Basic Electronics ECE101L

By

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Professor, SENSE

CONNECTORS

- "A conductive device used for connecting electrical circuits by means of wires and cables."

- Wires and cables are connected using permanent and temporary connections.
- Seperable connections are used when circuits can be connected to other electrical components.

Types of Connectors

1. USB Connectors
2. Audio Connectors
3. Power Connectors

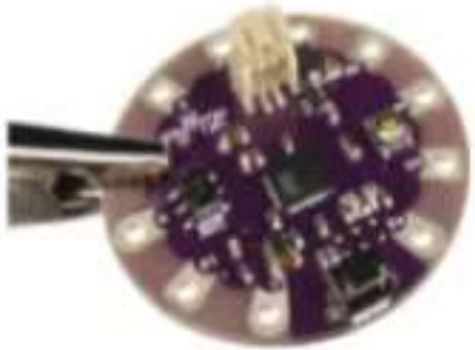
USB Connectors

USB Connectors come in two flavors host & peripheral. In the USB standard, there is a difference between the two, & the connectors on cables & devices reflect this.

▲USB-A Connector

▲USB-B Connector

▲USB Mini Connector



▲USB Micro Connector

Audio Connectors

Another familiar connector group are those used for audio-visual applications – RCA & Phono. While these can't be truly be considered to be same family, as the USB connectors.

▲ Female RCA Connector

▲ Female Phono Connector

▲ Male RCA Connector

▲ Male Phono Connector

Power Connectors

While many connectors carry power in addition to data, some connectors are used specifically to provide power connections to devices.

▲ *Barrel Connector*

▲ *IEC Connector*

▲ *Molex Connector*

▲ *JST Connector*

Wires

Wire color	Function
White	Neutral wire carrying current at zero voltage.
Black	Hot wire carrying current at full voltage.
Red	Hot wire carrying current at full voltage.
White, black markings	Hot wire carrying current at full voltage.
Green	Serves as a grounding pathway.
Bare copper	Serves as a grounding pathway.

Individual wires are color coded to identify their function. In some circuit installations, the white wire serves as a hot wire that carries voltage. If so, this white wire may be labeled with black tape or paint to identify it as a hot wire.

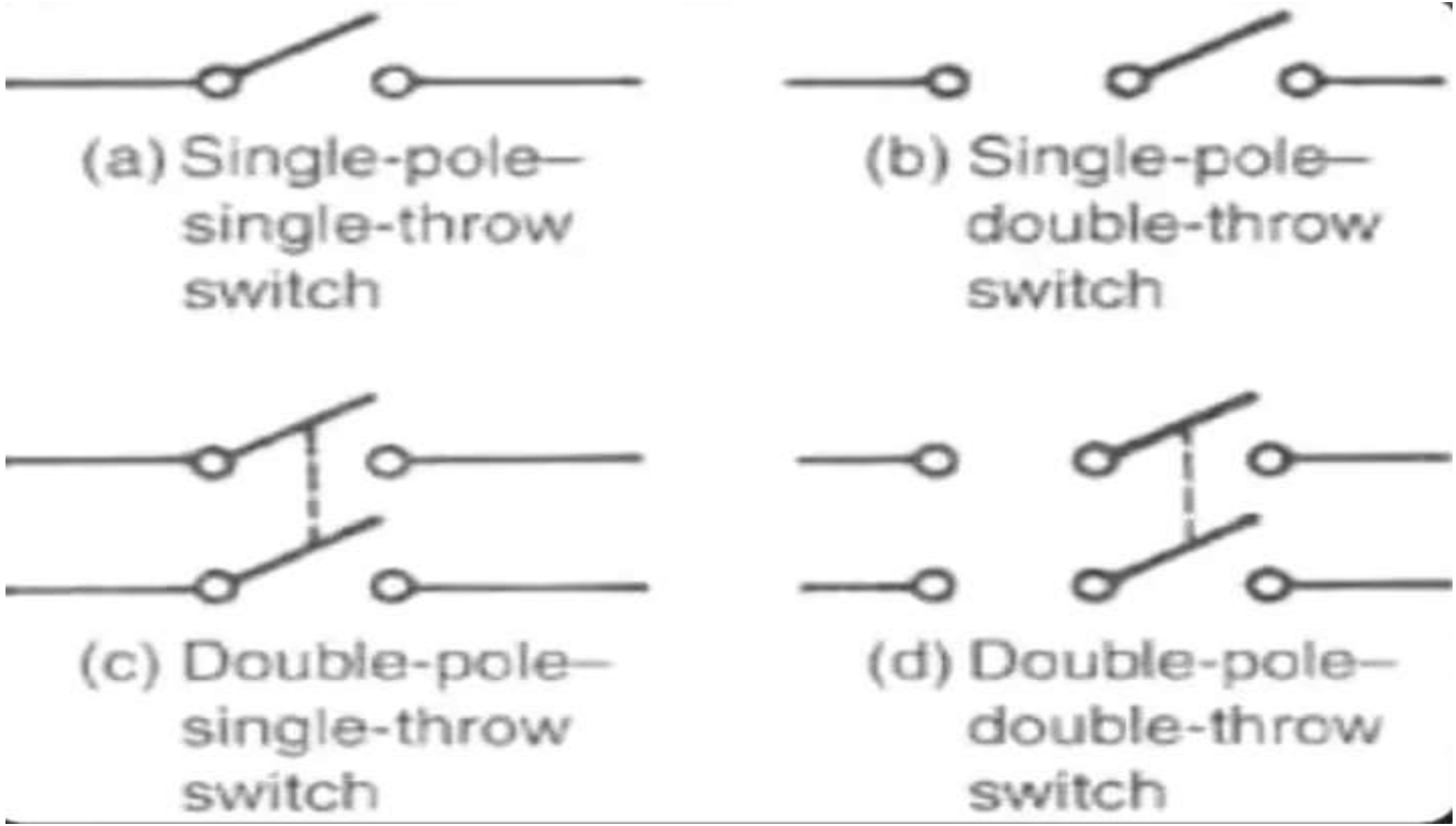
Wire Size Chart

Wire gauge	Wire capacity & use
#6	60 amps, 240 volts; central air conditioner, electric furnace.
#8	40 amps, 240 volts; electric range, central air conditioner.
#10	30 amps, 240 volts; window air conditioner, clothes dryer.
#12	20 amps, 120 volts; light fixtures, receptacles, microwave oven.
#14	15 amps, 120 volts; light fixtures, receptacles.
#16	Light-duty extension cords.
#18 to 22	Thermostats, doorbells, security systems.

Wire sizes (shown actual size) are categorized by the American Wire Gauge system. The larger the wire size, the smaller the AWG number.

Switches

- “An electromechanical device used to connect or disconnect a circuit is known as Switch.”
- The moving part of a switch used to connect or disconnect a circuit is called a Pole.
- If the contact of the switch alternatively connects and disconnects a circuit, it is called a Single Throw Type Switch.


(a) Single-pole–
single-throw
switch
(b) Single-pole–
double-throw
switch
(c) Double-pole–
single-throw
switch
(d) Double-pole–
double-throw
switch

Relays

Relays are the primary protection as well as switching devices in most of the control processes or equipments. All the relays respond to one or more electrical quantities like voltage or current such that they open or close the contacts or circuits. A relay is a switching device as it works to isolate or change the state of an electric circuit from one state to another.

