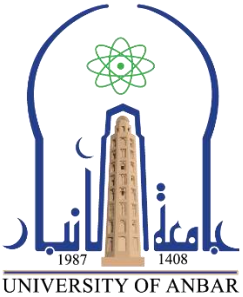


كلية : التربية للعلوم الصرفة

القسم او الفرع: الفيزياء

المرحلة: الثالثة

أستاذ المادة: م.م رؤى شاكر حماد

اسم المادة باللغة العربية: مختبر الألكترونيك

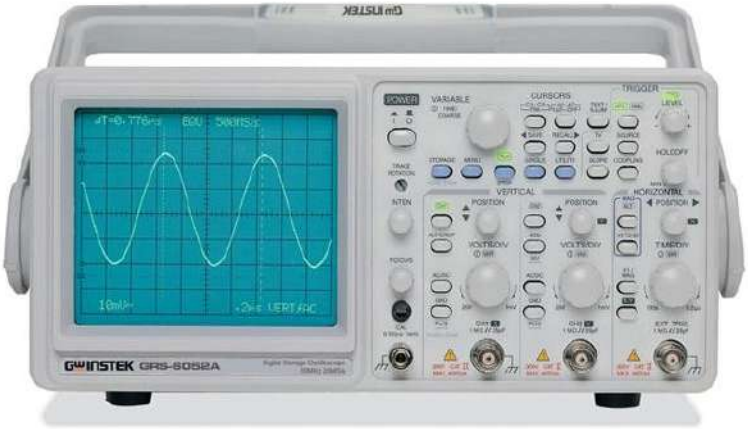
اسم المادة باللغة الإنكليزية: electronics Laboratory

اسم المحاضرة باللغة العربية: جهاز الاوسيلوسكوب

اسم المحاضرة باللغة الإنكليزية: Oscilloscope

Introduction

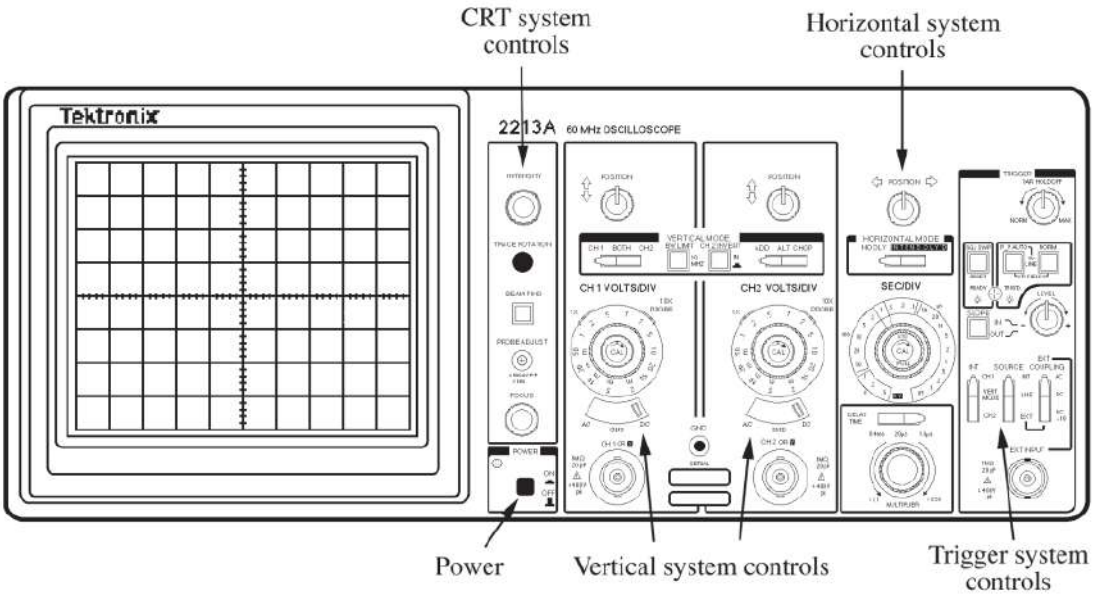
Electronic technology is prevalent in society, with many people utilizing devices like cell phones, TVs, and computers daily. These devices now operate at high speeds due to advancements in electronic technology. Engineers require specialized instrumentation, like an oscilloscope, to accurately design and test components in high-speed digital devices.



