



Computer Fundamentals & Programming

Input / Output (I/O)

Input Devices

Topics:

- Input Devices
- Examples of Input Device
- Keyboard
- Pointing Devices
- Graphic and Video Input Devices
- Audio Input Devices

Input Devices

Input Devices

- Any peripheral (piece of computer hardware equipment) used to provide data and control signals to a computer.
- Allows the user to put data into the computer.
- Without any input devices, a computer would only be a display device and not allow users to interact with it.

Input Devices

Examples of Input Device

- Keyboard
- Mouse
- Touchscreen
- Graphic tablet
- Microphone
- Scanner

Razi University
Educational Use



Input Devices

Keyboard

- One of the primary input devices used with a computer.
- The **keyboard** looks very similar to the keyboards of typewriters, with some additional keys.
- Keyboards allow a computer user to input letters, numbers, and other symbols into a computer
- Uses an arrangement of buttons or keys.
- Requires pressing and holding several keys simultaneously or in sequence.

Input Devices

Keyboard



- Typewriter keys
- Function keys
- Enter keys
- System keys
- Numeric keypad
- Other
- Application key
- Cursor control keys

Input Devices

Types of Keyboard

- Standard
- Laptop
- Gaming/Multimedia
- Thumb-sized
- Virtual
- Foldable

Razi University
Educational Use



Input Devices

Types of Keyboard

Standard

- Desktop computer keyboards, such as the 101-key US traditional keyboards or the 104-key Windows keyboards, include alphabetic characters, punctuation symbols, numbers and a variety of function keys.



Input Devices

Types of Keyboard

Laptop Keyboard

- The laptop computer keyboard is a small version of the typical QWERTY keyboard.
- A typical laptop has the same keyboard type as a normal keyboard, except for the fact that most laptop keyboards condense the symbols into fewer buttons to accommodate less space.



Input Devices

Types of Keyboard

Gaming and Multimedia Keyboard

- The gaming keyboards are designed for the convenience of the gamers and these types of keyboards provide the required controls on the keyboards like back lighting.



Input Devices

Types of Keyboard

Thumb-sized keyboard

- Smaller external keyboards have been introduced for devices without a built-in keyboard, such as PDAs, and smartphones.
- Small keyboards are also useful where there is a limited workspace.



Input Devices

Types of Keyboard

Virtual Keyboard

- The virtual keyboards are not actually physical keyboards, but they are simulated using a software.



Input Devices

Types of Keyboard

Foldable Keyboard

- Foldable keyboards are extremely good for travelling.
- Simply roll them up and then unroll them when you need them again.



Input Devices

Keyboard Layouts

- QWERTY
- QWERTZ
- AZERTY
- DVORAK

Razi University
Educational Use

Input Devices

Keyboard Layouts

QWERTY

- Common layout



Input Devices

Keyboard Layouts

QWERTZ

- Used in Germany, Hungary and Czech Republic



Input Devices

Keyboard Layouts

AZERTY

- It is used by most French speakers based in Europe

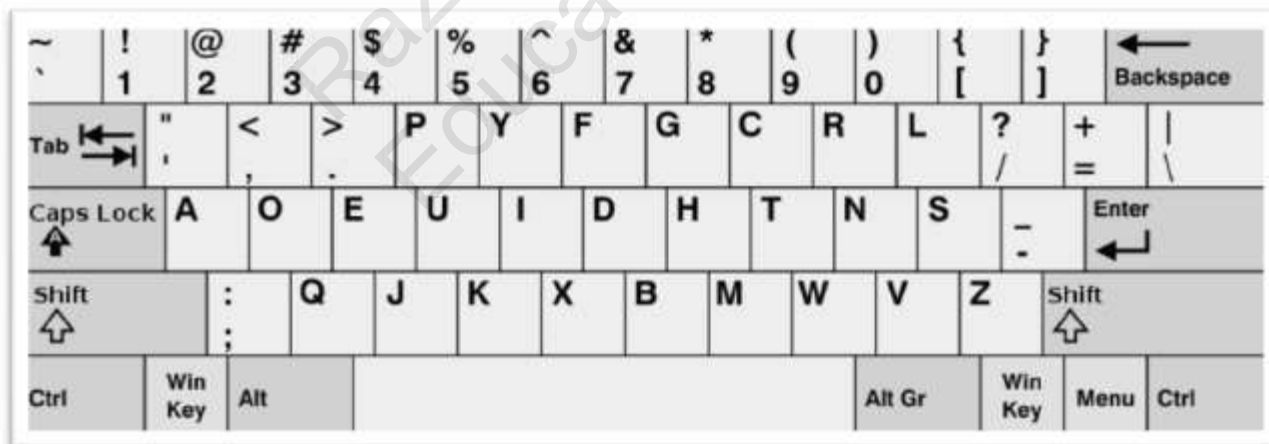
	1 &	2 é ~	3 " #	4 , {	5 ([6 -	7 è	8 _ \	9 ç ^	0 à @	°)]	+ =	←
Tab	A	Z	E	R	T	Y	U	I	O	P	{ [}]	 \ _
Caps	Q	S	D	F	G	H	J	K	L	M	° 	µ *	Enter
Shift	> <	W	X	C	V	B	N	? ,	: ;	/ :	§ !	Shift	
Ctrl	Alt										Alt	Ctrl	

