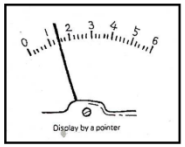
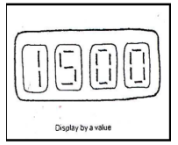
# ANALOG MULTIMETER

# DIGITAL MULTIMETER

**An analogue multimeter uses a pointer to indicate a value.**

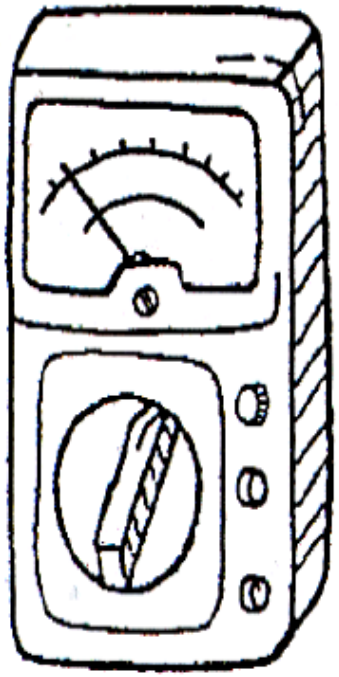



**A digital multimeter gives a numeric value.**

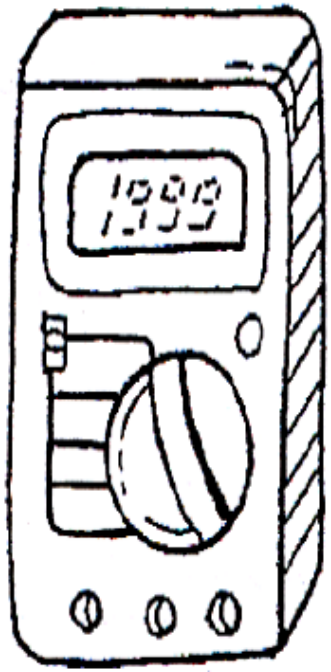


Most effective for reading movement of the pointer or measuring a change in value.

Analog multimeter

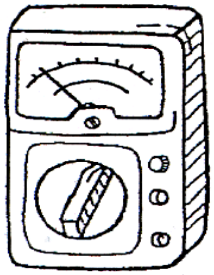


Digital multimeter



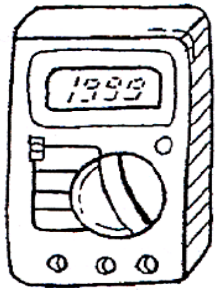

Most effective for precisely reading a value.

Analog multimeter



- Continuous movement of the pointer permit monitoring of how the value changes.
- Only need power when used as an ohmmeter .
- Low cost.
- The use of many scales on the same instrument can cause confusion.
- The polarities of the test leads must be used correctly. Otherwise reverse movement of the pointer can damage the meter.
- Can occur reading errors, especially when the pointer off marks.

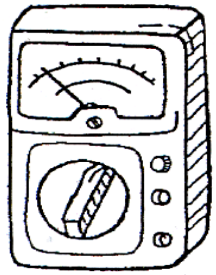
Digital multimeter




- Generally provide high accuracy.
- It is not necessary to convert the indicated value. It allows the value to be directly read.
- Each of the voltage rages provides high internal resistance. Therefore, the low voltage range also provides high internal resistance which is a great advantage when measuring semiconductor devices.
- Proper polarities of the test leads do not cause concern. If the polarities are reversed, a "-" indication is displayed.
- Need power.
- High cost.

# Analogy…

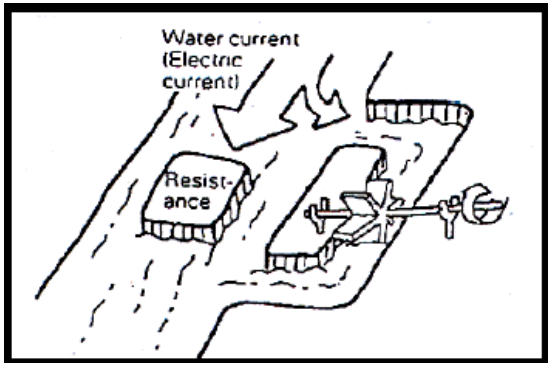
Analog multimeter



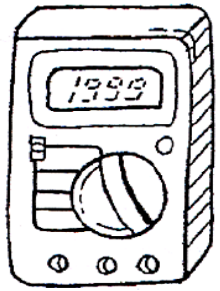
Is essentially a DC ammeter.

