SPECIFICATIONS

Transmitter Output: . . . . . 100 milliwatts, pulsed 1 Khz FM

Transmitter Duty Cycle: . . . . . Approx. 33%, 2 sec. on,4 sec. off

Harmonics: . . . . . -37 db minimum

Battery Life: . . . . . 8 days @ 4°C *(see Battery Life section)*

Batteries: . . . . . 4 alkaline "C" Cells

Operating & Storage Temperature Range: . . -40°C to +60°C

Ocean Depth Rating: . . . . . 7,300 metres (24,000 feet)

Frequency Range: . . . . . Channel A 154.585 MHZ
Channel B 159.480 MHZ
Channel C 160.725 MHZ
Channel D 160.785 MHZ
For other frequencies contact factory.

Industry Canada Identification: 9084

FCC Identification: FOX4ZLRF700AR

Range: . . . . . 4 to 6 miles (see page 4).

Antenna: . . . . . field replaceable 1/4" wave whip
zinc anode protected

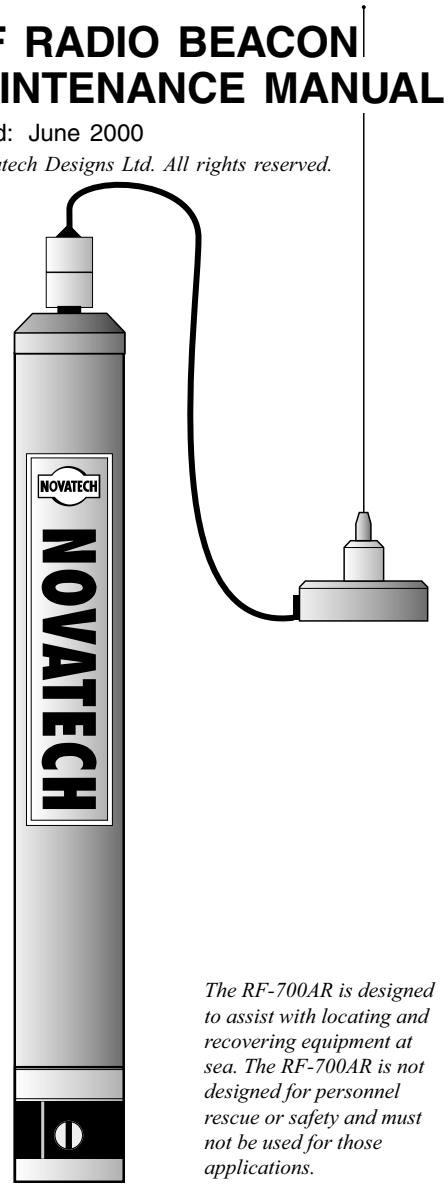
Materials: . . . . . 6061-T6 aluminum hard anodized to
Mil Spec A8625, Type 3.

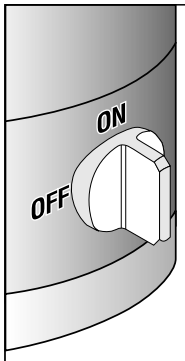
Weight with Batteries: . . . . . In water 2.1 lb. (.95 kg)
In air 3.6 lb (1.6 kg)

Pressure Case Dimensions: . . . . . 18.5" long (47O mm), 1.7" Diameter (43 mm)

RF-700AR VHF RADIO BEACON
OPERATION & MAINTENANCE MANUAL

Revised: June 2000





Pressure Switch with Manual ON/OFF Control

Innovative design combines pressure switch and manual on/off switch

The RF-700AR is designed to assist with locating and recovering equipment at sea. The RF-700AR is not designed for personnel rescue or safety and must not be used for those applications.

NOVATECH DESIGNS LTD.
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INTRODUCTION

The RF-700AR is a self-contained submersible Radio Beacon designed to assist in the location and recovery of underwater oceanographic equipment. It may be submerged for long periods in ocean depths to 7300 meters (24,000 feet). The activation of the RF-700AR is completely automatic, when submerged below 10 meters it is OFF and at the surface it is ON.

At the surface the beacon transmits a pulsing RF signal for approximately 8 days.

UNPACKING

Be sure to check shipping container for any signs of damage that might have damaged the contents. Report any such damage to the carrier.

CAUTION: During unpacking and installation be sure not to damage the cable. A nick or cut can lead to eventual failure.

OPERATOR WARNINGS

PRESSURE CASE

As with any sealed pressure case, the contents could be under pressure due to battery or seal failure. This could expel the batteries when the Pressure Switch is removed. To be safe, always point the open end away from you and always remove the Pressure Switch first. The Pressure Switch is designed to vent any internal pressure when it is being removed. If a battery is trapped in the case take extreme care, there could be a pressure buildup behind it and the battery could be expelled at any time.

