

Name: _____

MUS 348 / EE 480

Spring 2010

Lab experience #1

Resistors are commonly used in electronic circuits, along with other components like capacitors, inductors, and active devices such as transistors and integrated circuits (commonly called ICs). Resistors may be connected in series and/or parallel for many reasons, such as to reduce a voltage to a convenient value (as in a voltage divider) or to provide a value different from one that is commercially available.

Discrete resistors have a nominal value indicated by colored bands or other labeling. Refer to a color-code chart to interpret the nominal value indicated by the colored bands. The actual (measured) resistance will vary from the nominal value due to subtle mechanical and chemical differences that occur during manufacturing. The manufacturer specifies the maximum deviation from the nominal value as a \pm percentage. This range of deviation is called the *tolerance* of the resistor family. Typical tolerance values are $\pm 1\%$, $\pm 5\%$, or $\pm 10\%$. The resistors in your lab kit are probably 5%, which is indicated by a fourth band that is gold in color. Ohm's Law: $V=IR$.

Color code:

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

Tolerance: Gold (5%); Silver (10%).

P1. Get 10 resistors from the lab kits. Keep track of which kit so you can put them back later!

Using a resistor color code chart, fill out the table below.

The percentage difference between the nominal value (indicated by the color code) and the measured value is calculated using the equation:

$$\text{percent difference} = \frac{|\text{nominal value} - \text{measured value}|}{\text{nominal value}} \times 100\%$$

No.	Color bands on the resistor	Resistance value from color codes, ohms	Measured resistance using multimeter (Be sure that the decimal point and units are correct)	Percent difference of measured value relative to color code value, in percentage
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

P2. Select two resistors. Using your prototype board, connect these two resistors in *parallel* and then measure the combination resistance using the multimeter.

Resistor 1 labeled value: _____

Resistor 2 labeled value: _____

Calculated resistance of parallel combination based on labeled values: _____

R1 *measured* value: _____

R2 *measured* value: _____

Measured resistance of parallel combination: _____

Now draw a simple schematic diagram of this parallel circuit, including nominal and measured value labels.

Show the mathematical formula for how the equivalent resistance for a parallel combination of two resistors can be calculated. Also, compare the equivalent resistance *calculated* using the nominal values to the *measured* resistance and explain your results in a brief and concise manner using complete sentences.

P3. Select two other resistors. Connect these two other resistors in *series* on your prototype board and use the multimeter to measure the combination resistance of this series arrangement.

Resistor 3 labeled value: _____

Resistor 4 labeled value: _____

Calculated resistance of series combination based on labeled values: _____

R3 *measured* value: _____

R4 *measured* value: _____

Measured resistance of parallel combination: _____

Draw a simple schematic diagram of this series circuit, including nominal and measured value labels.

Show how to calculate the overall resistance for the series combination of the two resistors. Compare the measured resistance to the value calculated from the nominal values and explain your results in a brief and concise manner using complete sentences.