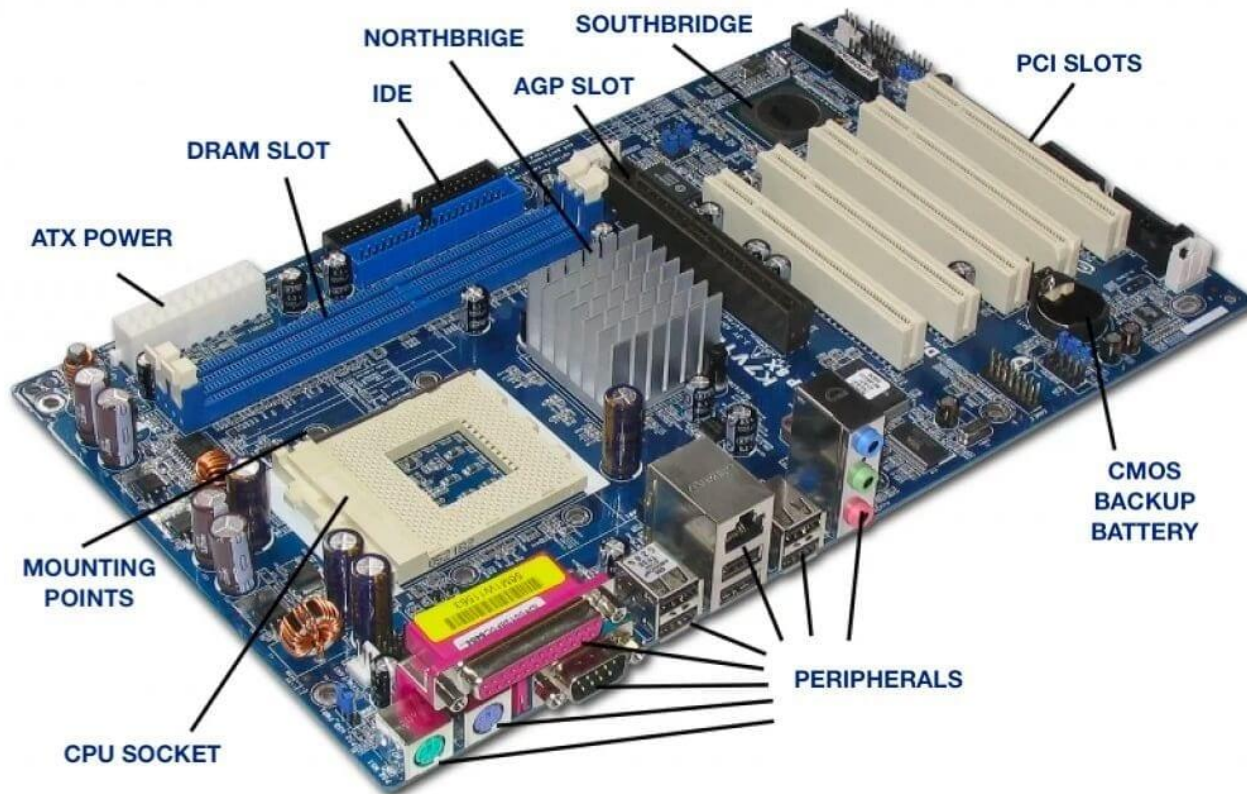


How to connect different components of a computer?

<https://www.youtube.com/watch?v=5qvVtB7fqXE>

Motherboard

The motherboard is the main component, based on its function, of the internal structure of all computers. Mainly responsible for the interaction of all the elements of the computer, such as the CPU, RAM, storage, graphics card, I/O, among others.



Functions:

1. I/O ports-

This is located in the rear panel of the CPU. This use to connect the outside hardware or peripherals of the computer.

PS/2 ports-

- a. 6 pins port
- b. Super seeds DIN – 5 pins port
- c. Speed – Upto 12 Kbps
- d. Transmission – Serial
- e. Color Green - Mouse
- f. Color Blue – Keyboard

DB 25 female connector (Parallel Port / *Printer Port*)

-this is use to connect the impact printer, one of that the DOT MATRIX printer.

Example : Epson LX 300 +

DB 9 male connector (*Serial or com1 port*)-

This port is used to connect a serial device of the computer, such as the serial mouse and external modem.

VGA port (DB-15)-

This is used to interface the DB cord of the monitor screen or to connect the monitor screen of the computer.

USB ports-

- a. 7 pins port
- b. Super seeds PS/2 port
- c. Speed – upto 40 Gbps
- d. Transmission – Serial
- e. No specific color
- f. USB Types –



USB-A



USB-B



USB-B MINI





USB-B MICRO


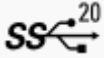




USB-C



LIGHTNING

tandard	Also Known As	Logo	Year Introduced	Connector Types	Max. Data Transf Speed
USB 1.1	Full Speed USB		1998	USB-A USB-B	12 Mbps
USB 2.0	Hi-Speed USB		2000	USB-A USB-B USB Micro A USB Micro B USB Mini A USB Mini B	480 Mbps
USB 3.2 Gen 1	USB 3.0 USB 3.1 Gen 1 SuperSpeed		2008 (USB 3.0) 2013 (USB 3.1)	USB-A USB-B USB Micro B USB-C*	5 Gbps

standard	Also Known As	Logo	Year Introduced	Connector Types	Max. Data Transfer Speed
USB 3.2 Gen 2	USB 3.1 USB 3.1 Gen 2 SuperSpeed+ SuperSpeed 10Gbps		2013 (USB 3.1)	USB-A USB-B USB Micro B USB-C*	10 Gbps
USB 3.2 Gen 2x2	USB 3.2 SuperSpeed 20Gbps		2017 (USB 3.2)	USB-C*	20 Gbps
USB 4	USB4 Gen 2x2 USB4 20Gbps		2019	USB-C*	20 Gbps
USB 4	USB4 Gen 3x2 USB4 40Gbps		2019	USB-C*	40 Gbps

LAN port-

This port is used to connect PC with a network, node, Router, Switch, etc.

Audio Port-

This is used to connect the speaker, mic, and MIDI (Musical Instrument Digital Interface) device of the computer

2. ATX Power connector (4 pin)-

This is used to connect the 4 pin of the power supply unit (PSU) .This is separate of the 20 or 24 pin of ATX power supply to provide DC voltage to computer processor.

3. DIMM Slot –

It is used to connect RAM with motherboard.

4. CMOS/BIOS BATTERY-

In this part, the CMOS/BIOS battery is hold, So that it can provide 3 volts direct current/voltage to the CMOS IC. To preserve the BIOS settings of the computer. Such as the time module, hardware information and settings/parameter, etc.

CMOS - Complimentary Metal Oxide Semiconductor

BIOS- Basic Input / Output System. Is a set of a program stored in CMOS IC, used to preserve the BIOS configuration of the computer.

CMOS BATTERY PART NUMBER- lithium dry cell CR 2032 3 volts

5. IDE connector (Integrated Drive Electronics)-

This connector is used to connect the IDE cable of the HDD (Hard Disk Drive) or CD/DVD ROM to the Motherboard IDE.

