A Raspberry PI based High Voltage System for lab testing the CPP muon chambers

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Overview

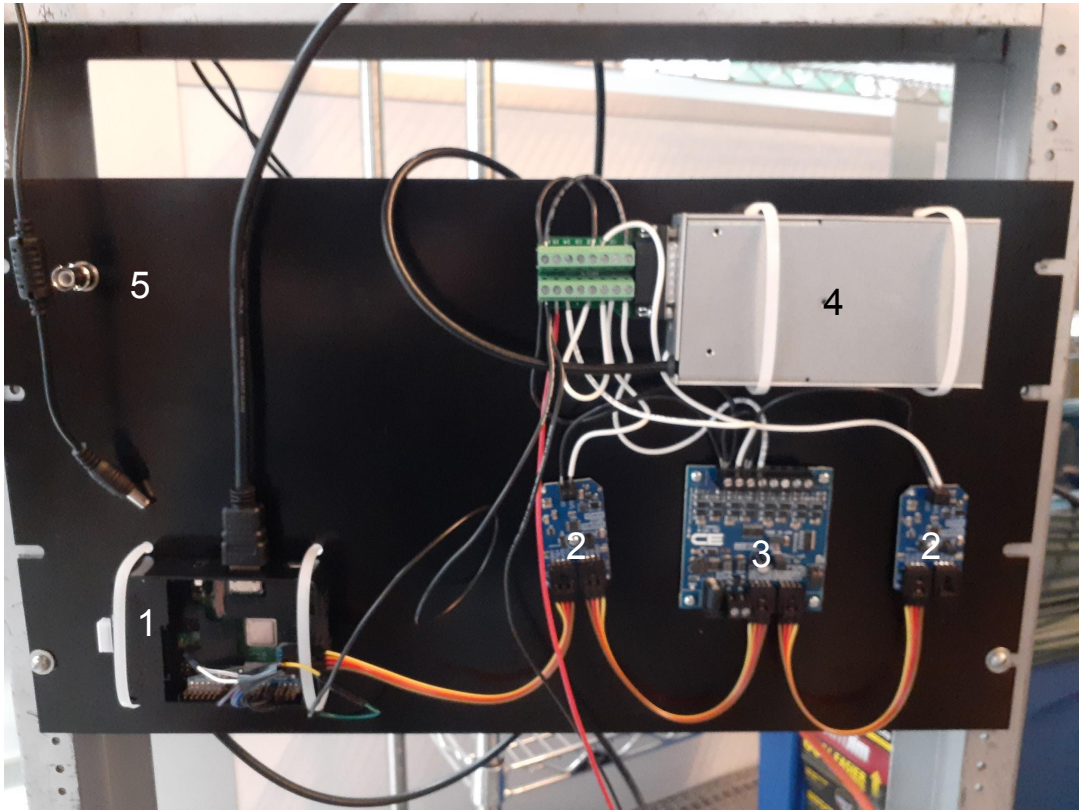
- The Multi-Wire Proportional Chambers require a high voltage system to run
- In order to test the MWPCs a Bertan uninterrupted power supply was used for the high voltage
- Bertan is unreliable so a new system was built
- System is designed to slowly ramp up voltage to a high voltage that the MWPCs need to run

