Solar Panel Properties

WARNING: DC power can be dangerous. DO NOT TOUCH LIVE CIRCUITRY.

Abstract: In this lab, Ohm's Law will be discussed and experimented with.

Materials:

- Solar Panel Cluster
- Resistor Box consisting of a 1/4 ohm resistor
- 2 Banana Jack wires (Preferably one red, one black)
- 2 Digital Multimeters (DMM)
- Work Light

Procedure:

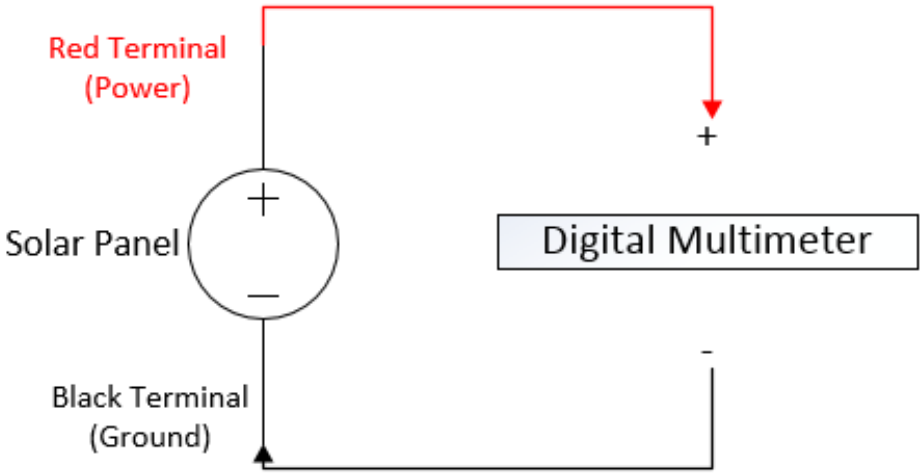

Figure 1: Basic Schematic for Part 1

Figure 2: DMM in the 20V Position

1. Place the work light approximately 2 feet from the solar panel cluster. Leave the work light in the off position.
2. Connect the DMM to the solar panel by connecting a red Banana Jack Wire from the red terminal on the solar panel to the middle plug on the DMM, labeled VΩmA. This terminal on the DMM will be used to measure voltage, resistance and current of a circuit.
3. Connect the black plug of the banana jack to the black terminal on the solar panel. Attach the other end of the banana jack to the right plug on the DMM, labeled COM. COM stands for common, or ground.
4. Turn the dial of the DMM to the correct position by turning the dial to DC voltage, 20 V. See figure 2 for the correct DMM position.
5. Turn the light on.
6. Record the voltage in the Vov column of Table 1 at the bottom of this section. Vov is the open voltage of the panel, which is the maximum voltage that the panel can output.
7. Remove the red banana jack wire from the DMM.
8. Turn the dial on the DMM to the 10A current position, shown in figure 3.

Figure 3: DMM in the 10A Position

9. Insert the red banana jack wire in to the farthest left terminal of the DMM, labeled 10Amax.
10. Record the current in the Isc column of Table 1 at the end of this section.
11. Remove all wires from all components

Table 1

Vov (V)	Isc (A)

Part 2

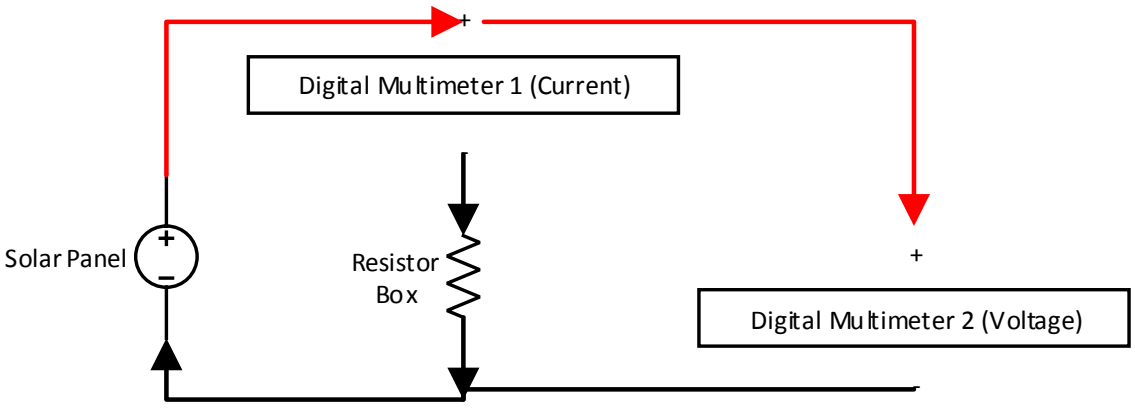

Figure 4: Electrical Circuit in Part 2

1. Set the first DMM to the 10 A dial position shown in figure 3.

2. Use a red Banana Jack wire to connect the red terminal on the solar panel cluster to the 10 Amax connection on the 1st DMM.
3. Use a different red banana jack wire to connect the COM connector on the 1st DMM to the red terminal of the resistor box.
4. Connect a black banana jack wire from the black terminal of the resistor box to the black terminal to the solar panel cluster.
5. Connect a red banana jack wire from the red connection on the solar panel cluster to the VΩmA connection on the 2nd DMM.
6. Connect a black banana jack wire from the black connection on the solar panel cluster to the COM connection on the 2nd DMM.
    - There should be 4 total wires connected to the solar panel cluster.
7. Turn the resistor box potentiometer and record the values from the 1st DMM and 2nd DMM and fill out the table below.
    - The 1st DMM measures Current (A) and the 2nd DMM measures Voltage (V).

Table 2

Measurement	Voltage (V)	Current (A)	Calculated Resistance (Ω)
1			
2			
3			
4			
5			
6			

Calculations:

1. Find the maximum power output of the solar panel. Hint: Use Vov and Isc from Part 1.

2. Plot a voltage versus current for the measurements taken in Part 2.

Analysis:

1. A series circuit is when all components are daisy-chained together, or the power flowing out of one component flows in to the next component. A parallel circuit is when components split the power flowing from a different component. What kind of circuit was built in Part 1 in this lab?

2. Describe what happened to the generated Voltage and Current of the solar panel when the resistance of the resistor box was changed in Part 2.

3. When the resistor box was connected to the solar panel in Part 2 of the procedure what was the maximum Power Generated by the solar panel? Hint: Power = V*I, Power in Watts (W).

4. What was the resistance of the resistor box for the maximum power generated in Question 3? Hint: V = I*R, R = resistance in ohms (Ω)