QUICK START

1. The RF-700AR is shipped with batteries installed.
2. Connect the Remote Flasher cable plug and secure locking sleeve.
3. Install antenna.

CUSTOMER SERVICE

If you have any questions or problems, please contact the factory. We are available to assist Monday to Friday 8:00 a.m. to 5:00 p.m.

Telephone: (902) 468-7275
Fax: (902) 481-5538
E-mail: sales@novatechdesigns.com.

WARRANTY

Novatech Designs Ltd. guarantees this product to be free from defective materials and workmanship and agrees to remedy any such defects for a period of 1 year commencing from the date of purchase. ***The Pressure Switch is guaranteed for 2 years, excluding corrosion damage.***

This warranty does not apply if the equipment has been subject to misuse, neglect, accident or improper installation, or altered outside our factory, or to damage caused by defective batteries. Novatech Designs Ltd. neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with this product, including damage resulting from design or equipment failure.

CORROSION PREVENTION

Corrosion is a problem common to all metals used in the ocean. To help minimize corrosion damage, the ST-400AR is made with 6061-T6 aluminum and is hard anodized; it is also fitted with a Zinc Anode. If the Zinc is more than 50% wasted, replace it with part no. ZN-100. If the anodized surface is damaged, pitted or gouged, protect it against further corrosion by applying tape, paint, or fast cure epoxy.

Several precautions can be taken prior to deployment to further minimize corrosion:

- Do not mount the flasher against metal.
- Wrap the entire flasher with vinyl tape. Take care not to cover the hole in the bottom of the Pressure Switch or the Zinc Anode.
- Prevent the anodized surface from being scratched or damaged. Damage to the anodized surface can cause pitting.

LICENSING REQUIREMENTS

Canada

An individual mobile radio station license is required for each beacon. Contact your local Industry Canada office. The Novatech certificate of technical acceptability number for the RF-700AR is 9084 for the frequency range 150.800 to 160.785 MHZ.

United States

A radio license is not required for the RF-700AR beacon if it is for commercial use and is being used with a ship with a radio station license. The FCC I.D. number for the RF-700AR is FOX4ZLRF700AR. Approved frequencies are: 154.585, 159.480, 160.725, and 160.785 MHZ.

Other Countries

Consult local radio licensing authorities.

4. Check that the Pressure Switch is secure, clockwise finger tight. Also check that the connector end of the Pressure Case is secure, clockwise finger tight.
5. Turn Pressure Switch knob to ON position
6. Turn on DR-400 DF Receiver or other receiver tuned to the correct frequency and check that there is a pulsing signal
7. RF-700AR is ready to be deployed

INSTALLATION

Various installation factors can affect the performance of the RF-700AR. Install the antenna base on your equipment in a location that will ensure that at the surface the antenna will be vertical and well out of the water. Keep the whip antenna clear of metal obstructions, nearby metal can absorb some of the R.F. energy, reducing the range.

CABLE & CONNECTORS

The following handling procedures should always be adopted when using **any** underwater cable or connector. Handling of cables and connectors is often overlooked but it is the major cause of premature RF-700AR failure.

- Ensure the connectors are lubricated – sparingly, we prefer Parker Super O Lube
- Any sand or mud in the female connector must be flushed out before use
- Do not disconnect by pulling on the cable
- Avoid sharp bends at cable entry
- Avoid angular loads on bulkhead connectors, over time this can destroy the neoprene to metal seal
- Pull straight when disconnecting, not at an angle

REMOTE ANTENNA BASE

CAUTION: When installing, be sure cable is slack where it enters the antenna base. A strained cable at that point can lead to a cable feed-through failure.

The Remote Antenna has been designed to operate without a ground plane so it can be mounted on any surface, metal or non-conductive. A metal surface may improve performance slightly. Do not coil the feed wire; this can reduce the signal strength.

There are two ¼" mounting holes on the Remote Antenna Base. The head of the mounting bolt **must not** touch the antenna.

PRESSURE CASE

When mounting the pressure case take care to prevent any side loading on the Pressure Switch or the top end Delrin bulkhead cap. Over time, side loading on those parts can cause a leak. ***Never attach anything to the two mounting screws on the Pressure Switch Zinc anode.***

To minimize corrosion never mount the pressure case directly to metal. Isolate the pressure case by wrapping it with vinyl tape at the contact points.

ANTENNA SELECTION

The RF-700AR is supplied with a ¼ wave whip antenna, part no. AN-701, and a low profile antenna, part no. AN-710. Install either antenna on the stud on the top of the antenna base and secure finger tight only — **do not use a wrench**. The ¼ wave antenna is suitable for long submersible deployment; the low profile antenna is not.

The ¼ wave antenna has a small zinc anode attached near its base to protect it from corrosion, replace the antenna when the zinc is wasted. If the antenna does get damaged or broken off, the RF-700AR is designed to still provide a very useful range of 1 to 3 miles.

