① ATA

Why ATA?

Hard disk drives are not directly connected to computers because they require a standardized interface to communicate with the computer's CPU and other components. This is where ATA standard comes to play.

Purpose of ATA:

The ATA interface provides a standardized way for the computer to communicate with the hard disk drive, allowing it to transfer data to and from the drive. The ATA interface also provides a ~~comm~~ common way for the computer to send commands to hard disk drive, such as request to read and write data.

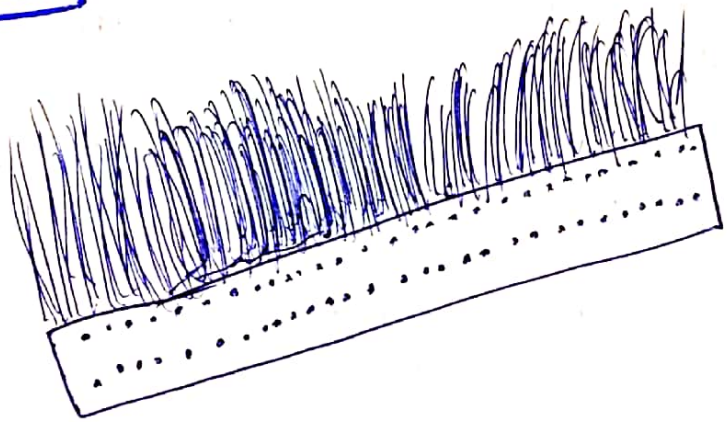
Without the ATA interface, hard disk drives would need to be connected to the computer using a custom interface designed specifically for that particular drive. This would (difficult for) make ↑ hardware manufacturers to develop compatible products and it would make more difficult for users to upgrade their storage systems.

In Conclusion, ATA ~~provides an~~ interface # provides a standardized and efficient way for computers to communicate with hard disk drives and other storage devices.

Data Rates

ATA Standards	Transfer Rate
ATA - 1	8.3 megabytes/sec
ATA - 2	16.6 MB/sec
ATA - 3	33MB/sec
ULTRA ATA/66	33MB/sec
ATA-5	66 MB/sec
ATA - 6	100MB/s.

Interface of ATA



② PATA

PATA stands for Parallel advanced Technology Attachment. which is an interface used to connect storage devices like Hard Disk Drives, Solid-State Drives, and optical drives to a computer motherboard.

It use parallel Data Transfer Method, where multiple bits of data are transferred simultaneously over multiple wires.

This method is used for multiple years but had some limitations, including slower data transfer, and a limited number of devices that could be connected to a single interface.

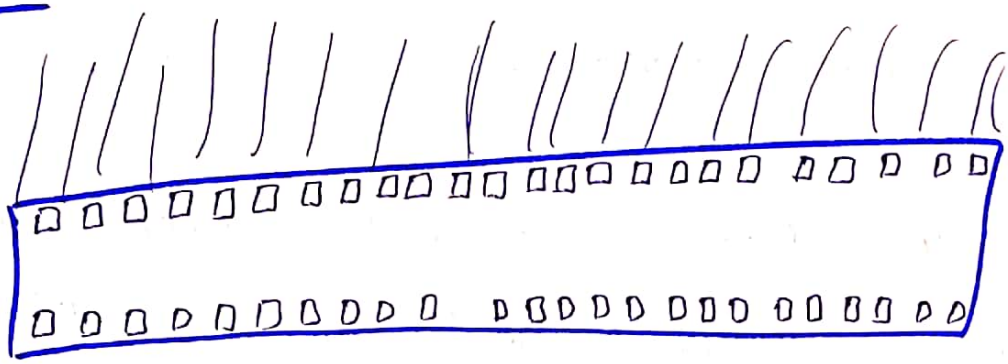
PATA cable have wide, flat design with a 40-pin connector or 80. The interface contains a set of control signals for controlling the storage devices and for recieving status information.

PATA is a specific Implementation of ATA interface.

Data Rates

The data rates of PATA are same as ATA interface.

Interface



③ SATA

SATA (Serial Advanced Technology Attachment) is a type of Interface that is used to connect storage devices like Hard Disk Drives, solid state drives and optical drives to a computer motherboard.

SATA use serial data transfer method, which allow for faster Data rates and more efficient use of bandwidth. SATA uses fewer wires and more efficient data Transfer method, which result in faster data transfer rates and improved system performance.