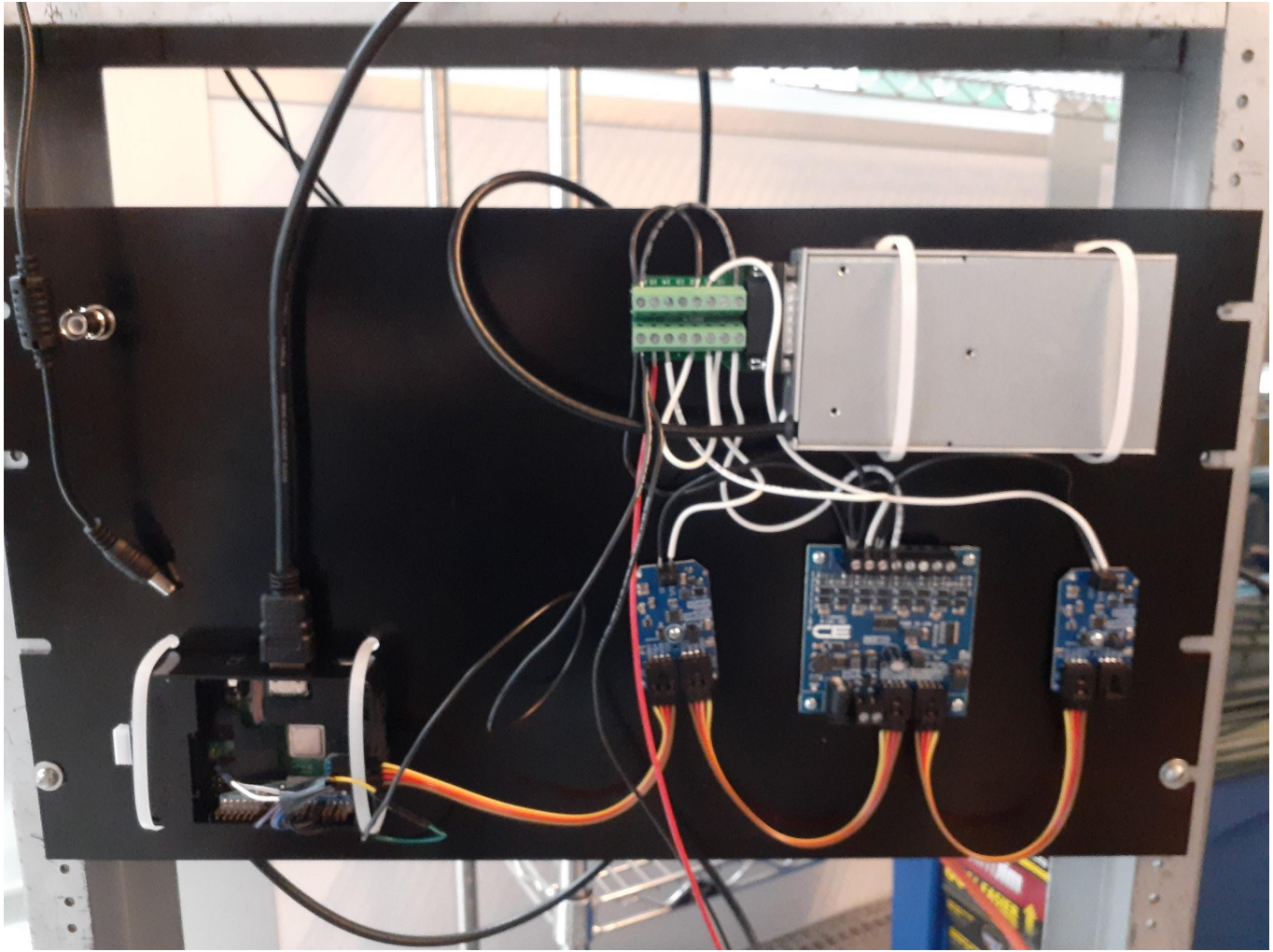
Bertan Model 375X

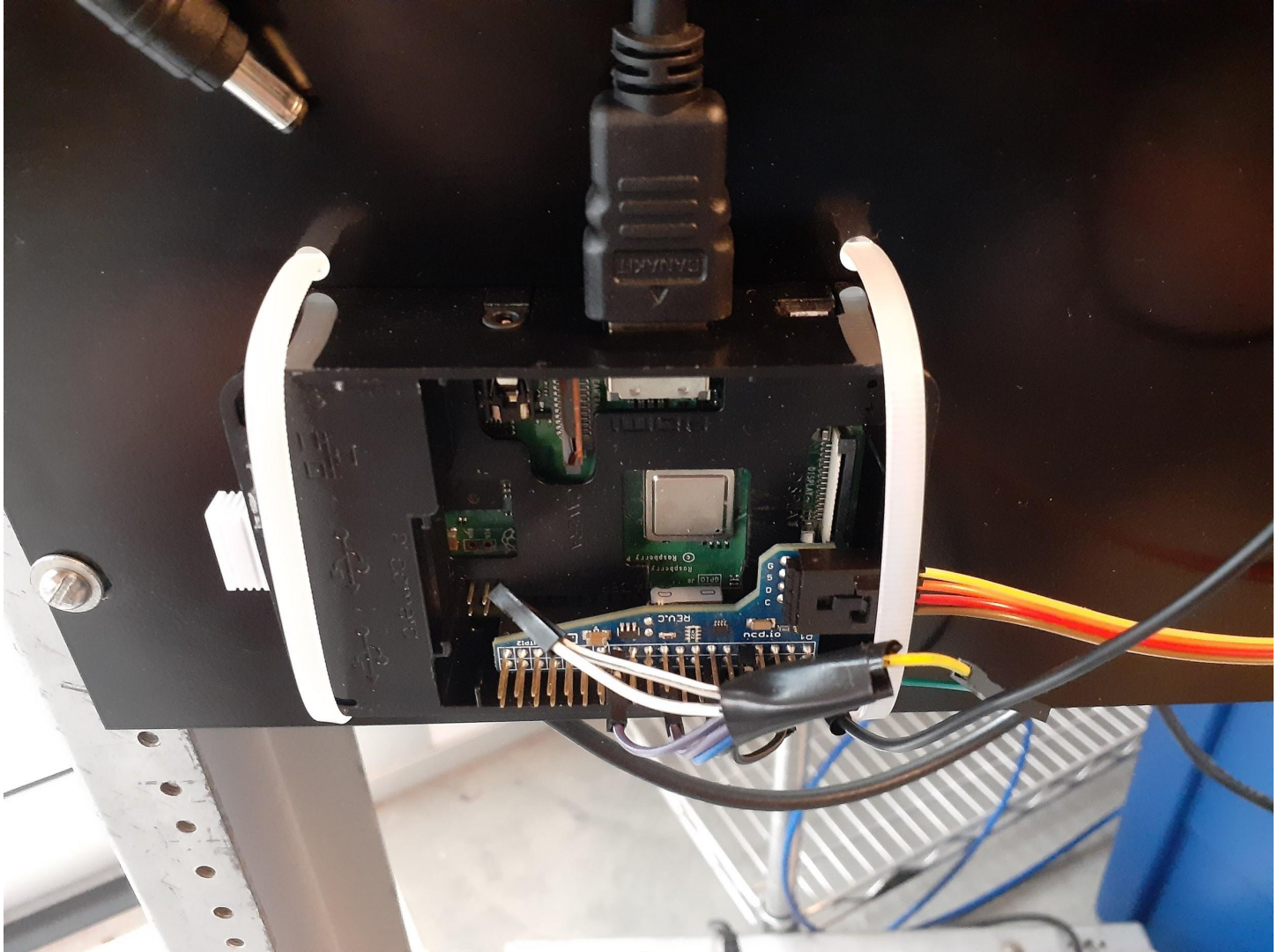
- Older System
- Has to be operated manually
- Voltage spikes are commonplace
- Constant Adjustments

