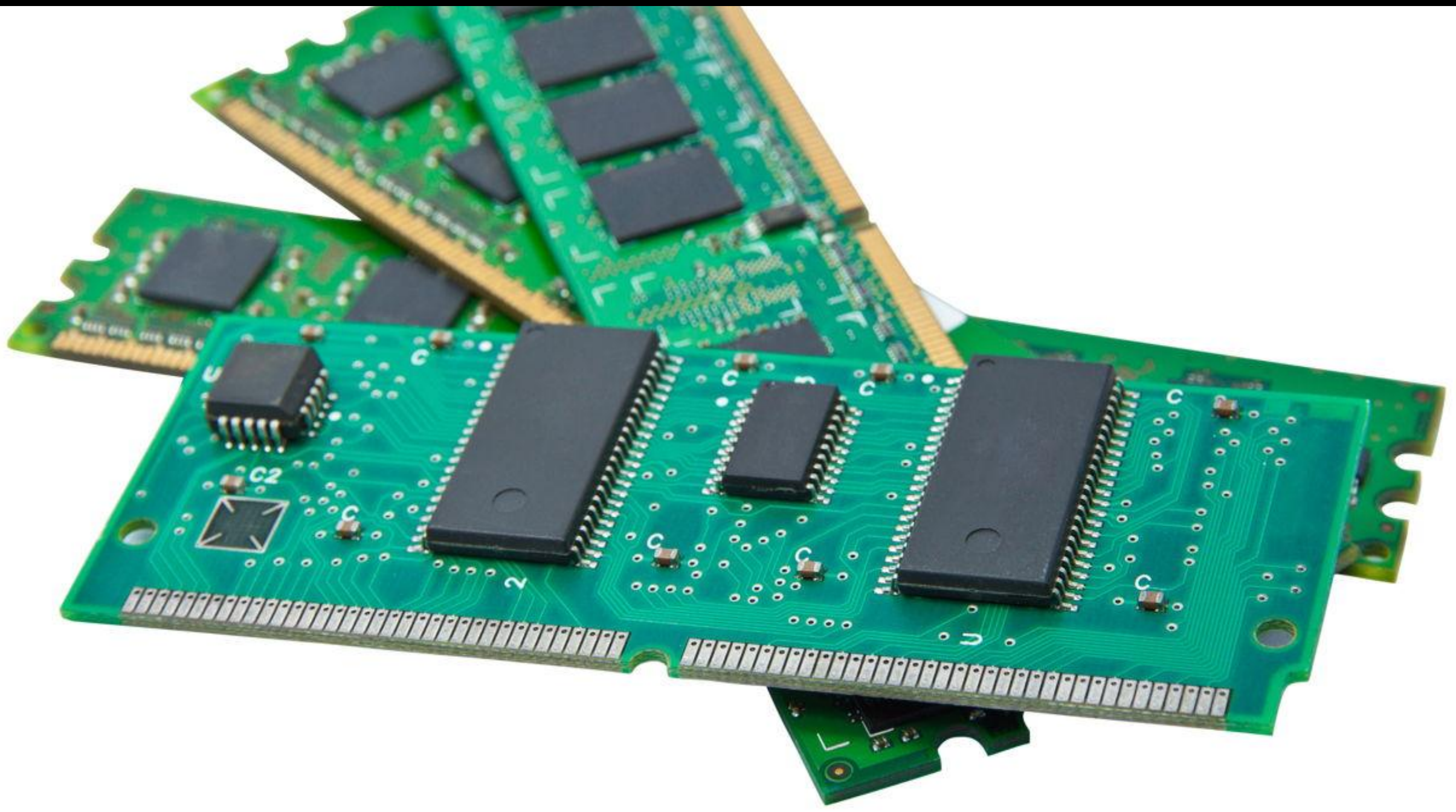
COMPUTER MEMORY



Memory

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

Primary Memory / Main Memory

- Primary memory holds only those data and instructions on which computer is currently working. Has limited capacity and data gets lost when power is switched off. It is also called main memory.
- It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instructions required to be processed earlier reside in main memory.

