

A  
Micro-project Report On

**Hard Disk Drive**

Submitted

in partial fulfillment of the requirement for the

**First Year of**

**Diploma in**

**Computer Science and Engineering**

by

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Under the guidance of

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**Department of Computer Science and Engineering**



**Yashwantrao Chavan Polytechnic, Ichalkaranji.**

**(Maharashtra State Board of Education, Mumbai)**

**2022-23**

**D.K.T.E Society's  
Yashwantrao Chavan Polytechnic, Ichalkaranji.**

**CERTIFICATE**

This is to certify that, Miss. Shreya Virupakash Kadate (Roll No. 25), Mr. Vinayak Chandrashekhar Kadate (Roll No. 26), Miss. Manasi Sunil Kamble (Roll No. 27), Miss. Yamini Satish Kamble (Roll No.28), Miss. Saniya Subhash Khade (Roll No. 29), Miss. Sanniti Sudhakar Koshti (Roll No. 30) have successfully completed the micro-project work and submitted microproject report on “ Hard Disk Drive ” for partial fulfillment of the requirement for degree of first year diploma in Computer Science and Engineering from the Department of Computer Science and Engineering as per rules and regulations of Yashwantrao Chavan Polytechnic, Ichalkaranji, Dist:Kolhapur.

**Date:**

**Place: YCP, Ichalkaranji**

**Name and Sign of Supervisor**

**Name and Sign of Head of Department-**

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Place: YCP, Ichalkaranji

Date:

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30

## **ABSTRACT**

Abstract should introduce topic, methodology and sample results. It precisely describes the purpose of the research and methodology used.

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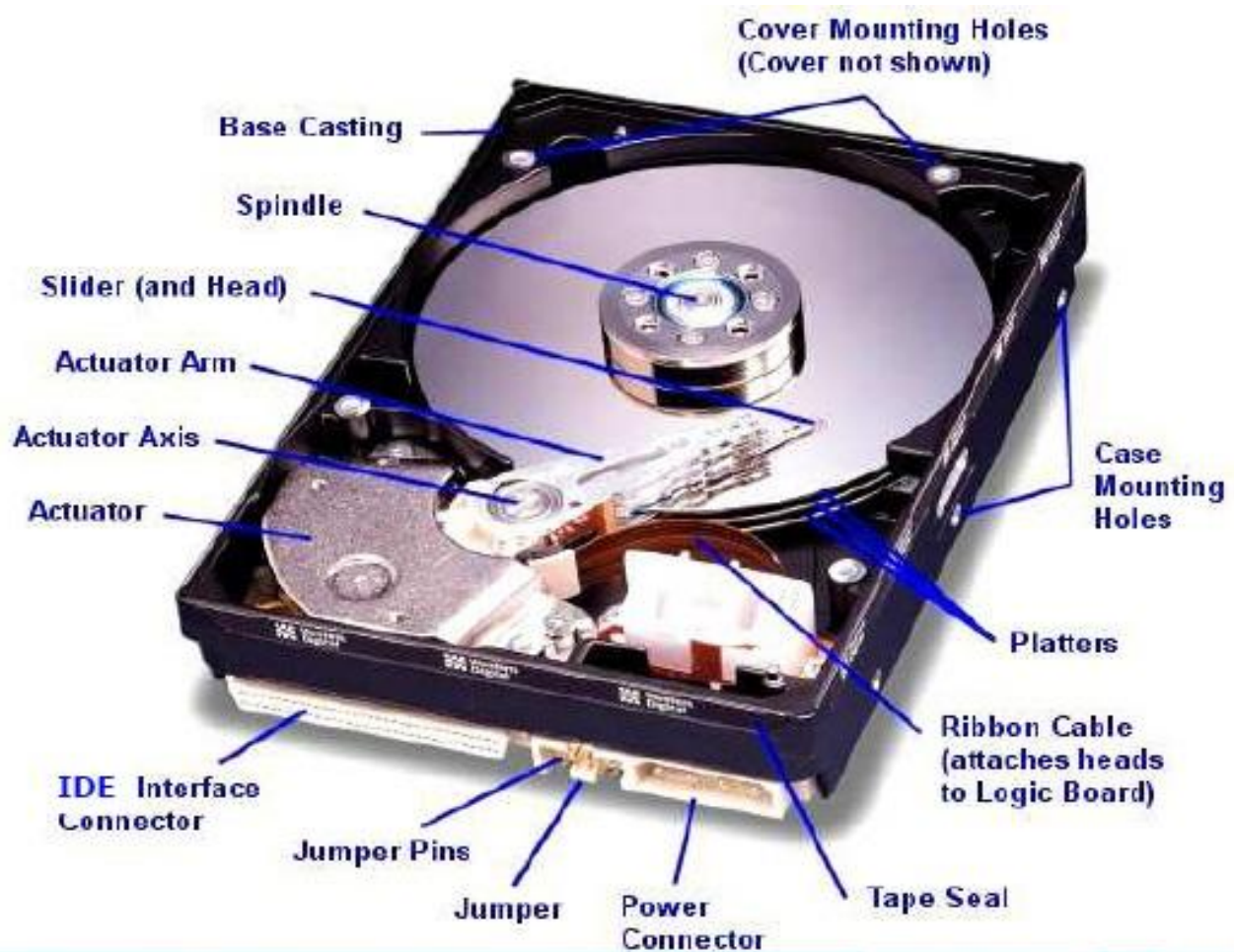
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## Introduction

