C E – 119
Computing Fundamentals (CF)

Compiled By:

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CE - 119 : Computing Fundamentals (CF)

- **Course Objectives:**
  - This course covers the concepts and fundamentals of computing and programming. Topics includes history, components of computers, hardware, software, operating systems, database, networks, number systems and logic gates. Also it includes programming topics such as basic building blocks, loop, decision making statements.

CE - 119 : Computing Fundamentals (CF)

- **Course Learning Outcomes (CLO)**

CLO No.	Outcome Statement	Level *
1	**Explain** the fundamental knowledge and concepts about computing infrastructure including hardware, software, database and networks.	C2
2	**Applying** and Implementing number systems and logic gates.	C3
3	**Applying** and Implementing problem solving skills and solve problems incorporating the concept of programming.	C3

Bloom's taxonomy level. C: Cognitive, P: Psychomotor, A: Affective

Books

- **Text Books**

1. Introduction to Computers, *Peter Norton*, 6th Edition, McGraw-Hill
2. Introduction to Programming using Python, *Daniel Liang*
3. Computing Essentials, *Timothy O'Leary and Linda O'Leary*

- **Reference Books:**

1. Discovering Computers, *Misty Vermaat and Susan Sebok*, Cengage Learning
2. Using Information Technology: A Practical Introduction to Computers & Communications, *Williams Sawyer*, 9th Edition, McGraw-Hill
3. Introduction to Python, *Paul Deitel, Harvey Deitel*

Marks Distribution

- **Total Marks (Theory) _____ 100**
  - Mid Term _____ 25
  - Assignments + Quizzes + Presentation _____ 25
  - Semester Final Examination Paper _____ 50
- **Total Marks (Laboratory) _____ 50**
  - Lab File _____ 15
  - Lab Exam/Quiz _____ 20
  - Lab Exam/Quiz (Theory Teacher) _____ 15

Course Instructors

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CE – 119: Computing Fundamentals

Chapter

2

I/O Devices & Peripherals

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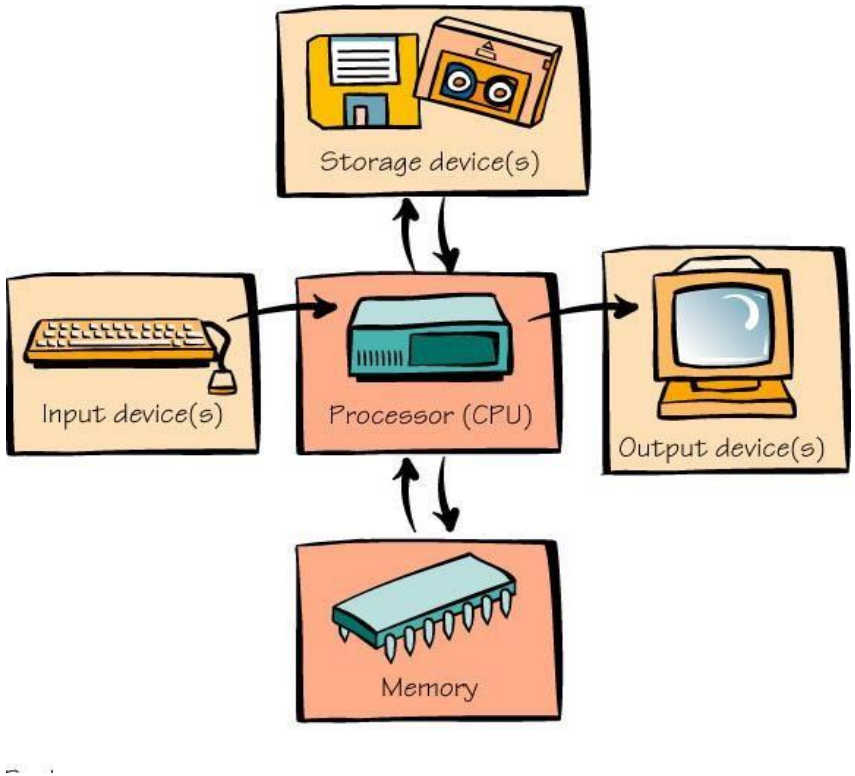
What Computers Do?

- Four basic functions of computers include:
  - Receive input
  - Process information
  - Produce output
  - Store information



Input Devices

- Computers accept information from the outside world.
- The keyboard is the most common input device.
- Pointing devices like the mouse also receive input.

Input Devices

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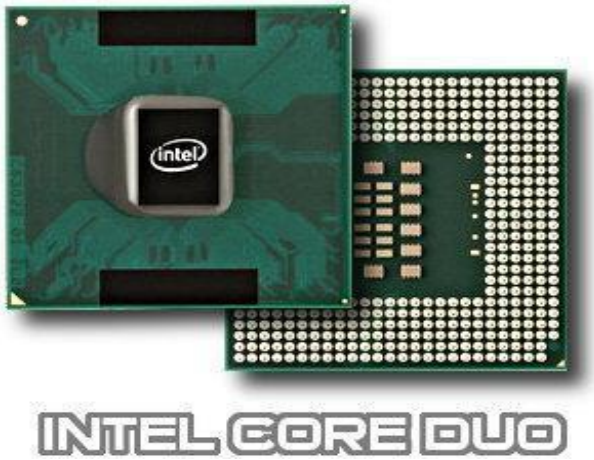
Process

- The processor, or **central processing unit** (CPU), processes information, and performs all the necessary arithmetic calculations.
- CPU is like the ***"brain"*** of the computer.



