

What is a Multimeter?

An instrument for measuring the properties of an electrical circuit



probes



display

unit

Function/Range
switch



Pens
ampermeter



COM (common),



Function/Range Switch

DC Voltage

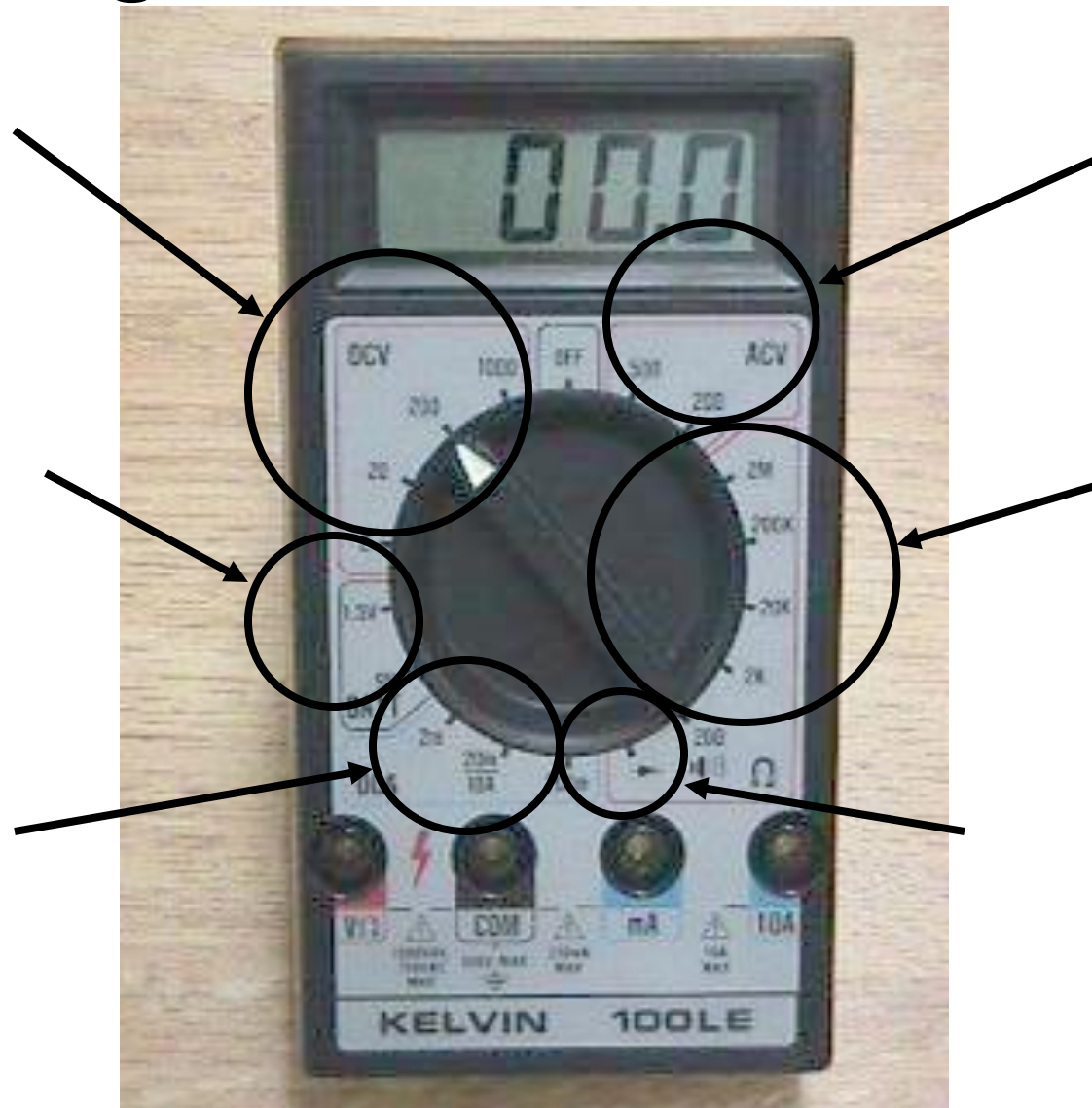
AC Voltage

Battery Test

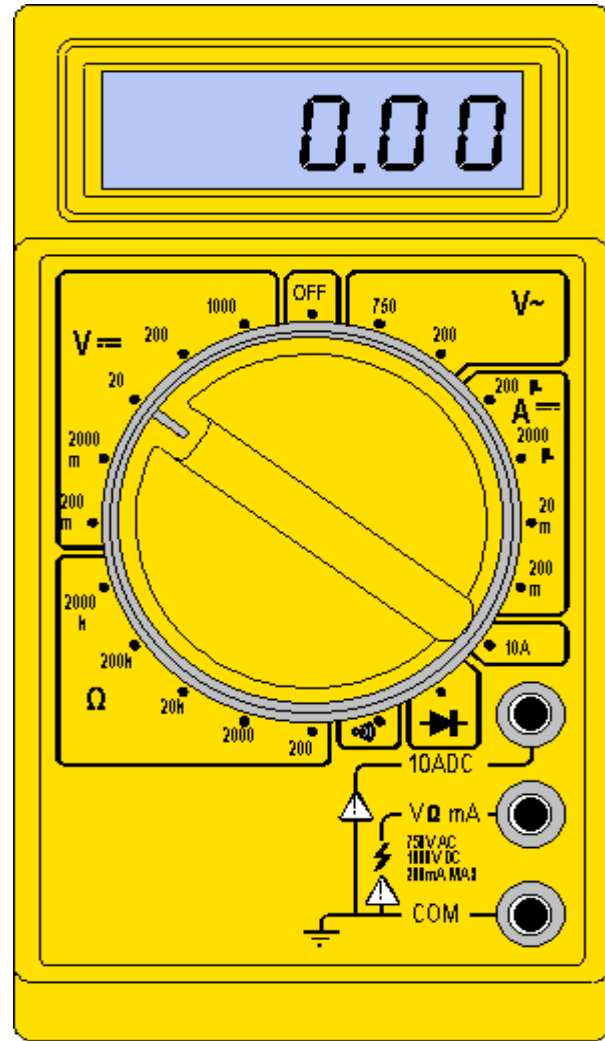
Resistance

DC Current

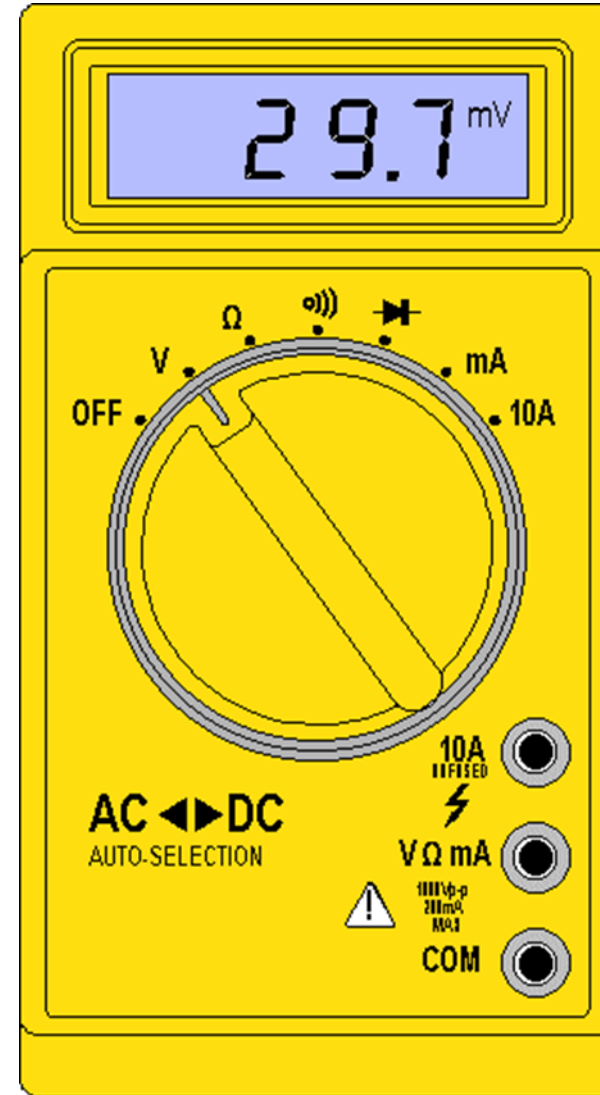
Continuity Test



Switched

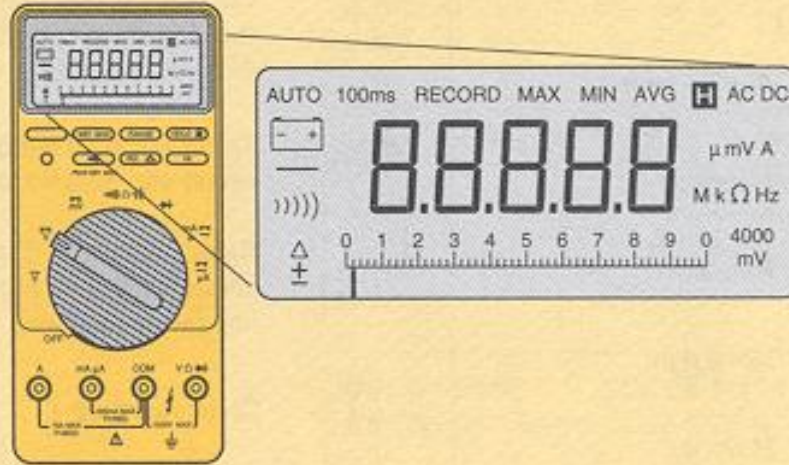


Autorangeing



SELECTED DMM ABBREVIATIONS

AC Alternating current or voltage
 DC Direct current or voltage
 V Volts
 mV Millivolts
 kV Kilovolts
 A Amperes
 mA Milliamperes
 μ A Microamperes
 W Watts
 k Ω Kilohms
 M Ω Megohms
 Hz Hertz
 kHz Kilohertz
 μ F Microfarads
 nF Nanofarads
 °F Degrees Fahrenheit
 °C Degrees Celsius



RPM Revolutions per minute
 COM Common
 OL Overload
 T Time
 LSD Least significant digit
 MAX Maximum
 MIN Minimum
 AVG Average
 TRIG Trigger
 V_{avg} Average voltage
 V_{max} Peak voltage
 V_{p-p} Peak-to-peak voltage
 V_{rms} Root-mean-square (rms) voltage
 Hi-Z High input impedance
 dB Decibel
 dBV Decibel volts
 dBW Decibel watts

Basic Instructions

- Be sure the test leads are connected appropriately for the intended measurement.
- Turn the meter's Function/Range switch to the function (ACV, DCV, DCA or Ω) to be measured.
- Select a range which is higher than the expected value.
- Connect the test leads to the circuit/component being tested. Observe proper polarity.
- Turn the meter's Function/Range switch to reduce the range and increase the accuracy.
- Record results.
- Remember to turn the power OFF when finished.

Manual vs. Auto Ranging

Manual

The user is responsible for choosing a setting by anticipating the output.

Always choose a setting higher than what you think the reading will be.



Manual vs. Auto Ranging

Where should you set the meter if you expect a reading around . . .

