



**National University of Sciences and Technology (NUST)  
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**Faculty Member:** Ma'am Mohaira

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Umair Naeem	332078
Moiz Asad	356745
Laraib Nadeem	345847
Maryam Shafeeq	352203

# Hard Disk Drive

## INTRODUCTION

### Definition of a Hard Drive

You might have encountered this situation: you turn on your PC and you get a dark screen with the message 'Inevitable Hard Disk Failure.' Or you've dropped your PC on the floor, your screen goes dark, and your PC won't walk out on once more. Generally, the issue is your hard drive. Assuming your hard drive has crashed, you might have lost every one of your records, photographs, music, and so on. It very well may be one of the additional disappointing encounters for any PC client. Peruse on to figure out how your hard drive functions and a few basic advances you can take to try not to lose every one of your documents on the off chance that it crashes.

The hard drive of a PC is a gadget that stores all the product introduced on a PC, as well as every one of the information documents made and utilized by this product. This incorporates any records you have made and downloaded, for example, photographs and music. The hard drive is a type of long-lasting stockpiling, as opposed to impermanent memory like irregular access memory (RAM). This implies that when you switch off the PC, the documents remain securely put away on the drive so you can utilize them again the following time you start your PC.

There are two general sorts of hard drives: hard plate drives (HDD), which utilize at least one turning circles and depend on attractive capacity, and strong state drives (SSD), which have no moving mechanical parts, however, utilize streak memory like the benevolent found in USB streak drives. If you have a standard personal computer, you doubtlessly have a hard plate drive. Strong state drives are more common for very good quality, costly PCs.

Each PC has something like one inward hard drive to store programming and information. If you are utilizing a Windows working framework, this drive is regularly called the C drive. On the off chance that you are utilizing a Mac, it is simply called the hard drive. If you really want additional capacity limit, you can introduce extra inward hard drives or associate separate outer hard drives.

### Hard Disk Drives (HDD):

Hard plate drives have been the predominant kind of stockpiling since the beginning of PCs. A hard circle drive comprises of an unbending plate made with non-attractive material, which is covered with a slim layer of attractive material. Information is put away by polarizing this flimsy film. The plate turns at a fast and an attractive head mounted on a moving arm is utilized to peruse and compose information. A commonplace hard circle drive works at a speed of 7,200 rpm (pivots each moment), so you will frequently consider this number to be essential for the

specialized details of a PC. The turning of the plate is likewise the wellspring of the murmuring commotion of a PC, albeit most present-day hard circle drives are genuinely peaceful.

Generally, hard plate drives are extremely hearty and can be utilized for a long time without issues. Be that as it may, hard circle drives can fall flat and perhaps the most widely recognized reason is a head crash. This happens when the attractive head scratches the attractive film. This commonly occurs because of an actual shock, such as dropping a PC while it's on. At the point when your hard drives experience mechanical disappointment you can frequently hear a crushing or scratching sound. Such an accident brings about information misfortune since the attractive film gets harmed. It is, in this way, consistently smart to have a reinforcement duplicate of the significant records on your hard drive.

## History

Hard drives, otherwise called hard plate drives (HDDs) were an innovation concocted by IBM-and they overwhelmed the market for almost 30 years.

They found a requirement for this kind of innovation in **1953**, and the principal hard drive was created and afterward licensed in **1956**. The main model was delivered in **IBM's San Jose, California lab.**

Hard drive innovation has changed to address business issues from that point forward, and they've likewise turned into much more straightforward to utilize.

Outside hard plate drives that were once the size of fridge units are currently simply inches long and can store a few gigabytes-and presently terabytes-of information. Outside hard drives are an incredible method for sponsorship up, secure, and transport basic business documents. They can be one of the most mind-blowing equipment answers for putting away a lot of information and guaranteeing that you have an idiot proof catastrophe recuperation plan. While the outside hard drive could ultimately be supplanted by distributed storage and reinforcement, convenient hard drives (and hard drive innovation in general) has positively changed starting around 1953.

## **First External Hard Drive**

The underlying IBM hard drives are viewed as outside gadgets since they didn't run inside the PC units. IBM engineer Reynold B. Johnson is the person who concocted the thought, of the outer hard drive. Johnson's most memorable outer hard drive, the IBM 350 Disk File, upheld the IBM 305 RAMAC PC framework.

This hard drive framework was presented on September 13, 1956. These hard drives were tremendous units that contained a few "platters" inside to store information. Put away in air-controlled rooms, the hard drives were set next to each other. They supplemented the tape stockpiling answers for their servers.