An electric current may be compared to a water current.

Measuring some of the water current provides a way to measure the flow rate of the entire water current.

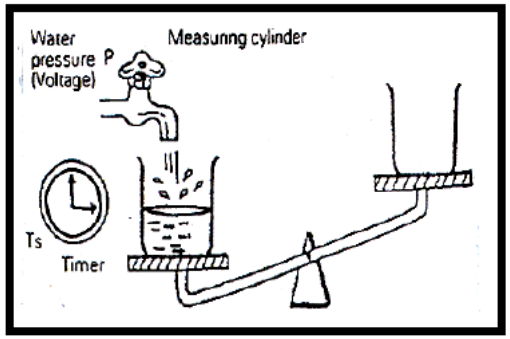


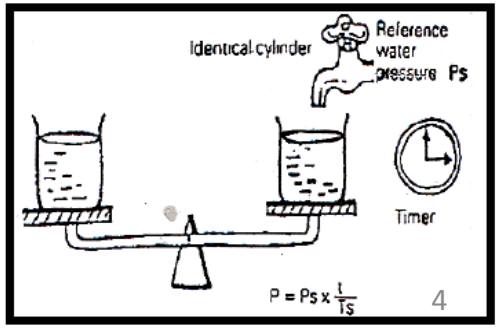

Digital multimeter



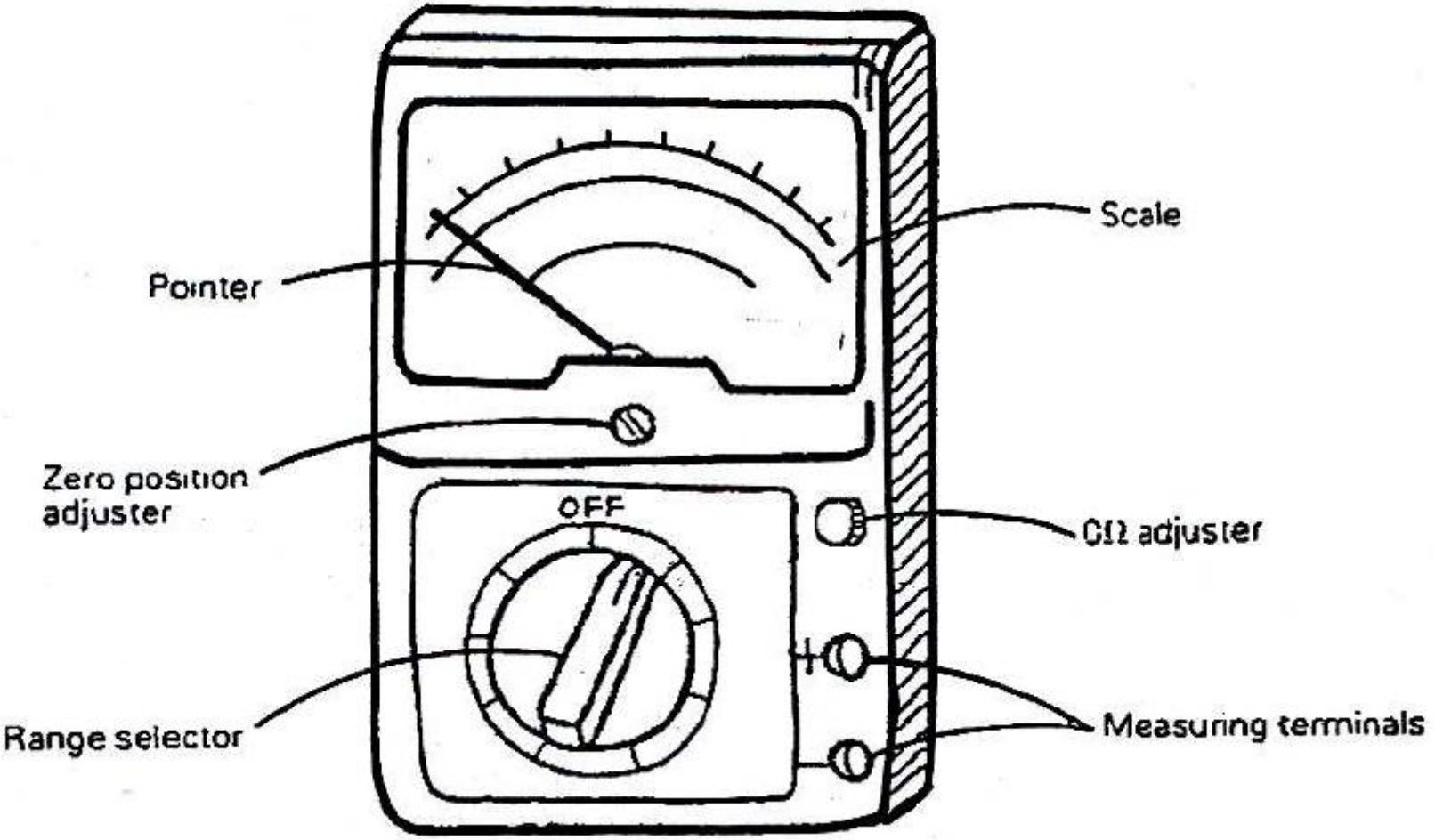

Is essentially a voltage comparator.

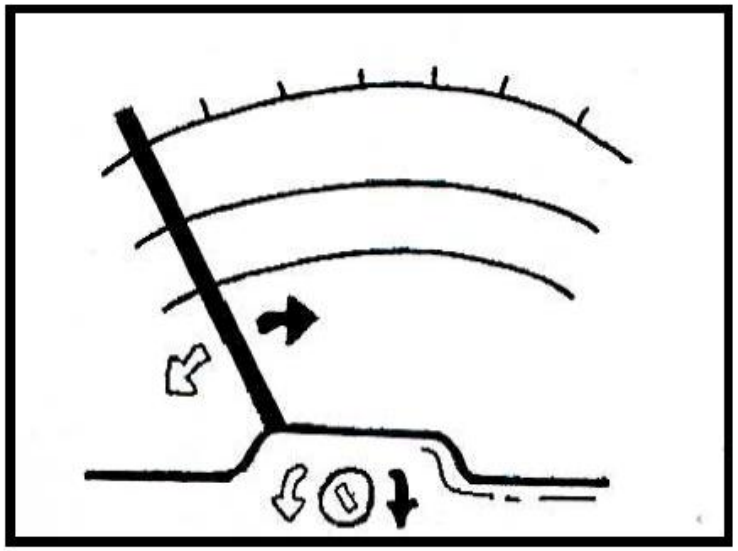
Measurement of voltage may be compared to measurement of water pressure by comparing the amounts of water.



