Experiment No. 9: OHM's Law

1. Objective

The objective of this experiment is to verify Ohm's law.

2. Apparatus

- Resistors (Different values)
- Bread Board
- Digital Multi-meter
- Variable DC power supply(maximum 30V)

3. Theory

Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points. The resistance R is the constant of proportionality as given in the Equation (9.1).

$$I = \frac{V}{R} \qquad (9.1)$$

Or

$$V = IR \qquad (9.2)$$

$$1\,V = 1A(1\Omega) \qquad (9.3)$$

Where I, is the current through the conductor in units of ampere (A), V is the voltage measured across the conductor in units of volt (V), and R is the resistance of the conductor in units of ohm (Ω). From the Equation (9.3), voltage drop across the resistor having 1Ω resistance will be 1V when 1A current through it. More specifically, Ohm's law states that the R in this relation is constant, independent of the current. Ohm's law is an empirical relation which accurately describes the conductivity of the vast majority of electrically conductive materials over many orders of magnitude of current. However some materials do not obey Ohm's law, these are called non-ohmic.

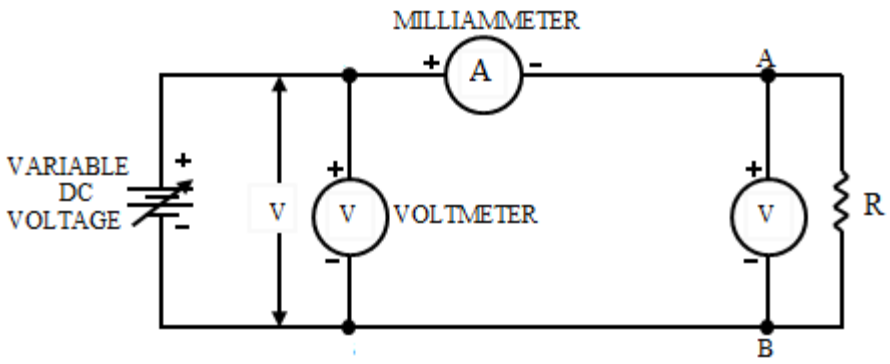

Figure 9.1: Circuit Diagram

4. Procedure

1. Construct the circuit as shown in the Figure 9.1.
2. Do not switch on the power supply. Disconnect the resistor R from the circuit and set it to a 1K by using ohmmeter. Now reconnect it.
3. Turn on the power supply and increase the value of voltages from 0 to 2V. Measure the current *I* (mA) and record it in the Table 9.1.
4. Measure and record in turn, the current I (mA) at each of the voltage settings shown in the Table 9.1 for R = 1KΩ.
5. Calculate the value of current I by using the Equation (9.1).
6. Use the measured value of resistance in Equation (9.1) to calculate the I in step 5.
7. Plot a graph of I (mA) versus V (V) from the measured values of Table 9.1.
8. Now fix the power supply voltage to 10V.
9. Measure the current I (mA) for the different values of R and record in the Table 9.2.
10. Plot a graph of I (mA) versus R from the measured values Table 9.2.

Table 9.1: Observations from the Constant R

S. No.	Voltage (V)	R Calculated (kΩ)	R Measured (kΩ)	I Calculated (mA)	I Measured (mA)
1	0				
2	2				
3	4				
4	6				
5	8				
6	10				

Table 9.2: Observations from the Variable R

S. No.	Voltage (V)	R Calculated (kΩ)	R Measured (kΩ)	I Calculated (mA)	I Measured (mA)
1	10				
2	10				
3	10				
4	10				
5	10				

Figure 9.2: Current Vs Voltage

Figure 9.3: Current Vs Resistance

5. Questions

1. Examine your graph of Figure 9.2 and describe the change in the current per unit voltage.

2. Do your experimental results verify ohm's law? Justify your answer.

6. Conclusions