Shallow Water Release

Operating Manual

Rev. B

August 2004

Manual Part # 200603

SWR specifications

Mechanical:

Release mechanism	-	Motor driven rotary type w/thrust bearings
Load rating	-	100 lbs (45 Kg) working
	-	400 lbs (181 Kg) ultimate
Depth rating	-	656 ft (200 meters)
Est. collapse depth	-	1968 ft (600 meters)
Length	-	17.8” (45.2cm) tip to tip
Diameter	-	3.0” (7.6cm) housing tube
		3.5” (8.9cm) collars
Weight in air	-	5.2 lb. (2.35 kg)
Weight in water	-	1.06lb (0.48 kg) EST.
Exposed materials:	-	Acetal (Pressure housing etc.)
		NiAlBz (shaft and bushing)
		Buna –N (O-rings)
		Ultem plastic (release link)
O-rings	-	2 each, size -144, 70D Buna-N
O-rings	-	2 each, size -141, 70D Buna-N
Back up rings	-	2 each, size -141
O-ring	-	1 each, size – 2-018
O-ring	-	1 each, size – 2-011

Electrical:

Receiver sensitivity	-	-100 dB re-1uPascal-meter
Command freq. band	-	(9.3 – 10.7) kHz
Pre-filter bandwidth	-	1.5 kHz
Post filter bandwidths	-	300 Hz
Quiescent current	-	250 microampere typical
Peak motor current	-	2.5 A
Power supply	-	12v alkaline welded battery pack
		(ORE offshore P/N A980146)
Deployment life	-	1 year and 40 releases

SWR (Shallow Water Release)

The ORE Offshore SWR is a low cost, light weight, shallow water acoustically actuated mechanical release designed for use in a variety of coastal mooring and platform applications. The SWR utilizes the same command code structure and high sensitivity receiver circuits that are used in all ORE and EdgeTech acoustic releases. This coding structure "Binary Acoustic Command System" (BACS) has been proven to be both highly reliable and secure. The SWR is packaged in a corrosion impervious housing, constructed entirely of Acetal, it has a depth rating of 200 meters with a large safety factor. The release mechanism is rated for a working load of 100 lbs, with an ultimate load rating of 400 lbs.

Opening the SWR: The transducer, electronics, battery pack and retaining ring are all mounted to the top end cap of the SWR (see fig. 2). A cable connects the release motor assembly on the bottom end cap to a header on the SWR circuit board. To open the SWR, grasp the housing in one hand and the top end cap collar in the other (see fig. 1). Twist the collar counterclockwise, unscrewing it completely, set the collar aside. Grasp the top end cap and carefully pull it out of the tube and disconnect the cable leading to the motor assembly. Set the bottom end cap/housing aside, for normal use the bottom end cap does not need to be removed. If performing annual maintenance, remove the bottom end cap assembly in the same manner as the top, being careful not to score the housing throat when pulling the bottom end cap free. If the unit has been recently deployed, be careful not to get any residual water droplets on the PCB while removing the end cap assemblies.

Turning the SWR on: Unless otherwise requested, all SWR are shipped with their batteries disconnected. To turn the unit on, open the housing as described above, locate the battery connector and mating PCB header (see fig. 2), and plug the battery into the header. There is no power switch, mating the connector turns the unit on. Note: when mating the connector, do it in a smooth continuous motion. Making and breaking the connection in rapid succession could conceivably cause the microprocessor to start in an undefined mode.

Turning the SWR off: To turn the SWR off, open the housing as described above, locate the battery connector and mating PCB header (see fig. 2) and unplug the battery from the PCB header. There is no power switch, disconnecting the battery turns the unit off. If the unit has been recently deployed, be careful not to get any residual water droplets on the PCB while removing the top end cap assembly.

Battery replacement: To replace the SWR battery pack, first open the unit as described above. The battery pack is held in by a retaining bracket that is attached to the far end of the circuit board (see fig.2). Remove the two #6 pan head screws from the retaining ring then remove the retaining ring from the end of the battery pack by pulling in the direction of the long axis of the pack. The opposite end of the pack is nested in a milled cutout in the top end cap. Pull the battery pack straight out of cutout in the end cap. Dispose of old battery packs in accordance with all applicable guidelines regarding Alkaline

Magnesium battery disposal. To install a new pack simply reverse the above procedure. If the unit has been recently deployed, be careful not to get any residual water droplets on the PCB while removing the top end cap assembly.