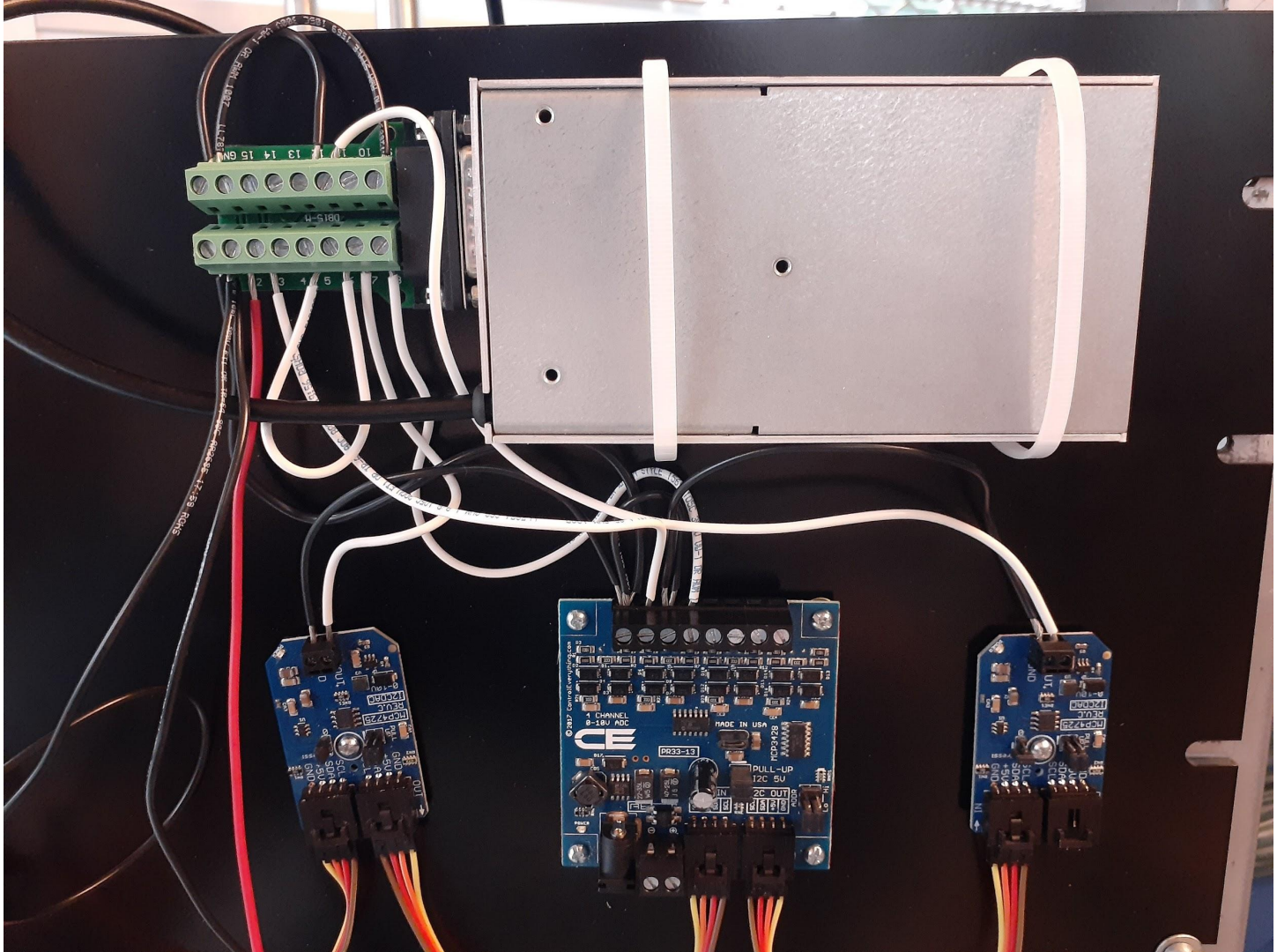
New System

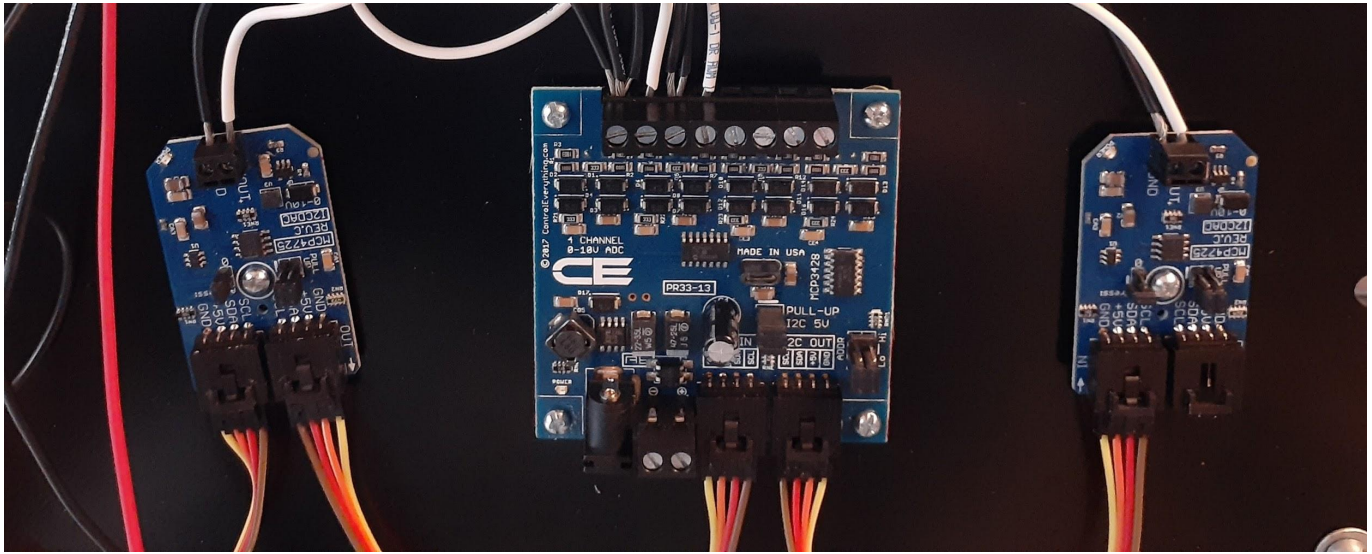
1) Raspberry PI 3B+
2) DAC - MCP4725
3) ADC - MCP3428
4) Spellman MPS 3P10/24/VCC
5) High Voltage Output



