

Computer Memory or Storage Devices

Storage Devices are the devices that are used for data storage in the computers. The computer has many types of data storage devices and they can be broadly divided as - Removable Data Storage Devices and the others as the Non-removable Data Storage Devices.

The memory of computer is **two types** viz. - **Primary Memory** and **Secondary Memory**.

Primary Memory is the **volatile memory** and the Secondary Memory is the **non-volatile memory**. The volatile memory is **erasable** and the non-volatile memory stores the content **that cannot be erased**. Basically, when we talk about the data storage devices **it is generally assumed to be those of secondary memory**.

Primary Memory:

Primary Memory is accessible directly by the processing unit. RAM is an example of primary memory. As soon as the computer is turned off, the contents of the primary memory would be lost. You can store and retrieve data much faster with primary memory compared to secondary memory. And Primary memory is also more expensive than secondary memory as the size of primary memory is lesser than that of secondary memory.

Computer memory stores two things: i). instructions to execute a programme, and ii). data. When the computer is performing any job, the data that have to be processed are stored in the primary memory. This data may come from an input device like keyboard or from a secondary storage device like a floppy disk.

The following terms related to memory of a computer or Primary memory:

1. **Random Access Memory (RAM):** The primary storage is called as Random Access Memory (RAM) because it is possible to randomly select and use any location of the memory, directly store and retrieve data. It takes same time to reach any address of the memory as it takes for the first address. It is also called read / write memory. The storage of data and instructions inside the primary storage are temporary. They disappear from RAM as soon as the power to the computer is turned off. The memories, which lose their content on failure of power supply, are known as volatile memories. So, we can say that RAM is a volatile memory.
2. **Read Only Memory (ROM):** There is another memory in computer, which is called **Read Only Memory (ROM)**. The storage of program and data in the ROM is permanent. The ROM stores some standard processing programmes supplied by the manufacturers to operate the personal computer. The ROM can only be read by the CPU but it cannot be changed. The basic input/ output programme is stored in the ROM that examines and initialises various equipment attached to the **PC** when the switch is made **ON**. The memories, which do not lose their content on failure of power supply, are known as non-volatile memories. **ROM** is **non-volatile** memory.
3. **PROM:** There is another type of primary memory in computer, which is called **Programmable Read Only Memory (PROM)**. You know that it is not possible to modify or erase programs stored in **ROM**, but it is possible for you to store your program in **PROM** chip. Once the programmes are written it cannot be changed and remain intact even if power is switched off. Therefore

programmes or instructions written in **PROM** or **ROM** cannot be erased or changed.

4. **EPROM:** This stands for **Erasable Programmable Read Only Memory**, which overcome the problems faced by **PROM** and **ROM**. **EPROM** chip can be programmed time and again by erasing previously stored information in it. Information stored in **EPROM** can be erased by exposing the chip to ultraviolet light for some time and the chip can reprogrammed by using a special programming facility. When the EPROM is in use, information stored in it can only be read.

5. **Cache Memory:** The speed of CPU is extremely high compared to the access time of main memory. Therefore the performance of CPU decreases due to the slow speed of main memory. To decrease the mismatch in operating speed, a small memory chip is attached between **CPU** and **Main Memory** whose access time is very close to the processing speed of **CPU**. It is called **CACHE** memory. **CACHE** memories are accessed much faster than conventional **RAM**.

To store programs or data currently being executed or temporary data frequently used by the CPU. So each memory makes main memory to be faster and larger than it really is. It is also very expensive to have bigger size of cache memory and its size is normally kept small.

6. **Registers:** The CPU processes data and instructions with high speed; there is also movement of data between various units of computer. It is necessary to transfer the processed data with high speed. So the computer uses a number

of special memory units called registers. They are not part of the main memory but they store data or information temporarily and pass it on as directed by the control unit.

The secondary Memory:

Secondary Memory is used for permanent storage of data in the computer. Some of the secondary storage devices are - **Hard Disk Drives** – which are the most common type of storage devices that are used in almost all the computer systems. The other ones include the **Floppy Disk Drives**, the **CD ROM** and the **DVD ROM**, the **Flash Memory**, the **USB data card** etc.

Floppy Discs:

Floppy Disks, which are soft magnetic disks, (often also called **Floppies** or **Diskettes**) are portable. They can be removed from a disk drive. Disk drives for floppy disks are called *Floppy Drives*. Floppy Disks are slower to access than hard disks and would have less storage capacity, however, they are much cheaper when it comes to cost. Floppies come in three basic sizes: Floppy Disks, initially as 8-inch (200 mm) media and later in 5.25-inch (133 mm) and 3.5-inch (90 mm) sizes. They were everywhere in the form of data storage and exchange from the mid-1970s well into the first decade of the 21st century. They are read and written by a floppy disk drive (FDD). Figure of floppies of 8-inch (200 mm), 5.25-inch (133 mm) and 3.5-inch (90 mm) sizes shown here.

Floppies use where small files such as word processing, small spreadsheets and databases need to be moved from one computer to another. Useful to backup small data files.

