Subject: Computer graphics
Topic : CRT working
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Important parts of CRT

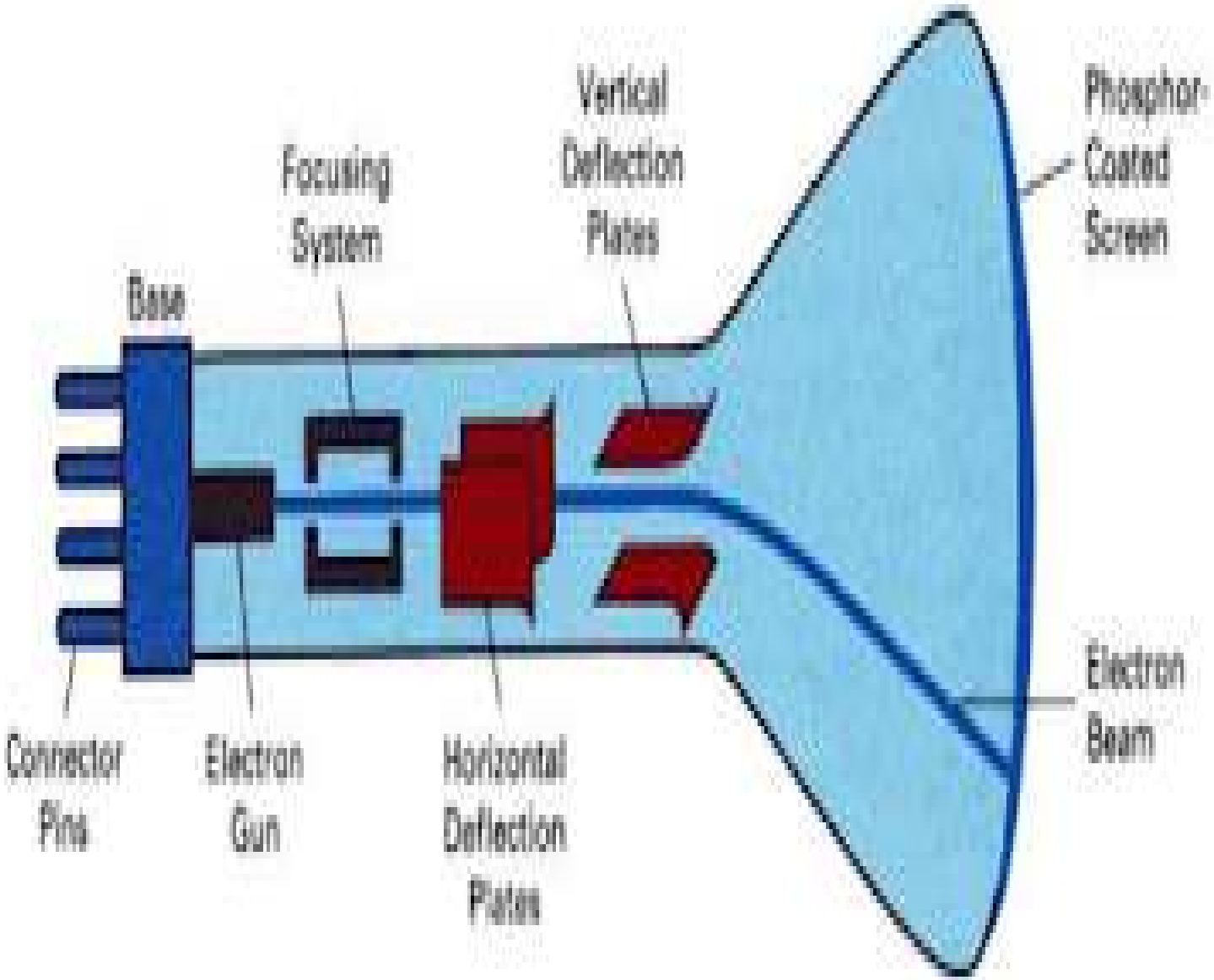
- Phosphor screen
- Electron gun
- Heated metal cathode
- Control grid
- Accelerating anode
- Focusing system
- Deflection system