Testing the SWR: After turning the unit on, or after replacing the battery pack, prior to deployment, it is important to test the unit to ensure it is operating correctly. SWRs are supplied with a single command code, ARM/RELEASE, when this command is received the SWR will toggle between its released and armed positions. A bi-directional motor circuit senses the position of the release shaft and either arms or releases the SWR. Using an appropriate deck unit, send the SWR the appropriate ARM/RELEASE command and verify the unit is fully functional. All ORE and EdgeTech deck unit models 8011, 8011A, 8011B, PS8000, AMD200 are compatible with the SWR.

Release link: The SWR is shipped with an expendable, engineering plastic release link. (see fig. 4) It is strongly recommended that this link be used with the SWR. Substitution of an alternate type of release link may lead to failure. It is of particular importance that no dissimilar metal come in direct contact with the release mechanism. When delivered with a Pop-Up recovery system the link is not included and the shaft used in the Pop-Up is made of the same alloy as the release mechanism.

Maintenance: The SWR requires minimal maintenance, aside from periodic o-ring and battery replacement. When changing o-rings make certain that the o-rings are installed on the high pressure side of the glands. The back rings, which help support the o-rings, should be installed with the curved side facing the o-ring. It is not necessary, or desirable to polish the bronze release mechanism components. The passivation layer that builds up on the bronze helps to protect the material. Depending on deployment conditions, it may be desirable to clean the instrument housing with a mild detergent.