Fixed Hard Discs (HDD):

A **Hard Disk Discs (HDD)** is a data storage device used for storage and retrieving such stored digital information using rapidly rotating disks (Platters) coated with magnetic material. An HDD retains its data even when powered off. Data is read in a random-access manner, meaning individual blocks of data can be stored or retrieved in any order rather than sequentially. Hard Disk Drives can be used for



storing operating systems software and working data. These are suitable for any application which requires very fast access to data for both reading and writing too. However, Hard disk drives may not be suitable for applications which need portability. Almost all computers used a fixed

hard disc. Used for on-line and real time processes requiring direct access. Used in file servers for computer networks to store large amount of data. Figure of 2.5" **SATA Hard Drive** shown here

This HDD is used to store operating system softwares which can be installed in computer to run it, and file data. Their capacity has been enlarged by the year.

Portable Hard Discs:

Portable Hard Discs are good fun because you can carry data all over the place and transfer information, programmes, pictures between computers.



Portable disks connected with lap tap.

Portable Discs are used to store very large files which need transporting from one computer to another and price is not an issue. Hard drives have to be handled quite carefully and when being transported should be wrapped in something soft and put in a padded bag. These are more expensive than other forms of removable media.

Magnetic Tapes:

Magnetic Tape has been used for **data storage** for over 50 years. When storing large amounts of data, tape can be substantially less expensive than disk or other data storage options. Tape storage has always been used with large computer systems.



Modern usage is primarily as a high capacity medium for backups and archives.

Magnetic tapes are used for applications which require extremely large storage capacity where speed of access is not an issue. It is commonly used for backups of file servers for computer networks, in a variety of batch processing applications such as reading of bank cheques, payroll processing and general stock control. Writing and retrieving data is slow. It uses serial access for reading and writing.

Optical backing storage media such as CDs and DVDs:

- CDs are used for large files (but smaller than 1GB) which are too big for a floppy disc to hold such as music and general animation.



- DVDs are used to hold very large files (several GB) such as movies. Both CDs and DVDs are portable i.e. they can be transported from one computer to another. Both can be used to store computer data.
- CD ROM/DVD ROM Applications which require the prevention of deletion of data, accidental or otherwise. CDs used by software companies for distributing software programs and data; by Music companies for distributing music albums and by book publishers for distributing encyclopedias, reference books etc. DVDs used by film distributors.
- CD R/DVD R Applications which require a single 'burning' of data, e.g. CDs - recording of music downloads from the Internet, recording of music from MP3 format, recording of data for archiving or backup purposes. DVDs – recording of film movies and television programs.
- CD RW/DVD RW Applications which require the updating of information and ability to record over old data. Not suitable for music recording but is very useful for keeping generations of files. DVDs have between five and ten times the capacity of CDs.
- These are the smallest form of memory available in the market today.
- Widely used as removable storage.
- They are more robust than other forms of storage.
- Though expensive than other forms they can be easily written to and updated.

Memory Sticks/Pen Drives:

USB flash drives are typically removable and rewritable, much smaller than a floppy disk. Storage capacities typically range from 64 MB to



64 GB. USB flash drives offer potential advantages over other portable storage devices, particularly the floppy disk. They have a more compact shape, operate faster, hold much more data, have a more durable design and operate more reliably due to their lack of moving parts. Flash drives are widely used to transport files and backup data from computer to computer.

Flash Memory Cards:

A **Memory Card** or **Flash Memory Card** is a solid-state electronic flash memory data storage device used with digital cameras, handheld and Mobile computers, telephones, music players, video game consoles and other electronics.

These days, most of the new PCs have built in slots for a variety of **memory cards; Memory Stick, Compact Flash, SD** etc. Some digital gadgets support more than one memory card to ensure compatibility.



The following table list out some of the key differences between the primary and secondary memory

Primary memory	Secondary memory
Primary memory is known as main memory.	Secondary memory is known as additional memory or back memory.
These memories are also called as internal memory.	These memories are also called as external memory.
Primary memory is temporary	The secondary memory is permanent
Commonly used primary memory (main memory) available in the range of 512 MB to 8 GB RAMs.	Generally secondary memories range between 80 GB to 4 TB Hard Disc Drives.
The primary memory devices are	The secondary memory devices are

connected to the computer through "slots".	connected to the computer through Cables.
The memory devices used for primary memory are semiconductor memories.	The secondary memory devices are magnetic and optical memories.
The primary memory is categorised as volatile and non volatile memories, RAM is the volatile memory and ROM is the non volatile memory.	The secondary memory is always non volatile.
The primary memory is composed of programs and data that are presently being used by the micro processor.	The secondary memory is enough capable to store huge amount of information.

Model Questions

1. The primary memory is the _____. **(Volatile memory)**
2. Secondary memory is the _____. **(Non volatile memory)**
3. RAM is an example of _____. **(Primary memory)**
4. The storage of program and data in the _____ is permanent. **(ROM)**
5. Floppy disks are _____ to access than hard disks. **(Slower)**
6. PROM or ROM cannot be _____ or changed. **(Erased)**
7. CACHE memories are accessed much faster than conventional _____. **(RAM)**
8. Secondary memories are also called as _____. **(External memory)**
9. The secondary memory is always _____. **(Non volatile)**
10. Portable discs are used to store very _____. **(Large files)**

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