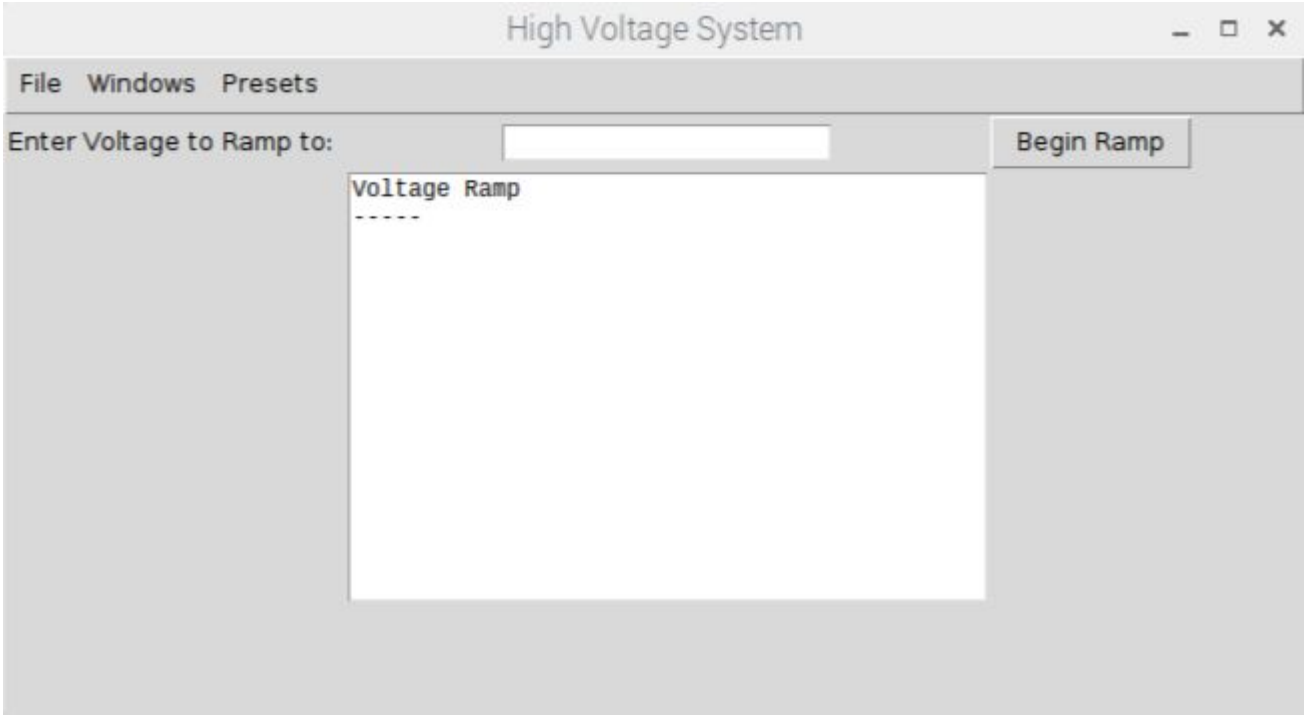



CANAKIT


4 CHANNEL
0-10V ADC
MADE IN USA
PR33-13
MCP3428
PULL-UP
I2C 5V
I2C OUT



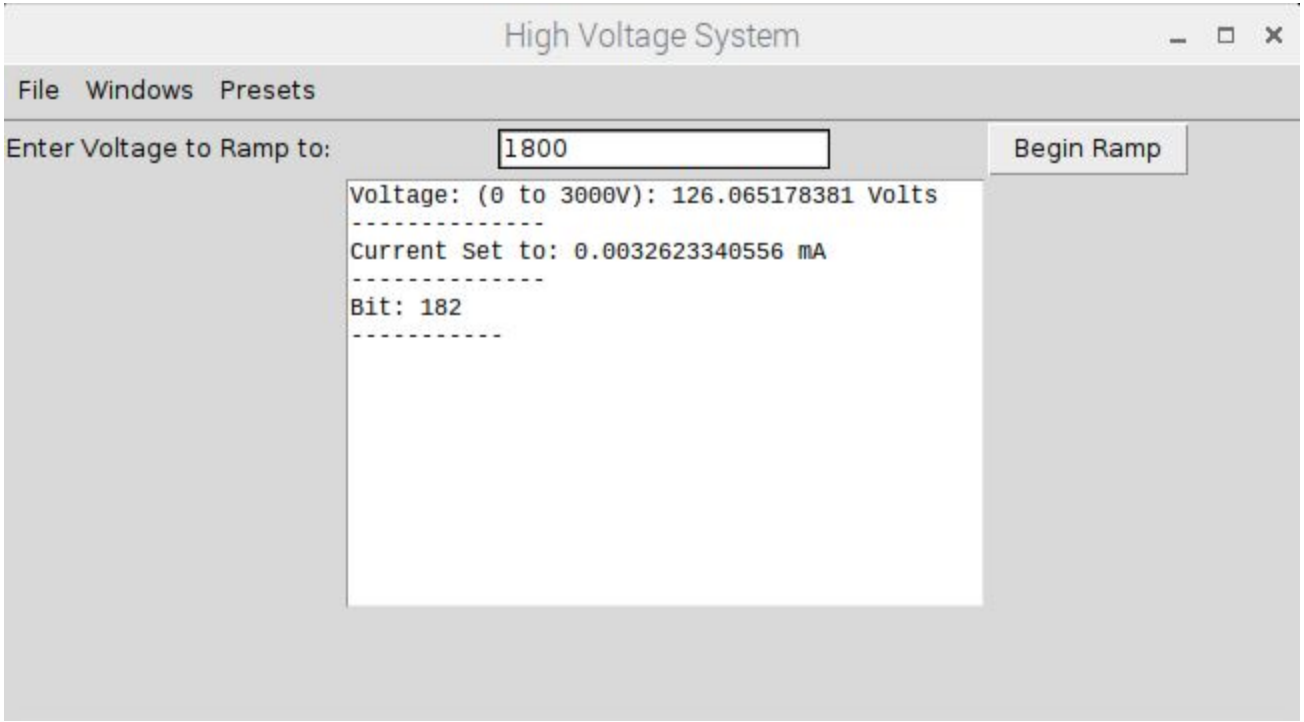
The two DACs (on left and right of above picture) convert the digital signal from the Raspberry PI (a 12-bit number) to an analog signal for the Spellman. The ADC (in the middle) takes the analog signal from the Spellman and converts it to a digital (12-bit) signal that can be read by the Raspberry PI.



A user entry field and button which starts the ‘ramp’