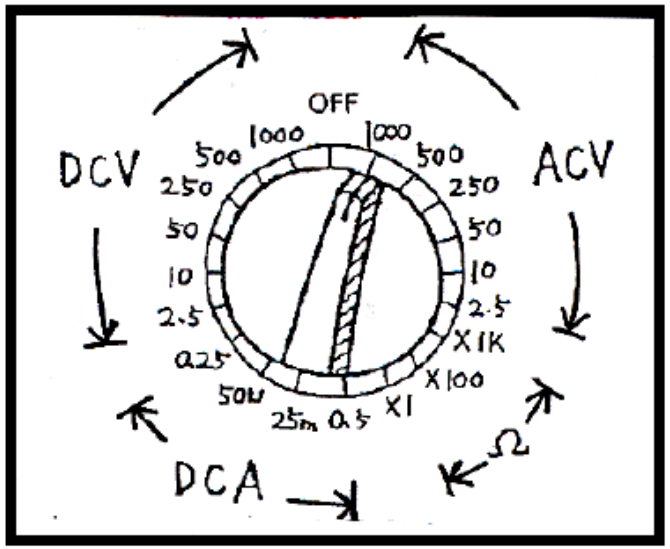



# ANALOG MULTIMETER



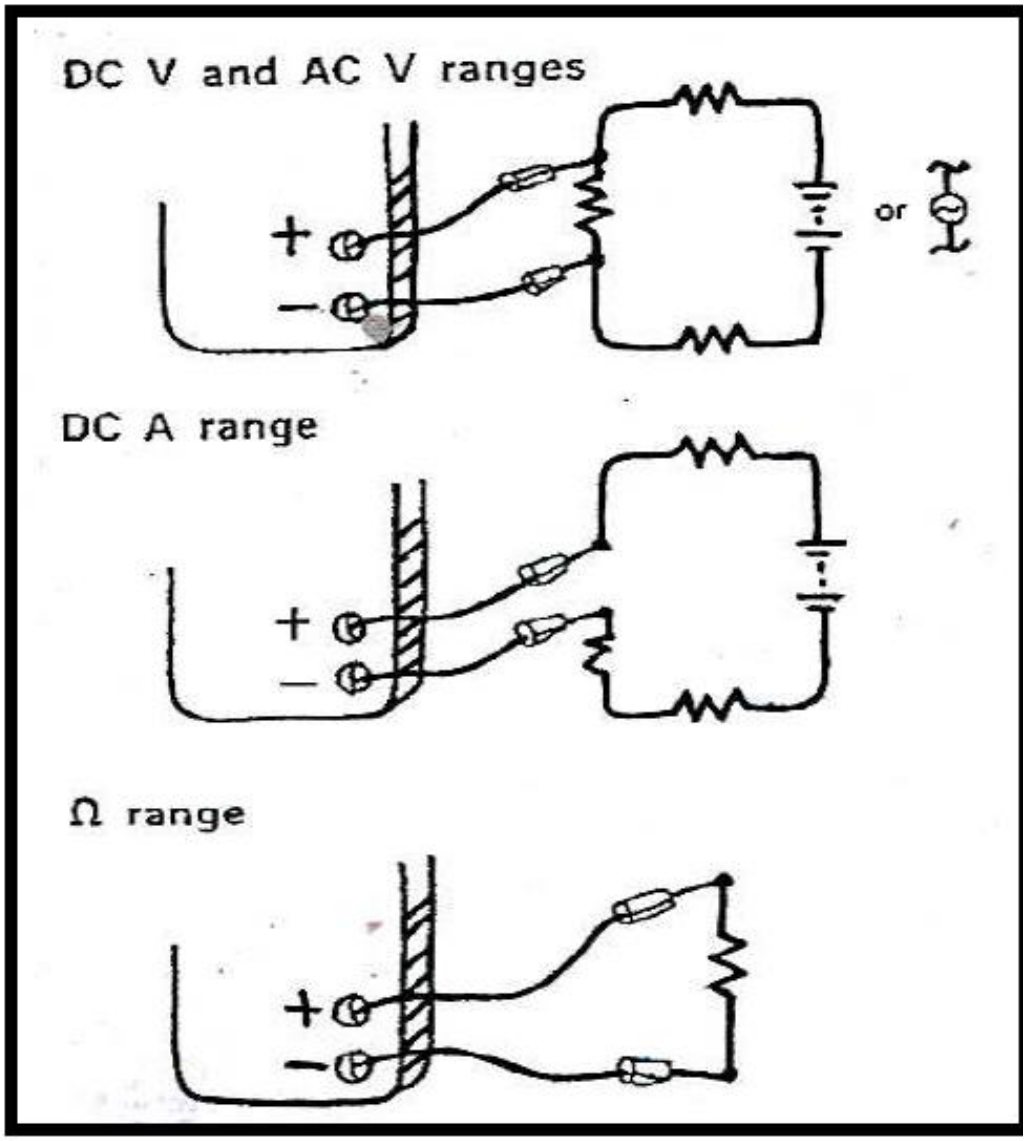


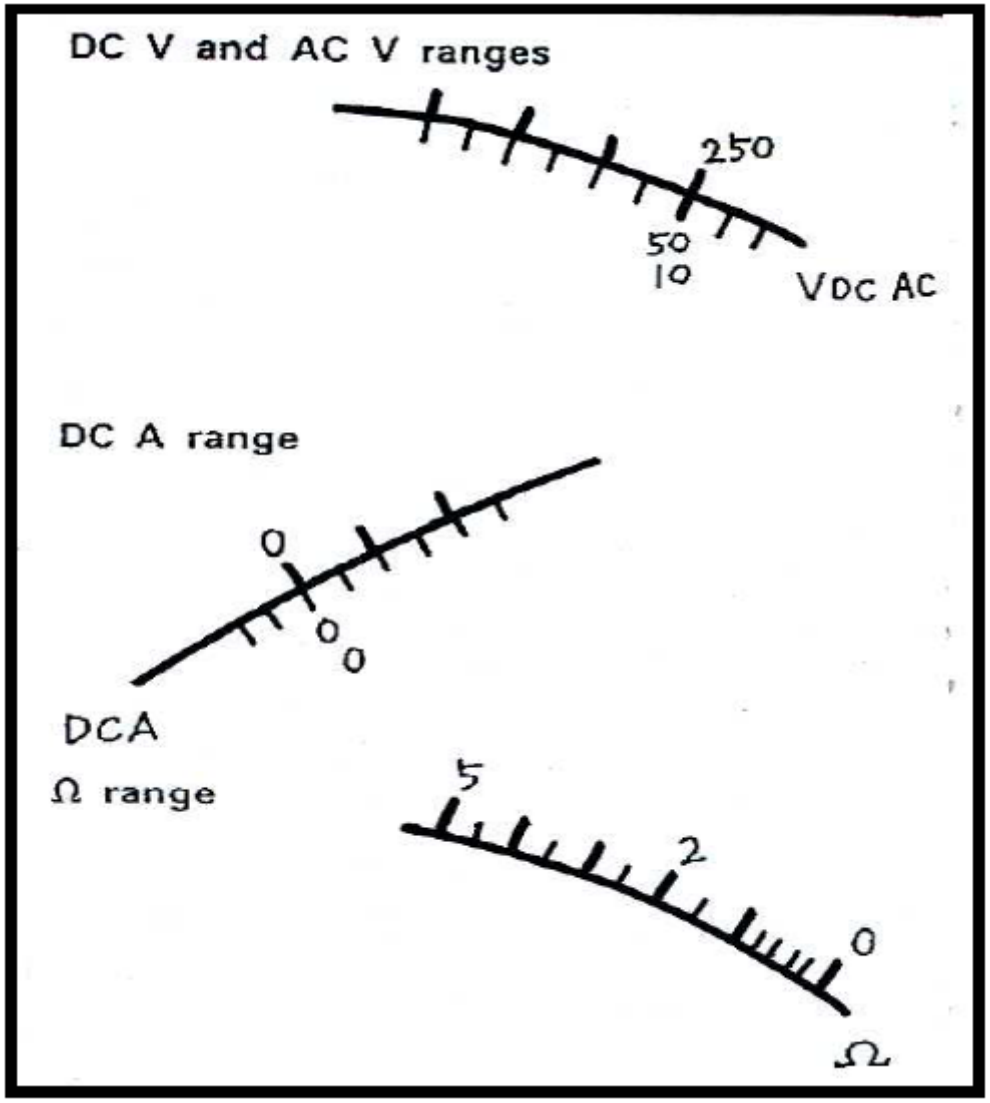
