

UNIT-II-Computer Peripherals

- 1) Input Devices :-Keyboard, Mouse, trackball, Joystick, electronic pen, Touch Screen, Image Scanner, OCR, OMR, MICR, Bar code reader, Digitizer, speech recognition devices.
- 2) Output Devices :-Monitors, Dot-matrix printer, Ink-jet printer, Laser Printer, Plotter
- 3) Modem and Projector
- 4) Bio-metric devices

Question

- A) What is Input? Explain Types of input device?
- B) What is Output? Explain Types of Output Device?
- C) Write a short notes on
 - 1) Scanner
 - 2) Bar Code reader
 - 3) Modem & Projector
 - 4) Bio matrices

Input Devices

“Input device is an electromechanical device that accepts data from outside world and translates them into a form a computer can interpret”

“An input device is a hardware or peripheral device used to send data to a computer. An input device allows users to communicate and feed instructions and data to computers for processing, display, storage and/or transmission.”

Following are the types of input device

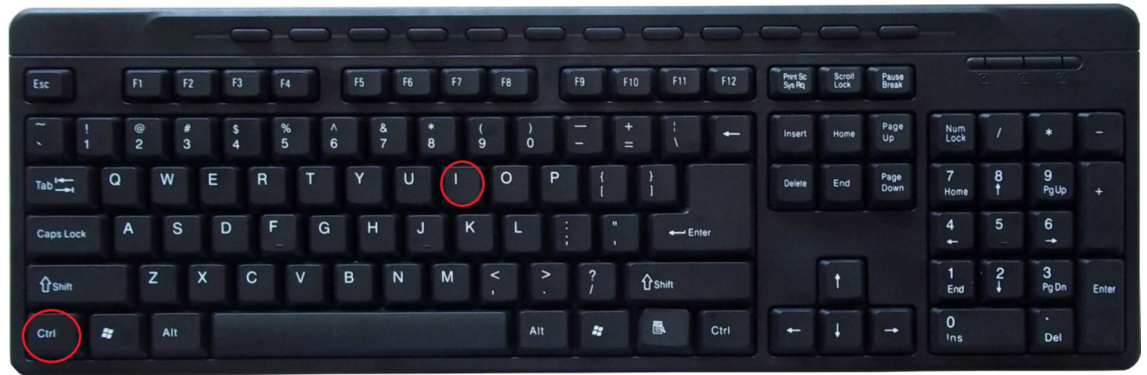
Keyboard, Mouse, trackball, Joystick, electronic pen, Touch Screen, Image Scanner, OCR, OMR, MICR, Bar code reader, Digitizer, speech recognition devices.

1) Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

The following fig shows a keyboard.



The keys on the keyboard are as follows –

➤ **Typing Keys**

These keys include the letter keys (A-Z) and digit keys (0-9) which generally give the same layout as that of typewriters.

➤ **Numeric Keypad**

It is used to enter the numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.

➤ **Function Keys**

The twelve function keys are present on the keyboard which is arranged in a row at the top of the keyboard. Each function key has a unique meaning and is used for some specific purpose.

➤ **Control keys**

These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).

➤ **Special Purpose Keys**

Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

2) Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends

corresponding signals to the CPU when the mouse buttons are pressed.

Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.



Types of Mouse

1. mechanical mouse

It uses a system of a ball and several rollers to track its movement. This type of mouse is typically of the corded variety and is not as popular as their optical cousins. A high quality mechanical mouse can provide great performance.

2. Optical Mouse

It has no mechanical parts like the ball and wheels. An optical mouse utilises optical electronics to track the mouse's position and movement. They are preferred over standard mechanical mice as they tend to be more reliable and require less maintenance

3. Cordless/Wireless Mouse

A cordless or wireless mouse, as the name suggests, has no cable and uses wireless technology such as IrDA (infrared) or radio (Bluetooth or Wi-

Fi) to communicate with the computer. They are ideal for use "on the road" or where cables are either not suitable or simply not wanted.

4. Bus mouse

A bus mouse requires a special electronic card, which provides a special port just for connecting the mouse to a computer. The special electronics card fits into one of the expansion slots of the computer.

5. Serial Mouse

A serial mouse plugs into a serial port. It does not require a special electronic card for connecting the mouse to a computer.

6. One, two and three buttons mouse

A mouse can have one, two, or three buttons. A one button mouse is good enough for a program designed to use only a single button. Some programs operate a two or three buttons mouse.

3) Trackball

TrackBall is a pointing device similar to a mechanical mouse. A trackball is a computer cursor control device used in many notebook and laptop computers. The trackball is usually located in front of the keyboard toward the user.

This is a ball which is half inserted and by moving fingers on the ball, the pointer can be moved.

Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button, or a square.



The user rolls the ball with the thumb, fingers or the palm of the hand to move a cursor

Advantages of Trackball

- Precision and Control
- Space and Positioning
- Control Limitations
- Physical Limitations
- Cost and Availability

4) Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions

A joystick is an input device that allows the user to control a character or machine in a computer program, such as a plane in a flight simulator. They look similar to the control device you would find on an arcade game, but nearly always include extra buttons for additional functionality.

Advantages of Joysticks

- It is useful for playing computer and video games.
- It is very easy to use by beginners.
- It is very fast interface.
- It is easier to navigate
- The control is in 3D (three dimensions).
- They provide fast interactions as required in most games and hence
- Used in games such as racing or flying styles etc.

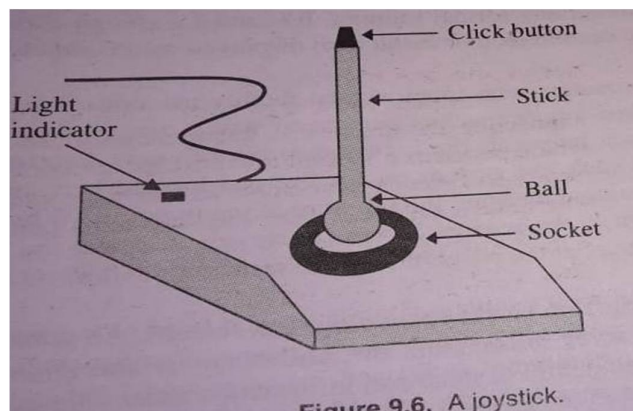


Figure 9.6. A joystick.