Figure 1

Figure 2

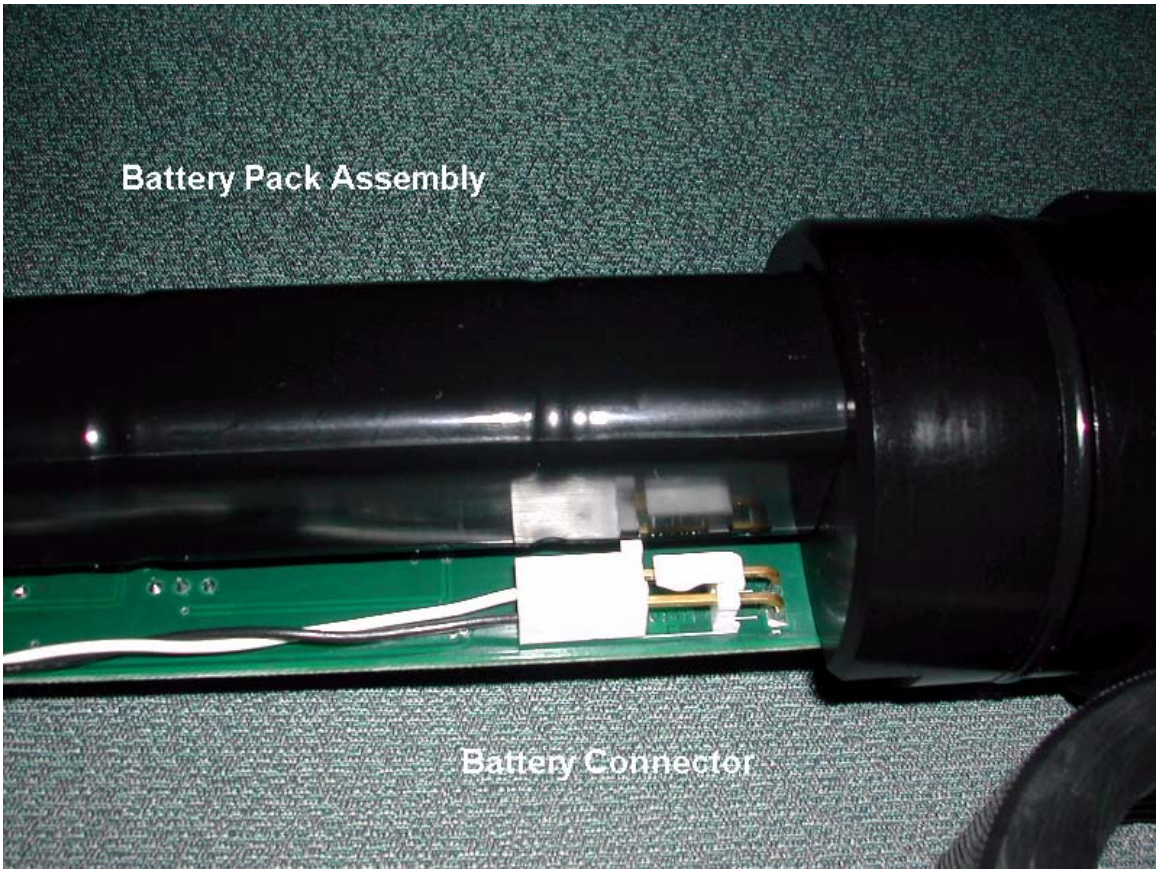


Figure 3

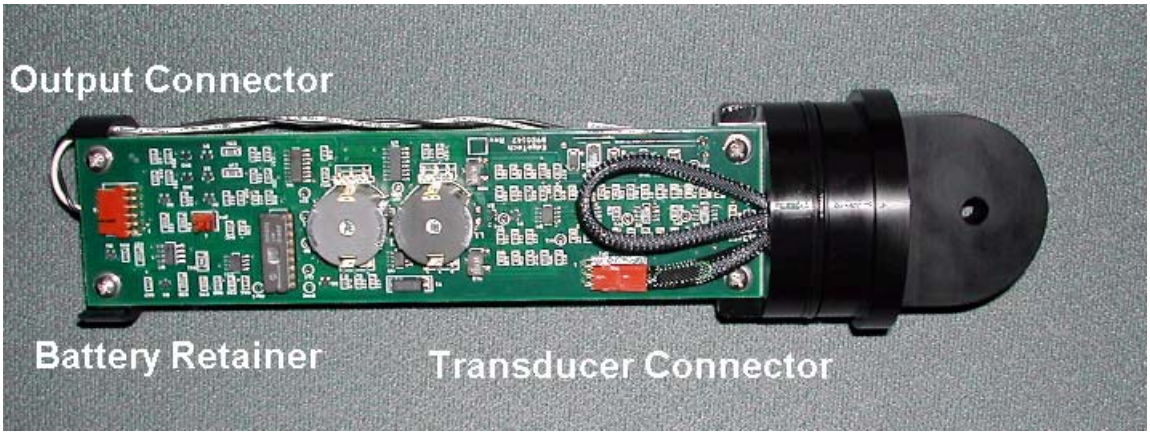
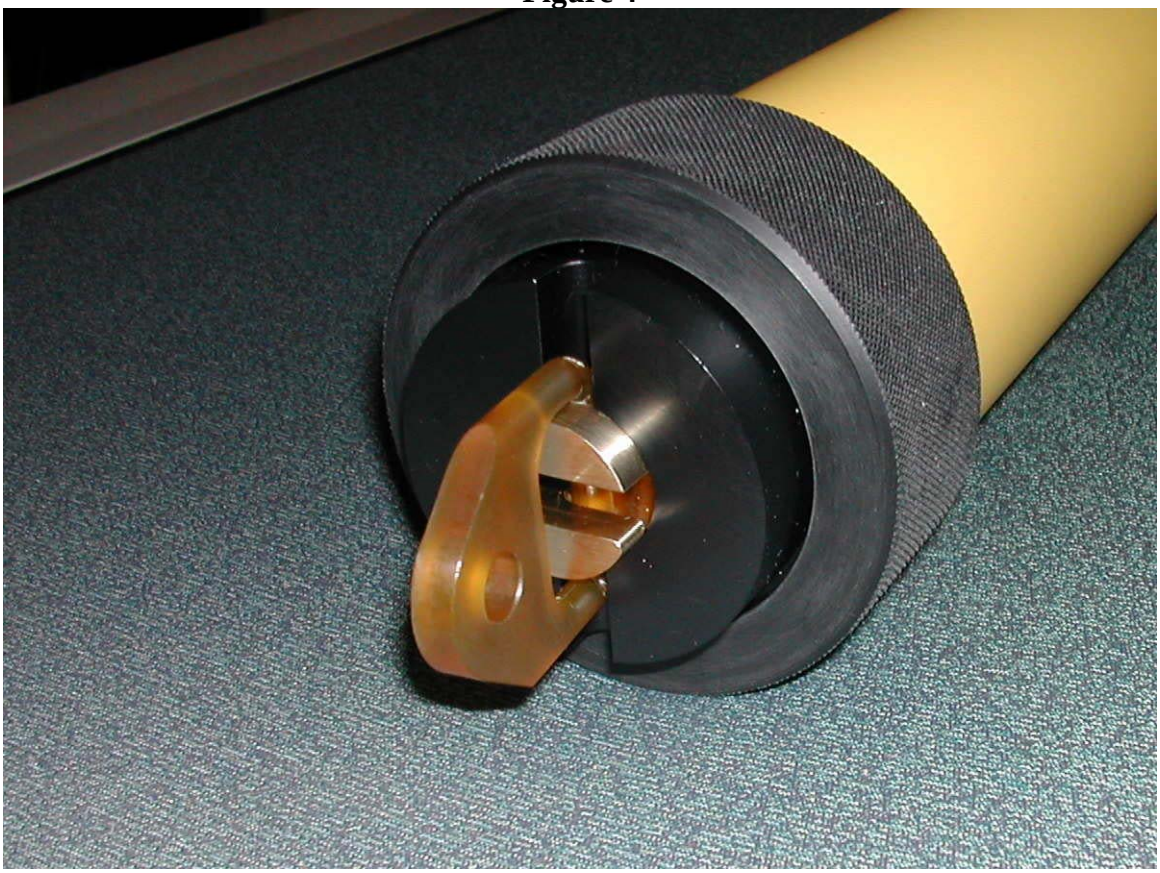