6. Front panel connectors (F-Panel) -

This is used to connect the Power LED, HDD LED, Power Switch and Reset switch of the computer system unit (CPU).

7. SATA connector-

This is Serial Advance Technology Attachment. The new standard of the IDE connection array of the computer HDD (SATA HDD) to the motherboard system.

8. CMOS/BIOS jumper-

This is used to disable the BIOS default setup. Such as to disabled the supervisor password of BIOS.

9. FDD connector-

The connector is used to connect FDD cable through the system board. Normally there are of 34 pins that is used to connect the 3.5" 1.44mb Floppy Disk Drive.

10. PCI slots-

A part of the computer motherboard used to connect the I/O cards of the computer. Such as LAN card, WIFI card, USB expansion card and Sound card.

Types of Motherboard Form Factors

AT Motherboard

An AT motherboard is a motherboard which has dimensions of the order of some hundred millimeters, big enough to be unable to fit in mini desktops. The dimensions of this motherboard make it difficult for the new drives to get installed. The concept of six pin plugs and sockets is used so as to work as the power connectors for this type of motherboards.

The hard to distinguish power connector sockets make it difficult for many users to easily make the proper connections and thus leading to the damage of the device.

Produced in the mid 80's, this motherboard lasted a good span from the Pentium p5 to the times when Pentium 2 had been started to be used. It has 12 pins power socket.



Form Factor ATX (Advanced Technology Extended)

Designed as an evolution of the **Baby AT form factor**, ATX marks a profound change in the architecture of the motherboard and other components such as the cabinet and the power supply.

Within the motherboard there are significant changes such as the location of the CPU socket, which is now placed near the power supply, thus allowing the flow of air caused by the fan of the source and not to be interfered with by any element as it happened with the technology Baby AT.

Another change was the connection between the source of the feed. Which is now a single connector, unlike the AT which were two. **Some of the most important improvements for ATX and benefits are:**

- Integrated input and output ports
- Slots of expansion without interference
- Start Control by software
- 3 Vol. from the source (reduces hardware cost, energy consumption, and heat)
- A better airflow
- Less interference in access to drive bays.
- It has 20 pins power socket.



Balanced Technology Extended (BTX)

The BTX was first introduced by Gateway Inc. and then by MPC Corporation and Dell Inc. It was also used in Apple's Mac Pro but was not BTX compliant. By September 2006, Intel canceled development; this was largely due to the lack of backward compatibility with the ATX form factor.

Balance technology extended was designed to reduce the problems of the circa-1996 ATX standards by decreasing power consumption and heat. The BTX standards provided efficient design for small and large systems and new features such as:

- An increased number of expansion slots
- Better electrical and thermal regulation
- Multiple system sizes and configurations
- Support for high-mass motherboard components
- Enhanced cooling capabilities with a straighter air flow path
- Reduced latency between the northbridge and southbridge
- Better component placement for back-panel input/output (I/O) controllers
- Reduced height requirements, which benefit system integration for blade servers and rack mounts
- It has 24 pins power socket.



What is BIOS?

As your PC's most important startup program, BIOS, or Basic Input / Output System, is the built-in core processor software responsible for booting up your system.

Typically embedded into your computer as a motherboard chip, the BIOS functions as a catalyst for PC functionality action.

Programmed on an erasable, programmable, read-only memory (EPROM) chip, BIOS is stored on this memory chip which retains data when the power source is switched off. When the PC is powered back on, BIOS retrieves that same stored data.

The BIOS system is also responsible for managing data flow between your computer's operating system and any attached devices including a hard drive, keyboard, video adapter, printer, or mouse.

Each time you power your PC on, BIOS runs through a process called Power-On Self Test, or POST, that determines whether your attached devices are operating correctly and are in their proper place.

Once all attachments are allocated and given the OK, your computer startup continues as usual and takes you to your load screen in a matter of seconds.

If BIOS detects any problems, an error screen will appear or a series of beep codes will sound, effectively indicating to you that something has gone wrong.

New developments in BIOS technology

BIOS software has existed within computers since the 1980s and has made plenty of leaps and strides when it comes to efficiency and improvement. However, with the rapid speed of technological evolution, BIOS has become outdated and presents a number of roadblocks for today's tech.

Newer PCs capable of handling several terabytes of storage prove to be too complex for weaker BIOS software. Limited to 16-bit processor modes and booting drives of 2.1TB or less, newer computers are usually equipped with 3TB drives or more.

Thus, the UEFI was born out of necessity for higher-powered booting. The new standard of BIOS accommodates the limitations the old BIOS system couldn't work around. UEFI, or Unified Extended Firmware Interface Forum, can run in 32-bit or 64-bit modes and theoretically handle drives up to 9.4 zettabytes.

Not only is UEFI a BIOS replacement, but it also functions as a mini operating system that runs on top of your PC's integrated firmware.

In essence, whether your computer is powered on by BIOS or UEFI, it is this software that you count on for fast boot times and proper processing functionality. Being able to access your PC's BIOS allows you to perform regular maintenance for healthy computer upkeep.

What are the basic functions of BIOS?

Now that you understand what BIOS is, let's dive into what it really does for your desktops, laptops, and tablets. BIOS's functionality can be broken down into four key responsibilities.

1. POST

As we mentioned before, POST is an acronym for the Power-On Self Test that your PC runs through the moment you turn it on. POST tests the hardware of your PC and ensures that there is nothing out of order and no errors present with your operating system.

POST goes through everything from your keyboard and disk drive to your **RAM speed in a computer** and integrated ports. Should everything be in order, POST will continue as usual and allow your PC to boot normally.

If there is a detected error, BIOS will issue an error message that may come in the form of displayed text or a series of error-indicating beeps.

These beeps are always signals to certain messages, so if you happen to get this result, you will need to check out what it means for your computer's hardware [1].

2. CMOS setup

Your PC stores all low-level settings like system time and hardware configuration within its CMOS.

This means that every change you make to your BIOS structure is saved on this special memory chip called the Complementary Metal-Oxide Semiconductor, or CMOS. The CMOS setup is responsible for setting your password, time, and date.

3. Bootstrap loader

The program that lives within your computer's EPROM or ROM, the bootstrap loader is tasked with reading your PC's hard drive boot sector to move along the complete operating system load.

When you restart your PC, the bootstrap loader activates the POST, then loads OS into memory. Newer PCs have replaced the bootstrap loader with an EFI, or Extensible Firmware Interface.

