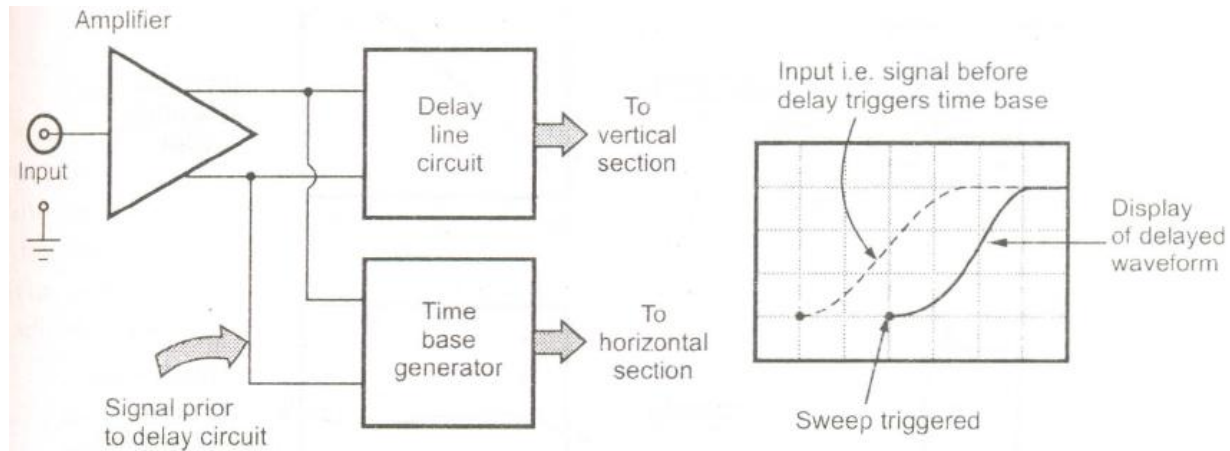


SPECIAL OSCILLOSCOPES

Delayed time base oscilloscope:

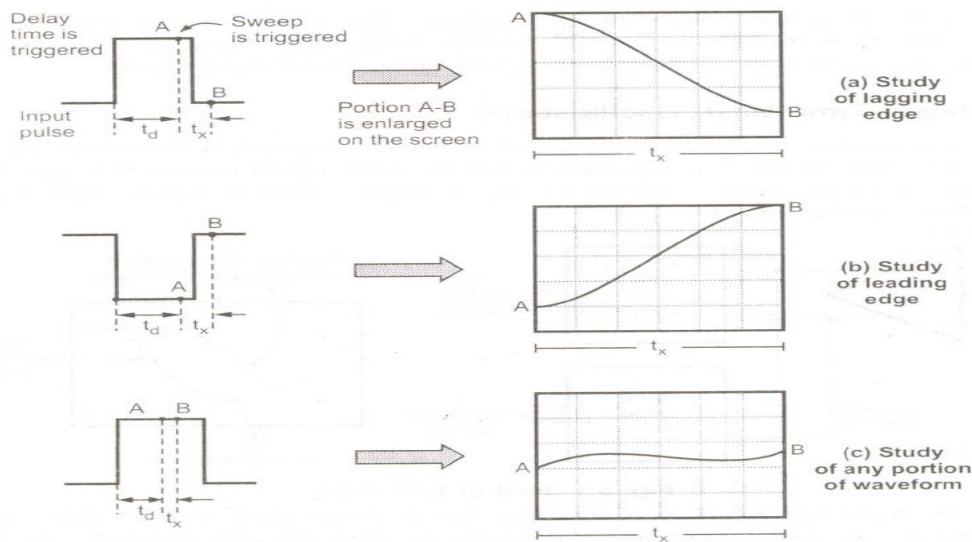
In a conventional oscilloscope, the signal to the vertical plates is delayed by some time, using a delay line circuit. The waveform before the delay circuit is used to trigger the time base. This allows the study of all the leading or lagging edges of a pulse type waveform. This is shown in the Fig