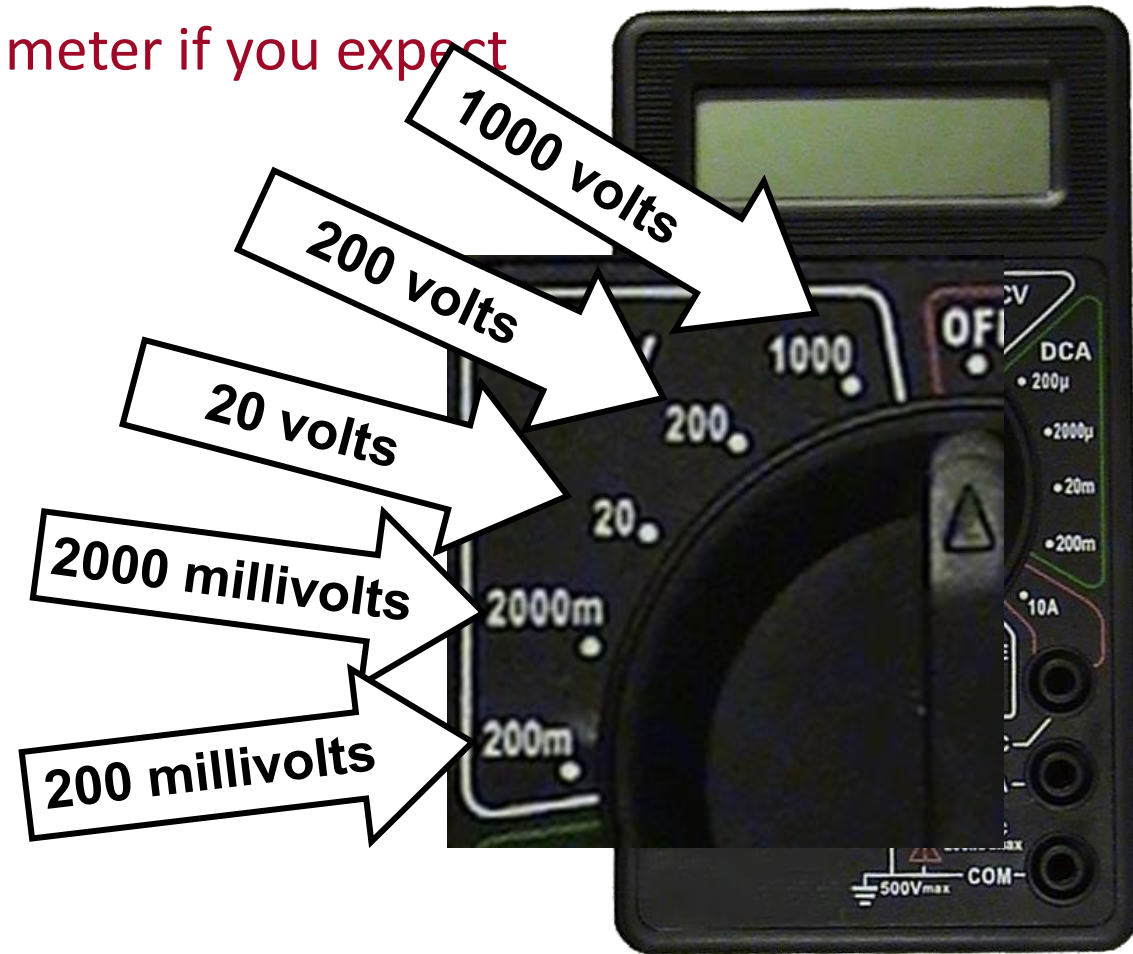
6 volts

50 millivolts

800 millivolts

800 volts

125 volts



Manual vs. Auto Ranging



Auto

The meter adjusts based on the input to provide the most detailed reading.

Auto ranging meters are generally a little more expensive.

