

Circuits Preliminary Lab

Physics

Your goal in this preliminary lab is to familiarize yourself with circuits, circuit design, Ohm's Law, and using a multimeter. You will know you've accomplished your goal when you can:

- a) Diagram a circuit and build the circuit you've diagramed
- b) Correctly predict the size of resistors needed to achieve desired current in series and parallel circuits (given a fixed voltage power source)
- c) Use LEDs in series and parallel circuits with predictable results
- d) Use a multimeter to correctly measure resistance, voltage, and current

Task 1: Experiment with a series circuit; one resistor; LED

1. Using a power supply set to 5V, design and draw a circuit that allows for around 15 mA (15 milliamps, or 0.015 amps) of current to flow through an LED. Assume that your LED will have a resistance of about 200 Ohms.
2. Build your circuit and test your current **without** the LED order to prevent burn-out (use a 200 Ohm resistor in place of the LED).
3. Add an LED and measure the total voltage and the voltage across each of the components of this circuit (ignore wires).
4. You do not need to measure the current through each component. Why?
5. Verify that your measured results match with what Ohm's Laws and the equation for resistance in series would predict.

Task 2: Experiment with a parallel circuit; multiple resistors, two LEDs

1. Still with a power supply providing 5V, design and draw a circuit that will drive one LED with around 15 mA of current and another LED with around 11 mA of current. (Now, assume that your LEDs will have about 100 Ohms of resistance.)
2. Build and test your circuit WITHOUT using LEDs to verify the correct levels of current (use 100 Ohm resistors in place of the LEDs).
3. Add your LEDs and test the voltage, resistance, and current of each circuit path and circuit component (including the total voltage of the circuit).
4. Verify that your measured results match with what Ohm's Laws and the equations for resistance in series and parallel would predict.

Task 3: Determine the actual resistance of your LEDs in each circuit

LED's do not show a linear relationship between the applied voltage and the resulting current – they have a variable amount of resistance. Based on the actual voltage of your circuits and the actual current of your circuits, what was the effective resistance of your LEDs?