

Multimeter

A **multimeter** or a **multitester**, also known as a **VOM (volt-ohm-milliammeter)**, is an **electronic measuring instrument** that combines several measurement functions in one unit. A typical multimeter can measure **voltage**, **current**, and **resistance**. **Analog multimeters** use a **microammeter** with a moving pointer to display readings. **Digital multimeters (DMM, DVOM)** have a numeric display, and may also show a graphical bar representing the measured value. Digital multimeters are now far more common due to their lower cost, greater precision having obsoleted analog multimeters.

A multimeter can be a hand-held device useful for basic **fault** finding and field service work, or a bench instrument which can measure to a very high degree of accuracy. Multimeters are available in a wide range of features and prices. Cheap multimeters can cost less than **US\$10**, while laboratory-grade models with certified **calibration**

Any meter will load the circuit under test to some extent. For example, a multimeter using a moving coil movement with full-scale deflection current of 50 **microamps** (μA), the highest sensitivity commonly available, must draw at least 50 μA from the circuit under test for the meter to

reach the top end of its scale. This may load a high-impedance circuit so much as to affect the circuit, thereby giving a low reading. The full-scale deflection current may also be expressed in terms of "ohms per volt" (Ω/V). The ohms per volt figure is often called the "sensitivity" of the instrument.

Function generator

A **function generator** is usually a piece of [electronic test equipment](#) or [software](#) used to generate different types of electrical [waveforms](#) over a wide range of frequencies. Some of the most common waveforms produced by the function generator are the sine wave, square wave, triangular wave and sawtooth shapes. These waveforms can be either repetitive or single-shot (which requires an internal or external trigger source).^[1] [Integrated circuits](#) used to generate waveforms may also be described as function generator ICs.

In addition to producing sine waves, function generators may typically produce other repetitive waveforms including sawtooth and triangular waveforms, square waves, and pulses. Another feature included on many function generators is the ability to add a DC offset.

Although function generators cover both audio and RF frequencies, they are usually not suitable for applications that need low distortion or stable frequency signals. When those traits are required, other [signal generators](#) would be more appropriate.

Some function generators can be phase-locked to an external signal source (which may be a frequency reference) or another function generator.^[2]

Function generators are used in the development, test and repair of electronic equipment. For example, they may be used as a signal source to test amplifiers or to introduce an error signal into a control loop. Function generators are primarily used for working with [analog circuits](#), related [pulse generators](#) are primarily used for working with [digital circuits](#).

Cathode Ray Oscilloscope (CRO)

Definition: The cathode ray oscilloscope (CRO) is a type of electrical instrument which is used for showing the measurement and analysis of waveforms and others electronic and electrical phenomenon. It is a very fast X-Y plotter shows the input signal versus another signal or versus

time. The CROs are used to analyse the waveforms, transient, phenomena, and other time-varying quantities from a very low-frequency range to the radio frequencies.

The CRO is mainly operated on voltages. Thus, the other physical quantity like current, strain, acceleration, pressure, are converted into the voltage with the help of the transducer and thus represent on a CRO. It is also used for knowing the waveforms, transient phenomenon, and other time-varying quantity from a very low-frequency range to the radio frequencies.

The CRO has Stylus (i.e., a luminous spot) which move over the display area in response to an input voltage. This luminous spot is produced by a beam of electrons striking on a fluorescent screen. The normal form of the CRO uses a horizontal input voltage which is an internally generated ramp voltage called "time base".

The horizontal voltage moves the luminous spot periodically in a horizontal direction from left to right over the display area or screen. The vertical voltage is the voltage under investigation. The vertical voltage moves the luminous spot up and down on the screen. When the input voltage moves very fast on the screen, the display on the screen appears stationary. Thus, CRO provides a means of the visualising time-varying voltage.