Characteristic of Main Memory

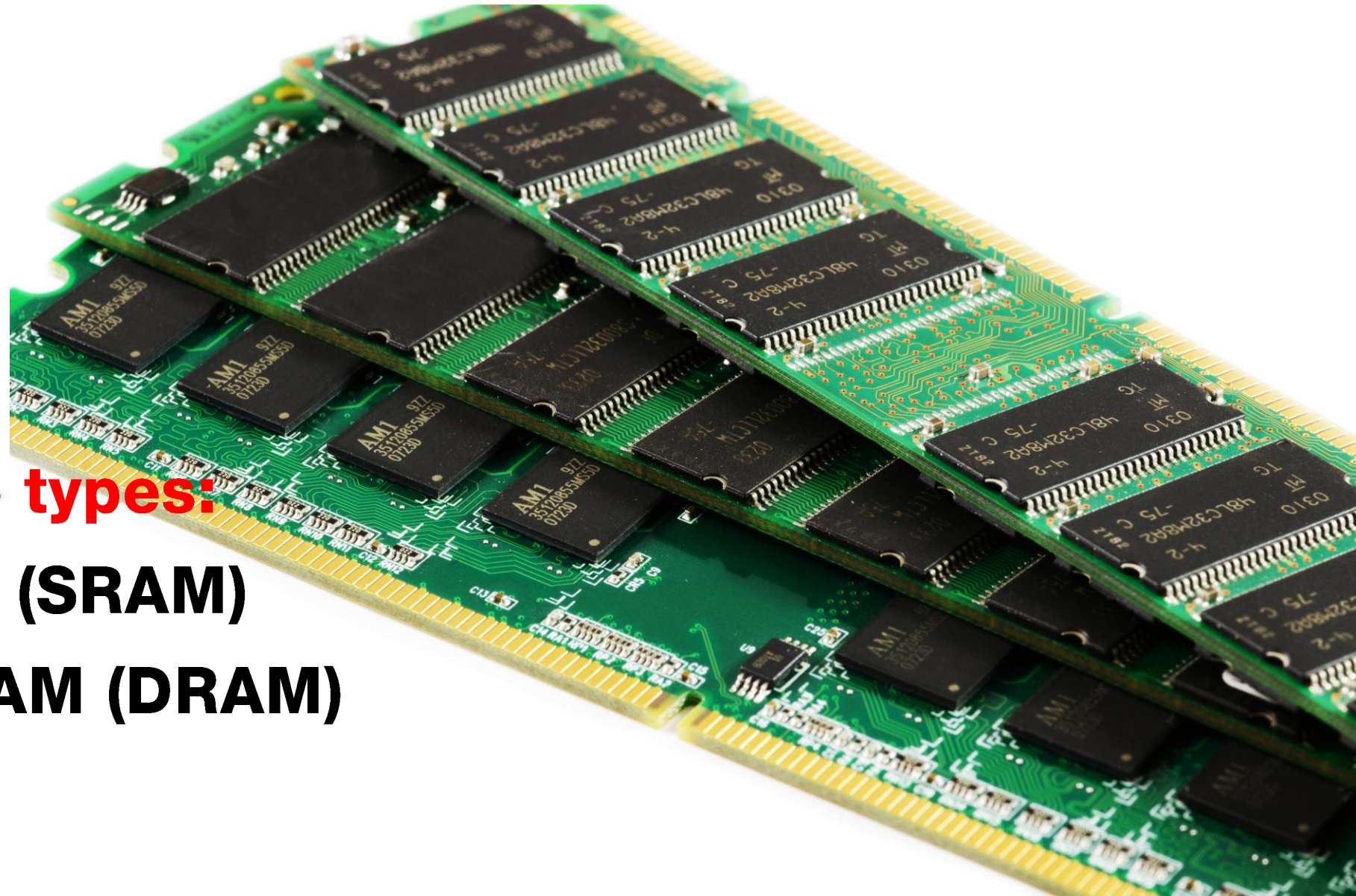
- These are semiconductor memories.
- It is known as main memory.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without primary memory.

Primary memory is divided into two subcategories:

1. **RAM (Random Access Memory)**
2. **ROM (Read Only Memory)**

Random Access Memory (RAM)

- **A RAM constitutes the internal memory of the CPU for storing data, program and program result. It is read/write memory. It is called random access memory (RAM).**



RAM is of two types:

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 remains applied.
- It has long data lifetime.
- There is no need to refresh.
- Faster
- Used as cache memory.
- Large size. Expensive.
- High power consumption.