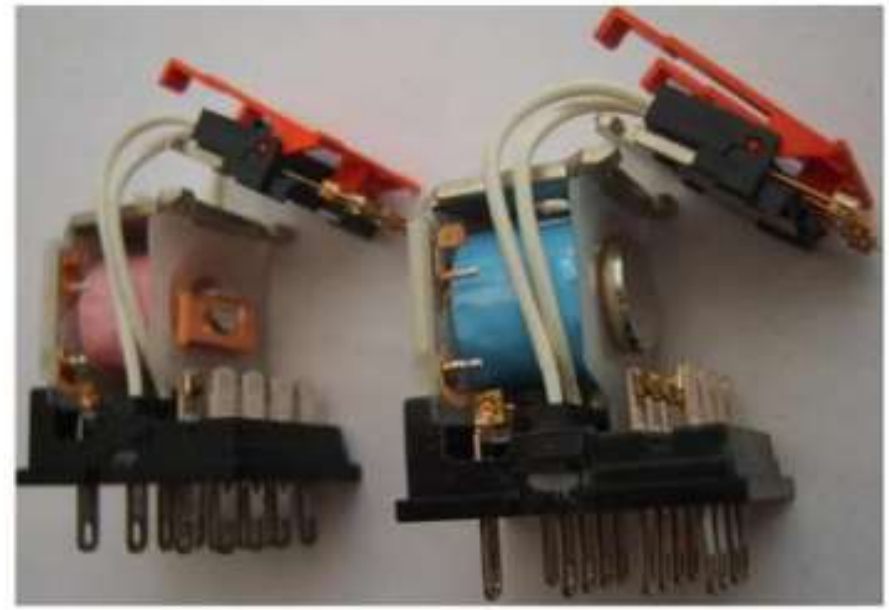
Different Types of Relays

Depending on the operating principle and structural features relays are of different types such as electromagnetic relays, thermal relays, power varied relays, multi-dimensional relays, and so on, with varied ratings, sizes and applications.

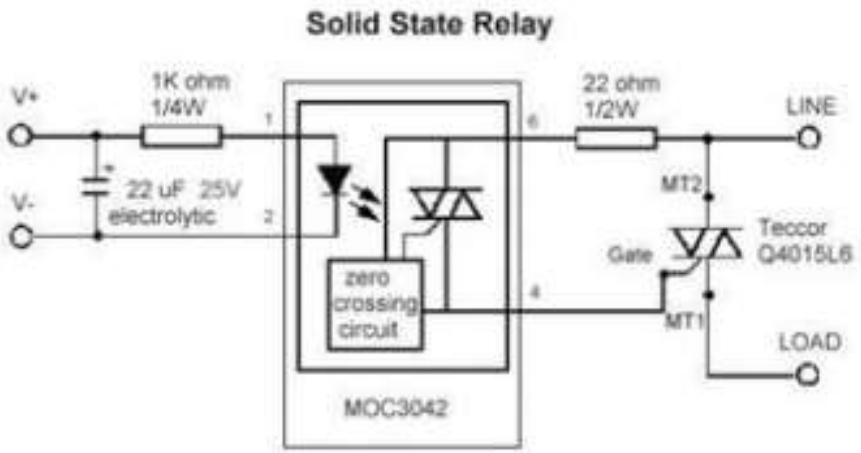
Electromagnetic Relays

These relays are constructed with electrical, mechanical and magnetic components, and have operating coil and mechanical contacts. Therefore, when the coil gets activated by a supply system, these mechanical contacts gets opened or closed. The type of supply can be AC or DC

DC v/s AC Relays

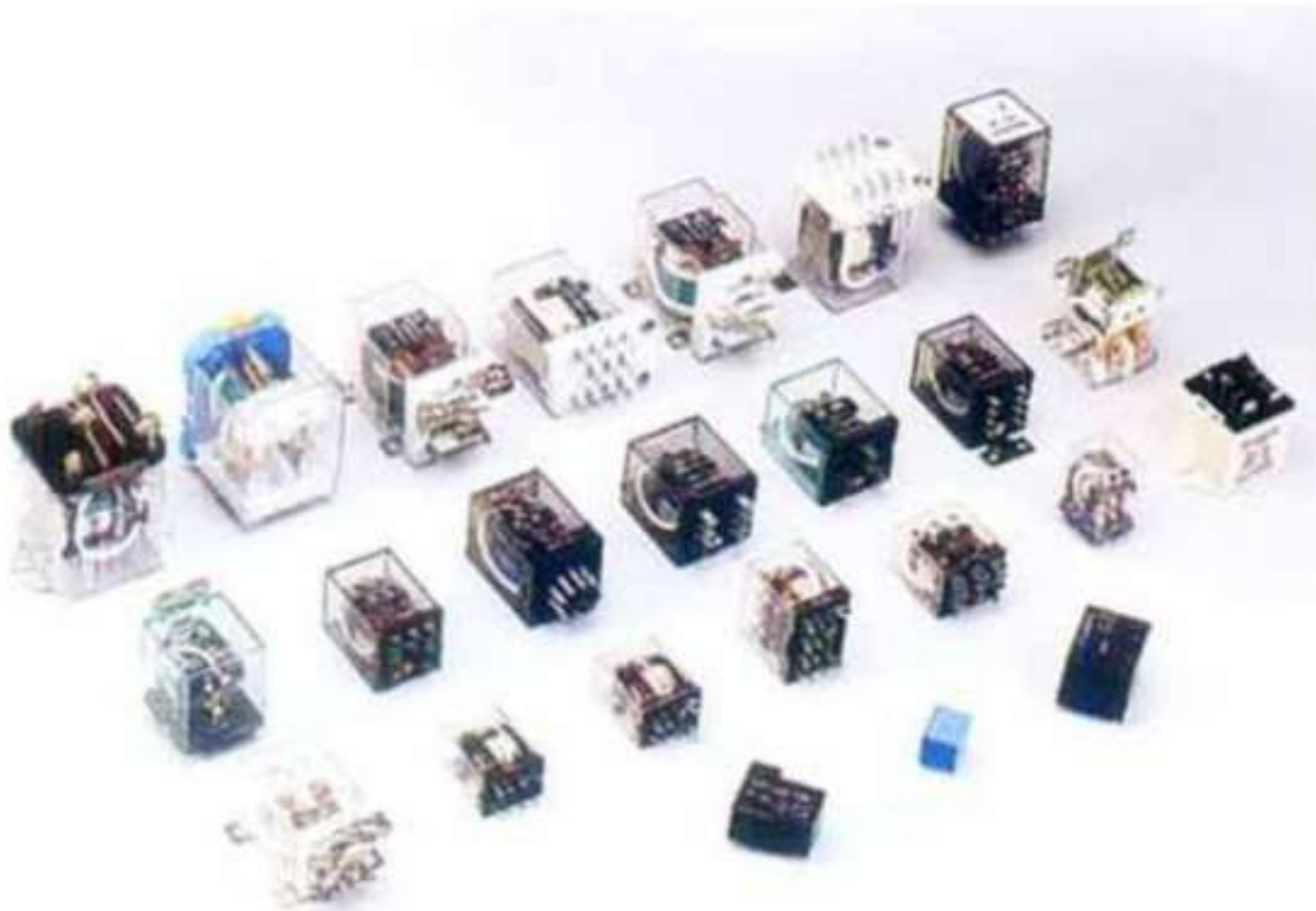


Solid State Relays



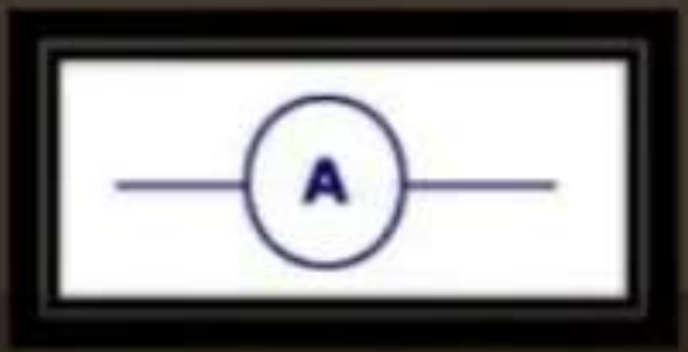
Solid State uses solid state components to perform the switching operation without moving any parts. Since the control energy required is much lower compared with the output power to be controlled by this relay that results the power gain higher when compared to the electromagnetic relays. These are of different types: reed relay coupled SSR, transformer coupled SSR, photo-coupled SSR, and so on.

