Resistors Lab (Lab 3)

Resistors in Parallel & Series Circuits

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1.0 PURPOSE

- Understand resistor functions in certain circuits.
- Understand Series and Parallel circuits.
- Understand how to use the desktop Ohmmeter.
- Understand how to use the breadboard.

2.0 EQUIPMENT NEEDED

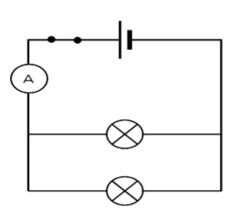
- (9x) 4-band ¼ watt axial resistors.
- (1x) desktop Ohmmeter.
- (1x) electronics breadboard.
- (1x) computer for Ohmmeter manual.
- (1x) short wire.

3.0 THEORY

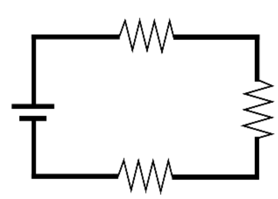
Parallel & Series Circuits

- A ***PARALLEL*** circuit is a circuit with "branches" that allows current to flow in a series of paths unlike in a series circuit. (It is not confined to one path) (Refer to document #1 for reference)
- Unlike in a parallel circuit, a ***SERIES*** circuit is a circuit that consist of one "closed loop" where current can only follow one path. (It is confined to one path) (Refer to document #2 for reference)

(Document #1-Parallel Circuit)



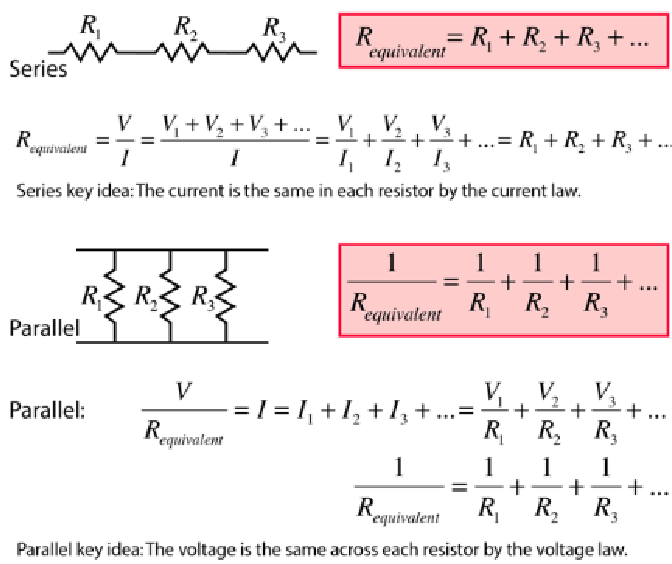
(Document #2-Series Circuit)



Resistors in Parallel & Series Circuits

- The behavior of a resistor differs from circuit to circuit. In *SERIES* circuits, the total resistance (Req) is equal to the sum of all the resistors that are in that specific circuit (Req = R1 + R2 +Rn…). In *PARALLEL* circuits, the rules are slightly different. The total resistance of the resistors is found by adding up the reciprocals of the resistance values, and then taking the reciprocal of the total (1 / Req = 1 / R1 + 1 / R2 + 1 / Rn…). (Document #3 proves these details)

(Document #3-Requivalent in Series & Parallel)



4.0 Experiemntal Results

Measuring between A to B (figure 1)

- This first part of the experiment involves calculating the total resistance between point A to B in the circuit for 3 separate circuits (A, B and C of figure 1). Refer to the diagram below for reference.

[Measured (a)]: Req = 798 Ω.
[Measured (b)]: Req = 7.593 KΩ.
[Measured (c)]: Req = 76.1 KΩ.

[Expected (a)]: Req = 330Ω(R1) + 470Ω(R2) = 800Ω(Req)
[Expected (b)]: Req = 3.3KΩ(R1) + 3.3KΩ(R2) + 1KΩ(R3) = 7.6KΩ(Req)
[Expected (c)]: Req = 22KΩ(R1) + 5.6KΩ(R2) + 0.680KΩ(R3) + 47KΩ(R4) = 75.28KΩ(Req)

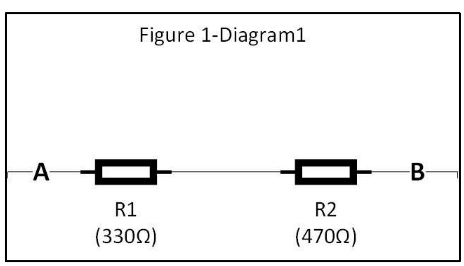
Measuring between A to B (figure 2)

