SG-2020 transceiver operation with a 4S2P LiPo battery
By Phil Salas – AD5X

LiPo (Lithium Polymer) batteries provide a high energy-storage-to-weight ratio, are compact, and provide a high discharge rate making them popular for electric RC airplanes and helicopters. A LiPo battery may also be a good choice for portable QRP ham radio operation. A LiPo 3-cell battery (3S) has a nominal voltage of 10.8VDC, a fully charged voltage of 12.6V, and a discharged voltage of 9VDC. A LiPo 4-cell battery (4S) has a nominal voltage of 14.4VDC, a fully charged voltage of 16.8VDC, and a discharged voltage of 12VDC. So a 3-cell battery is nominally under-voltage for some QRP transceivers. The 4-cell battery is more suitable for 12V transceivers, but the fully charged voltage of 16.8VDC exceeds the maximum input permitted by many transceivers. However, the LiPo 4S battery is perfect for the SG-2020 12-18VDC input voltage operating range. I found a new Floureon 4S2P 6200mAh Lipo Battery on eBay for $40 shipped. This battery looked perfect for portable weekend battery operation with my SG-2020.
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www.ebay.com/itm/1PCS-Lipo-RC-Battery-4S-14-8V-35C-6200mAh-XT60-Plug-for-RC-Airplane-Car-Boat-/161927204324?hash=item25b39d0de4:g:fOUAAOSwnDxUk8-Q

And I also found a LiPo balance charger for under $20:

www.ebay.com/itm/iMAX-B6-RC-Lipo-NiMh-NiCD-Battery-Balance-Charger-Discharger-LCD-Screen-Digital-/221917386130?hash=item33ab4e9592:g:oA0AAOSw9mFWJFJs

First, some battery current computations were needed. During portable operation I listen approximately 50% of the time, and am in actual QSOs 50% of the time. During a QSO, I assume 50% receiving and 50% transmitting times. The CW duty cycle using the standard PARIS format is 44% (key-down 44% of the time, key-up 66% during the transmission). For determining battery requirements, I assumed 20-watts transmit power.

The SG-2020ADSP2 typical current requirement is 500ma receive current, and 4-amps transmit current key down/500ma key up at 20-watts output. So for 50% listening and 50% QSOs:

Listening: 0.5(0.500A) = 0.250A
QSO: Receiving: 0.25(0.500A) = 0.125A, Transmitting: 0.25(0.44x4A + 0.66x0.500A) = 0.523A
Total average current = 900ma.

First I measured the voltage drop at the SG-2020 power connector at 20-watts output (~4 amps current). I only observed a 0.05VDC drop – verifying that this LiPo battery can indeed source high current.

Next I measured the 6.2AH battery at the average expected current drain of 900ma with my West Mountain Radio CBA IV battery analyzer. The results are shown in Figure 1. Note that the measured amp-hour rating of 6.115 AH is very close to the spec'd 6.2 AH amp-hour rating of this battery. The bottom line is that you should be able to operate over 6-hours before recharge is necessary using my operating duty-cycle analysis. In my case I've operated my SG-2020 over two weekends of casual use without needing to recharge the battery.

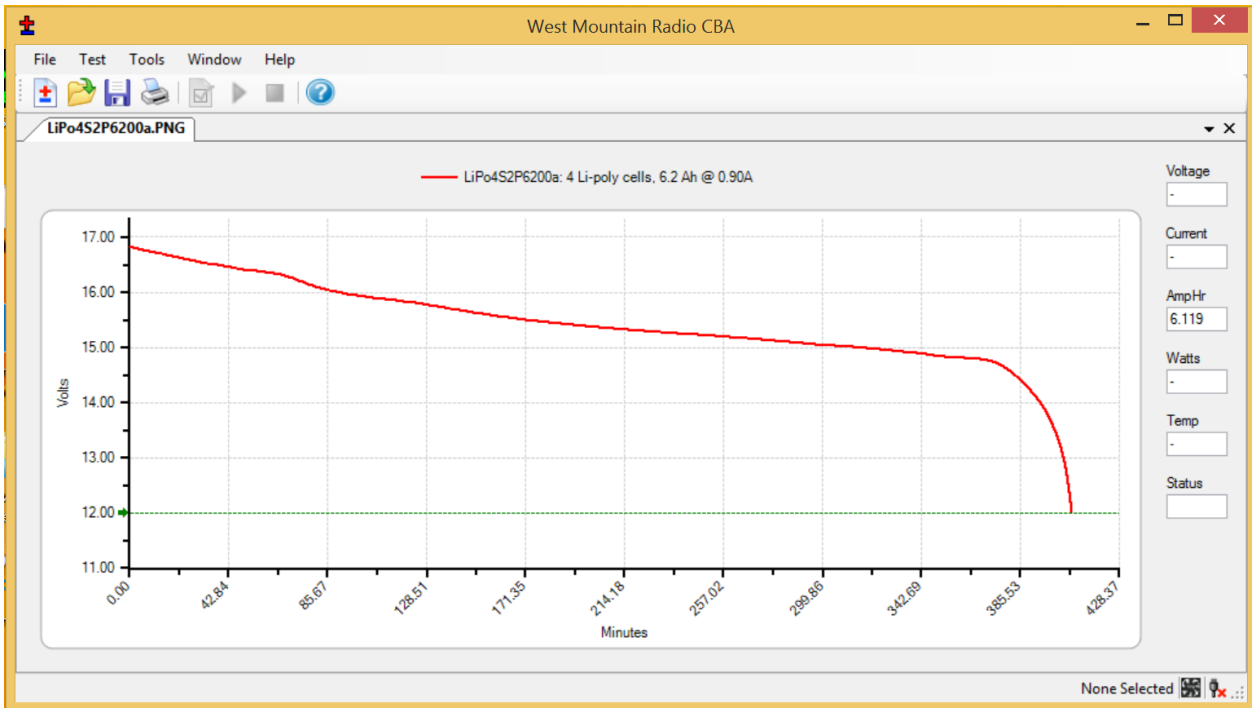

Figure 1: 4S2P 6.2AH LiPo battery

Finally, it is important to not over-discharge a LiPo battery. Small LiPo battery monitors with low-voltage programmable LOUD audio alarms are available on eBay. These monitors plug into the balancing connector on the battery. LED monitors are around $2 each, and LCD monitors are around $9 each. Here's an LED monitor:

www.ebay.com/itm/NEW-RC-Lipo-Battery-Low-Voltage-Alarm-1S-8S-Buzzer-Indicator-Checker-Tester-LED-/131588779853?hash=item1ea34d6f4d:g:sWIAAOSwgQ9V3Sxn

and here's an LCD monitor:

www.ebay.com/itm/Digital-LCD-Voltage-power-display-Monitor-W-Alarm-FOR-2-6S-Lipo-LiFe-Battery-/271942360202?hash=item3f51071c8a:g:~f0AAOSwDNdVt18G

The LCD monitor has a "less than 10ma" operating current specification. I couldn't find a current requirement spec for the LED monitor. So I bought both a LCD and a LED monitor and measured the current with a special fixture I built. I measured 9.5ma on the LCD monitor, and 13.7ma on the LED monitor – a negligible 4.2ma difference. I left the low voltage alarm set at the default 3.3V/cell (13.2VDC total battery voltage) to provide some margin over full discharge. As Figure 1 indicates, the total operating time is reduced by about 5-minutes over letting the battery fully discharge to 12VDC. Unplug the monitor when not using your battery to keep from discharging the battery when not in use, though it will take a long time and it is alarmed.