

EXPERIMENT NO -2

01. AIM OF THE EXPERIMENT: -

Study and use of oscilloscope and signal generator to view waveforms and measure amplitude and frequency of a given waveform.

02. OBJECTIVE: -

- To introduce the basic structure of a cathode ray oscilloscope.
- To get familiar with the use of different control switches of the devices.
- To visualize an ac signal, measure the amplitude, frequency, and time period.

03. COMPONENTS REQUIRED: -

- Cathode ray oscillator (CRO)
- Function generator (FG)
- Connecting probes

04. THEORY: -

The cathode ray oscilloscope (CRO) is a common laboratory instrument that provides accurate time and amplitude measurements of voltage signals over a wide range of frequencies. Its reliability, stability and ease of operation make it suitable as a general purpose laboratory instrument. A general purpose oscilloscope consists of the following parts: -

- Cathode ray tube
- Vertical amplifier
- Delay line
- Time base generator
- Horizontal amplifier
- Trigger circuit
- Power supply

❖ CATHODE RAY TUBE: -

It is the heart of the oscilloscope when the electrons emitted by the electron gun strike the phosphor screen, a visual signal is displayed on the CRT.

❖ VERTICAL AMPLIFIER: -

The input signals are amplified by the vertical amplifier. Usually the vertical amplifier is a wide band amplifier which passes the entire band of frequencies.

❖ DELAY LINE: -

As the name suggests, this circuit is used to delay the signal for a period of time in a vertical section of CRT. The input signal is not applied directly to the vertical plates because the part of the signal gets lost, when the delay time is not used. Therefore, the input signal is delayed by a period of time.

❖ TIME BASE GENERATOR: -

Time base circuit uses a uni-junction transistor, which is used to produce the sweep. The saw tooth voltage produced by the time base circuit is required to deflect the beam in the horizontal section. The saw tooth voltage at a constant time dependent rate.

