



# Electronic Instrumentation

## CATHODE RAY OSCILLOSCOPE

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# CATHODE RAY OSCILLOSCOPE

- It is very useful and versatile instrument which is used for display, measurement and analysis of wave forms and other phenomena of electrical and electronic circuits
- Electrical means: **Electrical is defined as something related to electricity, which is energy resulting from charged particles.**
- Electronic means: utilizing devices constructed or working by the methods or principles of electronics

# CATHODE RAY OSCILLOSCOPE

- CRO is basically an X-Y plotter which plots and input signal versus time or another signal.
- The stylus of this plotter is a luminous spot which moves over the display area in response to an input voltage
- The luminous spot is produced by a beam of electrons striking a fluorescent screen

# CRO..

- Due to low inertia effects of beam of electrons, such a beam is used for following the changes in instantaneous values of rapidly changing input signal.
- CRO contains two inputs
  1. Horizontal input
  2. Vertical input

# CRO

## Horizontal input

Voltage – internally generated ramp--- “time base

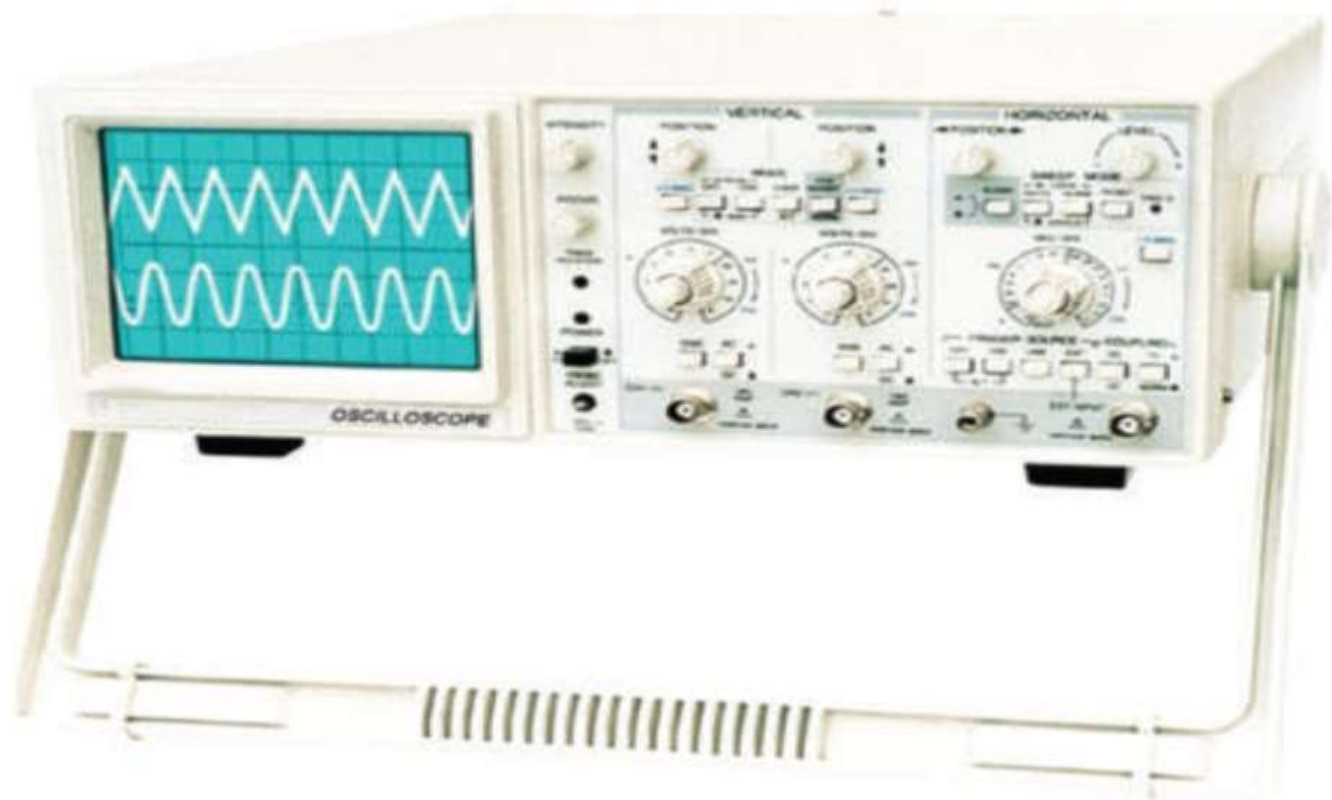
Move the luminous spot in a horizontal direction from left to right