5) Electronic pen

An electronic pen is a based point and draw device.threre are two types of electronic pen

1) Light Pen

A light pen is a light-sensitive pointing device commonly used to select or otherwise modify text or data on a screen.

Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

When the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU

It use photoelectric (light sensitive) cell and an optical lens mounted in a pen-shaped case.

A light pen is a light-sensitive computer input device, basically a stylus that is used to select text, draw pictures and interact with user interface elements on a computer screen or monitor.

The term light pen may also refer to a pointing input device utilizing a light that is commonly used during a presentation. The light pen can be a very much focused flashlight-type of device or a laser pointer, allowing a user to direct viewers' attention to a specific area, like a picture or text, in the presentation.

A light pen may also be used to describe the pen (stylus) used with a graphics tablet.

A computer aided design (CAD) application also use light pens frequently.



2) Writing pen with Pad

These types of electronics pen come with a special type of writing pad. A user writes on the pad with electronic pen whatever data he/she wants to input to the computer.

A modern PDA often provides this feature. Signature and message stored and transferred as graphics images are input with the use of this device.

6) Touch Screen

A touch screen is a computer display screen that is also an input device. The screens are sensitive to pressure; a user interacts with the computer by touching pictures or words on the screen.

Touch screen is the simplest, easiest to use of all input device, enabling users to use a computer without any formal training .it enables a user to choose from available option by simply touching with a finger the desired icons or menu items displayed on a computer screen.



Computer with touch screen facility use optical sensors, which can detect the touch of a finger on the screen. When a user touches the screen with a finger, the sensor communicates the position of touch to the computer, which interrupts the input made by user.

Touchscreens are used on a variety of devices such as computer and laptop monitors, smartphones, tablets, cash registers, and information kiosks. Some touchscreens use a grid of infrared beams to sense the presence of a finger instead of utilizing touch-sensitive input.

Following sectors use Touch screen technique

1. At Airport & Railway station to provide information to arriving passengers about hotels, restaurants, tourist spot in city.
2. In large museums or zoo provides attractions and facilities.

3. Large bank. Post office or insurance company introduce varies types of services to customers.
4. ATM machine

7) Image Scanner

An image scanner is an input device that translates paper document into an electronic format for input into to a computer.

An image scanner is a digital device used to scan images, pictures, printed text and objects and then convert them to digital images. Image scanners are used in a variety of domestic and industrial applications like design, reverse engineering, orthotics, gaming and testing.

This input device is very useful in preserving paper document in electronics form.

Following are the types of image scanner.

- 1) Flatbed Scanner
- 2) Hand-held Scanner

1) Flatbed Scanner

A flatbed Scanner is like a copier machine consisting of a box having a glass plate on its top and a lid that covers the glass plate.

A flatbed scanner is an optical scanner which makes use of a flat surface for scanning documents. The scanner is capable of capturing all elements on the document and does not require movement of the document

The following fig shows a flatbed scanner.



To scan a document, a user has to place it upside down on the glass plate .a light beam below the glass plate moves horizontally from one end to another when activated. After scanning one line, the light beams moves up a little and scan the next line.

The process repeat until the beams finishes scanning the entire document.it takes about 20 seconds to scan a document of 21 cm *28 cm size.

2) Hand-held Scanner

A user can hold a Hand-held Scanner in hand conveniently.it has a set of light emitting decodes encased in a small case. To scan a document, a user drags it slowly over the document from one end to the other end with its light on.

The user must drag the scanner steadily and carefully for correct conversion of the document into equivalent bit map. Hence, those applications use Hand-held Scanner in which high accuracy is not critical. User also uses when they have to scan low volume document .they are much cheaper than flatbed scanner.

The following fig shows Hand-held Scanner



8) OCR

OCR stands for Optical Character Recognition.

OCR is a technology that enables you to convert different types of documents, such as scanned paper documents, PDF files or images captured by a digital camera into editable and searchable data.

When user use image scanner for inputting text document they faced following limitation.

- 1) Since a scanned input document is stored as an image, instead of text, it is not possible to do any word processing document.
- 2) Storage space required for storing the document as an image is much more then that a required for storing the same document as a text.

OCR technology overcomes these limitations of scanner; in this case the scanner is equipped with Character Recognition software called OCR technique.

OCR converts bitmap image of Character to equivalent ASCII codes. That is the scanner first creates the bitmap image of the document and then the OCR software translate the array of grid points into ASCII text that the computer can interpret as letter, numbers and special character.

To translate bitmap of character into equivalent text, OCR software examine the bitmap of each character and compare with the pre-programmed set of characters, the machine can recognize.

OCR software is extremely complex because it is difficult to make a computer recognise an unlimited numbers of typefaces and fonts.

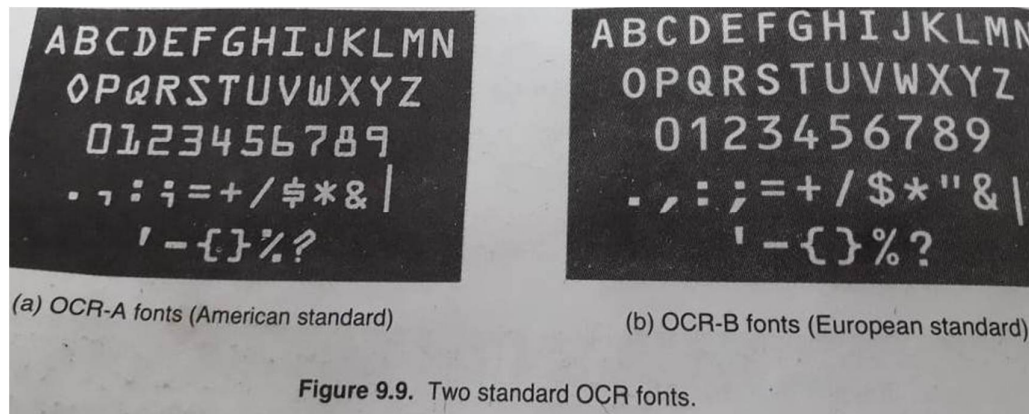


Figure 9.9. Two standard OCR fonts.