Input Devices

Keyboard Layouts

DVORAK

Dvorak layout uses less finger motion, increases typing rate, and reduces errors compared to the standard QWERTY



Input Devices

Writing keys

Key Type	Example
Alphanumeric	A-Z, 0-9
Punctuation	. , ! “ ?
Modifiers	Shift, Space Bar, Enter, Ctrl, Alt



Input Devices

Keyboard Shortcut Keys

Shortcut Keys	Description
Alt + F	File menu options in current program.
Alt + E	Edit options in current program
F1	Universal Help in almost every Windows program.
Ctrl + A	Select all text.
Ctrl + X	Cut selected item.
Shift + Del	Cut selected item.
Ctrl + C	Copy selected item.
Ctrl + Ins	Copy selected item
Ctrl + V	Paste
Shift + Ins	Paste
Ctrl + P	Print the current page or document.
Home	Goes to beginning of current line.
Ctrl + Home	Goes to beginning of document.
End	Goes to end of current line.
Ctrl + End	Goes to end of document.
Shift + Home	Highlights from current position to beginning of line.
Shift + End	Highlights from current position to end of line.
Ctrl + Left arrow	Moves one word to the left at a time.
Ctrl + Right arrow	Moves one word to the right at a time.

Input Devices

Pointing Devices

- A **pointing device** is a hardware input device that allows the user to move the computer pointer to select items on a display screen.
- Types of pointing device:
 - Based on rolling a ball
 - Based on touching a surface
 - Based on moving stick

Input Devices

Pointing Devices

Based on rolling a ball

- Example:
 - Mouse
 - Trackball

Razi University
Educational Use



Input Devices

Pointing Devices

Mouse

- A device that controls the movement of the cursor or pointer on a display screen.
- The mouse is important for graphical user interfaces because user can simply point to options and objects and click a mouse button.



Input Devices

Pointing Devices

Type of Mouse

- **Mechanical:** Has a rubber or metal ball on its underside that can roll in all directions.
- **Optical:** Uses a laser to detect the mouse's movement.



Input Devices

Pointing Devices

Trackball

- A trackball is a mouse lying on its back.
- To move the pointer, you rotate the ball with your thumb, your fingers, or the palm of your hand
- It does not require much space to use it



Input Devices

Pointing Devices

Based on touching a surface

- Example:
 - Touchpad
 - Graphic tablet
 - Touch screen
 - Light pen
 - Stylus

Input Devices

Pointing Devices

Touchpad

- A small, touch-sensitive pad used as a pointing device on some portable computers.
- By moving a finger or other object along the pad, you can move the pointer on the display screen.



Input Devices

Pointing Devices

Graphic Tablet

- A graphics tablet (or digitizer, digitizing tablet, graphics pad, drawing tablet) is a computer input device that allows one to hand-draw images and graphics, similar to the way one draws images with a pencil and paper.



Input Devices

Pointing Devices

Touchscreen

- A **touchscreen** is an electronic visual display that can detect the presence and location of a touch within the display area.
- The term generally refers to touching the display of the device with a finger or hand.