## Vertical input

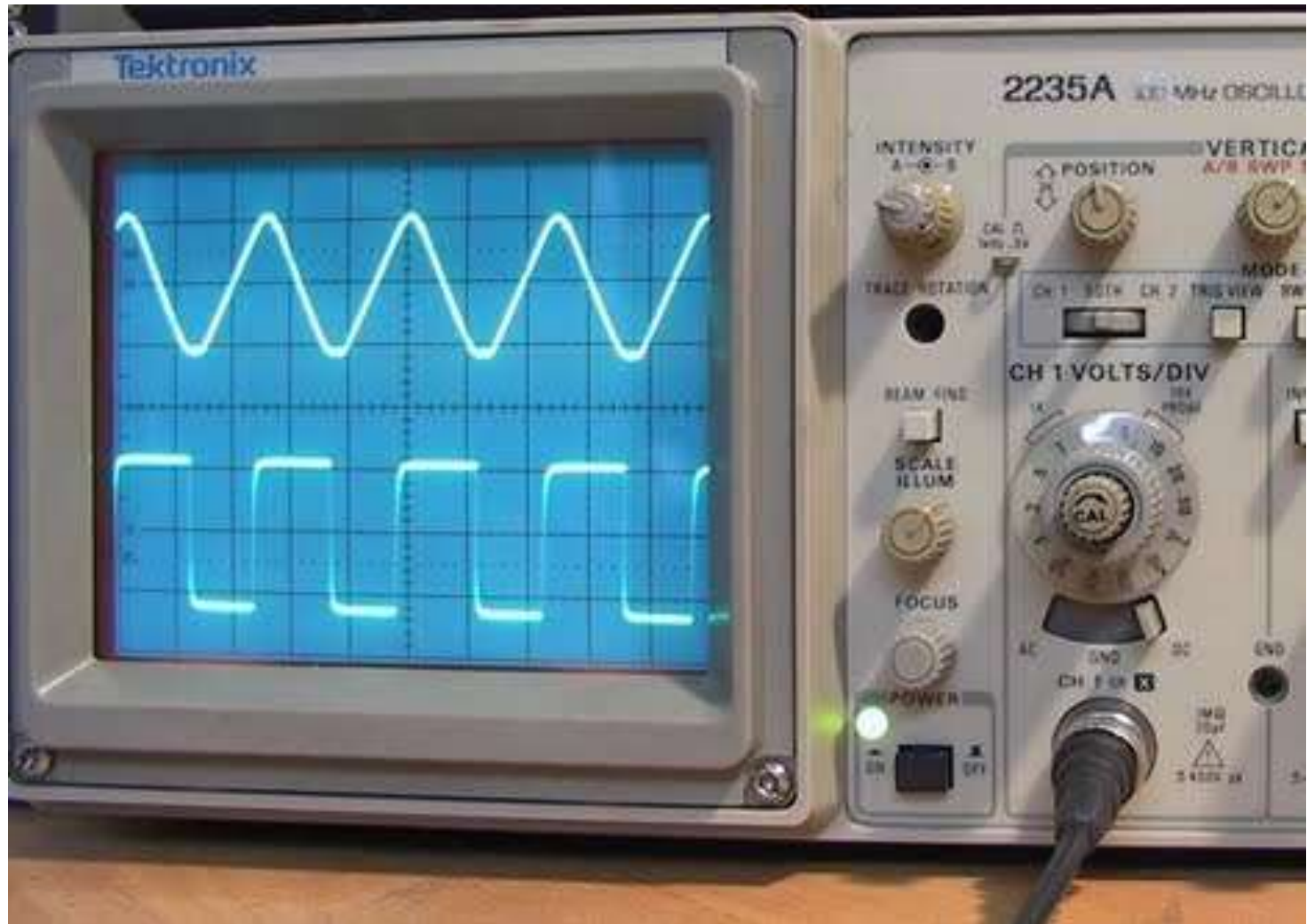
voltage under investigation—move the luminous spot in vertical direction from up to down

