LAB # 1

## Objective: To become familiar with Breadboard, DC Power Supply, Ammeter, Voltmeter, and Multimeter.

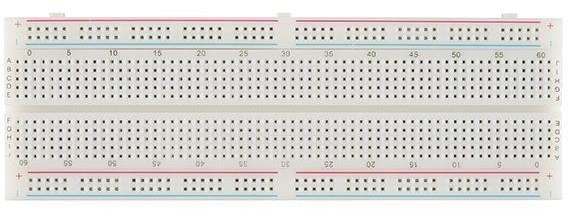
**Equipment:**

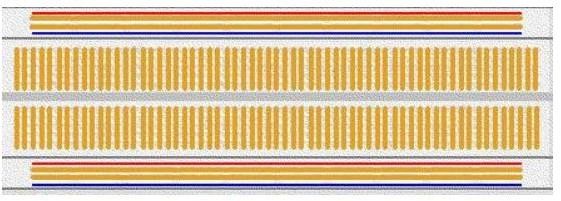
* Breadboard/ prototype board
* DC Power Supply
* Ammeter
* Voltmeter
* Multimeter (Analog and Digital)

**Theory:**

# BREADBOARD

A breadboard is a rectangular plastic board with tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode).





## Structure of Breadboard:

* **Plastic Body**: Breadboards are typically made of white plastic with a grid of holes.
* **Rows and Columns**: The holes are arranged in a grid, with rows and columns for easy placement of components.

## Connectivity of Breadboard:

* **Bus Strips**: These are used for power distribution. They usually run along the sides of the breadboard and are marked with a red line for positive voltage and a blue or black line for the ground.
* **Terminal Strips**: These are where most components are inserted. They consist of rows of holes connected internally by metal strips. The holes in each row are connected horizontally, allowing components to share connections.

## Usage of Breadboard:

* **Component Placement**: Components like resistors, capacitors, ICs, and wires can be inserted into the holes. The connections are made by placing component leads and wires into the holes so that they make contact with the metal strips inside.
* **Prototyping and Testing**: Breadboards allow for easy insertion and removal of components, making modifying and testing circuits simple.

## Advantages of Breadboard:

* **No Soldering Required**: This makes it reusable and great for beginners and prototyping.
* **Flexible**: Easy to make changes to the circuit.
* **Immediate Visual Feedback**: The circuit layout is visible, aiding in troubleshooting and understanding circuit design.

## Limitations of Breadboard:

* **Not Suitable for High-Frequency Circuits**: The connections can introduce noise and instability in high-frequency circuits.
* **Loose Connections**: Components can sometimes come loose if the board is handled roughly.

# DC POWER SUPPLY

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Power supplies are used to generate constant d.c. signals. These steady signals can supply a measurement circuit or sensor with power or calibrate an instrument.

## Basic Parts of The DC Power Supply

The DC power supply available in our labs is a triple output supply named:

1. Fixed supply (5V 3A)
2. Master (variable) (0-30V, 0-5A)
3. Slave (variable) (0-30V, 0-5A)

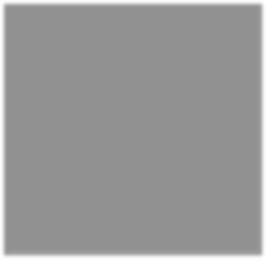
The master and slave can be connected either as independent supply or can be connected in series or parallel.

## Modes Of Operations of DC Power Supply

DC power supply can be operated in three modes:

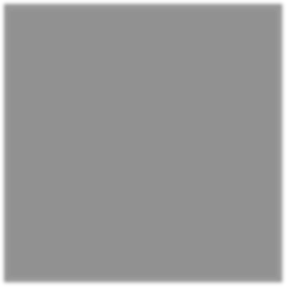
1. Independent
2. Parallel
3. Series
4. **Independent:** In this mode, both master and supply work independently.
5. **Parallel:** In this mode, the voltage and current limit settings of the slave supply are always held to be the same as those of the master. In this mode the slave controls do nothing.
6. **Series:** In this mode, the '+' slave terminal is connected internally to the '-' master terminal. Both supplies are then used as a single power supply with the output taken between the '-' slave terminal and the '+' master terminal. This power supply may be controlled by the master control knobs only. The reason for using series mode is that it doubles the available voltage.

# AMMETER



An ammeter is an instrument used to measure the current flowing through a circuit. Measures electric current in a circuit, usually in amperes (A), milliamperes (mA), or microamperes (µA). Ammeters must be connected in series with the load whose current is to be measured. This ensures that the entire current flows through the ammeter. An ideal ammeter has very low internal resistance to minimize the voltage drop across it and avoid altering the current in the circuit.

# VOLTMETER



A voltmeter is an instrument used to measure the voltage (electrical potential difference) between two points in an electric circuit. Measures voltage in volts (V), millivolts (mV), or kilovolts (kV). Voltmeters must be connected in parallel with the component or portion of the circuit across which the voltage is to be measured. An ideal voltmeter has very high internal resistance to minimize the current drawn by the voltmeter itself, ensuring accurate voltage measurement without significantly affecting the circuit.

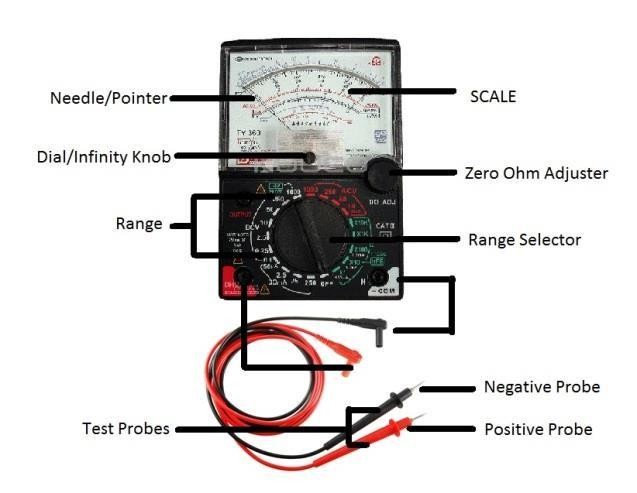
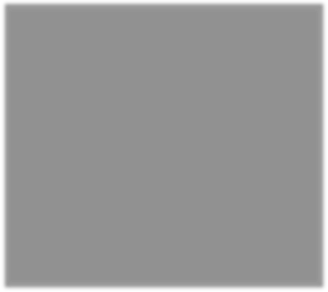
# MULTIMETER

Multimeters are essential tools in electronics and electrical engineering for measuring voltage, current, and resistance. Multimeter can be of two types.

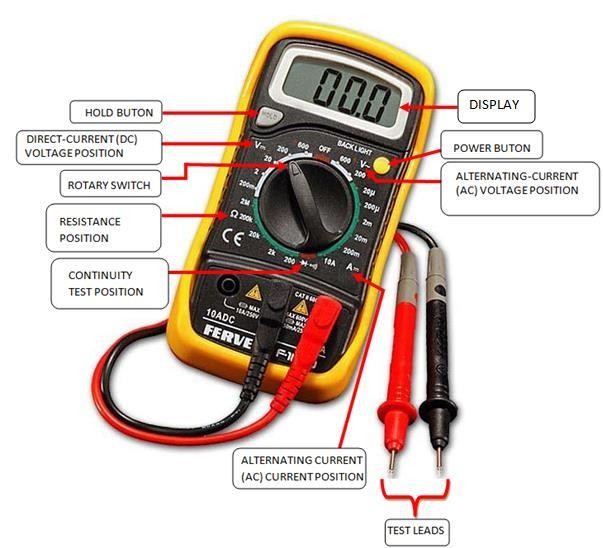
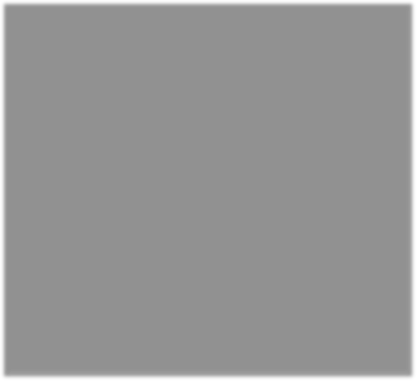
* 1. Analog multimeters
  2. Digital multimeters

Analog multimeters display measurements using a needle and a scale, while digital multimeters (DMMs) use a numerical display. Understanding the proper use of both types of multimeters is fundamental for accurate measurements in circuit analysis and troubleshooting.

**ANALOG MULTIMTER**



**DIGITAL MULTIMETER**



**POST LABS:**

1. What is a breadboard used for?
2. What do bus strips on a breadboard distribute?
3. What does a DC power supply generate?
4. What does an ammeter measure?
5. What does a voltmeter measure?

**RESULT:**