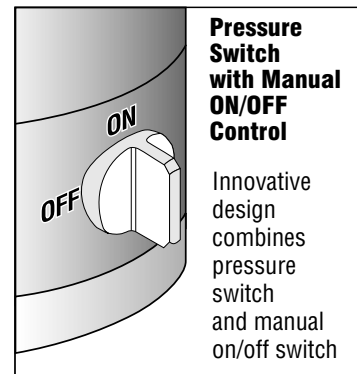


ST-400AR XENON FLASHER OPERATION & MAINTENANCE MANUAL

Revised: June 2000

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The ST-400AR is designed to assist with locating and recovering equipment at sea. The ST-400AR is not designed for personnel rescue or safety and must not be used for those applications.



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INTRODUCTION

The ST-400AR is a self-contained submersible Xenon Flasher designed to assist in the location and recovery of underwater oceanographic equipment. It may be submerged for long periods in ocean depths to 7300 metres (24,000 feet). The activation of the ST-400AR is completely automatic, when submerged below 10 meters it is OFF and at the surface it is ON at night only.

At the surface, the ST-400AR “double burst” flashes for approximately 7 days at night only and visual range is up to 3 miles at factory settings.

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.

HIGH VOLTAGE

The internal DC/DC converter power supply generates up to 410 volts DC and that passes through the cable to power the Remote Flasher, always observe the following:

- Never operate flasher with a damaged remote flasher head cable. A damaged cable could be a shock hazard.
- Never submerge with remote head cable disconnected.
- Whenever accessing the power supply board wait at least 1 minute before touching any parts of the circuit.

SPECIFICATIONS

Flash Tube:	Replaceable — rated for 20×10^6 flashes
Flash Rate:	adjustable 14/minute to 60/minute $\pm 5\%$ over 3 to 6 volt battery life (factory set at 20/minute)
Visible Range:	adjustable 2 to 4 nautical mile range (0.2 to 0.6 watt-seconds) $\pm 5\%$ over 3 to 6 volt battery life (factory set at 3 nm range)
Effective Intensity:	Adjustable 6 to 35 candelas (factory set at 20 candelas)
Operating Temperature Range:	-40°C TO + 60°C
Ocean Depth Rating:	Approx. 7,300 metres (24,000 feet)
Batteries:	4 alkaline “C” cell
Battery Life at 4°C:	Approx. 7 days, ON at night, OFF during day at factory settings
Pressure Case Material:	6061-T6 Aluminum, Hard Anodized to Mil Spec A8625 Type 3
Weight With Batteries:	In water 2.2 lb. (2.2 kg) In air 3.7 lb. (1.7 kg.)
Pressure Case Dimensions:	18.5" long (470 mm), 1.7" diameter (43 mm)

CUSTOMER SERVICE

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

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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.

QUICK START

1. The ST-400AR is shipped with batteries installed.
2. Connect the Remote Flasher cable plug and secure locking sleeve.
3. 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.
4. Turn Pressure Switch knob to ON position. Cover lens for darkness and verify “double burst” flash
5. The ST-400AR is ready to be deployed

INSTALLATION

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 ST-400AR 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 FLASHER HEAD

There are two ¼” mounting holes on 60 mm centers. The head of the mounting bolt and washer must not touch the lens, **do not over-tighten**.

PRESSURE CASE

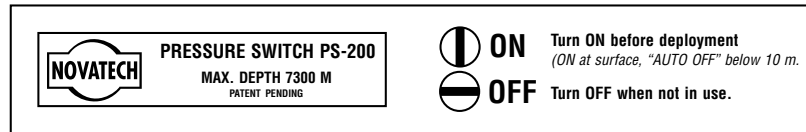
When mounting the pressure case take care to prevent any side loading on the Pressure Switch or the top end Delrin bulkhead cap. Over time, side loading on those parts can cause a leak. *Never attach anything to the two mounting screws on the Pressure Switch Zinc anode*

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.

OPERATING INSTRUCTIONS

BATTERIES

The ST-400AR uses 4 Alkaline “C” cells for approximately 7 days of nighttime flashing. Install fresh batteries with the positive terminal towards the bulkhead connector. The circuit is reverse polarity protected. Rechargeable batteries are not recommended. Always remove and discard batteries when the ST-400AR is not in use.



TURN ON & OFF

A manual ON/OFF switch is incorporated in the Pressure Switch. To turn ST-400AR ON or OFF rotate the knob as shown on label below.

