

DIGITAL MULTIMETER

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➤ A **Digital Multimeter (DMM)** is an electronic measuring instrument used to measure various electrical quantities.

➤ The standard measurements that are performed by a DMM are current, voltage and resistance.

➤ This is also called **Volt Ohm Milli Ammeter (VOM)**





Display
Screen

Dial
(Rotary Switch)

Transistor
Gain

Connection Ports

DT830B
DIGITAL
MULTIMETER

10A MAX
MAX 1000 Ω/1000
EACH TIME
VC1mA
1000V MAX
100mA MAX
FUSED
COM
500V MAX

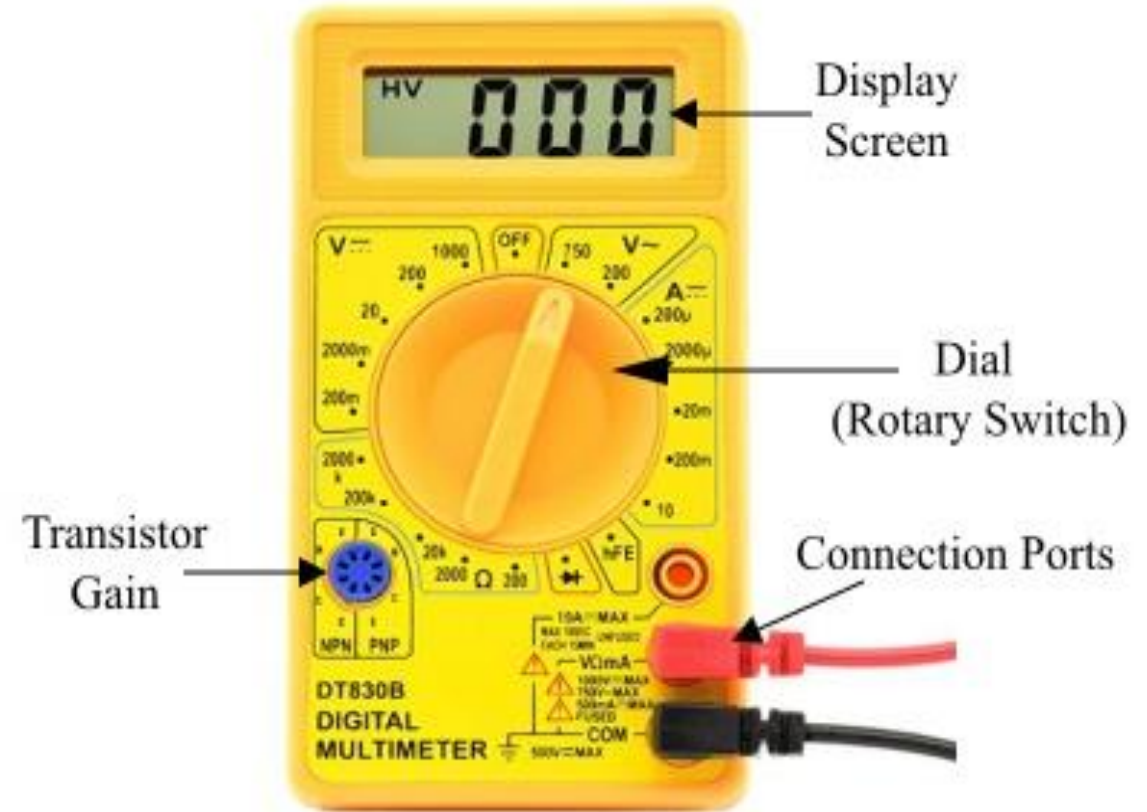
DMM Controls and Connection Ports

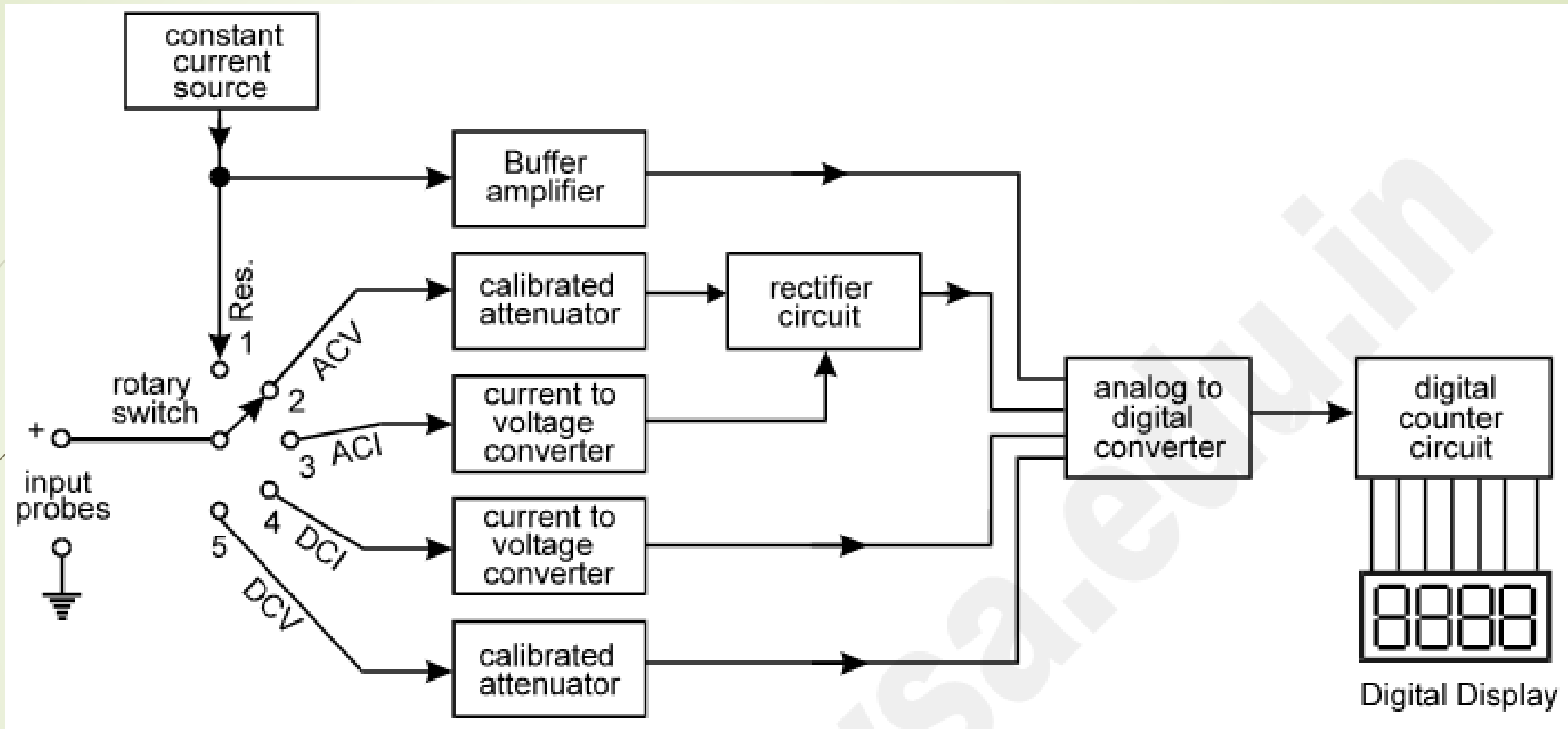
A typical DMM has a rotary switch, digital display and connecting jacks for the probes.



- **Display** – The DMM has an illuminated display screen for better visualisation. Most DMM have four digit display, the first of which can only be either a 0 or 1 and a + / - indication as well. There may also be some more indicators like AC / DC etc.
- **Connection Ports** – There are three or four ports available on the front of the DMM. However, only two are needed at a time. Typical ports of the DMM are –
 - **Common** – It is used with all measurements. The negative (black) probe is connected to this.
 - **VΩmA Port** – This port is used for the most measurements and positive (red)probe is connected to it.
 - **10A Port** – It is used to measure the large currents in the circuits.

- **Dial (Selection Knob)** – There is a rotary switch to select the types of measurement to be made and range that is needed.
- **Additional Connections** – There are some additional connections in DMM for other measurements like temperature, transistor gains etc.
- **Additional Buttons and switches** – There are a few additional buttons are present in a DMM. The main one is ON/OFF button.





