

Regulated vs Unregulated Power

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

Abstract: In this lab, regulated DC power will be compared to unregulated DC power to show the importance of regulated power in grid settings.

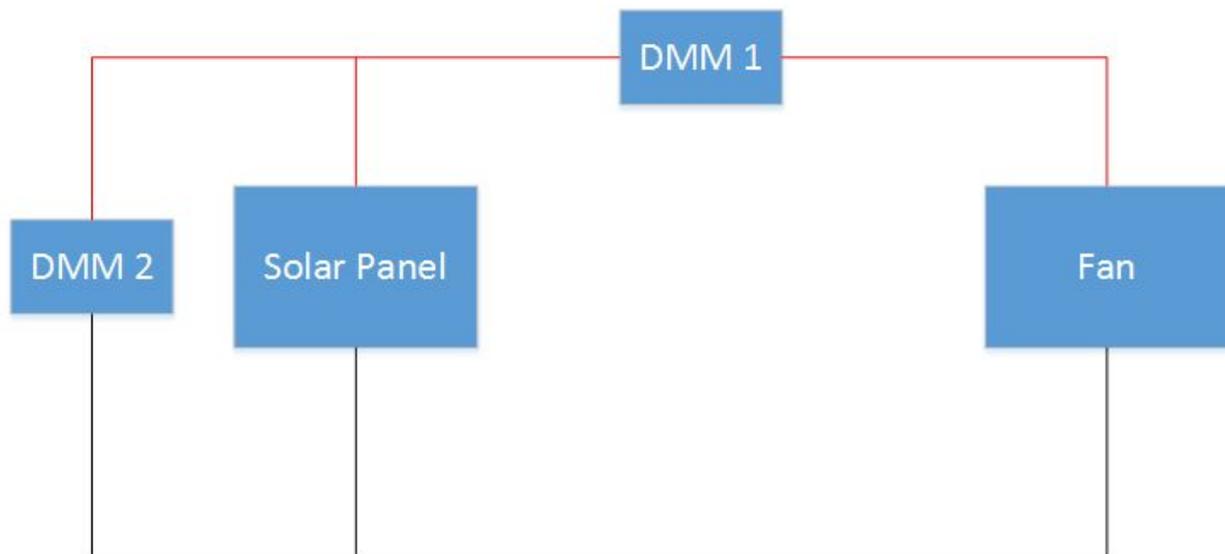
Materials:

- Solar Panel Cluster
- Wooden board with DC power regulator
- Banana Jack wires (Preferably one red, one black)
- 3 Digital Multimeters (DMM)
- Work Light
- Computer Fan

Procedure:

Part 1

Part 1 Schematic

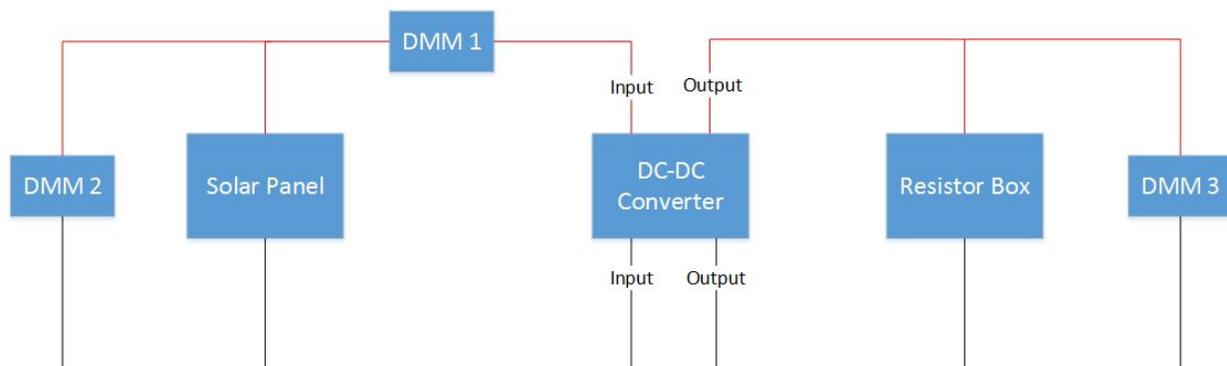


1. Place the light fixture approximately 1 foot away from the solar panel, with the light fixture OFF.
2. Insert the red wire from the 10 A Max terminal of the first DMM to the red terminal on the solar panel.
3. Insert another red wire from the COM port of the first DMM to the red wire of the computer fan.

4. Turn the first DMM dial to 10A position on the multimeter.
5. Insert the black wire from the fan to the black terminal on the solar panel.
6. Connect a black banana jack wire from the COM port on the second DMM to the black terminal on the solar panel.
7. Connect a red banana jack wire from the Voltage port on the second DMM to the red terminal on the solar panel.
8. Turn the second DMM to the 20V DC position.
9. Turn the light fixture ON.
10. Made a mental note of the approximate speed of the fan using the noise or air moved by the fan. This is not designed to get an exact speed, so does the fan move fast, slow or not at all?
11. Write the current (first DMM) and voltage (second DMM) from the solar panel in the calculations section of the laboratory.
12. Carefully move the light approximately 3 feet away from the solar panel.
13. Note the relative speed of the fan. Is it moving fan, slow, or not at all? What is the Voltage shown on the DMM and the current.
14. Turn the light fixture OFF.

Part 2

Part 2 Schematic



1. Remove the wires connected to the fan.
2. Connect the red wire that was connected to the fan to the Regulated power in red terminal.
3. Connect the black wire that was connected to the fan to the black regulated power in terminal.
4. On the near side of the wooden board are terminals marked "**Regulated Power Out**". Connect the red fan wire to the red terminal directly above this label. Connect the black fan wire to the black terminal directly above the same label.

5. Connect a red banana jack wire from the red terminal labeled on the "Regulated Power Out" side of the board to the 20V DC terminal on the third DMM.
6. Connect a black banana jack wire from the black terminal labeled on the "Regulated Power Out" side of the board to the COM terminal on the third DMM.
7. Turn the third DMM dial to the 20V DC position.
8. Position the light fixture approximately 1 foot away from the solar panel.
9. Turn the light fixture ON.
10. Note the relative speed of the fan. is it moving fan, slow, or not at all? What is the current of the solar panel (DMM 1)? What is the voltage of the solar panel (DMM2) and the voltage of the power regulator (DMM 3)?
11. Move the light fixture slowly away from the solar panel. How did moving the light affect the fan speed and fan voltage?

Calculations:

Part 1

Unregulated Fan (Step 11)

Voltage	Current

Part 2

Regulated Fan (Step 10)

Solar Panel Voltage	Solar Panel Current	Converter Voltage

Analysis:

1. How did the fan speed change when the light was moved with and without regulated power?

2. Estimate the current produced by the power regulator? Hint: $V_{in} * I_{in} = V_{out} * I_{out}$