Working of CRT

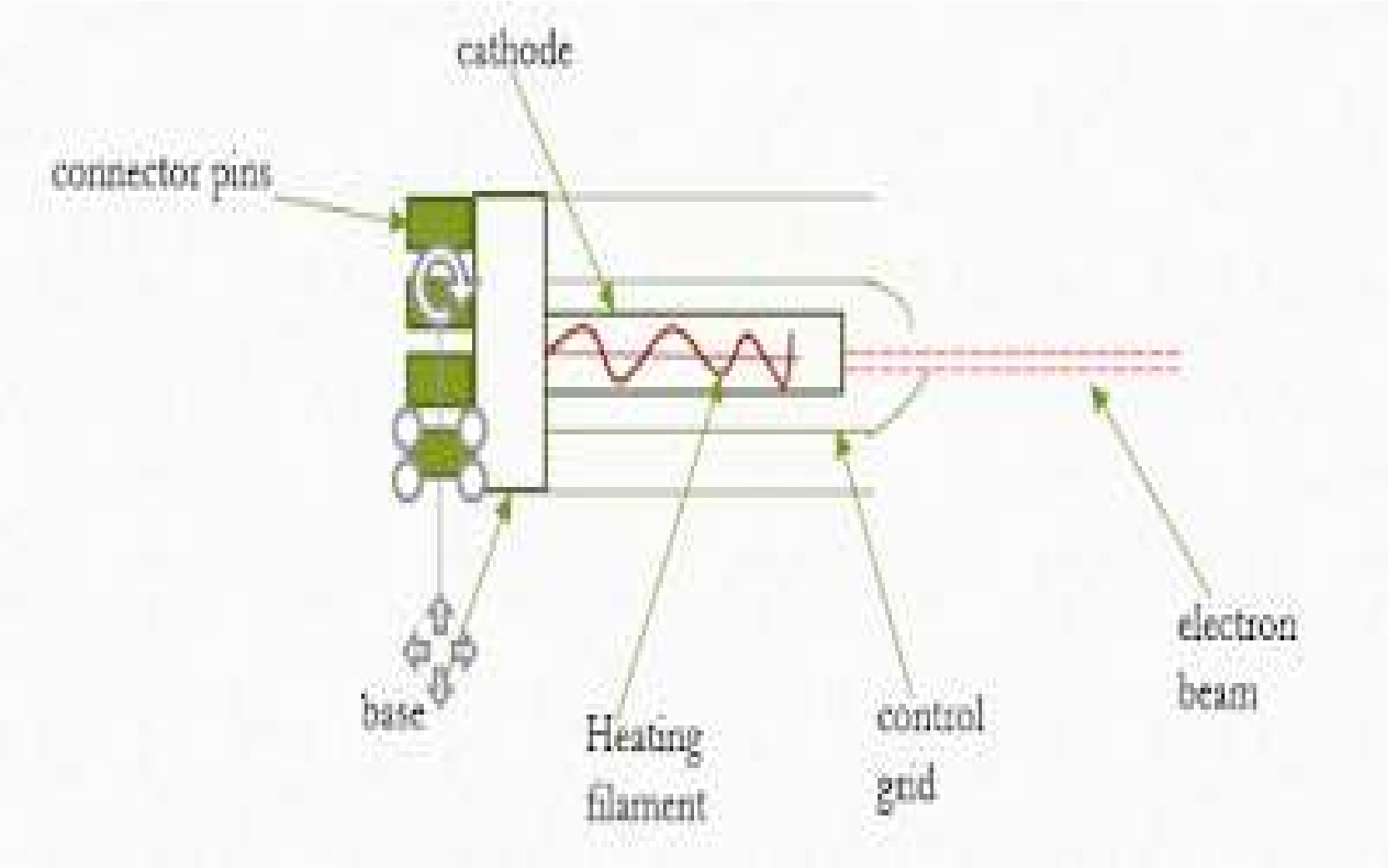
- A beam of electrons *(cathode* rays), emitted by an electron gun, passes through focusing and deflection systems that direct the beam toward specified positions on the phosphor coated screen.

- The phosphor then emits a small spot of light at each position contacted by the electron beam

- Light emitted by the phosphor fades very rapidly,redraw the picture repeatedly by quickly directing the electron beam back over the same points. This type of display is called a **refresh CRT(**Frequency at which picture is redrawn on the screen:-**Refresh Rate)**


Vertical
Deflection
Plates
Phosphor-
Coated
Screen
Focusing
System
Base
Electron
Beam
Connector
Pins
Electron
Gun
Horizontal
Deflection
Plates