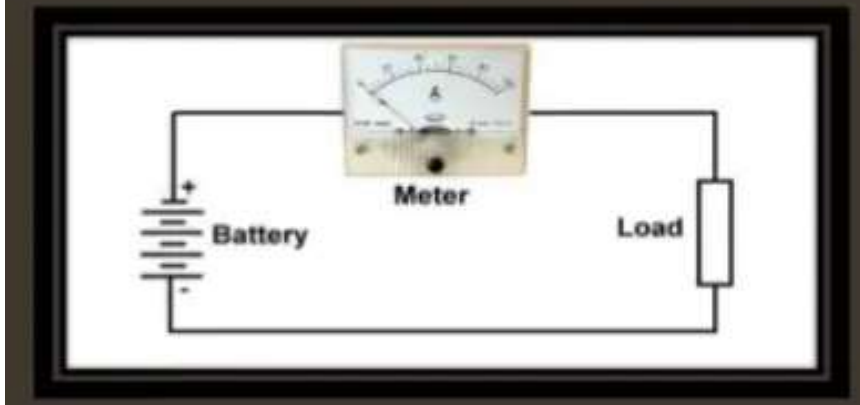
Relays of all Types & Makes – Including Numerical ones!

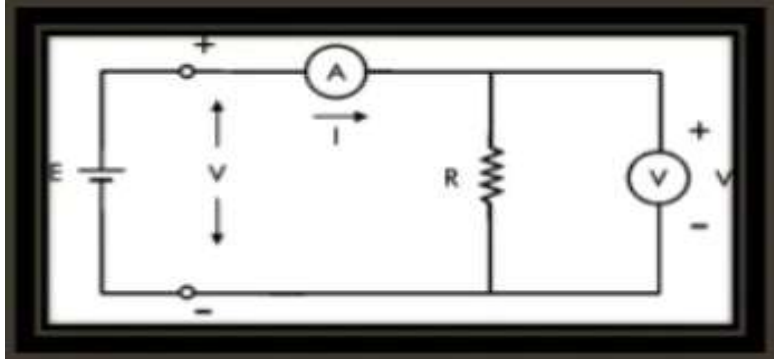


Ammeter

- Ammeter is a low resistance galvanometer
- It is used to measure the current in a circuit in amperes
- Galvanometer can be converted into an ammeter by using a low resistance wire in parallel with the galvanometer
- the resistance of the wire depends upon the range of the ammeter
- As shunt resistance is small the combined resistance of the galvanometer & the shunt is very low hence the ammeter has much lower resistance than galvanometer
- An ideal ammeter has zero resistance




Meter
Battery
Load


E
V
I
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000
RoHS

WHAT IS A VOLTMETER?

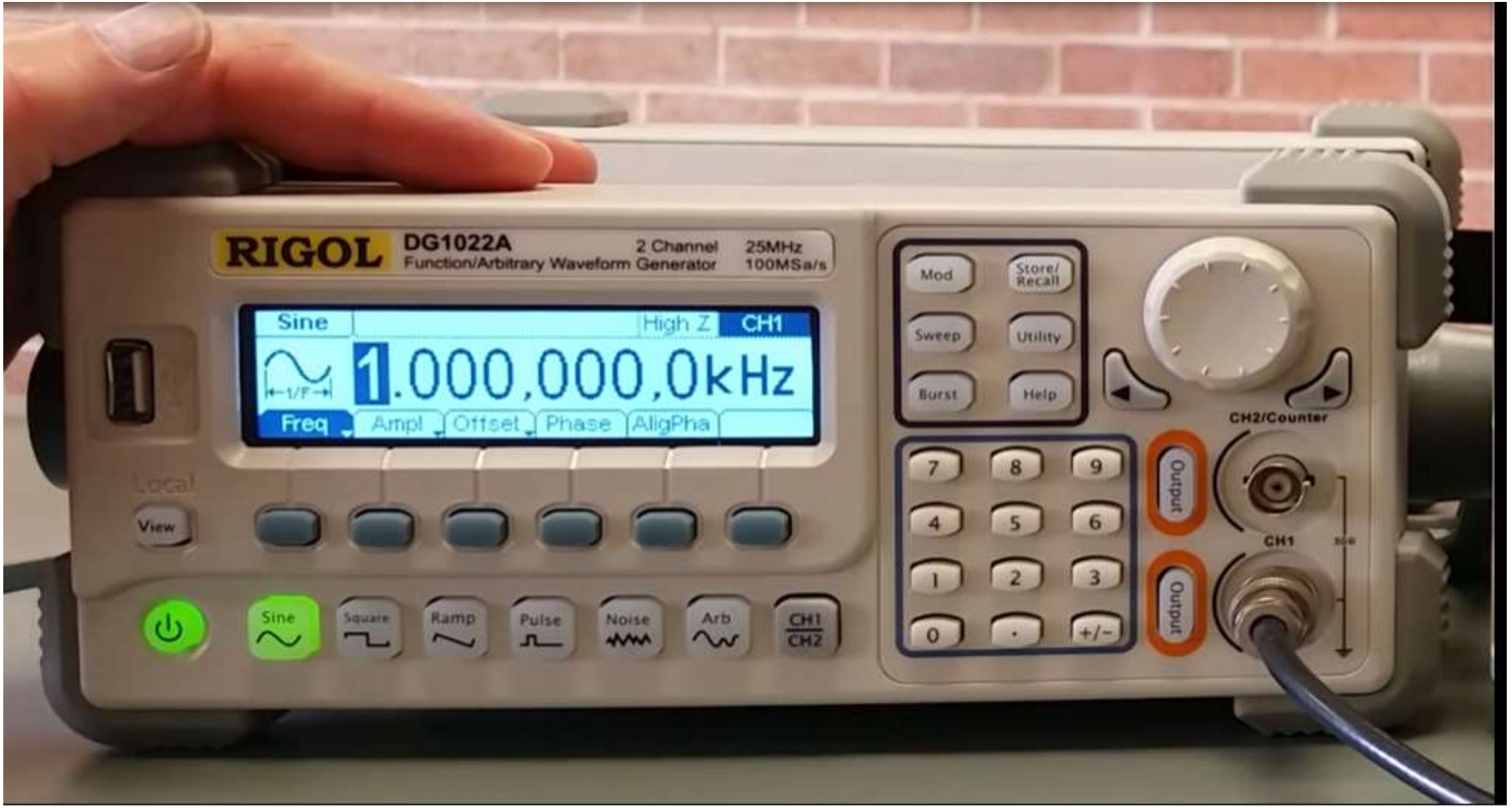
- It is the most common instrument used to measure voltage
- It measure either AC or DC voltage
- It is a measure of the voltage between two points of an electrical current

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.

