

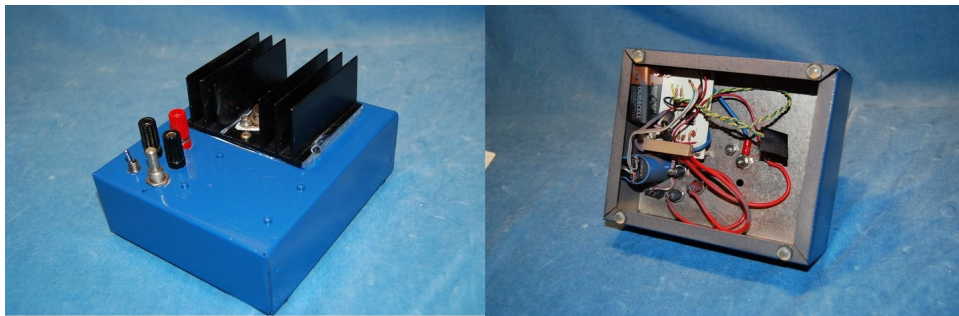
## DIY Homebrew Feature    Electronic Load

by Bob, KI4SBL

Do you ever wonder if those HT batteries are going to last through the upcoming bike race or 10K event? Well, this month's feature will enable you to test those pesky batteries and find out if they will perform, or not! Read on for a little peace of mind.

I found the schematic and circuit description for a nice, easy, electronic load on W1GHZ's site: [http://www.w1ghz.org/small\\_proj/ps\\_load.zip](http://www.w1ghz.org/small_proj/ps_load.zip). Paul has a bunch of great small projects on the site that are well worth a look. There are even circuit boards available for order, if you desire.

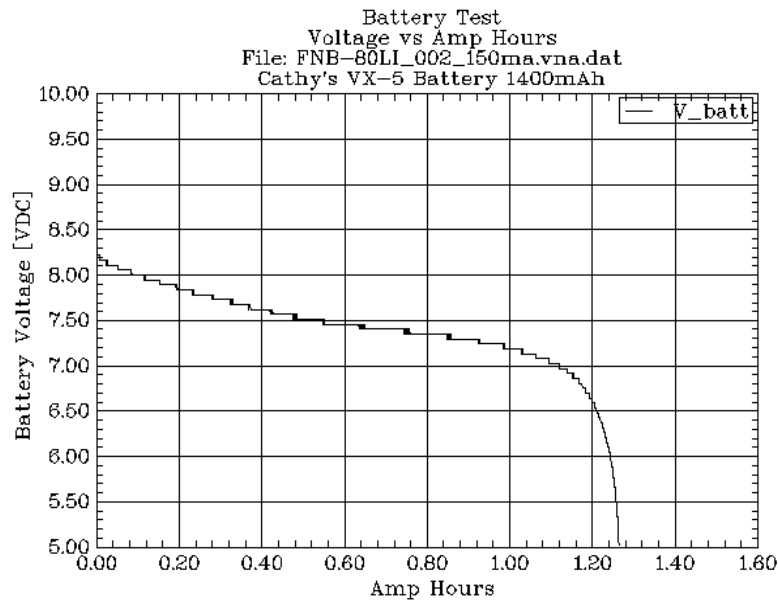
The electronic load is a fairly simple circuit that enables one to set a fixed amount of current drain over a range from just a few milliamps up to 13A! Sure, you could just purchase one of these units, with measurement software, (I.e. the CBA-II at <http://www.westmountainradio.com/CBA.htm>) but where's the DIY fun in that? I built the electronic load using parts on-hand and a custom PCB layout designed using the (free) Eagle PCB design software (<http://www.cadsoft.de/>). In my case, the available resistors in my junk box only allowed operation up to 8A due to power dissipation limits but that's good enough for all my radio needs. The finished project was built around an aluminum chassis and is shown in the photograph below.



*Finished Electronic Load Used in Testing Battery Capacity*

To quantify the test results, I modified data logging code for the Dataq DI-194RS (<http://www.dataq.com/products/startkit/di194rs.htm>) using open source code for this device found at: <http://users.sdsc.edu/~hubbard/neesgrid/dataq.html>. The data logging code described here is written for use on Linux but almost any logging hardware and software may be used to collect the voltage versus time data. The results are graphed in a X-Y form as voltage versus amp-hours, or milliamp-hours, as appropriate, similar as shown in the graph below. To use this data, just pick the minimum operating voltage of your rig and read the number of amp-hours off the chart and you'll know just how long your batteries will perform!

As an example, the FNB-80LI battery shown in the graph will fall below the 6V minimum operating voltage after  $1.24\text{Ah} / 0.15\text{A} = 8.27$  hours. Note that a 0.15A discharge rate was used in the test. So, unless this is a *really* long race, the HT should work fine for the duration without battery problems.



72c-0.8 28.06.2006, 14:16:48, DISLIN B1 file: FNB-80LI\_002\_150ma.vna.dat.pxy

R. Freeman

### *Battery Capacity Test Results for a FNB-80LI*

As a reminder, you should conduct the test with a discharge current that exceeds your radio's current drain specification in receive mode by several percent -- this will allow for a little transmit time and it helps to account for the fact that overall battery capacity is reduced at higher discharge rates. And, if you are prone to chewing on the microphone for extended periods, you might increase the discharge rate to something closer to the transmit specification! You get the idea, I hope.

Also note that it is important that Lithium Ion batteries not be drained to zero volts. In order to guard against this, the software requests a cutoff voltage to be used to terminate the test -- when the measured voltage falls below the cutoff voltage, the measurement is stopped.

Well, that's about it for this project. The files used to generate this project will be loaded into a Homebrew directory under Electronic Load in the Files section on the Yahoo Group site, for reference. I encourage anyone to build this little project and will offer my assistance too, if needed.

Finally, any questions, comments, improvements, and especially corrections are always welcome.

Happy Homebrewing!

Bob, KI4SBL