An updating text box which displays voltage and current information

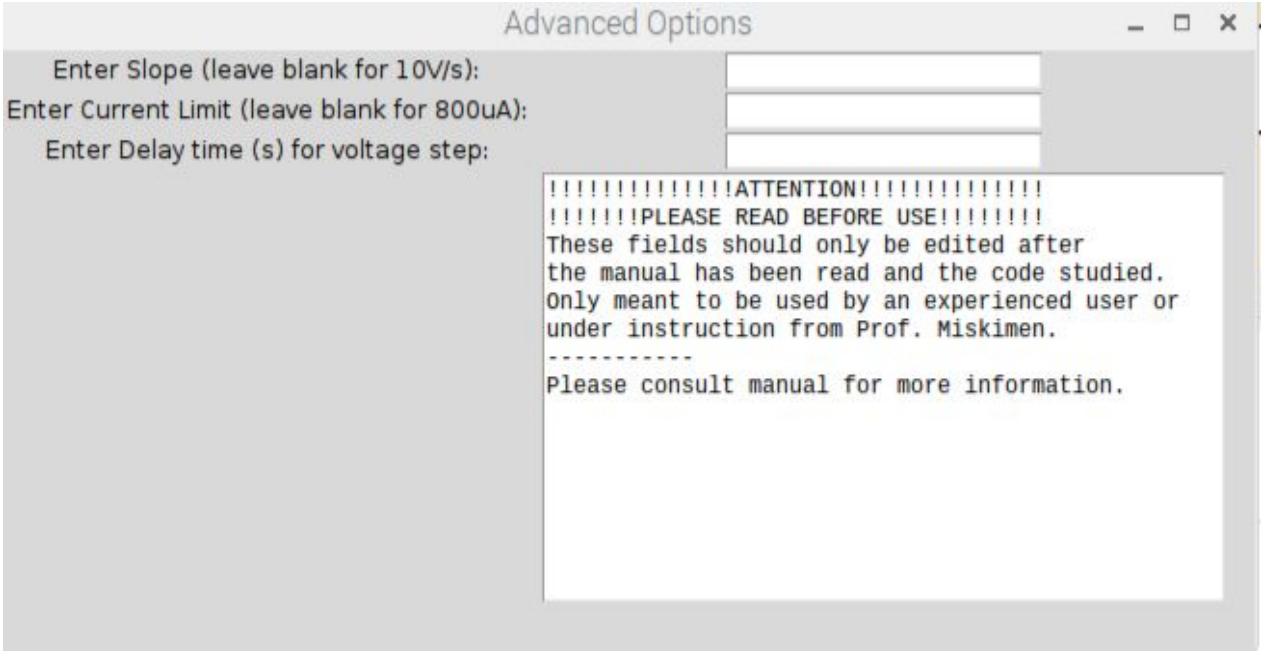
Cascade menus with multiple options to run the system



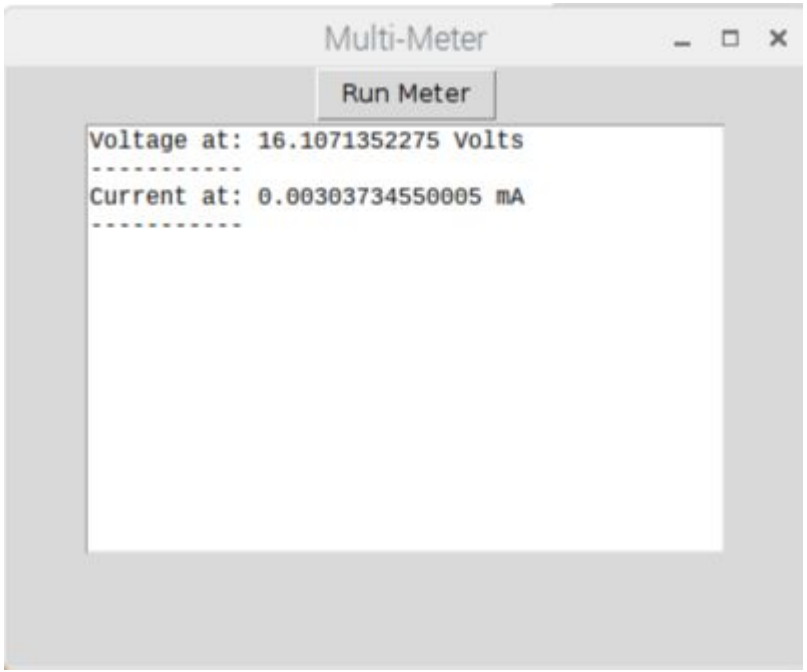
The system “in action”

Voltage and current are displayed and updated as this system is ramped

Bit - The raspberry pi controls the DAC by feeding it the voltage value in the form of a 12-Bit number