Process

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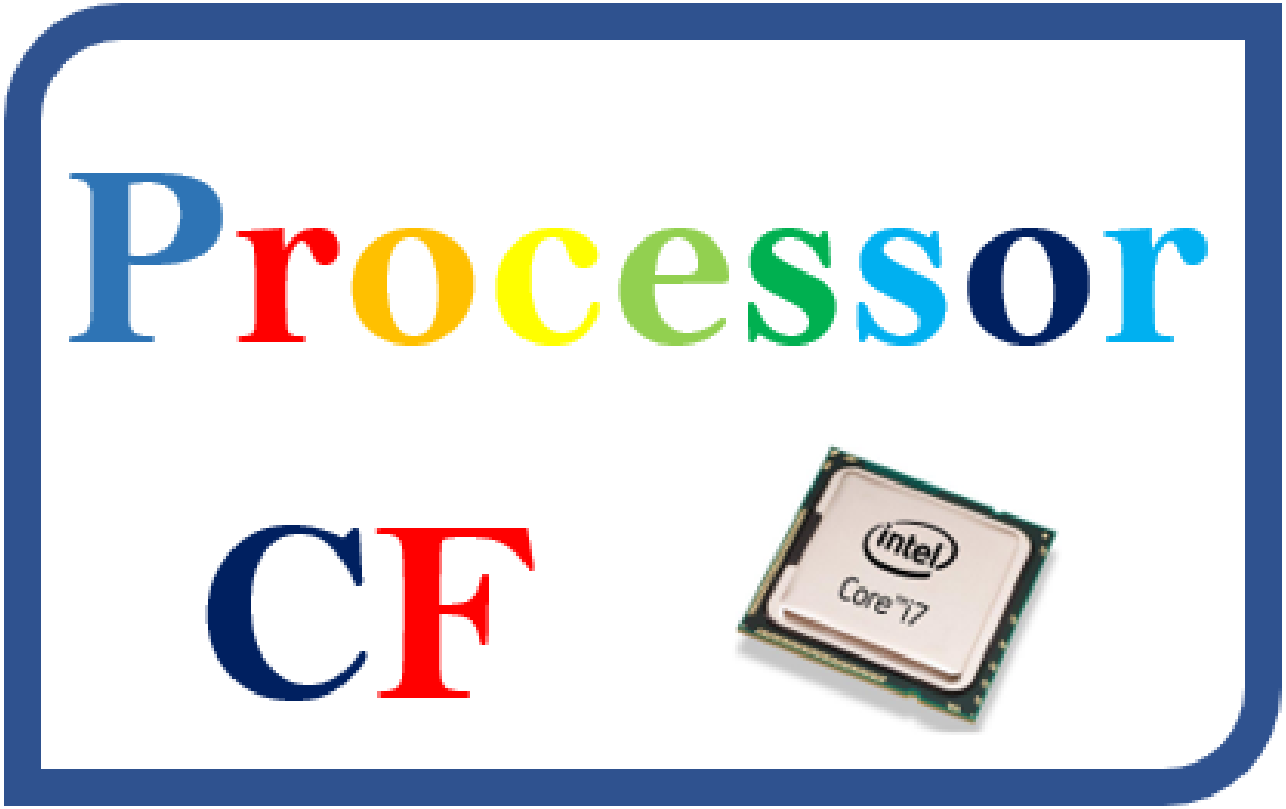

Output Devices

- Computers produce information and send it to the outside world.
- A **video monitor** is a common output device.
- **Printers** also produce output.

Output Devices

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Output Devices

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Storage Information

- Memory and storage devices are used to store information.
- **Primary storage** is the computer's main memory.
- **Secondary storage** uses disks or other media.

Storage Information

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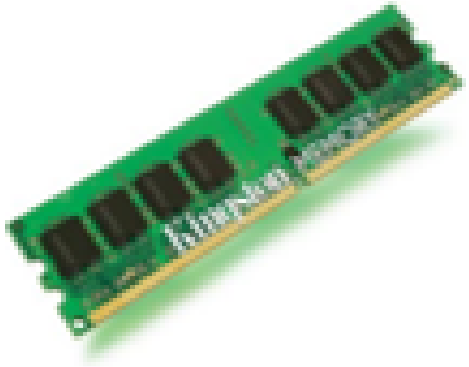
RAM

CF



Storage Information

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Storage Information

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Computer's Core: The CPU and Memory

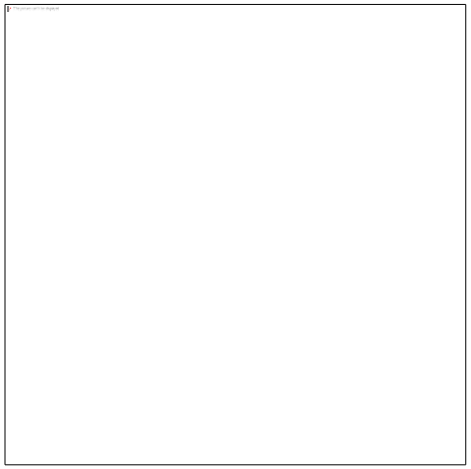
- When you purchase a computer, the selection of the CPU is a very important choice.
- There are two factors that are very important to computer users are:
  - Compatibility
  - Speed

Compatibility

- Not all software is compatible with any given CPU. Each computer has a unique **instruction set -** a vocabulary of instructions the processor can execute.
- New microprocessors can usually run older software, but new software is not usually compatible with old microprocessors.

Speed

- The computer’s speed is measured by the speed of its internal clock - a device to synchronize the electric pulses.
- Speed is measured in units called megahertz (MHz).



Primary Storage: The Computer's Memory

RAM (Random Access Memory):

- RAM is the most common type of primary storage, or computer memory.
- used to store program instructions and data temporarily
- unique addresses and can store in any location
- can quickly retrieve information
- will not remain if power goes off (**volatile**).

Primary Storage: The Computer's Memory

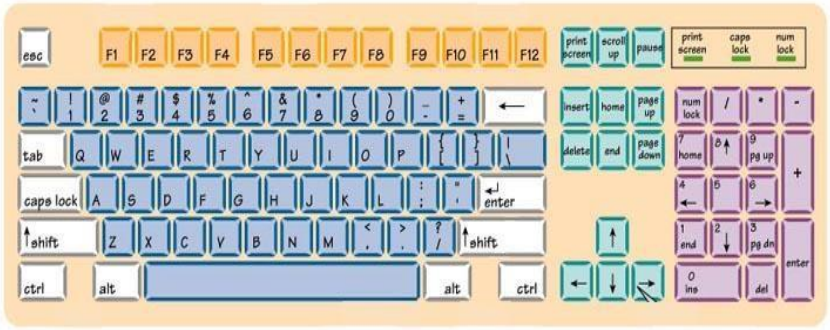
- **ROM**

  (Read-Only Memory):

  - information is stored permanently on a chip.
  - contains startup instructions and other permanent data.

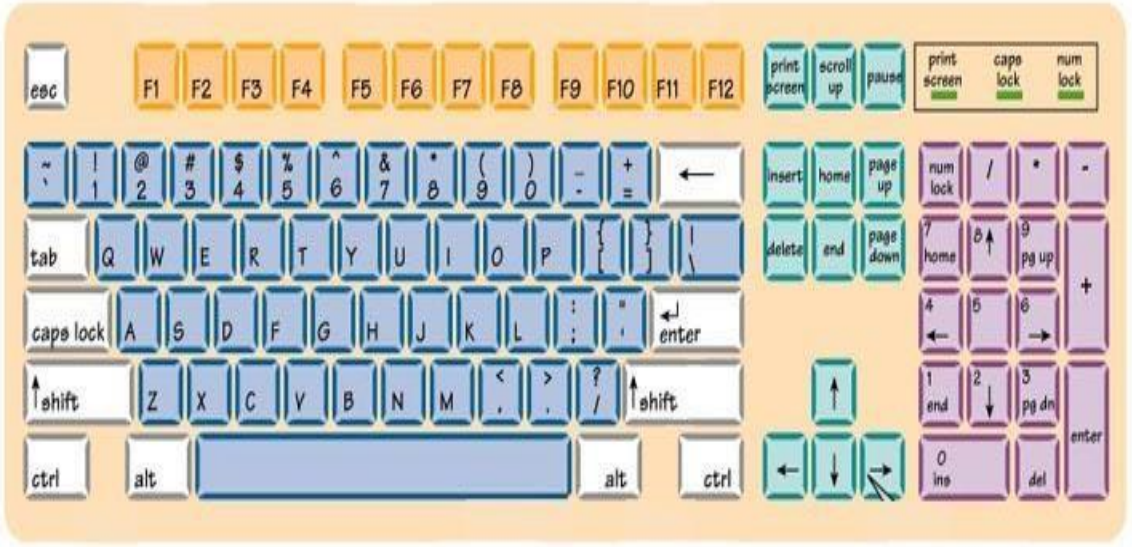
The Keyboard

- A standard computer keyboard has about 100 keys.
- Most keyboards use the **QWERTY** layout, named for the first six keys in the top row of letters.



