

ACOUSONDE™ EXTERNAL 3-D-CELL BATTERY HOUSING

For use with models B003A and B003B

Housing part no. B003-XHD, Coupler part no. B003-XHDC
August 2012

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PREFACE

This document describes the assembly of custom underwater equipment. The reader is assumed to have some familiarity with maintenance of underwater systems, particularly proper methods for installation, inspection, and removal of o-rings, likewise some practice at soldering and insulating solder joints. These skills are necessary to assure the best outcome with this equipment.

1 DOS AND DON'TS

This Dos and Don'ts section applies specifically to the B003-XHD external battery housing and the B003-XHDC flexible coupler/adaptor. Additional Dos and Don'ts apply to the Acousonde itself; please see the Acousonde documentation.

DO, before each deployment, swab the positive battery contact (at the deep end of the Acousonde's battery housing) and the positive contact surface on the B003-XHDC Acousonde adaptor with isopropyl alcohol.

DO inspect all o-rings and o-ring seats for cuts, abrasions, contamination, and adequate lubrication before each deployment.

DO, when securing the B003-XHDC flexible coupler/adaptor, tighten both ends (the adaptor and the watertight bulkhead) **securely** to avoid depth- or vibration-induced power failure. "Flats" have been machined into both the adaptor and the bulkhead to allow use of a wrench. Of course, as the material is simple aluminum, excessive force may damage the threads, so use judgement to avoid overtightening.

DON'T allow the battery-pack wires to become pinched when screwing the watertight bulkhead onto the battery housing.

DON'T allow battery-pack wires to short to each other or to anything else. This will deplete the battery unnecessarily and may result in battery-fluid leakage. Tape away the leads of unused packs to avoid accidental shorting.

DON'T drop the battery housing. An impact may permanently deform the watertight sealing surface.

DON'T force the Acousonde adaptor or watertight bulkhead if they will not "bottom" when screwed in by hand. You may have pinched wires or o-rings. Remove the adaptor or bulkhead, check threads, wires and o-rings, and try again. Tighten hard only *after* tightening by hand.

DON'T use a metal object, such as a knife or metal tweezers, to place or remove o-rings. You could damage the seating surfaces and introduce a leak.

DON'T use abrasive material to clean the anodized o-ring facing wall in the external battery housing or the anodized o-ring seats in the coupler/adaptor.

DON'T use petroleum-based lubricants (e.g. Vaseline) on the o-rings. It will degrade them.

DON'T allow alcohol to remain in contact with the polyurethane body of the flexible coupler/adaptor; if any alcohol contacts the urethane during cleaning, wipe it away quickly.

2 RECOMMENDED FIELD KIT FOR B003-XHD EXTERNAL BATTERY HOUSING

These recommendations apply specifically to assembling and mounting the B003-XHD external battery housing. Additional field-kit recommendations apply to the Acousonde itself; please see the Acousonde documentation.

Tools

- Cutters, diagonal, miniature (i.e. dikes, snips, side cutters) to cut cable ties in close quarters
- Heat gun (for installing heat-shrink tubing)
- Pliers, needlenose, for tightening cable ties in close quarters
- Soldering iron (for attaching or repairing battery wires)
- Wrench, adjustable, large (for securing both ends of the flexible coupler/adaptor)

Materials

- Alcohol, isopropyl, 99% or electronics grade
- Battery packs, 3-D-cell (4.5V)
- Cable “zip” ties, select size for mounting
- Foam cubes, polyurethane (for securing battery packs from excessive fore-and-aft movement)
- Foam strips, silicone (for securing battery packs from excessive side-to-side movement)
- Grease, silicone, Dow Corning 111 or similar (NOT petroleum-based!)
- Q-tips
- Solder (for repairing battery connections)
- Tape, electrical, Scotch Super 33+ or Super 88, or similar (insulating battery wires)
- Tape, rubber self-fusing, Scotch 23 or similar (attachment foundation)
- Tissues, wipe/low-lint
- Tubing, heat-shrink, 3/64” (1.19mm) or similar (better than tape for insulating battery wires)

Spare parts

- O-rings, round cross-section, Buna-N 70A durometer size 019 or equivalent
- O-rings, round cross-section, Buna-N 70A durometer size 126 or equivalent

3 INTRODUCTION

The B003-XHD external battery housing (Figure 1) allows powering of the Acousonde™ portable recorder from a 3-D-cell alkaline battery pack. The B003-XHD is designed for operation at depths up to 2000 m.