Hard drives are defined as non-volatile, random access, digital, magnetic, data storage devices.

Popular because increased recording capacity, reliability, and speed, as well as decreased cost.

Disk Drives are the most popular storage medium used in modern computers for storing and accessing data.



Hard Disk Drive

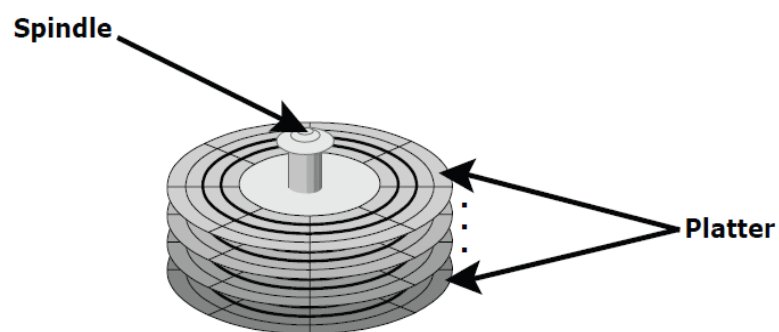
## Key Components of Hard Disk Drive

### 1. Platter



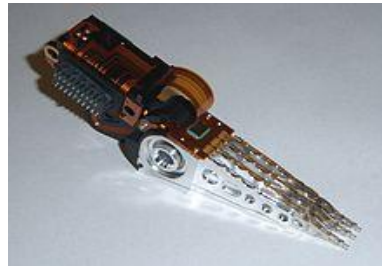
- A typical HDD consists of one or more flat circular disks called *platters*.
- The data is recorded on these platters in binary codes (0s and 1s).
- A platter is a rigid, round disk coated with magnetic material on both surfaces (top and bottom).
- The data is encoded by polarizing the magnetic area of the disk surface.
- Data can be written to or read from both surfaces of the platter.
- The number of platters and the storage capacity of each platter determines the total capacity of the drive.