4. BIOS drivers

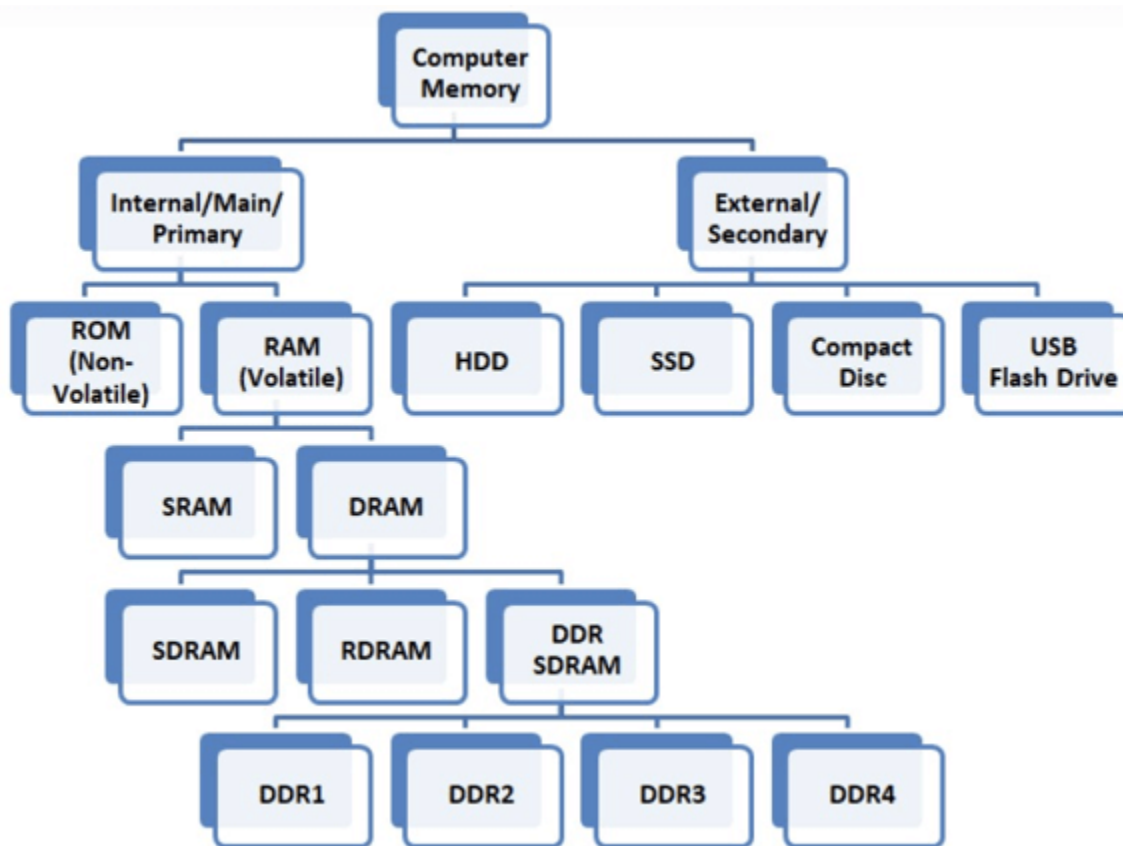
BIOS drivers are the many programs stored in your computer's many memory chips. These low-level drivers are used to boot your system and prompt basic operational controls on your PC.

DEL and F2 tend to be the most popular hotkeys for PCs, but if you're unsure of what your brand's hotkey is, this list of common BIOS keys by brand may help.

- **Acer:** F2 or DEL
- **ASUS:** F2 for all PCs, F2 or DEL for motherboards
- **Dell:** F2 or F12

- **HP:** ESC or F10
- **Lenovo:** F2 or Fn + F2
- **Lenovo (Desktops):** F1
- **Lenovo (ThinkPads):** Enter + F1.
- **MSI:** DEL for motherboards and PCs
- **Microsoft Surface Tablets:** Press and hold volume up button.
- **Origin PC:** F2
- **Samsung:** F2
- **Sony:** F1, F2, or F3
- **Toshiba:** F2

Computer Memory



ROM

The full form of ROM is a Read-Only Memory. It is a permanent type of memory. Its content are not lost when the power supply is switched off. The computer

manufacturer decides the information of ROM, and it is permanently stored at the time of manufacturing, which cannot be overwritten by the user.

Types of ROM

- **EPROM:** The full form of EPROM is Erasable Programmable Read-only memory. It stores instructions, but you can erase only by exposing the memory to ultraviolet light.
- **PROM:** The full form of PROM is Programmable Read-Only memory. This type of ROM is written or programmed using a particular device.
- **EEPROM** stands for electrically Erasable Programmable Read-Only Memory. It stores and deletes instructions on a special circuit.

What is RAM?

The full form of RAM is Random Access Memory. The information stored in this type of memory is lost when the power supply to the PC or laptop is switched off. The information stored in RAM can be checked with the help of BIOS. It is generally known as the main memory or temporary memory or cache memory or volatile memory of the computer system.

Uses of RAM

Here, are important uses of RAM:

- RAM is utilized in the computer as a scratchpad, buffer, and main memory.
- It offers a fast operating speed.
- It is also popular for its compatibility
- It offers low power dissipation

History of RAM

Type of RAM	Year Invented
FPM-(Fast page mode RAM)-	1990

EDO RAM (Extended data operations read-only memory)	1994
SDRAM (Single dynamic RAM)	1996
RDRAM (Rambus RAM)	1998
DDR (Double Data Rate)	2000
DDR2	2003
DDR3	2007
DDR4	2012

Types of RAM

Two main types of RAM are:

- Static RAM
- Dynamic RAM

Static RAM

Static RAM is the full form of SRAM. In this type of RAM, data is stored using the state of a six transistor memory cell. Static RAM is mostly used as a cache memory for the processor (CPU).

Dynamic RAM

DRAM stands for Dynamic Random Access Memory. It is a type of RAM which allows you to stores each bit of data in a separate capacitor within a specific integrated circuit. Dynamic RAM is a standard computer memory of the many modern desktop computers.

This type of RAM is a volatile memory that needs to be refreshed with voltage regularly. Else it loses the information stored on it.

SRAM VS DRAM

SRAM	DRAM
------	------

SRAM has lower access time, so it is faster compared to DRAM.

DRAM has higher access time, so it is slower than SRAM.

SRAM is costlier than DRAM.

DRAM costs less compared to SRAM.

SRAM requires a constant power supply, which means this type of memory which consumes more power.

DRAM offers reduced power consumption because the information is stored in the capacitor.

It is a complex internal circuitry, and it offers less storage capacity is available compared to the same physical size of a DRAM memory chip.

It is the small internal circuitry in the one-bit memory cell of DRAM. The large storage capacity is available.

SRAM has a low packaging density.

DRAM has a high packaging density.

What is SDRAM?

Traditional forms of memory including DRAM operate in an asynchronous manner. They react to changes as the control inputs change, and also they are only able to operate as the requests are presented to them, dealing with one at a time.

SDRAM is able to operate more efficiently. It is synchronised to the clock of the processor and hence to the bus

With SDRAM having a synchronous interface, it has an internal finite state machine that pipelines incoming instructions. This enables the SDRAM to operate in a more complex fashion than an asynchronous DRAM. This enables it to operate at much higher speeds.

As a result of this SDRAM is capable of keeping two sets of memory addresses open simultaneously. By transferring data alternately from one set of addresses, and then the other, SDRAM cuts down on the delays associated with asynchronous RAM, which must close one address bank before opening the next.

The term pipelining is used to describe the process whereby the SDRAM can accept a new instruction before it has finished processing the previous one. In other words, it can effectively process two instructions at once.