The Omnipresent Keyboard

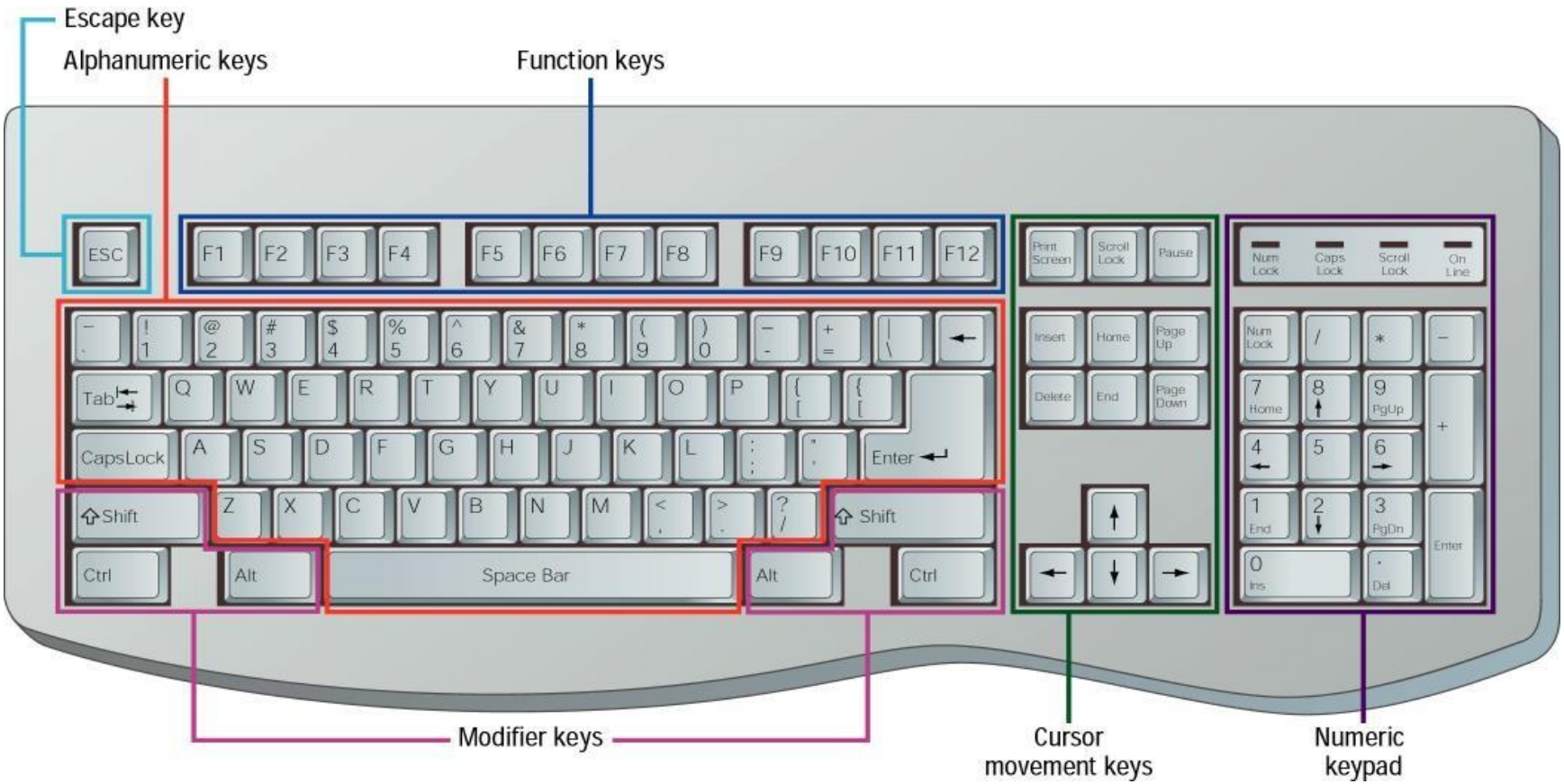
- Do you know where these keys are located on the keyboard and how to use them?
  - **Letters**, **Numbers**, **Cursor** Keys, **Delete** Key, **Enter** (Return) Key, and **Function** Keys



