Laboratory Application Assignment

In this lab application assignment you will examine the characteristics of a simple series circuit. You will also determine the required resistance values in a series circuit containing random unknowns.

Equipment: Obtain the following items from your instructor.

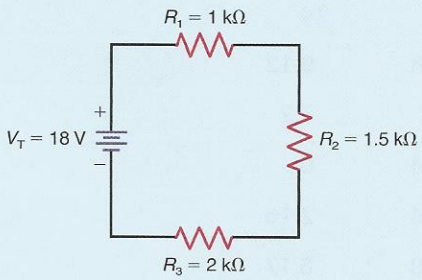
- Variable dc power supply
- Assortment of carbon-film resistors
- DMM

Series Circuit Characteristics

Examine the series circuit in Fig. 4–50. Calculate and record the following values:

R_T = _____, I = _____, V_1 = _____, V_2 = _____, V_3 = _____

Figure 4–50



Construct the series circuit in Fig. 4–50. Measure and record the following values.

(Note that the power supply connections must be removed to measure R_T.)

R_T = _____, I = _____, V_1 = _____, V_2 = _____, V_3 = _____

How does the ratio V_2/V_1 compare to the ratio R_2/R_1? _____

How does the ratio V_3/V_1 compare to the ratio R_3/R_1? _____

Add the measured voltages V_1, V_2, and V_3. Record your answer.

_____

How does this value compare to the value of V_T? _____

Does the sum of the resistor voltage drops satisfy KVL? _____

Using measured values, prove that the current, I, is the same in all parts of a series circuit. Show your calculations. _____

_____

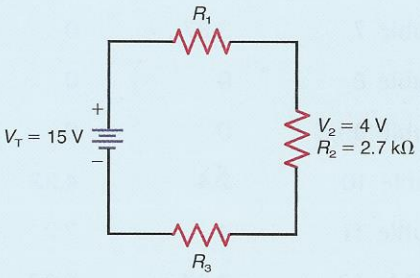
In Fig. 4–50, which series resistor dissipates the most amount of power? _____

Which resistor dissipates the least amount of power? _____

Design Challenge

Examine the series circuit in Fig. 4–51. Determine the values for R_1 and R_3 that will provide a voltage drop of 4 V across R_2. Note that V_T = 15 V and R_2 = 2.7 kΩ. In your design, R_1 and R_3 cannot be the same value!

Figure 4–51



Recommended Procedure

1. Make sure you understand the problem before you begin.
2. Draw a workable schematic on a separate sheet of paper.
3. Show all known circuit values on your hand-drawn schematic.
4. Show all your calculations in solving for the values of R_1 and R_3.
5. Select standard values for R_1 and R_3 that are within ±10% of your calculated values.
6. Construct the circuit using the standard values from step 5.
7. If your results are way off from what you expect, seek help from your instructor.
8. If your results are close to the specified design criteria, adjust the values of R_1 or R_2 (or both) to achieve best results.
9. You must show all calculations!
10. Have an instructor check your results, and receive your just reward.