Their design enables them to recognize text written using standard type's fonts (called OCR fonts)

The two such standard fonts are OCR-A (American standard) and OCR-B (European standard). note that if the document contains italics or bold face letters or fonts other than those, which the OCR software can recognize, the OCR software will not work perfectly.

9) OMR

OMR stands for optical Mark Reader AS well as Optical mark recognition.

OMR is a scanner, which can recognize pre-specified types of mark made by pencil or pen.

Optical Mark Recognition enables the respondent to select an answer to a question by filling in a "bubble" or "mark" associated with an answer choice

A common OMR application is the use of "bubble sheets" for multiple-choice tests used by schools. The student indicates the answer on the test by filling in the corresponding bubble, and the form is fed through an optical mark reader (also abbreviated as *OMR*, a device that scans the document and reads the data from the marked fields

For EXA.

In objective types tests application mark their choice of correct answer on a special pre-printed test scoring sheet by darkling a small square ,circular or oval shaped box by a pencil, these answer sheets are fed to an OMR device for grading with a computer automatically.

The technique used by an OMR device for recognition of mark on a document involves focusing a light beam on the document & detecting the reflected light pattern from the marks.

Pencil marks made with a soft lead pencil reflect the light strongly. Enabling the OMR device to determine which responses are marked.

“OMR” SHEET FOR: Some Exam meant to test something

Name: _____ Marking Scheme: _____
Roll Number: _____ Minimum qualifying mark(s): _____

1.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	11.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	12.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	13.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	14.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	15.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
6.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	16.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	17.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	18.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
9.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	19.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
10.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

10. Bar code reader

Data coded in the small lines are called bar codes. Bar codes represent alphanumeric data by a combination of adjacent vertical lines by varying their width and the spacing between them.

Barcode is predefined format of dark bars and white bars. The bars are structured to contain specific piece of information

A bar code (often seen as a single word, barcode) is the small image of lines (bars) and spaces that is affixed to retail store items, identification cards, and postal mail to identify a particular product number, person, or location.

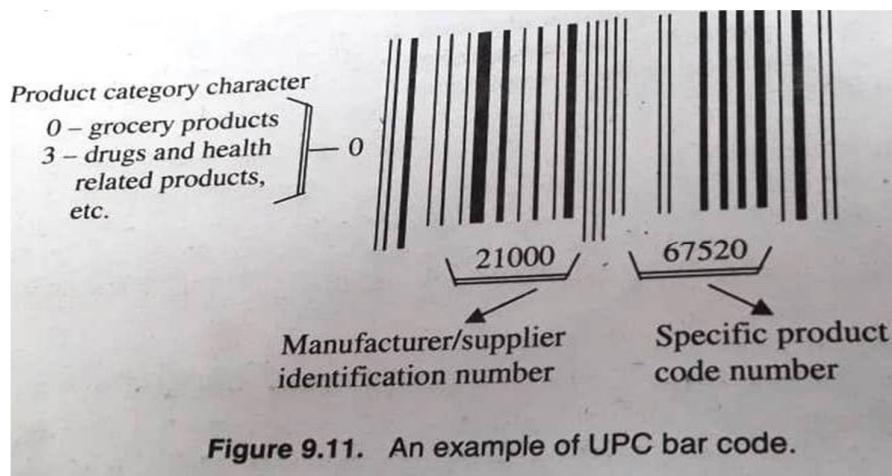
A barcode reader is used to read the code. The reader uses a laser beam that is sensitive to the reflections from the line and space thickness and variation.

The reader translates the reflected light into digital data that is transferred to a computer for immediate action or storage.

Bar codes and readers are most often seen in supermarkets and retail stores, but a large number of different uses have been found for them. They are also used to take inventory in retail stores; to check out books from a library; to track manufacturing and shipping movement; to sign in on a job; to identify hospital patients; and to tabulate the results of direct mail marketing returns.

A bar codes reader is a device for reading (decoding) bar coded image.it scans a bar code image and converts it into an alphanumeric value for input to a computer connected to it.

A bar code reader uses laser beams scanning technology.it focuses a laser beam across the pattern of bar code.



Feature of Bar-Code.

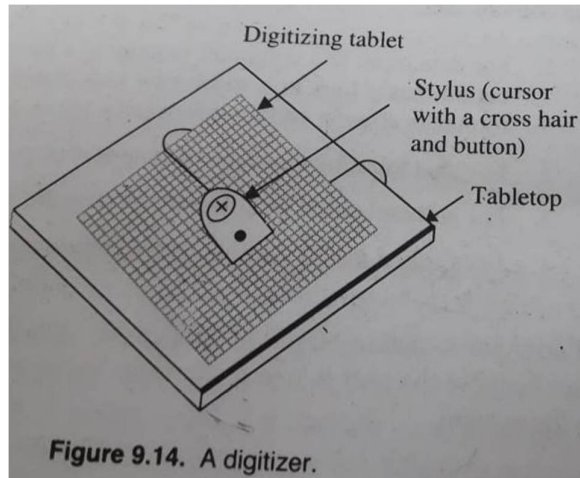
- 1) Barcodes eliminate the possibility of human error.
- 2) Using a barcode system reduces employee training time.
- 3) Barcodes are inexpensive to design and print.
- 4) Barcodes are extremely versatile.
- 5) Barcodes promote better decision making.
- 6) Data obtained through barcodes is available rapidly

11. Digitizer

A digitizer is an input device used for converting picture, maps, and drawing into digital form for input to computer. Digitizers convert analog or physical input into digital images

Digitizer consists of a digitizing tablet (graphics tablet) associated with a stylus. Digitizing tablet is a flat surface that contains hundreds of fine copper wires forming a grid. Each copper wire receive electric pulses.

The following fig shows a digitizer



The digitizing tablet easily spreads over a working table and consists to a computer. The styles are like a pen or a lens like curser with a cross hair and button.