The scope, short for oscilloscope, is a device that efficiently and rapidly creates voltage vs time graphs. It is essential for analyzing circuits with time-varying voltages and currents. Transducers also play a key role in converting non-electrical quantities like pressure, sound, or position into voltage for the scope to monitor various measurements. This feature is widely utilized in the fields of science and technology.

The cathode ray tube (CRT) is the central component of the oscilloscope. When you observe the instrument, you are looking at the screen where the electron beam hits. The scope's electronic circuits control the beam's movement

horizontally by applying voltages to deflection plates, establishing the time axis, and adjust the input signal's strength before moving the beam vertically to form the voltage axis.



The purposes of using an oscilloscope

an oscilloscope offers a convenient method for observing and studying electrical signals. It enables visualization of signal behavior over a period, aiding in the identification of signal features like frequency, voltage, period, waveform, etc. This tool assists in error diagnosis, circuit analysis, and enhancement for engineers and technicians.

How an oscilloscope works

The basic principle of the oscilloscope's operation depends on measuring electrical voltages over time and converting them into a graphic signal. This is done by connecting the input signal to the channel module, amplifying it, tightening the frequency and other settings.

The processed signal is then connected to a display screen, where it is displayed in successive waves on two axes: the horizontal axis represents time and the vertical axis represents voltage.

Types of oscilloscope:

There are several types of oscilloscopes, including:

1-Cathodic screen-based oscilloscope (CRT): It is the most common type that is widely used in laboratories and technical workshops. It uses a cathodic screen to display the signal and is controlled by control devices such as buttons and switches.

2- Digital Oscilloscope (DSO): It uses satellite technology to convert the electrical signal into numbers and displays it on a digital screen. It allows the user to record and analyze data more accurately and easily.

3- Storage Oscilloscope (DSO): It uses memory to store recorded signals and can be analyzed at a later time. It allows the user to analyze signals that occur frequently and change at high speed.

Benefits of using an oscilloscope:

-Provides a direct and clear view of the electrical signal over time.

-Helps in analyzing and testing electrical and electronic circuits.

-Helps diagnose and fix errors quickly.

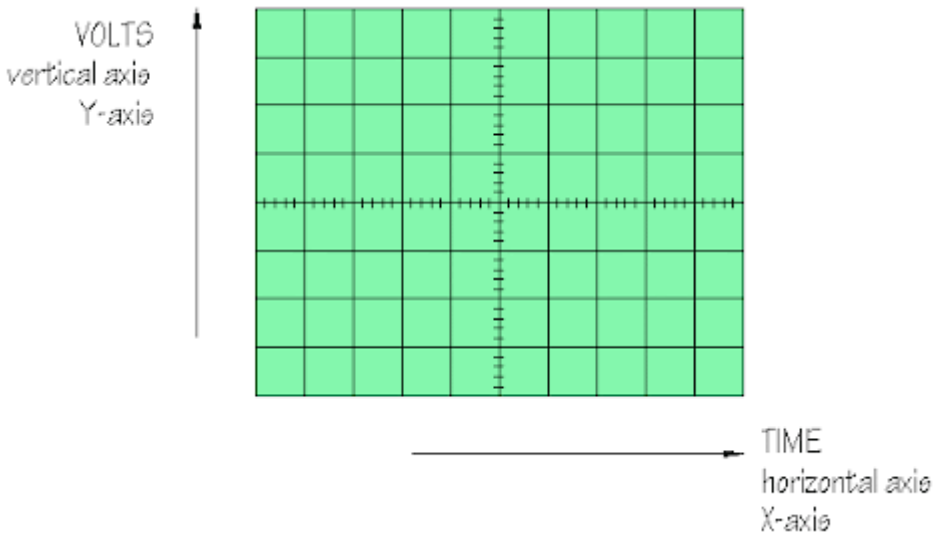
-It can be used in developing and designing new circuits and testing them.

