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## APPLICATION NOTE NO. 89

Revised September 2014

### **Retrofit Battery Pack for SBE 37 MicroCAT and SBE 44 Underwater Inductive Modem**

This Application Note provides information on the installation and use of the new battery pack for the SBE 37 MicroCAT (-SM, -SMP, -IM, and -IMP) and SBE 44 Underwater Inductive Modem.

***Note:** This application note is not applicable to any SBE 37 IDO MicroCATs (SMP-IDO, IMP-IDO), or to pumped SBE 37 MicroCATs (SMP, IMP) with firmware version  $\geq 4.0$ , which use a different battery pack (with a yellow top).*

#### **Background**

The custom-built 9-volt battery (made from three Panasonic BR-2/3A lithium cells) previously used in the SBE 37 and SBE 44 are no longer available. Six of these batteries were installed in a battery holder, forming a battery pack. The old battery holder is also obsolete and must be replaced.

(see [www.seabird.com/pdf\\_documents/MicrocatChangeNoticeFinalREV.pdf](http://www.seabird.com/pdf_documents/MicrocatChangeNoticeFinalREV.pdf) for additional information)

Sea-Bird designed a retrofit battery holder that uses 12 AA lithium cells, with 2 cells in series and each series string in parallel. These cells are available commercially worldwide. Sea-Bird part numbers:

- Retrofit battery pack holder – PN 801797 (**without** batteries) or PN 50442 (**with** batteries)
- 12 AA lithium batteries – PN 50441
- 7/64-inch Allen wrench – PN 31749

*Note: PN 31749 Allen wrench is included when you purchase PN 801797, 50442, or 50441.*

#### **Purchasing AA Lithium Cells**

The new battery pack holds twelve AA lithium cells. Any of the following types of cells can be used:

- Saft LS 14500, AA, 3.6 V and 2.45 Amp-hours each (<http://www.saftbatteries.com>) (**recommended**),
- Tadiran TL-4903, AA, 3.6 V and 2.4 Amp-hours each (<http://www.tadiran.com>), or
- Electrochem 3B0064/BCX85, AA, 3.9 V and 2.0 Amp-hours each (<http://www.electrochemsolutions.com>)

Sea-Bird will stock and supply the AA lithium cells, but customers are encouraged to obtain the cells from other commercial vendors when and where practical.

#### **Shipping Lithium Cells and Battery Pack**

Sea-Bird ships the lithium cells packaged separately within the shipping box (not inside the instrument or in the battery pack). **When packed in the manner shown and described here**, the lithium cells are **not** considered Dangerous/Hazardous Goods, and may be shipped via commercial aircraft (those governed by DOT or IATA, including passenger airlines, or cargo carriers such as FedEx, DHL, UPS, etc.); if shipped with the instrument, no more than the number of cells required to operate the instrument may be included in the shipment (i.e., no spares included).



Assembled  
battery pack

**WARNING! Do not ship the assembled battery pack or spare lithium cells by commercial aircraft.** Refer to *the current* instrument manual on our website for information on the *current* regulations, how they apply to the batteries in our equipment, and how we package and label our equipment.



Cells packed in heat-sealed plastic (above). Sea-Bird then places cells in bubble-wrap outer sleeve and strong packaging for shipment (below).



## Battery Pack Endurance

The old battery pack had a nominal capacity of 7.2 Amp-hours; Sea-Bird recommended a conservative value of 5 Amp-hours for planning purposes.

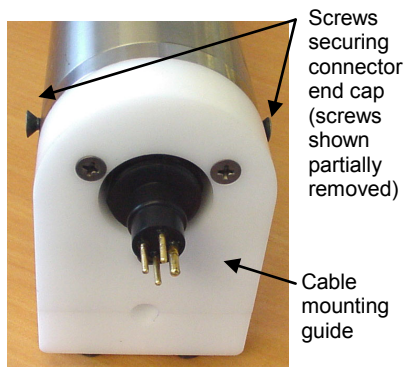
With the Saft lithium cells, the retrofit battery pack has a nominal capacity of 10.6 Amp-hours. This is lower than the Saft factory capacity rating ( $2.45 \text{ Amp-hours} * 6 = 14.7 \text{ Amp-hours}$ ), because the battery holder includes voltage up-conversion circuitry that consumes some battery capacity. For planning purposes, to account for the instrument's current consumption patterns and environmental conditions affecting performance, **Sea-Bird recommends using a conservative value:**

- Non-pumped MicroCATs (SM, IM), and SBE 44s **not** providing power to the RS-232 sensor – **8.8 Amp-hours**; **75% more usable capacity** than the old pack ( $0.75 = [8.8 \text{ Amp-hours} - 5 \text{ Amp-hours}] / 5 \text{ Amp-hours}$ )
  - Pumped MicroCATs (SMP, IMP) and SBE 44s providing power to the RS-232 sensor – **5.7 Amp-hours**; **14% more usable capacity** than the old pack ( $0.14 = [5.7 \text{ Amp-hours} - 5 \text{ Amp-hours}] / 5 \text{ Amp-hours}$ ).
- See *Field Service Bulletin 23: SBE 37 Pumped MicroCATs with Batteries (SMP, IMP)*.