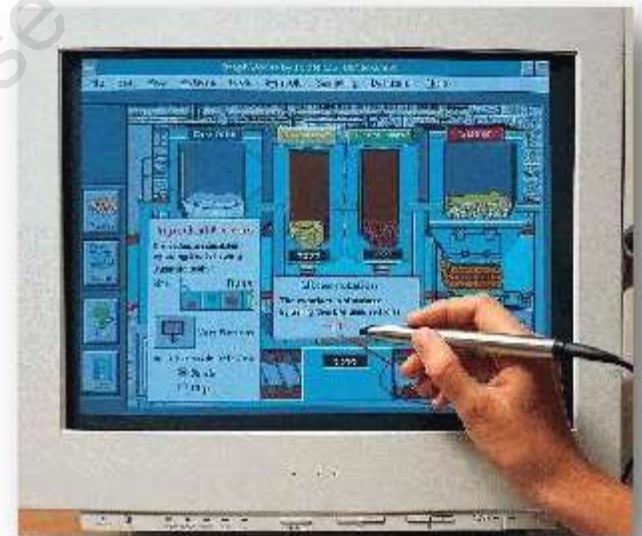


Input Devices

Pointing Devices

Light Pen

- A **light pen** is a computer input device in the form of a light-sensitive wand used in conjunction with a computer's CRT display.
- It allows the user to point to displayed objects or draw on the screen in a similar way to a touchscreen but with greater positional accuracy.



Input Devices

Pointing Devices

Stylus

- A stylus is a small pen-shaped instrument that is used to input commands to a computer screen, mobile device or graphics tablet.



Input Devices

Pointing Devices

Based on moving stick

- Example:
 - Joystick
 - Gamepad

Razi University
Educational Use

Input Devices

Pointing Devices

Joystick

- A **joystick** allows an individual to move an object in a game such as navigating a plane in a flight simulator.



Input Devices

Pointing Devices

Gamepad

- A **gamepad, game controller, joypad, or video game controller** is a peripheral device designed to be connected to a computer or console gaming system.
- It has multiple buttons and may have one or two mini joysticks.



Input Devices

Imaging and Video Input Devices

- Used to digitize images or video from the outside world into the computer.
- Example:
 - Digital camera
 - Webcam
 - Optical scanner
 - 3D scanner
 - Fingerprint scanner
 - Barcode reader

Input Devices

Imaging and Video Input Devices

Digital Camera

- A camera that stores the pictures or video it takes in electronic format instead of to film.
- Digital cameras have become the camera solution for most users today as the quality of the picture they take has greatly improved and as the price has decreased.



Input Devices

Imaging and Video Input Devices

Webcam

- A **webcam** is a hardware camera connected to a computer that allows anyone connected to the Internet to view either still pictures or motion video of a user or other object.



Input Devices

Imaging and Video Input Devices

Optical Scanner

- An **optical scanner** is a hardware input device that allows a user to take an image or text and convert it into a digital file, allowing the computer to read or display the scanned object.
- Two types of scanner:
 - Flatbed
 - Hand-held

Input Devices

Imaging and Video Input Devices

Image Scanner



Flatbed Scanner



Hand-held Scanner

Input Devices

Imaging and Video Input Devices

Image Scanner

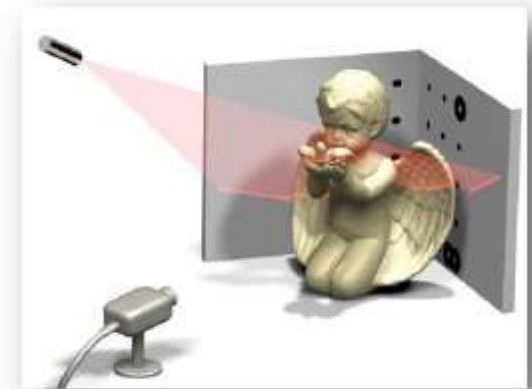
Flatbed Scanner	Handheld Scanner
Flatbed scanners look similar to a small photocopier with the document remaining flat and stationary during the scanning	Hand-held scanners are used for entering text and images that are less than a page wide. Hand-held scanners are adequate for small pictures and photos but are difficult for entire pages.

Input Devices

Imaging and Video Input Devices

3D Scanner

- A 3D scanner is a device that analyzes a real-world object or environment to collect data on its shape and possibly its appearance (i.e. color).
- The collected data can then be used to construct digital, three dimensional models.



Input Devices

Imaging and Video Input Devices

Fingerprint Scanner

- A **fingerprint scanner** or **fingerprint reader** is a hardware device that verifies a user or enters password information by scanning their finger.



