Secondary Memory (back up storage, Auxiliary memory)

The secondary memory stores much larger amounts of data and information. It is slowest and cheapest form of memory . Data in secondary memory can not be processed by CPU (Processor) directly , it must first be copied into primary memory (RAM). Secondary memory is non volatile ,this means data remain in secondary storage as long as it is not overwritten or deleted by the user . It is permanent storage device

Secondary memory devices include the following :

1- Magnetic storage devices such as :

*** Floppy Disk**

*** Tape**

*** Hard Disk**

2- Optical Devices such as:

***CD(Compact Disk)**

***DVD(Digtial VIDEO Disk)**

3- Solid State Disk

*** Flash Drive (USB Flash memory)**

Now we explain these types of secondary memory

1-Magnetic storage devices such as :

A*: Magnetic Tape

1- It is made of a plastic coated with magnetic materials to store data permanently .

2-It is usually 12.5 mm to 25 mm wide and 500 m 1200 m long .

3-Data is stored in tracks; there are 7 or 9 tracks (depending on the tape unit) which run the length of the tape.

4- Data can be read as well as recorded .

5- It can store data in sequential manner.

6-It is reusable , can be written , erased and rewritten .

7- It hold the maximum data, which can be accessed sequentially .

A*: Floppy disk(FD)

1- The characters (features) of FD

a-It is used to store data but it can store small amount of data

b- It is slower to access than hard disk

c- It is round in shape and thin plastic disk coated with iron oxide

d -Data is retrieved or recorded on the surface of the disk through a slot on the envelop

e - They have random access memory

f -fFloppy disk is removable from the drive

g -Data stored in concentric tracks

h - fFloppy disk is available in three size 8 inch , 5 1/4 inch , and 3 1/2 inch ,since 5 1/4 inch has capacity of 1.2 MB AND 3 1/2 HAS capacity of 1.44 MB

Fig : floppy disk (1.44 MB)

2-The parts (components) of floppy disk drive (FDD) (working of floppy disk)

The floppy disk drive consists of different parts . These parts interact with each other and perform the functions of reading and writing data on the floppy disk .The different parts as following :

2.1-Read / Write Head:

The floppy disk drive has a read / write head .It perform the work of reading and writing data on the floppy disk surface by converting the binary signals(bits) to electromagnetic signals (pluses magnetic)

The double –side floppy disk driver has two heads on both sides of floppy disk to read and write data on both sides of the floppy disk

The floppy disk drive uses the same head to perform both reading and writing data on the floppy disk.

The floppy disk head consists of two parts . The first part read and write head . The second part is that erases the data from a track before write head writes the data on the track

2.2-Head Actuator(Head arm)

The head actuator enables the read /write head to access all tracks on one side of the floppy disk .

The head actuator moves the read /write head forward from the center of floppy outwards and backward to place the head over the required track

2.3-Spindle Motor :

Once the R/W head positioned over the required track , the spindle motor spin the floppy disk in floppy disk drive**, to place the requested sector in this track under the read/ write head. .**

The spindle motor has a clamp that catches the floppy disk when the floppy disk enters the floppy disk driver .

The spindle motors rotates at speed of 300 rotation per minute .

2.4- Circuit Board

The circuit board connects all the parts of the floppy disk drive together ,

It consists of circuits that send the data signals to different parts of floppy disk drive

The function used to run the floppy disk drive is built into circuit board . It control the speed of the motor and manages the position of the read/write head over the required track

C*: Hard Disk drive

1- The feature of hard disk

a- It is a non –volatile

b- It is random access device

c-It is a data storage device used for storing and retrieving digital information using rotating disks (platters) coated with magnetic material

d- All program of computers are installed in the hard disk

f- the capacity of hard disk is measured in gigabyte and terabyte

2- The part of hard disk drive (Working of the hard disk)

2.1-Platters(disks):

Hard disk consists one or more platters(disks). Platters used for storing data. The data in platters are arranged in concentric circular called tracks. Each track is broken up into smaller areas called sectors.

Platters are made of magnetic surfaces in order to permanently store data.

The platter (disk) is divided into the following

- **surface :**

  Each surface has two surfaces (two sides) refer to upper or lower side of disk(platter)

  The upper side of the first disk (platter) is side 0

  The lower side of the first disk(platter) is side 1

  The upper side of second disk(platter) is side 2

  The lower side of the second disk(platter) is side 3 ….

- **Track:**

  Each platter(disk) is broken into thousand of concentric circular called Track .The outermost track is called track 0 and towards the center of magnetic surface are track1 , track 2 , ….