Zero position adjustor .




Meter selector range.

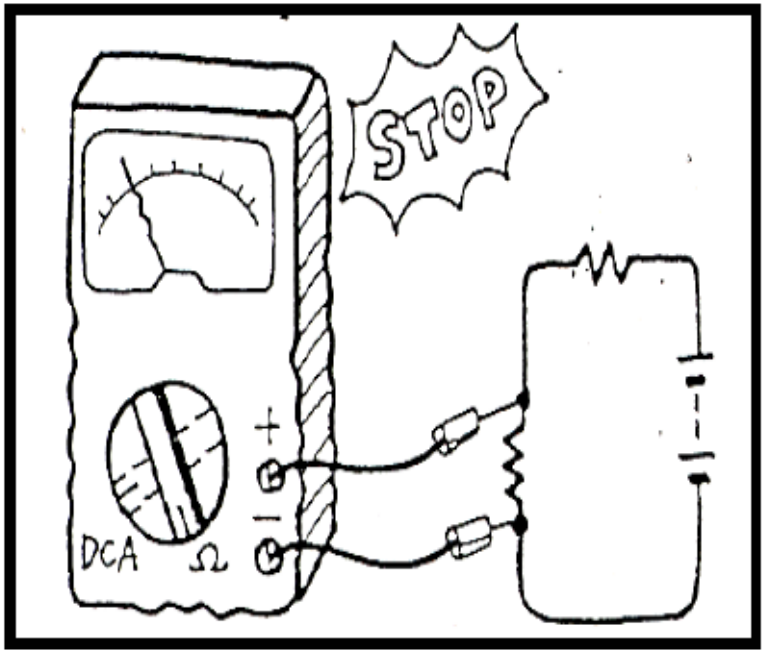
# Connection of test lead.




