

Unit –II

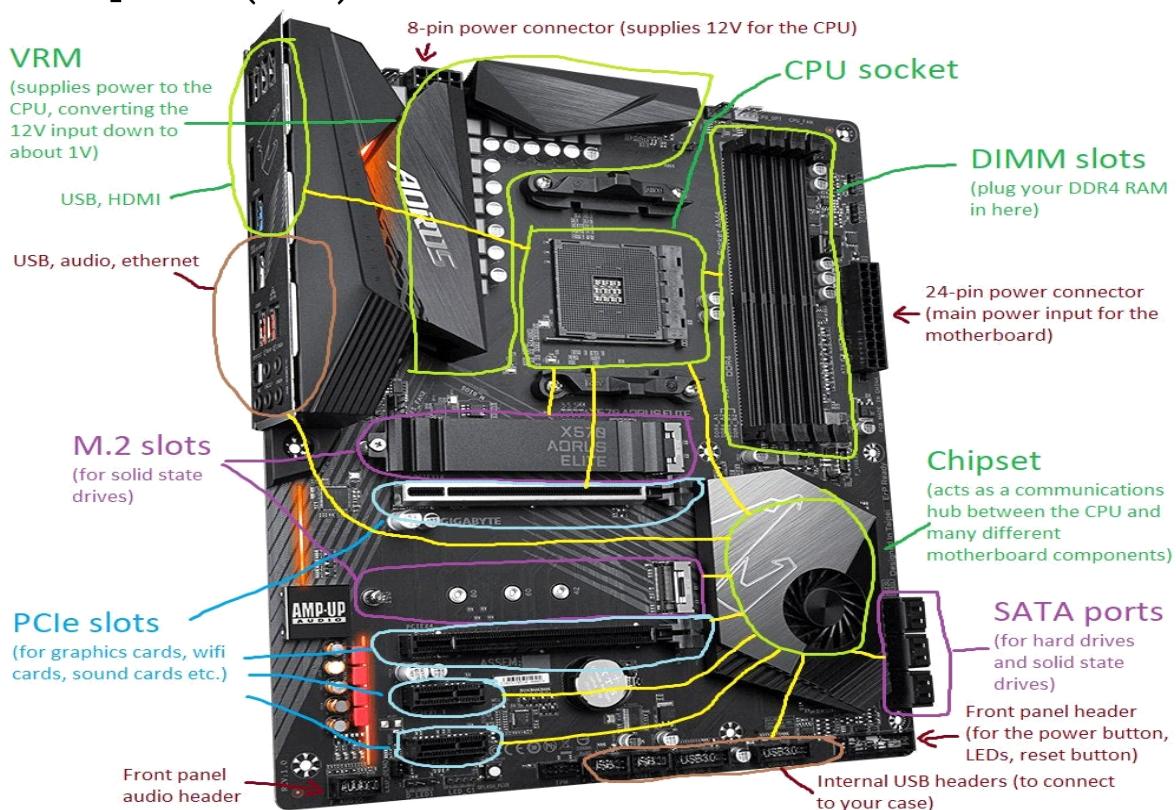
Hardware Component on Motherboard

- Computer Hardware:

“ includes the physical parts of a computer, such as , the case central processing unit (CPU), random access memory(RAM), monitor, mouse, keyboard, computer datastorage, card sound, speakers and motherboard”

Motherboard and its type:

“ A motherboard also called mainboard, main circuit board, mb, board, backplane board, base board, system board, logic board (only in Apple computers or mobo is the main printed circuit board (PCB)”



VRM-stand for voltage regulator model

DIMM-dual in-line memory module

SATA- serial advanced technology attachment

Pcie slots-peripheral component interconnect express

In general-purpose computers and other expandable systems. It holds

and allows communication between many of the crucial electronic components of a system, such as the central_processing_unit (CPU) and memory and provides connectors for other peripheralsUnlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's and memory controllers, interface connectors, and other components integrated for general use.

Motherboard means specifically a PCB with expansion capabilities. As the name suggests, this board is often referred to as the "mother" of all components attached to it, which often include peripherals, interface cards, and daughterboard cards; and a variety of other custom components

Similarly, the term *mainboard* describes a device with a single board and no additional expansions or capability, such as controlling boards in laser printers, television sets, washing machines, mobile phones, and other embedded systemswith limited expansion abilities.