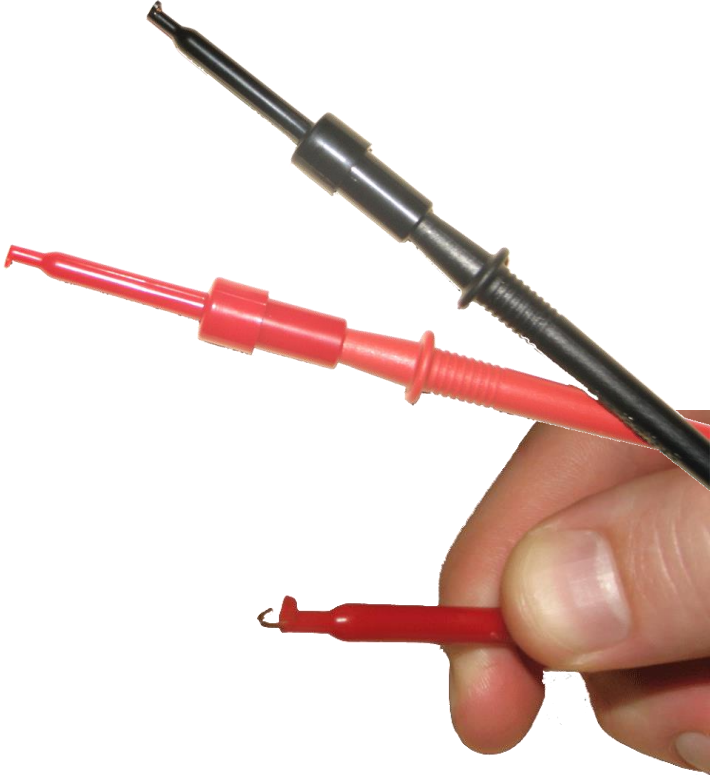
Test Leads



Standard Test Leads



Alligator Clip Leads

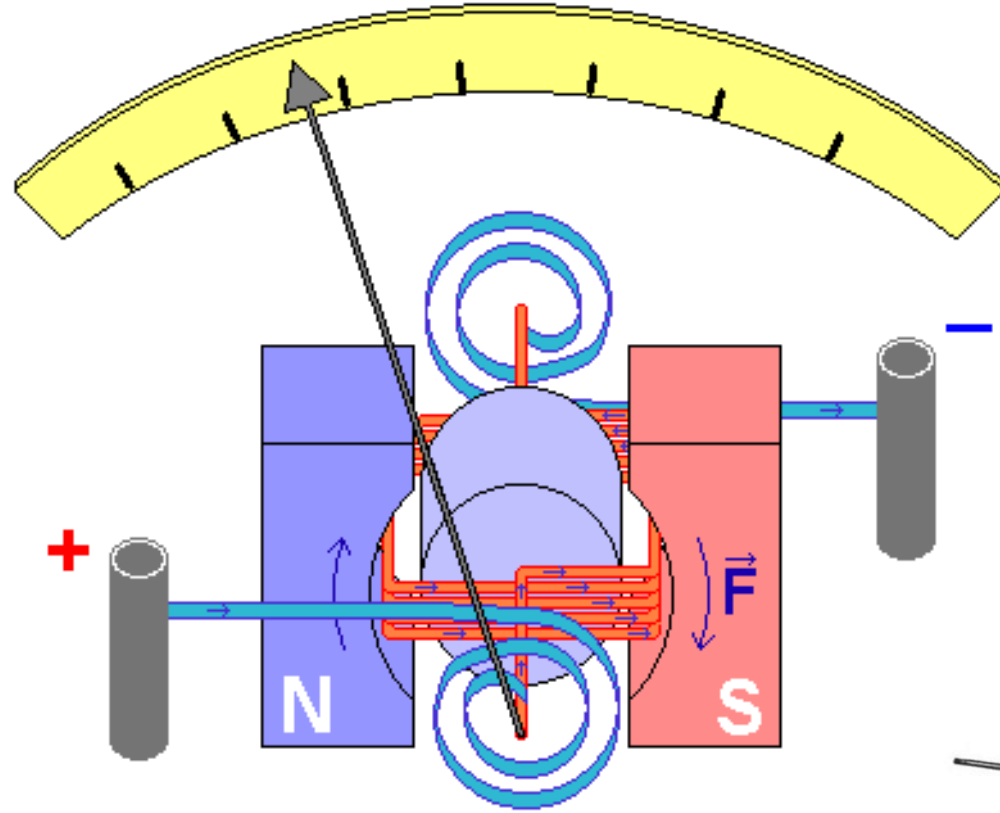


Hook Leads

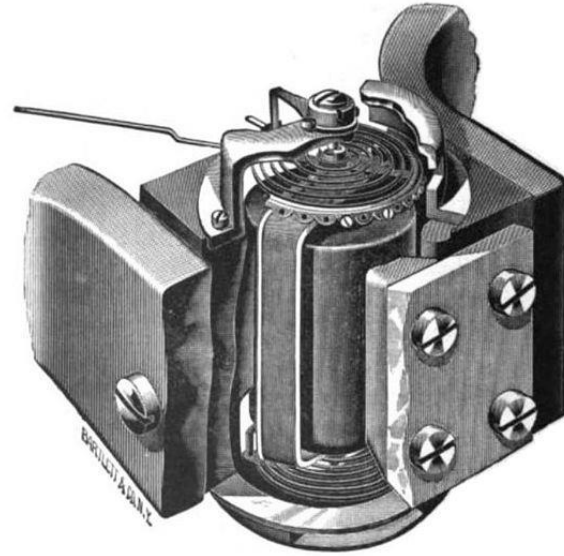
Test Leads

Test leads are used to connect the multimeter to the circuit to be tested.





Galvanometre şeması



1900'lü yıllarda kullanılan d'Arsonval galvanometresi

Voltage Meter

- The voltmeter is used to measure the voltage potential across a component in an active circuit.
- It can be used to measure either DC or AC voltages.
- AC voltage can ONLY measure sinusoidal (SINE) waveforms.



Test Lead Connections - Voltage



- Plug the **RED** test lead into the jack labeled V/Ω and the **BLACK** test lead into the jack labeled COM (common).

Ohmmeter



The ohmmeter is used to measure the resistance of a component.

POWER CANNOT be applied to the component being tested.

The ohmmeter actually applies a small voltage and uses Ohm's law to calculate the resistance from the measured current.

Test Lead Connections - Resistance

- Same As Voltage Measurement



Ampermeter

- The ampermeter is used to measure the current through a component in an active circuit.
- It can be used to measure only DC current.
- Some multimeters can also measure AC current.



Test Lead Connections - Current

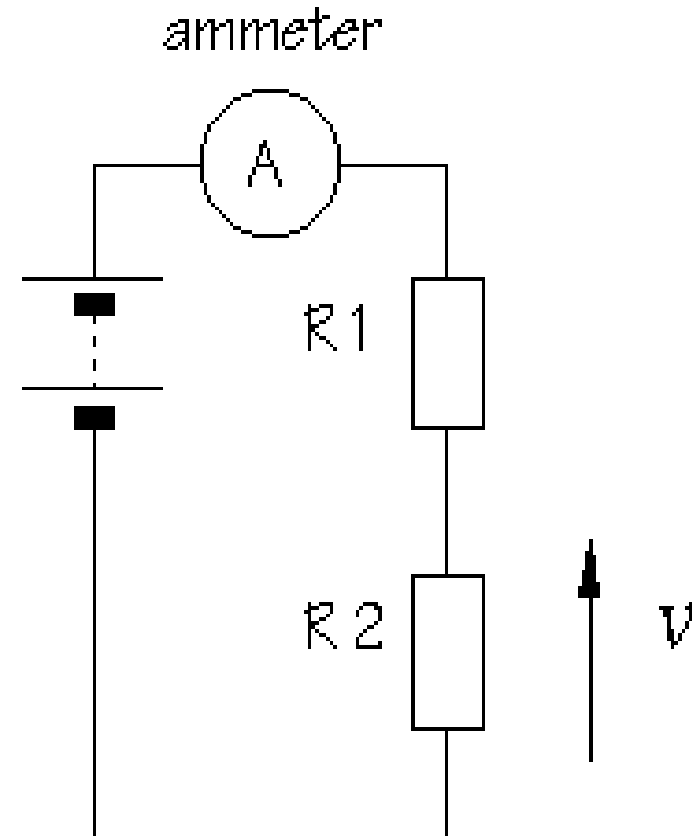
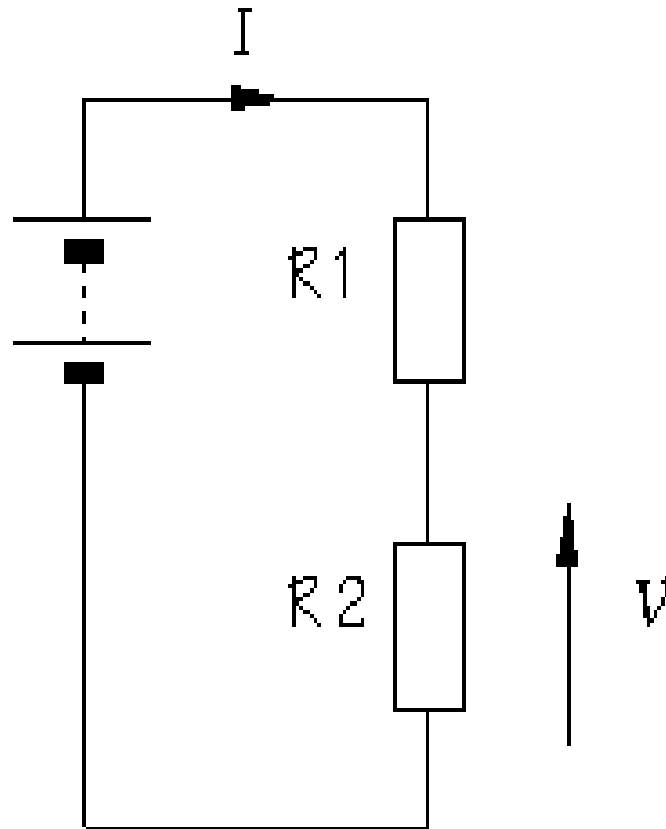
- Plug the **RED** test lead into the jack labeled mA for milliamps or into the jack labeled 10A for circuits with high current levels. Plug the BLACK test lead into the jack labeled COM.
- Be certain to select the range according to the test lead connections.
- Observe proper polarity.