For writing, one write command can be immediately followed by another without waiting for the original data to be stored within the SDRAM memory itself.

For reading the requested data appears a fixed number of clock pulses after the read instruction was presented. It is possible to send additional instructions during the delay period which is termed the latency of the SDRAM.

SDRAM types: DDR versions, etc

SDRAM technology underwent a huge amount of development. As a result several successive families of the memory were introduced, each with improved performance over the previous generation.

- **SDR SDRAM:** This is the basic type of SDRAM that was first introduced. It has now been superseded by the other types below. It is referred to as single data rate SDRAM, or just SDRAM.
- **DDR SDRAM:** DDR SDRAM, also known as DDR1 SDRAM gains its name from the fact that it is Double Data Rate SDRAM. This type of SDRAM provides data transfer at twice the speed of the traditional type of SDRAM memory. This is achieved by transferring data twice per cycle.

- **DDR2 SDRAM:** DDR2 SDRAM can operate the external bus twice as fast as its predecessor and it was first introduced in 2003.
- **DDR3 SDRAM:** DDR3 SDRAM is a further development of the double data rate type of SDRAM. It provides further improvements in overall performance and speed.
- **DDR4 SDRAM:** DDR4 SDRAM was the next generation of DDR SDRAM. It provided enhanced performance to meet the demands of the day. It was introduced in the latter half of 2014.
- **DDR5 SDRAM:** Development of SDRAM technology is moving forwards and the next generation of SDRAM, labelled DDR5 is currently under development. The specification was launched in 2016 with expected first production in 2020. DDR5 will reduce power consumption while doubling bandwidth and capacity.

DDR SDRAM



DDR RAM

Performance Comparison of RAM Types

Standard	Time in Market	Internal Rate	Bus Clock(MHZ)	Perfectch	Data rate(MT/s)	Tranfer rate(GB/s)	Voltage
SDRAM	1993	100-166	100-166	1n	100-166	0.8-1.3	3.3
DDR	2000	133-200	133-200	2n	266-400	2.1-3.2	2.5/2.6
DDR2 SDRAM	2003	133-200	266-400	4n	533-800	4.2-6.4	1.8
DDR3	2007	133-200	533-800	8n	1066-1600	8.5-14.9	1.35/1.5
DDR 4	2014	133-200	1066-1600	8n	2133-3200	17-21.3	1.2

Internal Rate is measured in MHz

MT/s – Mega Transfer per second

Prefetch – word bank

Summary:

- The full form of RAM is Random Access Memory.
- Two main types of RAM are 1) Static RAM and 2) Dynamic RAM
- Static RAM is the full form of SRAM. In this type of RAM, data is stored using the state of a six transistor memory cell.
- DRAM stands for Dynamic Random Access Memory. It is a type of RAM which allows you to store each bit of data in a separate capacitor
- FPM DRAM is a full form of Fast Page Mode Dynamic Random Access Memory
- Rambus Dynamic Random Access Memory is an extended form of an RDRAM
- RAM optimized for video adapters is called VRAM.
- EDO DRAM is an abbreviation of Extended Data Output Random Access Memory.
- Flash memory is an electrically erasable and programmable permanent type of memory
- The full form of DDR RAM is Double Data Rate.
- SRAM has lower access time, so it is faster compared to DRAM.
- RAM is utilized in the computer as a scratchpad, buffer, and main memory.

Parameters	RAM	ROM
Usage	RAM allows the computer to read data quickly to run applications.	ROM stores all the application which is needed to boot the computer initially. It only allows for reading.
Volatility	RAM is volatile. So, its contents are lost when the device is powered off.	It is non-volatile, i.e., its contents are retained even if the device is powered off
Accessibility	Information stored in the RAM is easily accessed.	The processor can't directly access the information that is stored in the ROM. In order to access ROM information first, the information is transferred into the RAM, and then it can be executed by the processor.
Read/Write	Both R (read) and W (write) operations can be performed over the information which is stored in the RAM.	The ROM memory allows the user to read the information. But, the user can't alter the information.
Storage	RAM is used to store temporary information.	ROM memory is used to store permanent information, which is non-erasable.
Speed	The access speed of RAM is	Its speed is slower in comparison with RAM.

Parameters	RAM	ROM
	faster.	Therefore, ROM can't boost up the processor speed.
Cost	The price of RAM is quite high.	The price of ROM is comparatively low.
Chip size	Physical size of RAM chip is bigger than ROM chip.	Physical size of ROM chip is smaller than the RAM chip of same storage capacity.
Preservation of Data	Electricity is needed in RAM to flow and to preserve information	Electricity is not required to flow and preserving information
Structure	The RAM chip is in rectangle form and is inserted over the motherboard of the computer.	Read-only memory (ROM) is a type of storage medium that permanently stores data on personal computers (PCs) and other electronic devices.

cache memory

Cache memory is a chip-based computer component that makes retrieving data from the computer's memory more efficient. It acts as a temporary storage area that the computer's processor can retrieve data from easily. This temporary storage area, known as a cache, is more readily available to the processor than the computer's main memory source, typically some form of DRAM.

Cache memory is sometimes called CPU (central processing unit) memory because it is typically integrated directly into the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU. Therefore, it is more accessible to the processor, and able to increase efficiency, because it's physically close to the processor.

Types of cache memory

Cache memory is fast and expensive. Traditionally, it is categorized as "levels" that describe its closeness and accessibility to the microprocessor. There are three general cache levels:

L1 cache, or primary cache, is extremely fast but relatively small, and is usually embedded in the processor chip as CPU cache.

L2 cache, or secondary cache, is often more capacious than L1. L2 cache may be embedded on the CPU, or it can be on a separate chip or coprocessor and have a high-speed alternative system bus connecting the cache and CPU. That way it doesn't get slowed by traffic on the main system bus.

Level 3 (L3) cache is specialized memory developed to improve the performance of L1 and L2. L1 or L2 can be significantly faster than L3, though L3 is usually double the speed of DRAM. With multicore processors, each core can have dedicated L1 and L2 cache, but they can share an L3 cache. If an L3 cache references an instruction, it is usually elevated to a higher level of cache.

What is a hard drive, and why do I need it?

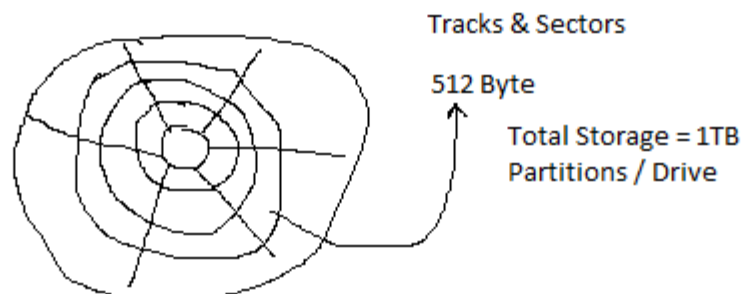
The hard drive is the component that stores your data. You'll often see the term “hard drive” abbreviated to “HDD.” There are several reasons you might want to buy one:

- You are out of space on your current HDD and need a bigger one
- You are noticing that it takes a long time to open documents or export large files like videos
- You are building a new PC from scratch

Whatever the situation, understanding why you want or need a new drive will help you know what you want and need. Once you've got that figured out, it's time to know more about the different types of hard drives and the trade-offs between them.

