

COMPUTER MEMORY

- Computer memory is the storage space on a computer.
- A computer uses primary memory and secondary memory to store data.

Primary Memory or Main Memory

- A primary memory is the storage space where data and instructions required by the CPU for processing are stored.
- Examples of primary memory include
- RAM, ROM etc

RAM



- Random access memory is a memory chip that holds data and instructions temporarily for immediate access and use by the CPU during processing.
- The amount of RAM on the computer's motherboard determines its capacity to hold and process large programs and data files.
- The larger the RAM, the faster the computer is.

Types of RAM include

- **Dynamic RAM (DRAM):** Is a type of memory that must be reenergized constantly or else it's contents will be lost.
- **Static RAM (SRAM):** It is faster and more reliable than DRAM but more expensive. It does not need to be reenergized so often like DRAM

ROM



- Read only memory is a memory chip into which data or programs are written permanently at a time of manufacture. New data can not be written on this memory and existing data can not be removed.
- The computer ROM chips containing data, instructions or information recorded permanently by manufacturers are called firmware.

Types of ROM chips include:

- **Programmable read only memory (PROM)**

This is a type of ROM on which permanent data can be written to and it can be written only once.

- **Electrically programmable read only memory (EPROM)**

This is just like PROM except that one can erase the contents of the chip partly or fully by an electric signal.

- **Erasable electrically programmable read only memory (EEPROM)**

These are ROM chips designed to be modified by the users

Differences between RAM and ROM

RAM

- ❖ Is volatile i.e. when power goes off, the data is also lost
- ❖ Is read and write memory
- ❖ Is stores data and information temporarily
- ❖ The memory can be increased in size

ROM

- ❖ Is non volatile
- ❖ Is read only memory i.e. data on it can't be edited
- ❖ Data and information is stored permanently
- ❖ Memory is not normally increased

CACHE MEMORY

- This is the type of memory used to store data and programs which are frequently used by the CPU.
- Cache memory serves as a buffer between the processor and the main memory

A buffer is a region of memory used to temporarily hold data while it is being moved from one place to another.

- The data and programs are transferred from secondary storage to cache memory by O.S, from where the CPU can access them.

- **Advantages**
- It consumes less access time as compared to main memory
- It stores data for temporary use
- **Disadvantages**
- Cache memory has limited capacity
- It is very expensive

COMPUTER - MEMORY UNITS

- It is the amount of data that can be stored in the storage unit.
- The storage capacity is expressed in terms of Bytes.
- The following are the main memory storage units:

Unit	Description
Bit (Binary Digit)	A binary digit is logical 0 & 1 representing a passive or an active state of a Component in an electric circuit.
Nibble	A group of 4 bits is called nibble.
Byte	A group of 8 bits is called byte. A byte is the smallest unit which can represent a data item or a character.
Kilobyte (KB)	1 KB = 1024 Bytes
Megabyte (MB)	1 MB = 1024 KB
Giga Byte (GB)	1 GB = 1024 MB
Tera Byte (TB)	1 TB = 1024 GB

calculations

- 1 byte = 8bits = 1 character
- $\frac{1}{2}$ byte = 4 bits = nibble

Questions

- How many bits are in
(a) 5 bytes (b) in 120 bytes
- How many bytes are in 640 bits
- How many bit are in the word
(a) Rose (b) English

MORE EXAMPLES

1. Convert

- i. 245MBs to bytes
- ii. 1024KBs to GBs

2. Given the statement madam **molly is a lazy teacher**

Calculate the number of KBs in the statement

3. A DVD-R has a capacity of 4.7GB. How many CD-R each having a capacity of 700MB would be required to store the information that is on DVD-R

4. Consider the phrase *Henry is a handsome boy*

- a) Find the number of MBs in the phrase
- b) How long will it take for the phrase to be downloaded from a website link with the speed of 10Mbps

Secondary memory

- This is the memory used by the computer systems to store large amount of data, information and instructions permanently.

