

Experiment No.1

Equipment Familiarization

Object

To be familiar with the laboratory equipment and functions of each one.

Theory

In this laboratory exercise, you will familiarize yourself with the usage of some of the most commonly used laboratory test and measurement equipment such as the multimeter, dc power supply, oscilloscope, signal/function generator and also the breadboard for test circuit construction.

- **Oscilloscope**

An oscilloscope, previously called an oscillograph, and informally known as a scope or o-scope, CRO (for cathode-ray oscilloscope), or DSO (for the more modern digital storage oscilloscope), is a type of electronic test instrument that allows observation of varying signal voltages, usually as a two-dimensional plot of one or more signals as a function of time. Other signals (such as sound or vibration) can be converted to voltages and displayed.





Oscilloscopes are used to observe the change of an electrical signal over time, such that voltage and time describe a shape which is continuously graphed against a calibrated scale. The observed waveform can be analyzed for such properties as amplitude, frequency, rise time, time interval, distortion and others. Modern digital instruments may calculate and display these properties directly. Originally, calculation of these values required manually measuring the waveform against the scales built into the screen of the instrument.

The oscilloscope can be adjusted so that repetitive signals can be observed as a continuous shape on the screen. A storage oscilloscope allows single events to be captured by the instrument and displayed for a relatively long time, allowing observation of events too fast to be directly perceptible.

Oscilloscopes are used in the sciences, medicine, engineering, automotive and the telecommunications industry. General-purpose instruments are used for maintenance of electronic equipment and laboratory work. Special-purpose oscilloscopes may be used for such purposes as analyzing an automotive ignition system or to display the waveform of the heartbeat as an electrocardiogram.

Early oscilloscopes used cathode ray tubes (CRTs) as their display element (hence they were commonly referred to as CROs) and linear amplifiers for signal processing. Storage oscilloscopes used special storage CRTs to maintain a steady display of a single brief signal. CROs were later largely superseded by digital storage oscilloscopes (DSOs) with thin panel displays, fast analog-to-digital converters and digital signal processors. DSOs without integrated displays (sometimes known as digitizers) are available at lower cost and use a general-purpose digital computer to process and display waveforms.

- **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). 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.

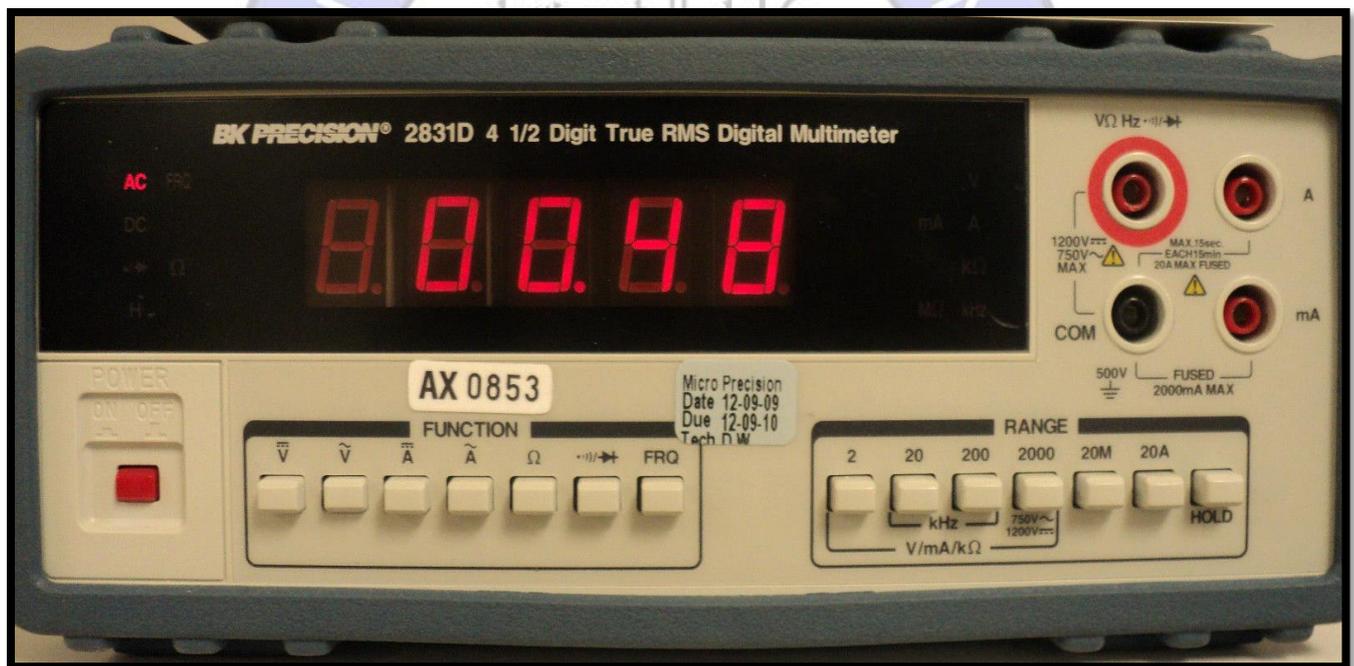
Function generators are used in the development, test and repair of electronic equipment. For example, they may be used as a signal source to test amplifiers or to introduce an error signal into a control loop. Function generators are primarily used for working with analog circuits, related pulse generators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

• Digital multimeters

A digital multimeter (DMM) is a test tool used to measure two or more electrical values—principally voltage (volts), current (amps) and resistance (ohms). It is a standard diagnostic tool for technicians in the electrical/electronic industries.

long ago replaced needle-based analog meters due to their ability to measure with greater accuracy, reliability and increased impedance. Fluke introduced its first digital multimeter in 1977.