- It helps in measuring and analyzing high frequency signals.

Upon viewing the oscilloscope interface, you will notice six primary sections labeled as: Trigger, Horizontal, Vertical, Power, Screen, and Inputs.

The main components of an oscilloscope include:

1- Display: This is the screen where the waveform is displayed. It can be a cathode ray tube (CRT) or a digital display, depending on the type of oscilloscope.

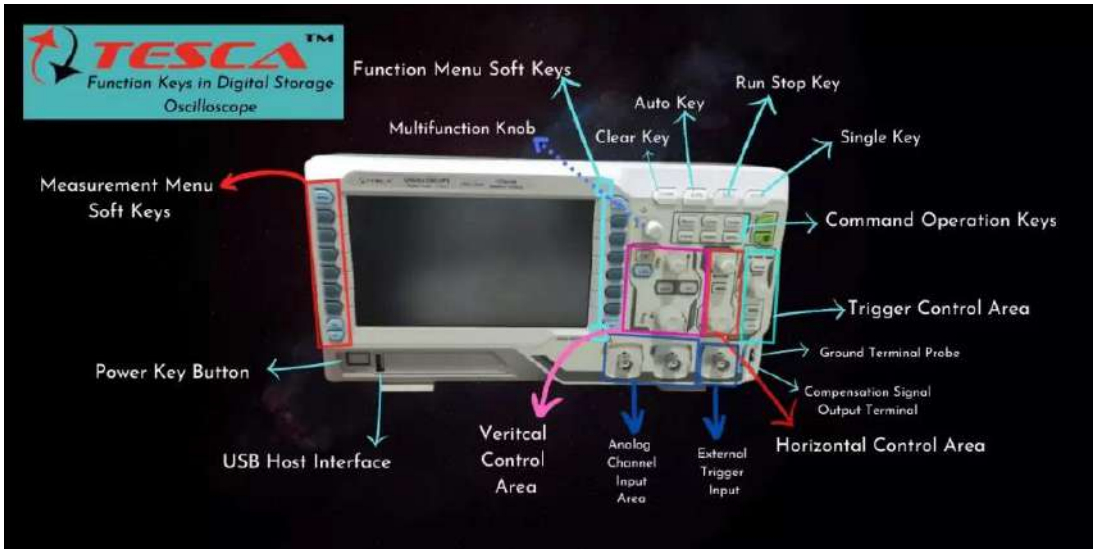


2-Input Channels: Oscilloscopes typically have one or more input channels where the electrical signal is connected. Each channel has a probe that connects to the signal source. The probes attenuate and couple the signal to ensure accurate measurements.

3-Time base Controls: The time base controls on an oscilloscope allow you to adjust the time scale or the horizontal axis of the display. This enables you to view the waveform over a specific time period.

4-Vertical Controls: The vertical controls adjust the vertical scale or amplitude of the waveform on the display. They allow you to zoom in or out on the signal to observe its voltage levels.

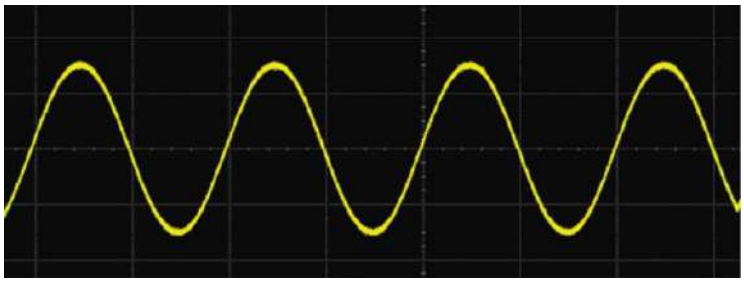
5- Trigger Controls: The trigger controls are used to stabilize the waveform on the display. They help synchronize the oscilloscope with the input signal, ensuring a stable and clear representation of the waveform.



