IV Curve testing process

Materials:

- PV Cell
- Pyranometer
- Fluke DVM
- Thermocouple
- Metal Surface for heat sink/source?
- Rheostat or potentiometer min power rating of P=Isc x Voc, mid range resistance R=Voc/Isc

Process:

1. Illuminate the cell at a measured value of sunlight (found with pyranometer) and adjust the cell temperature to the expected operating temperature.

2. Connect the rheostat to the cell and record the cell output voltage and current while changing variable resistance from a short circuit (Isc, V=0) to the largest value available.

3. Open the circuit and measure Voc at I = 0.

Curve Tracer Arduino Code Calculations

int k : this is the PWM value, it will sweep from 0, to 255 to supply low pass filter with 0-5v PWM
float pre_volt : this is the raw 10-bit integer to hold the value of voltage received in analog pin 0
float pre_current : this is the raw 10-bit integer to hold the value of current received in analog pin 2

const float bit_to_volt_conversion : the conversion factor to convert raw voltage input from 10bit to real voltage

$$\frac{5V}{1023} = 0.0048875855$$

const float voltage_gain : the gain of the op amp leading to analog pin 0. Subject to change based on PV max voltage.

$$2$$

const float voltage_gate : the gain of the voltage divider. Leads into voltage_gain op amp. Subject to change based on PV max voltage.

$$\frac{1}{6}$$

const float current_gain : the gain of the op amp leading to analog pin 2. Subject to change based on PV max voltage.

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const float current_resistor : the 2.26 Ω resistor used for heat dissipation, used to calculate total current gain.

2.26

const float amp_to_mA_conversion : multiplier to convert amps to milliamps.

1000.0

float final_volt : final converted value of raw voltage input to actual real-world voltage

pre_volt * bit_to_volt_conversion * (1/voltage_gain) * (1/voltage_gate)

raw value→10 bit conversion→inverse of gain→inverse of voltage gate

float final_current : final converted value of raw current input to actual real-world voltage

pre_current * bit_to_volt_conversion * (1/current_gain) * (1/current_resistor) * (amp_to_mA_conversion)

raw value→10 bit conversion→inverse of gain→inverse of 2Ω resistor→multiply by 1000 A to mA