OPERATING INSTRUCTIONS

BATTERIES

The RF-700AR uses 4 Alkaline "C" cells for approximately 7 days of operation. To replace batteries remove the Pressure Switch and install fresh batteries with the positive terminal towards the antenna. The circuit is reverse polarity protected. Rechargeable batteries are not recommended. Always remove and discard batteries when the RF-700AR is not in use**.**

TURN ON & OFF

A manual ON/OFF switch is incorporated in the Pressure Switch. To turn the Beacon ON or OFF, rotate the knob as shown in Figure 1.

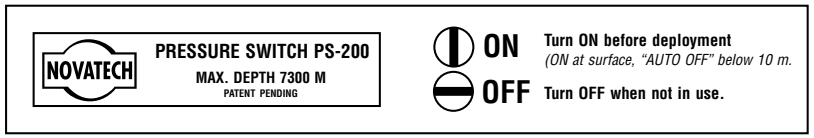

Figure 1. PS-200 Label

3. Make sure the PS-200 Pressure Switch is in the **upright position** (Cup Seal up, spring down); this will make sure a small internal pin will not fall out. **Do not lose that pin.**
4. Carefully pry off the rubber Cup Seal, do not scratch the Cup Seal or the mating "O" ring surface.
5. Observe the S.S. Flat Spring and note how it is installed.

Lubrication

1. Clean all surfaces and the Cup Seal.
2. Lubricate (very lightly) the "O" ring shaped portion of the Cup Seal and the mating aluminium surface with silicone grease (Parker Super O Lube). **Do not spread the silicone grease anywhere else. Excess silicone grease can cause the Pressure Switch to fail**.

Reassembly

1. Be sure the small pin is in place
2. Place the Stainless Steel Flat Spring back in its correct position
3. Install the Cup Seal and rotate the Cup Seal ¼ turn to make sure it is seated correctly
4. Test the operation by pressing the Cup Seal with your finger and listen for the micro switch clicking as you press down firmly
5. Thoroughly lubricate the outer portion of the Cup Seal
6. Make sure the Delrin Knob carrier is clean and lubricated
7. Install the Delrin carrier
8. Lubricate the two socket head cap screws
9. Install Zinc Anode and secure with the two socket head cap screws. It will be necessary to rotate the Delrin knob carrier to line up the threaded holes in the aluminum body

Testing

1. Install the PS-200 on your equipment

2. Make sure the Unit is ON when the PS-200 ON/OFF knob is in the ON position

3. Make sure the Unit is OFF when the PS-200 ON/OFF knob is in the OFF position

surface. The best way to prevent a problem is to service the "O" rings before every deployment.

Some of the main factors that can cause a "set" are:

- High storage temperature (exceeding 40ºC) over time will cause the rubber to harden
- Exposure to sunlight and ozone will cause the "O" ring to deteriorate and stiffen
- Temperature does not have to be that cold for an "O" ring to lose a great deal of its flexibility. At 4ºC, an "O" ring has stiffened significantly.
- "O" rings must be lightly lubricated with silicone- based grease. We recommend "Parker Super O Lube"
- A typical seal failure results in a very small amount of water, not a flooded case. Most seal failures occur near the surface
- The "O" ring becomes less flexible as the rubber ages
- If you are operating or storing at low temperature, it makes it even more important to service the "O" ring regularly

"O" RING MAINTENANCE

Novatech strongly recommends that "O" rings be serviced on a regular basis to ensure a reliable seal. **Remove and lubricate at least once a year or sooner and replace every two years or sooner**. With regular maintenance, "O" rings will be very reliable and trouble free. It has been, however, our observation that most "O" rings are neglected for years and expected to perform at the extremes of their design limits.

There are two "O" rings and a Cup Seal to service. The "O" rings are at the top end of the Pressure Case and on the Pressure Switch, the Cup Seal is on the Pressure Switch. Replace the two "O" rings with Parker #218 or equivalent available from Novatech or your local "O" ring supplier. Lubricate lightly with a silicone grease, we recommend Parker Super O Lube. Instructions for the lubricating or replacing the Cup Seal are below.

PRESSURE SWITCH CUP SEAL

The Cup Seal must not be overlooked when lubricating the "O" rings. The Cup Seal should be lubricated every year and replaced every two years or sooner. Lightly lubricate the Cup Seal by performing the following procedure:

Disassembly

1. Remove the two socket head cap screws on the Zinc Anode.
2. Withdraw the Zinc Anode and the black "Delrin" Knob Carrier.

Prior to deployment or testing, check that the pressure switch is secure by turning it fully clockwise, finger tight. **FAILURE TO SECURE PRESSURE SWITCH CAN RESULT IN A FLOODED RADIO BEACON**.