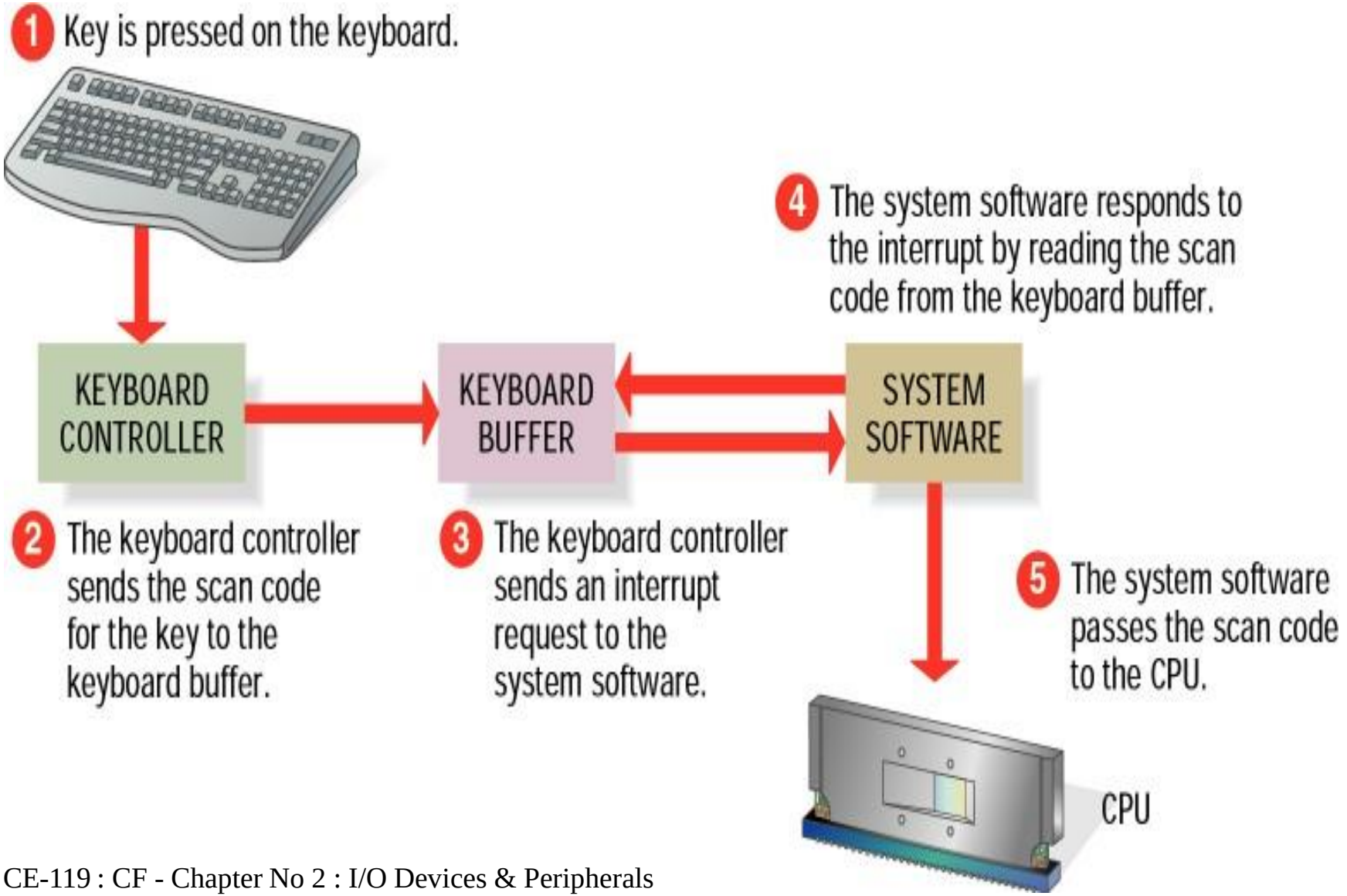
Standard Keyboard Layout

- Most keyboards have keys arranged in five groups:
  - Alphanumeric keys
  - Numeric keypad
  - Function keys
  - Modifier keys
  - Cursor-movement keys

Standard Keyboard Layout



Working of Keyboard



Pointing Devices

Mouse

Joystick

Touch Screen

Graphics Tablet

Mouse

- The mouse is a pointing device. You use it to move a graphical pointer on the screen.
- The mouse can be used to issue commands, draw, and perform other types of input tasks.

Mouse

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Mouse Techniques

- Using the mouse involves five techniques:
  1. **Pointing**;
     - Move the mouse to move the on-screen pointer.
  2. **Clicking**
     - Press and release the left mouse button once.
  3. **Right-clicking**
     - Press and release the right mouse button.
  4. **Double-clicking**
     - Press and release the left mouse button twice.
  5. **Dragging**
     - Hold down the left mouse button as you move the pointer.

Other Pointing Devices

- **Trackball**
  - A trackball is like a mouse turned upside-down. Use your thumb to move the exposed ball and your fingers to press the buttons.

Other Pointing Devices

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Touchpads or Trackpads

- A touchpad is a touch-sensitive pad that provides the same functionality as a mouse.
  - To use a touchpad, you glide your finger across its surface.
  - Touchpads provide a set of buttons that function like mouse buttons.

Touchpads or Trackpads

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Joystick

- It is also a pointing device.
- It consists of a vertical handle like a gearshift lever mounted on a base with one or two buttons.
- They are primarily used for playing games.
  Joysticks are popular for flight simulator and driving games.

Joystick

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Alternative Input Devices

- Light Pens
- Pen-based Systems
- Touch Screens
- Digitizing Tablets

CRT

(Cathode Ray Tube)

LCD

(Liquid Crystal Display)

Types of Monitor

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CRT

CF

Types of Monitor

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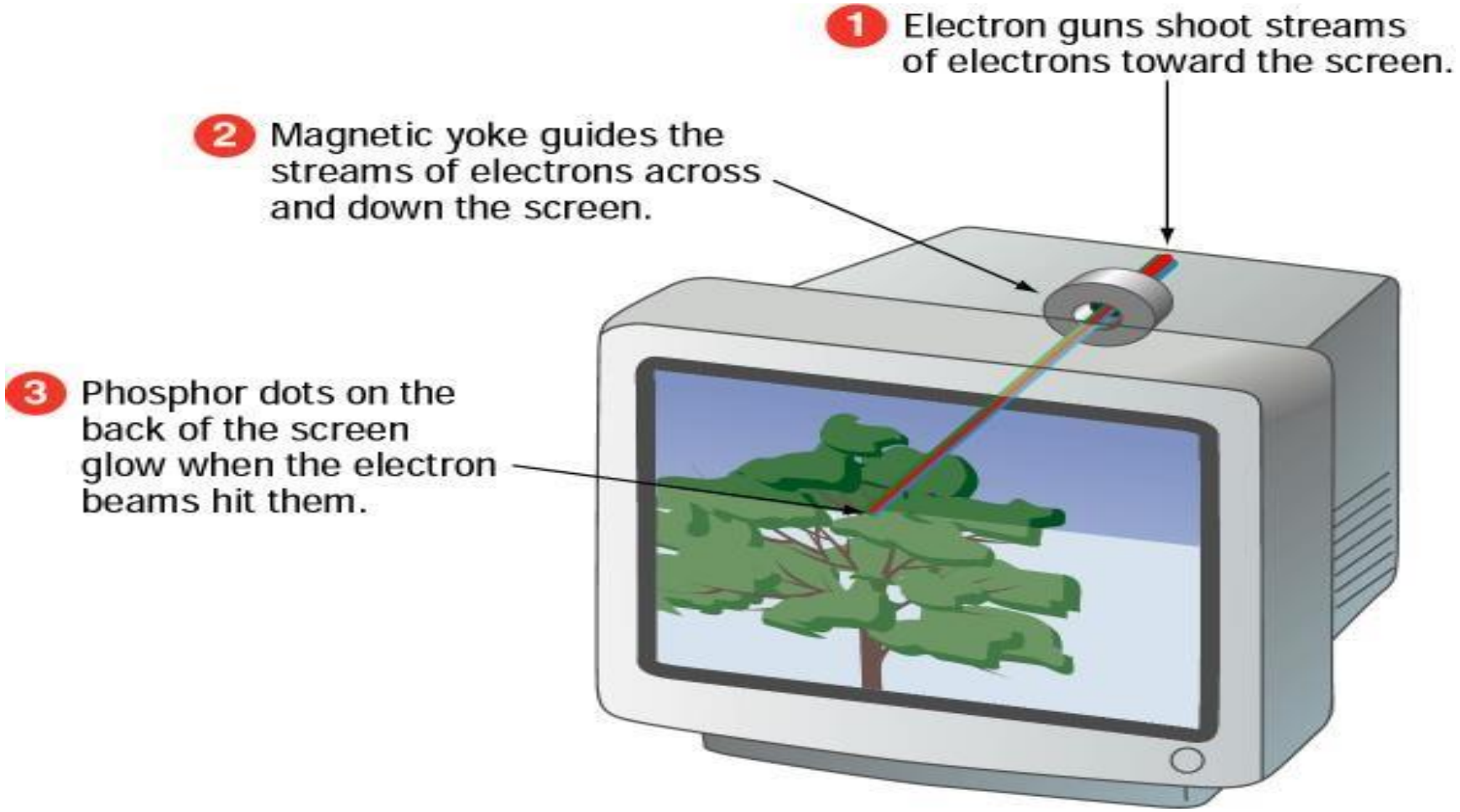
Types of Monitor