DC V and AC V ranges
250
50
10
VDC AC
DC A range
0
0
0
DCA
Ω range
5
2
0
Ω

## CONFIRMATION OF MEASURING RANGE

Most of the problems with this type of multimeter are caused by over current or by allowing the multimeter to fall. To prevent an over current, it is only necessary to confirm the measuring range. Application of a voltage should be avoided especially when the multimeter is in a current or resistance range has low internal resistance.



# SAFETY NOTES

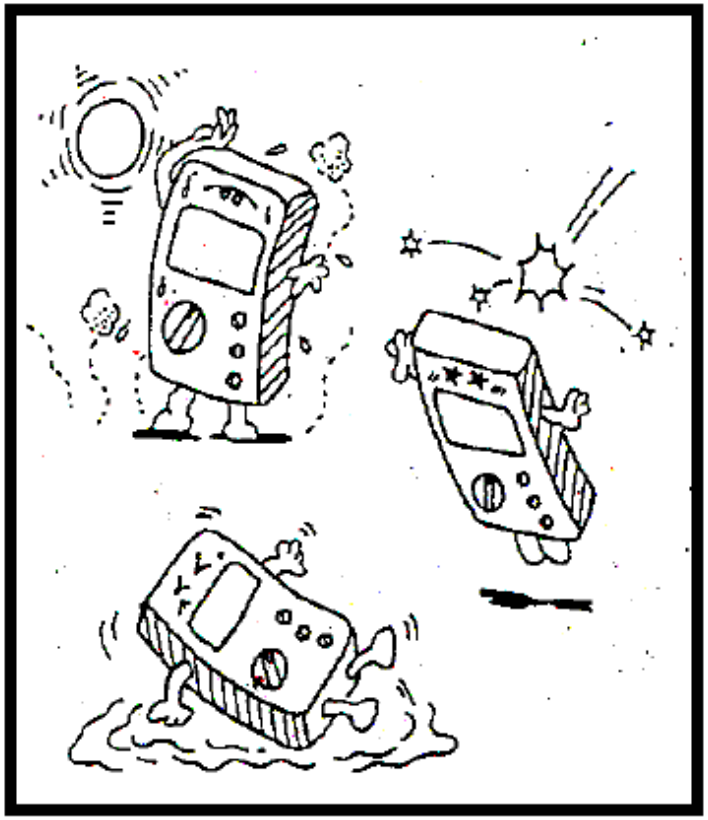
Avoid vibration and shock.

Avoid high temperature, high humidity and direct exposure to the sun.

**If the meter is to be stored for a long period if time, the batteries should be removed to prevent damage to the unit.**

**Keep your fingers away from the test leads metal probe contacts when making measurements.**

**Do not open the meter to replace batteries or fuses while the probes are connected.**



**Always turn off power and disconnect test leads before opening the covers to replace the fuse or batter.**

# SAFETY NOTES

Keep the meter dry. If it gets wet, dry it immediately.

Use and store the meter in normal temperatures.

Keep your fingers away from the test leads metal probe contacts when making measurements.