It connects to the tablet and a user can press it down at a point on the tablet to input the coordinates of points a user moves the stylus on the tablet a cursor on computer screen moves stimulatingly to a corresponding position on the screen to provide visual feedback to the user. This enables the user to draw sketches' directly or to input sketched drawings easily.

The architects and engineers commonly use digitizers in the area of CAD for designing cars, buildings, medical devices, robots, mechanical parts.

Designers of geographical information system applications also use them for digitizing of maps available in paper form.

12.Speech recognition devices.

Speech recognition devices are input device that allow a person to input data to a computer system speaking to it.

Speech recognition, voice recognition is a computer software program or hardware device with the ability to decode the human voice. Voice recognition is commonly

used to operate a device, perform commands, or write without having to use a keyboard, mouse, or press any buttons

Speech recognition is the ability of a machine or program to identify words and phrases in spoken language and convert them to a machine-readable format.

Currently speech recognition system has limited success because correct interpretation by a machine of the large number of words in the vocabulary of a language is difficult.

Major difficulties are that different user speaks with different accent and intonation (with different tone) and the fact that the meaning of words varies depending on the context in which it is used.

Following are the some list of application use Speech recognition devices

1. For data input to computer system by a person in situation where his/her hands are busy look at a measuring instrument or some other object exa-doctor.
2. for data input by dictation of long text or passage for later editing & view.
3. for authentication of a user by a computer system based on speech input.
4. for limited use of computer by individual with physical disabilities.

13. MICR

MICR stands for magnetic ink character recognition.

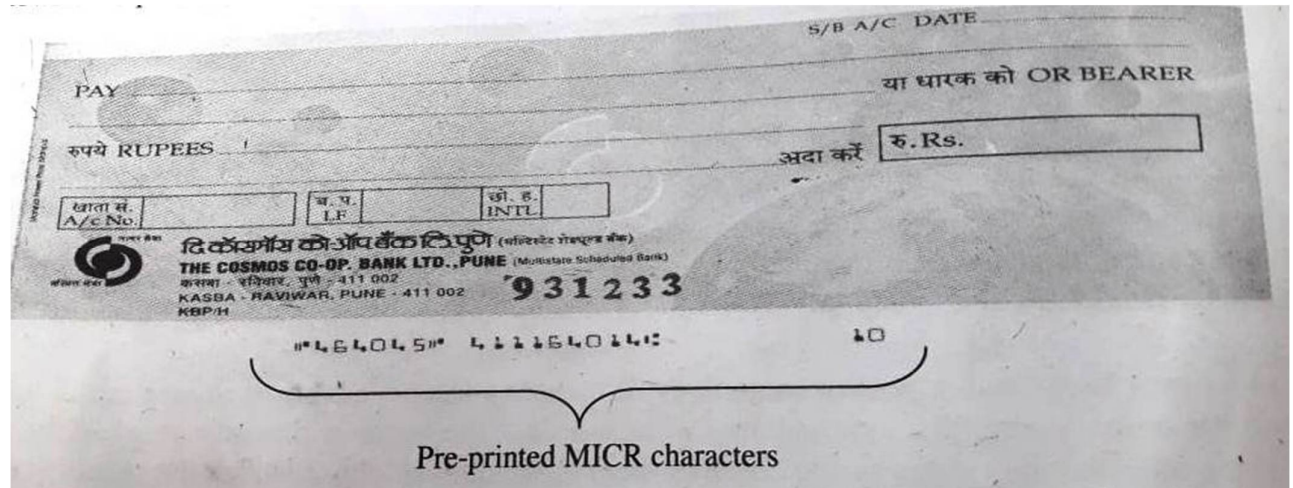
MICR (magnetic ink character recognition) is a technology used to verify the legitimacy or originality of paper documents, especially checks. Special ink, which is sensitive to magnetic fields, is used in the printing of certain characters on the original documents. Information can be encoded in the magnetic characters

MICR is similar to OCR, banking industry use it for faster processing of large volume of cheques handled every day by this industry.

A bank cheque has bank's identification code (name, branch), account number & cheque number pre-printed on it by using character from a special character set.

The character on the cheque are pre-printed using a special ink contains particles of iron oxide

The following fig shows a sample cheque that employs MICR technology



MICR technology is used by banks. Numbers and characters found on the bottom of checks (usually containing the check number, sort number, and account number) are printed using Magnetic Ink. To print Magnetic Ink need, you need a laser printer that accepts MICR toner.

When a customer presents a filled in cheque at a bank, a bank employee enters manually the customer supplied information including the written on the cheque.

The bank then processes this cheque by using an MICR reader sorter that can recognize magnetic ink character.

The MICR reader sorter reads the pre-printed data on the cheques, & sorts the cheque for distribution to other bank or for further processing.

Output Devices:-Monitors, Dot-matrix printer, Ink-jet printer, Laser Printer, Plotter

An output device is an electromechanical device that accepts data from a computer and translates them into a form suitable for use by outside world (user).

Output device generate computer output that are broadly of following two types.

1. Soft-copy Output

A soft-copy output is temporary in nature because it does not appear on a paper or some material that a user can carry for showing to other or filling and use later when he/she is not using a computer.

For Exa-content displayed on a terminal screen, or words spoken out by a voice response system are soft copy outputs.

2. Hard-copy Output

A hard-copy output is permanent in nature because it appears on a paper or some material that a user can carry for showing to other or filling and use later when he/she is not using a computer.

For Exa-, output produced on paper by printer or plotters are hard-copy output.

Following are the some examples of output devices

1. Monitors
2. Dot-matrix printer
3. Ink-jet printer
4. Laser Printer
5. Plotter

1. Monitors

The monitor is an output device.it is most popular soft-copy output device used today.

Monitor display an output on a television like screen. A monitor is associated usually with a keyboard and together they form a Video display terminals.

A VDT is both an input and output device. A user uses a keyboard to input data to computer and monitor to view the output from computer.

The name terminal comes from the fact that a terminal is at the terminus or end of a communication path.it is a most popular I/O device use today.