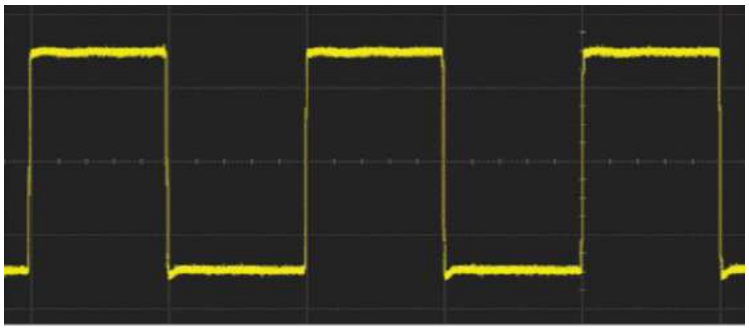
Waveforms

A waveform is the form or depiction of a wave, conveying important details about the signal, such as sudden voltage changes, linear variations, or constant levels. Various standard waveforms will be discussed in this section, focusing on the most commonly encountered ones.

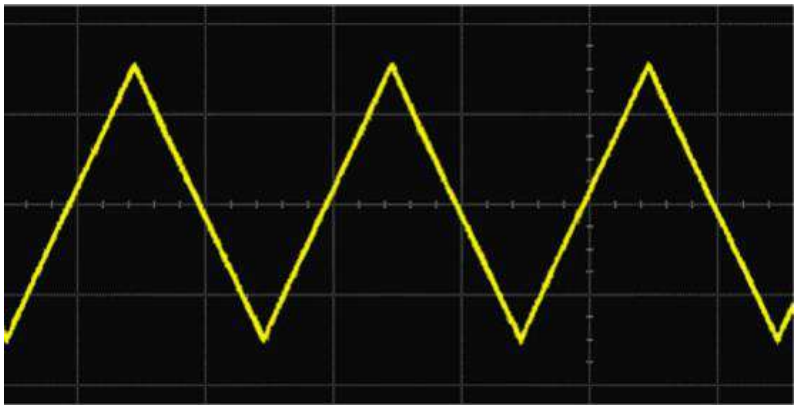
1-**Sine waves**



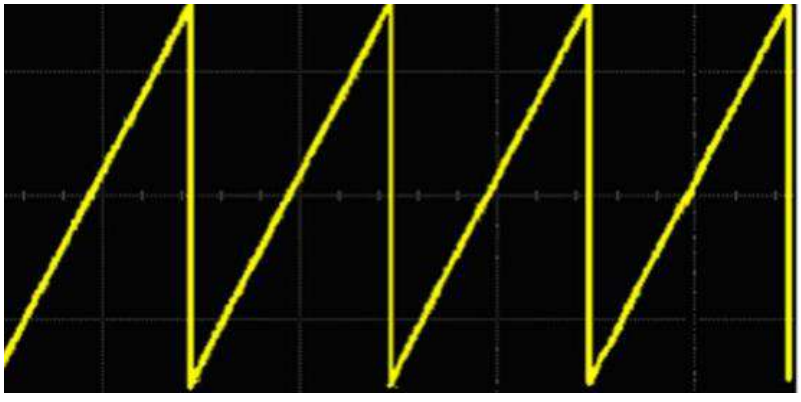
2-**Square/rectangular waves**



3-**Triangular/saw tooth waves**

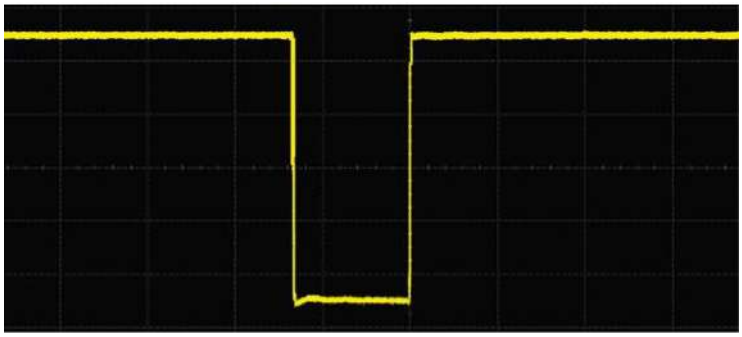


Triangular



sawtooth

4-Pulses



5-Complex waves