Dynamic RAM (DRAM)

- DRAM, unlike SRAM, must be continually refreshed in order for it to maintain the data.
- It has short data lifetime.
- Need to refresh continuously.
- Slower as compared to SRAM.
- Used as RAM.
- Lesser in size.
- Less expensive.
- Less power consumption

Read Only Memory (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.

There are two main reason why read only memory is used within the PC:

1. Permanent
2. Security

ADVANTAGES OF ROM

- Non-volatile in nature
- These can not be accidentally changed
- Cheaper than RAMs
- Easy to test
- More Reliable than RAMs
- These are static and do not require refreshing
- Its contents are always known and can be verified

Secondary Memory / Auxiliary Memory

- This type of memory is also known as external memory or non-volatile. It is slower than main memory. These are used for storing Data/Information permanently.
- CPU directly does not access these memories; instead they are accessed via input-output routines.

Characteristics of Secondary Memory

- These are magnetic and optical memories.
- It is known as backup memory.
- It is non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of the data in the computer.
- Computer may run without secondary memory.
- Slower than primary memories

There are two types of Secondary Memory

1. **Sequential Access Secondary Memory (ex: Tape drives)**
2. **Direct Access Secondary Memory (ex: Disk drives)**

Sequential Access Secondary Memory (SASM)

- **The data stored on SASM is accessed sequentially by the computer that is to access 100^{th} record; it has to traverse the previous 99 records.**
- **It is like music cassette.**
- **Magnetic Tapes are sequential access storage devices.**

Direct Access Secondary Memory (DASM)

- Data stored in a DASM can be accessed using a directory stored which contains the name given to the data file and its address or storage location.
- Magnetic Disk and Optical Disk are example of DASM.