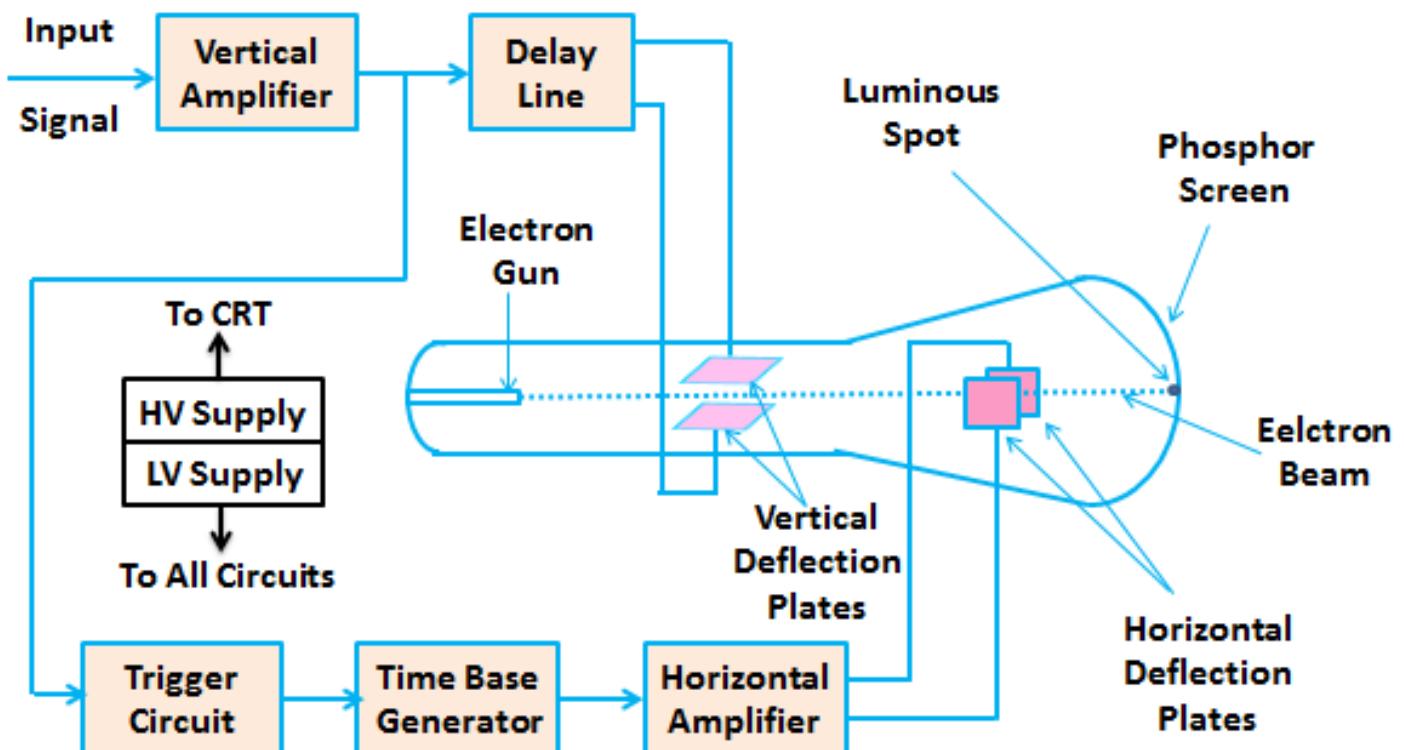
❖ HORIZONTAL AMPLIFIER: -

The saw tooth voltage produced by the time base circuit is amplified by the horizontal amplifier before it is applied to horizontal deflection plates.

❖ TRIGGER CIRCUIT: -

The signals which are used to active the triggered circuit are converted to trigger pulses for the precision sweep operation whose amplitude is uniform. Hence, input signal and the sweep frequency can be synchronized.

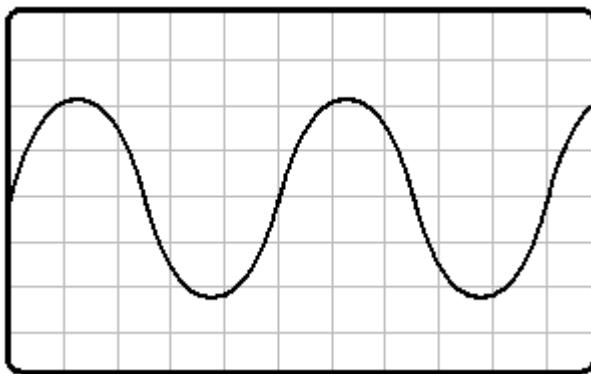
i.e. In a CRO, a triggering circuit is provided for synchronizing two types of deflection so that horizontal deflection starts at the same point of the input vertical signal each time it sweeps.



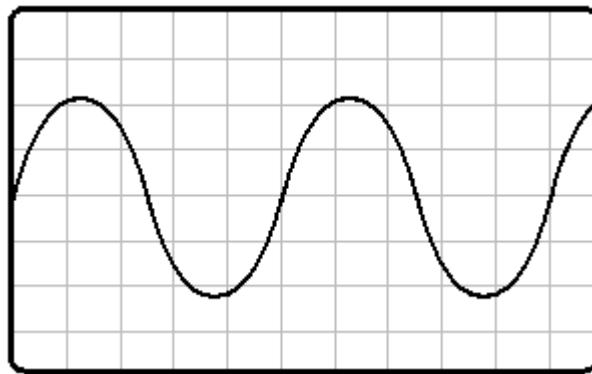
Block Diagram of Cathode Ray Oscilloscope (CRO)

05. PROCEDURE: -

- Turn on the oscilloscope.
- Adjust the intensity and focus of the trace.
- Use the X & Y knobs to Centre the trace horizontally and vertically.
- Connect the cable from CH1 of the CRO to function generator.
- A signal will appear on the screen.
- Make sure that the inner red knobs of the Volt/div and the Time/div are locked clockwise.
- Set the frequency of the generator to 100 Hz.
- Adjust the volt/div and time/div knobs so that you get a suitable size signal.
- Count the number of vertical squares lying within the signal, then calculate the peak to peak values as: - $VP-P = \text{No. of Vertical Div.} * \text{Volt/Divs.}$



- Count the number of horizontal squares lying within the duty cycle, then calculate time values as: -
 $\text{Time} = \text{No. of horizontal Div.} * \text{Time/Divs.}$



- Calculate the frequency of signal by using formula: -
 $\text{Frequency} = 1/T$

06. CALCULATIONS: -

For sine wave

(I). Amplitude =

(II). Time Period =

(III). Frequency =

For Square wave

For Triangular wave

(I). Amplitude =

(II). Time Period =

(III). Frequency =

For Triangular wave

(I). Amplitude =

(II). Time Period =

(III). Frequency =

07. OBSERVATIONS: -

Sl No.	Type of wave	Voltage (V)	Time Period (S)	Frequency (Hz)	
				Theory	Practical
1					
2					
3					

08. CONCLUSION: -