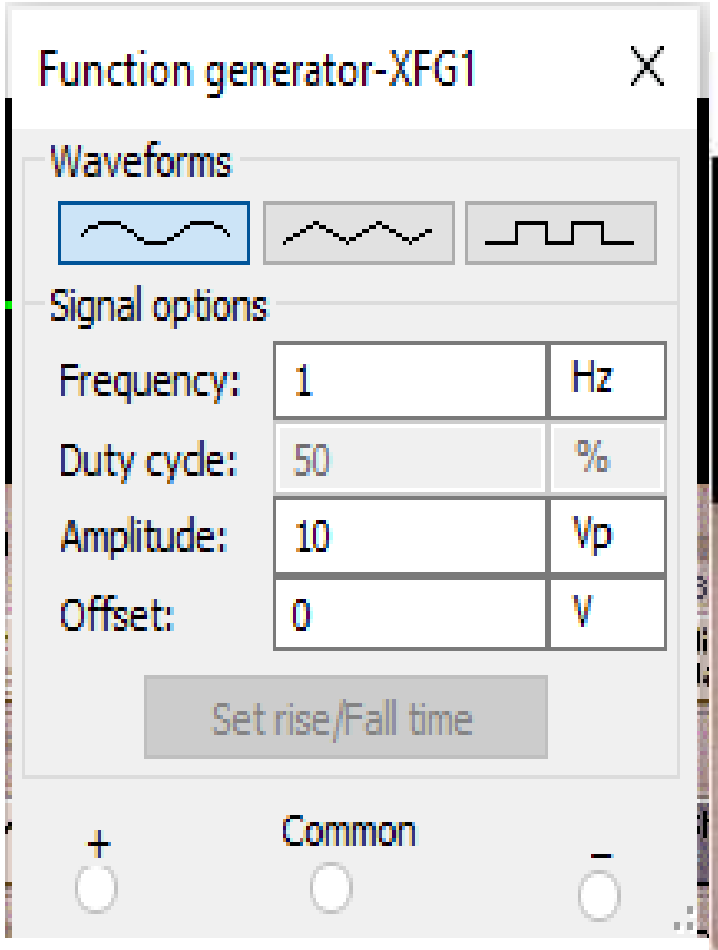
- Some of the most common waveforms produced by the function generator are the sine, square, triangular and sawtooth shapes.

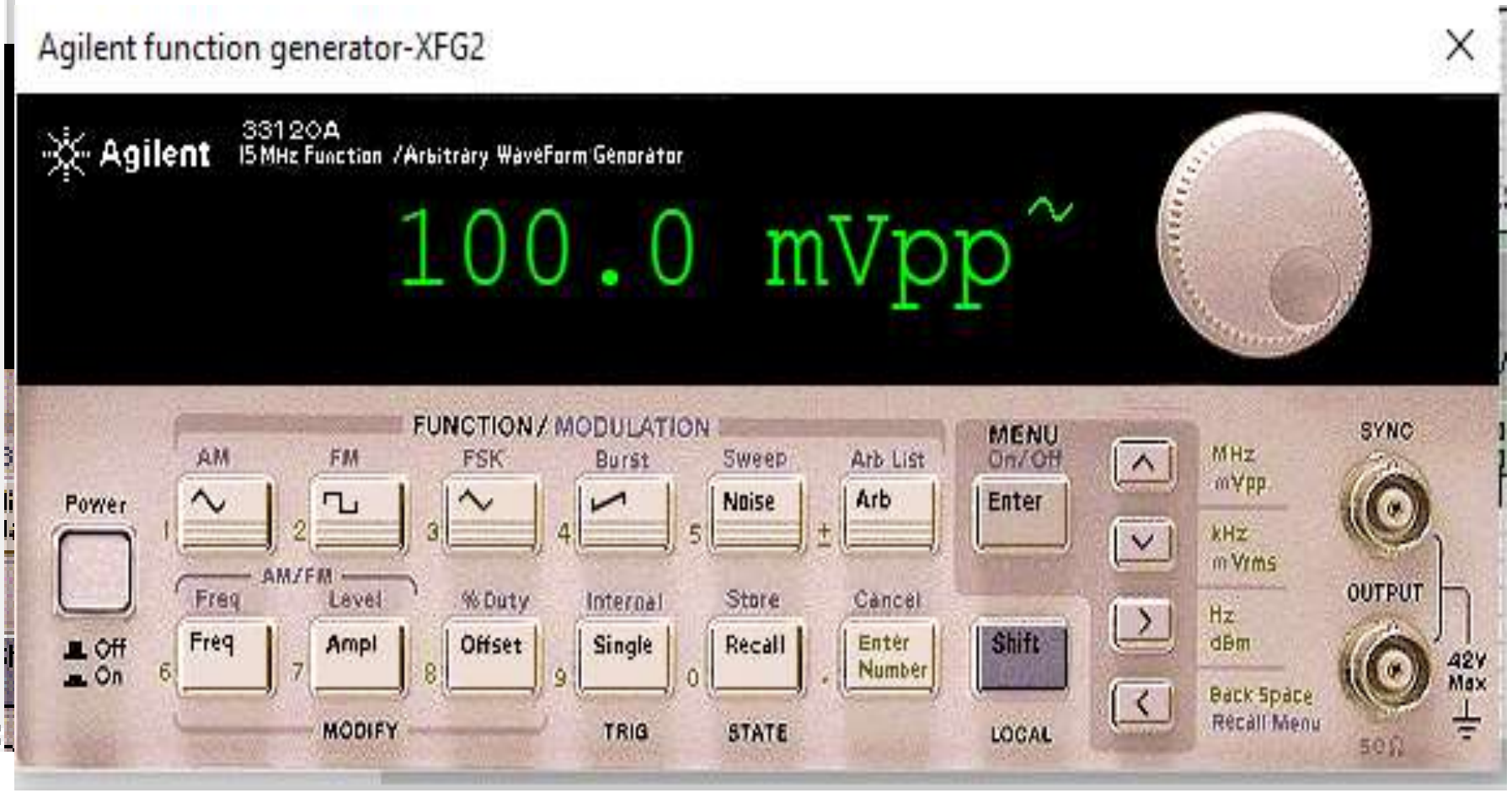
- These waveforms can be either repetitive or single-shot. which requires an internal or external trigger source.

