ECE112 - Lab 2

Purpose

- Continue building soldering skills
- Determining equivalent resistance of series and parallel connected resistors
- Confirm ohms law

Parts/tools needed:

- Big pad protoboard
- Wire for making connections
- 7 resistors of varying resistance
- Battery pack with batteries
- Soldering iron, tip and solder
- Diagonal Cutters and Pliers
- Digital Multimeter (DMM)

Building the Circuit

1. Choose 7 different valued resistors. These will be available in the lab. It does not matter what the different resistances are. Then, using the resistor color code or your DMM, choose three resistors and determine the resistance for each one and annotate each resistor symbol (just below the reference designator) in the schematic in figure 1 as you build the circuit. The battery pack is not connected at this point. A resistor code table is shown in figure 2. Our resistors will be of the *4-Band* type. Figure 2 will show in color only when displaying the *.pdf* page.

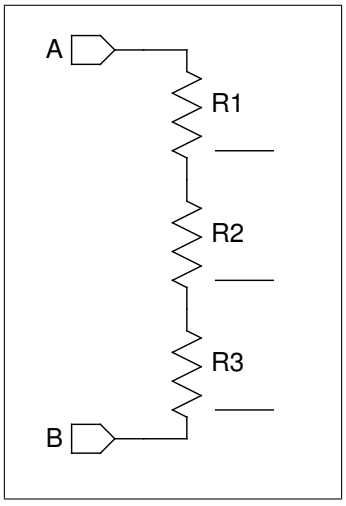
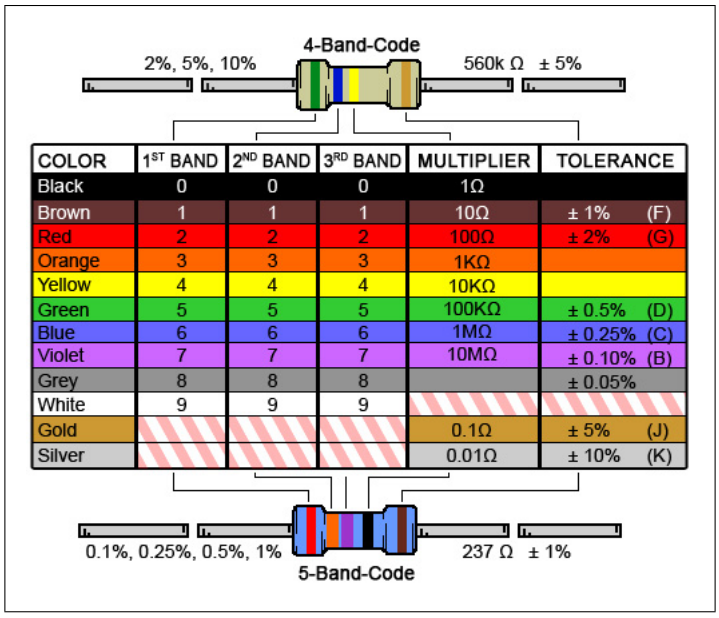


Figure 1: Resistors in Series



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8		± 0.05%
White	9	9	9		
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

Figure 2: Resistor Color Code

2.a Calculate the equivalent resistance of series resistors R1, R2 and R3. Show your work below.

b. Then using the DMM, measure the equivalent resistance of R1, R2 and R3 on your protoboard at points A and B. How do your calculations compare with what you have just measured?

c. What rule could you write about how series-connected resistors add?

3. Now build the slightly more complicated circuit in figure 3 reusing R1, R2 and R3 from before. This schematic has both series and parallel connected resistors. Annotate the schematic with the resistor values as before. As you build the circuit, pause before connecting the bottom end of R4 so you can measure its value with the DMM.

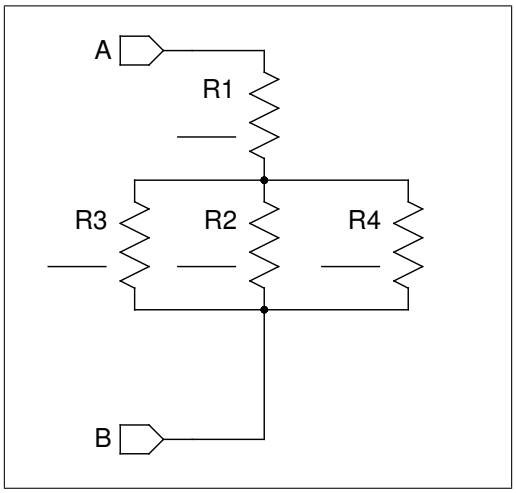


Figure 3: Resistors in Series and Parallel

a. Explain what the problem would be if R4 was soldered into the circuit and you tried to measure its value with the DMM.

b. Compute the equivalent resistance of parallel resistors R2, R3, and R4. Show your calculations below.

c. Now, calculate the equivalent resistance of the resistor network between terminals A and B. Show your calculations below.

d. Measure the resistance between terminals A and B with the DMM. How does this value compare with your calculated values?

e. What rule could you write about how parallel-connected resistors add?

4. Now build the circuit in figure 4. Again, annotate the schematic with your chosen values. This circuit is yet another extension of the previous one. You only need to add two resistors.

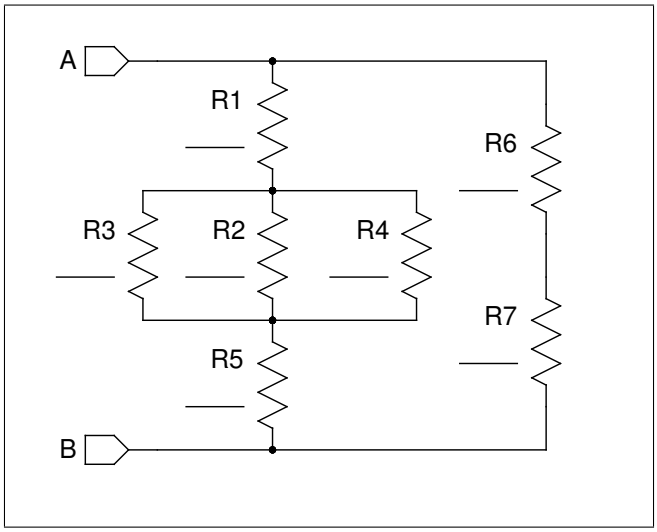


Figure 4: A Complex Resistor Network

a. Now, calculate the equivalent resistance of the resistor network between terminals A and B. Clearly show your calculations below.

b. Measure the resistance between terminals A and B with the DMM. Write the measurement below. Does the measured value agree with your calculated value?

_____

c. Measure the battery pack voltage and record it here.

Battery Voltage: _____

d. Connect the battery pack to the resistor network at A and B with the DMM connected to measure current. Record the current reading below.

_____

e. Using Ohm's Law, calculate the current that should be flowing into terminal A given your resistor network equivalent resistance and battery voltage. Show your calculations below.

f. Does the current calculated agree with what Ohm's law would indicate?

_____

4. Have your TA check off your work.

5 Afterwards, unsolder all the components from the board and store them for reuse. Also, pull one battery out of the battery holder to prevent damage to the batteries.