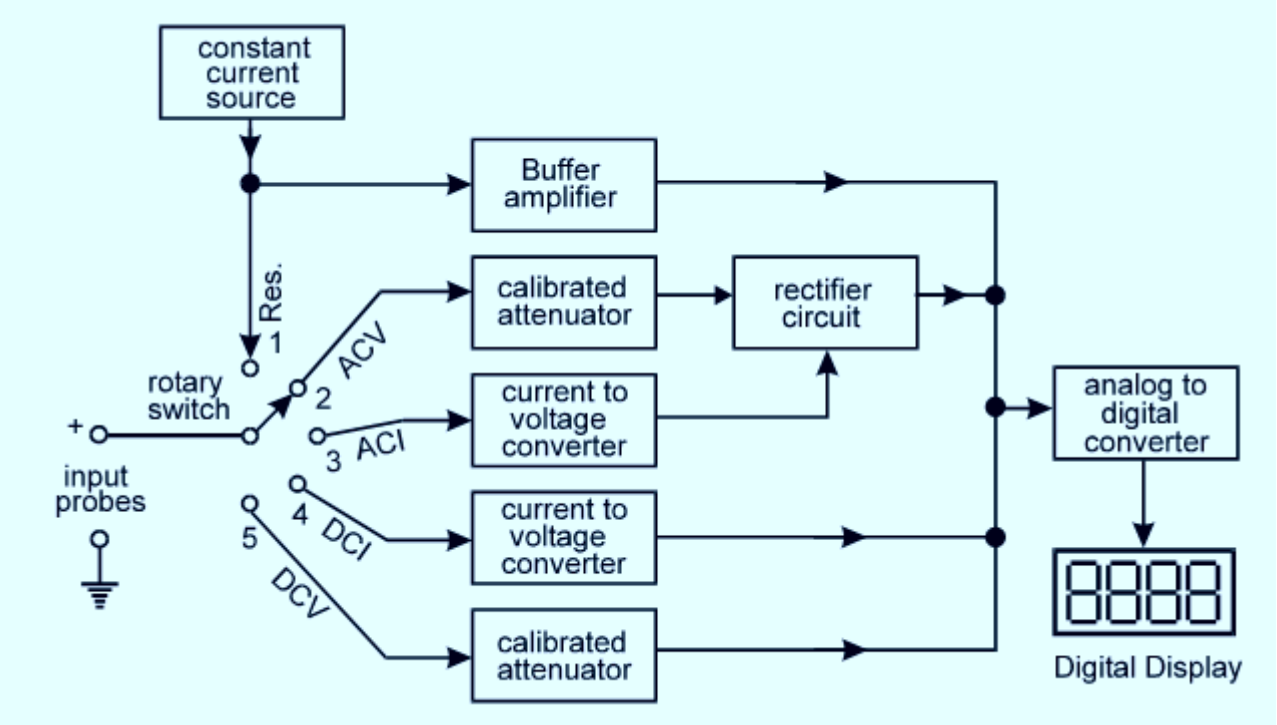
constant current source
Buffer amplifier
calibrated attenuator
rectifier circuit
Res.
1
2 ACV
3 ACI
rotary switch
+
input probes
current to voltage converter
4 DCI
5 DCV
current to voltage converter
calibrated attenuator
analog to digital converter
Digital Display

DMM

Except current, most of the measurements are based on voltage. For instance, while measuring resistance, a small amount of current is sent across the terminals of the DuT. The voltage drop generated is taken as input and is divided by the current by the internal circuitry to determine the resistance.

The block diagram shown above, gives an overview of working of the multimeter. Taken through the probes, the input is analog and enters the internal circuitry in form of a wave. The input signal is first conditioned where-after it proceeds to its respective measurement circuitry. Further, it is optimized for its range selection and sent to an analog to digital converter. Analog to digital converter can be of various types depending upon capabilities of multimeter and the manufacturer involved. In order to convert the signal, the ADC takes samples of the analog wave. To ensure signal reconstruction, the rate of sampling should be at least twice the frequency of the analog signal.

Most of the ADC used in multimeters followsdual slope integration method in which the digital signal is compared to a reference. Their output goes to a successive approximation register (SAR) which sends the final output to the processing unit and balances the reference signal for optimized comparison. A clock input is needed for the SAR counter which is provided by a crystal oscillator.The processing involved in multimeters is usually limited to summing up the pulses and is an integrator circuit.
After analog to digital conversion, the resultant is sent to the processing unit which takes the values, decodes their magnitude and sends to the LCD.

Multimeters are into electronic measurement purposes since long and are expected to stay for long and get more modifications of measuring quantities. Analog multimeters were initially in trend but required calibration and human error often caused errors in measurements. With digital measurements, results are not only more accurate but can also be resolved to a high level. From voltage to currents, digital multimeters can now even measure temperature, capacitance and can now have RS232 connectors for communication to smarter machines. With newer designs rolling out every day and specialized ICs being made for each and every conceivable measurement, innovative developers continue to put more functionality into the cramped corners of the multimeter while operating at nominal power conditions and costs.