CRT Monitor	LCD Monitor
1. It is less expensive than a LCD monitor.	1. It is more expensive than a CRT monitor.
2. It takes more desk space.	2. It takes less desk space.
3. It uses more energy than LCD monitor.	3. It uses less energy than CRT monitor.
4. It uses picture tube technology.	4. It uses liquid crystal technology.
5. Its weight is more than LCD.	5. Its weight is less than CRT.
6. It emits harmful radiation.	7. It does not emit harmful radiation.

CRT Monitors

- In CRT monitors, electrons are fired at phosphor dots on the screen.
- The dots are grouped into pixels, which glow when struck by electrons.
- In color CRTs, each pixel contains a red, green, and blue dot. These glow at varying intensities to produce color images.

CRT Monitors



Flat-Panel Displays Monitors

- Most flat-panel monitors use liquid crystal display (LCD) technology or Electro-luminescent (EL).
- Passive matrix LCD uses a transistor for each row and column of pixels.
- Active matrix LCD uses a transistor for each pixel on the screen.
- Thin-film transistor displays use multiple transistors for each pixel.

Factors affecting Screen Clarity

- Resolution
- Refresh Rate
- Dot Pitch

Resolution

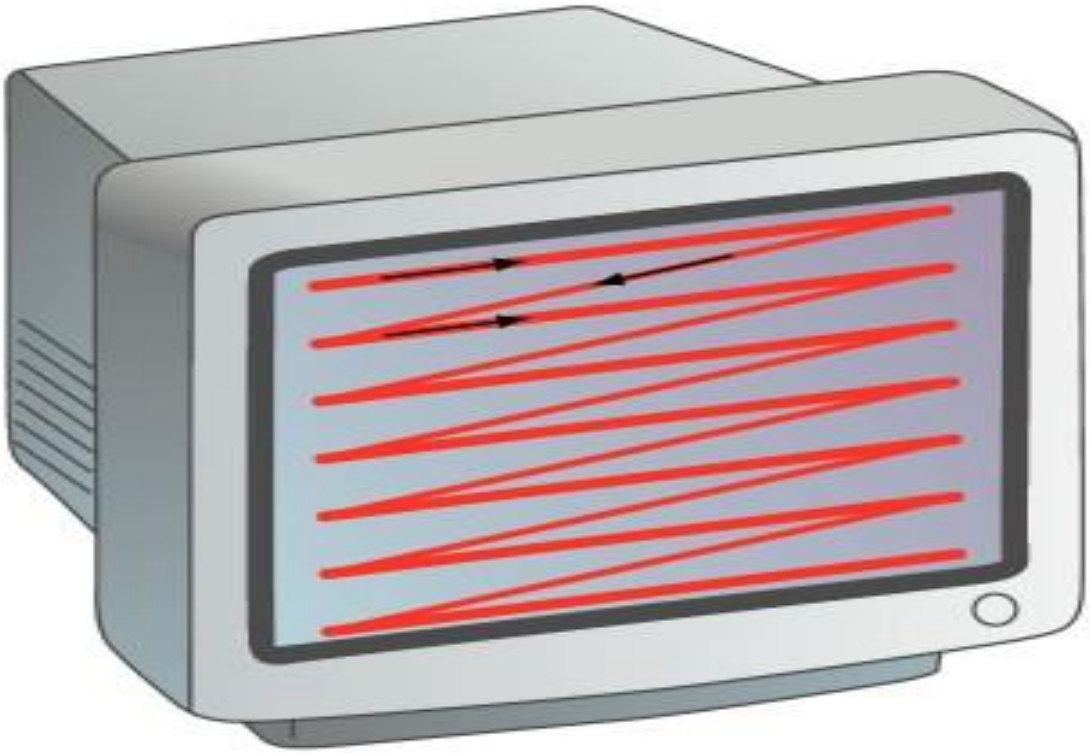
- **Resolution** is the number of pixels on the screen, expressed as a matrix. Example such as 600x800.
- A 17" monitor offers resolutions from 640x480 up to 1280x1024.
- The **Video Graphics Array (VGA)** standard is 640x480. Super VGA (SVGA) monitors provide resolutions of 800x600, 1024x768 or higher.
- **Resolution (image sharpness) is important.**

Refresh Rate

- **Refresh Rate** is the number of times each second that the electron guns scan the screen's pixels.
- Refresh rate is measured in Hertz (Hz), or cycles per second.
- Look for a refresh rate of 72 Hz or higher.
- A slower rate may cause eyestrain.