### 2. Spindle



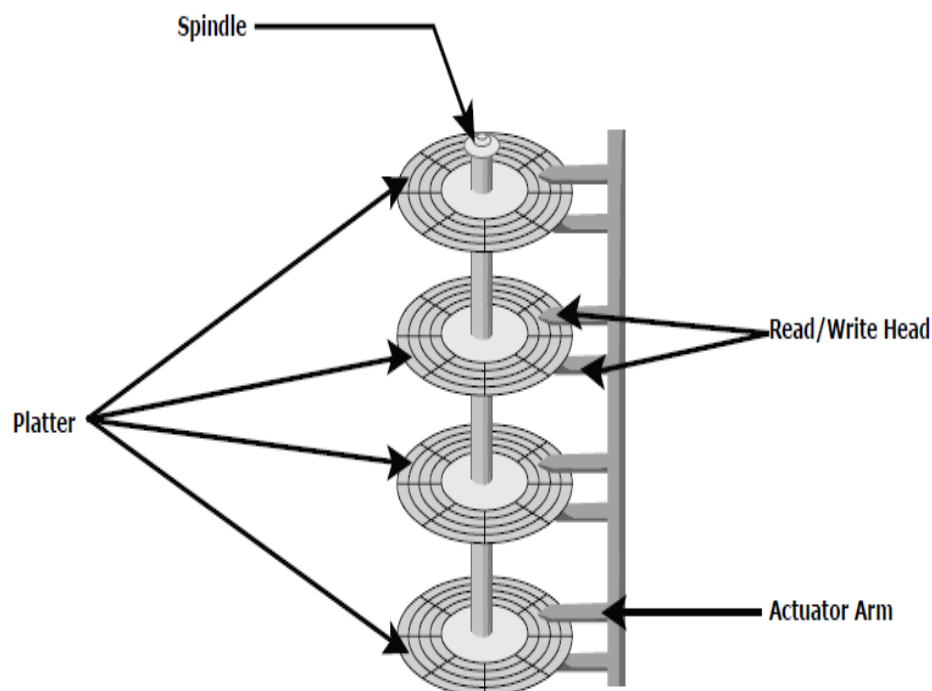
- A spindle connects all the platters and is connected to a motor.
- The motor of the spindle rotates with a constant speed.
- The disk platter spins at a speed of several thousands of revolutions per minute (rpm).
- Disk drives have spindle speeds of 7,200 rpm, 10,000 rpm, or 15,000 rpm.

### 3. Read/Write Head



- Read/Write (R/W) heads -> read and write data from or to a platter.
- Drives have two R/W heads per platter, one for each surface of the platter.
- The R/W head uses the magnetic polarization for reading and writing data on platter.
- When the spindle is rotating, there is a microscopic air gap between the R/W heads and the platters, known as the head flying height.
- This air gap is removed when the spindle stops rotating and the R/W head rests on a special area on the platter near the spindle.
- This area is called the landing zone.
- R/W head accidentally touches the surface of the platter outside the landing zone, a head crash occurs.

