

OPSC 110 - ELECTRONICS FOR OPTICS AND PHOTONICS I
Laboratory 2: Ohm's Law and Multimeters

Date: _____

Group: _____

Name	Time In	Time Out	Total Time

Objectives:

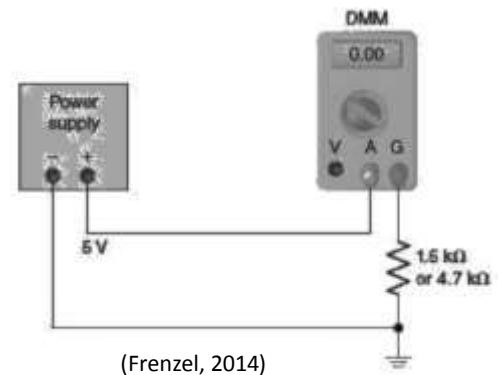
1. Verify Ohm's law.
2. Measure current and voltage with a multimeter.

Materials:

- DC power supply
- DMM
- 1.5-k Ω , ½ -W resistor
- 4.7-k Ω , ½ -W resistor

Procedure:

1. Connect a 1.5-k Ω resistor to the output terminals of one of the bench power supplies. Turn on the power supply, and set the voltage across the resistor to 5 V. Measure the voltage across the resistor with the multimeter to verify that the power supply voltage is correct.
2. Using Ohm's law, calculate the current (I) that will flow in the resistor.
3. Turn off the power supply, and connect the multimeter in series with the resistor to measure current (**IMPORTANT: Let your instructor verify the setup before turning the power supply on again**). Set the multimeter to measure current on the correct range. Then turn on the power supply, and note the current on the multimeter. How do your calculated and measured values for current compare? Explain the reasons for any differences.
4. Turn off the power supply. Replace the 1.5-k Ω resistor with a 4.7-k Ω resistor. The multimeter should still be wired to measure current. Turn on the power. The voltage should still be set to 5 V. Measure the current with the new resistor value. How did the current vary when you increased the resistance but held the voltage constant?



5. Set the power supply voltage to 10 V. Again measure the current in the 4.7-k Ω resistor. How did the current change with the voltage increase?
6. If you have a variable voltage supply, do the following. While observing the current on the multimeter, reduce the voltage with the power supply control to 6 V. What happens to the current? Next, increase the voltage to 12 V with the power supply control. How does the current change?

Results:

1.5-k Ω resistor connected to 5 V source:

Calculated current I:	Measured current I:
How does the two compare?	
Explain the difference between the measured and the calculated value:	

4.7-k Ω resistor connected to 5 V source:

Calculated current I:	Measured current I:
How does the two compare?	
Explain the difference between the measured and the calculated value:	

4.7-k Ω resistor connected to 10 V source:

Calculated current I:	Measured current I:
How did the current change with the voltage increase?	

4.7-kΩ resistor connected to variable voltage supply:

What happens to the current when the voltage is reduced from 10V to 6V?

What happens to the current when the voltage is increased from 6V to 12V?

Questions:

1. What is the current in a circuit in which you double the voltage and half the resistance?

2. Explain how the DMM is wired into the circuit to measure the current.

3. What is the theoretical and actual value of current in a circuit if the resistance is zero?

Reference: Frenzel, L. E., (2014). *Experiments Manual for Contemporary Electronics. Fundamentals, Devices, Circuits, and Systems*. (1st ed). New York. NY: McGraw-Hill Companies. Inc.

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