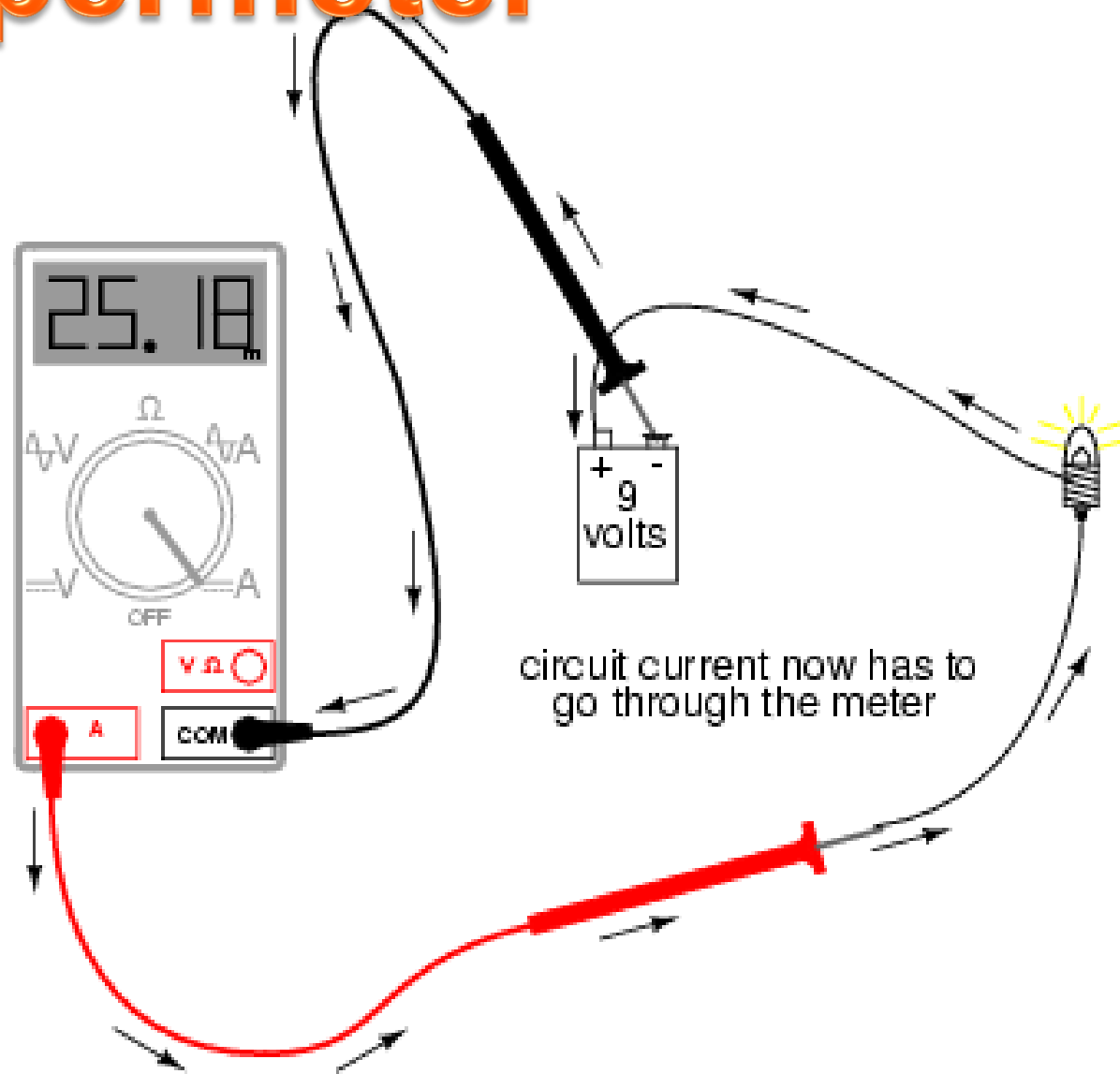
Basic Instructions

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Ammeter mode measures current in Amperes. To measure current you need to power off the circuit, you need to *break the circuit* so that the ammeter can be connected in series. All the current flowing in the circuit must pass through the ammeter. Meters are not supposed to alter the behavior of the circuit, so the ammeter must have a very LOW resistance. The diagrams below show the connection of a multimeter to measure current.