Block diagram of Digital Multimeter

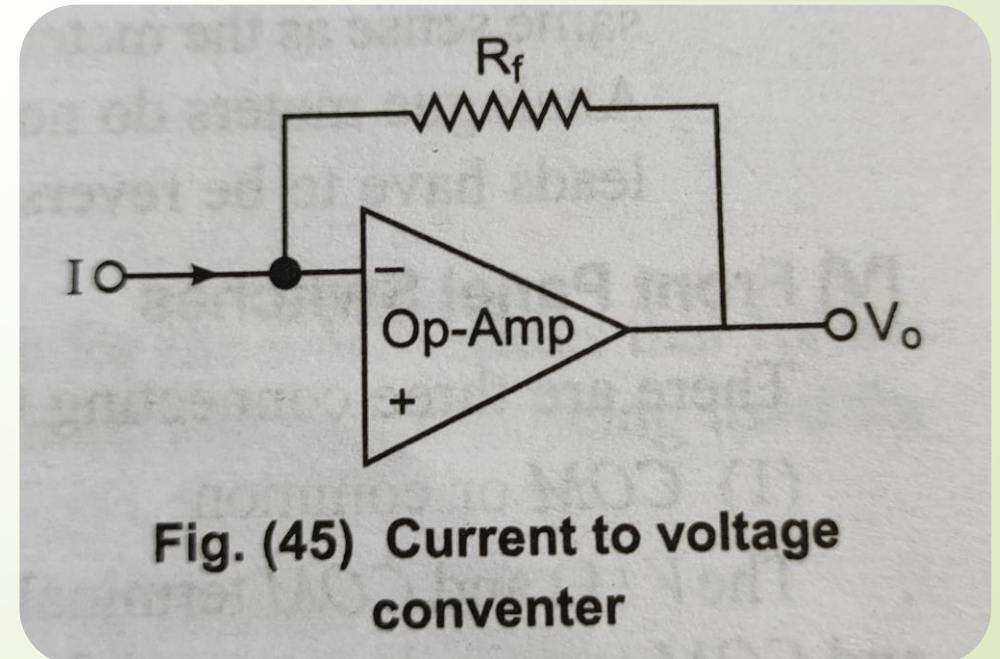
Measurements using Digital Multimeter

- **In AC Voltage Mode** – The applied input voltage is fed through a calibrated, compensated attenuator, to a full-wave rectifier followed by a ripple reduction filter. The resulting DC is fed to analog to digital converter (ADC) and finally to the display system.

For Current Measurement

- **In DC Current Mode** – The drop across an internal calibrated shunt is measured directly by the Analog to Digital Converter (ADC).
- **In AC Current Mode** – After AC to DC conversion, the drop across the internal calibrated shunt is measured by the ADC

$$V_o = I R_f$$



Measurement of Resistance

- In the resistance range, the Digital Multimeter operates by measuring the voltage across the externally connected resistor, resulting from a current flowing through it from a calibrated internal current source

