Lab 9 – Series/Parallel Resistors

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The purpose of this lab is to:

Experiment with series circuits and verify that the simulation, analysis (calculations) and test results all agree.

From the resistor kit select 8 resistors: 2 each 470Ω, 2 each 1kΩ, and 1 each of the following:

2.2kΩ, 3.3kΩ, 4.7kΩ, 10kΩ

Measure and record the value of each resistor. Connect the resistors as shown in Figure 1. Measure and record the total resistance, RT. Then connect the resistors as shown in Figure 2, the 9V come from the Elvis II (Modular Engineering Educational Laboratory Platform). Then measure and record with the Digital Multimeter the current and voltages of the series circuit.



Figure 1

**Series/Parallel Circuit**

Equipment needed:

1 – Digital Multimeter

1 – Elvis II

8 – resistors.

|  |  |  |
| --- | --- | --- |
|  | Expected | Measured |
| R1 = | 470Ω | 462.22 Ω |
| R2 = | 470Ω | 456.52Ω |
| R3 = | 1kΩ | 989.8 kΩ |
| R4 = | 1kΩ | 986.4kΩ |
| R5 = | 2.2kΩ | 2.153kΩ |
| R6 = | 3.3kΩ | 3.247kΩ |
| R7 = | 4.7kΩ | 4.636 kΩ |
| R8 = | 10kΩ | 9.797kΩ |

Expected = value you expect it to be

Measured = using Digital Multimeter

|  |  |  |  |
| --- | --- | --- | --- |
|  | Calculated | Simulated | Measured |
| R34 = | 500Ω | 500Ω | 494.42Ω |
| R567 = | 1.031kΩ | 1.031kΩ | 1.0122kΩ |
| R345678 = | 11.531kΩ | 11.531kΩ | 11.305kΩ |
| R2345678 = | 451.593Ω | 451.593Ω | 438.95kΩ |
| RT = | 921.593Ω | 921.593Ω | 901.6Ω |

Calculated = using Excel calculations

Simulated = Multisim simulation

Measured = using Digital Multimeter

Figure 2

**Series/Parallel Circuit**



|  |  |  |  |
| --- | --- | --- | --- |
|  | Calculated | Simulated | Measured |
| V1 = | 9V | 9V | 9.028V |
| IT = | 9.766mA | 9.766mA | 9.887mA |
| VA = | 4.410V | 4.41V | 4.3972V |
| VB = | 4.219V | 4.219V | 4.2044V |
| VC = | 3.835V | 3.825V | 3.8103V |

Calculated = using Excel calculations

Simulated = Multisim simulation

Measured = using Digital Multimeter

Adjust R2 so that the VA voltage is equal to 4.5V. Then measure the value of the new R2 and calculate and simulate a value that would produce the 4.5V.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Measured | Simulated | Calculated |
| VA = | 4.5000V | 4.5V | 4.5V |
| R2 = | 479.78Ω | 489.9Ω | 489.972Ω |

Calculated = using Excel calculations

Simulated = Multisim simulation

Measured = using Digital Multimeter

Observations: Putting resistors in series increases the total resistance, while putting them in parallel drops their total resistance.