

Capacitor Testing Guide

The purpose of this guide is to provide instructions for how to test the ultracapacitors to make sure that they are properly polarized, hold charge correctly, can source large amounts of current and have proper capacitance values.

This charging guide was developed in conjunction with advice from Professor Bauer. Any questions should be directed to him.

Charged Voltage Test:

Purpose of this test:

The purpose of this test is to make sure that the capacitors are properly polarized, they have similar capacitance values and that they can hold charge properly. To properly perform this test you will have to spend a few hours with the capacitors because a large component of the test is to make sure that they hold charge.

Step by Step guide:

1. First connect 10 ultra capacitors in series. Make sure that they are connected properly with respect to polarization.
2. Connect these series ultra capacitors to a voltage source, again make sure that the voltage supply is properly connected to the capacitors with respect to polarity.
3. Charge the capacitors up to their max voltage.
4. Keep the ultra capacitors connected to the voltage source for several hours at the same voltage.
5. After 2 hours disconnect the series ultra capacitors from the voltage source
6. Measure and record the voltage across each capacitor using a DMM
7. Every 1 hour measure the voltage across each capacitor
8. Take these measurements several times and make a table of the voltage measurements
9. Look at the measurement analysis guide below to access the capacitors

Measurement Analysis:

- First it is important to note that with the quality of ultra capacitors that we are using it is likely that only 1/100 will be faulty according to Professor Bauer.
- If at any point a capacitor measures a negative voltage, remove the capacitor from the series connection and dispose of it because it is reverse polarized which means it is permanently ruined.
- If a capacitor is not holding onto charge i.e. voltage has dropped by more than $\frac{1}{3}$ of a volt over a few hours then dispose of the capacitor.
- If a capacitor is not within a few tenths of a volt from the other capacitors then you probably do not want to use it because its capacitance value is too different. If you are using balancing boards in your design you can relax this restriction a bit.

Carbon Pile Load Tester:



Purpose: This is a more advanced test that is used to check if capacitors are capable of sourcing large currents. The test works by connecting the ultra capacitors to a carbon pile whose resistance varies greatly depending on the pressure applied to the pile. You will be able to get resistance to near zero as you crank up the dial which will then result in currents in the 100's of amps. If the capacitors are functioning properly then the maximum current output will be about 1900 amps. When testing you should not go above half of that value so if they can output over 900 amps they are performing properly at least in terms of ability to source current.

Step by Step guide:

1. Ask Professor Bauer for specific instructions because unfortunately the tester was broken when we went to see him.