Definition of terminologies

- ❖ **Storage device:** is the device that reads and writes data to and from the storage medium.eg CD or DVD drive, hard disk drive
- ❖ **Storage medium:** is the physical material on which a computer keeps data
- ❖ **Reading:** is the process in which a storage device transfers data from a storage medium into memory
- ❖ **Writing:** is the process in which a storage device transfers data from memory to storage medium (saving)

- ❖ **Capacity:** is the number of bytes (characters) a storage medium can hold
- ❖ **Access time:** is the measure of the amount of time it takes a storage device to locate an item on a storage medium
- ❖ **Disk formatting:** is the process of preparing a disk for reading and writing by organizing the disk into storage locations called tracks and sectors

Categories of secondary storage media

There are many storage devices which fall under the following categories

Magnetic media

- Magnetic storage media represents data as magnetic spots on the tape or disk, with a magnetized spot representing a 1 bit and absence of a spot representing 0 bit.
- Common examples of magnetic media include
 - Hard disk
 - Floppy disk
 - Magnetic tape
 - Zip disk

Magnetic tape

- Magnetic tape is magnetically coated ribbon of a plastic capable of storing large amounts of data and information at low cost
- Magnetic tape requires sequential access i.e. data must be accessed in the order in which it is stored

Disadvantages

- Random data access is not possible.
- Has limited shelf life of two years

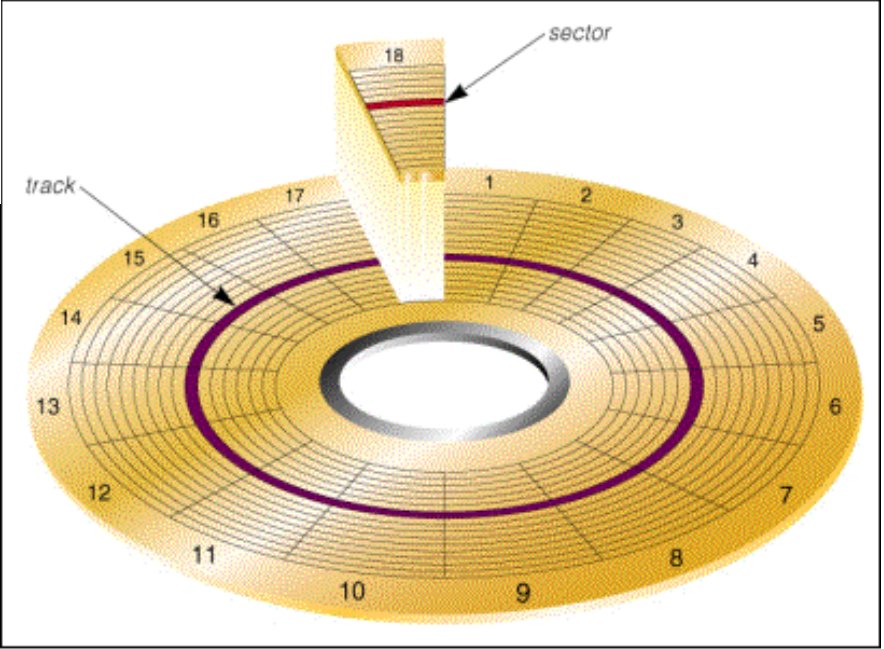


Hard disk

- This is also called hard disk drive, usually consists of several circular metal platters coated with magnetic oxide that can be magnetized to represent data
- A track is narrow recording band that forms a full circle on the surface of the disk. The tracks are further divided into sectors
- A cluster, also called allocation unit consists of two to eight sectors of space used to store data