Figure 4



SWR electronics description:

EdgeTech PCB assembly P/N B980142 Rev-A

PCB size	-	2.00” x 8.00” x 1.08” w/ 4 each, 0.169” dia. mounting holes
Operating voltage range	-	9 – 12v nominal
Current drain	-	250uA typical
Receiver sensitivity	-	-100dB re-1uPascal-meter
Detector bandwidth	-	300Hz

PCB assembly B980142 has been designed to function as the complete electronic package for a receive only, motor driven acoustic release. This circuit board incorporates the same high sensitivity acoustic receiver and tone detectors that are used in EdgeTech’s high performance deep water releases. The PCB also incorporates the additional circuitry and software required to maintain accurate control of the release motor shaft position.

Receiver: The receiver is made up of a three stage, micro power series of amplifiers that yield 80dB of gain in the frequency band of interest. The first stage is a diode protected, wide band differential amplifier. The transducer input is designed for a floating piezo element that is connected to the electronics by a twisted shielded pair of conductors. The second stage is a multiple-feedback band pass filter with a Q of approximately 13, centered at lower command tone frequency. The third stage is a similar multiple feedback band pass filter that is centered at the upper command tone frequency. The resultant transfer function is reasonably flat in the pass band with good attenuation of out of band signals.

Hard limited Amplifier: The received signal is hard limited before being fed to the tone detectors. This is done to reduce the influence of received signal level on detection time. The hard limiter is composed of a micro power comparator and a micro power reference diode. The comparator is configured with approximately 50mV of hysteresis. This provides sufficient noise immunity to bring the detectors operation slightly above the noise floor of the receiver. The output of the comparator drives a 2.5v reference diode on and off. The reference diode assures that the square wave signals amplitude is both temperature and supply voltage independent.