Example: a motherboard is the main board in your computer that contain the circuit for everything required for you to type the words on your keyboard.

Type of motherboard:

1. AT Motherboard :(Advance Technology This is the first type of motherboard included in the list. These products have immense physical dimensions that are ranging up to hundreds of millimetres. Therefore, they require more space for installation and display limited installation abilities inside mobile phones and mini desktop versions. Types Of Motherboard Form Factors [ATX, Mini ITX, LPX, BTX, AT] Motherboards are an integral component of a device. It consists of two major components: the RAM and CPU, which perform the most significant tasks. A motherboard provides logistics for all elements so that they can work in coordination. The modern motherboards consist of rapid cooling abilities, reduction in heat production, multiple systems configurations, and many card slots.

Moreover, the tools are available in different sizes depending on the available space. Hence, based on these factors, this article offers you different types of motherboards. So, keep reading the article below for more information on the major types of motherboard form factors.

Motherboard, also referred to as logic or baseboard, is a crucial component of electronic units. It constitutes a non-conductive plastic body coupled with a circuit and a socket holder. The main task of the motherboard is to provide logistics for all the components of a device to work in coordination with each other.

In addition to this, the plastic sheet is also integrated with aluminium strips to connect multiple components in a circuit. The size of the motherboard varies among various gadgets like laptops, smartphones, and computers. This is because of the lack of space in smaller items like smartphones as compared to large computer monitors.

Similarly, the replacements of components also vary in different products. For Example, laptop sockets and other materials are adjusted on top of the motherboard. Therefore, it is not easy to replace them. There are many types of motherboards available in the market. Most notable among them include AT motherboard, ATX motherboard, Mini ITX motherboard, BTX motherboard, and LPX motherboard

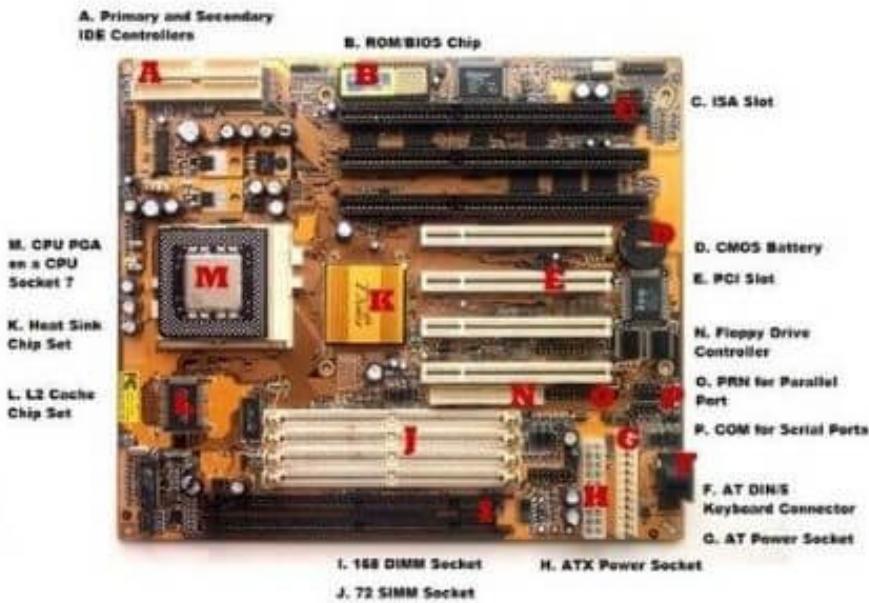
1. AT Motherboard:

This is the first type of motherboard included in the list. These products have immense physical dimensions that are ranging up to hundreds of millimetres. Therefore, they require more space for installation and display limited installation abilities inside mobile phones and mini desktop versions.

at motherboard form factor

Instead, they can be used inside a large computer monitor where sufficient space is available to install the item along with the required drivers and connectors. These units utilize sockets and six-pin plugs for connecting various power sources with each other.

Similarly, it requires a great deal of attention to identify the power connectors and might require expert guidance while doing so. Similarly, these materials also require a 12 pin plug to power the motherboard. Hence, they are an ideal choice for large desktops.