Following are the type's monitors.

1. The CRT monitor. These are big and heavy and use a lot of desk space and electricity. It is the oldest technology used by monitors and is based on the cathode ray tube technology that was developed for television. Monitors are made with better parts which give a higher display resolution and picture sharpness than a television. This type of monitor is no longer popular.



Advantages of Monitors

1. Resolution and Aspect Ratio

They operate at any resolution, geometry and aspect ratio without the need for rescaling the image.

2. Highest Resolutions

CRTs run at the highest pixel resolutions generally available.

3. Black-Level and Contrast

Produce a very dark black and the highest contrast levels normally available. Suitable for use even in dimly lit or dark environments.

4. Colour and Gary-Scale Accuracy

CRTs produce the very best colour and grey-scale and are the reference standard for all professional calibrations.

5. Cost

CRTs are less expensive than comparable displays using other display technologies.

2. LCD Flat panel. Much thinner and lighter than monitors with a cathode ray tube.

The LCD monitor, the most common kind of flat panel display. It is a newer technology than CRT. LCD monitors use much less desk space, are lightweight and use less electricity than CRT. They have been used for many years in the screens of laptop and notebook computers. They also work as touch screens in tablet computers, mobile phones, and other handheld technologies.



3. An LED Monitor (short for Light Emitting Diode) or LED display is an LCD Monitor that uses light emitting diodes for back lighting. The first LCD Monitors used cold cathode fluorescent lamps instead of LEDs to illuminate the screen.



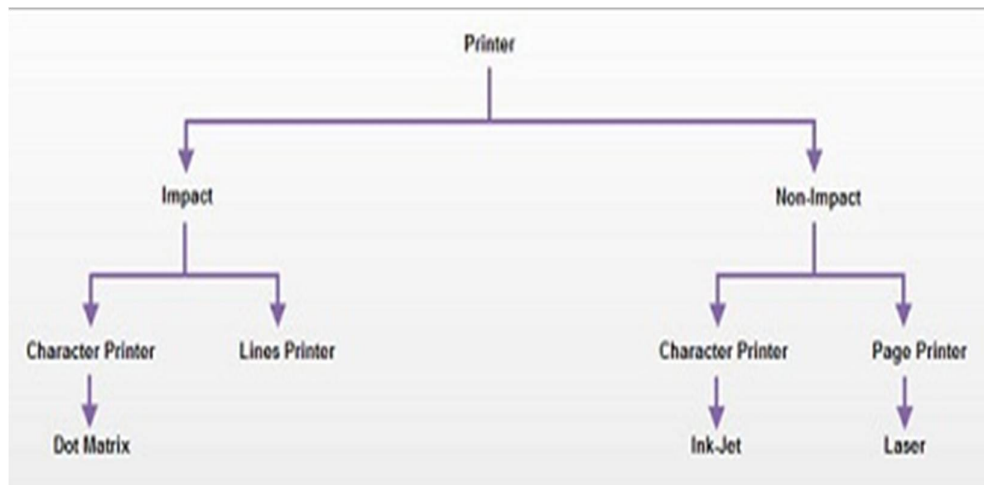
2. Printer

Printers are the most popular hard-copy output device used today.

A printer is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper.

A printer is an external hardware output device that takes the electronic data stored on a computer or other device and generates a hard copy of it

Following are the some types of printers



1. Dot Matrix Printer
2. Ink-Jet Printer
3. Laser Printer

1. Dot Matrix Printer

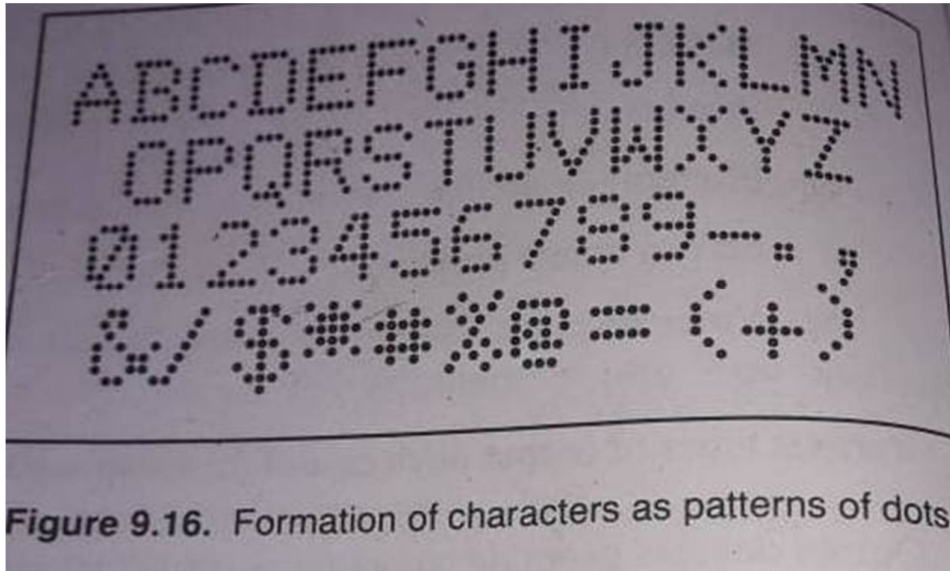
The Dot Matrix printer is character printer that prints one character at a time. They from character and all kinds of image as pattern of dots.

It prints characters as combination of dots. Dot matrix printers are the most popular among serial printers. These have a matrix of pins on the print head of the printer which form the character. The computer memory sends one character at a time to be printed by the printer. There is a carbon between the pins & the paper. The words get printed on the paper when the pin strikes the carbon. There are generally 24 pins.

The dot-matrix printer uses print heads containing from 9 to 24 pins. These pins produce patterns of dots on the paper to form the individual characters. The 24 pin

dot-matrix printer produces more dots than a 9 pin dot-matrix printer, which results in much better quality and clearer characters.

Following fig shows a printing mechanism of dot matrix printer.



It has a print head that moves horizontally across the paper. The print heads contains an array of pins.