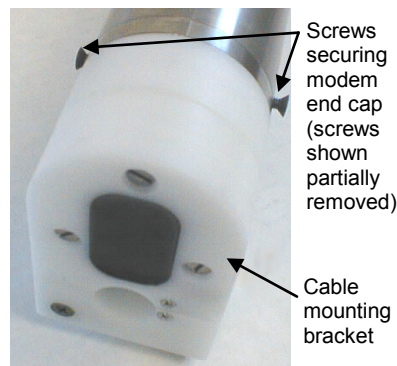
These values can also be used with the alternate lithium cell types (Tadiran TL-4903 and Electrochem 3B0064/BCX85).

## Removing Old Battery Pack and Installing Retrofit Battery Pack

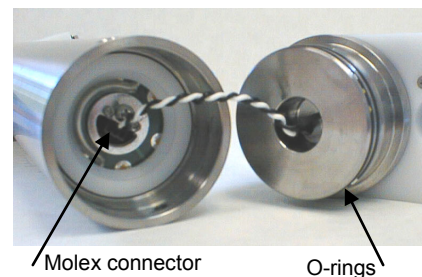
1. Remove the I/O connector end cap (SBE 37-SM, 37-SMP) or the modem end cap (SBE 37-IM, 37-IMP, 44):
  - A. Wipe the outside of the end cap and housing dry, being careful to remove any water at the seam between them.
  - B. Remove the 2 flat Phillips-head titanium machine screws. Do not remove any other screws from the housing.  
*Note: For plastic-housing MicroCATs shipped or retrofitted after July 2008, these are hex screws instead of Phillips-head screws. Sea-Bird ships the MicroCAT with a 9/64-inch Allen wrench for these screws.*
  - C. Remove the end cap by pulling firmly and steadily on the plastic cable mounting bracket/inductive coupler. It may be necessary to twist or rock the end cap back and forth or use a non-marring tool on the edge of the cap to loosen it.
  - D. The end cap is electrically connected to the electronics with a Molex connector. Holding the wire cluster near the connector, pull gently to detach the female end of the connector from the pins.
  - E. Remove any water from the O-ring mating surfaces inside the housing with a lint-free cloth or tissue.
  - F. Put the end cap aside, being careful to protect the O-rings from damage or contamination.



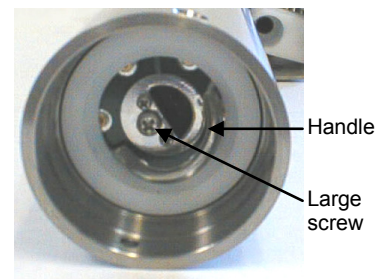
SBE 37-SM, 37-SMP



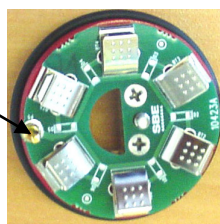
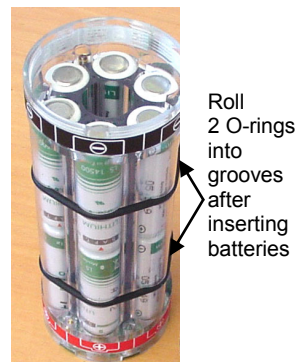
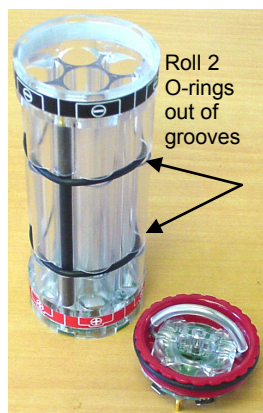
SBE 37-IM, 37-IMP, 44