Figure 1. PS-200 Label

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 ST-400AR is functioning properly.

1. Turn Pressure Switch knob to ON
2. Cover the lens for darkness
3. Verify a “double burst” flashing
4. Expose lens to light, Flasher stops flashing
5. Turn Pressure Switch knob to OFF, flasher stays off in the dark
6. ST-400AR is ready to be deployed.

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

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.

“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.
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

ADJUSTMENTS

To gain access to the electronic board, remove the top cap (bulkhead connector end) on the pressure case by rotating the black Delrin cap counterclockwise by hand. **Only hand tight when reinstalling.**

CAUTION: The ST-400AR generates high voltage so do not operate it without the protective sleeve around the electronic board.

SINGLE FLASH (disable “double burst”)

Remove black jumper on lower end of PC Board (end opposite the flash tube). Battery life will increase by approximately 30%.

ADJUST FLASH RATE

Flash rate control location is marked on the yellow label — use a small flat screwdriver to prevent damage to the control. Higher flash rate will decrease battery life (see graph, figure 2).

ADJUST INTENSITY (VISIBLE RANGE)

Intensity control location is marked on the yellow label. Increasing intensity will decrease battery life (see graph, figure 2).

The measurement of light and the units used can be confusing and misleading. The standard in the marine industry is Effective Intensity measured in Candelas. Tests were performed in clear nighttime conditions at sea. From the resulting data, the following table was prepared.

Note: As conditions are highly variable, your actual range may be less than the estimates in Table 1.

INTENSITY SETTING	EFFECTIVE INTENSITY (Candelas)	RANGE nautical miles
MINIMUM	6	2.0
FACTORY SETTINGS	15	3.0
MAXIMUM	35	4.0

Table 1. Effective Intensity measured in Candelas (estimated)

BATTERY LIFE

The following graph may be used to estimate the approximate battery life for different “double burst” flash rate and intensity settings. Your actual results may vary since we have assumed one day is 12 hours daylight, 12 hours night. The ST-400AR operates only at night, 12 hours per 24-hour period. Your actual day to night ratio will depend on the time of year.

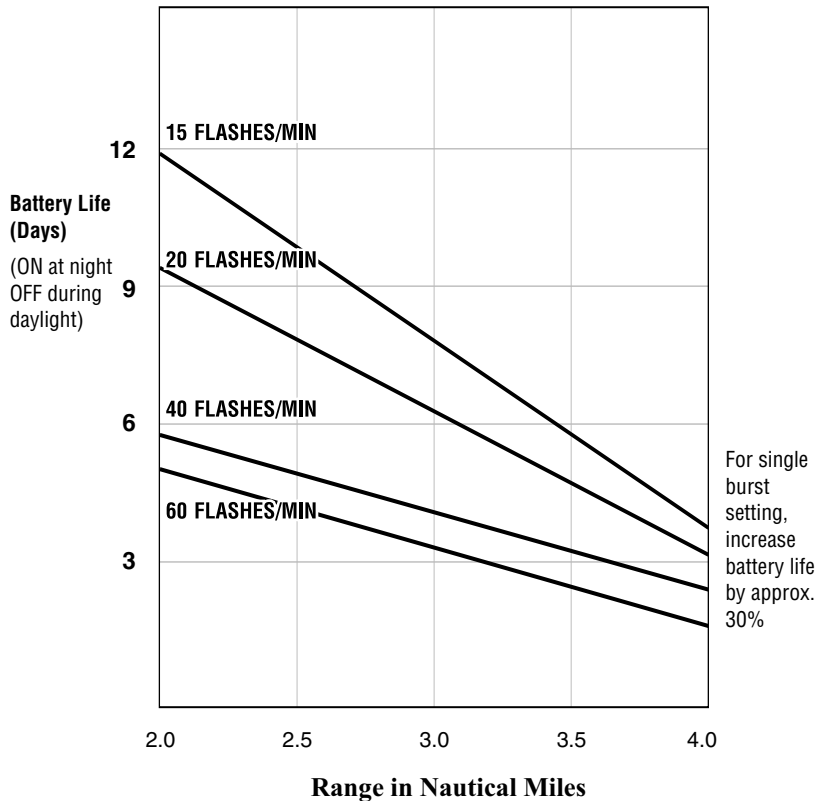


Figure 2. ST-400AR — Battery Life Estimates “Double Burst Flash”

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 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 40°C) 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 4°C, 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