13.8 x 12 Inches

AT MOTHERBOARD

These motherboards have bigger physical dimensions of hundreds of millimetres and hence they are not the right fit for the mini desktop category of computers. Bigger physical size also inhibits installing new drivers. Sockets and six-pin plugs are used as power connectors in these motherboards. These power connectors are not that easily identifiable and hence users face difficulties in connecting and using it.

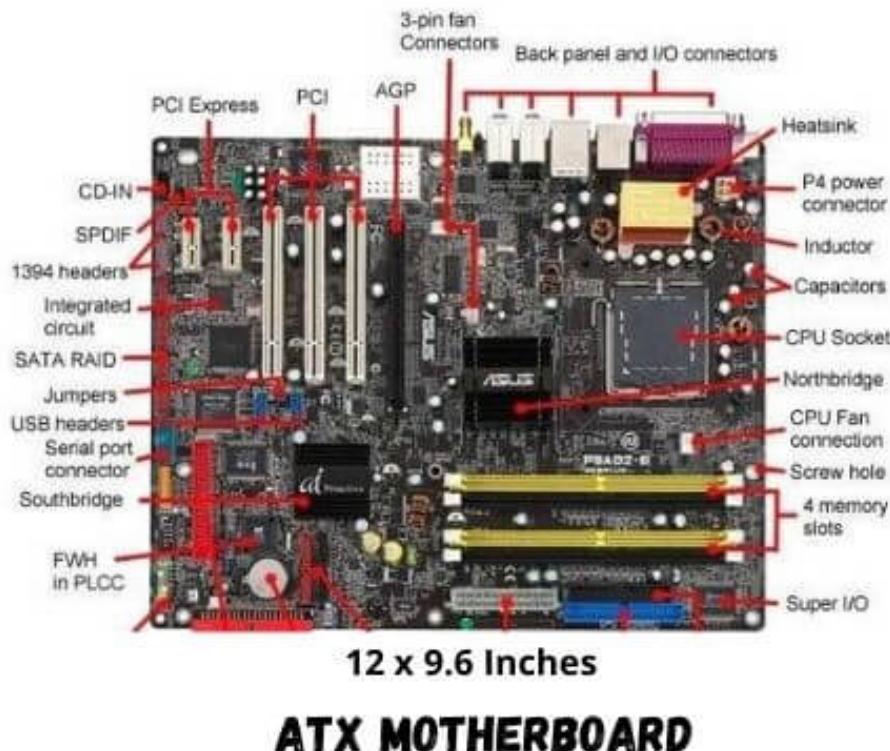
This type of motherboard was in vogue in the 1980s and it enjoyed a substantial self-life.

2. ATX Motherboard:

ATX denotes advanced technology extended, it was developed by Intel during the 1990s and it was an improved version over an earlier version

of AT motherboard. It is smaller in size when compared to AT and it provides interchangeability of the connected components. There is a marked improvement ATX Form Factor

The ATX motherboard is the advanced and upgraded version of the AT motherboards. The abbreviation ATX stands for Advanced Technology Extended. The product was first developed in the 1990s by Intel and is highly efficient in terms of performance. The compact size alongside the interchangeability of the connected components is the highlight of the system.



in the connector aspects. This is attributed to the improvement in the

connector aspects. Another significant aspect of the object is the inclusion of sleep mode. It is a power management mode that is characterized by a reduction in power drainage. The sleep mode also allows users to resume their work where they left it off when the computer was last used

Along with this, this motherboard is also capable of converting 5 volts current to 3.3 volts rapidly. Contrary to AT motherboards, The ATX form factor utilizes one 20-pin plug for powering the system. Furthermore, it also contains many other connectors, including video cards, modems, network cards, and video cards that further amplifies its abilities

3. LPX Motherboard: LPX (short for Low Profile extension), originally developed by, western digital was a loosely defined motherboard format form factor widely used in the 1990s. This board had two improvements over earlier versions. The first one is Input and Output ports were taken to backside and the second one was the introduction of Riser card to facilitate more slots and easier connection. Some of these features were deployed in the AT motherboard. The main disadvantage in this board is the lack of Accelerated Graphic Port (AGP) slots which led to a direct connection to PCI. Issues in these motherboards were addressed in NLX boards.