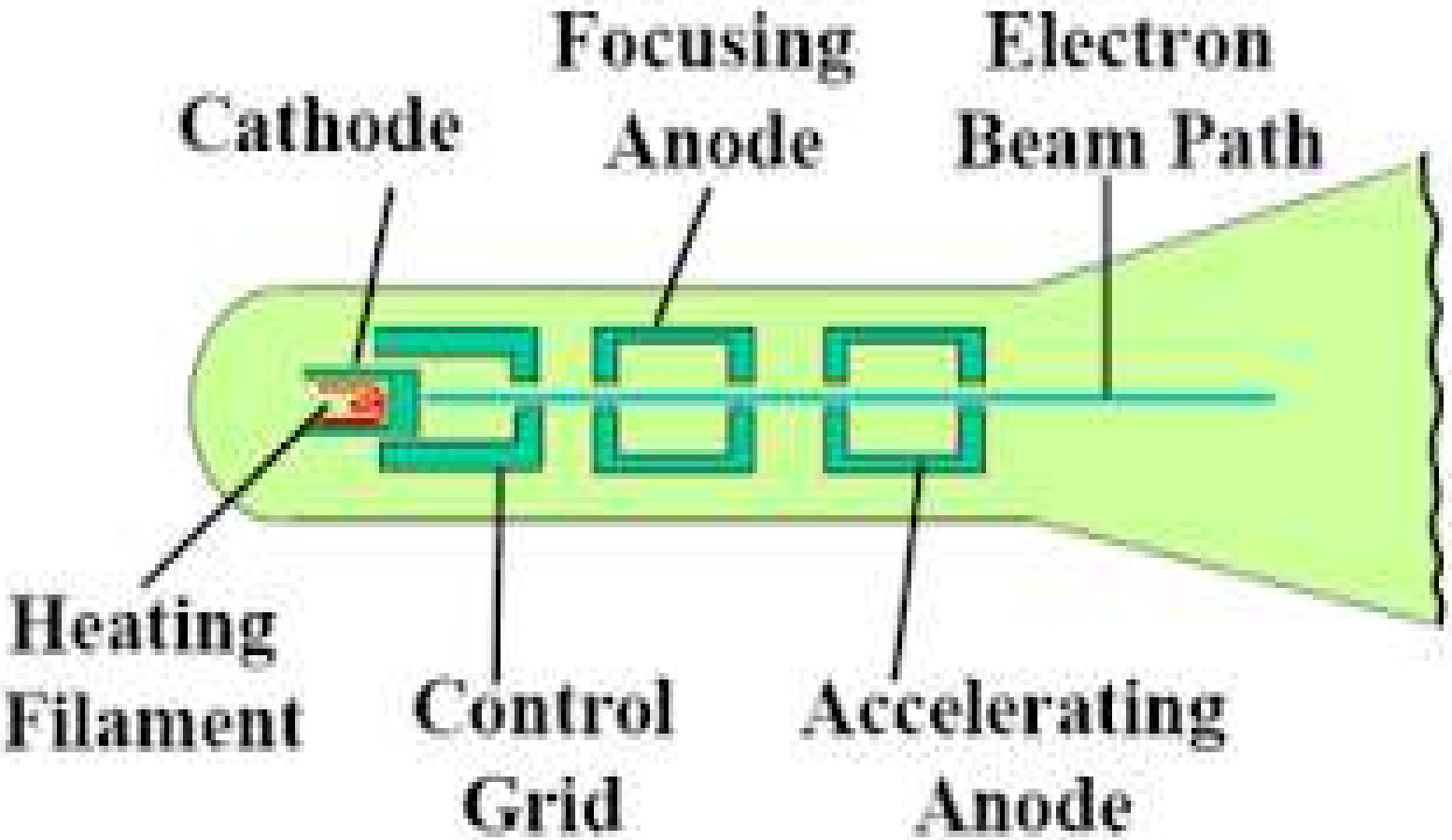
Electron Gun



- Major elements are the heated metal cathode and the control grid
- Heat is supplied to the cathode by directing a current through filament
- This causes electrons to be ‘boiled off’ the hot cathode surface

- Intensity of the electron beam is controlled by setting voltage levels on the control grid
- A **high positive voltage** accelerates the free, negatively charged electrons towards the phosphor coating
- A **high negative voltage** applied to the control grid will shut off the beam by repelling electrons
- A **smaller negative voltage** on the control grid simply decreases the no of electrons passing through.
- We control the **brightness of a display** by varying the voltage on the control grid.

The accelerating anode



- The accelerating voltage can be generated with an accelerating anode
- Sometimes the electron gun is built to contain the accelerating anode and focusing system within the same unit.

The focusing system

- Used to force the electron beam to converge into a small spot as it strikes the phosphor.
- Focusing is accomplished with either **electric fields or magnetic fields**
- Electrostatic focusing is commonly used in TV and computer graphics monitors.

- With electrostatic focusing, the electron beam passes through a positively charged metal cylinder that forms **an electrostatic lens**.
- The action of the electrostatic lens focuses the electron beam at the center of the screen.
- **Magnetic lens** focusing produces the smallest spot size on the screen and is used in special purpose devices.

The deflection system

- The system is used to control the deflection
- When electrostatic deflection is used, two pairs of parallel plates are mounted inside the CRT envelope.
- One pair of plates is mounted horizontally, to control the vertical deflection, and the other pair is mounted vertically, to control horizontal deflection

Phosphor screen

- Different kinds of phosphors are available for use in a CRT.
- Besides color, a major difference between phosphors is their ***persistence:***
- How long they continue to emit after the CRT beam is removed.

- **Persistence is defined as the time it takes the emitted light from the screen to decay to one-tenth of its original intensity**.
- Lower persistence phosphors require higher refresh rates to maintain a picture on the screen without flicker.
- A phosphor with **low persistence** is **useful for animation;**
- **A high-persistence** phosphor is **useful for displaying highly complex, static pictures**

- Another important properties of phosphor includes **Resolution and Aspect Ratio**
- The maximum number of points that can be displayed without overlap on a CRT is referred to as the **resolution.**
- **Number of pixels per square inch is called resolution**

- The ratio of vertical points to horizontal points necessary to produce equal-length lines in both directions on the screen is known as **Aspect Ratio**.
- An aspect ratio of ¾ means that a vertical line plotted with 3 points has the same length as a horizontal line plotted with 4 points