$$V_o = \frac{R_f}{R_i} V_i$$

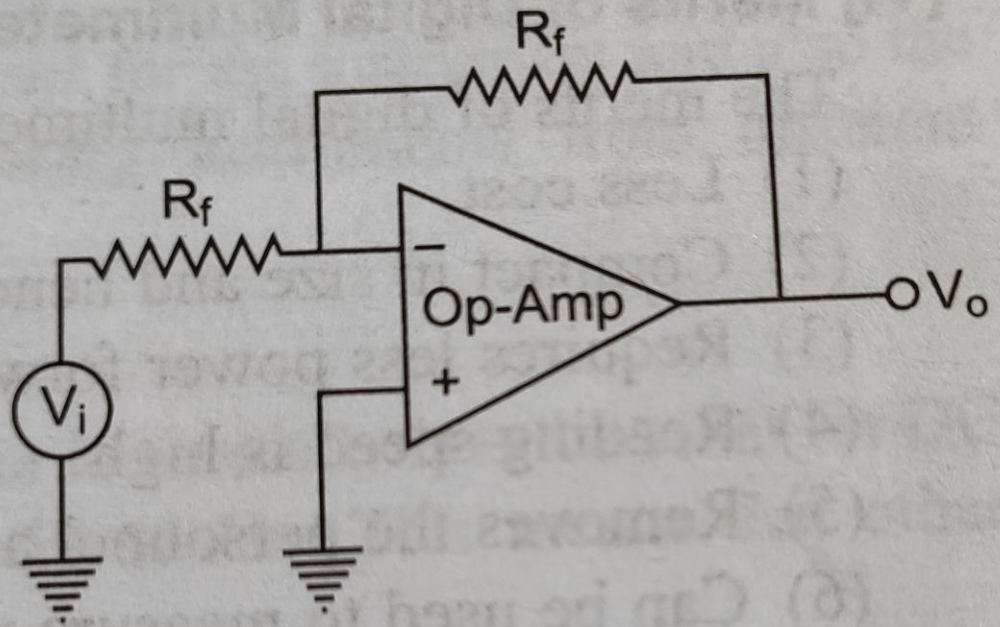


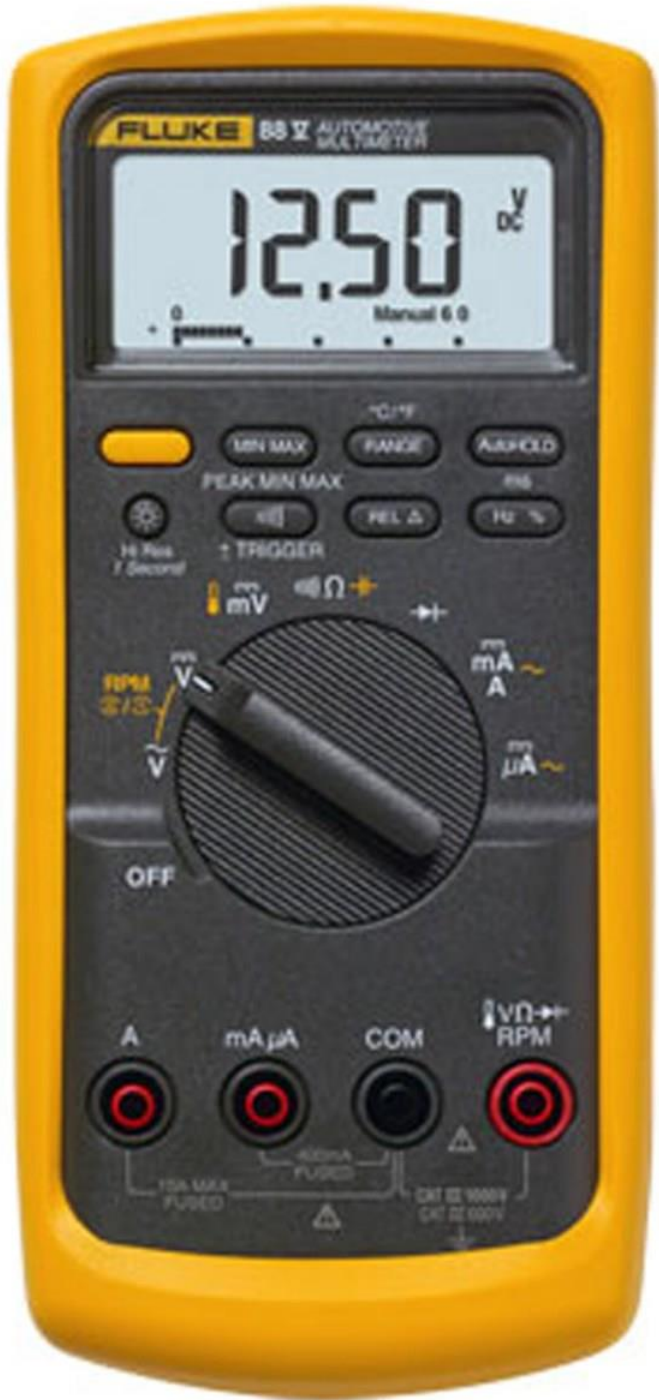
Fig. (46) Scale changer circuit

Operation of Digital Multimeter - Steps for use

- Turn the meter ON.
- Insert the probes into the correct connecting ports.
- Set the dial (rotary switch) to the correct measurement type and range for the measurement to be made. While selecting the range, ensure that the maximum range is above than that is expected. Optimise the range for the best reading.
- Once the measurement is completed, it is a wise precaution to place the probes into the voltage measurement ports and turn the range to maximum voltage. So that if the meter probes are accidentally connected across a high voltage point, there is a little chance of damage to the DMM.

Advantages of Digital Multimeter :

- They are having high input impedance, So there is no loading effect.
- They are having higher accuracy.
- An unambiguous reading is obtained.
- The output can be interfaced with external equipment.
- They are available in smaller sizes.
- It can be used for measurement of A.C. and D.C. both quantity.
- It can be used for measurement of various parameters such as resistance, voltage, current etc.
- It has sensitivity of $20 \text{ k}\Omega/\text{V}$ which is fairly high.
- Measurement of quantities with different range can be possible.
- It is small in size or compact.
- It is very simple to use unlike analog multimeter as results are displayed in numeric value directly and user need not have to read manually from the scale.



Any questions..
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