Unit 1
Particles,
Quantum
Phenomena
and Electricity

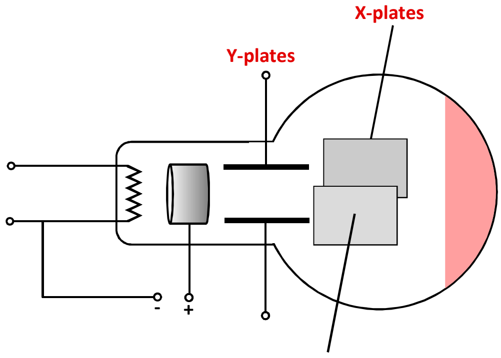
6.2
Using an oscilloscope

AS29

6.2 Using an Oscilloscope

Construction

A basic oscilloscope (or cathode ray oscilloscope, CRO) consists of an electron gun and two sets of deflecting plates to move the electron beam to any point on a fluorescent screen at the front of the vacuum tube.



The **Y-plates** deflect the beam in the vertical (y) direction.

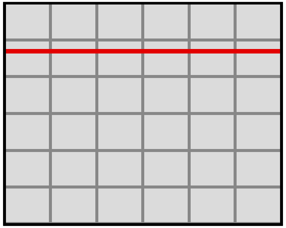
The **X-plates** deflect the beam in the horizontal (x) direction.

A more sophisticated CRO would also contain some electromagnet coils to help focus the beam. There are controls on the front to adjust the **Y-gain**, (the volts scale on the y-axis of the screen), and the **timebase**, (the internally applied p.d. which adjusts the seconds scale on the x-axis of the screen).

Appearance of the screen

The **trace** obtained on the screen of an oscilloscope is really a graph of the p.d. applied between the Y-plates plotted against time.

The diagram opposite shows the trace obtained when a direct p.d. is connected to the Y-plates, with the upper plate positive.



Direct p.d. on Y-plates. Timebase on.

The central horizontal line on the scale represents zero volts.

If the connections are reversed, the result would be a horizontal line at an equal distance on the negative side of zero.

Unit 1
Particles, Quantum Phenomena and Electricity

6.2 Using an oscilloscope

Reading an oscilloscope trace

The top trace opposite shows a sinusoidally varying alternating p.d.

The **period** (T) or time for one cycle is found by reading the distance between successive crests (or troughs) on the time axis, as shown on the diagram.
Multiply the distance by the timebase scale you have selected.

The **peak p.d.** (V_0) is found by reading the amplitude (A) of the trace, as indicated.
Multiply the height of a crest (or the depth of a trough) by the volts scale you have selected.

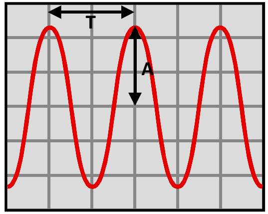
The oscilloscope is a voltmeter

An oscilloscope has a very high input resistance, like all good voltmeters, and draws almost no current from a circuit.
Its advantage is that it can measure alternating as well as direct potential differences and display graphs of their variation with time.

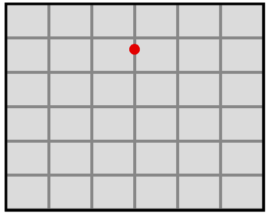
The real versatility of the oscilloscope is that the input p.d.s could come from any source, for example, the output p.d. of a microphone or the variation in p.d. of a sensing circuit.

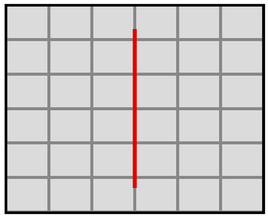
Using an oscilloscope

Your practical circuses include a number of experiments that make use of oscilloscope measurements. Review your notes on these to make sure you are familiar with the practical details of using oscilloscopes.



Alternating p.d. on Y-plates
Timebase on


Direct p.d. on Y-plates. Timebase off.


Alternating p.d. on Y-plates
Timebase off

AS29