TEST OPERATION

The following quick test verifies the RF-700AR is functioning properly.

1. Turn Pressure Switch knob to ON
2. Turn on DR-400 DF Receiver or other receiver tuned to the correct frequency and check that there is a pulsing signal
3. Turn Pressure Switch knob to OFF and pulsing signal stops
4. RF-700AR is ready to be deployed

DIRECTION FINDING RECEIVER

Any Direction Finding Receiver that tunes the 154 to 161 MHZ range may be used to locate the RF-700AR. NOVATECH supplies the hand-held DR–400 D.F. Receiver.

When selecting a receiver or when ordering the RF-700AR, one factor must be considered. Direction Finding Receivers requires a certain amount of time to lock on to a signal, the NOVATECH DR-400 needs less than ¼ second, while some older shipboard D.F. Receivers need almost 2 seconds.

The RF-700AR is normally shipped with a duty cycle (D/C) of 2 seconds ON and 4 seconds OFF. That duty cycle will work with virtually all D.F. receivers. If you are using the DR-400 D.F. Receiver ONLY, then the ¼ second ON and 1.5 second OFF duty cycle works best. To change duty cycle refer to "Adjusting Duty Cycle" on page 7. When using a ship's D.F. Receiver, test it before you head out.

If you plan to use the ship's D.F. Receiver be sure to check that it is operating properly.

RANGE

Range of the beacon is essentially "line of sight". To maximize range the beacon and D.F. Receiver should be as high as possible.

One can expect a minimum range of 4 miles working to a Zodiac, and 4 to 6 mile range if you are on the deck of a vessel 25 feet off the water.

The following formula can be used as an approximate guide for range: (beacon at surface)

$$\text{RANGE (Miles)} = \sqrt{H \times 2}$$

Where H = height of D.F. RECEIVER antenna in feet above water surface

ADJUSTMENTS

ADJUSTING THE DUTY CYCLE (D/C)

Novatech beacons are set at the factory to cycle ON and OFF; this is called the duty cycle. The standard duty cycle is approximately 2 seconds ON, 4 seconds OFF. The supplied duty cycle is posted on the serial number label.

It is strongly recommended that a performance check be done to verify compatibility with your direction-finding receiver. If the duty cycle is not compatible, then changing the dipswitch settings as shown in Table 1 can alter it. To gain access to dipswitch on the transmitter board, grasp the antenna cap and rotate counterclockwise. DO NOT use a wrench to either loosen or tighten the cap. Just finger tight when re-installing.

DUTY CYCLE	SWITCH	SETTING
2 sec. ON **15 sec. OFF** Approx. battery life 20 days	4	OFF
	3	OFF
	2	OFF
	1	OFF
2 sec. ON **4 sec. OFF** Standard Setting Approx. battery life 8 days	4	OFF
	3	ON
	2	OFF
	1	OFF
.25 sec. ON **1.5 sec. OFF** Preferred setting for DR-400 Approx. battery life 15 days	4	OFF
	3	OFF
	2	ON
	1	ON
Continuous ON (for test purposes only)	4	ON
Pulse Operation (normal)	4	OFF

Table 1. Duty Cycle Switch Settings

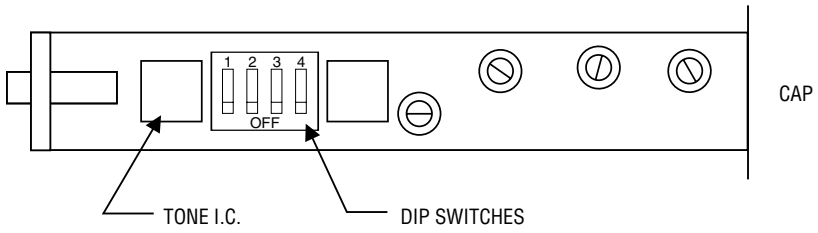

Figure 2. Transmitter Board

CRYSTAL REPLACEMENT

The crystal is shock mounted to ensure long life. Do not interfere with its mounting, it must be free to move. If it is badly aligned, that is an indication that the beacon has been severely banged or dropped. Re-position it so it is close to the board on its shock pad and parallel to the side of the board. Crystal replacements are available from the factory. They may be installed without re-tuning.

MAINTENANCE

There are no user repairable parts in the Remote Head or the Pressure Case. Return both units to the factory for repairs.

REGULAR MAINTENANCE

- Rinse thoroughly with fresh water after every use
- Always remove batteries when not in use
- Always use fresh batteries
- Protect “O” ring surface from damage
- Replace worn or damaged “O” rings
- Keep batteries and electronics dry

“O” RING FACTS

“O” rings don’t last forever; two to five years is a conservative estimate.

The main problem with “O” rings is that over time they can take a “set”. They lose their original round shape and they become slightly flattened resulting in less squish. Reduced squish can lead to a water leak near the