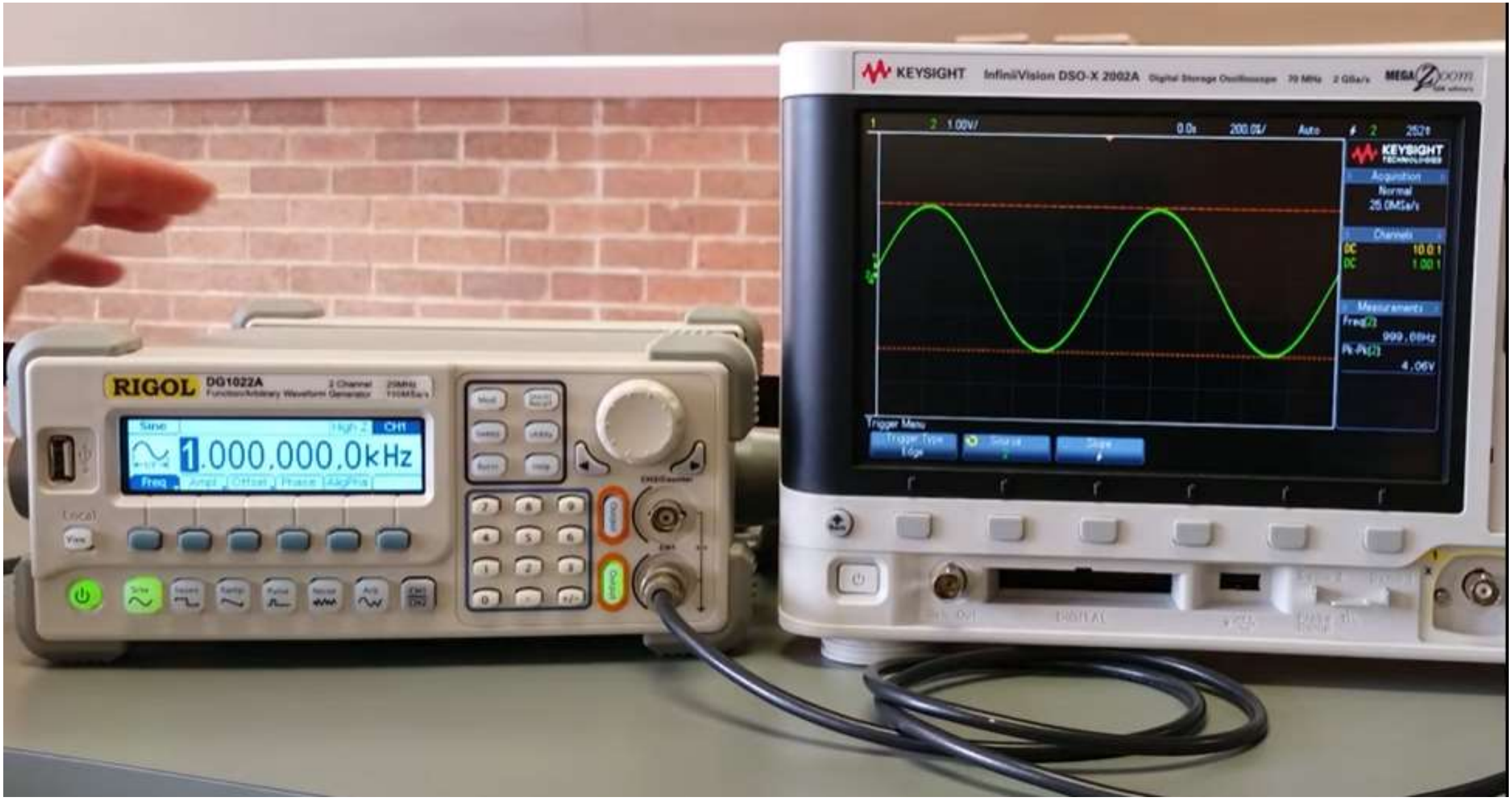


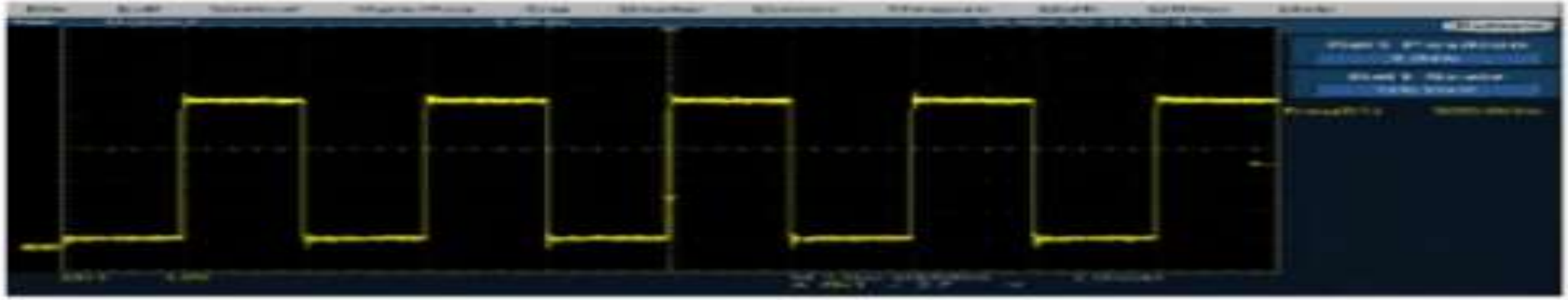
[Lab 5 - Function Generator - Bing video]

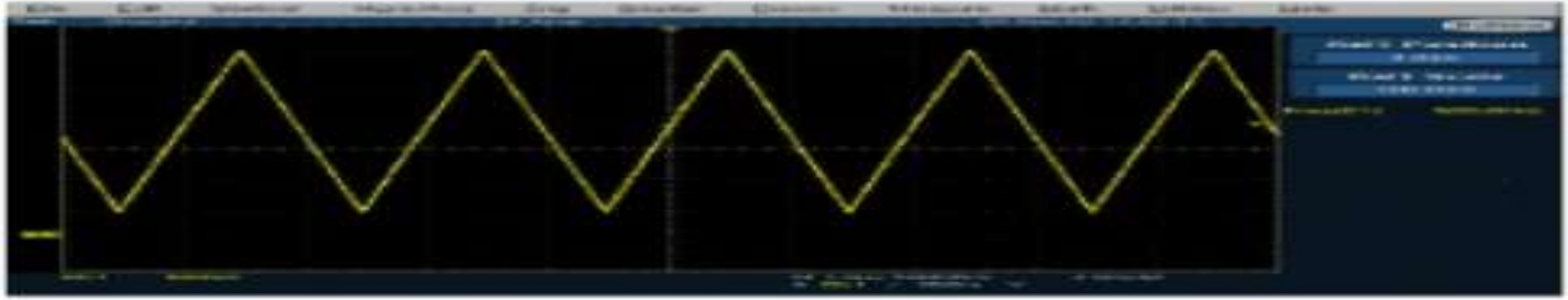
Multisim –Function generator

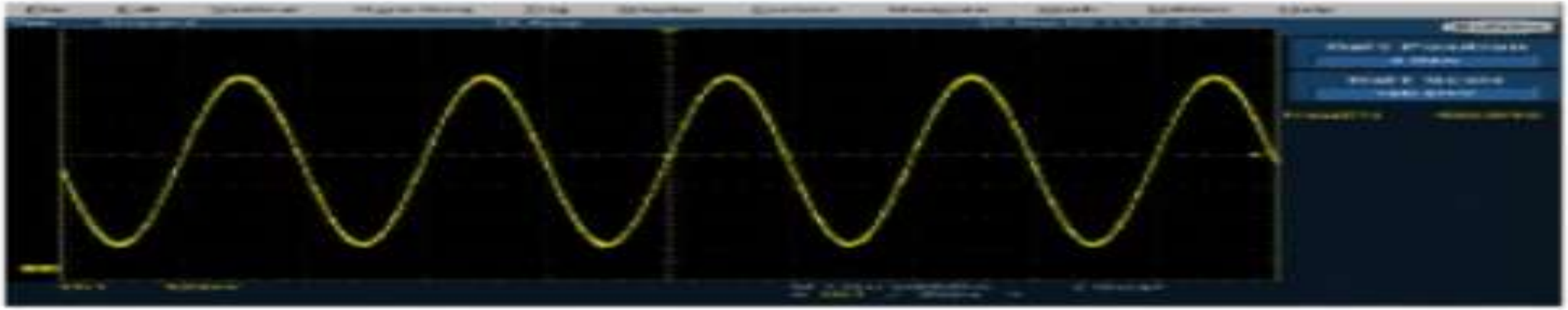





KEYSIGHT
InfiniiVision DSO-X 2002A
RIGOL
DG1022A
1.000,000.0kHz
Freq
Trigger Menu
Acquisition
Normal
Channels
Measurements







Specifications

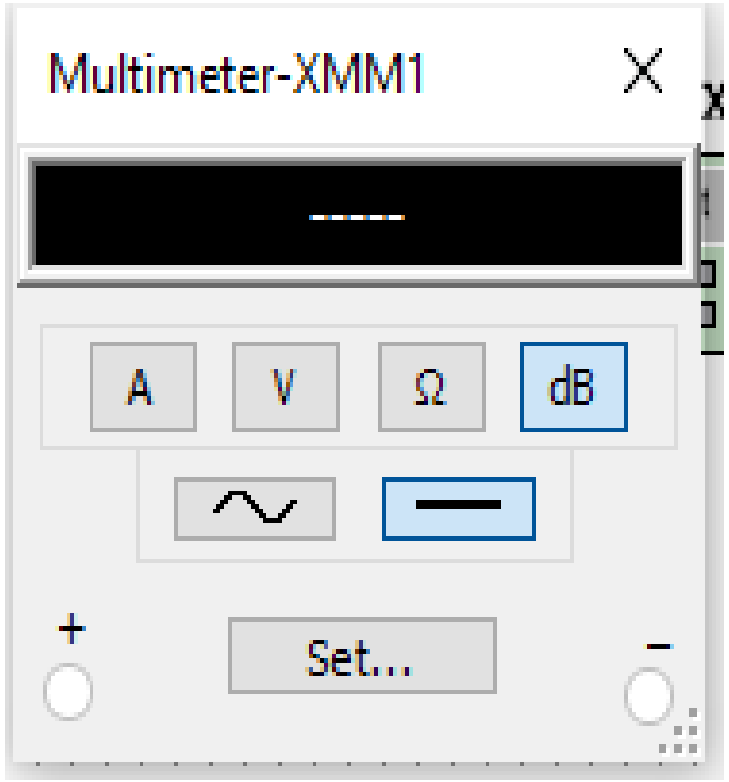
Typical specifications for a general-purpose function generator are as below.