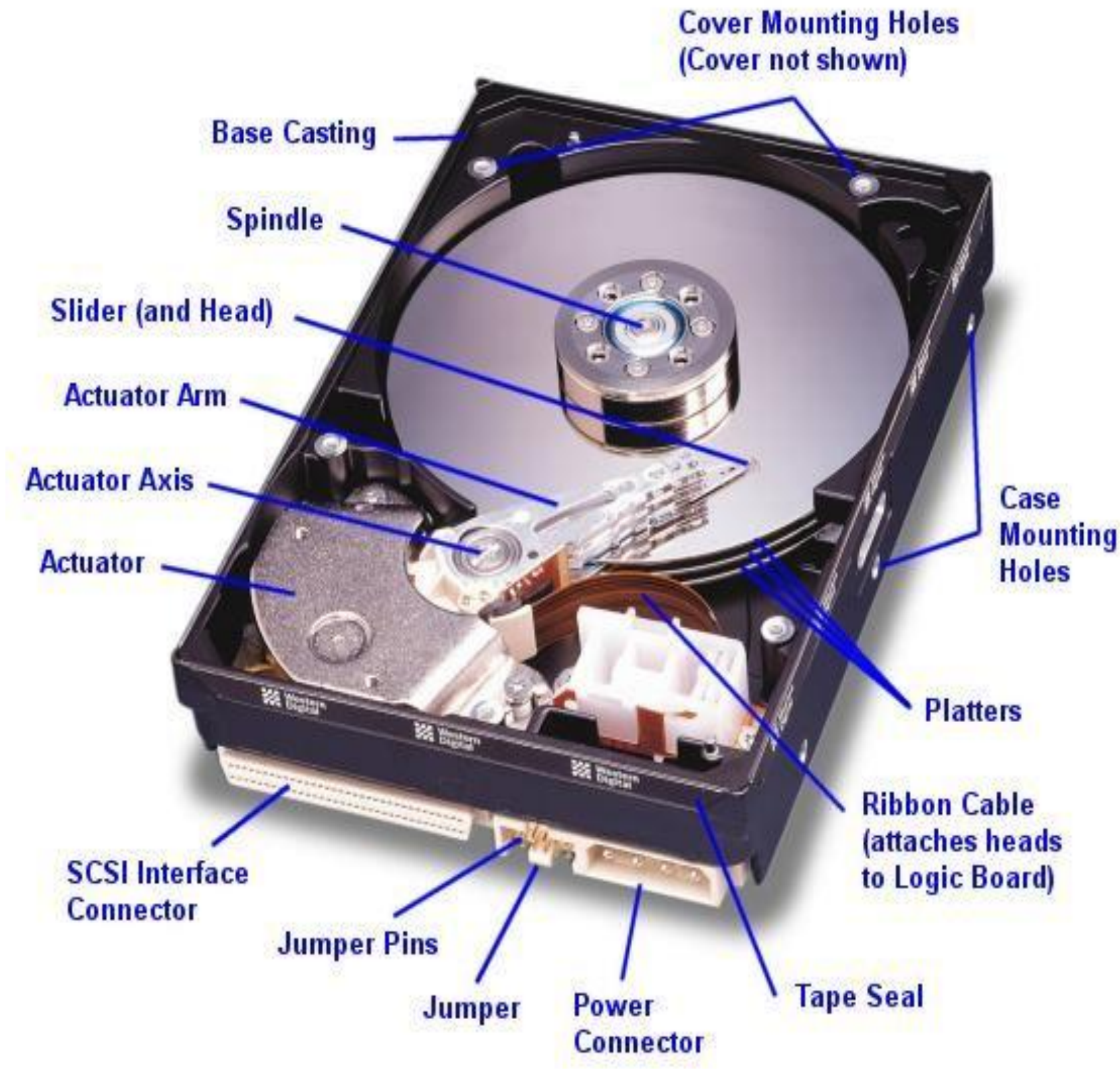
Hard Disk

- Hard disk is made of rigid substance that is capable of storing a greater amount of data than the soft material.
- Hard disk is metal platter coated with a thin film of magnetic material.
- Information is recorded on both side of each disk as a series of magnetized (signifying for 1 bit) or non-magnetized (signifying for 0 bit) spots.
- Hard disk rotates at very high speed around 3600 RPM.

Hard Disk

- **Hard disk can further divided into:**

1. **Removable hard disk** (Disk Pack)
2. **Fixed Hard disk** (Winchester Disk)



Removable hard disk (Disk Pack)

- **The storage capacity of a disk pack depend upon the number of recording surface.**
- **A disk pack consists of several disks which are mounted together on a spindle for access by the drive.**
- **On the same disk drive any number of disk packs can be used.**

Fixed Hard disk (Winchester Disk)

- **Winchester disk is a sealed disk technology that was developed by IBM.**
- **In this type of disk drive since its not removable the access arms are in the center and data are stored on the top of the top platter and on the bottom of the bottom platter as well.**

Advantage of Hard Disk:

- Direct Access
- Mass Storage
- Portability
- Reusability
- Low cost
- Transfer rate

Disadvantage of Hard Disk:

- Disk Crash
- Cost per bit
- Dust free environment

Disadvantage of Hard Disk:

- **Disk Crash**
- **Cost per bit**
- **Dust free environment**

CD-ROM (Compact Disk)

- The compact disc-CD was inverted in 1982 by two well known companies, Philips and Sony.
- Initially it was an audio CD.
- It is a small optical disk on which data such as music, text, or graphic images is interlay encoded.
- CD contains data in the same way as the hard disk.
- A CD is a fairly simple piece of plastic about of an inch (1.2mm) thick.
- The data is recorded by creating pits by a laser beam.

Types of Compact Disk

1. **CD-DA: Audio CD, Digital audio**
2. **Photo-CD: developed to hold digitized photograph and sound**
3. **Video-CD: Can hold around 70 min of video.**
4. **CD-R: (write once and read many)**
5. **CD-RW: Rewritable CD.**

DVD (Digital Versatile Disk)

- **DVD drives are replacing CD-ROM drives in personal computer and as a medium for storing computer programmers.**

- **DVD-ROM is an optical disc storage media format that can be used for data storage, which include movies with high video and sound quality.**

DVD (Digital Versatile Disk)

- **DVD-ROM is a non-volatile optical storage medium similar to CD-ROM , which contain computer data that cannot be erased or rewritten.**
- **DVD-RW stands for digital versatile disk Rewritable.**
- **Allows up to 17 gigabytes of storage (from 4.7 GB to 17 GB).**