

## **ENGR 065 Circuit Theory**

### **Lab 1: Introduction to the Electrical Circuits**

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#### **Section**

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**Objectives:**

- To obtain the voltage measurements of the power supply
- To obtain the resistance measurements of a resistor using a Digital Multimeter

**Introduction:**

A circuit element is a two terminal electrical device meant for points of connection to other electrical components. In this lab, the circuit elements used is a power source and various resistors. The power source used allows voltage adjustments and its accuracy will be tested with a digital multimeter. Likewise, the given resistors will be tested for their accuracy or tolerance, with a digital multimeter in comparison to its stated resistance from the color-coded bands.

**Procedure:**Voltage Measurement:

After reading the manuals for the power supply and digital multimeter, turn the power supply on. Adjust the knob to achieve 5.0V. Set the multimeter as a voltmeter for DC voltage and measure the voltage value of the power supply, pay attention to the polarity. Write down the measured value and find the percentage of error using the formula:

$PE = |Measured\ Value - Indicated\ Value| / (Indicated\ Value) * 100$ . Adjust the voltage knob to 10.0V and repeat measuring the voltage and finding the percentage of error.

Resistance Measurement:

Check the circuit kit given and ensure all the resistors are included. Read the color code of each resistor and measure the resistance value with the multimeter set to ohms. Calculate the tolerance of each resistor and find the percentages of error.

**Data and Measurements:**Part1: Voltage Measurements

Indicated Value	Measured Value	Percent Error
5.0 V	4.99 V	0.20%
10.0 V	10.02 V	0.20%

Part2: Resistance Measurements

Indicated Value	Color Code	Measured Value	Indicated Tolerance	Measured Tolerance
100 $\Omega$	Brown, Black, Brown	99.7 $\Omega$	5%	0.30%
270 $\Omega$	Red, Violet, Brown	269.5 $\Omega$	5%	0.19%
470 $\Omega$	Yellow, Blue, Brown	468 $\Omega$	5%	0.43%
680 $\Omega$	Blue, Gray, Brown	673 $\Omega$	5%	1.03%
1 k $\Omega$	Brown, Black, Red	988 $\Omega$	5%	1.20%
2.2 k $\Omega$	Red, Red, Red	2.111 k $\Omega$	5%	4%
3.3 k $\Omega$	Orange, Orange, Red	3.280 k $\Omega$	5%	0.61%
5.6 k $\Omega$	Green, Blue, Red	5.62 k $\Omega$	5%	0.36%
10 k $\Omega$	Brown, Black, Orange	9.89 k $\Omega$	5%	1.10%
100 k $\Omega$	Brown, Black, Yellow	99.6 k $\Omega$	5%	0.40%
4.7 M $\Omega$	Yellow, Brown, Green	4.7 M $\Omega$	5%	0%
10 M $\Omega$	Brown, Black, Blue	10.24 M $\Omega$	5%	2.40%

### Analysis:

From looking at the measured values of the resistors and calculating the percentage of error, the resistance of the resistors is within the indicated tolerance. The percentage of error in the voltage measurements can be from the number of significant digits, the power supply displays only to the tenths place while the digital multimeter displays a reading to the hundredths place.

### Conclusion:

This lab effectively demonstrated the ability to use a digital multimeter as a voltmeter and ohmmeter to read voltage and resistance values. From performing this lab, calculating the resistors measured tolerance proved the accuracy of each resistor's indicated tolerance.