Advantages

1. The Dot matrix printers are cheap and easily available in the market.
2. They can make carbon copies of the print out unlike non-impact printers.
3. The printing costs are the lowest as compared to other printers.
4. The printout fades gradually rather than coming to a halt suddenly. You therefore get plenty of time to change the ribbon before crisis emerges.
5. They use paper continuously unlike other printers that require frequent change of paper.
6. The maintenance cost is low as compared to other printers.
7. They tolerate dirty and hot conditions as are found in industrial environments.

2. Ink-Jet Printer

Inkjet printers are character printer that forms character and images by spraying small drops of ink on a paper. The print head of an inkjet printer contains up to 64 tiny nozzles.

The ink comes out of the nozzle in a form of vapours. After passing through a reflecting plate, it forms the desired letter/shape at the desired place.

When the resistor heats up, the ink near it vaporizes and ejects through the nozzle making a dot on the paper placed in front of the print head.

Inkjet printer produces higher quality output than dot matrix printers do because they form character by very tiny ink dots.

In the inkjet printing mechanism, the print head has several tiny nozzles, also called jets. As the paper moves past the print head, the nozzles spray ink onto it, forming the characters and images

A high resolution inkjet printer has many as 64 nozzles within a height of 7mm providing print resolution of around 360 dots per inch.

The ink-jet printer is non-impact printer because they print by spraying ink on the paper.

Inkjet printer comes monochrome and colours, a monochrome printer use single cartridge with black ink, where as a colour inkjet use two ink cartridge

Advantage of Ink-Jet Printer

1. Inkjet printers use a small footprint and are easy to move around, which makes them reasonably portable in a small business or home office environment.
2. Image quality-This makes for extremely high-quality photos and graphics with lifelike results.
3. Image colour-With better quality comes better colour. Again, the use of ink and the technology behind the inkjet printer means they can reproduce extremely bright and vivid colours with exceptional tone and shading
4. Low initial cost-Even if image quality isn't at the top of your printer buying list, price probably is. Whether it's at home or the office, everyone likes to keep an eye on their wallet when shopping for a printer.

Following fig shows ink-jet printer



3. Laser Printer

A laser printer is a popular type of personal computer printer that uses a non-impact, photocopier technology.

Laser printer is page printers that print one page at a time. Main components of laser printer are a laser beam source, a multi-sided mirror, a photoconductive drum and toner.

The laser printer produce high quality output because they form character by tiny particles, the most common laser printer have a resolution of 600 dpi (dots per inch) some are 1200 dpi. Due to their resolution, these printer give excellent graphics art quality.

Laser printer is non-impact printer. Hence, they are quite in operation, but we cannot use them for producing multiple copies of a document in a single printing.

Laser printer is fastest in printing speed than other printer, low speed printer can print 4 to 12 pages per minute, high speed laser printer are also available. owing to their better print quality and printing speed, laser printer are more expensive than other types of printer.

Following are the advantages of Laser Printer.

1. It is not noisy and is faster than impact printer.
2. It can be both single and multi-coloured.
3. Its operating cost is low.
4. It can print both text and images.
5. Its printing quality is better than impact printer
6. Superior Quality – Laser printers are known for their superior quality printing
7. Faster Printing

3. Plotter

A plotter is a printer that interprets commands from a computer to make line drawings on paper with one or more automated pens.

A plotter is typically used to print large-format graphs or maps such as construction maps, engineering drawings and big posters.

A plotter is a computer hardware device much like a printer that is used for printing vector graphics.

Instead of toner, plotters use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines onto paper rather than a series of dots like a traditional printer. Though once widely used for computer-aided design, these devices have more or less been phased out by wide-format printers. Plotters are used to produce a hard copy of schematics and other similar applications.

Advantages of Plotter

Size – Large plotter printers are capable of printing on material which is as large as 60 inches wide.

Different materials – Many plotter printers can print onto other materials as well as paper. That might be plywood, cardboard, plastic or even aluminium

Quality every time – The beauty of a plotter printer is that it can reproduce the same template again and again with no deterioration in the quality of the line drawing.

Types of plotter

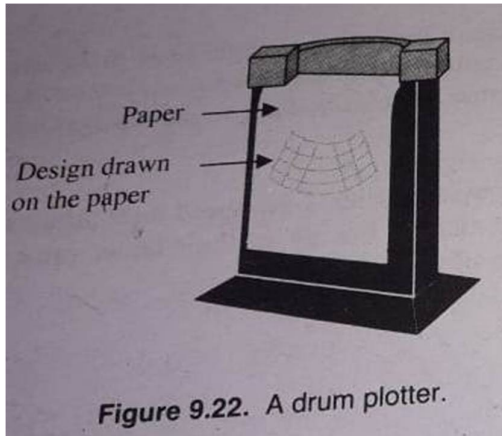
1. Drum Plotter

A drum plotter is also known as Roller Plotter. It consists of a drum or roller on which a paper is placed and the drum rotates back and forth to produce the graph on the paper.

It also consists of mechanical device known as Robotic Drawing Arm that holds a set of colored ink pens or pencils. The Robotic Drawing Arm moves side to side as the paper are rolled back and forth through the roller.

In this way, a perfect graph or map is created on the paper. This work is done under the control of computer. Drum Plotters are used to produce continuous output, such as plotting earthquake activity.

The following fig shows a Drum plotter



2. Flatbed Plotter

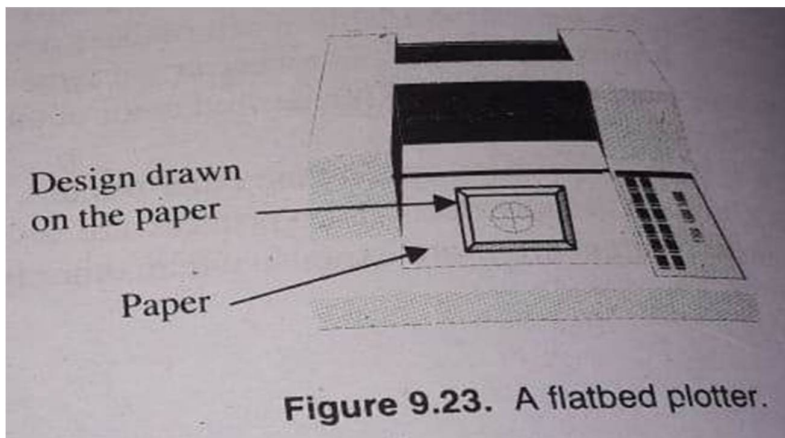
A flatbed plotter is also known as Table Plotter. It plots on paper that is spread and fixed over a rectangular flatbed table.