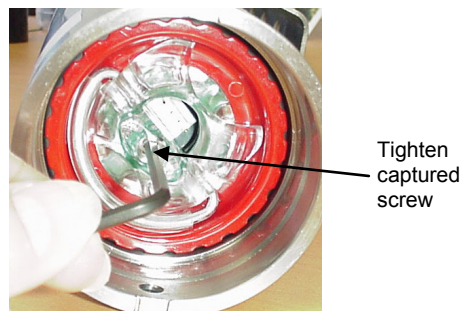
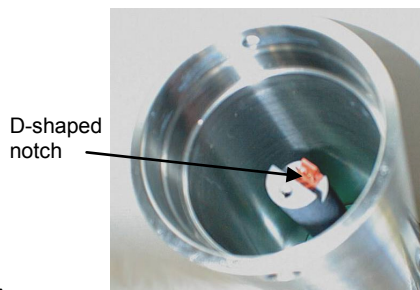
2. Remove the **old** battery pack assembly from the housing:
  - A. Remove the large Phillips-head screw and lock washer from the upper PCB.
  - B. Lift the battery pack assembly straight out of the housing, using the handle.



3. Place the AA lithium cells in the **retrofit** battery pack:
  - A. Place the cover plate handle in an upright position. Holding the edge of the red\* cover plate, unscrew the cover plate from the battery pack assembly. (\*Note: Color may vary.)
  - B. Roll the 2 O-rings on the outside of the battery pack out of their grooves.
  - C. Insert each cell into the pack, **positive end (+) first**.
  - D. Roll the 2 O-rings on the outside of the battery pack into place in the grooves. The O-rings compress the side of the battery pack and hold the cells tightly in place in the pack.
  - E. Reinstall the battery pack cover plate: Align the pin on the battery cover plate PCB with the post hole in the battery pack housing. Place the handle in an upright position. Screw the red cover plate onto the battery pack assembly. Ensure the cover is tightly screwed on to provide a reliable electrical contact.



4. Place the retrofit battery pack assembly in the instrument housing:
  - A. Align the D-shaped opening in the cover plate with the D-shaped notch on the shaft. Lower the assembly slowly into the housing, and once aligned, push gently to mate the banana plugs on the battery compartment bulkhead with the lower PCB in the battery pack assembly. A post at the bottom of the battery compartment mates with a hole in the battery pack's lower PCB to prevent improper alignment.
  - B. Secure the assembly to the shaft with the captured screw, using the 7/64-inch Allen wrench. Ensure the screw is tight to provide a reliable electrical contact.



5. Reinstall the end cap:
  - A. Remove any water from the O-rings and mating surfaces in the housing with a lint-free cloth or tissue. Inspect the O-rings and mating surfaces for dirt, nicks, and cuts. Clean as necessary. Apply a light coat of O-ring lubricant (Parker Super O Lube) to O-ring and mating surfaces.  
**CAUTION: Do not use Parker O-Lube, which is petroleum based; use only Parker Super O-Lube.**
  - B. Plug the female end of the Molex connector onto the pins, with the flat portion of the female end against the flat portion of the 'D' cutout. Verify the connector is properly aligned – a backward connection will prevent communication with the computer.
  - C. Carefully fit the end cap into the housing until the O-rings are fully seated.
  - D. Reinstall the 2 flat Phillips-head titanium screws to secure the end cap.

*Note: For precautions on securing the end cap to a plastic housing, see Field Service Bulletin 15: Alert and Handling Precautions – SBE 37 MicroCATs and SBE 49 FastCATs with Plastic Housing Option.*

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## Application Note Revision History

Date	Description
July 2008	Initial release.
September 2008	<ul style="list-style-type: none"><li>• Add information that battery end cap screws are hex instead of Phillips head for newer and retrofitted models with plastic housings.</li><li>• Add reference to MicroCAT change notice on website for background information on battery pack changes.</li><li>• Add precaution on reinstalling battery end cap screws for plastic housing; reference Field Service Bulletin 15.</li></ul>
February 2010	<ul style="list-style-type: none"><li>• Update link to Tadiran.</li><li>• Update wording on shipping batteries – clarify that cannot ship spares on commercial aircraft.</li><li>• Update address.</li></ul>
October 2010	Add note that does not apply to IDO MicroCATs.
November 2011	<ul style="list-style-type: none"><li>• Update battery endurance for pumped MicroCATs (SMP, IMP) and SBE 44s providing power to the RS-232 sensor, based on Field Service Bulletin 23.</li><li>• Add note that does not apply to pumped MicroCATs (SMP, IMP) with firmware version <math>\geq 4.0</math>.</li><li>• Update Electrochem website URL.</li></ul>
September 2014	<ul style="list-style-type: none"><li>• Update lithium cell and battery language to conform to latest IATA rules.</li><li>• Update reference to location of additional information on lithium battery shipping requirements.</li><li>• Add information about not using Parker O-Lube, which is petroleum based.</li></ul>