Tone detector: The command tone detectors are high stability, narrow band, L-C filters that are used to detect the presence of command tones in the hard limited signal. These filters are 300 Hz wide and integrate the signal for approximately 3.5mS. before validating the tone. The 3.5mS. integration plus the approximately 1.5mS. rise time of the receiver requires that the command tone be present for a minimum of 5mS. before it is detected. Note: BACS command tones pulse widths are on the order of 20mS. This is because the decoding algorithm requires the presence of the tones over a relatively wide window.

Command decoding: Command codes reside in, and are decoded by the firmware running in a RICS (reduced instruction code set) microprocessor. Processor synchronization, timing and decoding of commands can be monitored at the “SYNC” test point.

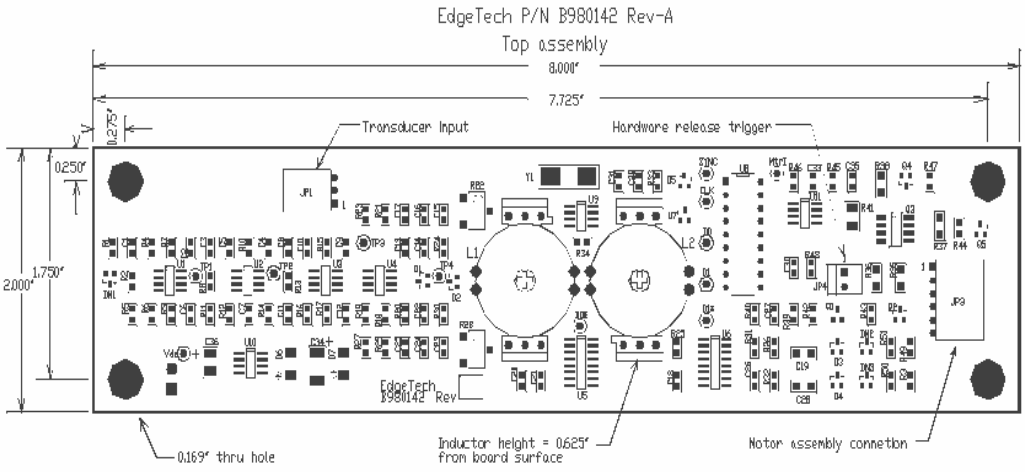
Release/Arm command execution: When a unit’s specific Release/Arm command is decoded by the processor it attempts to rotate the release shaft 90 degrees in the appropriate direction. The motor is mounted on a block that contains two micro switches and a motor / release shaft coupling. The shaft coupling has two flats on it that have been machined at 90 degrees from each other. The switches in the mounting block are oriented 180 degrees from each other. Shaft position control is achieved by monitoring the switch states, supply voltage and motor current. When the Release/Arm command is decoded the processor looks at the state of the shaft position switches and determines whether it is in the armed or released position. The processor then turns the motor on and attempts to drive the release shaft to its alternate position. Motor direction is controlled via a bi-polar “H-bridge” transistor array. The motor current is monitored via an excess current sensing circuit. This has been implemented to protect the unit from damage in the event the release shaft becomes jammed by use of a non-standard release link while

arming the unit. If the processor detects an excess current situation it will stop, reverse direction and attempt to return to its starting position. The voltage applied to the motor is digitized by the processor and used to determine a correction factor for stopping the motor in the correct shaft positions.

Release/Arm hardware execution: Connector JP4 on the circuit board can be used to hardware initiate the Release/Arm function. A contact closure on this two pin connector will be treated by the processor a Release/Arm request. This feature has been added to facilitate test, shaft position calibration and external instrument actuation.

Batteries: This unit is intended to be powered by two, diode OR'ed stacks of eight AA alkaline batteries (nominally 12v). When the batteries are configured as a 2 x 2 x 4 cell long pack, the PCB, top end cap and retaining bracket form a rugged electronics assembly. The retaining bracket also serves to center and stabilize the assembly within the ID of the instrument housing. This battery pack will provide power for a 1 year deployment or 800 release/arm cycles with a large safety factor.

