1
B9053-00093	SHAFT,LUBRICATED T-RELEASE	1
2500-1704731	BEARING	1
23200-18716	ROLL PIN, 1/8DIA X 7/16 LG	1
504114	SCREW, PAN HD, 8-32 X 1/4	1
22825-20001	SCREEW, P100 FH, 1/4-20 X 1/2	1
B9042-00012	BUSHING, UPPER THRUST BEARING	1
B9053-00135	STANDOFF, MM 1/4-20 X .375	1
23200-TA815	BEARING, THRUST, 1/2" BORE	2
23200-RA815	WASHER, THRUST, 1/2ID X .03THK	4
23031-24002	NUT, LOCK, 5/16-24, NYL INSERT	1
B9053-00080	BUSHING, LOWER THRUST BEARING	1
513458	WASHER, LOCK, #8	1
22938-00N00	WASHER, FH, 3/8, NYLON	2

504238	SCREW, SET, 10-32 X 3/16	2
B9042-00248	RETAINER, HOOK, PIN	1
B9042-00249	RETAINER, LATCH, PIN	1
503622	SCREW 8-32 x 1/2 FH	3
501263	NUT 1/4-20	1
184063	SWITCH MINI	1
513492	4-40 SPLIT LOCK WASHER	6
170984	HOUSING, CONN, 4 PIN	1
185337	Shoulder Screw 8-32 x 3/8	1
185434	Shoulder Screw 8-32 x 1/8	1
185043	Flanged Bearing 3/16 ID, 5/16 OD, 1/4 lg	1
506605	4-40 x 1/4 FHCS	2
503878	4-40 x 1/4 PH	6
184349	6-32 x 1/8 SHSS	2

## 9. Tandem Release

Part # 9042-00266 Tandem pieces only







<b>PART NUMBER</b>	<b>DESCRIPTION</b>	<b>ITEM NO.</b>	<b>QTY PER ASSEMBLY</b>
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C9042-00264	TOP SPREADER,TANDEM	1	1
23200-CP116	COTTER PIN,1/8X1,CRES	2	2
22975-00200	WASHER,FLAT 3/4X1.75MAX OD,316	3	2
23038-10200	NUT, HEX, 3/4-10, 316	4	4
B9042-00263	BOTTOM SPREADER,TANDEM	5	1
22831-18T25	SCREW,HHCS,5/16-18X2.50,TITAN.	6	4
22931-00T01	WASHER,5/16IDX3/4ODX5/64T	7	8
22931-00N01	WASHER,5/16 X 3/4,SHLDR,NYLON	8	8
B9042-00265	INSULATING TUBE,TANDEM	9	4
23031-18T00	NUT,HEX,5/16-18,TI	10	8
A9042-00269	BUSHING,SHACKLE,TANDEM	11	2
B9042-00259	ASSY,ANODE,ZINC,2.00 X 1.75	12	1
22925-00201	WASHER,LOCK,1/4,316,SS	13	1
22925-00000	WASHER,FLT,1/4,316,SS	14	1
161497	SHACKLE,SAFETY,	15	4
161713	CHAIN,GALVANIZED,2FT.SECTION	16	1
161721	RING,WELDLESS	17	1
B9042-00266	TANDEM RELS, ASSY DWG	18	1