# CRO

- Luminous spot thus traces the waveform of the input voltage with respect to time



# CRO



# CRO

- When the input voltage repeats itself at a very high speed, the trace on the screen appears stationary
- It provides us a means of visualizing time varying voltage
- It basically operates on the principle of voltages but it is possible to convert current, strain, acceleration, pressure and other physical quantities into voltages
- CROs are used to investigate the waveforms and other time varying quantities



# Modern CROs

- Modern CROs have additional features
  1. Oscilloscopes can measure frequencies up to 16Hz
  2. Can observe events as small as 20Hz in duration
  3. Multimeters and counters
  4. Can calculate rise time, pulse width, phase difference

# Types of Oscilloscopes

1. Sampling oscilloscopes
2. Storage oscilloscopes
3. Digital oscilloscopes
4. Analog oscilloscopes.
5. Dual trace oscilloscopes

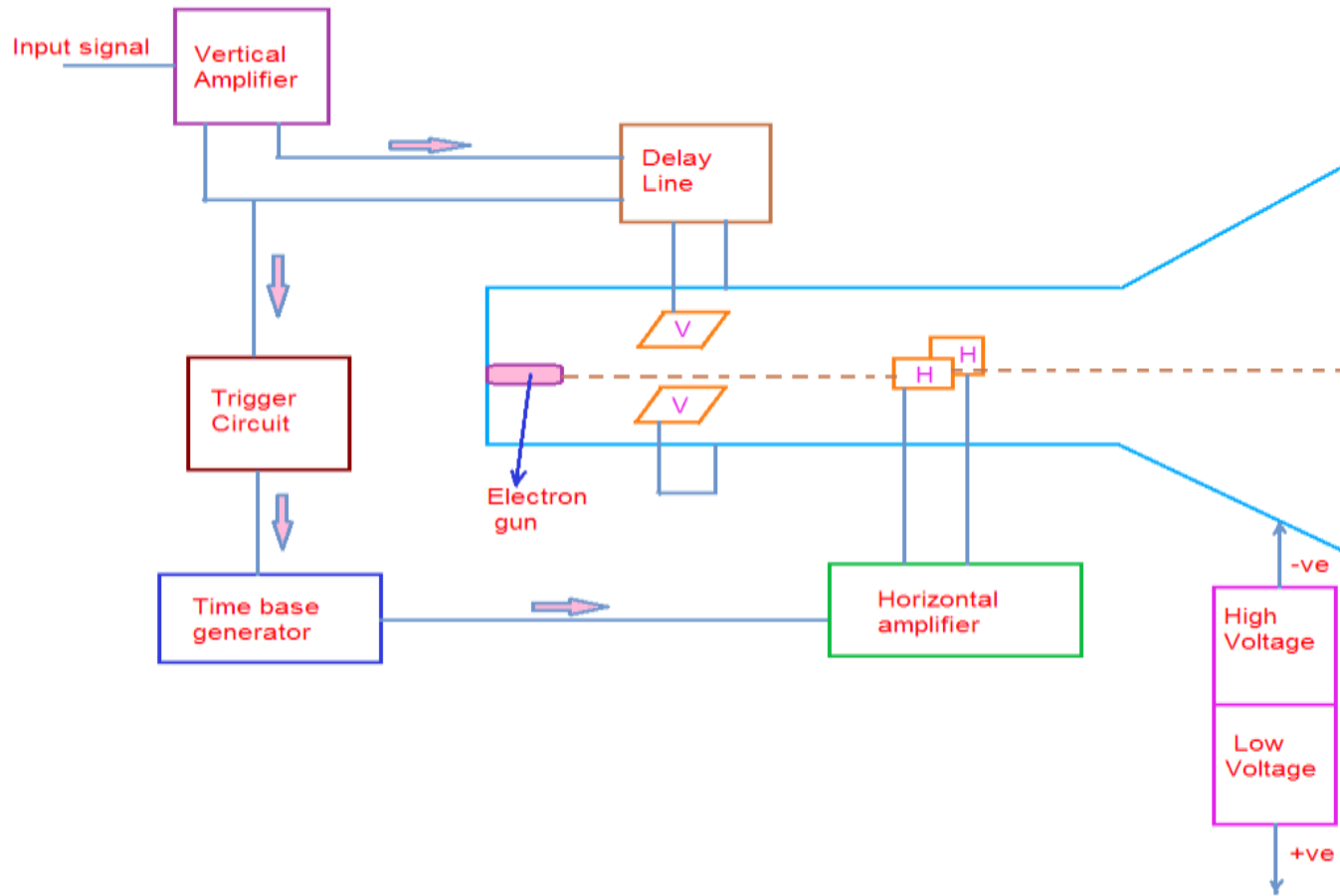
# Components of CRO

- CRO is used to display, measure and analyse various types of waveforms and other phenomena in electrical and electronic circuits
- CRO is a test instrument which allows an individual to plot and view two dimensional graphs of electronic signals