Figure 5



Appendix A
C980263, SWR POP-UP MANUAL ADDENDUM

The SWR pop-up system combines a SWR acoustic release, a buoyant line canister and a recoverable bottom plate to form a simlpe, easy to use line recovery system. The line canister is a syntactic foam filled PVC shell with a center tube that the release is mounted in. The canister has enough storage space for 45 meters of 3/8" double braid nylon line. Line capacity is dependant on line diameter, construction and material. The line is held captive by a recoverable bottom plate that is held in place by the release. The buoy is nominally 15 pounds buoyant, this can be easily increased by attaching additional floation to the top pad eye of the release.

Refer to drawing # C980263 while reading these instructions

Installing the SWR in the canister:
The SWR acoustic release is held in place in the center tube of the canister by its threaded end cap retaining collars. To install the SWR in the canister:

- Turn the release ON, command it to it's released state if needed.
- Remove the release endcaps retaining collar.
- Slide a # 2- 337 O-ring (item 16), up along the housing until it is resting behind the transducer endcaps retaining collar. This is used as a cushion to provide some "give" to the assembly.
- Insert the SWR into the center tube of the canister.
- Screw the release endcaps retaining collar on tightly while holding the transducer endcaps retaining collar.

Packing the pop-up canister with line:
The SWR pop-up system was designed to work with a recovery line that has a soft loop spliced in one end and a thimble spliced at the other end. The soft loop is used to attach the line to the canister, the thimble is used to connect to the lifting point.

- Pull the soft loop thru the 1" diameter line tube in the canister.
- Push the clevis pin thru the soft loop pinning it to the top of the line tube (items #17 & 15). Secure the clevis pin by insertind and bend the cotter pin in the clevis pin. This provides a way to easily disconnect the recovery line for winching, service, etc.
- Pull the recovery line out straight to remove any kinks or twists in it before packing it into the canister.
- Invert the canister, allow it to rest on the SWR's top pad eye.
- Pack the line in the canister by randomly "flaking" the line around the center tube / release. Avoid coiling the line or attempting to lay it in a pattern. As the volume of flaked line builds up, compress it by firmly pressing down.

Closing the canister:
The end of the lifting line that has been terminated with a thinble exits the canister thru a narrow slot that has been milled in the cover plate. To prevent the line for being pulled out of the canister a stop must be used on the line. The recommended method is to bend

a tight loop in the line, close to the thimble and secure the loop with a tiewrap. This method secures the line in the canister without reducing the load capacity of the line.

Packed line canister

Lifting line stop

Note: Do not use tie-wraps with metal tabs in them.

Closing the canister (continued):

- Bend and tie wrap a rope stop in the lifting line as described above.
- Slide the lifting line into the slot in the cover plate, the stop should be resting against the inside face of the cover.
- Ensure that the release is in its released state, send its release command if nessesary.
- Place the cover on the canister, the slot in the cover should be aligned with the weld bead on the side of the canister canister. The bronze rod in the center tube of the cover plate assembly should align with the slot in the SWR's release mechanism. It may be nessasary to rotate the release in the tube to align it with the cover.
- Press down firmly on the cover, ensure that the bronze rod is fully seated in the release mechanism's slot.
- Send the release command to the SWR to arm it while pressing down firmly on the cover plate.

You will observe that the SWR's release mechanism rotates 90 degrees and grasps the bronze rod. The cover is now held firmly in place, the canister can be moved without having the line fall out.

Transfering the load:

To prevent loss of the canister cover or damage to it, the cover is isolated from the load with a short piece of chain. The top of the chain is bolted to the cover, the lifting line is shackled to the mid point of the chain and the actual load attachment point in the bitter end of the chain.

- Place one of the 5/16 galvanized washers on the 5/16 bolt (items 6 & 11).
- Slide the bolt half way thru the hole for it in the cover plate assembly.

- Slide one end of the 5 link long piece of chain (item 8) over the 5/16 bolt.
- Slide the bolt the rest of the way thru the cover plate assembly, secure it with a lock washer, flat washer and nuts (items 11, 13 & 14). The bolt is double nutted so that it does not have to be tightend agaist the plastic tube in the cover plate.
- Shackle (item 7) the thimble on the lifting line to the middle link of the chain. Secure the thimble with the cottter pin provided.

The load recovery point is the far end of the chain, use a shackle to attach to the last link on the chain to the lifting point.