A flat-bed plotter is a mechanical drafting device used with many CAD programs for designers

The flatbed plotter uses two robotic drawing arms, each of which holds a set of colored ink pens or pencils. The drawing arms move over the stationary paper and draw the graph on the paper. Typically, the plot size is equal to the area of a bed.

The plot size may be 20- by-50 feet. It is used in the design of cars, ships, aircrafts, buildings, highways etc. Flatbed plotter is very slow in drawing or printing graphs. The large and complicated drawing can take several hours to print. The main reason of the slow printing is due to the movement mechanical devices.

The following fig shows a flatbed plotter



Modem and Projector

1. Modem

A Communication system use a special device called modem to perform modulation and demodulation

A modem is a network device that both modulates and demodulates analog carrier signals for encoding and decoding digital information for processing.

Modems accomplish both of these tasks simultaneously and, for this reason, the term modem is a combination of "modulate" and "demodulate."

A modem is a hardware device that allows a computer to send and receive data over a telephone line or a cable or satellite connection.

When a data communication system uses an analogue facility for data transmission between two digital devices, it requires two modems, one near each device.

The following fig shows a modem

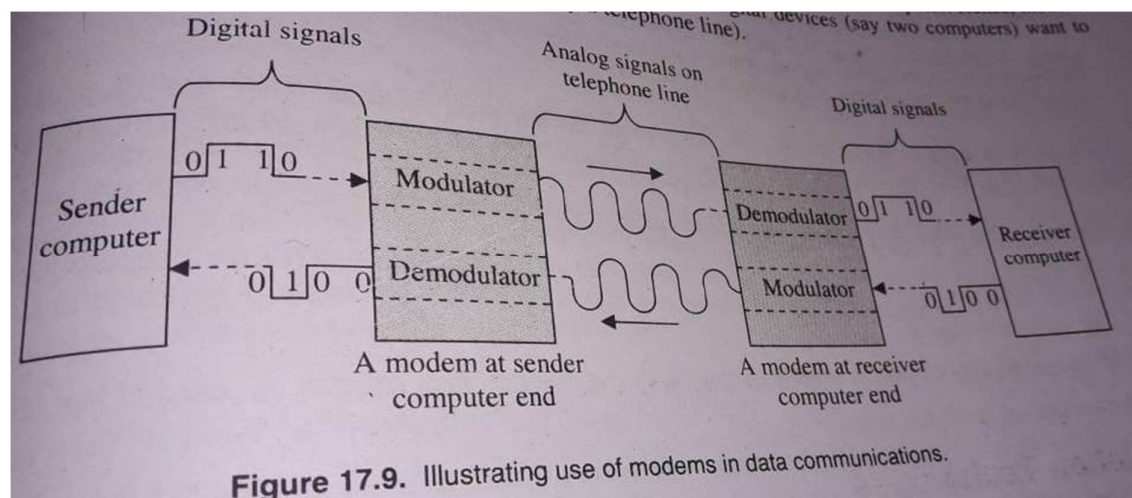


Figure 17.9. Illustrating use of modems in data communications.

In an above fig when sender computer generates & sends digital signal, modulator of the modem placed near senders computer convert it to analogue form.

The communication system then transmits this analogue signal through telephone line up to the modem near receiver computer. The demodulator of this modem then convert analog signal to digital form and passes on the digital data to

receiver computer. The receiver computer processes the data and then the modulators of the modem near it modulate the processed data to analogue form.

The communication system returns this analog data through telephone line to the sender computer end, where the demodulator of the modem near it demodulate analog signal to digital form. And then passers the digital data to sender computer.

Projector

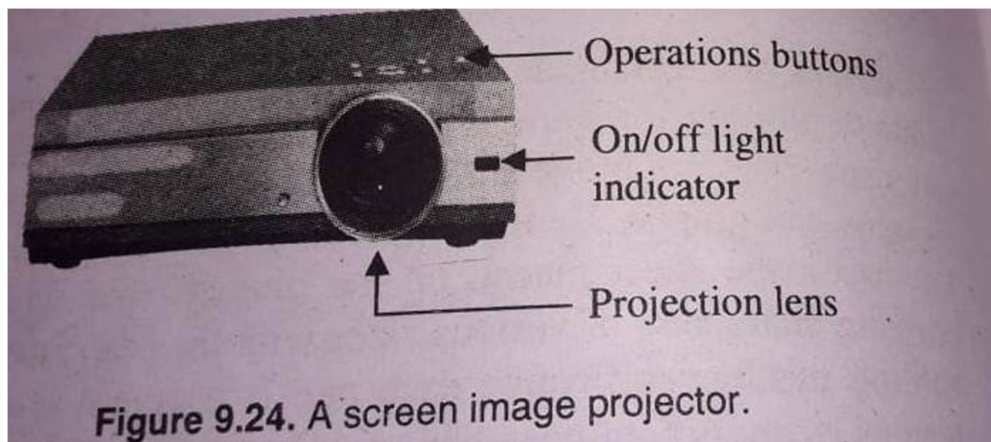
A projector is an output device that can take images generated by a computer or Blu-ray player and reproduce them onto a screen, wall, or other surface.

A projector is a device that uses light and lenses to take an image and project a magnified image onto a larger screen or wall.

Screen Image Projector

Screen Image Projector is an output device, which is used to project information form a computer on a large screen so that a group of people can view it stimulatingly It is very useful for making presentation to group of people with direct use of a computer.

Following fig shows Screen Image Projector



A screen image projector, we can plug it to a computer directly .a presenter makes a presentation to a group of people by projecting the presentation material page by page on a large screen with help of computer keyboard and mouse.