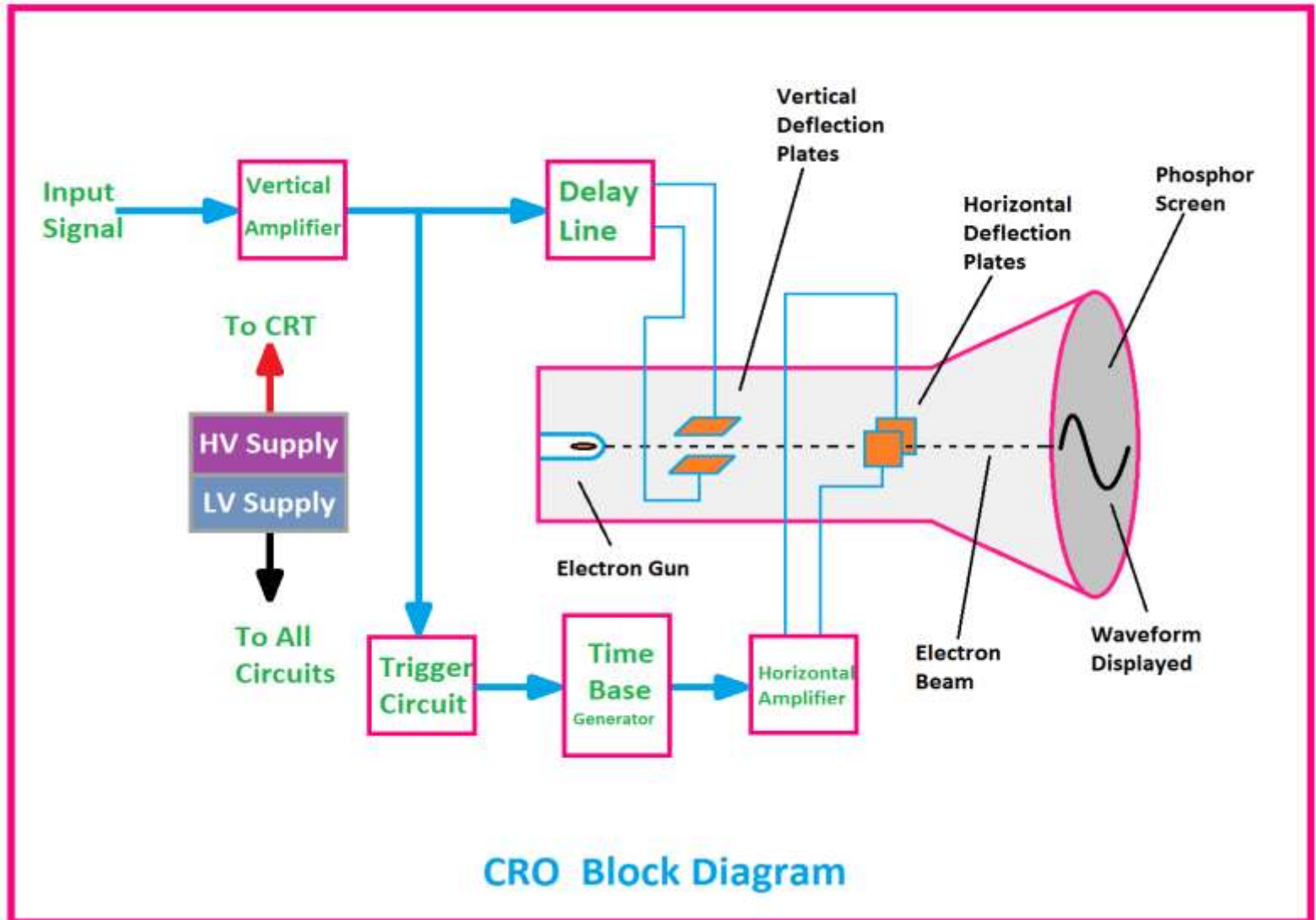
# Components of CRO

- 1) Cathode ray tube(CRT)
- 2) Vertical amplifier
- 3) Delay line
- 4) Horizontal amplifier
- 5) Time base generator
- 6) Triggering circuit
- 7) Power supply