Input Devices

Imaging and Video Input Devices

Barcode Reader

- A **barcode reader** or **scanner** is a hardware device capable of reading a barcode and printing out the details of the product or logging that product into a database.



Input Devices

Audio Input Devices

- Audio input devices allow a user to send audio signals to a computer for processing, recording, or carrying out commands.
- Example:
 - Microphone
 - MIDI keyboard

Input Devices

Audio Input Devices

Microphone

- A **microphone** is a hardware peripheral that allows computer users to input audio into their computers.



Input Devices

Audio Input Devices

MIDI Keyboard

- A **MIDI (Musical Instruments Digital Interface) keyboard** is typically a piano-style user interface keyboard device used for sending MIDI signals to a computer.
- MIDI information is sent to a computer that capable of reproducing an array of digital sounds or samples that resemble traditional analog musical instruments.

Input Devices

Audio Input Devices

MIDI Keyboard



Output Devices

Topics:

- Output Devices
- Examples of Output Device
- Printer
- Monitor
- Speakers
- Projector

Output Devices

Razi University
Educational Use

Output Devices

Output Devices

- Any peripheral that receives or displays output from a computer.
- Computer hardware equipment used to communicate the results of data processing carried out by a computer to the outside world.

Output Devices

Examples of Output Device

- Monitor
- Printer
- Speakers
- Projector

Razi University
Educational Use



Output Devices

Monitor

- The device which displays computer output.
- The monitor displays the video and graphics information generated by the computer through the video card.
- Monitors are very similar to televisions but usually display information at a much higher resolution.

Output Devices

Monitor

Monochrome Monitor

- A **monochrome monitor** is a type of CRT computer display which was very common in the early days of computing, from the 1960s through the 1980s, before color monitors became popular.
- They are still widely used in applications such as computerized cash register systems



Output Devices

Monitor

Monochrome Monitor

- Monochrome monitors actually display two colors, one for the background and one for the foreground.
- The colors can be black and white, green and black, or amber and black.

Output Devices

Monitor

Color Monitor

- Color monitors can display anywhere from 16 to over 1 million different colors.
- Color monitors are sometimes called RGB monitors because they accept three separate signals -- red, green, and blue.



Output Devices

Types of Monitor

- Cathode Ray Tube (CRT)
- Liquid Crystal Display (LCD)
- Light-emitting Diode (LED)

Razi University
Educational Use

Output Devices

Types of Monitor

Cathode Ray Tube (CRT)

- Large
- Heavy
- Produce heat
- Not expensive



Output Devices

Types of Monitor

Liquid Crystal Display (LCD)

- Less space
- Lighter
- Low power consumption
- Expensive
- Limited viewing angle



Output Devices

Types of Monitor

Light-emitting Diode (LED)

- Less space
- Lighter
- Very expensive
- Provide higher contrast and better viewing angles than LCD monitor

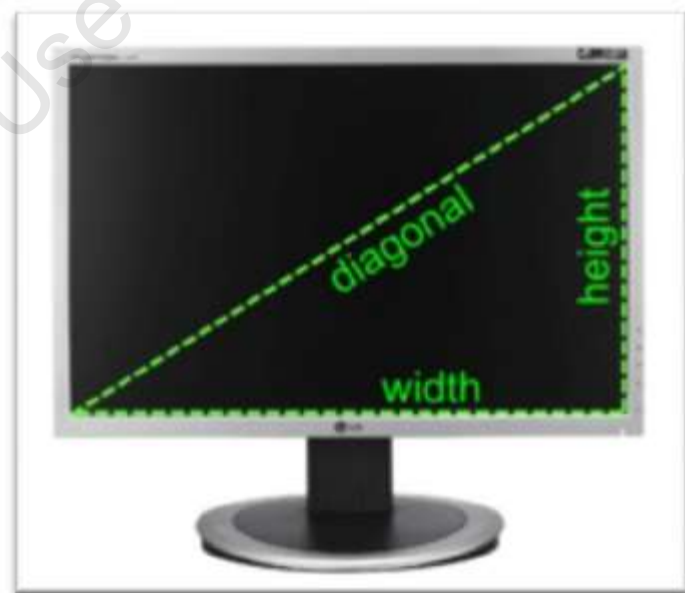


Output Devices

Monitor Features

Screen Size

- The actual amount of screen space that is available to display a picture, video or working space
- Desktop screens are usually 14 - 25 inches by diagonal measurement.