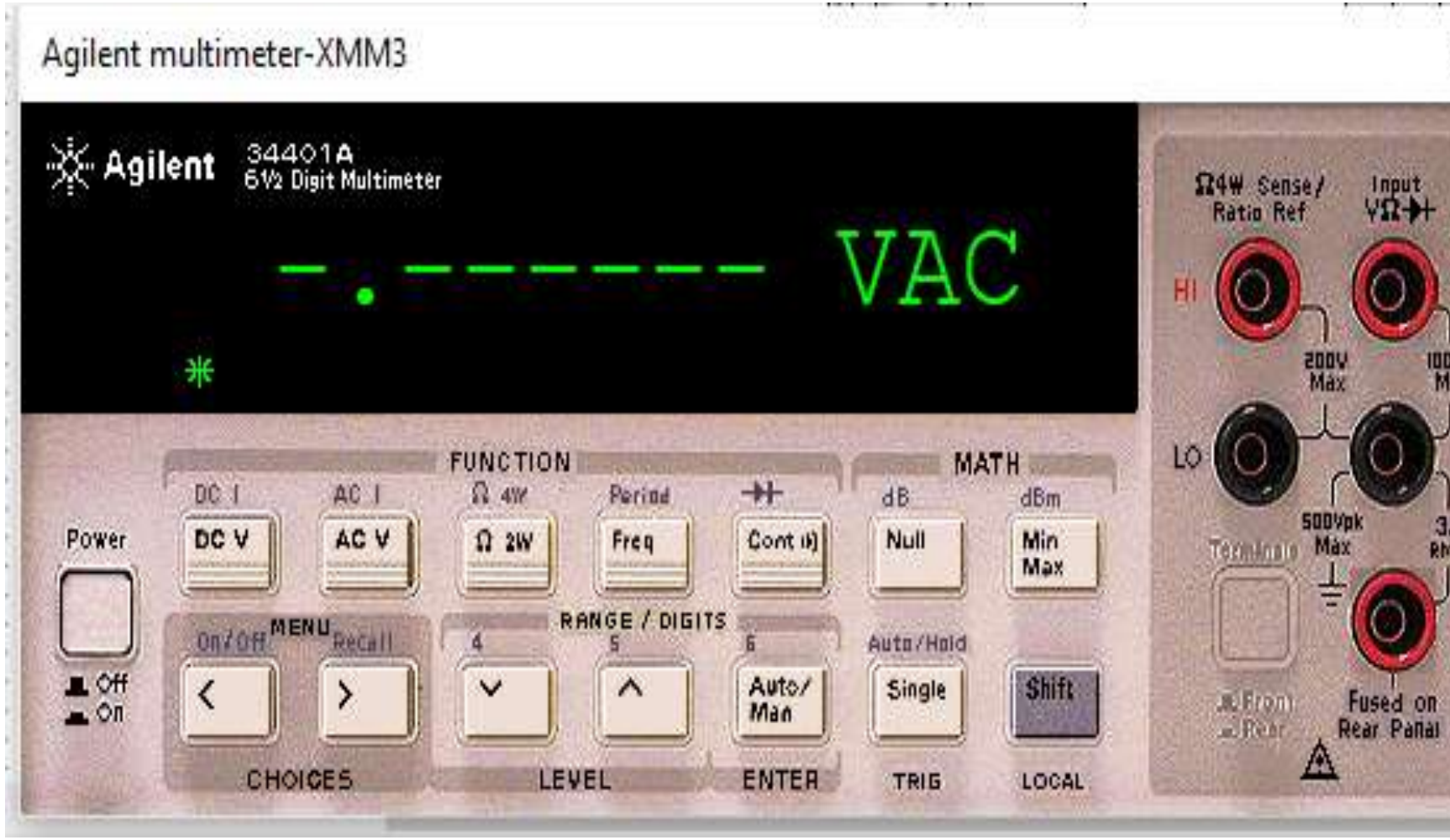
- Produces sine, square, triangular, sawtooth (ramp), and pulse output. Arbitrary waveform generators can produce waves of any shape.

- It can generate a wide range of frequencies. For example, the Tektronix FG 502 (ca 1974) covers 0.1 Hz to 11 MHz.

Digital Multimeter – Basic Guide

Multisim - Multimeter





What is a Digital Multimeter?

- **A Digital Multi-meter (DMM) is simply an electronic instrument that measure electrical parameters.**

- **A DMM measures**
  - AC / DC volts,
  - AC / DC current
  - Resistance

- **DMM may have a variety of special features that are designed for a wide number of applications.**
  - Frequency
  - Temperature
  - Capacitance
  - Continuity in circuit
  - Diode check

Front Panel Symbols

Symbol	Meaning
V ⎓	V DC
V ∿	V AC
mV	millivolts (.001V or 1/1,000V)
A	Amps
mA	milliamps (.001A or 1/1000A)
µA	microA (.000001A or 1/1,000,000A)
Ω	Resistance (Ohms)
kΩ , MΩ	kilo-Ohms, Megohms
))))	Continuity beeper

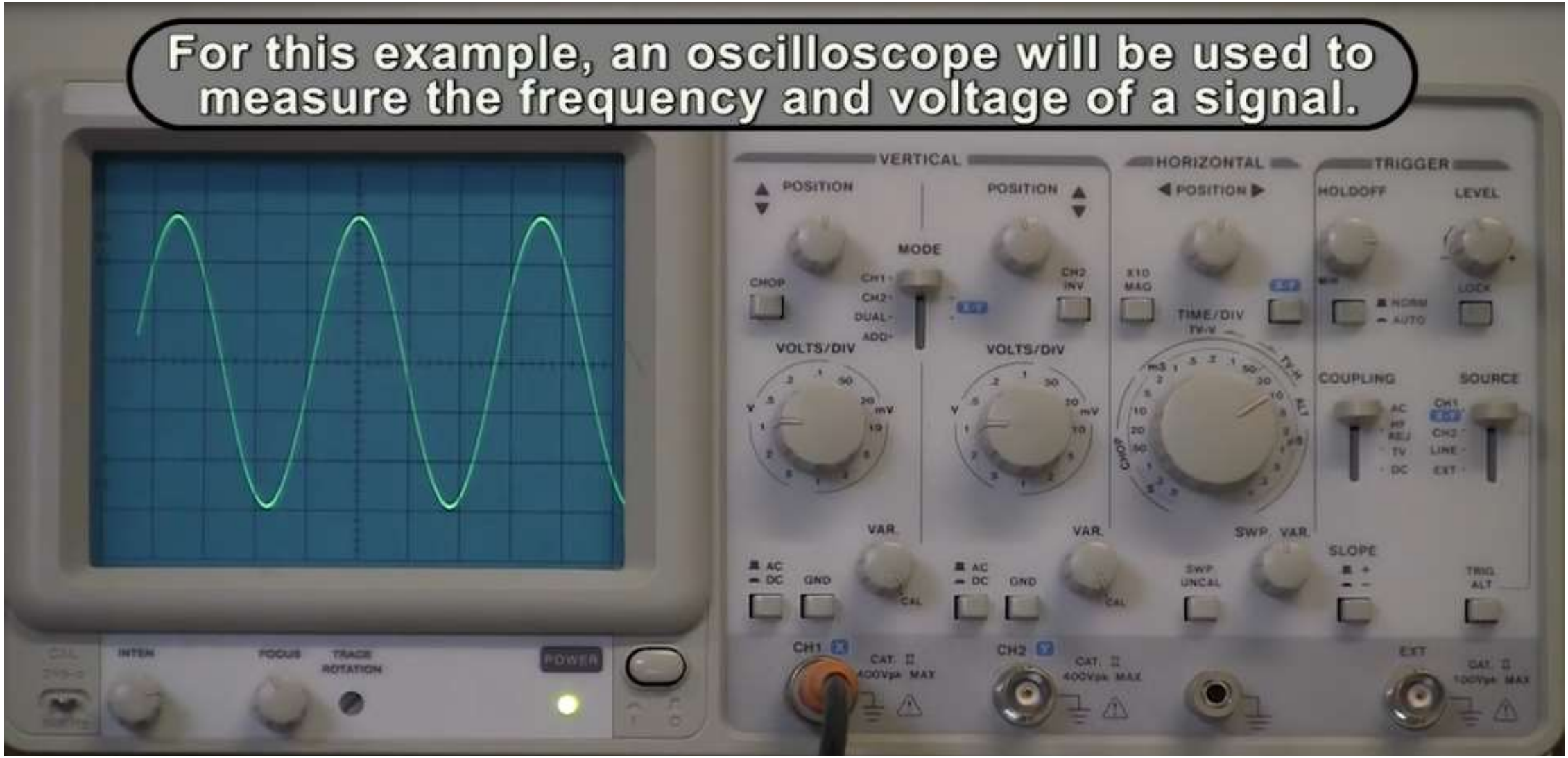
CRO (Cathode Ray Oscilloscope) Working and Applications