Refresh Rate

1. The electron gun scans from left to right,



2. and from top to bottom,

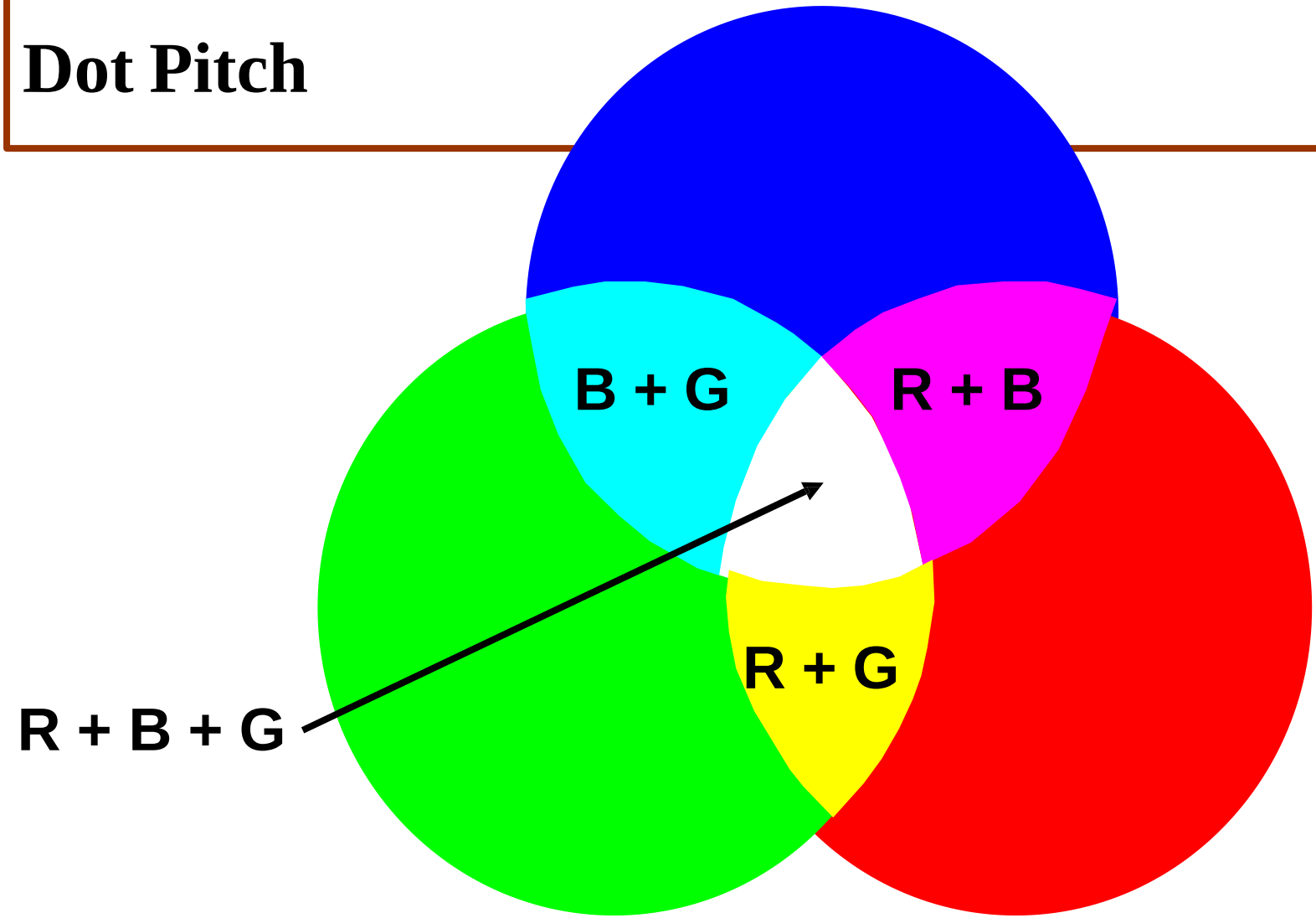
3. refreshing every phosphor dot in a zig-zag pattern.

Fast scanning = Quick refresh (less flicker)

Dot Pitch

- **Dot Pitch** is the distance between the phosphor dots that make up a single pixel.
- In color monitors, three dots (red, green, and blue) comprise each pixel.
- Look for a dot pitch no greater than .31 millimeter.

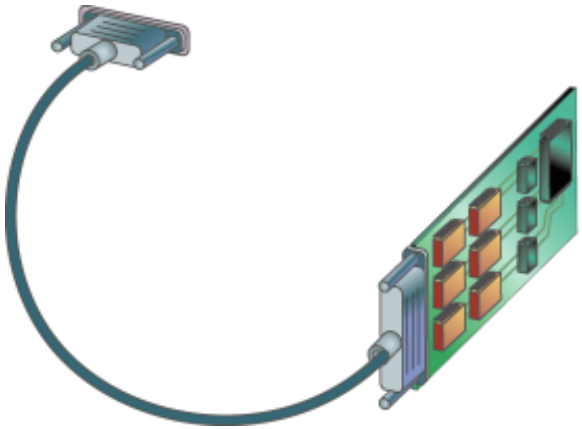
Dot Pitch



Phosphor Dot Color Mixing

Video Controller

- The video controller is an interface between the monitor and the CPU.
- The video controller determines many aspects of a monitor's performance, such as resolution or the number of colors displayed.
- The video controller contains its own on-board processor and memory, called video RAM (VRAM).



