

Experiment 3: Ohm's Law

Equipment Needed

- AC/DC Electronics Lab Board
 - Wire Leads
 - Resistors (assorted values)
- D-cell Battery
- Digital Multimeter (DMM)
- Graph paper

Purpose

The purpose of this lab will be to investigate the three variables involved in a mathematical relationship known as Ohm's Law.

Procedure

1. Choose one of the resistors you have been given. Using the chart on the next page, decode the resistance values and record that value in the first column of Table 3.1 on the next page.

MEASURING CURRENT

2. Construct the circuit shown in Figure 3.1a by pressing the leads of the resistor into two of the springs in the Experimental Section on the Electronics Lab Board.

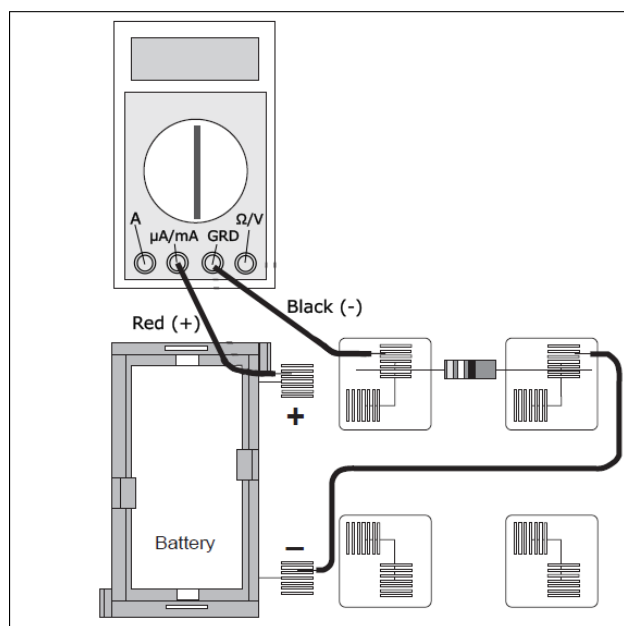


Figure 3.1a

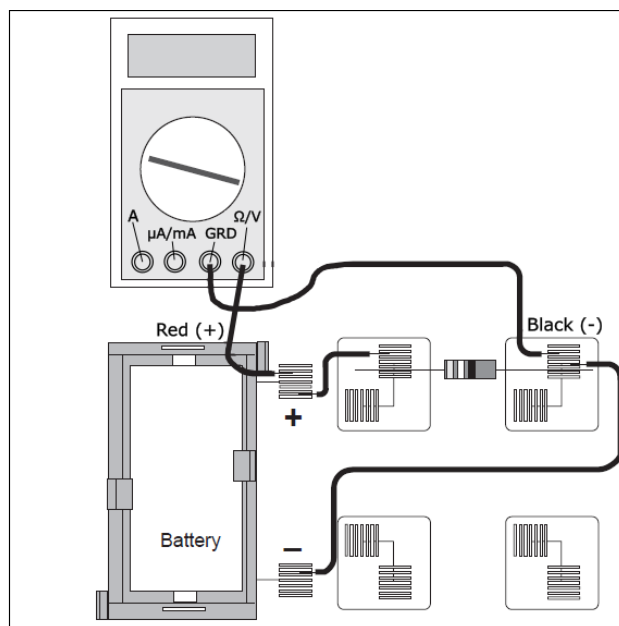


Figure 3.1b

3. Set the Multimeter to the 200 mA range, noting any special conditions needed for measuring current; make sure that the red lead is connected to the μA and mA port and the black lead is connected to the ground. Connect the circuit and read the current that is flowing through the resistor. Record this value in the second column of Table 3.1.
4. Remove the resistor and choose another. Record its resistance value in Table 3.1, then measure and record the current as in Steps 2 and 3. Continue this process until you have completed the process for all of the resistors you have been given. As you may have more than one resistor with the same value, keep them in the order you used them, since you will need to use them again in the same order in the next steps.

MEASURING VOLTAGE

- Disconnect the wires from the Multimeter and connect a wire from the positive lead (spring) of the battery directly to the first resistor you used, as shown in Figure 3.1b. Change the Multimeter to the 2 V DC scale and re-connect the leads, with the red lead now connected to the resistance and voltage port, as shown also in Figure 3.1b. Measure the voltage across the resistor and record it in Table 3.1.
- Remove the resistor and choose the next one you used. Record its voltage in Table 3.1 as in Step 5. Continue this process until you have collected data for all of the resistors.

Table 3.1

Resistance (Ω)	Current (A)	Voltage (V)	Voltage/Resistance

Data Processing

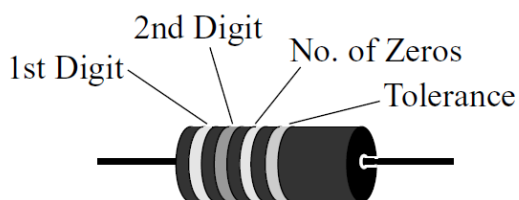
- Construct a graph of Current (y-axis) vs. Resistance (x-axis).
- For each of your sets of data, calculate the ratio of Voltage/Resistance. Compare the values you calculate with the measured values of the current.

Discussion

- From your graph, what is the mathematical relationship between Current and Resistance?
- Ohm's Law states that current is given by the ratio of voltage/resistance. Does your data agree with this?
- What were possible sources of experimental error in this lab? For each one, would you expect it to make your measured values larger or smaller?

Reference

Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Fourth Band

None	$\pm 20\%$
Silver	$\pm 10\%$
Gold	$\pm 5\%$
Red	$\pm 2\%$



NOTE: The 4.7 ohm resistor has a gold third band to indicate that the two-digit number from the first two bands should be divided by 10.