Introduction:

➢The CRO stands for a cathode ray oscilloscope. In modern electronics, the CRO plays an important role in the electronic circuits. It is typically divided into four sections which are display, vertical controllers, horizontal controllers, and Triggers. Most of the oscilloscopes are used the probes and they are used for the input of any instrument. We can analyze the waveform by plotting amplitude along with the x-axis and y-axis.

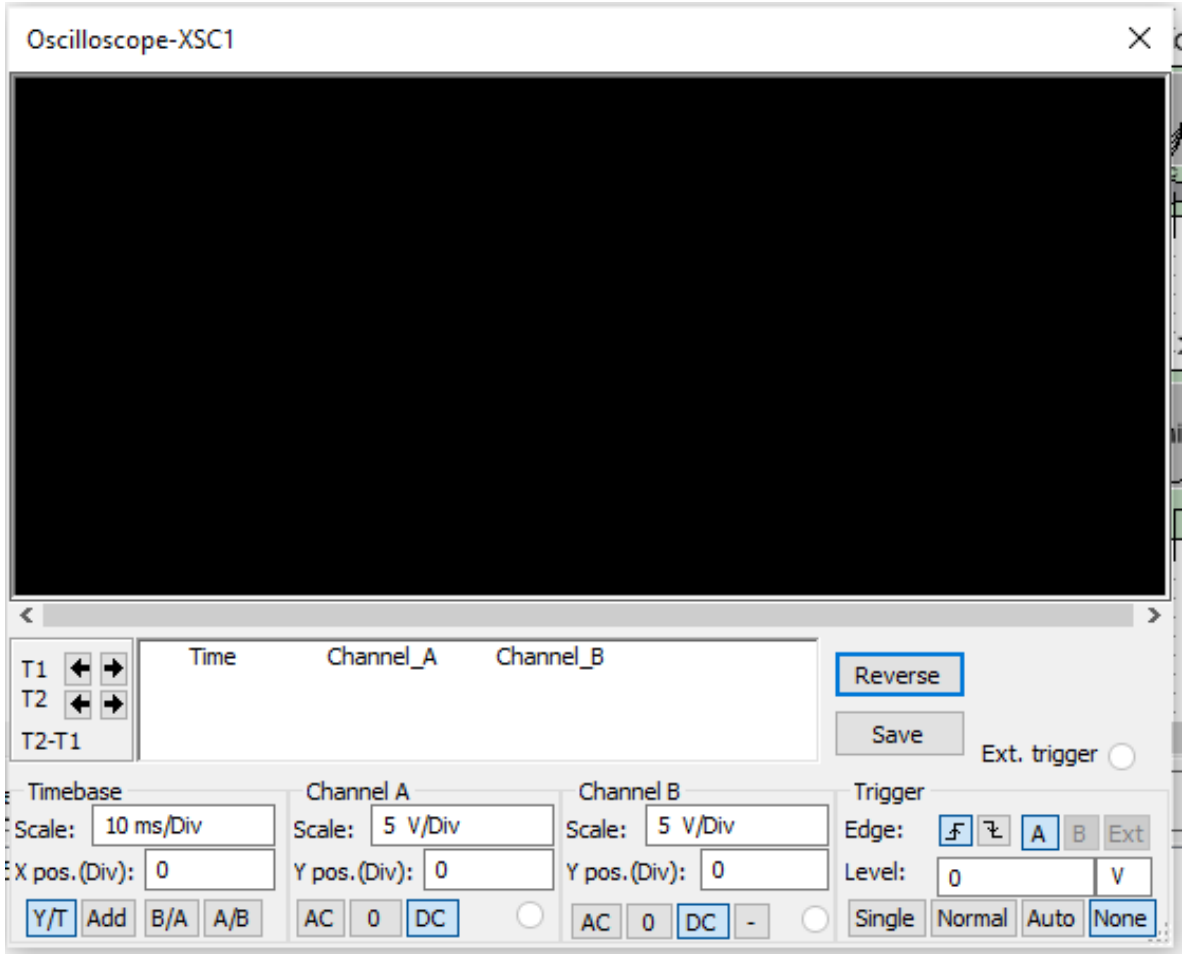