- **Cylinder:**

  Track with the same radius of all the disks(platters) called cylinder .

  Cylinder can be used to calculate the disk capacity .

- **Sectors :**

Each track is dividing into equal segments (small unit) called sectors . Sectors is the basic unit for storing data.

Every track on the surface of the disk(platter) has the same number of sectors .the sectors are separate by gaps .

Sectors are numbered from 1 and each sector can hold more than 512 bytes of data .

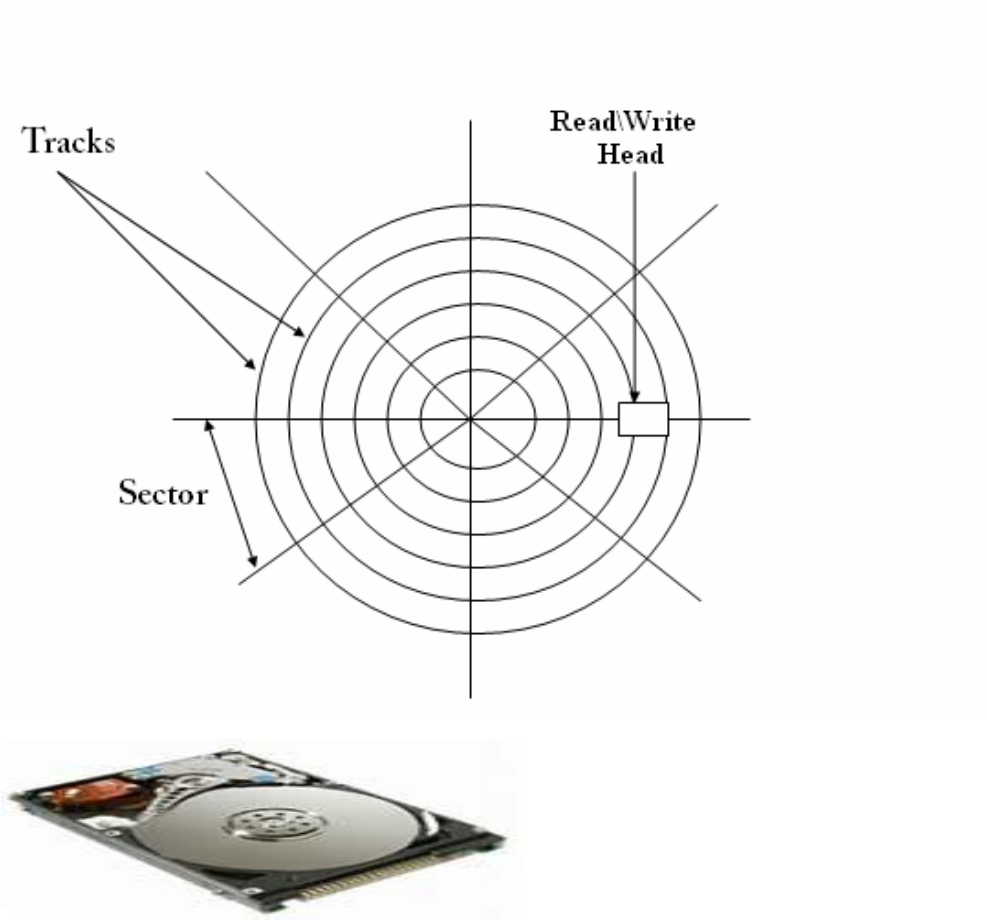

Figure : Hard Disk

2.2- Read /Write Head :

The read/ write heads are the most sophisticated part of hard disk drive . Each platter(disk) has two read/write heads one mounted on the top surface and other one at the bottom of surface

We can call these magnetic heads , head 0, head 1 , head2 ….

The read/write heads convert the information , which is in the form of bits to magnetic pulses when it is to be stored (write)

On the platter and reverse the process while reading (i.e convert magnetic pluses to bits)

2.3-Head Actuator(Head arm)

The read /write arm control the movement of the read/write heads. The head actuator moves the read /write head forward from the center of hard disk outwards and backward to place the head in the right position(desired track) based on the data that needs to be accessed or written .

2.4- spindle motors :

Once the R/W head positioned over the required track ,the spindle motor spins the hard disk platters in hard disk driver with high speed **, to place the requested sector in this track under the read/ write head** . The rotation rate of hard disk is between 5400 revolution per minute (rpm) and 7200 rpm **.**

2.**5-Circuit Board**

The circuit board connects all the parts of the hard disk drive together ,

It consists of circuits that send the data signals to different parts of hard disk drive

The function used to run the floppy disk drive is built into circuit board . It control the speed of the motor and manages the position of the read/write head over the required track

3-Hard Disk Performance: Several basic parameters determine the performance of a given hard disk drive. A seek operation is the movement of the read/write head to the desired track.

