

Resistance in Circuits¹

Equipment Needed:

1 Circuits Experiment Board (EM-8622)	Demo cart
1 Multimeter	Demo cart
1 Resistors (assorted)	Demo cart

Purpose

The purpose of this lab will be to experiment with the variables that contribute to the operation of electrical circuits. This is a group effort and each member will take an active role. For each new setup a new member will assemble the circuit and the other members will operate and take readings as required. You will measure different combinations of resistance and compare them to the theoretical values.

1 Procedure

1. Choose the three resistors of different resistance. Enter those sets of colors in Table 1 below. We will refer them as R_1 , R_2 and R_3 .
2. Determine the coded value of your resistors. Enter the value in the column labeled “Coded Resistance” in Table 1. Enter the Tolerance value as indicated by the color of the fourth band under “Tolerance.”
3. Use the Multimeter to measure the resistance of each of your three resistors. Enter these values in Table 1.
4. Determine the percentage experimental error of each resistance value and enter it in the appropriate column.

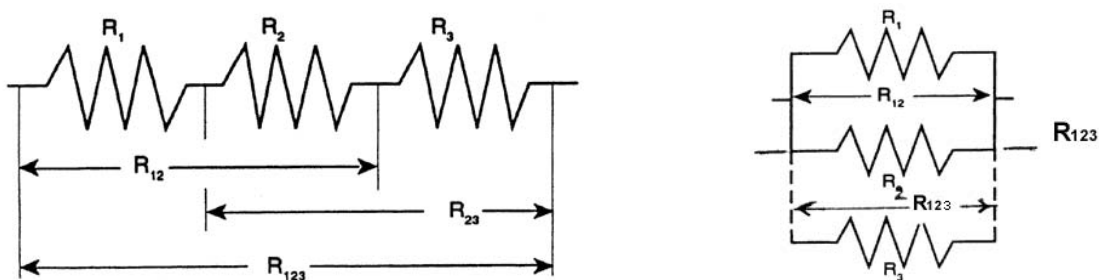


Figure 1: Resistors in Series and in Parallel

¹Adapted from PASCO Basic Electricity ©1993, PASCO Scientific Roseville, CA

Table 1: Color Code and Measurement: Identical Resistance

	Color				Coded Resistance	Measured Resistance	Percentage Error	Tolerance
	1st	2nd	3rd	4th				
1								
2								
3								

$$\text{Experimental error} = \left| \frac{\text{Measured} - \text{Coded}}{\text{Coded}} \right| \times 100\%$$

5. Now connect the three resistors into the SERIES circuit in the left hand side of Figure 1, using the spring clips on the Circuit Experiment Board to hold the leads of the resistors together without bending them. Measure the resistances of the combinations as indicated on the diagram by connecting the leads of the Multimeter between the points at the ends of the arrows and record your result in Table 2. Use the “Measured Resistance” (*not* the “Coded Resistance”) in Table 1 to calculate the theoretical values and find the percentage difference.

Table 2: Resistors in Series

Resistor	Measured	Theory	Percentage Difference
R_{12}			
R_{23}			
R_{123}			

6. Construct a PARALLEL circuit as in the right hand side of Figure 1, first using combinations of two of the resistors, and then using all three. Measure and record your values for these circuits in Table 3.

Table 3: Resistors in Parallel

Resistor	Measured	Theory	Percentage Difference
R_{12}			
R_{23}			
R_{123}			

7. Construct a COMBINATION circuit as in Figure 2. Measure and record your values for these circuits in Table 4.

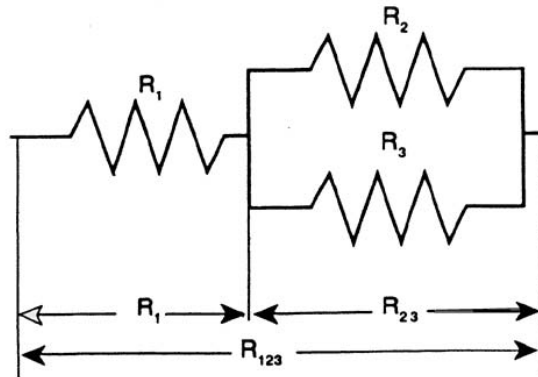


Figure 2: Resistors in Combination

Table 4: Resistors in Combination

Resistor	Measured	Theory	Percentage Difference
R_{123}			

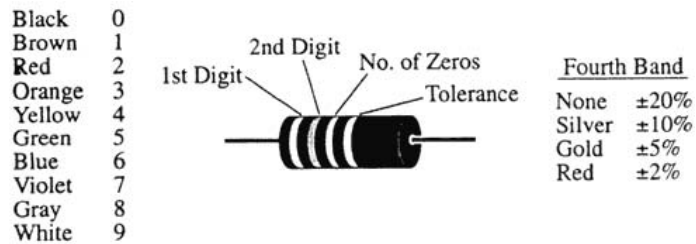


Figure 3: Resistor Color Code

You can also check out the Graphical Resistance Calculator at
<http://www.dannyg.com/examples/res2/resistor.htm>