Aside from the Acousonde itself, the fully-assembled mating system for the Acousonde comprises four major components, as shown in exploded view by Figure 2:

- B003-XHDC flexible coupler/adaptor, with two o-rings on the Acousonde adapter and two more on the watertight bulkhead that mates with the underwater housing;
- battery pack;
- packing material to mitigate pack movement within the housing; and
- B003-XHD underwater housing, with pressure-relief valve and sacrificial zinc.



Figure 1. Model B003A Acousonde assembled with B003-XHD external battery housing.

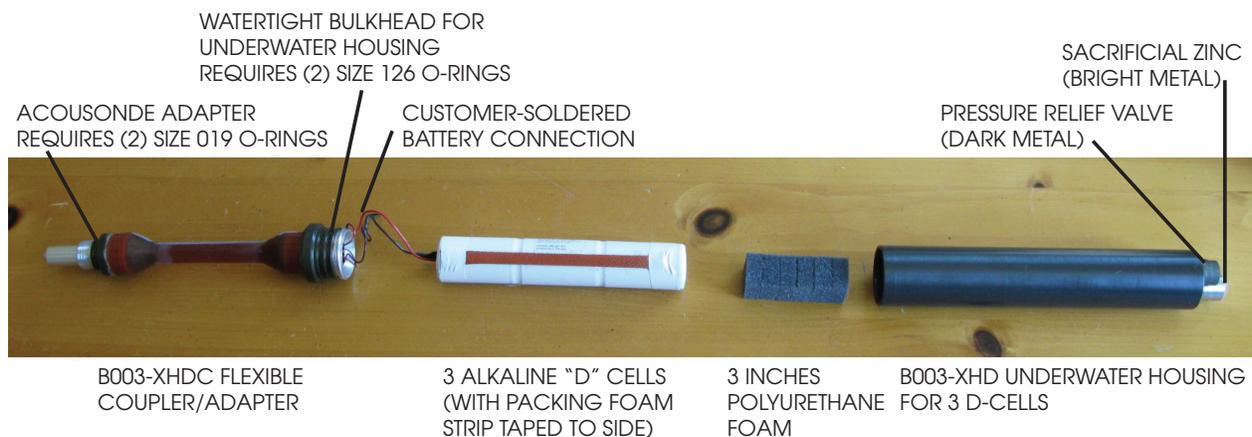


Figure 2. Exploded view of B003-XHD external battery housing assembly.

4 SECURING THE BATTERY PACK

The B003-XHD was designed to accommodate manufacturing variance in D cell size and to allow room for “service loops” of excess wire. As a result, however, typical D-cell battery packs may move within the housing, wearing out the connection wires prematurely, causing unnecessary noise, and possibly being noticed by the tagged animal.

We recommend two steps towards securing the battery pack in the housing.

First, cut a strip of silicone foam about half the length of the battery pack. Stretch the foam out to twice its original length and tape it to the pack as shown in Figure 3.

Second, place three 1-inch cubes of polyurethane packing foam at the bottom of the housing as indicated in Figure 2.



Figure 3. Example of mechanically securing battery pack using a silicone foam strip. If it appears the battery pack may move excessively within the housing, tape foam to the side of the pack before inserting into the housing. In this example, a length of silicone foam about half the length of the pack was stretched out to the pack’s full length and affixed to the pack using electrical tape.