# Block diagram of CRO

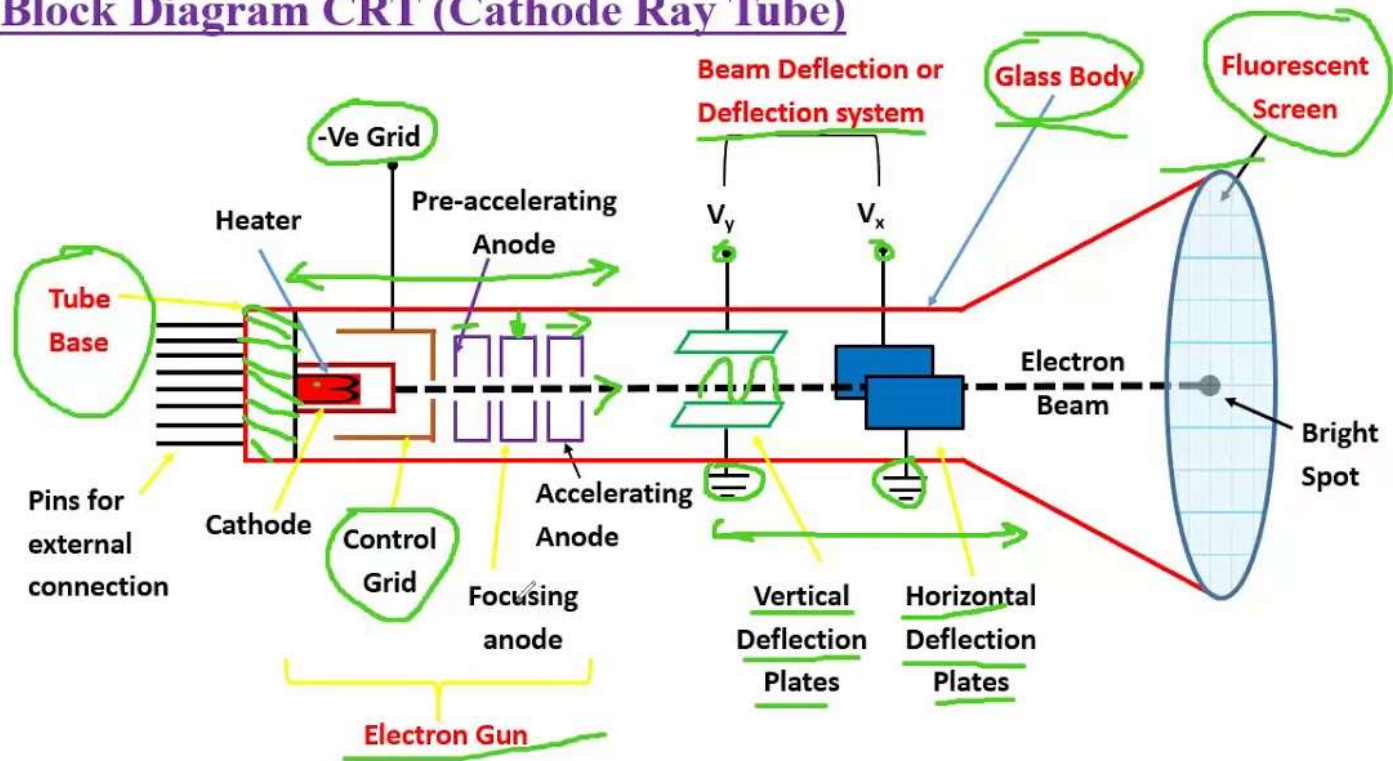


# CRO Block diagram



# Cathode ray tube

Block Diagram CRT (Cathode Ray Tube)



# CRT

- It is called as heart of the CRO
- CRT is a vacuum sealed glass envelope that has a source of electrons which emits electrons, that are accelerated to pass through two pairs of plates before striking a phosphor coated screen internally so as to provide a visual display of signal