S.NO	PATA	SATA
1.	PATA stands for Parallel Advanced Technology Attachment.	SATA stands for Serial Advanced Technology Attachment.
2.	It is a 40 pin connector.	It is a 7 pin connector.
3.	It is high in cost.	It is cheaper in cost.
4.	The speed of data transfer is lower.	The speed of data transfer is higher.
5.	Power consumption is more.	Power consumption is less.
6.	The cable size is bigger.	The cable size is smaller.
7.	It doesn't have the feature of hot swapping.	It has the feature of hot swapping.
8.	External hard drives cannot be used.	External hard drives can be used.

SATA drives



HDD -

Types of HDD on the basis of use :

1. Basic Disk

Volumes / Partitions

- a. Primary - Max. 4 (No any extended partition can be created)
Max. 3 (Extended Partitions can be created)
Primary Partition is used to install OS because it can keep booting files.
- b. Extended - It is used to create logical drives.

2. Dynamic Disk

Multiple HDD can be used to form large partition

- a. Simple Volume
- b. Spanned Volume
- c. Stripped Volume
- d. Mirrored Volume
- e. RAID-5

UNIT	ABBREVIATION	STORAGE
Bit	B	Binary Digit, Single 1 or 0
Nibble	-	4 bits
Byte/Octet	B	8 bits
Kilobyte	KB	1024 bytes
Megabyte	MB	1024 KB
Gigabyte	GB	1024 MB
Terabyte	TB	1024 GB
Petabyte	PB	1024 TB
Exabyte	EB	1024 PB
Zettabyte	ZB	1024 EB
Yottabyte	YB	1024 ZB

What is File System?

Regardless of type and usage, a disk contains a file system and information about where disk data is stored and how it may be accessed by a user or application. A file system typically manages operations, such as storage management, file naming, directories/folders, metadata, access rules and privileges.

FAT16

FAT16, which was initially known simply as FAT, can trace its roots back to the 1970s. FAT is an acronym for File Allocation Table and the 16 indicates a 16-bit file system. The file system was initially developed for use on floppy disks, but it also worked for hard disks when that hardware was available.

Because FAT16 was created so long ago, it has inherent limitations that make it largely unsuitable for use on modern operating systems. As a 16-bit file system, FAT16 can map a maximum of 65,526 clusters. Like most Windows file systems, FAT16 supports a variety of cluster sizes, allowing it to be used on hard disks that are as small as 16 MB or as large as 2 GB. A later revision to the file system allowed it to support volumes up to 4 GB.

The earliest SD card products were routinely formatted with the FAT16 file system due to its support across Windows, Mac, Linux and OS/2 operating systems.

FAT32

The FAT32 file system was introduced in Windows 95 OEM Service Release 2, which was widely known at the time as Windows 95 OSR2. The FAT32 file system offered two main improvements over FAT16. First, FAT32, being a 32-bit file system, supports much larger disks than the FAT16 file system. FAT16 supports a maximum volume size of 4 GB, while FAT32 can be used on volumes up to 16 TB.

It is worth noting that even though the FAT32 file system can be used on multi-terabyte volumes, the 16 TB limit exceeds the capabilities of some Windows operating systems. For example, Windows XP imposed a maximum FAT32 volume size of 32 GB. The Windows XP, Vista, ME and 2000 versions of the Disk Management console also limited FAT32 volumes to a maximum of 32 GB. More modern Windows operating systems such as Windows 10 support a FAT32 volume up to 2 TB in size, which still fall well short of the 16 TB maximum volume size.

The second major improvement of the FAT32 file system is support for long filenames. The FAT16 file system requires filenames to adhere to the 8.3 naming convention, meaning filenames are limited to eight characters followed by a period and a three-character extension. In contrast, FAT32 allows filenames up to 255 characters long.

One of the primary limitations of the FAT32 file system is that the maximum file size on a FAT32 volume is 4 GB. Most modern SD cards come formatted with FAT32, which is why consumer devices such as GoPro cameras split video recordings into 4 GB files. Due to its flexibility and wide support on multiple operating systems, FAT32 is often the file system of choice for troubleshooting flash drives provided by vendors.

NTFS

NT File System arrived in Windows NT in 1993 but is also supported by subsequent versions of Windows such as Windows 2000, Windows XP, Windows

7, Windows 8 and Windows 10. NTFS is the most widely used file system on Windows Server and on Windows desktop systems.

Windows 10 uses NTFS by default.

Unlike FAT16 and FAT32, NTFS is a journaling file system. Transactions are logged to a file system journal, which makes it possible to use Windows file utilities such as CHKDSK to repair data corruption and return the file system to a consistent state.

One of the primary design goals behind the creation of NTFS was to improve file system security. Early on, only Windows NT could read a disk formatted with NTFS, which could stop an attacker even if they had physical access to the disk. However, today, every supported Windows operating system can read NTFS disks.

Microsoft added another security improvement in NTFS through support for NT File System permissions. The company updated NTFS in Windows 2000 to include file system-level encryption, which Microsoft refers to as EFS, or the Encrypting File System. EFS uses symmetric multikey encryption to protect file system contents.

NTFS capacity limitations have evolved considerably over the years. The Windows NT version of the file system could theoretically handle disks up to 256 TB and individual files up to 16 TB. In contrast, the version of NTFS in Windows 10 can be used on volumes up to 8 PB in size.

ReFS

ReFS stands for Resilient File System. It debuted in Windows Server 2012. Microsoft designed this file system to be the next-generation replacement for NTFS; although, technically, ReFS is based on NTFS. ReFS uses integrity streams and allocate-on-write technology to preserve the data stored on the volume. ReFS also performs proactive error correction by using a built-in scrubber to check for data corruption and fix it automatically. Microsoft developed a tool called ReFSUtil to assist with recovering data from damaged ReFS-formatted volumes that also copies found files to another disk.

ReFS also brings a huge increase in capacity over NTFS. The file system has a theoretical volume size limit of 1 yottabyte -- or, approximately, 1 trillion TB -- with a maximum file size of 16 exabytes, which equals about 16 million TB.

In its initial release, ReFS lacked some of the most widely used NTFS features, including native encryption and deduplication. However, data deduplication was added to ReFS in Windows Server version 1709. Even so, ReFS still lacks quite a few of the features in NTFS, including file system compression and file system encryption and it cannot be used to boot a drive.

Features	MBR (Master Boot Record)	GPT(GUID Partition Table)
Maximum capacity	2TB	9.7 ZB
Maximum partitions	26	128
Partition/boot data location	At the beginning of the drive	Throughout the drive
BIOS type	Legacy BIOS	UEFI

Dynamic Disk –

This disk is used to create large drive by adding storage from different disk. It can be easily extended and shrinked.