Ampermeter

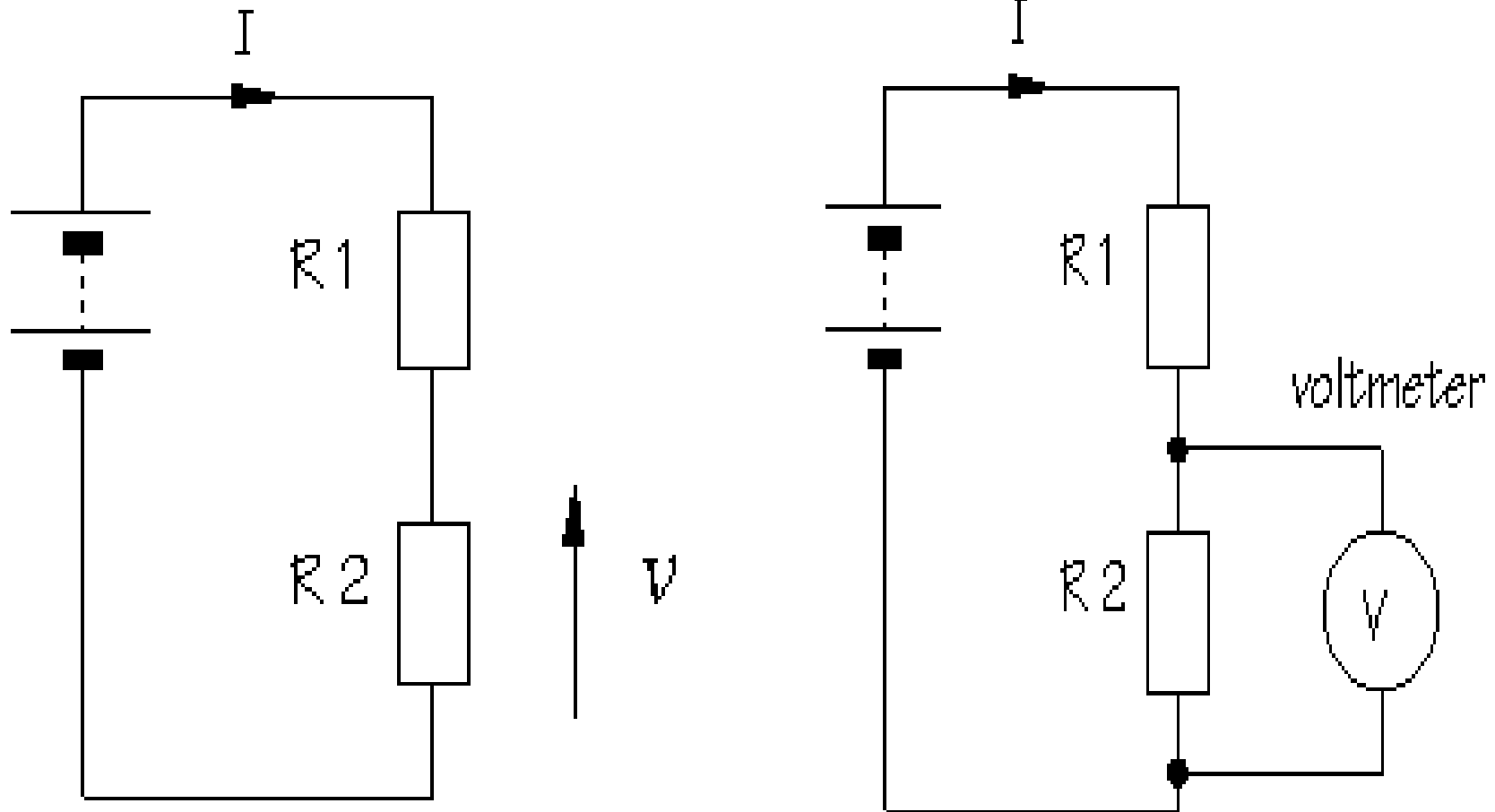


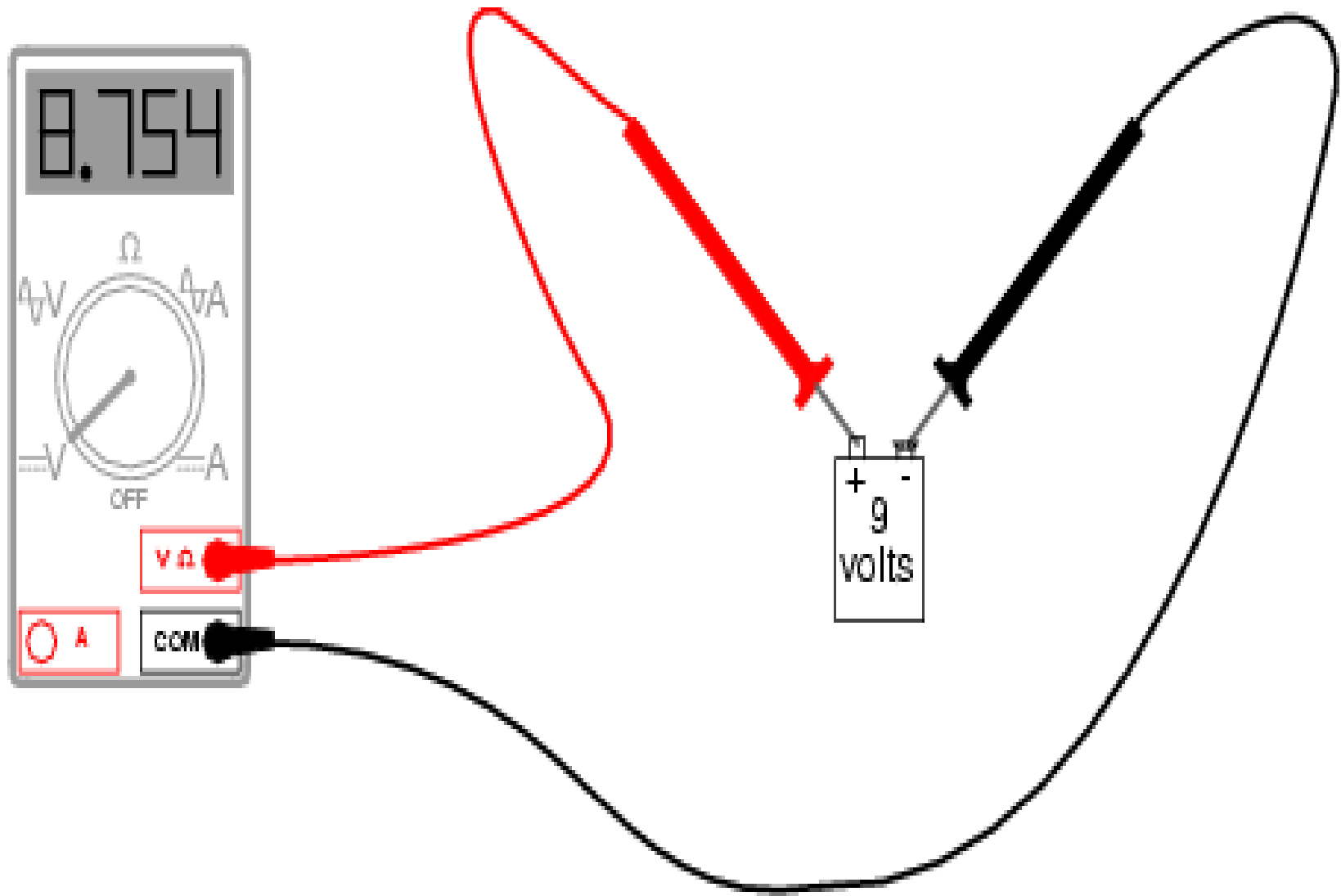
Multimeter as a Voltmeter

To use a multimeter as a voltmeter it is connected in parallel between the two points where the measurement is to be made.

The voltmeter provides a parallel pathway so it needs to be of a high resistance to allow as little current flow through it as possible. Voltage measurements are the most common measurements. Processing of electronic signals is usually thought of in voltage terms. Voltage measurements are easy to do because you do not need to change the original circuit you only need to touch the points of interest.

