ELEC1120 ELECTRO PRINCIPLES I

EXPERIMENT #2 OHM'S LAW

NAME _____ SECTION _____

PURPOSE

To use **VOM**'s and **DMM**'s to measure the basic electrical quantities in a DC circuit and to verify Ohm's Law.

EQUIPMENT

LAB SUPPLIED PARTS	SERIAL NUMBERS
DC power supply	_____
Triplett VOM	_____
Fluke DMM	_____

PARTS KIT PARTS

Resistors 1kΩ and 3.3 kΩ ¼ watt
Set of meter leads
Set of clip to clip jumper leads

INTRODUCTION

Voltmeters, ammeters and ohmmeters contain many of the same parts. To save on costs a single meter that can perform all three functions is often employed. This type of meter is called a multimeter or **VOM** (**V**olt **O**hm **M**illiamp meter). When this type of meter has a digital display it is often called a **DMM** (**D**igital **M**ulti**M**eter). During this lab a **VOM** and **DMM** are used to measure all three basic electrical quantities. They are also used simultaneously in a simple circuit to measure current and voltage. The data from these measurements is used to plot the linear relationship between current and voltage for a fixed resistance.

PROCEDURE #1 VOLTAGE MEASUREMENT

1) Record the equipment serial numbers in the spaces provided above.

2) Adjust the power supply **voltage control** to minimum (fully counterclockwise) and the **current control** to maximum (fully clockwise). Set the **DMM** to measure **Volts DC** using the 2 volt range.

3) Connect the circuit shown in Figure 1 using the 1 kΩ resistor. Note Figure 2 shows the schematic representation of the circuit.

4) Turn on the power supply and **DMM**. Adjust the power supply **voltage control** so the voltage is somewhere between .450 volts and .490 volts. Note because of the small voltage it may be a little tricky to set the voltage exactly. Any value between .450 volts and .490 volts will do. **DO NOT ADJUST THE POWER SUPPLY CONTROLS FOR THE REST OF THIS PROCEDURE.**

5) Change the **DMM** to the 1000 V range and record the measurement in the top row of table #1. Measurements should be recorded exactly as they appear on the **DMM** display. Change **DMM** ranges to complete the **MEASUREMENT** column of table #1. Indicate any measurement that is out of range by marking **"OR"** at the right side of table #1. Also indicate the range that gives the most accurate measurement by putting an **"*"** at the left side of the table. Do not forget to indicate the correct units.

TABLE #1 DMM VOLTAGE MEASUREMENTS

RANGE	MEASUREMENT
1000 V	
200 V	
20 V	
2 V	
200 mV	

6) Do not move the power supply controls. Replace the **DMM** with the **VOM** and record the measurements for each range in table #2 below. Indicate the range that gives the most accurate measurement by putting an **"*"** at the left side of the table.