Output Devices

Monitor Features

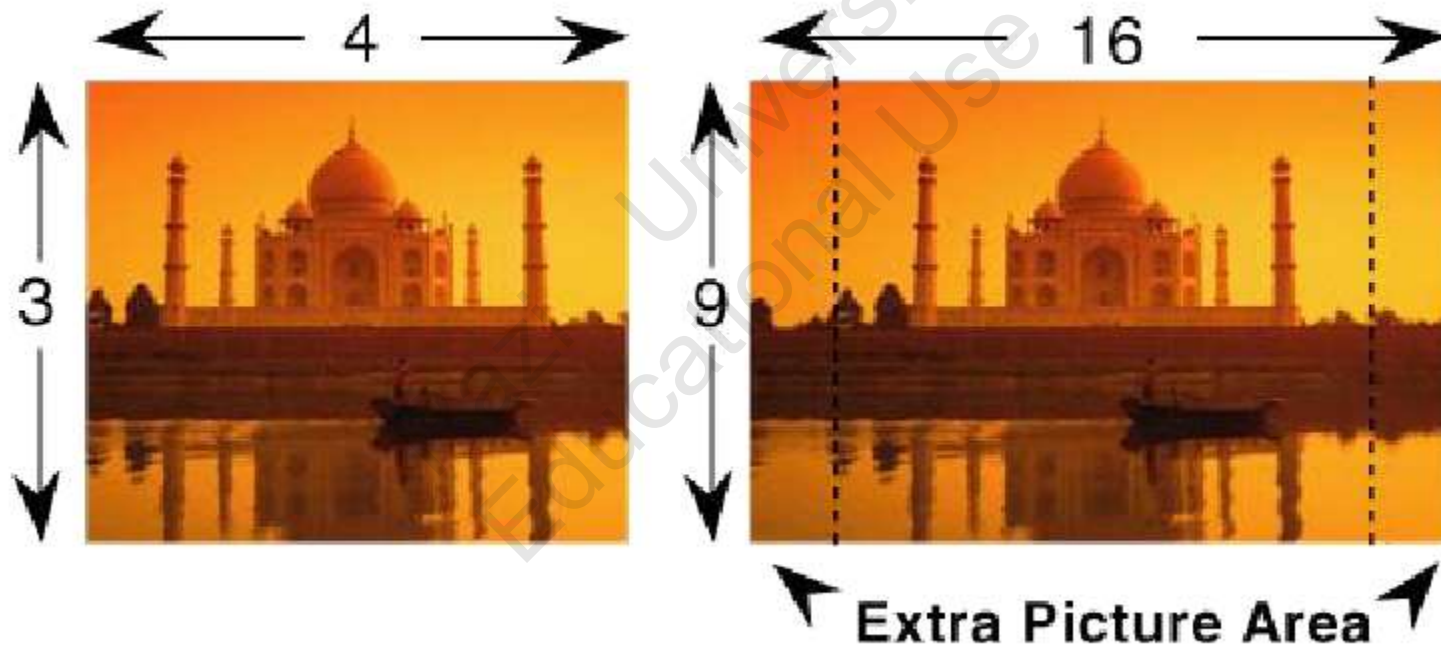
Aspect Ratio

- The aspect ratio of a display is the fractional relation of the width of the display area compared to its height.
- Two common aspect ratio:
 - 4:3
 - 16:9