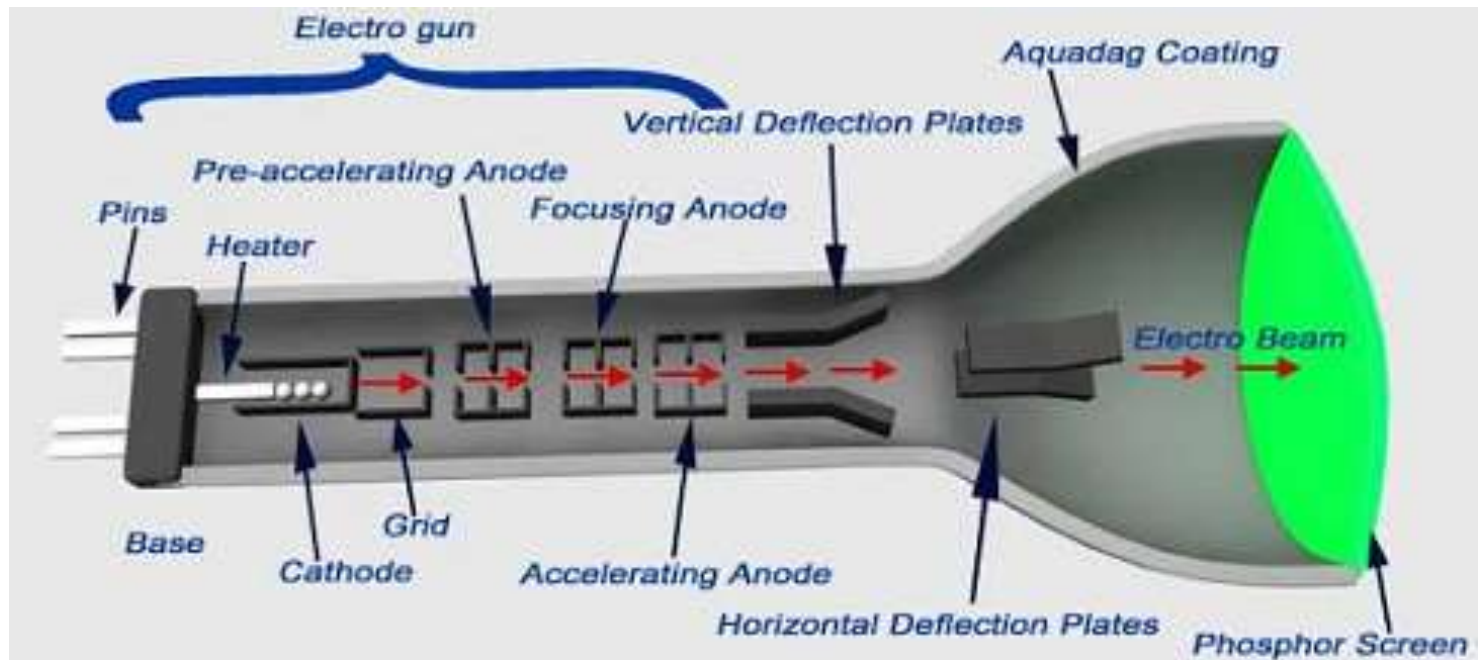
- **Parts of CRT**

1. Electron gun
2. Deflection plate system
3. Fluorescent screen
4. Glass envelope
5. base



# Electron gun

1. It is source of accelerated, energized and focused beam of electrons

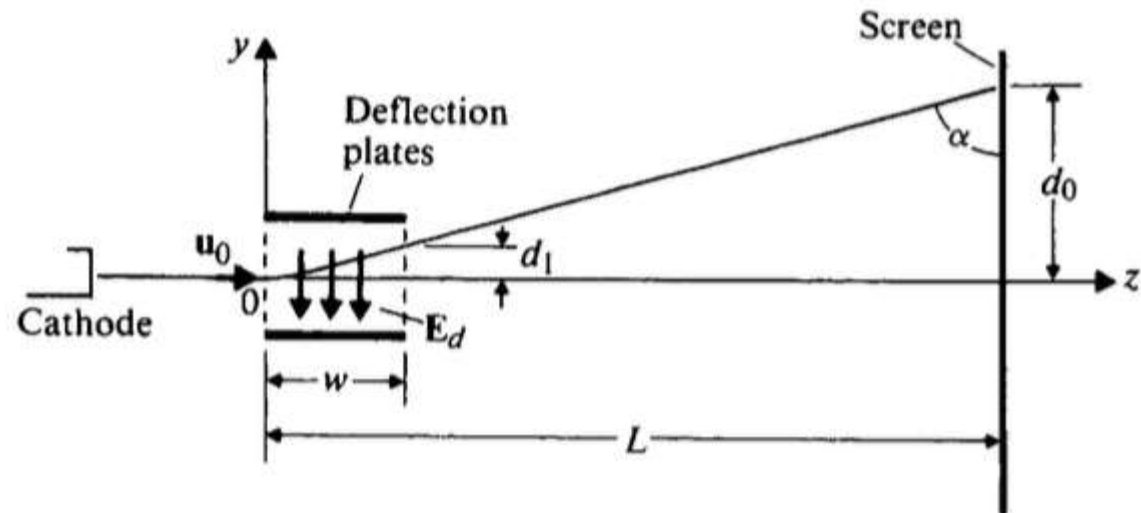


# Parts of CRT

1. **Heater** – heats the cathode
2. **Cathode** – generates electrons (cathode is coated with a layer of barium oxide)
3. **Control grid**- made up of nickel (controls the number of electrons)
4. **Pre-accelerating and accelerating anode**- accelerates the electrons connected to a common positive potential of 500 Volts
5. **Focusing anode**- focus the electron beam – connected to a potential of 500V

# Deflection system

- Two pairs of plates(horizontal plates(X-plates XI-XI) vertical plates(Y platesYI-YI))



# Screen

- It is coated with natural or synthetic phosphor which emits visible light when the electron beam strikes over it
- Fluorescence-
- Physical characteristics of phosphor
- Number of electrons bombarding with the screen



**Thank You**