External Battery Pack

The optional external battery pack for the TAPS-6 contains three additional batteries which, together with the internal battery, approximately quadruple the operational life of TAPS. The external battery pack is contained in a pressure housing similar to that of TAPS-6 itself. Thus it is safe to the same depths as TAPS-6. These instructions cover the use and maintenance of this external battery pack.

The battery pack connects to TAPS-6 with a 1m cable with 8-pin connectors on each end to match the 8-pin jacks on TAPS-6 and on the battery case. Either end of this cable can be connected to either case.

The 8-pin jack on TAPS-6 is used to provide external power to the unit for battery charging or for remote operations. This connector also provides serial communications to TAPS-6. When the external battery is connected to TAPS-6, however, these pins are unavailable.

A 4-pin connector on the battery case, normally covered with a dummy plug, has been provided to allow communcations with TAPS while the external battery pack is attached. A serial communications cable, similar to the download cable used on TAPS itself, is provided to connect to a PC.

The external battery pack acts just like the charger unit when it is connected. If the external battery voltage is higher than the internal battery voltage, the external batteries will try to charge the internal batteries. While this is not necessarily bad, for optimum results you should begin with a fully-charged TAPS-6 battery to prevent losing charge on the external battery pack. Need we mention that the external battery pack should be fully charged before connecting it to TAPS

TAPS-6 operations are basically unchanged when the external battery pack is used. However, the external battery is a substitute for the charger/IO box used in remote mode and only one or the other can be used to power the TAPS-6.

The shorting plug must be installed on TAPS in order for TAPS to operate or for communications with TAPS, as usual. When the shorting plug is removed, little to no current is drawn from the batteries other than a small amount of current exchange to equilibrate the battery pack voltages. You can check the battery pack voltage from the STATUS screen: the voltage shown will be the equilibrium value for all four batteries in parallel.

In operation, the battery with highest voltage provides current to TAPS. Thus, all of the batteries will discharge at approximately the same rate. Again, the STATUS screen will provide information on the battery voltage of the total battery pack. If this voltage reaches approximately 21 V, the batteries are 80% depleted.

WARNING
Full battery voltage is present at the pins of the 8-pin connector on the external battery unit. Keep the dummy plug or an interconnect cable installed on this jack at all times.

CHARGING THE BATTERY PACK

The external battery pack contains a charge regulator circuit similar to the one inside TAPS-6. You can use the TAPS-6 charging cables to connect the external battery pack to the TAPS Charger/IO box and charging proceeds just as for TAPS. You will find that the external battery pack takes longer to charge because of it's higher capacity, however.

Because the batteries in the external battery pack are NiCads like those in TAPS, it is important that you charge them periodically. Allowing a battery pack to completely discharge can damage the cells, resulting in lower effective capacity -- hence shorter operational life. Sufficient mistreatment can result in zero capacity.

ESTIMATING BATTERY LIFE

TAPS-6 draws about 350-400 mA while operating. The internal battery capacity is 5.7 amp-hours, thus one would expect TAPS to operate about 14-16 hours before the battery expired. With the external battery pack, these times would be approximately 57-65 hours of continuous operation.

If TAPS is operating in **CAST** mode, each data set consumes 71 bytes of data. The data storage inside TAPS-6 holds 2 MB; roughly, there is room for 29,500 data sets in memory. At 4 pings per data set, a new data set would be generated about every 2 seconds. Thus memory would last for about

59,000 seconds or about 16 hours. This is a pretty good match to the internal battery.

At 24 pings per data set, new data would be produced about every 5 seconds. Internal memory would last about 41 hours. This is comparable to the extended life added by the external battery pack.

If TAPS is operating in **INTERNAL SOUNDER** mode, memory storage becomes more critical. On the other hand, it is reasonable to take SOUNDER records at more widely spaced time intervals than CAST data.

The number of bytes per data record in SOUNDER mode depends upon the number of range bins selected. You can calculate the size of a SOUNDER record from

$$N_{bytes} = 23 + 24 * N_{BINS}$$

where NBINS is the number of range bins selected in the Programming screen. If we assume 117 bins (15 meters max range), then N = 2831 bytes per record. Data memory can hold 740 such records.

Estimating battery life in EXTERNAL SOUNDER mode is more complicated than the example above, however. In the interval between data records, TAPS turns off the transceivers and idles at about 30-40 mA current draw. With external batteries, TAPS could idle for about 3 weeks as opposed to the 57-65 hours
estimated above for CAST operations.

An EXCEL spreadsheet has been created to help estimate battery life and memory capacity for INTERNAL SOUNDER mode operations. This spreadsheet is contained on the CD supplied with TAPS-6.