### 4. Actuator Arm Assembly

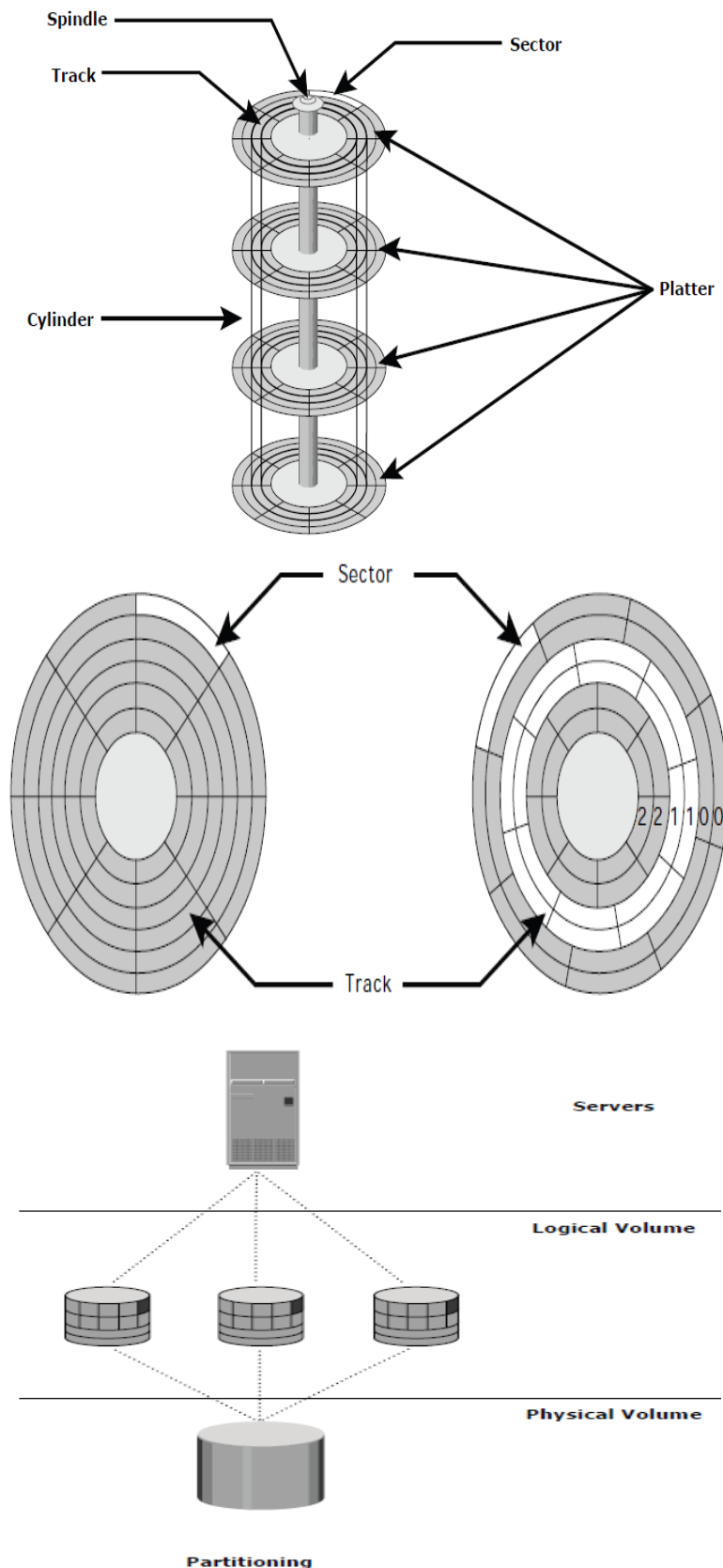


- The R/W heads are mounted on the actuator arm assembly.
- Which positions the R/W head at the location on the platter where the data needs to be written or read.



## 5. Controller

- The controller is a printed circuit board, mounted at the bottom of a disk drive.
- It consists of a microprocessor, internal memory, circuitry and firmware.
- The firmware controls power to the spindle motor and the speed of the motor.