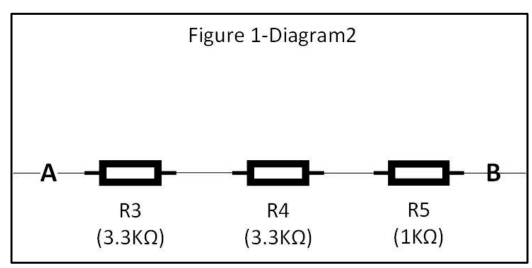
- This first part of the experiment involves calculating the total resistance between point A to B in the circuit for 3 separate circuits (A, B and C of figure 2). Refer to the diagram below for reference.

[Measured (a)]: 1/Req = 194 Ω.
[Measured (b)]: 1/Req = 617Ω.
[Measured (c)]: 1/Req = 588Ω.

[Expected (a)]: 1/Req = 1/330Ω(R1) + 1/470Ω(R2) = 193.88Ω(Req)
[Expected (b)]: 1/Req = 1/3.3KΩ(R1) + 1/3.3KΩ(R2) + 1/1KΩ(R3) = 622.64Ω(Req)
[Expected (c)]: 1/Req = 1/22KΩ(R1) + 1/5.6KΩ(R2) + 1/0.680KΩ(R3) = 586.34Ω(Req)

Figure 1 diagrams





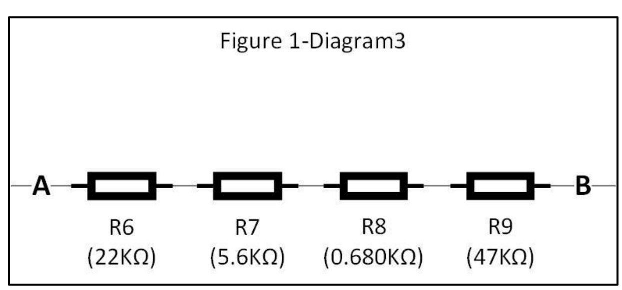
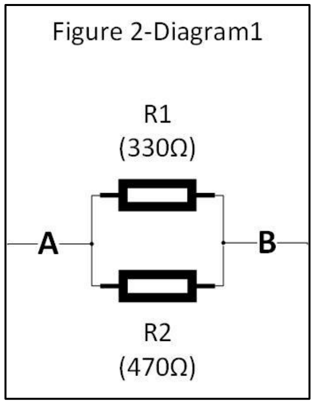
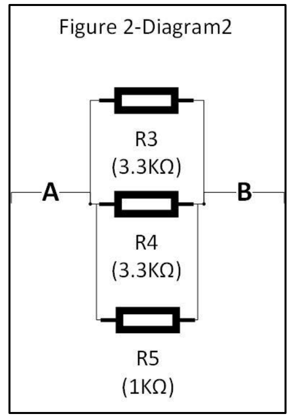
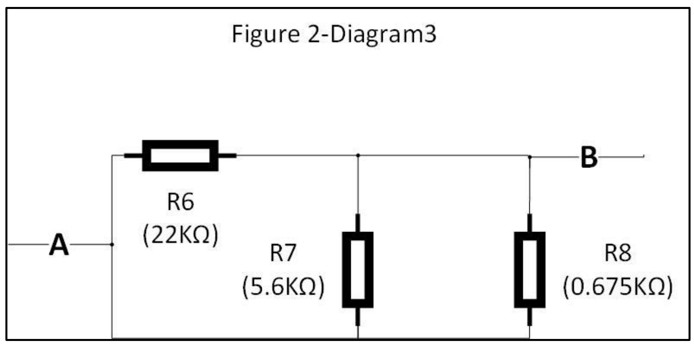


Figure 2 diagrams







5.0 Conclusion

- I believe that the purpose(s) for this lab have been achieved. Not only have I learned to use the lab's desktop Ohmmeter (I only used a cheap handheld one in the past) but I have learned more information about types of circuits and how resistors interact in them. Although all my results (in the end) are correct theoretically, there was one issue. When reading the value of the resistor, both my fingers were across A to B causing incorrect results from the Ohmmeter. Once only one of my fingers was on the leads of the resistor, the results from the Ohmmeter were correct. Finally, alongside learning how to use the desktop Ohmmeter, I also learned how to correctly use an electronics breadboard!