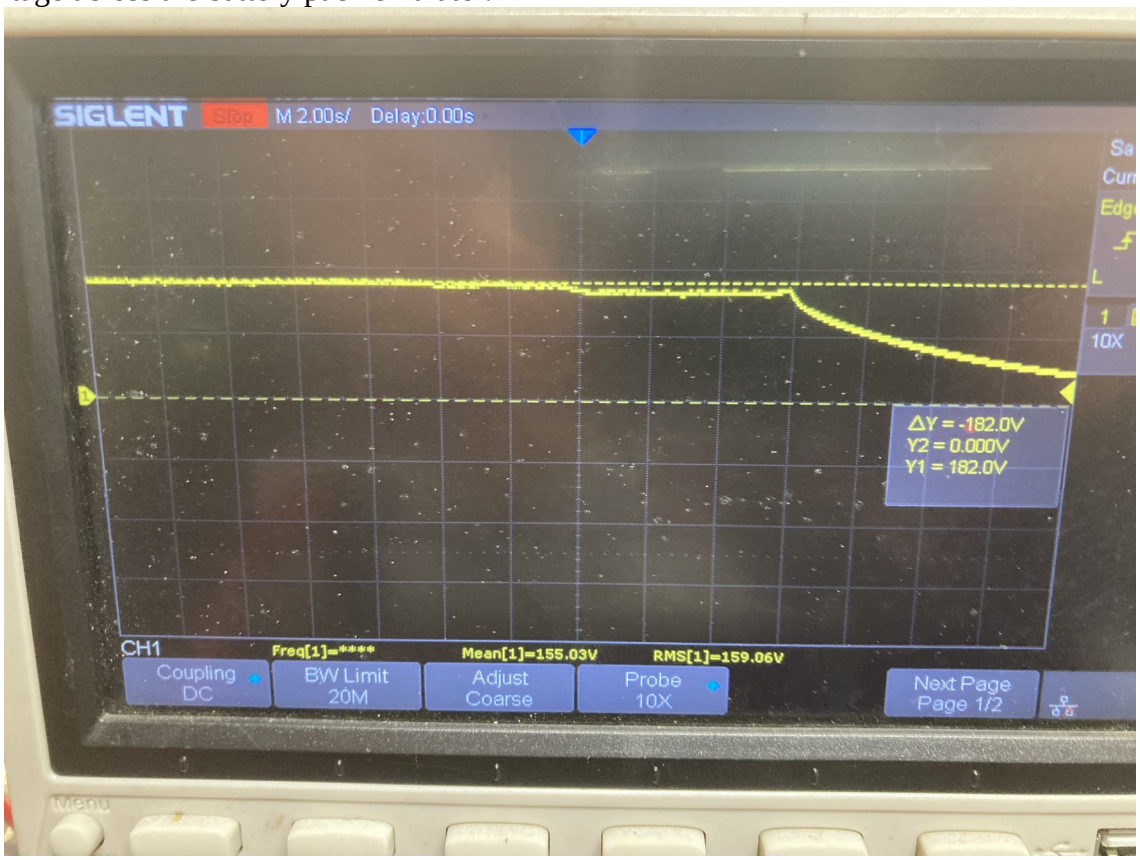
Battery Pack Emulator Short Charge Test (7/27/2023)

Firmware Rev: 4

Purpose: This is the first charging test that is done with the battery pack emulator. The emulator contains 12 series cells that are monitored by a BMS as well as 36 reverse series zener diodes which are intended to emulate more cells. The voltage current characteristic of a zener diode should be similar to that of a battery that is sinking power. That is, approximately flat at a certain voltage, not linear like a resistor.

Description: The charger is set to a charge set point of 50. This corresponds to a current of 0.396A. The charger is set to this low of a current in an attempt to not burn up the zener diodes. The battery pack emulator is attached across the output of the charger and a short charge spurt is run.

Results: The charge test was terminated when some smoke was observed in the vicinity of the zener diodes. Hopefully, this was from the wood or electrical tape contacting the diodes and not the diodes themselves. The current through the battery emulator initially overshot at about 0.6A; however it then seemed to settle to about to about 0.34A to 0.38A. Before the test, the real 12s battery pack was measured at 37.93V. After the test this voltage rose to 38.35V. The following trace was recorded for the total voltage across the battery pack emulator.



Analysis: The charge seemed to work as intended besides the smoke. As has been previously observed, the system does not maintain a perfect constant current. However, it regulates the current well enough to charge the batteries. That is, it acts more like a current source than a voltage source. The voltage per zener diode corresponds to approximately 4V which seems slightly high as the zener diodes are rated at 3.9V reverse voltage. This means that for future complete charge tests, the charge complete voltage threshold should be set at 193.2V or slightly lower.