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Experiment #7

Wheatstone Bridge.

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**Experiment #7**

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**Objective**

 The objective of this experiment is to use the principle of the Wheatstone bridge to determine when a circuit is balanced.

**Materials Required.**

* Breadboard
* Digital multimeter
* 4.7KΩ resistor
* 6.8KΩ resistor
* 5.6KΩ resistor
* 1KΩ resistor
* 10KΩ potentiometer
* Power supply (DC current)

**Procedure:**

* Wire the circuit on the schematic onto the breadboard using the materials.
* Measure and record the required values as directed by the manual to make your evaluation.

**Data.**



**Voltages around the loop.**

1. Measure and record the voltages around Loop 1 (VS, VR1, VR2).

*VS = -10.02V VR1 = 3.11V VR2 = 6.91V*

1. Add these voltages.

*VS + VR1 + VR2 = 0*

*3.11V + 6.91V – 10.02V = 0*

1. Measure and record the voltages around Loop 2 (VS, VR3, VR4).

*VS = -10.02V VR3 = 5.48V VR2 = 4.53V*

1. Add these voltages.

*VS + VR3 + VR4 = 0*

*5.48V + 4.4V – 10.02V = 0*

**Voltages measured to a common reference point(Ground).**

1. Measure the voltage between the following and point G. This will be the common point of ground.

*VA = 10.02V VC = 10.02V VE =0V*

*VM = 6.91V VB = 10.02V VD = 4.53V*

*VF = 0V*

1. Compare these voltages and explain the similarities and differences.

*With VE and VF the measured value is equal to zero.*

*With VM and VD the measured value is equal to that of the measured voltage drop across the corresponding resistors.*

*With VA, VC and VB measured value is equal to the that of the total voltage applied.*

**Current Measurement**

1. Measure and record the total current(ITOTAL) and the current through each branch.

*IT = 1.5mA IB1 = 0.7mA IB2 = 0.8mA*

1. Compare the total current to the sum of the currents through each branch.

*IT = IB1 + IB2*

**Resistance Measurement**

1. Measure and record the resistance in Branch #1 (R1 + R2).

*14.98KΩ*

1. Measure and record the resistance in Branch #2 (R3 + R4).

*12.29KΩ*

1. Measure and record the total resistance in the circuit.

*6.75KΩ*

**Voltages Between Two Points**

1. Close the switch and measure the voltages between the Point M and Point D (VMD)

*2.37V*

1. How could you obtain this voltage from the measurements made in steps 2 and 4?

*VR3 – VR1 = VMD*

1. Place a Load resistor (1KΩ) between Point M and Point D. Measure the Load voltage.

*0.32V*

1. To balance the bridge, adjust the potentiometer so that there is no voltage across the Load resistor. Remove R2 from the circuit and measure the resistance.

*3.84KΩ*

**Conclusion**

1. Calculate each voltage and compare it to the measured value.

*VT = 10V VR1 = 3.2V VR2 = 6.8V VR3 = 5.51V VR4 = 4.54V*

*The calculated value is approximately equivalent to that of the measured value.*

1. Calculate the resistance of each branch and the total resistance and compare it to the corresponding measure values.

*RB1 = 14.7KΩ RB2 = 12.4KΩ RT = 6.726KΩ*

*Compared to the measured values the calculated values are approximately equivalent.*

1. Of what advantage is it to measure voltage to a common point (or ground)?

*Measuring to a common point helps makes the voltage accurate and it is also convenient to do that.*

**Summary**

*With this experiment the function of a Wheatstone bridge circuit used for measuring for an unknown resistor with three known resistors to form a quadrilateral and applying voltage between a pair of opposite corners was examined.*