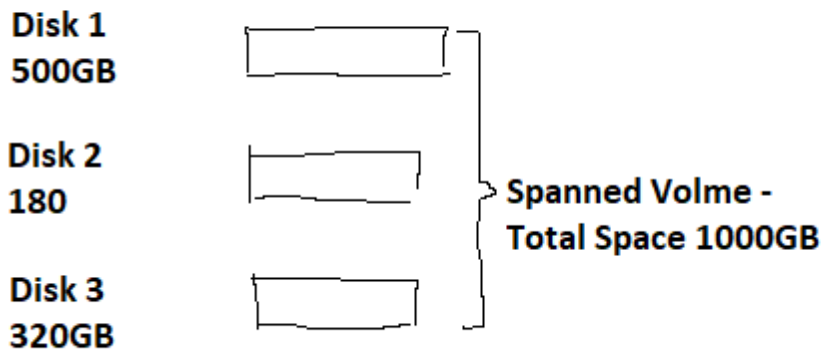
We can convert a Basic Disk into Dynamic Disk.

Steps :

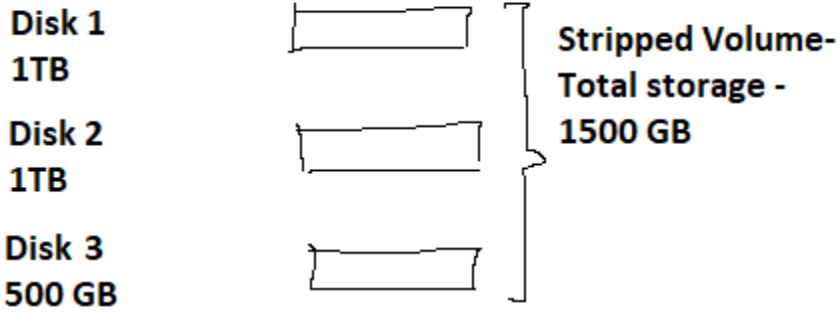
Run -> diskmgmt.msc -> Now disk management window will open -> RC on any selected disk -> convert to dynamic disk

Types of volume created on Dynamic Disk :-

1. Simple Volume-
 - a. Uses only single
 - b. It can be extended and shrinked.
2. Spanned Volume –
 - a. Uses multiple disk. These disks can be of different size.
 - b. It is used to create a large drive.
 - c. It is slow to read or write data.
 - d. It does not provide fault tolerance.

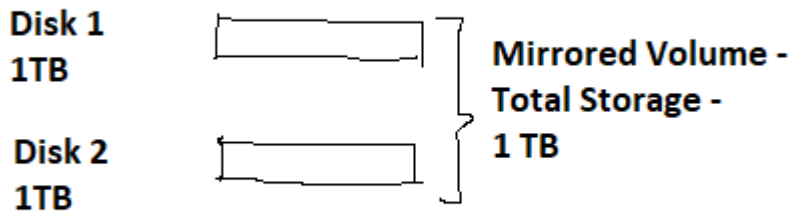


3. Stripped Volume :-
 - a. Uses multiple disks to create a large drive. But it takes equal storage space from each disk and minimum space from each disk is taken from the smallest disk.
 - b. It is faster than spanned volume to read and write data.
 - c. It does not support fault tolerance.



4. Mirrored Volume :-

- a. It requires 2 disk of same size.
- b. It is not used to create large drive.
- c. It provides fault tolerance. It keeps copy of one disk data at another disk.
So, if a disk fails, we can get out data from another disk.
- d. Wastage of storage.



Introduced in 2003, SATA (or Serial Advanced Technology Attachment) is the default interface for most desktop and laptop hard drives. They are referred to as SATA hard drives, but they are

actually rotary hard drives with spinning platters and a moving needle that writes data to consecutive sectors on each platter. SATA hard drives are incredibly fast compared to their predecessor, the PATA hard drive, and can write to the disk with an interface rate of 6 Gb/s with a throughput of 600 MB/s.

A single drive can range from 500 GB to 16 TB and are available at a lower cost than any of the other drive types discussed here. They are good drives if you need a lot of cheap storage and don't need extremely high reads or writes. Since data is physically written to a disk, it can also become fragmented, meaning that different sectors can be spread across different areas of the disk, slowing down the drive. They also are vulnerable to shock and sudden movement since there are moving parts in each drive, which makes them a poor choice for laptops.

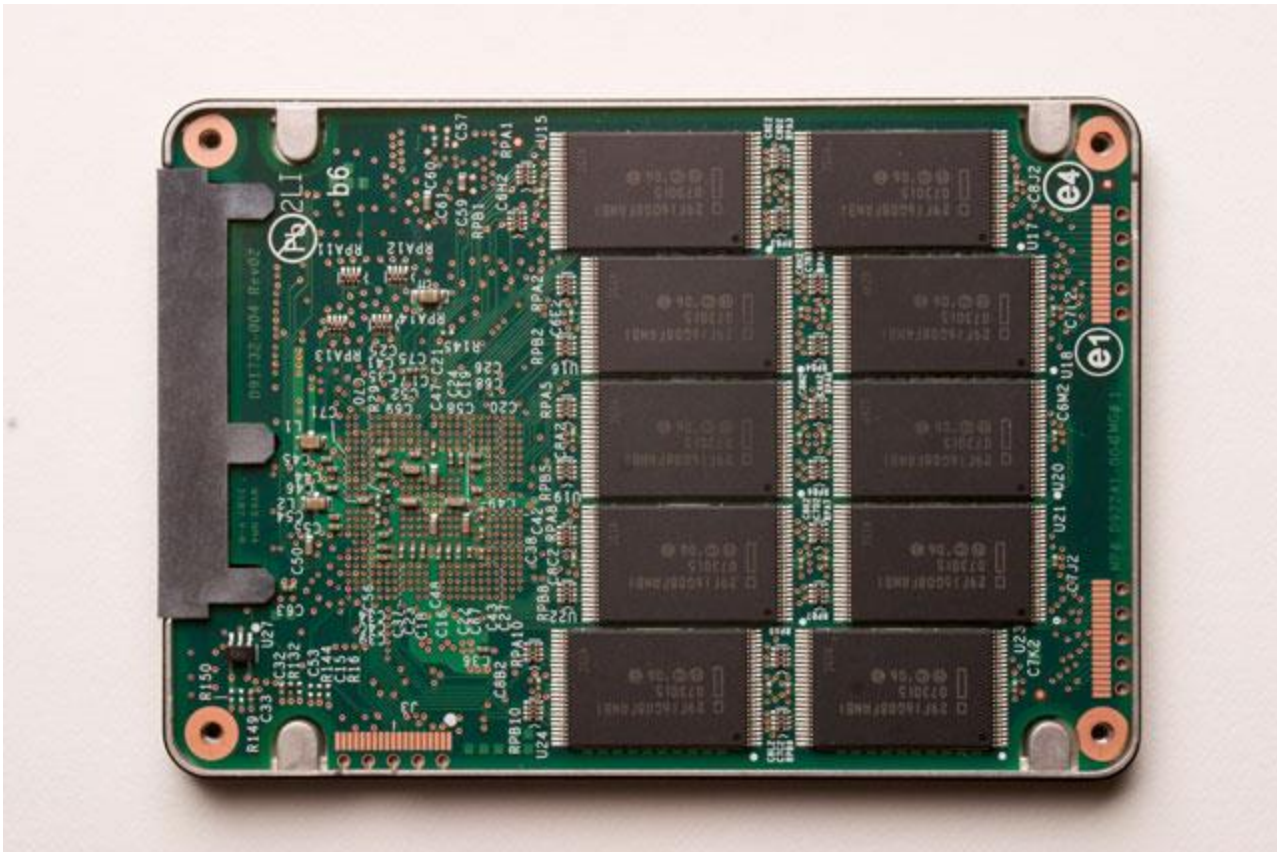
Pros:

- Low cost
- High disk sizes

Cons:

- Not good for laptops
- Requires regular de-fragmentation

SSD hard drives



SSD stands for Solid State Drive. These disks don't have any moving parts. Instead, all of the data is stored on non-volatile flash memory. That means that there isn't a needle that has to move to read or write data and that they are significantly faster than SATA drives. It's difficult to find an exact speed because it varies by manufacturer and form factor, but even the lower-performing drives are comparable to SATA drives.

The downside is that these drives are significantly more expensive and don't come in as many sizes. SSD drives range from about 120 GB to 2 TB, and are about 2-4 times the price of a SATA hard drive of the same size. Since there are no moving parts, these drives are also a lot more durable, and there are form factors built specifically for laptops, making them ideal for storage on the go.

Pros:

- Fast

- More durable, especially for laptops

Cons:

- More expensive than SATA drives
- Lower disk sizes

NVMe



Released in 2013, Non-Volatile Memory Express, or NVMe, is a type of SSD that's attached to a PCI Express (PCIe) slot on a main board. These slots were originally designed for graphics cards, so they are incredibly fast. Speeds on NVMe drives can reach an interface rate of 32 Gb/s with a throughput of 3.9 GB/s. That can be very useful if you are doing something that needs a lot of disk throughput, like gaming or high-resolution video editing.

For as fast as it is, there are some drawbacks to NVMe. For starters, they are only available on desktop PCs and are very expensive. Also, while they can be used as secondary drives, to use it to

its full potential, you'll want to install your operating system on it. Most BIOS don't support booting from NVMe at this time. It's still possible to get one that does, but it might mean replacing your entire main board.

Model	Reading Speed	Writing Speed
Crucial P2 500GB	2,300	940
Crucial P1 1TB	2,000	1,700
Crucial P2 250GB	2,100	1,150
Crucial P1 500GB	1,900	950

When to choose SATA, SSD or NVMe

There are a lot of considerations when deciding between different components. You have to choose what fits your technical, capacity and budget requirements. Below are some guidelines that may help, and while they won't fit every situation, you may find them useful when planning your next PC build.

You may want to consider a SATA drive if you:

- Need a large amount of storage
- Are on a tight budget
- Need a general purpose hard disk

You might want to consider an SSD drive if you:

- Are upgrading a laptop

- Need fast storage under 2TB

You might be better served by an NVMe drive if you:

- Are building a high-end workstation or gaming PC
- Don't have a budget constraint
- Are building a server that is going to host a storage-intensive application

It's also worth mentioning that you're not limited to buying just one hard drive; PCs can typically support several at a time. And whether you get the performance you want from it will depend on where you save files. For example, a common configuration for PCs that render video is to use a faster drive like an SSD or NVMe to run video rendering software (Camtasia, Adobe Premier, etc.) and then transfer the finished product to a cheaper, larger SATA drive.

Assembling of computer

<https://www.youtube.com/watch?v=ms9jc8SaBZ0>

File system:-

What is the definition of a file system?

A file system is a process that manages how and where data on a storage disk, typically a hard disk drive (HDD), is stored, accessed and managed.

FAT16

FAT16, which was initially known simply as FAT, can trace its roots back to the 1970s. FAT is an acronym for File Allocation Table and the 16 indicates a 16-bit file system.

As a 16-bit file system, FAT16 can map a maximum of 65,526 clusters. Like most Windows file systems, FAT16 supports a variety of cluster sizes, allowing it to be used on hard disks that are as

small as 16 MB or as large as 2 GB. A later revision to the file system allowed it to support volumes up to 4 GB.

FAT32

FAT32, being a 32-bit file system, supports much larger disks than the FAT16 file system. FAT16 supports a maximum volume size of 4 GB, while FAT32 can be used on volumes up to 16 TB.

It is worth noting that even though the FAT32 file system can be used on multi-terabyte volumes, the 16 TB limit exceeds the capabilities of some Windows operating systems. For example, Windows XP imposed a maximum FAT32 volume size of 32 GB. The Windows XP, Vista, ME and 2000 versions of the Disk Management console also limited FAT32 volumes to a maximum of 32 GB. More modern Windows operating systems such as Windows 10 support a FAT32 volume up to 2 TB in size, which still fall well short of the 16 TB maximum volume size.

The second major improvement of the FAT32 file system is support for long filenames. The FAT16 file system requires filenames to adhere to the 8.3 naming convention, meaning filenames are limited to eight characters followed by a period and a three-character extension. In contrast, FAT32 allows filenames up to 255 characters long.

One of the primary limitations of the FAT32 file system is that the maximum file size on a FAT32 volume is 4 GB. Most modern SD cards come formatted with FAT32, which is why consumer devices such as GoPro cameras split video recordings into 4 GB files. Due to its flexibility and wide support on multiple operating systems, FAT32 is often the file system of choice for troubleshooting flash drives provided by vendors.

NTFS

NT File System arrived in Windows NT in 1993 but is also supported by subsequent versions of Windows such as Windows 2000, Windows XP, Windows 7, Windows 8 and Windows 10. NTFS is the most widely used file system on Windows Server and on Windows desktop systems.

Windows 10 uses NTFS by default.

Unlike FAT16 and FAT32, NTFS is a journaling file system. Transactions are logged to a file system journal.

One of the primary design goals behind the creation of NTFS was to improve file system security. Early on, only Windows NT could read a disk formatted with NTFS, which could stop an attacker even if they had physical access to the disk. However, today, every supported Windows operating system can read NTFS disks.

Microsoft added another security improvement in NTFS through support for NT File System permissions. The company updated NTFS in Windows 2000 to include file system-level encryption, which Microsoft refers to as EFS, or the Encrypting File System. EFS uses symmetric multi key encryption to protect file system contents.

NTFS capacity limitations have evolved considerably over the years. The Windows NT version of the file system could theoretically handle disks up to 256 TB and individual files up to 16 TB. In contrast, the version of NTFS in Windows 10 can be used on volumes up to 8 PB in size.

ReFS

ReFS stands for Resilient File System. It debuted in Windows Server 2012. Microsoft designed this file system to be the next-generation replacement for NTFS; although, technically, ReFS is based on NTFS. ReFS uses integrity streams and allocate-on-write technology to preserve the data stored on the volume. ReFS also performs proactive error correction by using a built-in scrubber to check for data corruption and fix it automatically. Microsoft developed a tool called ReFSUtil to assist with recovering data from damaged ReFS-formatted volumes that also copies found files to another disk.

