



Almustaqbal University
Engineering And Technical Engineering
Computer Techniques Engineering Department
Electrical Engineering Fundamentals

Class :- 1st



Lectuer 1

How to use ammeter, voltmeter and ohmmeter.

By

Eng. Ali Adnan


2025-2026

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

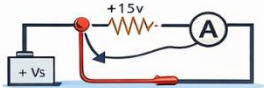
This laboratory session is designed to bridge the gap between theoretical concepts and practical implementation. It introduces the fundamental electrical measurement instruments—ammeter, voltmeter, and ohmmeter—and establishes the essential procedures for accurate circuit measurements, reliable analysis, and safe engineering practice.

How to use Ammeter, Voltmeter, and Ohmmeter

Ammeter A




Series



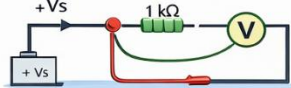
Series

Break the circuit to place the ammeter in **series** to measure current (A).

Voltmeter V



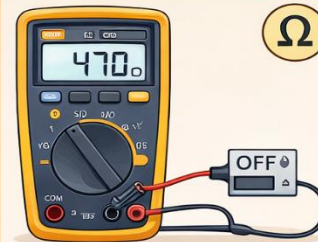
Parallel




Parallel

Connect the voltmeter across the resistor to measure voltage (V).

Ohmmeter Ω



Power OFF



Power OFF

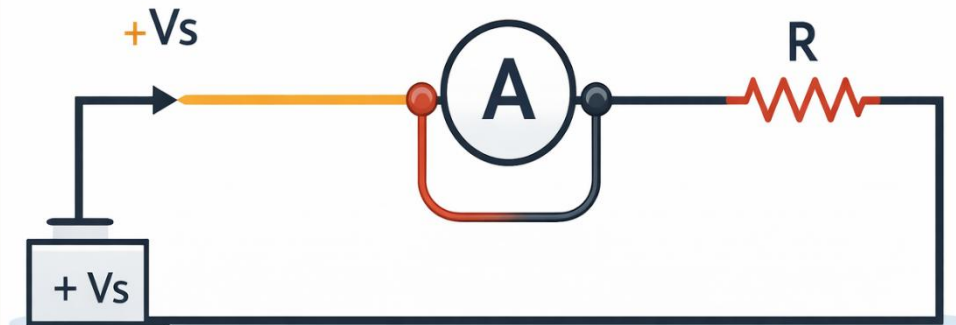
Turn off power before using ohmmeter to measure resistance (Ω).

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

1. Ammeter — (for measuring current)

- **Name:** Ammeter (Ammeter / DMM in Current mode)
- **Measures:** Electric current I
- **Symbol:** A
- **Unit:** Ampere (A) or milliampere (mA)
- **Connection method:** Series connection within the current path
- **Why series?** Because the current must pass through the meter in order to be measured.

Ammeter (Series)

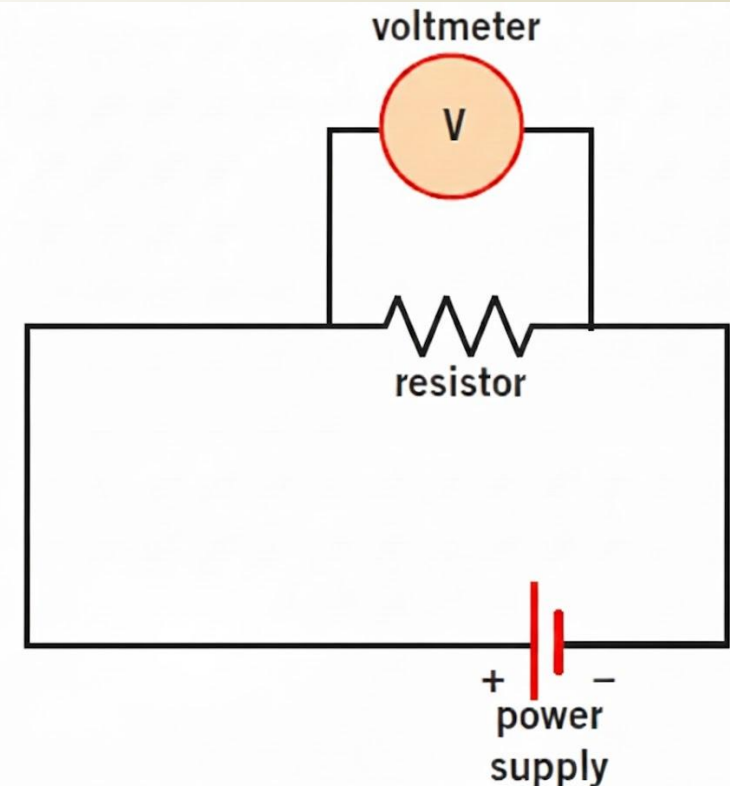


Measuring current through
the ammeter (A) in **series**

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

2. Voltmeter — (for measuring voltage)

- **Name:** Voltmeter (Voltmeter / DMM on Voltage mode)
- **Measures:** Electrical potential difference (voltage) V
- **Symbol:** V
- **Unit:** Volt (V)
- **Connection method:** **Parallel** across the component / across the two points where the voltage is to be measured
- **Parallel** Because a voltmeter measures the potential difference between two points

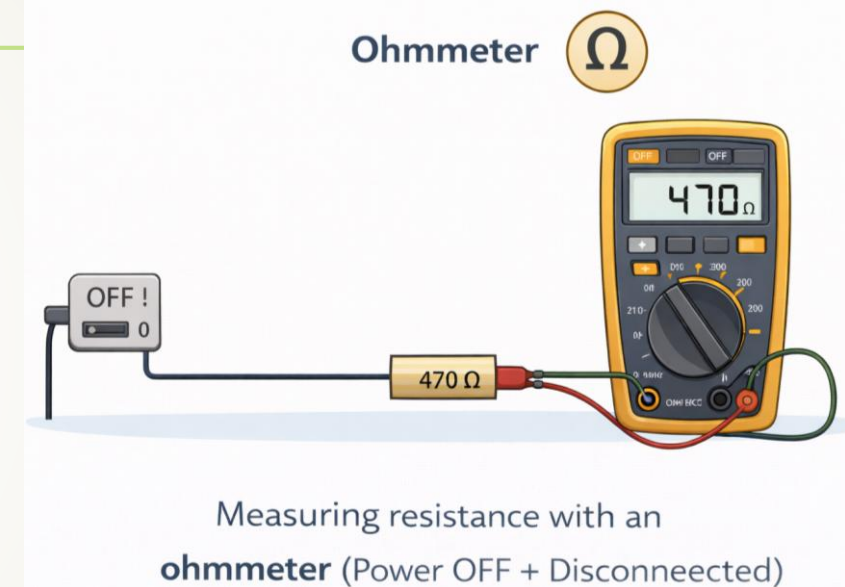


Measuring voltage with the voltmeter (V) in parallel across two points

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

3. Ohmmeter — (for measuring resistance)

- **Name:** Ohmmeter (Ohmmeter / DMM on Resistance mode)
- **Measures:** Electrical resistance R
- **Symbol:** Ω (Omega)
- **Unit:** Ohm (Ω) (*sometimes $k\Omega$, $M\Omega$*)
- **Connection method:** Connect across the resistor
- **Essential condition before measuring:** Power OFF / disconnect the circuit from the supply
- **Power OFF** Because an ohmmeter measures resistance by applying a small internal voltage/current from its own battery; an external power source can cause incorrect readings and may damage the meter.



Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

Brief review of fundamental units and symbols :-

1. International System of units:-

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Luminous intensity	candela	cd

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

Brief review of fundamental units and symbols :-

2. Abbreviation in multiples and sub-multiples :-

Symbol	Prefix	Multiplying factor
T	Tera	10^{12}
G	Giga	10^9
M	Mega (or Meg)	10^6
K	Kilo	10^3
d	Deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	Micro	10^{-6}
n	Nano	10^{-9}
p	Pico	10^{-12}

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

Instrument	Measures (quantity)	Quantity symbol	SI unit (name)	Unit symbol	Device symbol (schematic)	Correct connection
Ammeter	Current	I	ampere	A	Ⓐ	Series (insert into the current path)
Voltmeter	Voltage (potential difference)	V	volt	V	Ⓥ	Parallel (across the component / 2 nodes)
Ohmmeter	Resistance	R	ohm	Ω	Ⓢ / Ω	Across the component (with power removed)

Experiment No. 1 “How to use ammeter, voltmeter and ohmmeter”

Ohm's Law

Ohm's Law describes the relationship between voltage, current, and resistance for ohmic elements (such as many resistors) and is given by:

$$V = IR$$

$$I = \frac{V}{R}$$

$$R = \frac{V}{I}$$