The presenter can also directly point to, mark or edit certain portion of the content of the displayed materials during the presentation to make the presentation more understandable

A presenter can prepare full-multimedia presentation with audio, video, image & animation and make a lively & interesting presentation by using this device.

A screen image projector has common presentation equipment today,

Advantages of projector

- 1) Largest possible picture
- 2) Smaller images a great option also. Perhaps you don't want a huge image, or maybe you don't have space for one.
- 3) Low cost.
- 4) Space saving.
- 5) Easy to install

Bio-metric devices

A biometric device is a security identification and authentication device. Such devices use automated methods of verifying or recognising the identity of a living person based on a physiological or behavioural characteristic. These characteristics include fingerprints, facial images, and iris and voice recognition

Biometrics is the measurement and statistical analysis of people's unique physical and behavioural characteristics.

Components of biometric devices include:

1. A reader or scanning device to record the biometric factor being authenticated
2. Software to convert the scanned biometric data into a standardized digital format and to compare match points of the observed data with stored data
3. A database to securely store biometric data for comparison

Following fig shows a biometrics device



Biometrics is any use of biological data in technology. Biometric systems focusing exclusively on the identification of humans have become the major kind of biometric system in today's IT world.

Governments, businesses and organizations can use biometric systems to get more information about individuals or about a populace as a whole. Many biometric systems are developed for security applications.

Advantages of Biometrics device

- 1) Physiological-Fingerprints, face, Hands, Eyes
- 2) Behavioural-Voice, Signature, Keystroke Dynamic
- 3) Biometric technology is very useful for ID verification
- 4) Biometric technology is high individual identification accuracy
- 5) Biometric technology is less exposed to damage and sudden changes
- 6) Biometric technology is that it is less time consuming, dependable & user friendly
- 7) Biometric technology can be effectively employed in forensics.
- 8) Fingerprints won't be lost and can't be attained and copied by someone aiming to illegally gain access.

Computer Memory: - RAM, ROM, Cache Memory

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored. The memory is divided into large number of small parts called cells. Each location or cell has a unique address, which varies from zero to memory size minus one.

1. RAM

RAM (Random Access Memory) is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.



Fig-RAM

Types of RAM

1. Static RAM (SRAM)
2. Dynamic RAM (DRAM)

Static RAM (SRAM)

The word static indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis.

There is extra space in the matrix, hence SRAM uses more chips than DRAM for the same amount of storage space, making the manufacturing costs higher. SRAM is thus used as cache memory and has very fast access.

Characteristic of Static RAM

1. Long life
2. No need to refresh
3. Faster
4. Used as cache memory
5. Large size
6. Expensive
7. High power consumption

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually refreshed in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

Characteristics of Dynamic RAM

1. Short data lifetime
2. Needs to be refreshed continuously
3. Slower as compared to SRAM
4. Used as RAM
5. Smaller in size
6. Less expensive
7. Less power consumption

2. ROM

ROM stands for **Read Only Memory**. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as **bootstrap**. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.

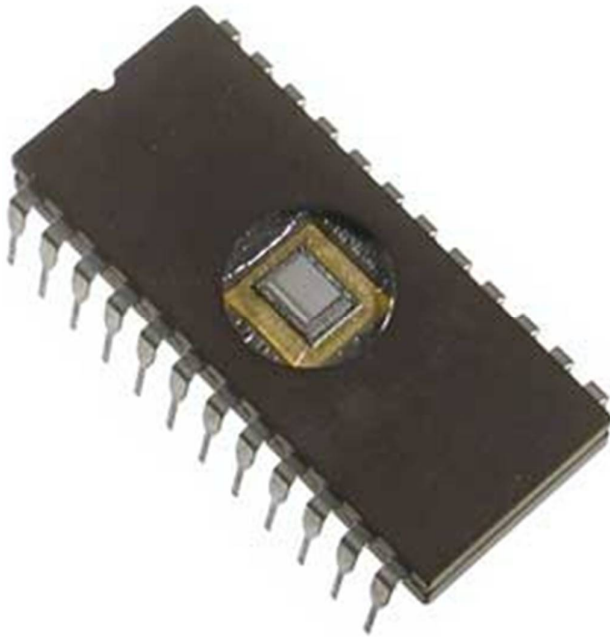


Fig-ROM

Types of ROM

1. MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs, which are inexpensive.

2. PROM (Programmable Read Only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program. Inside the PROM chip, there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

3. EPROM (Erasable and Programmable Read Only Memory)

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming, an electrical charge is trapped in an insulated gate region. The charge is retained for more than 10 years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use, the quartz lid is sealed with a sticker.

4. EEPROM (Electrically Erasable and Programmable Read Only Memory)

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of reprogramming is flexible but slow.

Advantages of ROM

The advantages of ROM are as follows –

1. Non-volatile in nature
2. Cannot be accidentally changed
3. Cheaper than RAMs
4. Easy to test
5. More reliable than RAMs
6. Static and do not require refreshing
7. Contents are always known and can be verified

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the CPU and the main memory. It is used to hold those parts of data and program which are most frequently used by the CPU. The parts of data and programs are transferred from the disk to cache memory by the operating system, from where the CPU can access them.

Cache memory is the fastest memory on the system, required to keep up with the CPU as it fetches and executes instructions. The data most frequently used by the CPU is stored in cache memory. The fastest portion of the CPU cache is the *register* file, which contains multiple registers. Registers are small storage locations used by the CPU to store instructions and data.

Cache memory, also called CPU memory, is high-speed static random access memory (SRAM) that a computer microprocessor can access more quickly than it can access regular random access memory (RAM). This memory is typically integrated directly into the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU.

Advantages

The advantages of cache memory are as follows –

1. Cache memory is faster than main memory.
2. It consumes less access time as compared to main memory.
3. It stores the program that can be executed within a short period of time.
4. It stores data for temporary use.

Disadvantages

The disadvantages of cache memory are as follows –

1. Cache memory has limited capacity.
2. It is very expensive