## **Hard Drives in the 80's and 90's**

Mac previously presented the idea of the PC in the 1980's, with Microsoft rapidly taking action accordingly. These PCs by and large contained inner hard drive circles or a confounded

manifestation of an outer hard drive. These frameworks were restricted with respect to how much capacity they permitted and were not viewed as easy to understand. In 1983, Apple presented the Profile outside hard drive. This early portrayal of the outside thumb and hard drives realized today connected to the rear of Apple units.

Mac's creation neglected to take off, and PC organizations changed to an interior hard drive interface. This innovation was the essential hard circle drive innovation utilized all through the leftover 1980's and the mid 1990's. Inner hard circle drives were subsequently redone to increment extra room. In the event that a client required more space, the person in question would basically supplant the inner drive in their PC with one that held more information. Yet again it was only after 1994 that the outside hard drive became the overwhelming focus.

### **1994 to Today:**

Reynold B. Johnson's unique outside hard drive ideas took on another structure inside the PC business in 1994. General Serial Bus, or USB, innovation was presented in 1994 by seven innovation monsters. The innovation organizations behind USB innovation were Compaq, DEC, IBM, Intel, Microsoft, NEC, and Nortel. These organizations overall designed the outer hard drive innovation that we see today, and outside hard drives come in two essential structures. Theoretical Explanation

## **Working Principle of a Hard Disk**

A hard disk typically works on the principle of simple magnetism to store the data and information. A hard drive typically consists of a large plate that is usually made up of a magnetic material and is known as a platter. The platter is usually constructed in a circular shape. The surface of the magnetic plate is divided into billions of tiny compartments. The magnetization of the tiny areas can be performed independently. Magnetized tiny area of the plate denotes a binary high and is equivalent to binary value one; whereas the demagnetized tiny area denotes a binary low and is equivalent to binary value zero. This indicates that the letters, numbers, and other forms of data stored by the hard disk drive are a combination of binary values, i.e., zeroes or ones. The smallest portion of the information stored by the hard disk drive is known as a bit. The process of magnetization of materials is typically preferred to store information in the disks as it does not get affected by switching off the power supply. The data is retained by the drive even if it is not connected to the power supply for a long time period. The magnetized portion of the hard disk tends to stay magnetized until it is externally demagnetized, thereby allowing reliable storage of data.

## **Components of a Hard Disk**

A hard disk drive typically consists of 9 major components, namely an actuator, a read-write arm, a central spindle, a magnetic platter, a plug, a read-write head, circuit board, a connector, and a small spindle.

### **1. Actuator**

The actuator is a straightforward gadget that aides in the transformation of electrical energy into mechanical energy. Here, the primary motivation behind the actuator is to drive the read-compose arm. At first, stepper engines were commonly utilized by the hard drives to move the read-compose arm, however they were before long supplanted by the actuators as stepper

engines move at a similarly slower rate, are less solid, need accuracy, and are significantly more delicate to actual boundaries of the climate like temperature, pressure, and so on. In the absolute most recent forms of hard plate drives, voice curls are utilized in the spot of actuators.

## 2. Read-Write Arm

The read-write arm acts as a driving mechanism that moves the read-write head over the surface of the platter in a back-and-forth direction.

## 3. Central Spindle

The spindle attached to the center of the platter holds the device in place and helps in the uniform rotation of the disk at a considerably high speed along its axis.

## 4. Magnetic Platter

An attractive platter is a roundabout circle that is regularly comprised of aluminum or glass and has an attractive covering applied on its surface. It is one of the main pieces of a hard circle drive. The attractive platter of a hard circle is principally liable for the capacity of information with the assistance of the magnetization cycle. A hard circle drive comprises of various attractive platter plates that are stacked on top of each other and are mounted on a typical shaft. The revolution each moment of the platter is straightforwardly corresponding to the speed of activity of the gadget.

## 5. Plug

The plug of the hard disk helps to connect the hard disk drive to a computer system.

## 6. Read-Write Head

The read-compose head is a little piece of a magnet connected to the highest point of a read-compose arm that plays out the primary errand of perusing information from the hard circle and composing the information on the outer layer of the platter. A hard circle drive ordinarily comprises of two read-compose sets out toward every platter circle. One of the heads is joined to the highest point of the platter, though, the other is set in close contact with its base. This empowers the gadget to get to information accessible on the two sides of the platter. To safeguard the gadget from extreme mileage, the read-compose head is made to drift over the surface and a layer of liquid or air is embedded between the read-compose head and the platter.

## 7. Circuit Board

The circuit board of a hard disk drive is usually made up of aluminum, glass, or ceramic material. It is embedded in the internal circuitry of the hard disk drive and is used to circulate the data contained by the disk by controlling the flow of data to and from the magnetized platter.