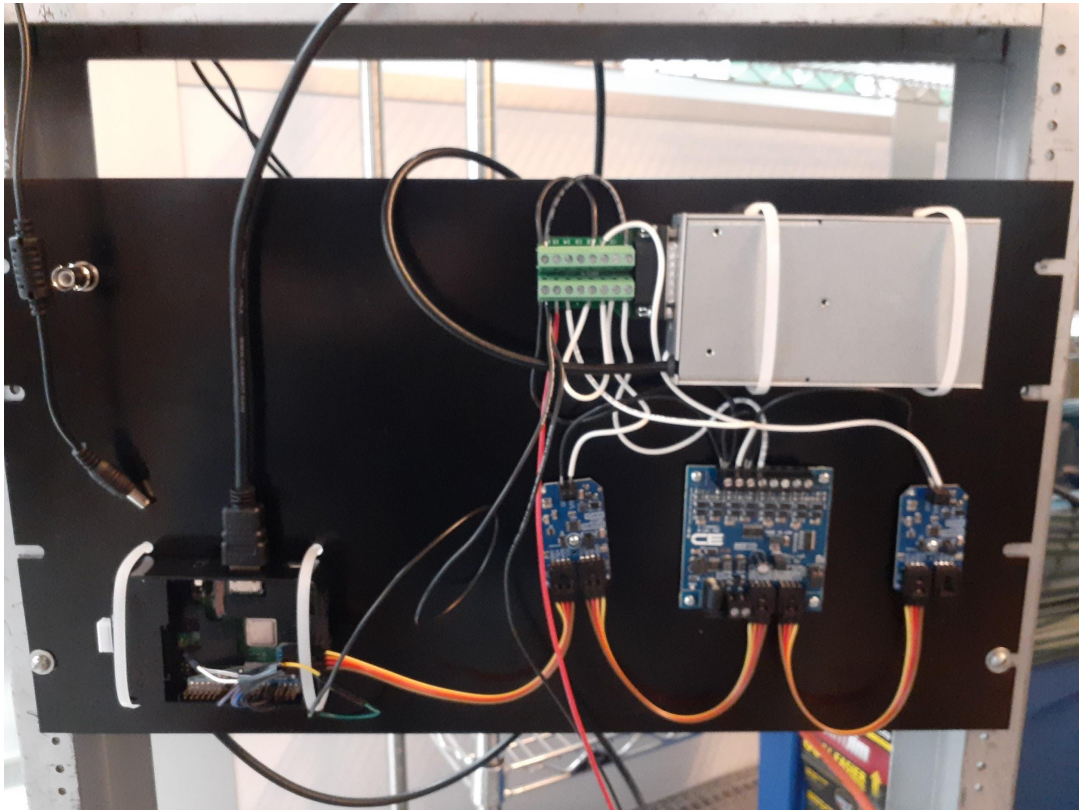
Advanced options that do not have to be changed to run the system but the user may wish to edit these for testing purposes.