TABLE #2 VOM VOLTAGE MEASUREMENTS

RANGE	MEASUREMENT
1000 V	
300 V	
100 V	
30 V	
10V	
3 V	
1 V	

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Voltage Measurement

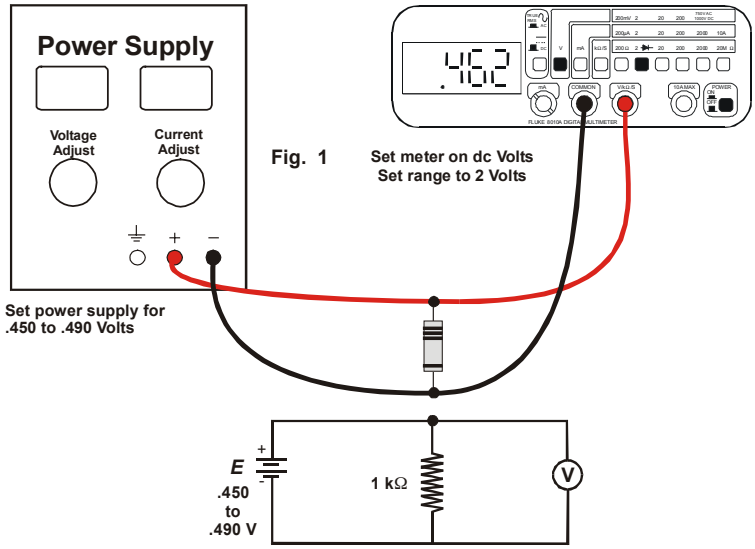


Fig. 2 Schematic Circuit for Fig 1

PROCEDURE #2 CURRENT MEASUREMENT

1) Adjust the power supply **voltage control** to minimum (fully counterclockwise) and the **current control** to maximum (fully clockwise). Set the **DMM** to measure **Milliamps DC** on the 20 milliamp range.

2) Connect the circuit shown in Figure #3 using the 1 KΩ resistor. Note Figure #4 shows the schematic representation of the circuit.

3) Turn on the power supply and **DMM**. Adjust the power supply **voltage control** so the **DMM** indicates the current is 8.00 mA.

4) Set the DMM range to 2000 mA and record the measurement in row one of table #3. Measurement should be recorded exactly as they appear on the **DMM** display. Change the ranges to complete the MEASUREMENT column of table #3. Indicate any measurement that is out of range by marking **"OR"** at the right side of table #3. Also indicate the range that gives the most accurate measurement by putting an **"*"** at the left side of table #3. Do not forget to indicate the correct units.

TABLE #3 DMM CURRENT MEASUREMENTS

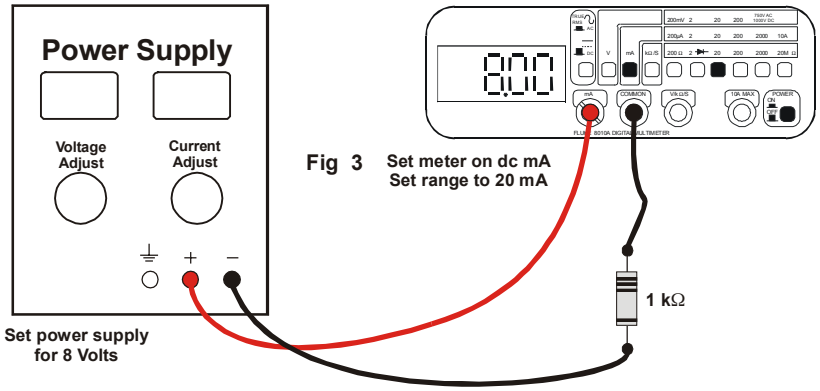
RANGE	MEASUREMENT
2000 mA	
200 mA	
20 mA	
2 mA	
200 µA	

5) Replace the **DMM** with the **VOM** and adjust the power supply so the resistor current is 8 mA (on the 10 mA range). Enter the measurements for each DC current range in table #4 below. Indicate any measurement that is out of range by marking **"OR"** at the right side of the table. Also indicate the range that gives the most accurate measurement by putting an **"*"** at the left side of table #4.

TABLE #4 VOM CURRENT MEASUREMENTS

RANGE	MEASUREMENT
1000 mA	
100 mA	
10 mA	
.1 mA	

Current Measurement



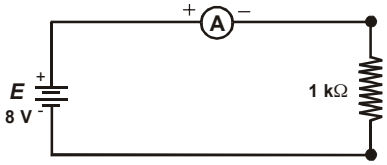


Fig. 4 Schematic Circuit for Fig 3

PROCEDURE #3 RESISTANCE MEASUREMENT

1) Set the **DMM** to measure resistance by pressing the kΩ/S push-button and connecting the meter leads to the V/kΩ/S and COMMON terminals.

2) Follow the procedure described on **page 5 of the prelab** to measure and record the resistances of the 1 kΩ and 3.3 kΩ resistors.

