Laboratory Application Assignment

In this lab application assignment you will examine the concept of voltmeter loading. As you will learn, voltmeter loading can be a problem when measuring voltages in high-resistance circuits but is usually not a problem when measuring voltages in low-resistance circuits. This lab application assignment also proves that a DMM produces less of a loading effect than an analog VOM.

Equipment: Obtain the following items from your instructor.

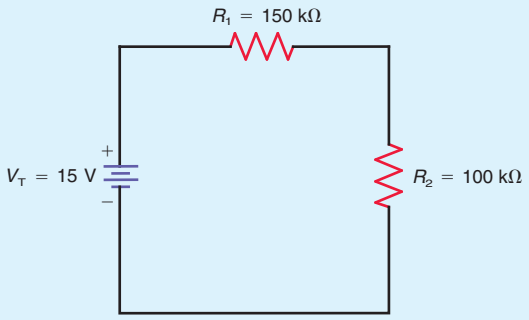
- Variable dc power supply
- Assortment of carbon-film resistors
- Simpson 260 analog VOM or equivalent (Ω/V rating = 20 kΩ/V)
- DMM

Voltmeter Loading

Calculate the voltmeter resistance, R_V, of the analog VOM when set to the 10-V range (R_V = Ω/V rating × V_{range} setting); R_V = _____. Next, connect the leads of your DMM to the leads of the analog VOM. With your DMM set to measure resistance and the analog VOM set to the 10-V range, measure and record the voltmeter resistance, R_V: R_V = _____

Examine the circuit in Fig. 8–36. Calculate and record the voltage across R_2: V_2 = _____

Figure 8–36



Construct the series circuit in Fig. 8–36. With your analog VOM set to the 10-V range, measure and record the voltage across R_2: V_2 = _____

How does your measured value compare to your calculated value? _____

Remeasure the voltage across R_2 using your DMM: V_2 = _____
How does this value compare to your calculated value?_____

_____

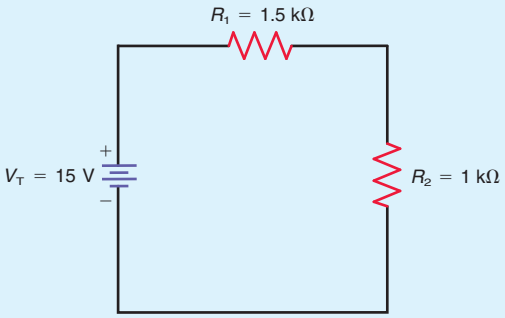
Which meter loaded the circuit more, the analog VOM or the DMM? _____

How do you know? _____

What is the voltmeter resistance of your DMM on all voltage ranges? _____

Examine the circuit in Fig. 8–37. Calculate and record the voltage across R_2: V_2 = _____

Figure 8–37



Construct the series circuit in Fig. 8–37. With your analog VOM set to the 10-V range, measure and record the voltage across R_2: V_2 = _____
How does your measured value compare to your calculated value? _____

_____

Remeasure the voltage across R_2 using your DMM: V_2 = _____

How does this value compare to your calculated value? _____

_____

Did the analog VOM load the circuit when measuring the voltage, V_2, in Fig. 8–37? _____

If not, why? _____

_____

In Fig. 8–36, draw the equivalent circuit with the analog VOM connected to measure the voltage drop across R_2. Do the same in Fig. 8–37. Describe the differences in each of the equivalent circuits. _____

_____

In general, describe why voltmeter loading is more likely to be a problem when measuring voltages in high-resistance circuits rather than low-resistance circuits. _____

_____

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