Multimeter as a Voltmeter

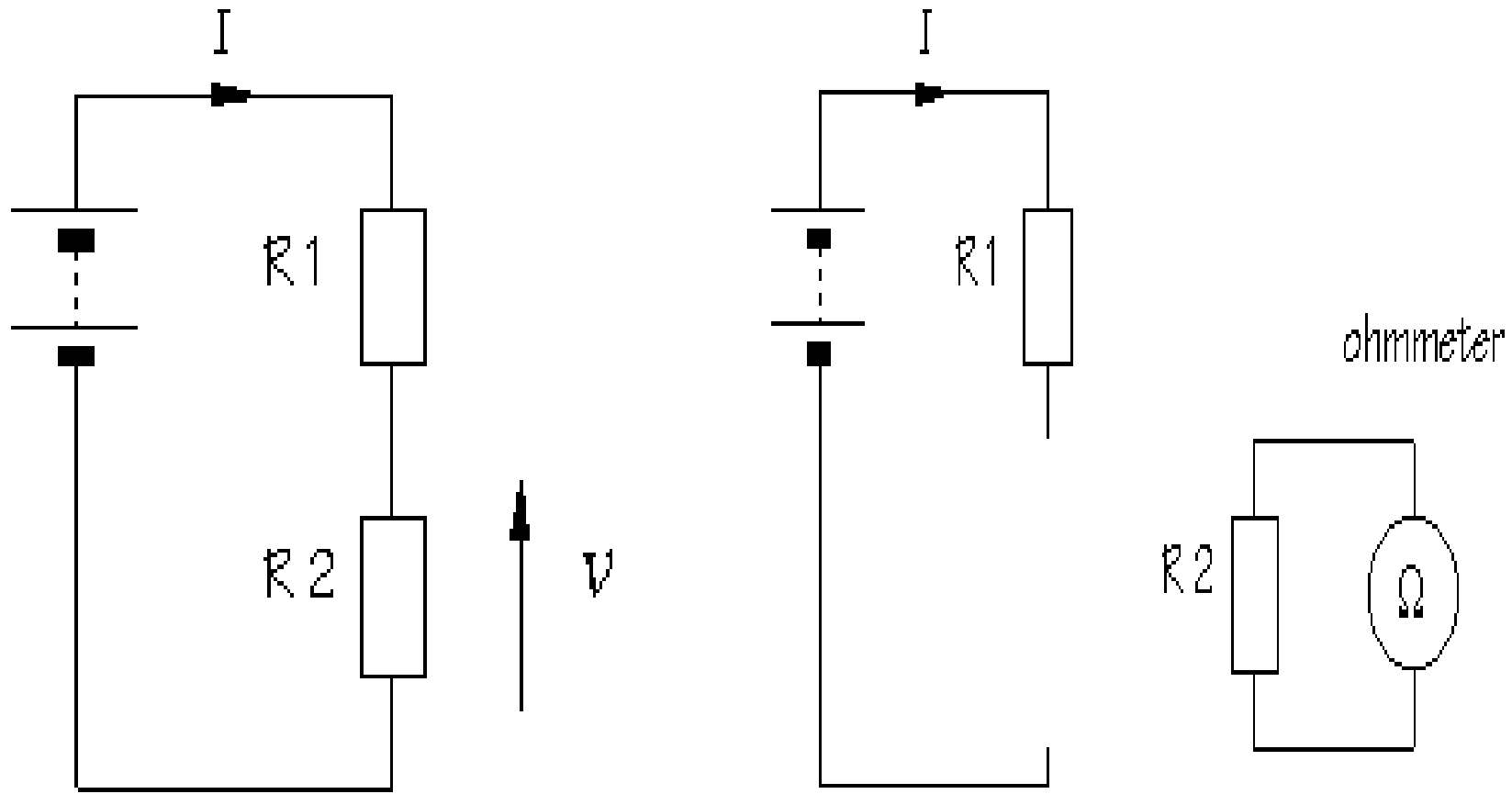




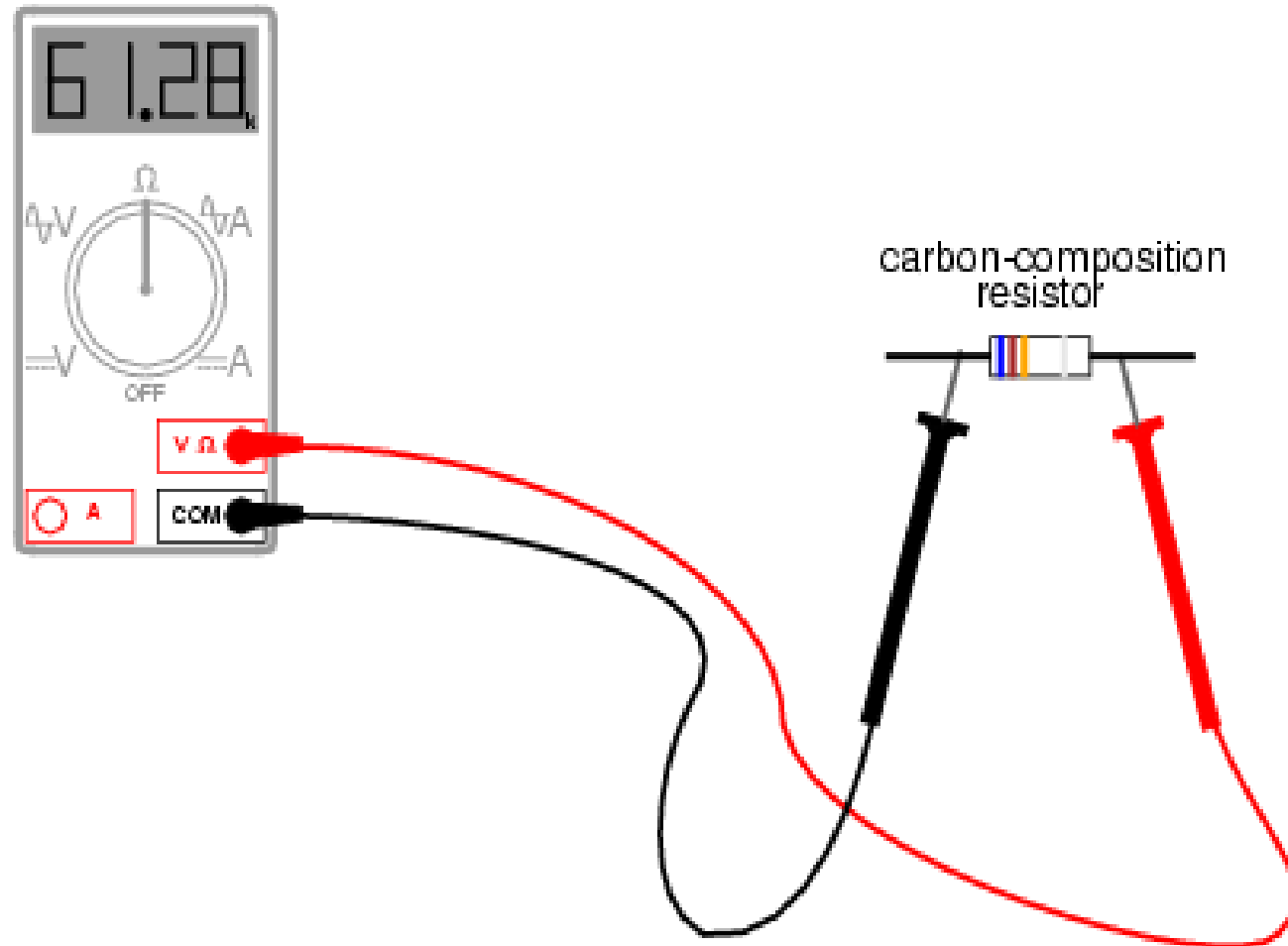
Multimeter as a Ohmmeter

- Power always has to be off
- Component has to be removed from circuit
- Start at lowest Ohm setting

Multimeter as a Ohmmeter



Multimeter as a Ohmmeter



Testing for Continuity

Method 1

There will be a speaker icon where resistance is measured.

The meter will beep to indicate continuity.