User entries include the time interval between data sets in minutes, the number of range bins, the number of batteries (1 if using the internal battery, 4 if using the external battery pack), and an estimate of the actual capacity of the battery in percent. The actual capacity of batteries varies with temperature; in cold water the capacity could be a little as 50% of the nominal capacity, for example. User entries are marked by a bold outline around a yellow background.

Outputs include the estimated battery life in hours and days, the number of data sets memory will hold, and the time until memory is full in hours and days.

This spreadsheet is fairly accurate (that means we tried it once and it actually worked). There are factors that can impact these estimates, however, that are out of our control. The major external factor is battery neglect. Once again, if you mistreat the NiCad batteries in TAPS or the external battery pack by letting them sit discharged, they will repay you in kind.

TAPS-8 Memory/Current Budget
11/26/2002

Minutes between data sets	12	
Data sets per hour	5	
Number of pings/data set	16	
Transceiver on-time/data set	21	seconds
Number of range bins	117	
Maximum range	15	

ITEI	Second	mA	a-h
Transmitter on	21.0	300	0.0018
Transmitter inrush	3	1000	0.0008
Amp-hours per data set			0.0026
Amp-hours per data set * sets/hour			0.0129
CPU quiescent current		25	0.0250
<Amps> draw from battery			0.0379
Battery capacity (Amp-hours)	5.7		
# of batteries	4		
Derate for temperature	100%		
Estimated capacity (Amp-hours)	22.8		
Expected battery lifetime (hours)	601		
days	25		

ITEI	# Byte
Header	23
Sv Data	2808
Total bytes/data record	2831
TOTAL BYTES per HOUR	14155
Memory (MB)	2
bytes	2,097,152
# of data sets possible	740
memory capacity in hours	148
memory capacity in days	6

MOUNTING

As with the TAPS-6, mounting of the external battery pack is up to the user. Tabs have been provided as attachment points for either safety lines or bolted fittings. We prefer using stainless steel hose clamps to secure the battery pack and adding a safety line from one or more tabs to the structure. We also cover the hose clamps in tygon

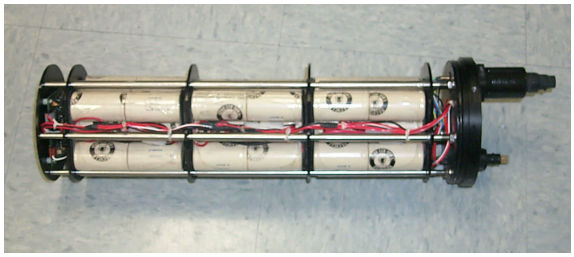
tubing to isolate the clamps from the aluminum case. This helps prevent corrosion damage to the case.

TROUBLESHOOTING

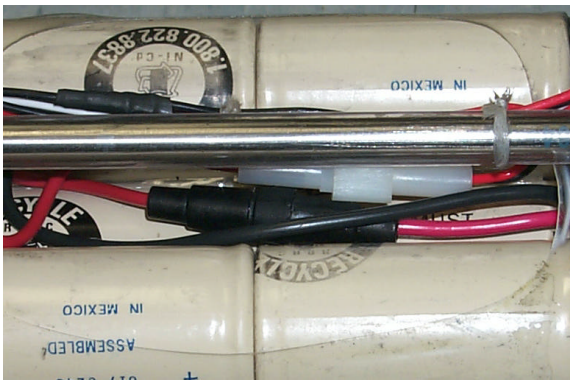
Each battery inside the external battery case is fused. Shorting the external pins will cause one or more of these fuses to blow. If you suspect this has occurred, you will have to open the case to inspect the batteries.

Open the case by removing the four screws on the periphery of the case at the connector endcap end. If you even SUSPECT that there has been a leak into the case, DO NOT STAND IN FRONT OF THE ENDCAP when you remove these screws as the endcap can be explosively propelled by internal pressure. People have died from similar accidents. It is good practice to NEVER point the end of the case at yourself or anyone else when removing the fastening screws.

Remove the nylon screw in the center of the endcap. Install the slide hammer threaded portion into this threaded hole and remove the endcap assembly. The batteries and the charge regulator circuitry are connected to the endcap and will come out as a unit.



The fuses are 'in-line' types located in the black plastic holders in the wiring channel. The small end unscrews allowing the fuse to be removed.



The fuses are Buss type BK/GDB -5A, 5 amp fast-blow type. These are the same fuses as used in TAPS-6 and those spares can be used in the External Battery Pack.

Re-installation is straight-forward. You should check the o-ring and the o-ring seat for foreign matter, cleaning with alcohol as necessary and re-greasing with o-ring lube. Stand the pressure case on it's sealed end on the floor and lower the battery assembly into the case. Align the screw holes with the case holes before pressing the endcap into the case. Re-install the screws to secure the endcap and re-install the filler screw in the center of the endcap. Use anti-seize on all screws.