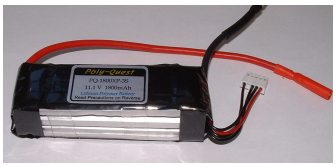
Battery Report

Date: 18th September 2005
Battery Type: Poly-Quest PQ-180CXP-3S Li-Po
3 x series Lithium-Polymer battery pack)
Weight: 145g
Dimensions: 104mm x 31mm x 26mm
Manufacturers Rating: 11.1V 1800mAh, max discharge current 20C (36A) constant.
Note: All tests are carried out in a controlled 24C ambient for consistency.
Author: Mark Hopkins

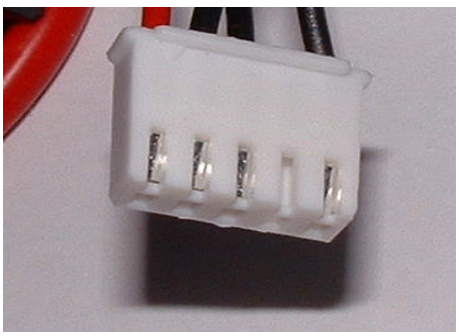


The Poly Quest PQ-180CXP-3S Battery Pack

Mechanical.

The battery is in a 3 x series Li-Po configuration, with the cells stacked horizontally similar to the previous examples I have tested. Additionally, there is a spacer between the cells to allow the middle cell to dissipate its heat evenly with the rest of the pack, to prolong cycle life.. The two out-put wires (+ve & -ve) exit from opposite ends, which is the first example I have seen that does this. The wires are extremely heavy duty and quite capable of carrying serious current and are more than adequate for small model helicopter use without any problem at all. A very useful additional connector exits from the negative end carrying four wires. These are connected to the individual cells allowing the user to monitor the balance of each cell and correct if necessary. The cells in this battery are slightly different than other Li-Po cells I have seen, as the positive and negative terminals exit from opposite ends. The pack was built with a PCB at each end for the terminals to be soldered to. As mentioned in previous reports of other batteries, there was no protection circuit fitted to the pack to protect from over voltage, under voltage, over current, over/under temperature, cell imbalance, etc. The ability to balance the cell pack should certainly extend battery life if utilised correctly.

Side view of the pack showing the space between the cells



The very useful external connector for checking and balancing your pack

Electrical

The voltage of each cell was measured before commencing charge and the pack was found to be slightly out of balance with cell 3 showing 50mV lower than the other two. The pack was then charged to 12.6V (4.2V per cell) with a current limit of 1200mA, in a 24C ambient, and with a termination current of 100mA at 12.6V.

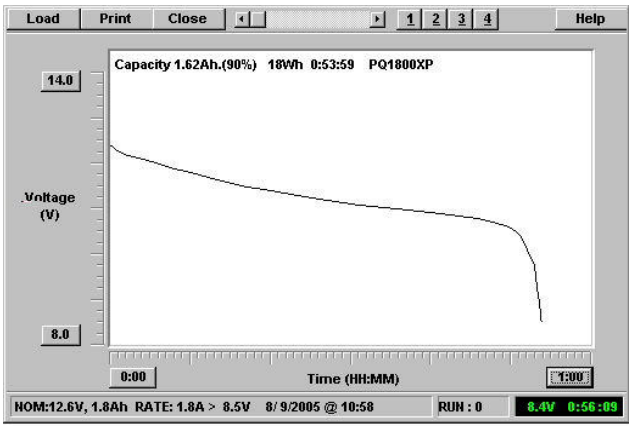
The pack was discharged at C rate (1800mA) with a 8.5V cut-off voltage. The capacity at this rate was 1.76Ah, 20Wh, the cell pack reached a maximum temperature of 30.3C. The battery was then charged as before then discharged at 10A and 20A respectively, the following results were recorded:
At 10A the capacity was 1.62Ah, 16Wh, the cell pack reached a maximum temperature of 56.4C.
At 20A the capacity was 1.78Ah, 17Wh, the cell pack reached a maximum temperature of 71.4C.
After a 3 mintue rest the voltages were recorded as:
Cell 1 - 3.631V
Cell 2 - 3.680V
Cell 3 - 3.207V

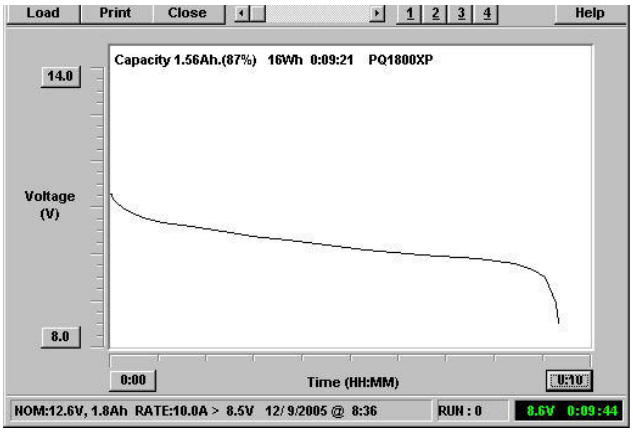
Cell 3 is 400mV lower than the rest of the pack.

Pack Performance at a Glance

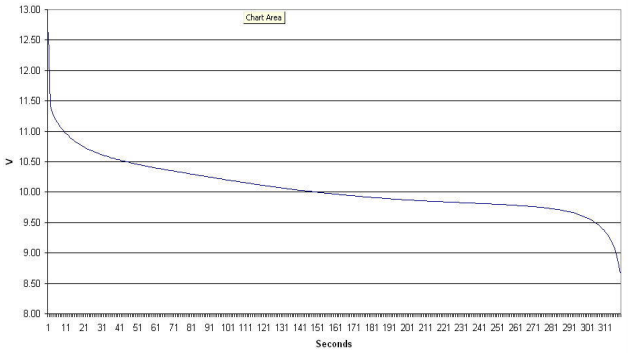
Current	Capacity (Ah)	Capacity (Wh)	Gravimetric Energy Density (Wh per kg)	Max Temp/ Comments
1.8A	1.62	18	124.13	31.5C ok
10A	1.56	16	110.34	56.4C ok
20A	1.78	17.14	118.20	71.4C Excessive

Discharge Graphs





PQ-1800XP-3S (Amb 24C)
Discharge rate 20A. Capacity 1.78Ah 17.14Wh.



Conclusion

Some thought has gone into the design of this battery, the air gap for the middle cell, for example, should extend cycle life due to even heat dissipation. The battery however, arrived in a state of imbalance which was rather noticeable in the discharged state, and although a 'balancing' charger should correct this problem it really should not exist in a 'virgin' pack, especially as some users may not have this feature on their chargers.

As usual I have to mention the lack of protection to be a concern, and the fact that the cell pack arrived as 'new' in an unbalanced condition is a shame, as a lot of effort has gone into this design. There is the ability to correct this problem using the 'Balance' connector and appropriate kit though. The battery performed well at C rate and 10A. The voltage held up very well at 20A too, although the temperature did go just over max at this level.

Mark Hopkins
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