13 x 9 Inches

LPX MOTHERBOARD

4. BTX Motherboard:

BTX denotes Balanced Technology Extended, intended to manage

demands of new technologies in terms of more power requirements hence generation of more heat. Intel stopped further development of BTX boards during the mid-200BTX motherboard, also known as Balanced Technology extended, was first utilized in 2004. BTX system is specifically designed to reduce the power requirement of the whole item. Along with this, the object is also capable of reducing the heat generated by the product. The enhanced technology incorporated in the unit contains a serial advanced technology attachment, peripheral component interconnects express, and a universal serial bus.c



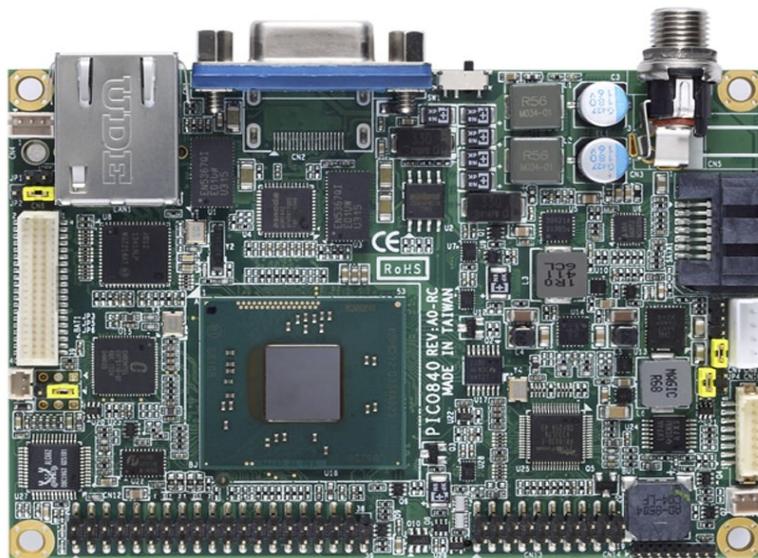
12.8 x 10.5 Inches

BTX MOTHERBOARD

0s to concentrate on low power CPU.

5. Pico BTX motherboard:

These boards are smaller in size and hence the word Pico. Two expansion slots are supported in spite of being sharing the top half of BTX. Half-height or riser cards are its unique features and it supports the demands of digital applications.



6. Mini ITX motherboard:

It's a miniature version of motherboard over its earlier versions. Designed in the early 2000s and its dimension is 17 x 17 cm. Mainly used in small form



6.7 x 6.7Inches

MINI ITX MOTHERBOARD

factor (SFF) computer due to its lower power consumption and faster cooling ability. This motherboard is the most preferred in the home theatre domain due to its lower level of fan noise that will improve the quality of the theatre system. Moreover, the object is also capable of cooling at a faster rate than most other materials available in the market. This makes them ideal for small-configuration computer systems. Due to the low noise generated by the fan, these motherboards are mostly used in home theatre PC systems. Therefore, providing seamless entertainment at a reasonable price range. The design of the material provides one expansion slot along with a standard PCI slot.

The object utilizes an ultra-low-power processor that cools down rapidly.

Rapid cooling can be achieved with the help of a heat sink only, unlike previously mentioned tools that use fans with an already existing heatsink. Last but not least, this version also includes two universal serial bus ports with a parallel port, input, output ports, and serial ports.

7. Micro-ATX Motherboard:

The Micro-ATX motherboard is a smaller motherboard that saves space and energy and is generally cheaper as a result. It has an equal amount of room for memory as the ATX in four RAM slots but has a maximum of four PCIe slots instead of seven and comes with less room for storage than the ATX board.



HDD:

- HDD means Hard Disk Drive and it is also called as hard drive.

The hard Disk is inserted into the Hard Disk Drive

- It is also portable, so we can carry the hard disk from one computer

to other computer.

- It is secondary storage device, so it stores the data permanently, till

the data is erased by the user.

- So, it is also called as non-volatile because the data in the Hard Disk

will not get erased even if the power supply is switched off.