Output Devices

Monitor Features

Aspect Ratio



Output Devices

Monitor Features

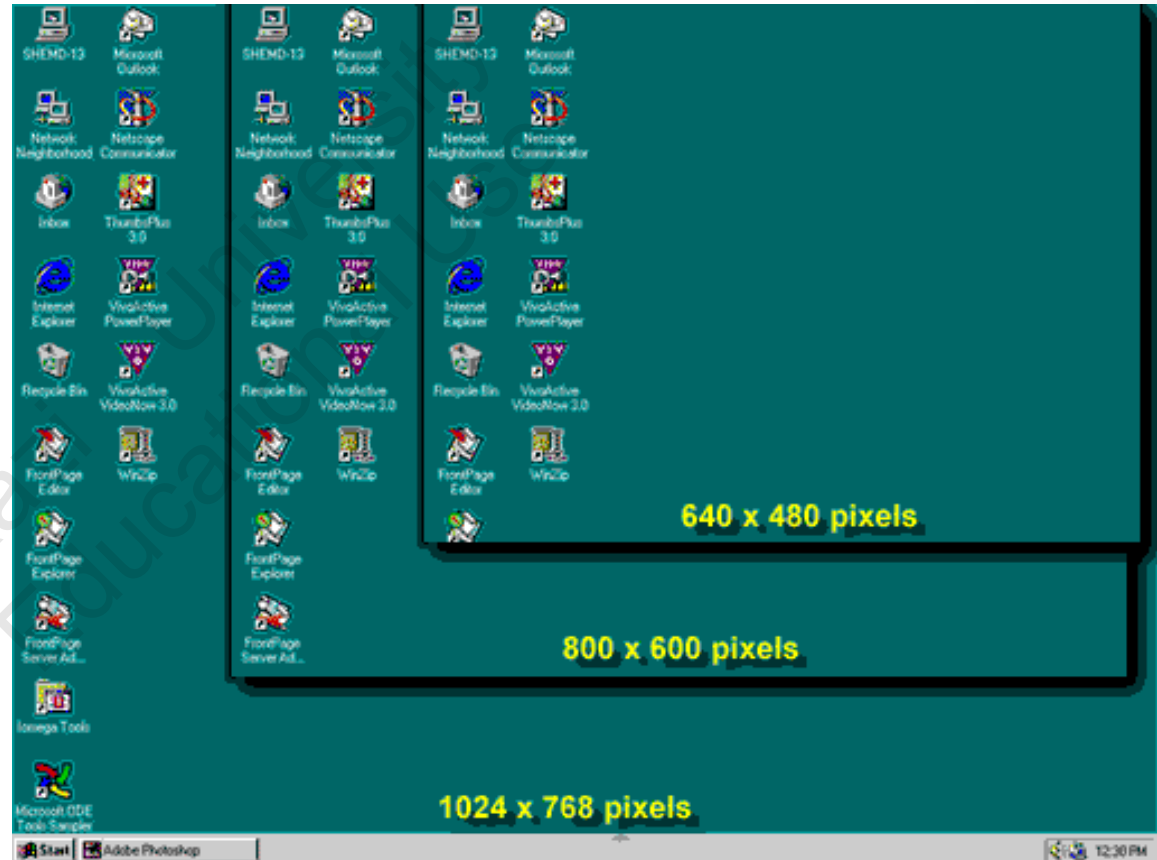
Display Resolution

- The resolution of a monitor indicates how densely packed the pixels are.
- In general, the more pixels (often expressed in dots per inch), the sharper the image.
- Most modern monitors can display 1024 by 768 pixels, the SVGA standard.
- Some high-end models can display 1280 by 1024, or even 1600 by 1200.

Output Devices

Monitor Features

Display Resolution



Output Devices

Monitor Features

Refresh Rate

- The refresh rate is the number of times in a second that a monitor draws the data.
- The *refresh rate* for a monitor is measured in hertz (Hz)
- The standard refresh rate is 75Hz, this means that the monitor redraws the display 75 times per second.
- A flickering monitor can contribute to eyestrain and headaches.
- The faster the refresh rate, the less the monitor flickers.

Output Devices

Monitor Features

Color Depth

- Color depth describes how many colors that can be displayed on a monitor's screen.
- Common color depths used by monitor:
 - 4-bit (EGA) = 16 colors
 - 8-bit (VGA) = 256 colors
 - 16-bit (High Color) = 65,536 colors
 - 24-bit (True Color) = 16 million colors

Output Devices

Monitor Features

Color Depth



EGA Monitor



VGA Monitor



Output Devices

Printer

- Printer is an external hardware device responsible for taking computer data and generating a hard copy of that data.
- Printers are one of the most used peripherals on computers and are commonly used to print text, images, and photos.

Output Devices

Types of Printer

Printers can be categorized into:

- Impact Printer
- Non-Impact Printer

Razi University
Educational Use

Output Devices

Impact Printer

- It strikes paper and ribbon together to form a character, like a typewriter.