Video Controller

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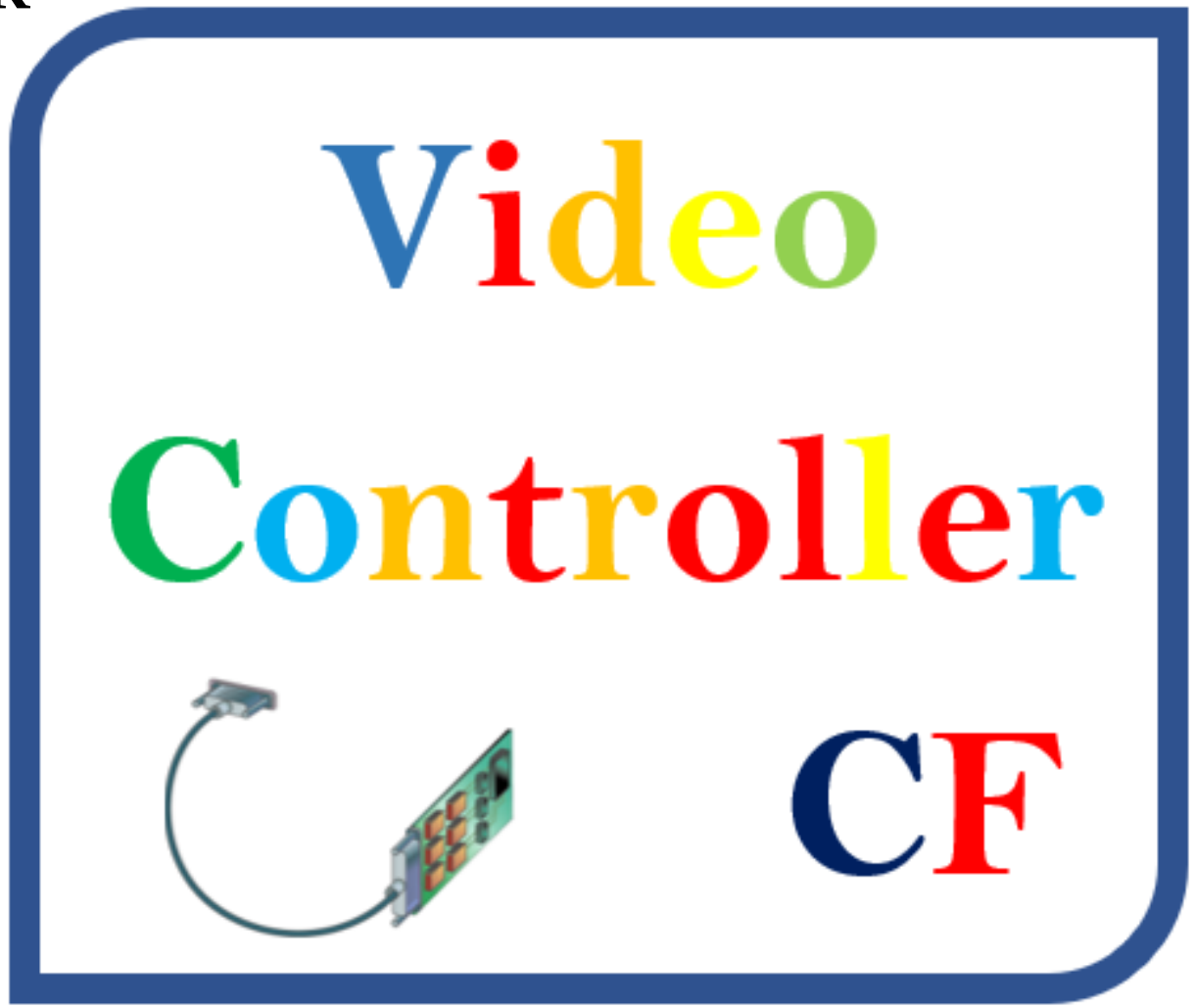
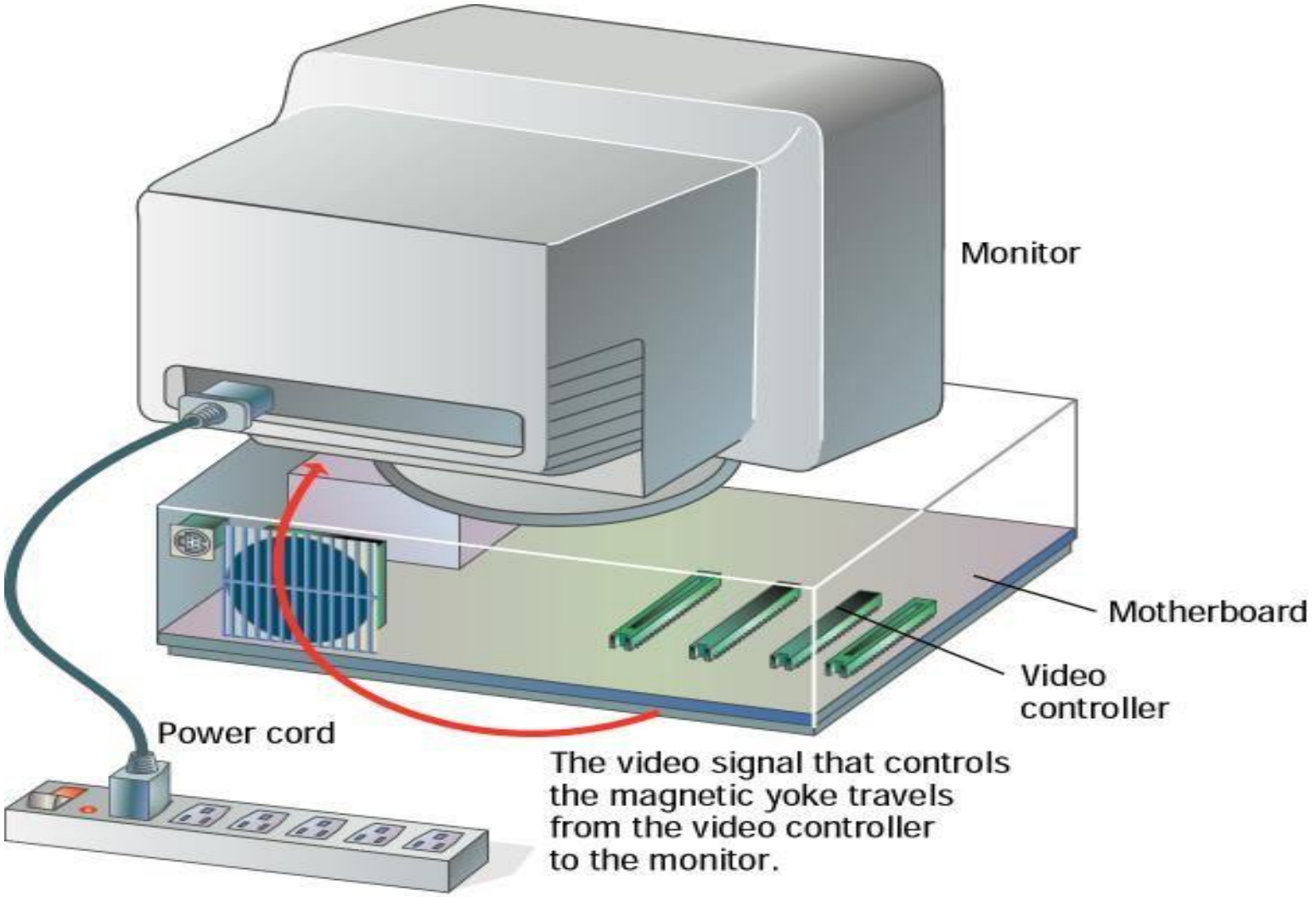


Video Controller



Standards of Monitors

- VGA: Video Graphic Array-
  - Supports 16 x 256 colors depending on the resolution
  - At 320 x 200 pixels: 256 colors
  - At 640 x 480 pixels: 16 colors
- SVGA: Super VGA-
  - 800 x 600 pixels and 1024 x 768 pixels – 256 colors
- XGA: Extended Graphic Array-
  - 16.7 million colors at 1024 x 768 pixels

Printer : Paper Output

- In computer, paper output is sometimes called **Hard Copy**.
- Hard copy come from one of two kinds of printers:
  - Impact Printers
  - Non-Impact Printers

Printer : Paper Output

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Printer Categories

Printers fall into two categories:

- **Impact printers** use a device to strike an inked ribbon, pressing ink from the ribbon onto the paper.

- **Non-impact printers** use different methods to place ink (or another substance) on the page.

Impact Printers

- **Line Printers**
  - Used by mainframes for massive jobs
  - Limited characters available
- **Dot-Matrix Printers**
  - Image formed from dots printed on paper
  - Good for text and graphics
  - Inexpensive

Non-Impact Printers

- **Laser Printers**
  - Image transferred to paper with laser beam
  - Faster and more expensive than dot-matrix
  - High-resolution hard copy

Other Non-Impact Printers

- **Ink-Jet Printers**
  - Dots of ink are sprayed onto the paper to form the image
  - High-resolution hard copy
  - Some models print can print color photographs

Other Non-Impact Printers

- **Plotters**
  - Image transferred to paper with ink pens
  - Very high resolution
  - Excellent for scientific and engineering applications
  - They are mostly used for print-outs that are too large to be printed by printers.

Other Non-Impact Printers

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Printer Quality

When evaluating printers, consider four criteria:

1. **Image quality**– Measured in dots per inch (dpi). Most printers produce 300 – 600 dpi.
2. **Speed**– Measured in pages per minute (ppm) or characters per second (cps).
3. **Initial cost**– Consumer printers cost $250 or less, but professional printers can cost thousands of dollars.
4. **Cost of operation**– This refers to the cost of supplies used by the printer.

