

<b>Experiment No. 2</b>	<b>VERIFICATION OF KIRCHHOFF'S LAWS</b>
<b>Date:</b>	

**Aim:**

To verify Kirchhoff's current law and Kirchhoff's voltage law for the given Circuit.

**Apparatus:** This kit consists of

1. Regulated power supplies
  - a. Variable power supply 0 to +15V ----- 2Nos
  - b. Fixed power supply 0 to +15V ----- 1No
2. Resistor Bank
3. Required circuitry for the experiments

**Theory:**

**Kirchhoff's laws:**

**1. Kirchhoff's Current law:**

"In any circuit, the algebraic sum of the currents meeting at a point (or junction) is zero."

$$\sum I = 0$$

**2. Kirchhoff's Voltage law:**

"The algebraic sum of the products of currents and resistances in each of the conductors in any closed path (or mesh) in a network plus the algebraic sum of the e.m.fs in a path is zero."

$$\sum IR + \sum e.m.f = 0$$

**Kirchhoff's Current law:**

1. Connect variable power supply 0 to +15 V either from CH2 in the Kirchhoff's Current law circuit between the points 1 & 2.
2. Connect ammeters (0 – 200mA) between points 3 & 4, 5 & 6, 9 & 10, 11 & 12 and 15 & 16

**Note:** If five meters are not available for measuring current then for measuring one meter other current meter points should be shorted. For example, to measure **I** connect ammeter between 3 & 4 and short remaining all current meter points. Again, to measure **I1** connect ammeter between 5 & 6 and short remaining current meter points. Similarly, for measuring other currents.

3. Connect resistors from resistor bank in the circuit in place of R1, R2, R3 & R4
4. For the different values of input voltage measure the currents flowing in the circuit.
5. Note down the values of all currents in a tabular form.
6. From the above table it is observed that

$$I = I1 + I2 + I3 + I4$$

**KCL - Theoretical Values:**

S.No.	Voltage	Current				I= I1+ I2 + I3+I4
		I1	I2	I3	I4	
	Volts	mA	mA	mA	mA	mA
1	4					
2	6					
3	8					
4	10					

**KCL - Practical Values:**

S.No.	Source Voltage	Current				$I=I_1+I_2 + I_3+I_4$
		I1	I2	I3	I4	
	Volts	mA	mA	mA	mA	mA
1	4					
2	6					
3	8					
4	10					

**Kirchhoff's Voltage law:**

1. Connect variable power supply 0 to +15 V from CH2 in the Kirchhoff's voltage law circuit between the points 1 & 2.
2. Connect voltmeters (0 – 20V) between points 3 & 4, 5 & 6, 7 & 8,  
**Note:** If three meters are not available for measuring voltage then for measuring one-meter other voltmeter points should be opened. For example, to measure V1 connect ammeter between 3 & 4 and open remaining all voltmeter points. Again, to measure V2 connect ammeter between 5 & 6 and open remaining current meter points. Similarly, for measuring other voltages.
3. Connect resistors from resistor bank in the circuit in place of R1, R2, and R3.
4. For the different values of input voltage measure the voltages across the resistors in the circuit.
5. Note down the values of all voltages in a tabular form.
6. From the above table it is observed that

$$V = V_1 + V_2 + V_3$$

**KVL – Theoretical Values**

S.No.	Voltage				Total Voltage
	V	V1	V2	V3	$V_1 = V_1 + V_2+V_3$
	Volts	Volts	Volts	Volts	
1	4				
2	6				
3	8				
4	10				

**KVL - Practical Values**

S.No.	Voltage				Total Voltage
	V	V1	V2	V3	$V_1 = V_1 + V_2+V_3$
	Volts	Volts	Volts	Volts	
1	4				
2	6				
3	8				
4	10				

**Precautions:**

1. Readings should be taken without parallax error.
2. Meter connected to the circuit with proper polarities.
3. While changing/removing the connections on the kit supply to be turned off.

**Result:**

Thus Kirchhoff's voltage law and Kirchhoff's current law  
Verified both theoretically and practically.

**VIVA QUESTIONS:**

1. What is current?
2. What is voltage?
3. What is resistance?
4. What is ohm's law?
5. What is KCL and KVL?
6. What do you mean by junction?
7. What directions should be assumed for KCL?
8. What are the positive and negative signs in KVL?
9. What is the colour coding of resistors?
10. What are the precautions to be taken while doing the experiment?
11. What is the range of ammeters and voltmeters you used in this experiment