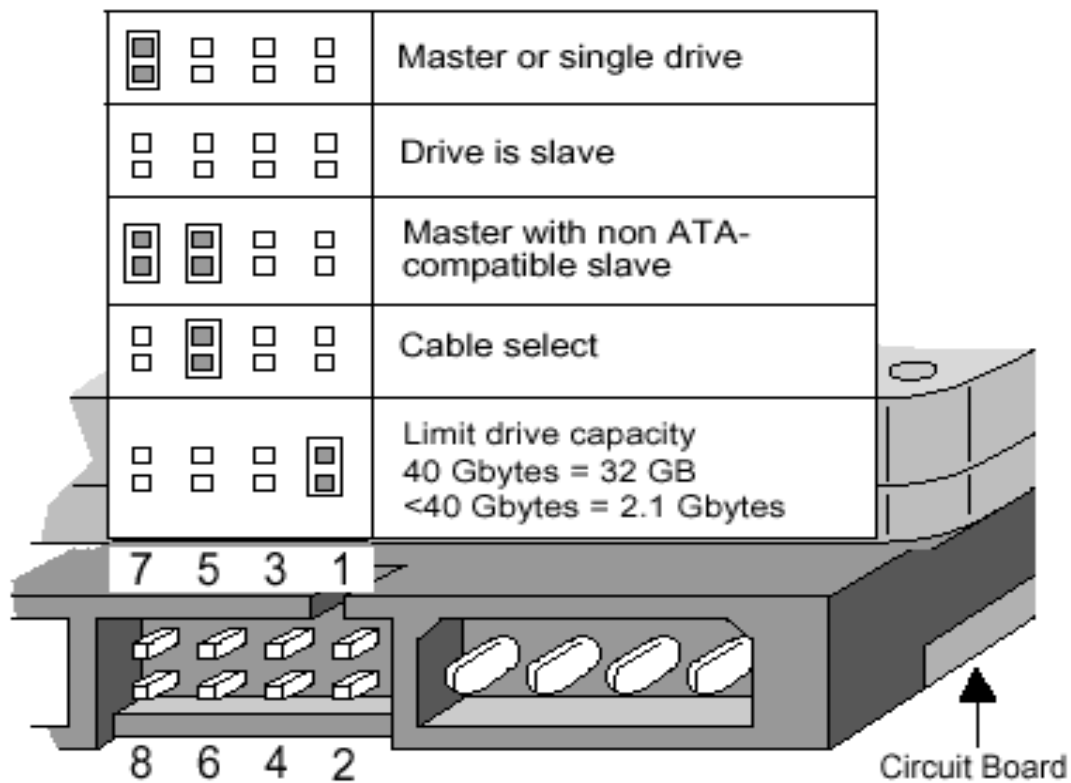


**Current hard disk form factors**

<b>Form factor</b>	<b>Width (mm)</b>	<b>Height (mm)</b>	<b>Largest capacity</b>	<b>Platters (max)</b>	<b>Per platter (GB)</b>
3.5"	102	19 or 25.4	4 TB(2011)	5	1000 GB
2.5"	69.9	7,9.5,12.5, or 15	2 TB(2012)	4	500 GB
1.8"	54	5 or 8	320GB (2009)	2	160 GB

<b>Abbreviation</b>	<b>Meaning</b>	<b>Description</b>
SASI	Shugart Associates System Interface	Historical predecessor to SCSI.
SCSI	Small Computer System Interface	Bus oriented that handles concurrent operations.
SAS	Serial Attached SCSI	Improvement of SCSI, uses serial communication instead of parallel.
ST-506	Seagate Technology	Historical Seagate interface.
ST-412	Seagate Technology	Historical Seagate interface (minor improvement over ST-506).
ESDI	Enhanced Small Disk Interface	Historical; backwards compatible with ST-412/506, but faster and more integrated.

### Disk Drive Interfaces



## Details with figure



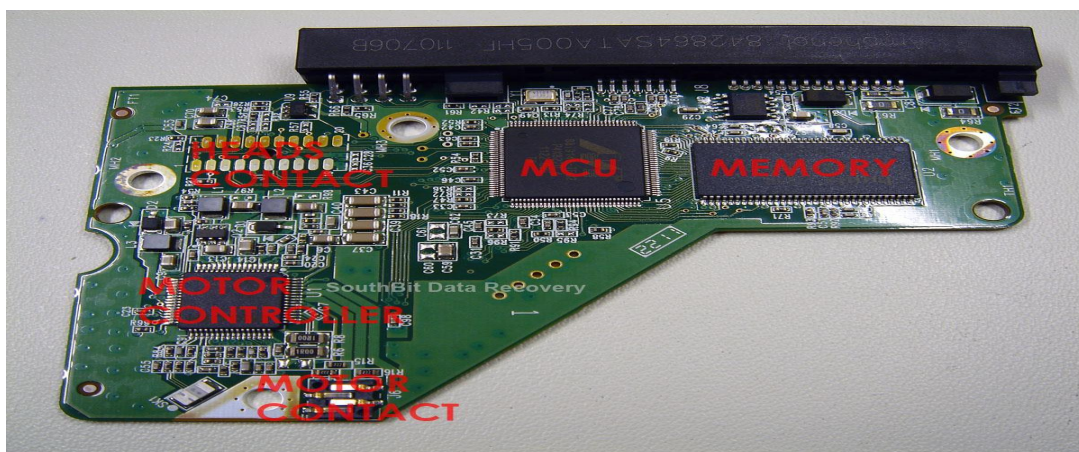
- The top side of the HDA is covered by the top cover, usually silver in color, with a sticker detailing information about the hard drive such as manufacturer, capacity, model, serial number etc.



- The underside of the hard drive houses the printed circuit board, or PCB.
- Hard Disk Assembly
- Motor Spindle Base



- SATA drives have 2 connectors. The small connector carries data to and from the drive,
- The larger is the power connector for 5v and 12v lines.