1- Seek Time: A seeks time is the movement of the read\write head to the desired track. The seek time is the average time for this operation to be performed. Typically, hard disk drives have an average seek time of several milliseconds, depending on the particular drive.

2- Latency Time: The latency period is the time takes for the desired sector to spin under the head once the head is positioned over the desired track. Latency time depend on the constant rotational speed of the disk.

3-Access time: The sums of average seek time and the average latency time is the access time for the disk drive.

2- Optical devices (another type of secondary memory include CD disk AND DVD disk)

Data is read and written in this type with help of **Leaser** , so it called **Optical**

D*: CD disk (compact disk)

It is the most popular and least expensive type of optical disk .

CD is capable of being used as data storage device .

CD are categorized into three main types:

1-CD-ROM (Compact Disk –Read Only Memory):

It is designed to store computer data of text and graphics ,as well as stereo sound . It is capable of storing large amount of data – up 1GB ,although the most common storage capacity is 700 MB .Data is recorded permanently on the surface of the optical disk through the use laser . The recorded content can not be changed or erased by users . It is also called "WORM"(Write Once Read Memory)

2-CD-R(Compact Disk – Recordable)

Data can be written on these disks only once . The data once stored in these disks can not erased .

3- CD-RW(Compact Disk- Rewritable)

It is erasable disk .CD-RW is used to write data multiple times on the disk.

E*: Digital Video Disk (DVD):

DVD is also know as super density disk , A DVD is an optical disk storage media . DVD offer higher storage capacity than compact disks (CD) while having the same dimension .DVD can store several Gigabytes of data . DVD is primarily used to store music or movies and played back on your television or the computer too. DVD is not rewritable media .

DVD come in three types:

*- DVD –ROM (Digital Video Disk- Read Only Memory).

*- DVD-R (DVD-Recordable)

*-DVD-RW(DVD- Rewritable**)**

3-Solid -State Drive (SSD)

It is storage medium that used semiconductors rather than magnetic media.

E-USB Flash Drive

Flash drive is a data storage that consists of flash memory with portable USB (Universal Serial Bus) interface . USB flash drive are typically removable , rewritable and much smaller than a floppy disk.

A USB flash drive is same as size of thumb that plugs into USB port on the computer .Today flash drive are available in various storage capacities as 256 MG , 512 MB , 1GB ,4 GB , up to 64 GB.

They are widely used as easy and small medium to transfer and store the information from their computer **.**

Flash memory is very fast compared to hard disk . Flash memory is closer in form to solid- stste drive ,which means that is storage medium that used semiconductors rather than magnetic media such as Hard disk .

** The Difference between Internal and External hard disks:

Internal hard disks are located inside your main computer unit, while external hard disks are joined to the main computer unit via a lead which you plug into the back of your computer unit. Some external hard disks(such as flash memory) will plug into the USB port (connector) located at the back of your computer. Other external hard disks require the installation of a special card within your computer which allows the connection of the external hard disk to the computer unit.

The characteric of primary storage (main memory (Ram)):

1- The computer **can not** run without primary memory .

2- It is known as **main memory , storage memory** or **internal memory**.

3- It is **volatile type** of memory ,it means data is lost in case power is **switch off**.

4- Primary memory is **faster access** time than secondary memory .

5- Data is **directly accessed** by processor unit ..

6- **Capacity** is usually in **16 to 32 GB** .

7- Primary memory can be accessed by **data bus** .

8-Primary memory is **costlier** than secondary memory.

The characteric of secondary memory :

1-Computer **can run** without **secondary memory** .

2- Secondary memory is known as a **back up memory , mass storage** or **Auxiliary memory** .

3- It is **non- volatile** type of memory because data is stored **permanently** even the power of the computer is **switched off.**

4- It is **slower** than primary memory .

5- Data **can not** be accessed **directly** by the processor ,is first copied from secondary memory to primary memory , then processor can access it .

6- **Capacity** is generally from **200 GB to Terabyte** .

7- It is accessed by **I/O device channels** .

8- It is **cheaper** than primary memory .

H.W:What are differences between primary memory and secondary memory.

المحاضرة الخامسة

تقنيات الحاسبة

المرحلة الاولى

مدرسة المادة : وداد عبد الخضر