Advantages	Disadvantages
<ul style="list-style-type: none">• Less expensive• Can make multiple copies with multipart paper	<ul style="list-style-type: none">• Noisy• Print quality lower in some types• Poor graphics or none at all• Slow

Output Devices

Impact Printer

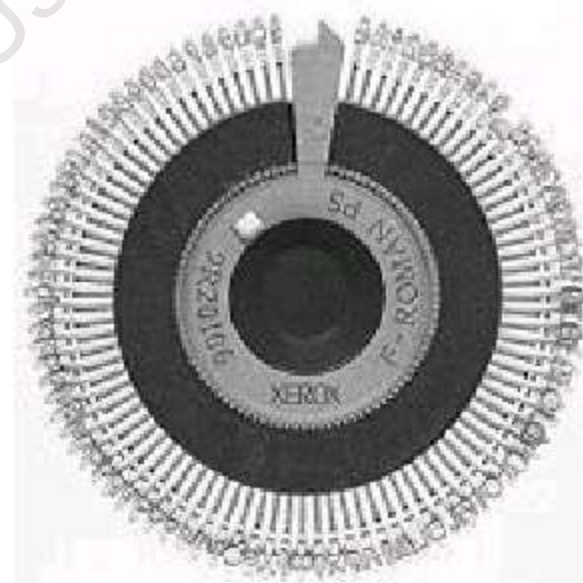
Daisy-wheel

- Similar to a ball-head typewriter, this type of printer has a plastic or metal wheel on which the shape of each character stands out in relief.
- A hammer presses the wheel against a ribbon, which in turn makes an ink stain in the shape of the character on the paper.
- Daisy-wheel printers produce letter-quality print but cannot print graphics.

Output Devices

Impact Printer

Daisy-wheel



Output Devices

Impact Printer

Dot-Matrix

- Creates characters by striking pins against an ink ribbon.
- Each pin makes a dot, and combinations of dots form characters and illustrations.

Output Devices

Impact Printer

Dot-Matrix



Output Devices

Non-Impact Printer

- It uses ink spray, toner powder or inkless

Advantages	Disadvantages
<ul style="list-style-type: none">• Quiet• Can handle graphics and often a wider variety of fonts than impact printers• Fast	<ul style="list-style-type: none">• More expensive• Occupies a lot of space• The cost of maintaining is high

Output Devices

Non-Impact Printer

Laser Printer (Toner-based)

- A laser printer rapidly produces high quality text and graphics.
- Laser printers are often used in corporate, school, and other environments that require print jobs to be completed quickly and in large quantities.



What is printer toner made out of?

Toner is a powder used in laser printers and photocopiers to form the printed text and images on the paper, in general with a toner cartridge. In its early form it was a mix of carbon powder and iron oxide. Then, to improve the quality of the printout, the carbon was melt-mixed with a polymer.

Output Devices

Non-Impact Printer

Multifunction Printer (Toner-based)

- An **MFP** is an office machine which incorporates the functionality of multiple devices in one.
- A typical MFP may act as a combination of some or all of the following devices:
 - Printer
 - Scanner
 - Photocopier
 - Fax



Output Devices

Non-Impact Printer

Ink-jet Printer

- Inkjet printer operates by propelling variably-sized droplets of liquid or molten material (ink) onto almost any sized page.



Output Devices

Non-Impact Printer

Thermal Printer (Inkless)

- Thermal printers work by selectively heating regions of special heat-sensitive paper.
- These printers are commonly used in calculators and fax machines; and although they are inexpensive and print relatively fast, they produce low resolution print jobs.



Output Devices

Printing Speed

The printing speed is measured in:

- **cps** (characters per second)
- **lpm** (lines per minute)
- **ppm** (pages per minute)

