

## FREQUENTLY ASKED QUESTIONS

### HARDWARE

### BATTERIES

Q: What kind of batteries can I use in my MEG if I want to build my own?

A:

(1) Earlier APECS 1 & 2 used a pair of SAFT Lithium C-cells which were wired in series and together produced 7.2vdc at 7300mAH (SAFT P/N: LS26500 for those having access to them).

(2) As of July 2003, we were forced to abandon the C-Cell lithium batteries due to the USA Hazardous Materials (HAZMAT) Regulations having not renewed the exemption on small shipments (by weight) of lithium batteries. The HAZMAT fees on shipping made the availability of these batteries highly expensive. To ship one small box would cost US\$50 for the HAZMAT fee. We then switched to the Eveready Industrial Alkaline AA cells and made a 5-pack (7.5vdc). These are rated at 2850mAH per cell. This bundled package fits in slightly less space than the double C-Cell space. We then use a foam pad to take up some of the excess space in the battery box. We use a flat braid "solder wick" type copper wire for jumpers between cells.

Q: What special parts are needed to build my own battery packs?

A: The battery connector that mates with the MEG's battery box consists of the following components:

- 1 – Red, vinyl insulated 24 AWG stranded copper wire
- 1 – Black, vinyl insulated 24 AWG stranded copper wire
- 1 – heat shrink tubing piece, 1 7/8" long and 3" across, 0.045" wall thickness, color, optional (we use black and white tubings).
- 1 – MOLEX p/n 03-06-1023 Connector Receptacle 2-pos .062
- 2 – MOLEX p/n 02-06-5135 Connector Terminal Female 24-30 AWG Gold

These are distributed by GC/WALDOM, DigiKey, and many more Molex distributors, or on a limited basis, ISC can provide you the parts, assembled if desired.

TIPS:

- Black electrical tape can be used if the heat shrink tubing is unavailable, but keep it thin, no more than one wrap otherwise clearance will be tight in the battery box.

Q: Why not use rechargeable batteries in the MEG?

A: Rechargeable batteries, like lithium ion, nickel metal hydride (NIMH), and nickel cadmium, have short times on run time for the APECS 2 electronics. There is also a critical, load voltage you don't want to be very far under during a dive (5.0 volts) on the primary subsystem. NIMH batteries have a habit of not holding their high charge voltage for very long. Our experience in other equipment with NIMH is the voltage drops considerably a few days after charging to a full charge state thus may be unreliable for a long dive.

Q: I built up fresh Saft Lithium battery packs. They measured only 6.5v and rapidly decayed during their first dive down to below the 5v low battery warning. I soldered the wires between cells as I would for the alkaline batteries. What's going on?

A: Lithium batteries build up an oxide layer between its internal connections of the cells and the bulkhead contacts to the outside over time. This makes the batteries appear they are not fresh, or falsely low. A technique our battery distributor related to us for a partial cure is as follows:

- Need a 10watt ceramic 7 ohm resistor.
- Need a high impedance multimeter.
- Set voltmeter to 10v DC range.
- Hold the leads of the resistor and the meter leads to the battery contacts (do one cell at a time).
- Watch the load resistor drop the voltage until it starts to settle out and then it should start to reverse and go higher. Continue longer for 1 minute. This whole process per cell should take no longer than 3 minutes.
- Repeat for the second cell.
- Let the batteries set for 15-30 minutes so they have a chance to recover from this operation.
- Measure the voltage again. If you are getting 7.0-7.2 volts with no load, you haven't killed the batteries yet.
- Install the batteries in the Meg and power on the electronics. Check the systems battery monitor voltage to see if there is an improvement. On the primary, let it run for about 15 minutes as if in a dive, monitor the load voltage occasionally to see if performance is better. If it still drops down to 5v, try repeating the above procedure one more time before giving up on the batteries you assembled.

Things not to do with lithium batteries, especially the SAFT:

- Never short the batteries with a direct short. They have an internal fuse that will blow. It's intent is to prevent the battery from overheating and exploding. This is a non-resettable fuse. If it is blown, the battery is shot, permanently.
- Use caution while soldering wires to contacts. Use low heat and make your solder connection quickly. The lithium batteries are sensitive to heat. If you solder the leads then you risk losing performance from the battery. Our battery distributor uses a spot welder to weld on solder tabs, or the actual jumper tabs between cells, thus minimizing heat on the internals of the batteries.

Last update: 08 April, 2005