

Battery Testing Procedures

Occidental College February 4, 2017

Battery Quality Test:

(Please read all of the instructions before doing this test.)

This hand-held tester will tell you the internal conductance of your battery and therefore the condition of your battery. It also tells you the cold cranking amps (CCA) that your battery can output, yet another indicator of your batteries condition.

- Clip the handheld battery tester to the terminals of the battery to power on. Ensure a solid connection is made with the terminal. Bad connections can yield incorrect data.
- Press the power button and then press the OK button to begin.
- Select the CCA amount you would like to test, then click OK. The default is 500 amps. An Odyssey PC1100 battery can provide 500 CCA.
- Allow the test to run, then observe the resulting measurements.
- If the tester indicates that your battery is low, charge your battery and retest.
- The tester will tell you the battery's voltage, internal resistance, and measured CCA value.
- Press the SEL button to cycle through the different measurements.



Carbon-Pile Load Test:

(Please read all of the instructions before doing this test.)

This device puts an actual load on the battery and will tell you the charge and condition of your battery. **There is a large amount of current flowing from the battery in this test, so please use caution.**

- First, ensure that the knob on the front of the tester is in the OFF position. It may take several revolutions of CCW turning before you feel the knob tightening. **DO NOT OVERTIGHTEN THIS KNOB OR IT WILL BREAK.**
- Before beginning the test, locate and record the CCA or Amp-hour capacity of the battery being tested, either one will do. An Odyssey PC100 battery has 500 CCA.
- Clip the tester leads to the battery. Once again, ensure that the connection is solid, because a bad connection can cause misreads and arcing.
- Ensure that everybody near the tester is alert and sufficiently far from the terminals to avoid any unexpected sparking.
- **DO NOT TURN THE CENTER KNOB AT THIS TIME.**
 - ❖ To properly test the battery, the knob on the face of the tester needs to be turned clockwise until the D.C. AMPS needle reads half of the batteries specified CCA or three times the specified Amp-hour capacity.
 - ❖ Once one of those points has been reached, stop turning the knob and let the tester run until it beeps. **DO NOT** turn the knob very hard, as it may break the tester.
 - ❖ After the beep, quickly read and record the battery condition and charge level specified on the D.C. VOLTS readout, then turn the knob back to the off position. **DO NOT** let the tester run long after it beeps. Doing so can damage the tester.
- Now, carry out the steps specified above.



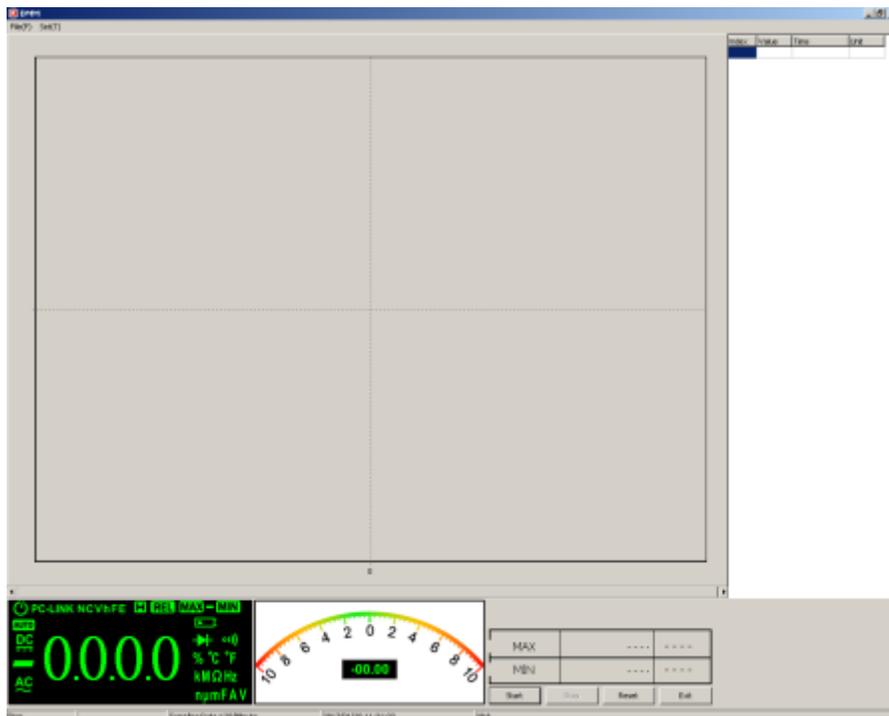
Constant Current Endurance Race Test:

(Please read all of the instructions before doing this test.)

This setup will put a constant load on the battery for 90 minutes. This is meant to simulate the conditions that the battery will be in during the endurance race. The software provided will record the change in the battery's voltage over time. Analyzing this data will allow you to graphically see how long the battery lasts under a 25 Amp load.

➤ Installation

- ❖ Locate and download the necessary files from the download area of the solarcup.org website.
- ❖ From those files, first run the setup.
- ❖ Then, install the USB driver v1.7.0.
- ❖ Next, connect the data logging multimeter into your personal computer. If your computer doesn't detect the device, restart your console and try again.
- ❖ Finally, locate the DMM software and run the program. You should see something like this:



A graph of the battery voltage will appear in the box on the upper left, while the box on the right will show the data values as they come in. The battery voltage will be shown in the box on the lower left.

➤ Setup and Performing the Tests

- ❖ Ensure the data logging multimeter is plugged into your computer and the software opens properly.
- ❖ Next, ensure that the two channels of the constant load tester wired in parallel. This will allow you to draw 25 Amperes from the battery without burning out the tester. Each channel of the tester must be set to amps. There should be two wires already on the tester to connect these channels correctly.
- ❖ Then, connect the negative and positive terminals of the battery to the constant load device with the provided cables. Also, connect the data logging multimeter to the same two connections.
- ❖ Ensure that all connections are sturdy.
- ❖ Before powering on the constant load tester, make sure that all four knobs are turned all the way counter clockwise.
- ❖ Power on the constant load tester and make sure the CC (constant current) option is highlighted for both channels. If that is not the case, simply press the CC/CV buttons located beneath the four knobs, until the correct settings are selected.
- ❖ Take note of the red indicator lights. If any of them light up, make the appropriate adjustments.
- ❖ To perform the test, first go into the software to the Set(T) tab and select Data Sampling. Set this to around 10 samples/second.
- ❖ Next, click the start button in the software. The computer will prompt you to enable the PC-link mode on the data logging multimeter. To do so, simply hold the Red "Data Link" button for 3 seconds.
- ❖ **DO NOT BEGIN THE TEST YET.** Once you start the test in the software, you will have to quickly turn both channels on using the ON/OFF buttons located beneath the knobs.
 - If the setup is new, you will also have to set the current to 12.5 Amps on each channel using the COARSE and FINE knobs for each respective channel. Because the channels are in parallel, this draws a total of 25 Amps from the battery, comparable to the current draw during the actual race. Once you set the channels for 12.5 amps each leave them there to test your other batteries.
- ❖ Now, begin the test by clicking start in the software. At that point the software should be reading the battery voltage. Follow the steps above to begin taking data.
- ❖ Allow the test to run until the battery voltage goes down to 10.5V, then promptly turn off the constant load tester using the two separate channel power buttons. **DO NOT LET THE TEST RUN THE BATTERY DOWN ANY FURTHER**, it can cause damage to your battery.
- ❖ Lastly, stop the test in the DMM software and save the data in the File, save tab.
- ❖ The data will be saved as a .txt file and can be opened and analyzed using Excel.