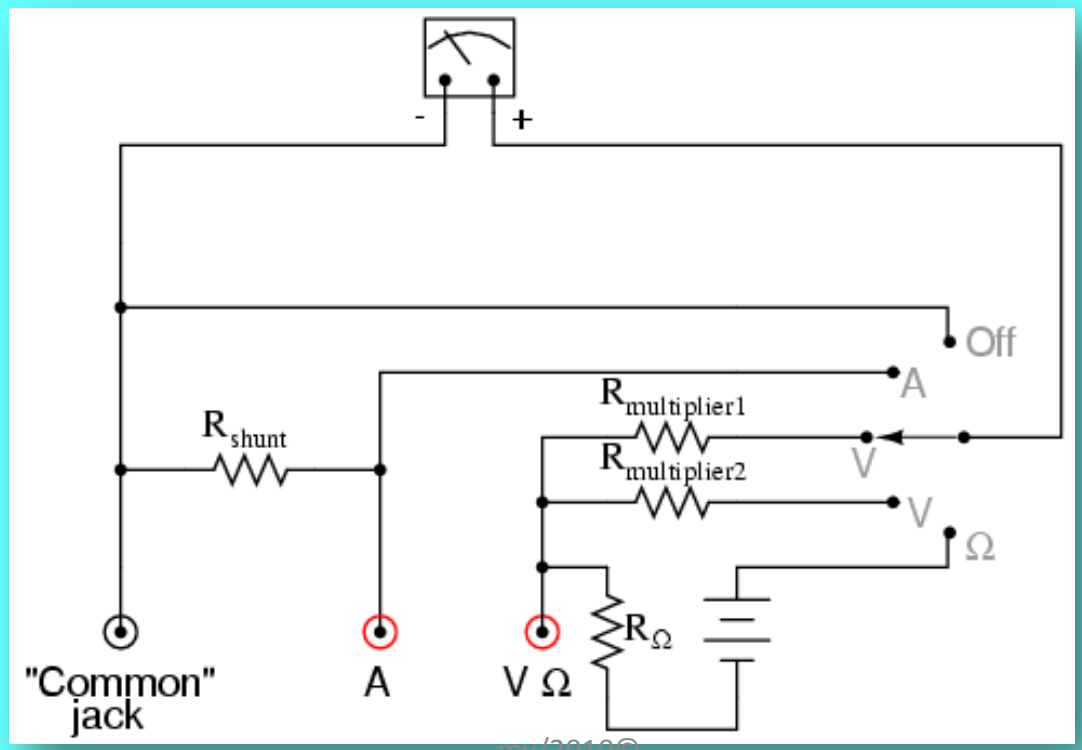
Do not open the meter to replace batteries or fuses while the probes are connected.

Never connect the meter leads across voltage source while the function switch is in the current or resistance mode. Doing so can damage the meter.

Always turn off power and disconnect test leads before opening the covers to replace the fuse or batter.

# ANALOG MULTIMETER

- **A multimeter is basically a PMMC meter.**
- **A multimeter consists of an ammeter, a voltmeter, and an ohmmeter.**
- **A function switch connects the appropriate circuit to the d'Arsonval movement.**



# SENSITIVITY OF AN ANALOG MULTIMETER

• Multimeter must have a high sensitivity of at least 20kΩ/V otherwise their resistance on DC voltage ranges may be too low to avoid upsetting the circuit under test and giving an incorrect reading.

• To obtain valid readings, the meter resistance should be at least 10 times the circuit resistance.

• You can increase the meter resistance by selecting a higher voltage range, but this may give a reading which is too small to read accurately!

•On any DC voltage range:

Analog Meter Resistance = Sensitivity x Max. reading of range.

Eg: A meter with 20kΩ/V sensitivity on its 10V range has a resistance of 20kΩ/V x 10V = 200kΩ

# DIGITAL MULTIMETER
## Block diagram

A basic block diagram of a digital multimeter (DMM) is shown in Fig. 6.14. It shows the basic flow of information from the analog input signal through the various analog signal conversion circuits which convert the measured quantity to a d.c. voltage equivalent. Then the ADC translates this d.c. signal to digital form, and the display system shows the resultant value with appropriate annunciation, such as measurement units of the original input signals. Thus, a DMM is made up of following three basic elements:

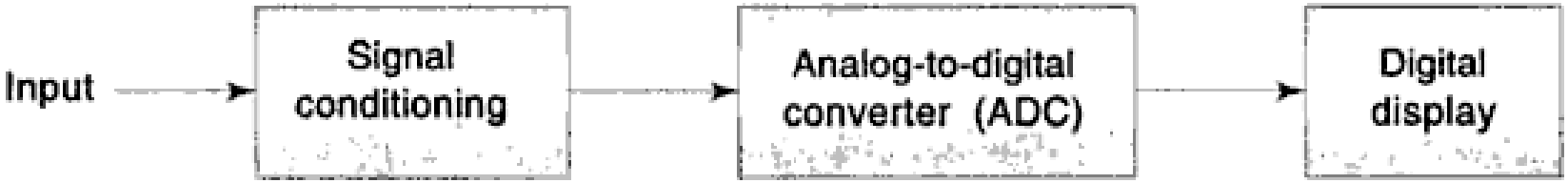



**Fig. 6.14** *Basic Block Diagram of Digital Multimeter (DMM)*