Testing for Continuity

Method 2

Turn the dial to a setting for Ohms.

The meter will read zero to indicate continuity.



Testing for Continuity

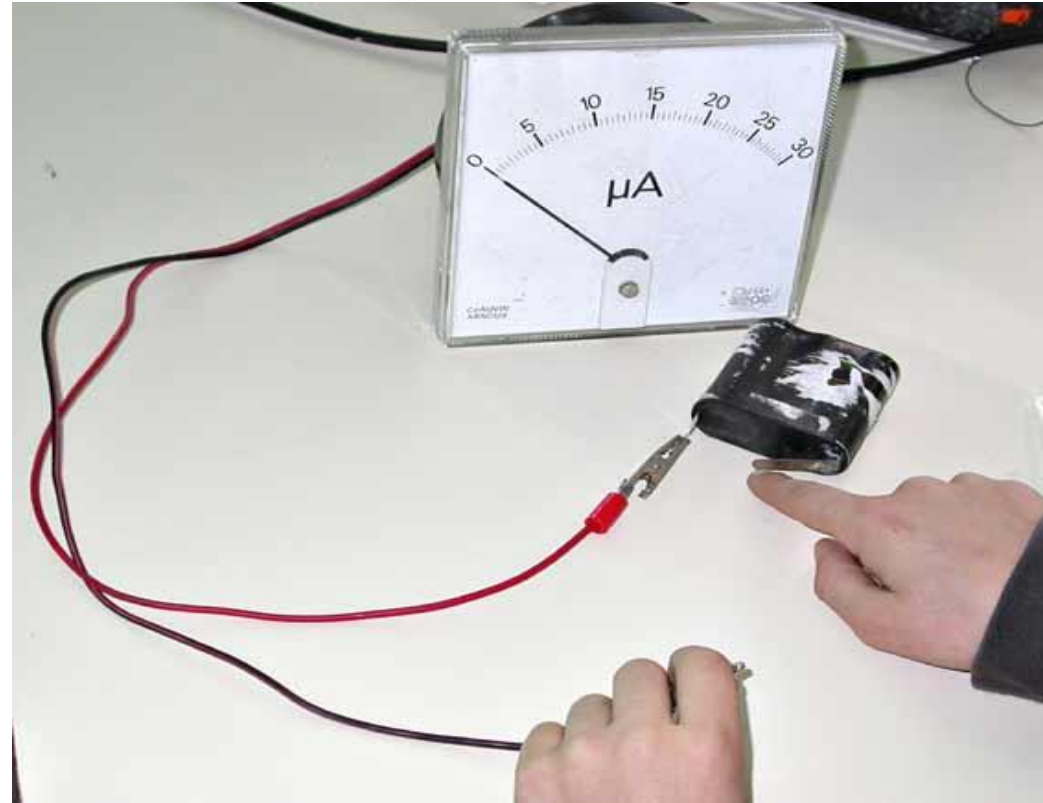
Method 2

Turn the dial to a setting for Ohms.

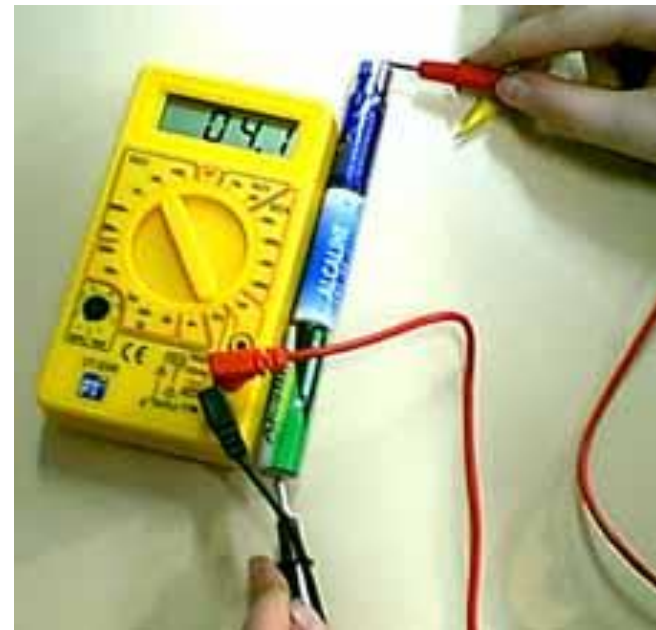
The meter will read zero to indicate continuity.



Electric Circuits



Do not use ampermeter like this !!!!



Measurement with a voltmeter