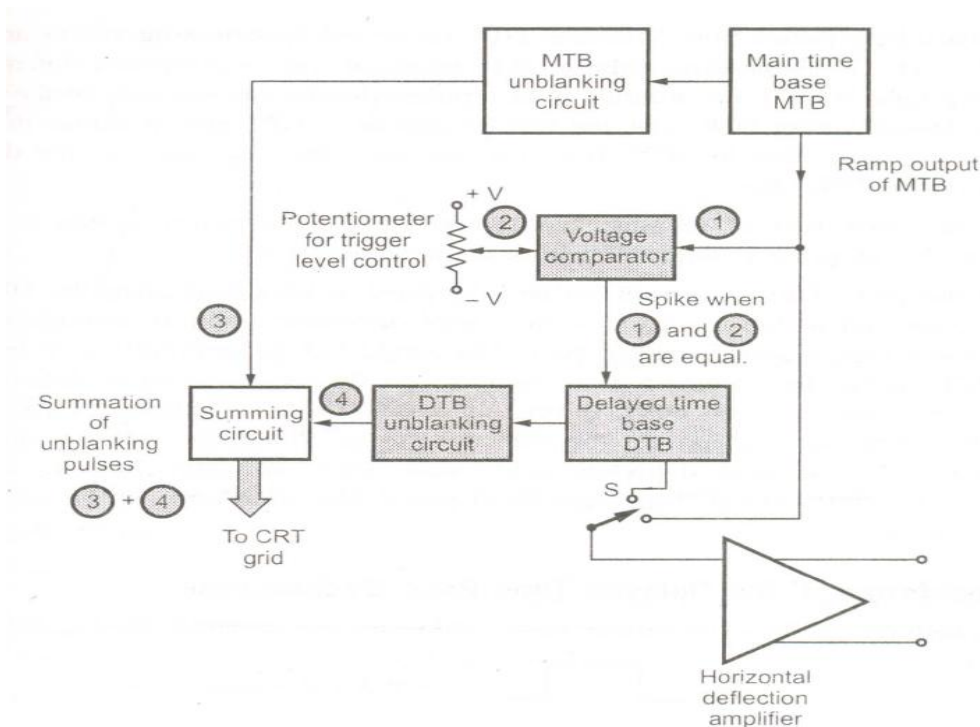
Due to triggering of time base by input signal, sweep starts well in time and when input appears at vertical sections, the sweep is triggered and delayed waveform is displayed. The delay ensures that no part of the waveform gets lost.

In a delayed time base oscilloscope, a variable time delay circuit is used in the basic time base circuit. This allows the triggering of sweep time after the delay time. Thus the delay time is variable. This time is denoted as t_d . After this, the sweep is triggered for the time t_x . Then the portion of the waveform for the time t_x gets expanded on the complete oscilloscope screen, for the detail study.

If input is pulse waveform and leading edge is used to trigger the delay time, then lagging edge can be displayed to fill the entire oscilloscope screen. This is shown in the Fig (a). Similarly if the lagging edge is used to trigger the delay time then leading edge can be displayed on the entire screen for the time t_x . This is shown in the Fig.(b). If the time delay is perfectly adjusted, then any portion of the waveform can be extended to fill the entire screen. This is shown in the Fig. (c).



Use of additional time delay



Delayed time base oscilloscope

The normal time base circuit is main time base (MTB) circuit which functions same as conventional oscilloscope. The function of MTB blanking circuit is to produce an unblanking pulse which is applied to CRT grid to turn on an electron beam in the CRT, during the display sweep time. The ramp output of MTB is given to the horizontal deflection amplifier via switch S. It is also given as one input to the voltage comparator. The other input to the voltage comparator is derived from the potentiometer whose level is adjustable.