TABLE #5 DMM RESISTANCE MEASUREMENTS

RESISTOR	MEASUREMENT
1 kΩ	
3.3 kΩ	

3) Use the **VOM** to measure and record the resistances of the 1 kΩ and 3.3 kΩ resistors. Follow the procedure described on **page 3 of the prelab.**

TABLE #6 VOM RESISTANCE MEASUREMENTS

RESISTOR	MEASUREMENT
1 kΩ	
3.3 kΩ	

PROCEDURE #4 OHM'S LAW PLOTTING CURRENT VS VOLTAGE

1) Using the **DMM** as the voltmeter and the **VOM** as the ammeter, connect the circuit shown in Figure 5. Use the 1 kΩ resistor as the resistance. Note Figure 6 shows the schematic representation of the circuit. Adjust the power supply so the resistor voltage climbs from 0 to 10 volts in 2 volt steps. In table #7 below record the **VOM**'s current level at each voltage step.

TABLE #7 CURRENT vs VOLTAGE 1kΩ

VOLTAGE	CURRENT
0 V	
2.00 V	
4.00 V	
6.00 V	
8.00 V	
10.00 V	

2) Replace the 1 kΩ resistor with the 3.3 kΩ resistor and complete table #8 below.

TABLE #8 CURRENT vs VOLTAGE 3.3kΩ

VOLTAGE	CURRENT
0 V	
2.00 V	
4.00 V	
6.00 V	
8.00 V	
10.00 V	

Circuit for Measuring Current vs Voltage

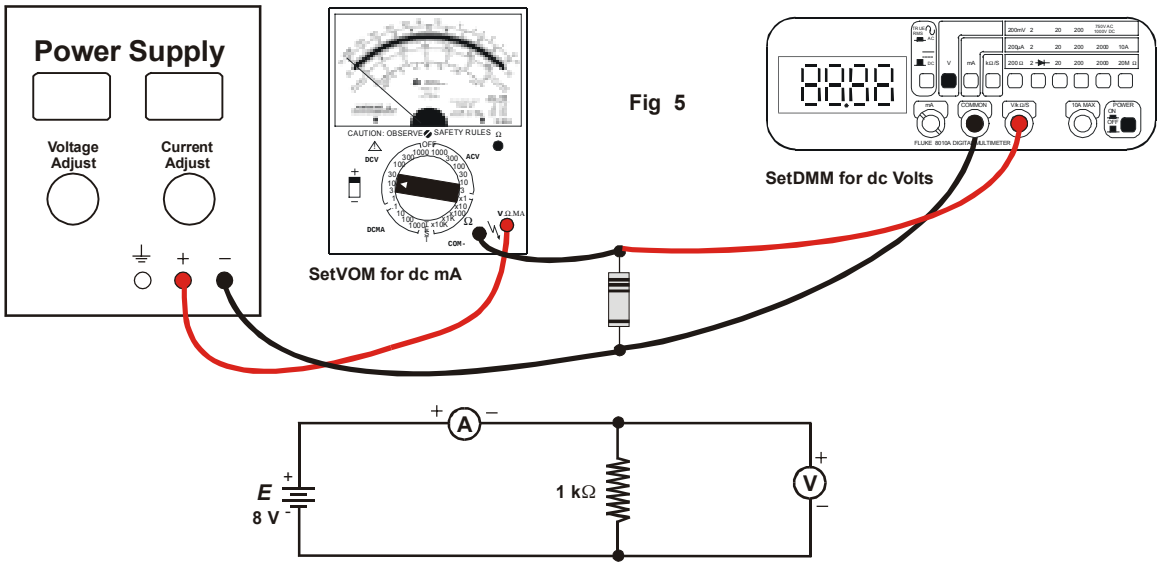


Fig 5

Fig. 6 Schematic Circuit for Fig 5

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3) Use the voltage and current values from tables #7 and #8 to plot the curves of current vs voltage for the 1 kΩ and 3.3 kΩ resistors. Clearly label each of the curves on the graph below.

CURRENT vs VOLTAGE