5 WIRING

The interior of each watertight bulkhead has been provided with positive (red) and negative (black) wires that must be soldered directly to the battery pack. As with all soldering it is important to use sufficient heat, and to avoid moving the wires while the solder cools, in order to prevent cold solder joints.

Remember to place the o-rings on the watertight bulkhead before soldering the battery pack! This means that care will be required during soldering to avoid contaminating the o-rings.

Insulate the completed solder joints either with heat-shrink tubing (as shown in Figure 4) or with electrical tape. Heat-shrink tubing is the more robust alternative.

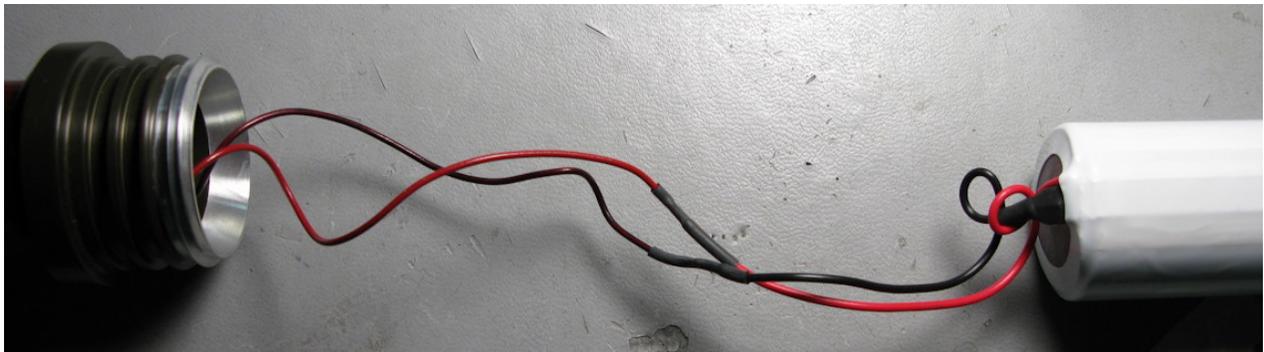


Figure 4. Securing battery wires to the watertight bulkhead. The wires shown are about as long as one would want; it may be easier to cut the battery-pack wires shorter than what is shown. Note the use of heat-shrink tubing to assure that the solder connections do not short to each other or to the housing interior. Be sure to place the o-rings on the watertight bulkhead before soldering (the o-rings are not shown in this photograph).

6 ASSEMBLY

The primary danger during assembly is that of pinched wiring. Pinched wires may short the battery pack, potentially leading to leakage of battery fluid and subsequent damage to the housing (the housing's pressure-relief valve should prevent dangerous buildup of gas pressure).

Figure 5 shows how easily wires may be pinched during assembly. The red wire in the photograph appears within the circumference of the bulkhead, but in reality it protrudes just beyond, and during assembly could protrude even further.

To avoid pinching wires, begin final assembly by holding the flexible coupler/adaptor vertically and balancing the battery pack on top of it (Figure 6). This ensures that no wires will emerge to be pinched as the housing is lowered onto the watertight bulkhead.

To minimize the number of turns required to screw the watertight bulkhead into the housing, align the threads in the housing and the bulkhead before joining them together. The threads are designed with abrupt ("blunt") starts so that, if aligned properly before joining, they will engage easily and rapidly. Once the threads engage, only about 1-1/2 turns will seat the bulkhead, minimizing twisting of the wires inside. After the bulkhead is hand tight, use a wrench to ensure it is secure.



Figure 5. Wiring in danger of pinching. Take great care not to allow wires to be pinched during assembly! If this red (power) wire is pinched when the battery housing is secured, it could short out the battery pack, leading to instrument failure, battery leakage, and permanent damage to the housing.



Figure 6. Avoiding wire pinch during assembly. To avoid wire pinch, balance the battery pack vertically on top of the bulkhead during assembly while lowering the housing onto the pack. This way no wiring will become exposed to pinching as the housing is assembled. Take care to keep the o-rings clean during this process (the o-rings are not shown in this photograph).