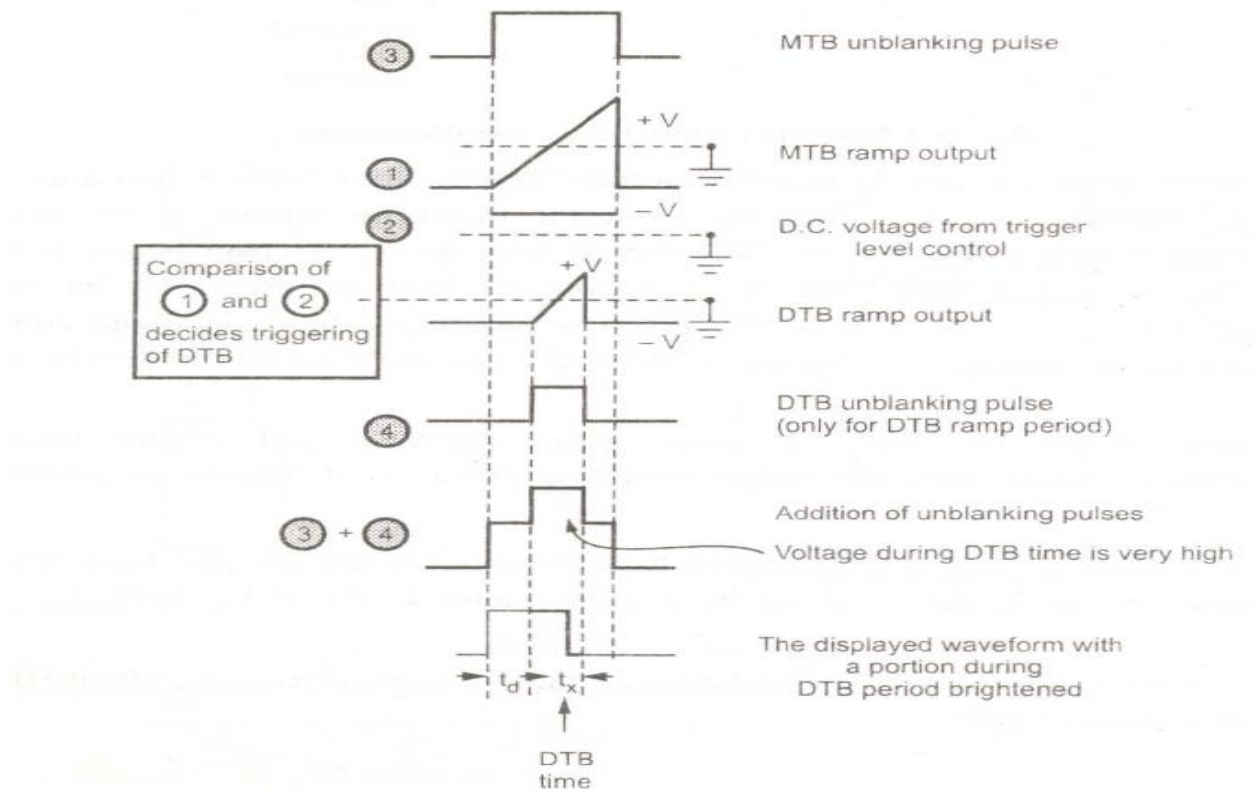
The unblanking pulses from MTB and DTB are added by **summing circuit** and given to the CRT grid. The unblanking pulse of MTB produces a trace of uniform intensity. But during ramp time of DTB, the addition of two pulses decides the intensity of the trace on the screen. Hence during DTB time, the voltage applied to CRT grid is almost twice than the voltage corresponding to MTB time. This increases the brightness of the displayed waveform for the DTB time.

When the part of the waveform to be brightened is identified, then the DTB ramp output is connected to the input of the horizontal deflection amplifier through switch S. The DTB ramp time is much smaller than MTB period but its amplitude (- V to + V) is same as MTB ramp. Hence it

causes the oscilloscope electron beam to be deflected from one side of the screen to the other, during short DTB time. By adjusting DTB time/ div control, the brightened portion can be extended, so as to fill the entire screen of the oscilloscope. The horizontal deflection starts only after the delay time t_d from the beginning of the MTB sweep. Thus very small part of the waveform can be extended on the entire screen.

Waveforms of the Delayed Time Base Oscilloscope

The waveforms of the delayed time base oscilloscope are shown in the Fig



Analog storage oscilloscope:

The conventional cathode ray tube has the persistence of the phosphor ranging from a few milliseconds to several seconds. But sometimes it is necessary to retain the image for much 'longer periods, up to several hours. It requires storing of a waveform for a certain duration,' independent of phosphor persistence. Such a retention property helps to display the waveforms of very low frequency.

Mainly two types of storage techniques are used in cathode ray tubes which are:

- i) Mesh storage and ii) Phosphor storage

Sampling Time Base:

The time base circuit of the sampling oscilloscope is different than the conventional oscilloscope.

The time base of sampling oscilloscope has two functions:

- i) To move the dots across the screen
- ii) To generate the sampling command pulses for the sampling circuit.

It consists of synchronous circuit, which determines the sampling rate and establishes a reference point in time with respect to the input signal. The time base generates a triggering pulse which activates the oscillator to generate a ramp voltage. Similarly it generates a stair case waveform. The ramp generation is based on the output of the synchronizing circuit.

Both the ramp as well as staircase waveforms are applied to a voltage comparator. This comparator compares the two voltages and whenever these two voltages are equal, it generates a sampling pulse. This pulse then momentarily bias the diodes of the sampling gate in the forward direction and thus diode switch gets closed for short duration of time.

The capacitor charges but for short time hence, it can charge to only a small percentage of the input signal value at that instant. This voltage is amplified by the vertical amplifier and then applied to the vertical deflecting plates. This is nothing but a sample. At the same time, the comparator gives a signal to the staircase generator to advance through one step. This is applied to horizontal deflecting plates, thus during each step of the stair case waveform, the spot moves across the screen. Thus the sampling time base is called a staircase-ramp generator in case of a sampling oscilloscope.

Source : <http://elearningatria.files.wordpress.com/2013/10/ece-iii-electronic-instrumentation-10it35-notes.pdf>