ReFS also brings a huge increase in capacity over NTFS. The file system has a theoretical volume size limit of 1 yottabyte

In its initial release, ReFS lacked some of the most widely used NTFS features, including native encryption and deduplication. However, data deduplication was added to ReFS in Windows Server version 1709. Even so, ReFS still lacks quite a few of the features in NTFS, including file system compression and file system encryption and it cannot be used to boot a drive.

What is a Printer?

A printer is an output device that generates text and graphics on a physical medium like paper.

Different types of Printers

Printers can be grouped into two categories. They are as follows: –

- Impact Printers
- Non-Impact printers

A printer's speed is normally shown in **pages per minute** (ppm). The printer's resolution is expressed as **dpi** (dots per inch). The greater the number, the greater is the resolution.

Impact Printers

It's a type of printer that works with paper via direct contact with the ink ribbon. Usually these printers are noisy but remain in use today as they are remarkable for their multi-part features.

An impact printer has the same mechanisms as the typewriter.

Some of the **examples of the Impact Printers** are Dot-matrix printers, Daisy-wheel printers, and line printers.

Non-Impact Printers

It is a type of printer that doesn't touch a ribbon to print it. They used technologies such as laser, xerographic, electrostatic, chemical, and inkjet.

In general, non-impact printers are much quieter. Maintenance or repair is less likely than earlier impact printers.

Some of the **examples of the Non-Impact Printers** are Inkjet printers and Laser printers.

List of different types of Printers

Dot-Matrix Printers

The dot-matrix printer uses 9 to 24 pin print heads. Such pins generate dot patterns to shape the individual characters on the page.

The dot-matrix printer of 24 pins produces more dots than a dot-matrix printer of 9 pins, which results in much better quality and clearer characters.

The basic rule is that the more pins the letters on the document are clearer.

The pins hit the ribbon individually as the printing mechanism travels in both directions along the entire print line, from left to right, then right to left, and so on.

With a dot-matrix printer, the user can generate a color output.

Dot-matrix printers are inexpensive and usually print at speeds of between 100 and 600 characters per second.

Ink-Jet Printers

The inkjet printer is the first and most common type. They are still commonly used though a bit outdated since they are fairly priced.

Their greatest advantage is that they can effortlessly combine different colors.

While laser printers are quicker, inkjet printers give the best picture and image quality.

Versatility is another reason to choose an inkjet printer. Inkjet can print on a wide range of media as opposed to other types of printers.

You can print on a specially designed canvas for example. Plus, you can print on various paper sizes, from banner size to anything else.

Laser Printers

The majority of laser printers use light, photosensitive drums, or photoreceptor belts.

The source of light emitted from the laser shaft draws the image onto a spinning drum or photo-receptor plate.

During printing the laser will scan page line by line. There are four laser printer subtypes available, including monochrome, strong ink, single coloring, and four coloring.

The generally accepted writing method is black and white lasers, which offer content in black text.

The users who only print pictures from time to time would probably use the laser color printer.

How to unbox, install and use Hp Laserjet M1005 printer?

<https://youtu.be/r5cQ6kDVHBA>

Difference between Impact and Non-Impact printers

Sl. No	Feature	Impact Printers	Non-Impact Printers
1	Behavior	Characters, graphics are printed on a paper by striking.	Characters, graphics are printed on a paper by without striking.
2	Mechanical	For printing, Electro-Mechanical devices are used	It does not make use of the Electro-Mechanical device for printing.
3	Speed	These are faster. Covers 250 words per second	These are slower. Covers a page in 30 seconds.
4	Noise	It is very Noisy.	It is silent.
5	Examples	Dot-matrix printers, Daisy-wheel printers, and line printers.	Inkjet printers and Laser printers.

Advantages and Disadvantages of Impact and Non-Impact printers

	Impact Printers	Non-Impact Printers
Advantages	Ideal for composite types of printing as they can quickly print across several layers of paper. It can stand up to dusty conditions, vibrations, and high temperatures.	Generally, much quieter than impact printers as the process is not striking. It can produce high-quality outputs.
Disadvantages	Due to the striking operation usually noisy. Print consistency similar to text, which is only appropriate for printing labels, envelopes, or invoices for mailing.	It cannot print composite forms.

What is a Microprocessor?

The microprocessor is the central unit of a computer system that performs arithmetic and logic operations, which generally include adding, subtracting, transferring numbers from one area to another, and comparing two numbers. It's often known simply as a processor, a central processing unit, or as a logic chip. It's essentially the engine or the brain of the computer that goes into motion when the computer is switched on. It's a programmable, multipurpose device that incorporates the functions of a CPU (central processing unit) on a single IC (integrated circuit).

How does a Microprocessor Work?

A microprocessor accepts binary data as input, processes that data, and then provides output based on the instructions stored in the memory. The data is processed using the microprocessor's ALU (arithmetical and logical unit), control unit, and a register array. The register array processes the data via a number of registers that act as temporary fast access memory locations. The flow of instructions and data through the system is managed by the control unit.

What is core in Micro-processor?

A processor core (or simply “core”) is an individual processor within a [CPU](#). Many computers today have [multi-core](#) processors, meaning the CPU contains more than one core

What Is Multithreading?

Multithreading is a form of parallelization or dividing up work for simultaneous processing. Instead of giving a large workload to a single core, threaded programs split the work into multiple software threads. These threads are processed in parallel by different CPU cores to save time.

What is hyper-threading?

Hyper-Threading Technology is a hardware innovation that allows more than one thread to run on each core. More threads means more work can be done in parallel.

How does Hyper-Threading work? When Hyper-Threading Technology is active, the CPU exposes two execution contexts per physical core. This means that one physical core now works like two “logical cores” that can handle different threads. The ten-core Intel® Core™ i9-10900K processor, for example, has 20 threads when Hyper-Threading is enabled.

Clock Speed

The clock speed is the speed at which a microprocessor is able to execute instructions. It's typically measured in Hertz and expressed in measurements like MHz (megahertz) and GHz (gigahertz).

What is Lithography?

Lithography or more generally Photo-**lithography** in fabrication is used to pattern the transistor circuits onto silicon.

What is Turbo Boost Technology?

CPUs don't always need to run at their maximum frequency. Some programs are more dependent on memory to run smoothly, while others are CPU-intensive. Turbo Boost Technology is an energy-efficient solution to this imbalance: it lets the CPU run at its base clock speed when handling light workloads, then jump to a higher clock speed for heavy workloads.

Running at a lower clock rate (the number of cycles executed by the processor every second) allows the processor to use less power, which can reduce heat and positively impact battery life in laptops. But when more speed is needed, Turbo Boost Technology dynamically increases the clock rate to compensate. This is sometimes called "algorithmic over-clocking."

Turbo Boost Technology can potentially increase CPU speeds up to the Max Turbo Frequency while staying within safe temperature and power limits. This can increase performance in both single-threaded and multithreaded applications (programs that utilize several processor cores).

What is Optane Memory?

Optane memory recognizes, remembers, and provides speedy access to your frequently used files, applications, and games.

Intel Processor Name description :