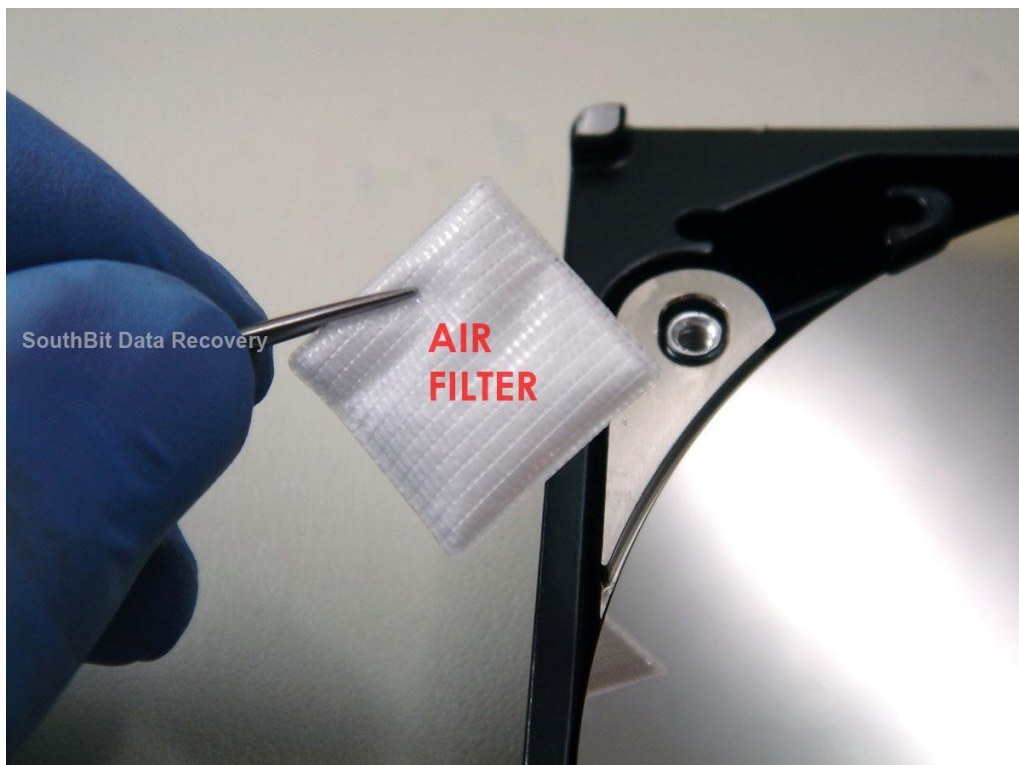


- There are 3 main components of the PCB. They are the main controller unit, or MCU; motor controller and onboard memory (cache)
- The MCU is equivalent to the processor (CPU). essentially the brains and computing power of the drive
- The motor controller performs the function of spinning up the platter/s inside the drive, and controlling the movement of the voice coil which directs head movement.





- The underside of the lid houses a seal which protects the drive from the outside world.



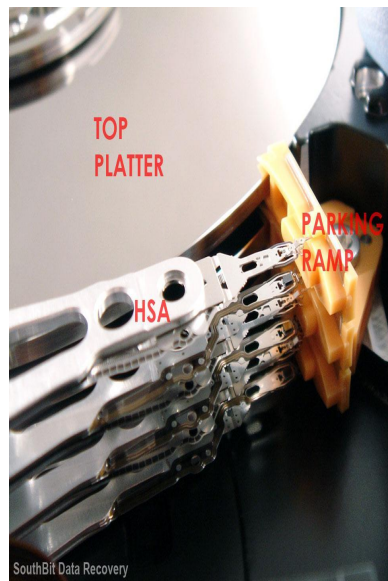
- The air filter purifies the air circulating in the drive in operation.
- It will collect any microscopic fragments of metal or oil which are used in the manufacturing process, or created through wear and tear



- A hard drive also has an air circulation filter inside.
- Over time as the drive is used, the bearings and the electromechanical components wear, creating fine metal particles that float around in the drive.
- The circulation filter catches these particles and traps them within the filter.



- This view shows the main components of the drive. .
- The head stack assembly, or HSA, is the assembly which holds the read and write heads.
- These heads fly nanometers over the surface of the drive on sliders, reading and writing your data.
- A plastic ramp is included to hold the heads in place the drive is not in use.
- Some drives park the heads in the middle of the platters on a special layer, this being seen mainly on older drives.

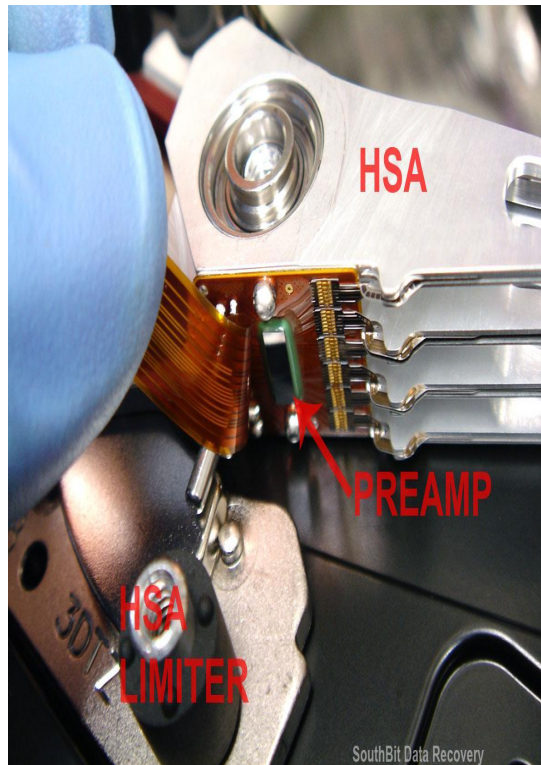


- The HSA holds the actual read and write heads at the end of the assembly, fixed to sliders.
- This particular drive has 6 heads, 3 pairs of 2.
- For each side of the platter there is one read and write head.

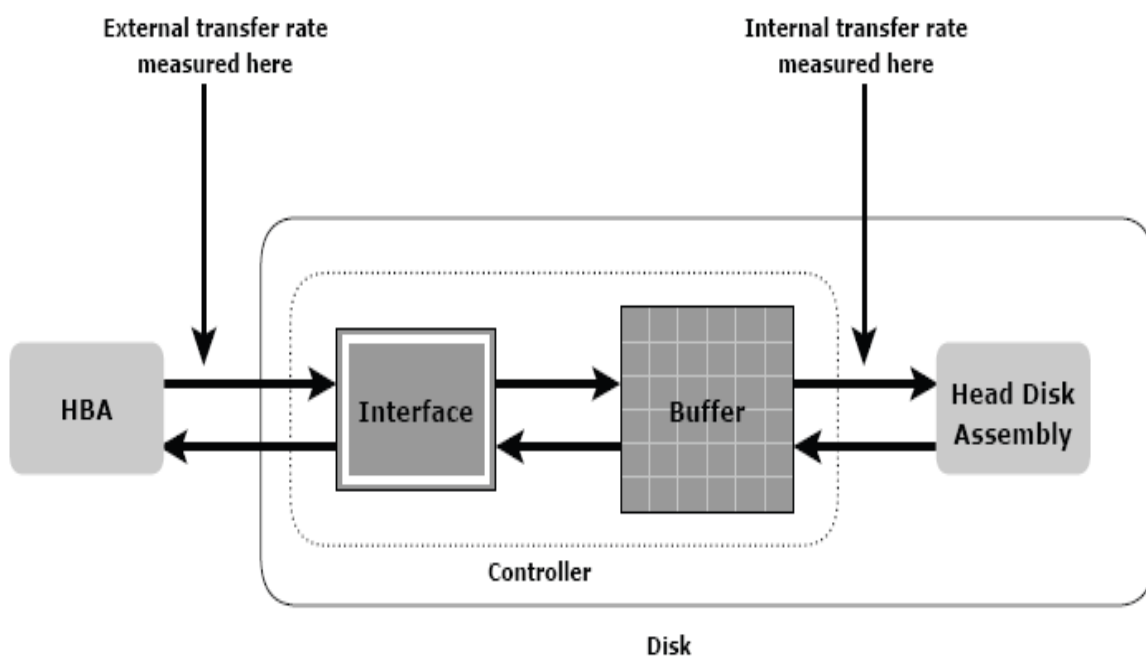


- The sliders allow the head assembly to fly over the platters, only a few nanometers above the surface.
- This is many times thinner than the thickness of a human hair.
- When the drive is spinning at full speed, the heads will be unloaded from the parking ramp and fly over the platters.





- The read and write heads work with very weak signals. For these signals, the “ones and zeros”, to be of use the signals need to be amplified.
- The preamp on the HSA performs this feature, much like the amplifier in a hifi.



**Data Transfer Rate**