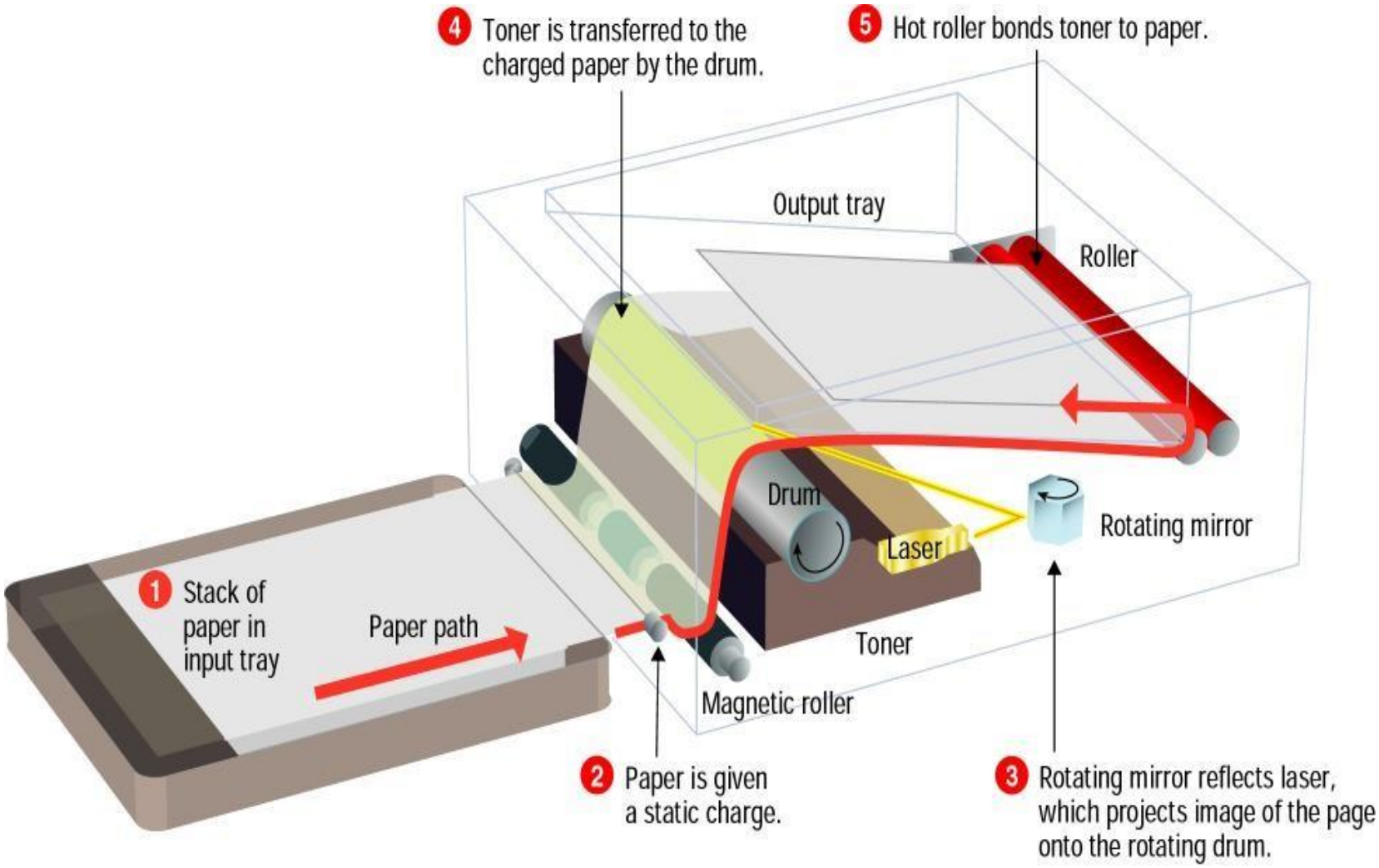
Ink-jet Printers

- Ink jet printers are an example of non-impact printers.
- The printer sprays tiny droplets of ink onto the paper.
- Ink jet printers are available for color and black-and-white printing.
- Ink jet printers offer speeds of (2 – 4 pages per minute ppm) and resolution (300 – 600 dots per inch dpi), comparable to low-end laser printers.

Laser Printer

- Laser printers are non-impact printers.
- They use heat and pressure to bond particles of toner to paper.
- Laser printers provide resolutions from 300 – 1200 dpi and higher.
- Black-and-white laser printers usually produce 4 – 16 ppm.
- Laser printers produce higher-quality print than ink jet printers, but are more costly.

Laser Printer Working



Secondary Storage: Input and Output

- Peripherals with both input and output functions.
- This form of storage is semi-permanent
- Examples include:
  - Magnetic tape
  - Magnetic disks
  - Optical disks

Magnetic Tape

- Magnetic tape is a common form of storage for mainframe computers.
  - Information is accessed sequentially
  - Massive storage for low cost but retrieval is slow
  - DAT (Digital Audio Tape) is preferred for storage on small computers

Magnetic Tape

Floppy Disk

Magnetic Tape

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Magnetic Tape

Hard Disk

Magnetic Tape

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Magnetic Tape

Zip Disks and Zip Drive

Magnetic Tape

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Zip disk

& drive

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Hard Disks

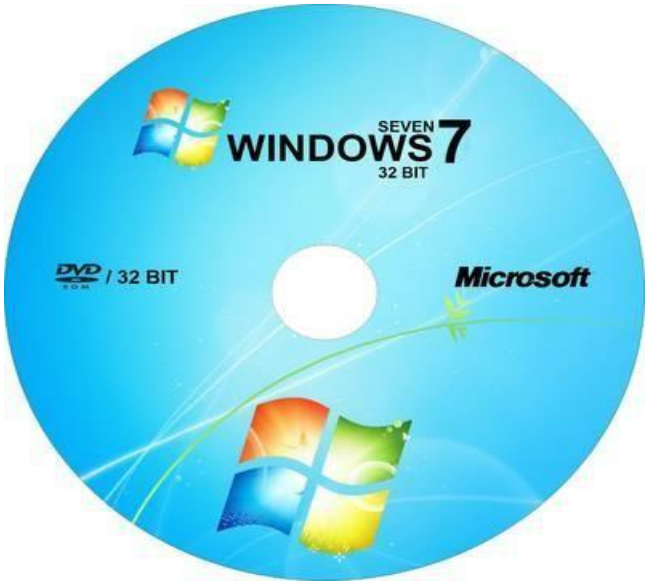
- Hard disks are:
  - Rigid, magnetically sensitive metal disks.
  - Designed so that information can be randomly accessed
  - Designed for large storage capacity
  - Able to access data quickly
  - Not removable from the drive

Diskettes

- Diskettes are:
  - Flexible, magnetically sensitive plastic disks
  - Information can be randomly accessed.
  - Has limited storage capacity
  - Access of data not as quick as hard disks
  - Removable from the drive

CD-ROM

- CD-ROM and magneto-optical disks provide:
  - Random access of information
  - A high storage capacity
  - Are removable from the drive



CD-ROM

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Von Neumann Architecture

- All computers more or less based on the same basic design, the Von Neumann Architecture.
- Model for designing and building computers, based on the following three characteristics:
- The computer consists of four main sub-systems:
  1. Memory
  2. ALU (Arithmetic/Logic Unit)
  3. Control Unit
  4. Input/Output System (I/O)
- Program is stored in memory during execution.
- Program instructions are executed sequentially.

Von Neumann Architecture