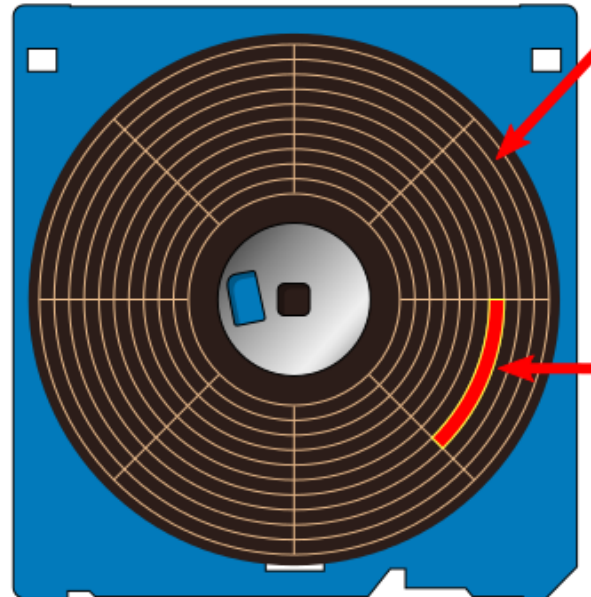
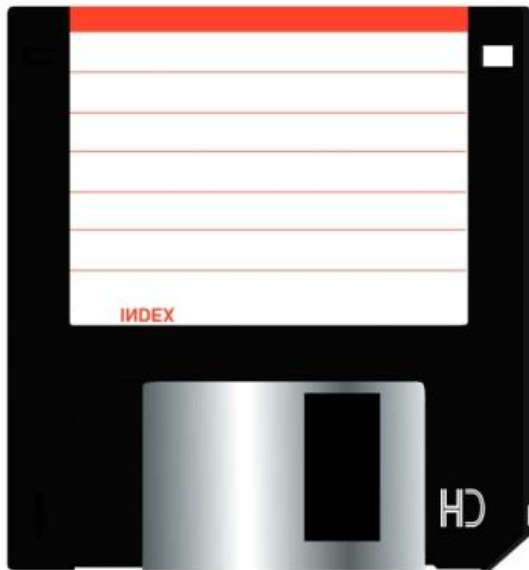


hard disk installed in system unit



Floppy disk

- Is a portable storage medium that consists of a thin circular flexible plastic disk with a magnetic coating enclosed in a square shaped plastic shell.



Advantages of Floppy Disks

- Floppy diskettes are portable
- Floppy diskettes are cheap
- Random Data Access on a diskette is possible
- A floppy diskette can be write-protected from being changed

Disadvantages of Floppy Disks

- Floppy diskettes are not reliable – they need to be handled with a lot of care, else risk losing data.
- Floppy diskettes are not durable.
- Data Access time is relatively slow.
- They have limited Storage capacity (only 1.44MB)

Optical media

- These are electro mechanical units coated with highly reflective materials. The data is written to the surface of the disk spinning by focusing a high power laser beam.
- Optical storage devices are categorized into two namely; compact disks (CDs) and digital video disk (DVDs)

Compact disks

CD-R (compact disk recordable)

- This is a CD which can be written on only once and can be read many times. The data on this disk can not be erased once it has been written to it.

CD-RW (compact disk Re-writable)

- This is erasable CD that can be written on multiple times. A CD-RW drive and CD-RW software is required to write on CD-RW

CD-ROM (compact disk read only memory)

- The content of a standard CD-ROM is written by the manufacturer and its content can only be read and used.
- A typical CD-ROM holds from 650 MB to 1GB of data,
- Note: Both CD-R and CD-RW have a standard storage capacity of 700MB

Digital video disk

DVD-R(Digital Video disk Recordable)

- This is extremely high capacity compact disk that can be written on once and read many times. Has a standard storage capacity of 4.7GB

DVD-RW (digital video disk rewritable)

- This is similar to CD-R W except that it has a storage capacity of 4.7GB

Blue Ray Disk Rom (BD-ROM)

- These are high capacity DVD formats with storage capacities of up to 100GB

Care for Optical Disks

- The following should be done for the safety of data on Optical disks:
- Do not expose the disc to excessive heat or sunlight
- Do not eat, smoke or drink near a disc.
- Do not stack disks.
- Do not touch the underside of the disk.
- Always store the disc in a jewel box when not in use
- Always hold a disc by its edges.
- Do not drop the disk to the ground.
- Don't bend the disk.



Do not expose the disc to excessive heat or sunlight.

Do not eat, smoke, or drink near a disc.

Do not stack discs.

Do not touch the underside of the disc.

Do store the disc in a jewel box when not in use.

Do hold a disc by its edges.

Solid state storage media

- Solid state storage media consist entirely of electronic components and contain no moving parts.
- They store data electronically other than magnetic or optical technology.

Examples include

USB flash drive

- A USB flash drive is a flash memory storage device that plugs in a USB port on a computer



Flash memory cards

- Common types of flash memory cards include Memory Stick, CompactFlash (CF), SmartMedia, microSD, miniSD, xD, Picture Card, etc.
- They are commonly used in electronic devices such as digital cameras and mobile phones. They are tiny, re-recordable, and able to retain data without power.