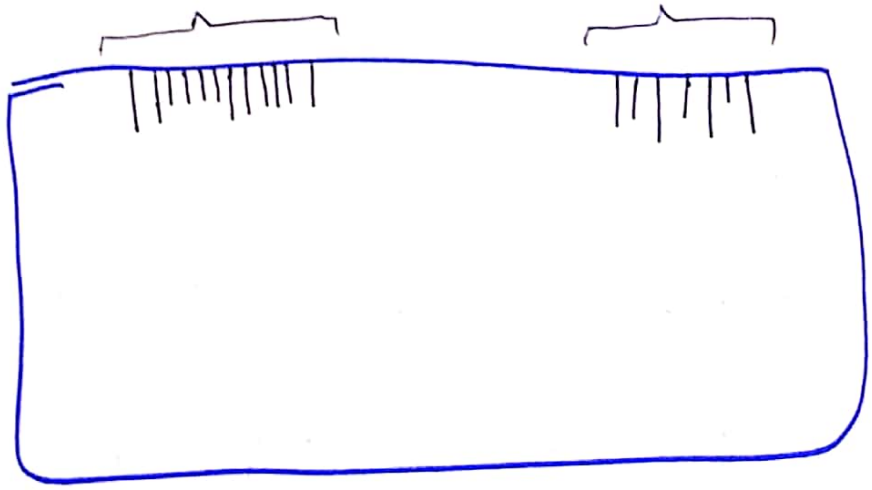
Data Rates

SATA revision	Transfer Rate
SATA I	1.5 Gbps or 150MB/s
SATA II	3Gbps or 300MB/s
SATA III	6Gbps or 600MB/s

INTERFACE (Slim SATA (IMO-297))

12-pins For Power

7-Pins for Data



④ SCSI

SCSI (Small Computer System Interface) is a set of standards for connecting and transferring data between computers and peripherals devices, such as hard disk, tape drivers, CD/DVD drives and printers.

SCSI supports faster data rates and they are much faster than ATA/PATA/SATA. SCSI has longer cable lengths and support more devices, making it useful in expertise environment with large storge system and complex server configuration.

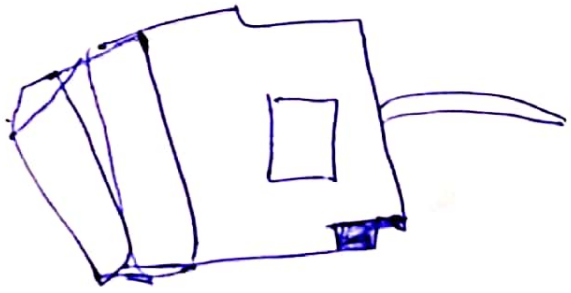
SCSI are expensive and require specialized hardware and Software to Implement. For this reason SCSI is less commonly used in consumer-level systems. and used in expertise level environments where high performance is critical.

Data Rates of SCSI

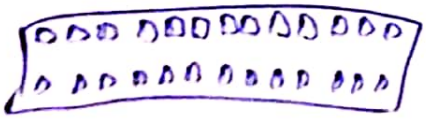
SCSI Standards	Data Rate
SCSI-1	5MB/s
FAST-SCSI	10MB/s
Wide-SCSI	20 MB/s
ULTRA SCSI	20MB/s
ULTRA-2SCSI	40MB/s
ULTRA-640-SCSI	640MB/s

Interface of SCSI-3 External Connector

Both ends of cable use a 68-pin male plug



The socket on the host adapter and devices are 68 pin female.



⑤ USB

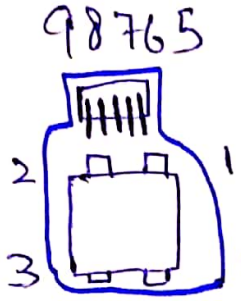
USB stands for (Universal Serial Bus). It is a standard Interface that is used to connect various devices, such as printers, scanners, keyboards, mice flash drives, smartphones and tablets to a computer.

USB is a plug and play Interface. which means devices can be connected and disconnected while computer is running without the need of restart or special configuration.

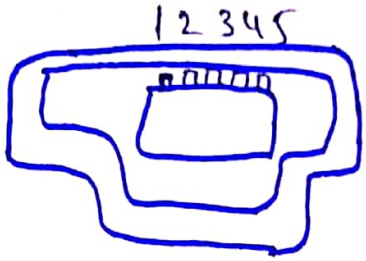
Data Rates

USB Standard	Data Rate
1.0 and 1.1	12 Mbps
2.0	400 Mbps
3.0	5 Gbps
3.1	10 Gbps
3.2	20 Gbps

Interface of USB



Type-B (Super Speed)



Mini-A

(6) FireWire 1394

FireWire 1394 is a high speed Interface. that provide data Transfer rate between devices.

It is a Serial Interface that can be used to connect variety of devices, including external hard drives, cameras and audio interfaces to the computer.

FireWire designed to be faster than USB, with data. transfer rate up to 800 Mbps.