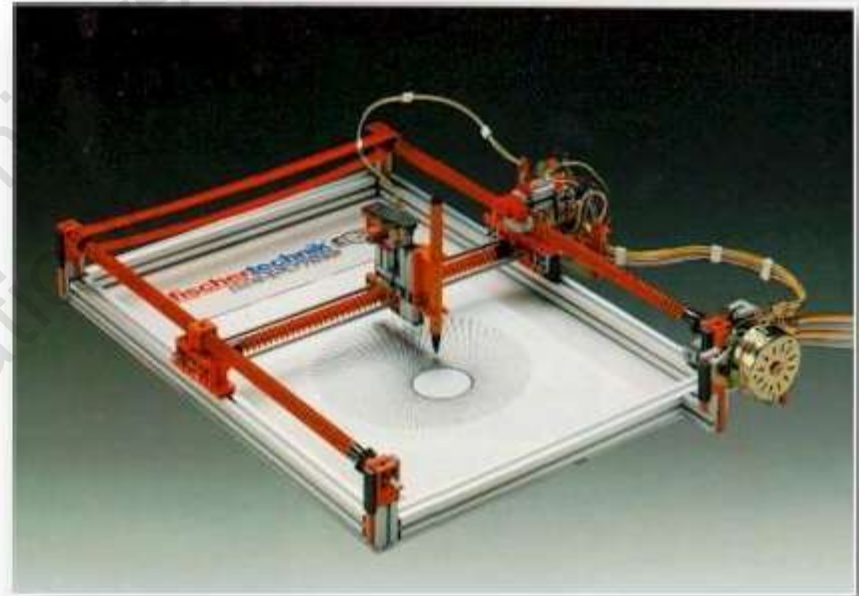
Output Devices

Plotter

- The **plotter** is a computer printer for printing vector graphics
- Plotters are used in applications such as computer-aided design such as diagrams, layouts, specification sheets and banners
- The plotter is capable of producing color drawings in a matter of minutes
- Plotters differ from printers in that they draw lines using a pen
- Plotters are considerably more expensive than printers

Output Devices

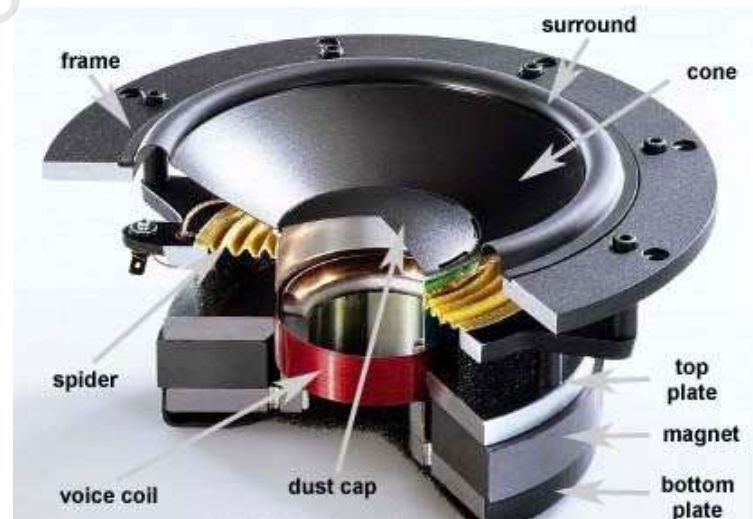
Plotter



Output Devices

Speakers

- A hardware device connected to a computer's sound card that outputs sounds generated by the computer.
- Speakers can be used for various sounds meant to alert the user, as well as music and spoken text



Output Devices

Headphones

- Headphones give sound output from the computer.
- They are similar to speakers, except they are worn on the ears so only one person can hear the output at a time.



Output Devices

Projector

- An output device that can take the display of a computer screen and project a large version of it onto a flat surface.
- Projectors are often used in meetings and presentations so that everyone in the room can view the presentation.



Output Devices

Projector

Types of projector

- Cathode Ray Tube (CRT) projector
- Liquid Crystal Display (LCD) projector
- Digital Light Processing (DLP) projector

Output Devices

Projector

Cathode Ray Tube (CRT) projector

- In the early days of projectors, CRT projectors were commonly used.
- They utilized three tubes, one for each of the primary colors.
- Due to their large size, low light output and the frequent need to converge and align the images projected from each of the three tubes, they are no longer commonly used.



Output Devices

Projector

Cathode Ray Tube (CRT) projector

- Long service life; CRT tubes maintain good brightness to 10,000 hours.
- CRT projectors are both considerably larger and heavier than comparable LCD and DLP projectors.
- CRT projectors require far more time to set up and adjust than LCD and DLP based projectors.

Output Devices

Projector

Liquid Crystal Display (LCD) projector

- LCD projectors work by utilizing polarized mirrors that pass and reflect only certain colors of light.
- This causes each channel of red, green and blue to be separated and later re-converged via a prism after passing through an LCD panel that controls the intensity and saturation of each color.



Output Devices

Projector

Liquid Crystal Display (LCD) projector

- An LCD projector can achieve greater brightness at a lower energy consumption
- Smaller than CRT projectors

Output Devices

Projector

Digital Light Processing (DLP) projector

- DLP projectors can be classified as one-chip or three-chip.
- One-chip DLP projectors can produce more than 16 million colors while three-chip models can produce more than 35 trillion colors.
- This allows DLP projectors to reproduce more natural and lifelike images.