## 8. Flexible Connector

The flexible connector attached to the internal mechanism of the hard disk drive near the platter is mainly used to carry data from the circuit board to the read-write head of the device and vice versa.

## 9. Small Spindle

A small spindle is attached to the side of the machinery that helps the read-write arm of the device to swing sideways over the magnetized platter.



Figure 1: Parts of Hard Disk

### Working of a Hard Disk

A hard drive comprises of a heap of circles or platters that twist at a fundamentally rapid. A recording head is normally connected to the top and the base piece of every platter. A layer of infinitesimal polarized metal grains is applied to the outer layer of the plates. The principal reason for the covering of polarized metal grains present on the outer layer of plates is to shape attractive examples to hold the data or store the information. For this reason, the grains will generally organize themselves as gatherings. Here, each gathering shaped by the grains is known as a little. The two states wherein the charge of the grains can be accomplished indicate the parallel pieces 0 and 1. The information is put away on to the plate by changing over advanced information or the parallel blend of pieces into simple information or the electric flow. The exchange of pieces happens with the assistance of an electromagnet that is appended to the inside system of the hard drive. The attractive field produced by the electromagnet is profoundly extraordinary and is equipped for turning around or redirecting polarization of the metal grains. To recover the data put away on the drive, an attractive peruse is utilized. The data that is put away on the outer layer of the hard plate drive is organized in a particular request. The information bits containing the data are organized in concentric round ways. These ways are known as tracks. The tracks can be additionally isolated into more modest regions known as areas. At the point when the client gives an order to save the information, the read-compose top of the gadget attempts to find the free areas of the platter and lay out magnetization and demagnetization of the attractive grains present in that specific region as per the info signal. A

piece of the hard circle drive is explicitly committed to monitor the free and spent bits of the drive. The guide that shows the utilization of the drive is known as the record designation table or FAT. At the point when the client gives an order to the PC to save data on the outer layer of the circle, then, at that point, the PC moves toward the record distribution table to find the proper spot expected to save the information. When the appropriate spot is situated by the PC, the read-compose head is made to likewise continue the outer layer of the platter. At last, the grains present on the outer layer of the plate get polarized and demagnetized according to the info information, and the information is effectively saved. To peruse the information or to recover back the saved data, the cycle gets turned around. A hard circle drive is vulnerable to losing information if the particles of unfamiliar material like residue particles, dampness particles, and so forth figure out how to enter the inside hardware of the gadget, which is the reason a reinforcement of the information put away into a hard plate is generally liked. This implies that a hard circle is a fragile gadget that requires legitimate and cautious dealing with.

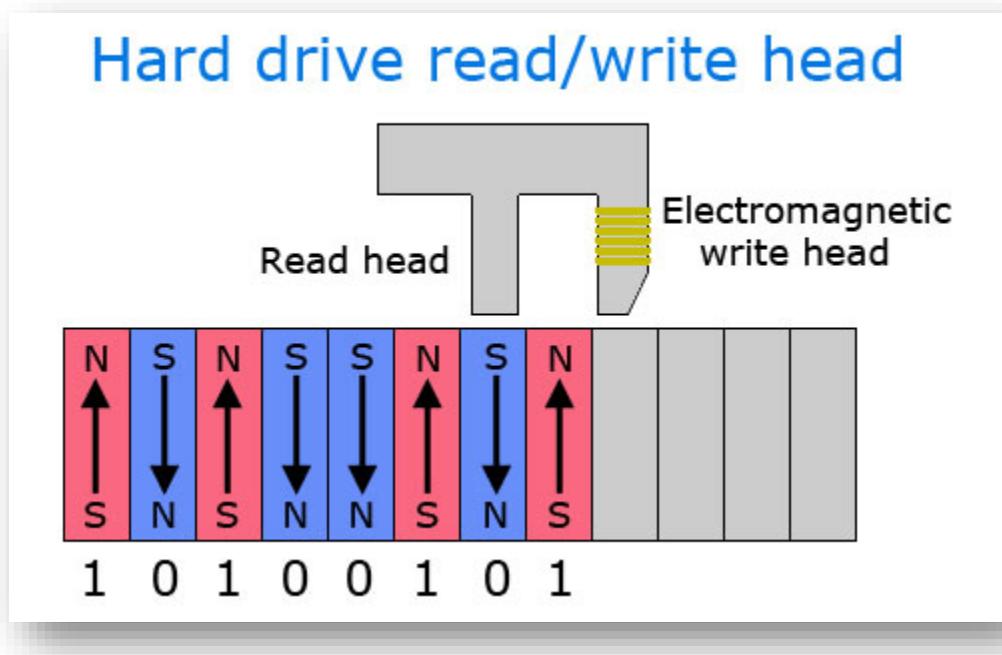


Figure 2: Demagnetization and Magnetization in Hard Disk

## What are the different types of Hard Disk?

Currently there are four types of Hard Disk:

1. **PATA** (Parallel Advanced Technology Attachment) – This is the oldest type of hard disk. It was first used in 1986. PATA Hard Disk uses the ATA interface standard to connect to the computer. It was earlier referred to as Integrated Drive Electronics (IDE). It is a medium speed hard disk, its data transfer rate is up to 133MB / s. This drive stores data using magnetism.
2. **SATA** (Serial Advanced Technology Attachment) – In most of today's computers and laptops you will find this type of Hard Disk. The data transfer rate of SATA Hard Disk is higher than a PATA

- drive. Its speed can be from 150MB / s to 600MB / s. SATA cables are very thin and flexible, which is much better than PATA cables. It is better than the old hard disk drive in many ways.
3. **SCSI** (Small Computer System Interface) – This type of hard disk uses a small computer system interface to connect to the computer. This is quite parallel to the IDE hard drive. The new version of the SCSI Hard Disk (16-bit ultra – 640) has a data transfer speed of up to 640 MBps and can connect to 16 devices with a cable of 12 meters in length.
  4. **SSD** (Solid State Drives) – It is one of the latest drives today. Much better and faster than all other hard disk devices. SSD uses flash memory technology to store data. Its data access speed is very fast. It costs a lot more than an HDD drive.

## **Characteristics of Hard Disk**

Some important characteristics of the hard disk are as follows:

- ✓ The hard disk provides a large storage capacity. The capacity of a personal computer hard disk is from 160 GB to 2TB and more.
- ✓ It is much faster than the floppy disk.
- ✓ It is the primary media for storing data and programs.
- ✓ It is more reliable than a floppy disk.
- ✓ Data stored on the hard disk is safer than the floppy disk.

## **Performance characteristics**

The elements that limit an opportunity to get to the information on an HDD are for the most part connected with the mechanical idea of the pivoting plates and moving heads, including:

- Look for time is a proportion of what amount of time it requires for the head gathering to go to the track of the plate that contains information.
- Rotational idleness is brought about on the grounds that the ideal plate area may not be straightforwardly under the head when information move is mentioned. Normal rotational dormancy is displayed in the table, in view of the factual connection that the typical idleness is one-a portion of the rotational period.
- The piece rate or information move rate (when the head is in the right position) makes defer which is an element of the quantity of blocks moved; normally generally little yet can be very lengthy with the exchange of enormous bordering records.

Postponement may likewise happen on the off chance that the drive plates are halted to save energy.

Defragmentation is a method used to limit delay in recovering information by moving related things to truly general regions on the disk. Some PC working frameworks perform defragmentation naturally. Albeit programmed defragmentation is expected to decrease access delays, execution will be briefly diminished while the system is in progress.

Time to get to information can be worked on by speeding up (in this way lessening dormancy) or by decreasing the time spent looking for. Expanding areal thickness increments throughput by expanding information rate and by expanding how much information under a bunch of heads, in this manner possibly lessening look for action for a given measure of information. An opportunity to get to information has not stayed aware of throughput increments, which themselves have not stayed aware of development in piece thickness and capacity limit.

## **Applications:**

- ✓ HDD has a large storage capacity.
- ✓ It is small and portable.
- ✓ Its performance is very high.
- ✓ It works faster.
- ✓ Very cheap to produce.
- ✓ Fairly fast to access the data.
- ✓ Easily replaced and upgraded.
- ✓ Persistent storage.
- ✓ It is light in weight.
- ✓ It is fixed inside a computer so cannot be lost.
- ✓ Faster than optical disks like DVD's
- ✓ Lower power.
- ✓ Silent operations.
- ✓ Its sizes are very small.
- ✓ It is portable to uses.
- ✓ The computer can communicate with them easily.
- ✓ It can store data like text documents, pictures, videos, audio, files, etc.
- ✓ It can also store operating system files as well as all software related files.
- ✓ Store items can't lose when the computer switches off.
- ✓ Usually fixed inside a computer so can't get lost.

## **Conclusion**

The hard disk drive is probably the most important component to your computer. Without it your computer would never be able to save any files, you would not be able to boot up your operating system, and could never play a game or download a file. Computers now a days comes with a hard drive with three times more space than in previous computers but it is amazing how fast the computer cashed will be depleted. It is very important to know the size of your hard drive as well, because if you do not know and you run out of space, your computer will not work and you will not be able to download anything until you add another hard disk drive.

As you can see the hard disk drive is a very important part of the computer. Without it your computer would not operate at all. Please find out how much memory your hard disk drive can hold and also keep track of how much data has been saved, so you will not run out.