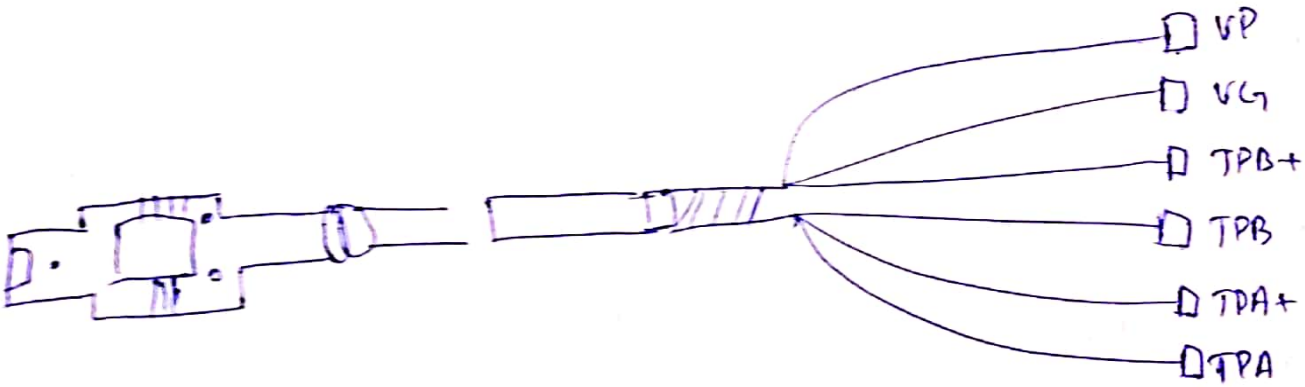
FireWire is capable for providing power to connected devices.

Firewire provide high bandwidth and low latency and used in professional video ~~audio~~ audio applications.

Data Rates

Version	Data Rate
Fire Wire 400	400 Mbps or 50 MB/s
// 800	800 Mbps or 100 MB/s
// S1600 and S3200	1.6 Gbps or 200 MB/s

INTERFACE of Firewire 1394



(B) MINI-USB

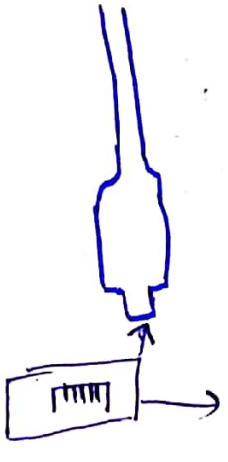
MiniUSB is a type of USB connector which is similar to the USB Type A connector but smaller in size.

Used in cameras & mobile phones way to transfer data and for charging the device. It has five pins allow for data transfer and other functions. MiniUSB is replaced by MicroUSB and is widely used Now.

Data Rates

USB 1.0/1.1	1.5 Mbps (low Speed) 12Mbps (High Speed)
USB 2.0	480 Mbps
USB 3.0	5Gbps
USB 3.1	10Gbps

Interface



MINI USB Type A

⑨HDMI

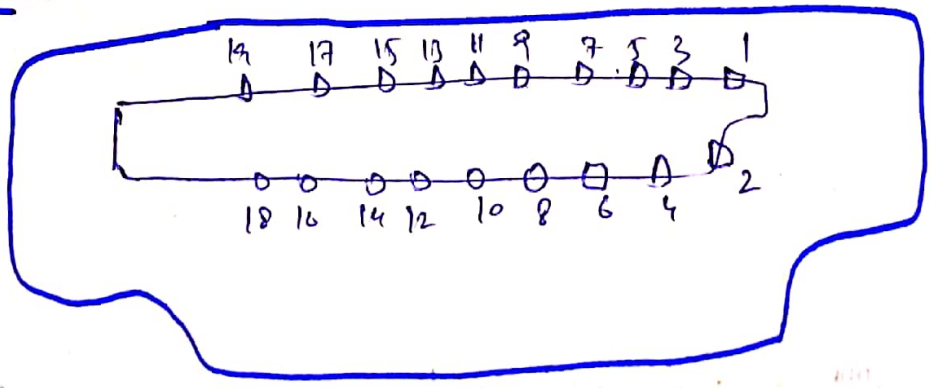
HDMI stands for High Definition Multimedia Interface. It is a digital interface that is used to transmit high quality audio and video signals between devices such as TVs, monitors, projectors and home theater systems.

HDMI uses single cable for transmitting both video and audio signals. unlike analog interfaces such as VGA and component video. which require separate cable for video and audio.

Data Rates

Version	Data Rate
1.0 - 1.2	4.9Gbps
1.3 - 1.4b	10.2Gbps
2.0 - 2.0b	18Gbps
2.1	48Gbps

Interface



Date 20
M T W T F S S

(10) SSD

SSD stands for "Solid State Drive", which is a type of storage device used in computers and other electronic devices to store data.

In SSD data is stored in blocks of memory called "pages".

SSD provide faster read and write speeds, lower power consumption and improved durability and reliability.

Data Rates of SSD:

SATA SSDs: 400-500 MB/s

NVMe SSDs: Read Speed 2-7 GB/s
Write Speed 1-5 GB/s

PCIe SSDs: Read Speed 15 GB/s

INTERFACE: