

Experiment 3

Series circuits

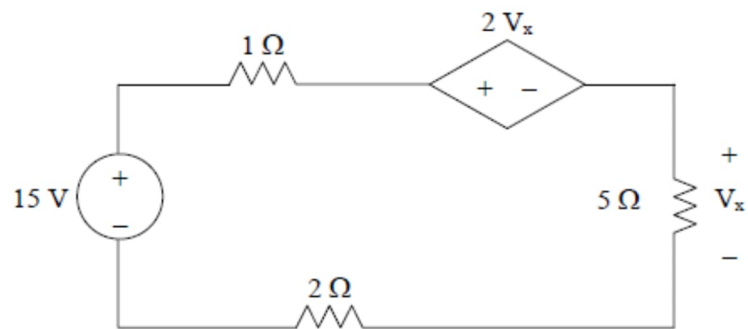
Name	Group	Grade
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Objectives:

1. To measure voltages and currents of series circuits and compare them with calculated results.
2. To verify the notions of voltage division in series circuits.

Pre-Lab

Find V_x in the circuit shown.



Solution:

The experiment

1. You are given four resistors. Measure the resistance of each resistor. The smallest resistor is labeled R_1 , the next resistor is R_2 and the largest is R_4 .
2. Using the circuit of Figure 1 with $E = 10$ volts. Determine the theoretical value of the current and record it in Table 1. Construct the circuit. Set the multimeter to read DC current and insert it in the circuit at point A. Remember, ammeters are **connected in series** and require the circuit to be opened for proper measurement. Record this current in Table 1. Repeat the current measurements at points B and C.
3. Using the theoretical current found in Step 1, apply Ohm's law to determine the expected voltage drops across R_1 , R_2 , and R_3 . Record these values in the Theory column of Table 2.
4. Set the multimeter to measure DC voltage. Remember, voltage is measured **across components**. Record this value in Table 2. Repeat this process for the voltages across R_2 and R_3 . Determine the percent deviation (as shown in the equation below) between theoretical and measured for each of the three resistor voltages and record these in the final column of Table 2.

$$\text{Deviation} = \frac{|V_{\text{calculated}} - V_{\text{measured}}|}{V_{\text{calculated}}} \times 100$$

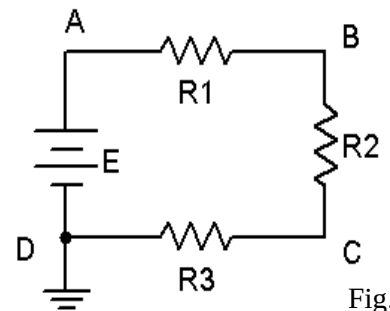


Fig. 1

Table 1

<i>Theory</i>	<i>Point A</i>	<i>Point B</i>	<i>Point C</i>

Table 2

<i>Voltage</i>	<i>Theory</i>	<i>Measured</i>	<i>Deviation</i>
<i>R1</i>			
<i>R2</i>			
<i>R3</i>			

Calculations:

- Consider the circuit of Figure 2 with $E = 20$ volts. Using the voltage divider rule, determine the voltage drops across each of the four resistors and record the values in Table 3 under the Theory column. Also determine the voltages V_{AC} and V_B , again using the voltage divider rule.
- Construct the circuit of Figure 2. Set the multimeter to measure DC voltage. Place the multimeter probes across $R1$ and measure its voltage. Record this value in Table 3. Also determine the deviation. Repeat this process for the remaining three resistors.
- To find V_{AC} , place the red probe on point A and the black probe on point C. Similarly, to find V_B , place the red probe on point B and the black probe on ground. Record these values in Table 3 with the deviations.

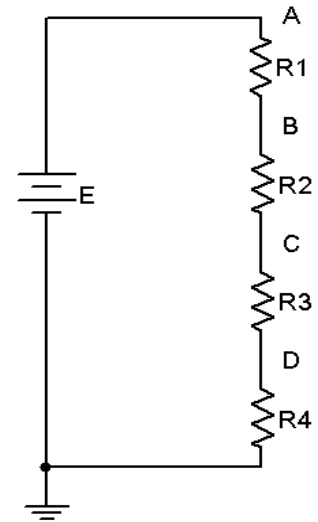


Fig. 2

Table 3

<i>Voltage</i>	<i>Theory</i>	<i>Measured</i>	<i>Deviation</i>
<i>R1</i>			
<i>R2</i>			
<i>R3</i>			
<i>R4</i>			
V_{AC}			
V_B			

** Using the measured voltages, is KVL satisfied in Tables 2 and 3?.....

Conclusion

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