What is a CRO

Cathode Ray Oscilloscope

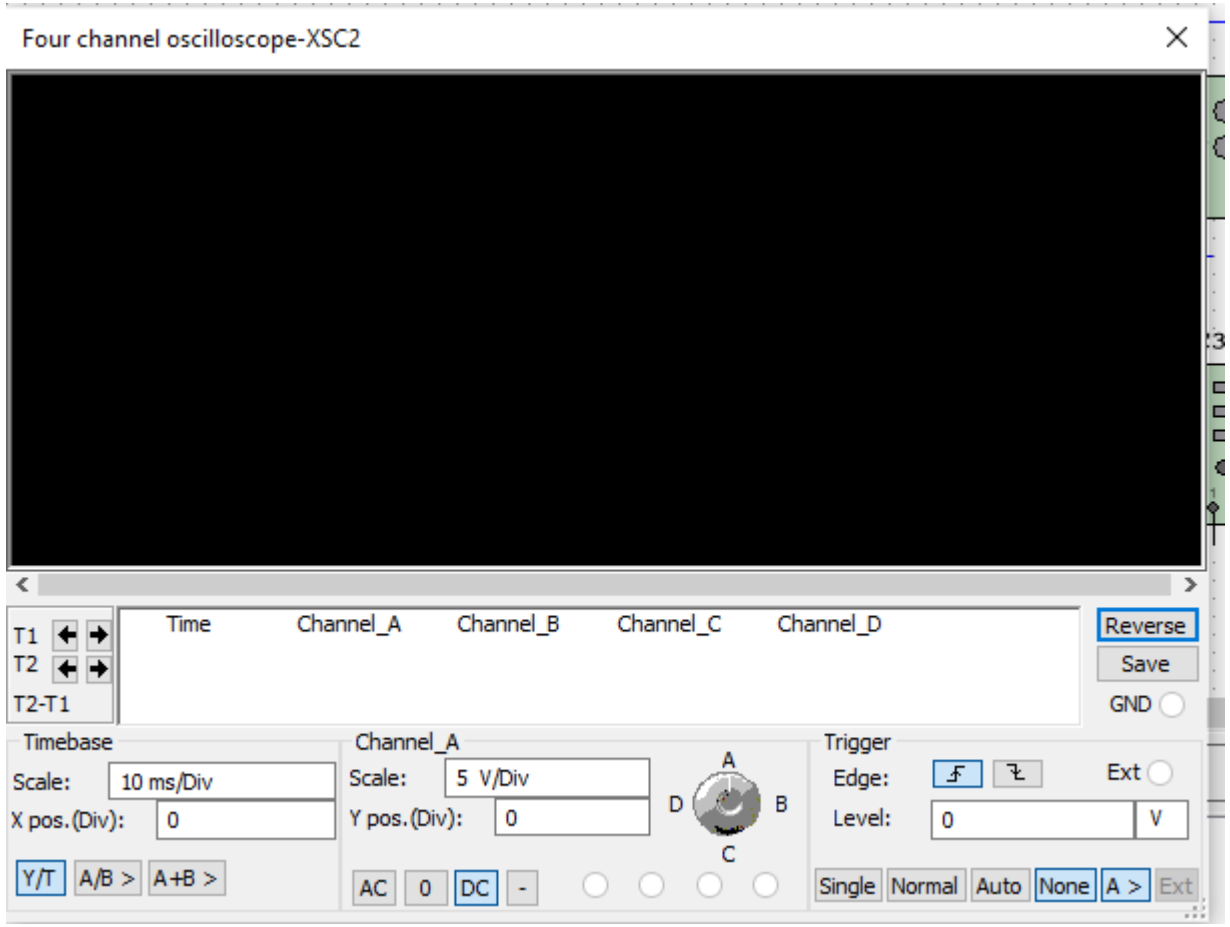


[How to use an oscilloscope with an A/C source - Bing video]

Multisim-Oscilloscope -CRO

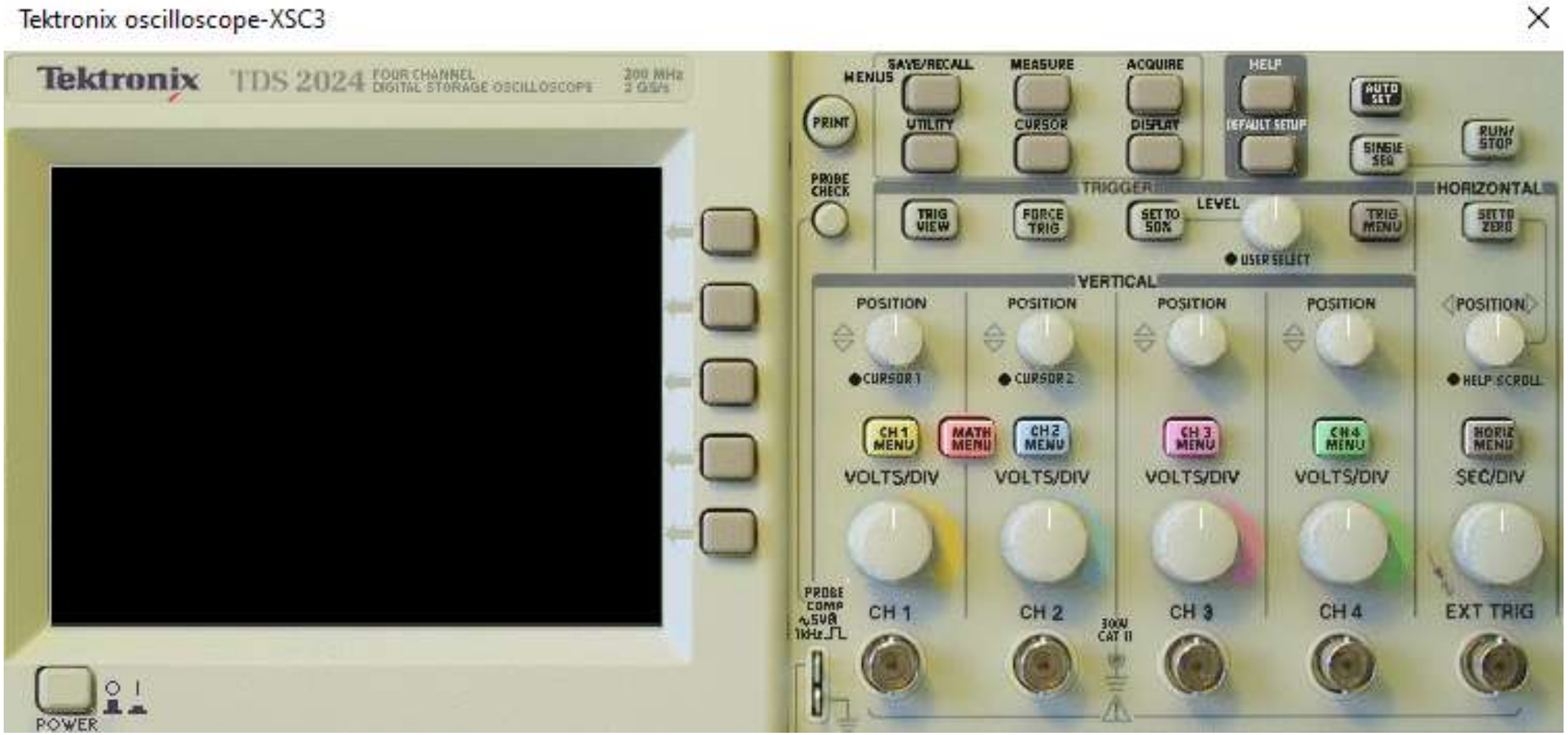


Two channel CRO



Four channel CRO

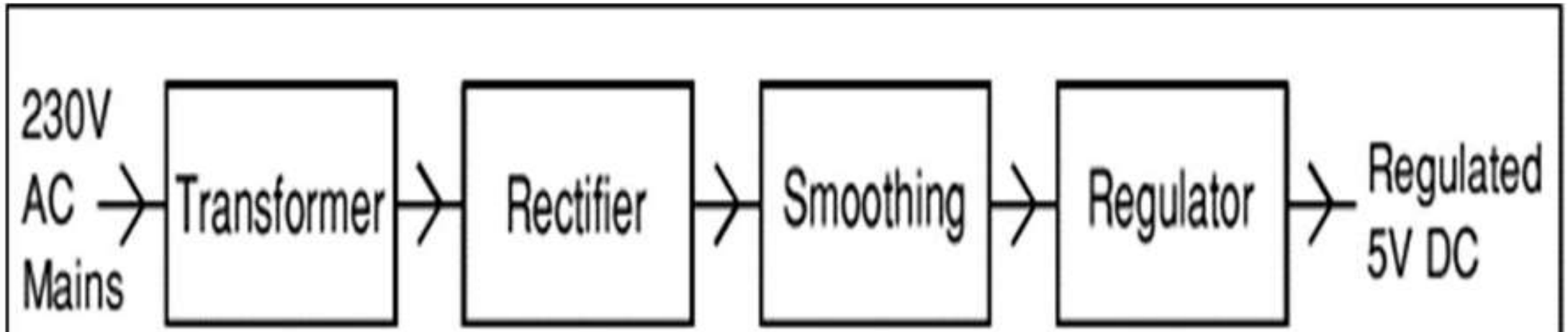
Multisim-Oscilloscope -CRO



Four channel CRO

Block Diagram

- A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.



Block Diagram of a Regulated Power Supply System

Low Voltage AC/DC Power Supply