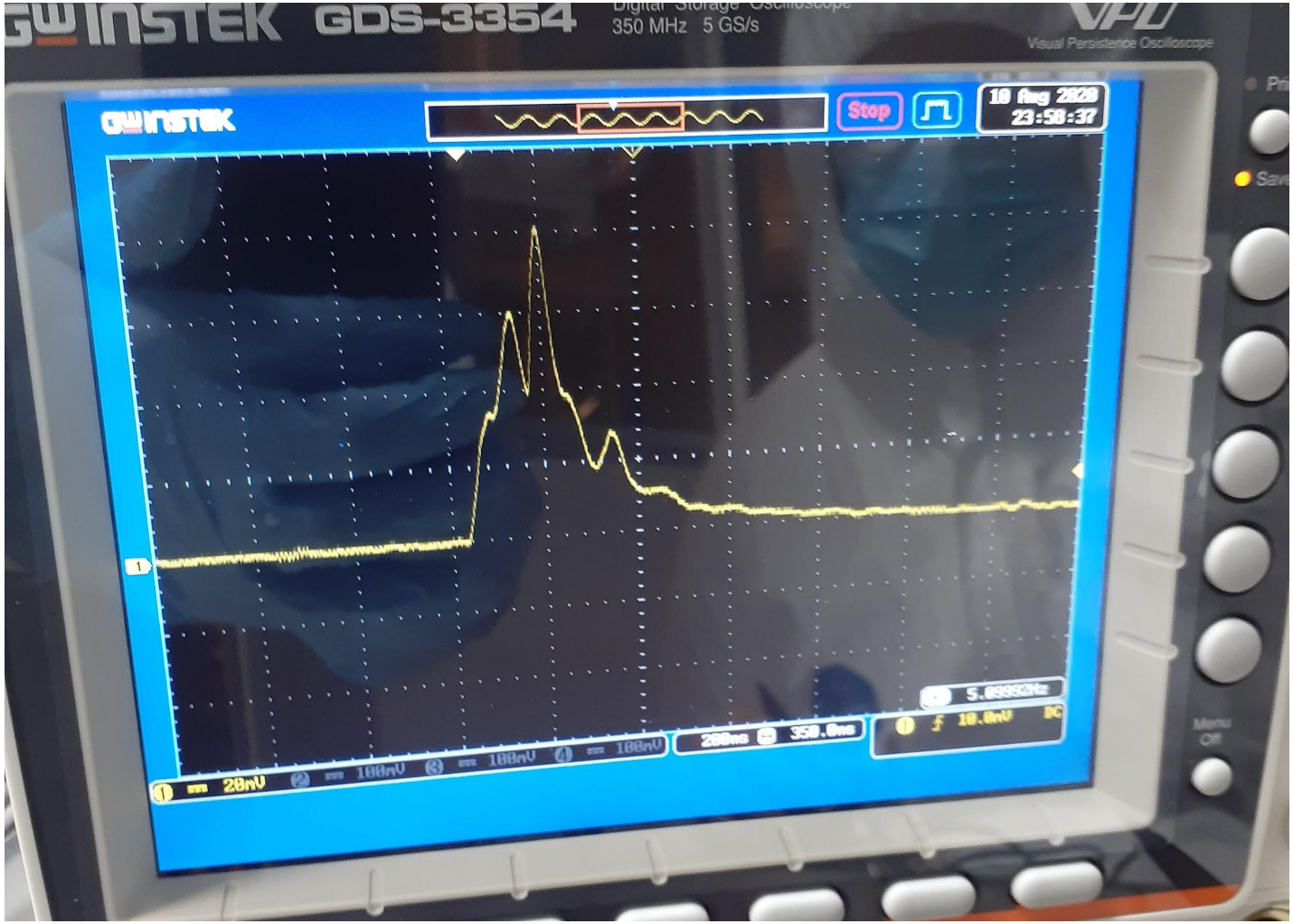


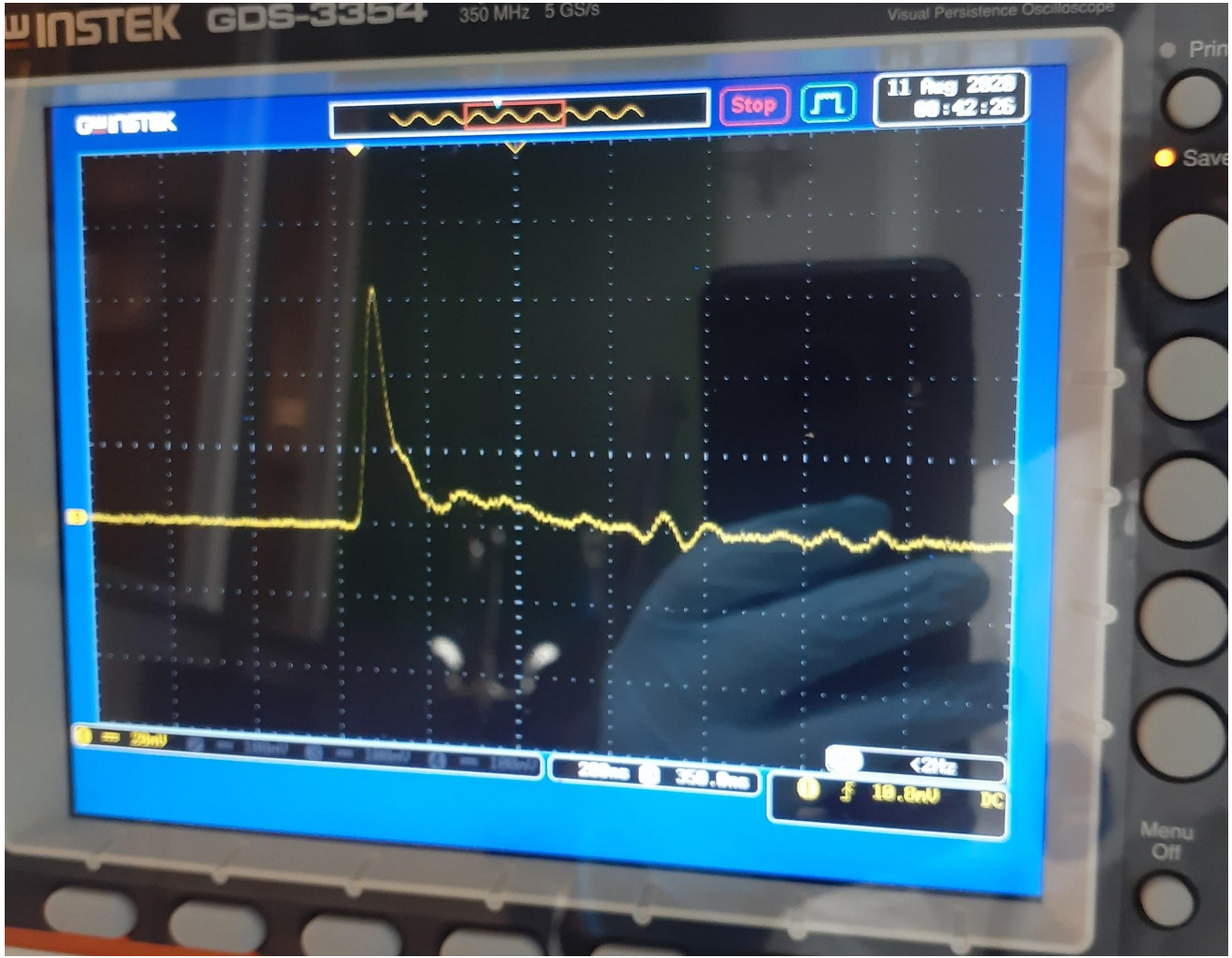
A simple “Multimeter” which pulls voltage and current value of the system from the ADC.

Continually updates for the user

1) User inputs parameters (voltage, slope, current limit)
2) Raspberry PI sends signals to both DACs to control voltage and current limit
3) DACs send analog signal to Spellman
4) The Spellman outputs high voltage as the voltage “steps” up
5) The ADC pulls voltage and current readings from the spellman and sends them back to the Raspberry PI.
6) Process continues until goal voltage is reached
7) Once value is reached system makes sure voltage is within +1/-1 uncertainty and monitors current




GW INSTEK GDS-3354
350 MHz 5 GS/s
Visual Persistence Oscilloscope
Stop
18 Aug 2020
23:58:37
20mV
100mV
100mV
100mV
200ns
350.0ns
10.0mV
DC


INSTEK GDS-3354
350 MHz 5 GS/s
Visual Persistence Oscilloscope
Stop
11 Aug 2020
08:42:26
Print
Save
Menu
Off