Digital multimeters combine the testing capabilities of single-task meters—the voltmeter (for measuring volts), ammeter (amps) and ohmmeter (ohms). Often, they include a number of additional specialized features or advanced options. Technicians with specific needs, therefore, can seek out a model targeted for particular tasks.



The face of a digital multimeter typically includes four components:

- Display: Where measurement readouts can be viewed.
- Buttons: For selecting various functions; the options vary by model.
- Dial (or rotary switch): For selecting primary measurement values (volts, amps, ohms).
- Input jacks: Where test leads are inserted.

- **Power supply**

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment,



while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

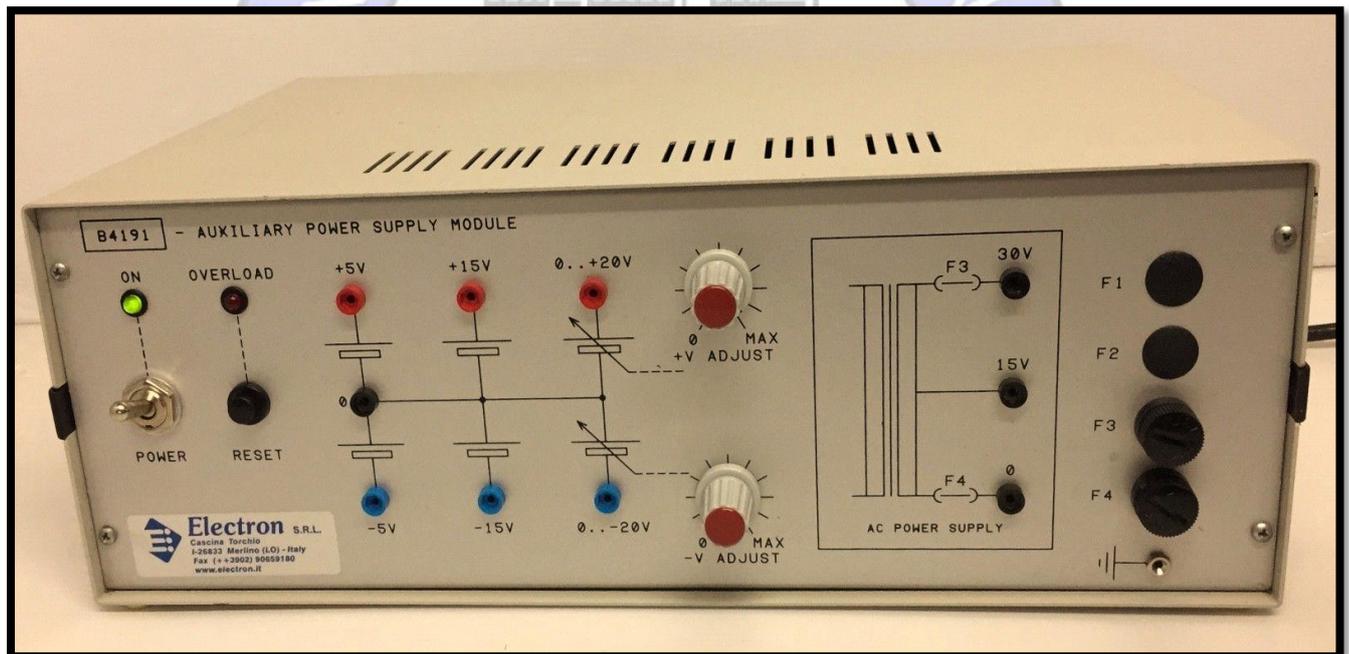
All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output connections that deliver current to the load. The source power may come from the electric power grid, such as an electrical outlet, energy storage devices such as batteries or fuel cells, generators or alternators, solar power converters, or

another power supply. The input and output are usually hardwired circuit connections, though some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

- **Auxiliary power supply**

Auxiliary power supply is electric power equipment that is provide an alternate source and that serves as backup for the primary power source at the station main bus or prescribed sub-bus.

An offline unit provides electrical isolation between the primary power source and the critical technical load whereas an online unit does not.



Discussion

1. What is the main purpose of Oscilloscope?
2. What is the main purpose of Digital multimeters?
3. What is the main purpose of Function generator?
4. What is the main purpose of Auxiliary power supply?