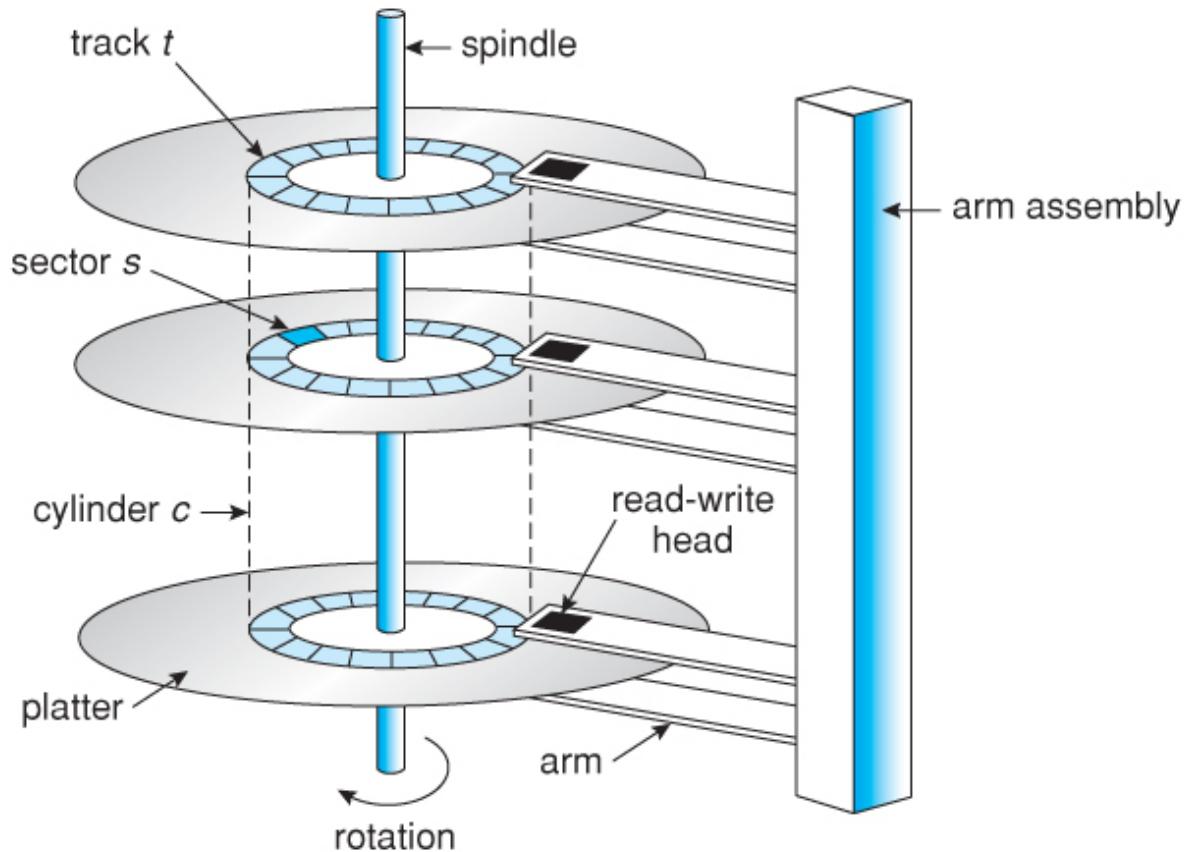
- It is also available in two forms i.e. On-line and Off-line.
- Its size is 3.5 inch for the desktop PC and 2.5 inch for Laptops.

Today the HDD storage capacity is 3TB, which is very high as

compared to Floppy Disk, CD, DVD, Pen Drive, etc.

- It is connected to the computers by cables such as PATA and SATA or the USB cables.





Types of HDD:

There are three types of HDD:

1] Zip Disk

2] Disk Pack

3] Winchester Disk

1] Zip Disk:

- It consists of only one disk i.e. platter.
- So, its storage capacity is very less as compared to all HDD types i.e. Disk Pack and Winchester Disk i.e. 100MB.

2] Disk Pack:

- It consists of two or more disks i.e. platters.
- All these disks i.e. platters are connected to the central shaft (rod). When the shaft rotates, then the disks (platters) also rotate at high speed.

• Every disk has a separate read/write head. This read/write head moves in and out of the disk, either to read the data from the disk or to write the data into the disk.

- In disk pack the number of disk are not fixed i.e. we can remove the disk and also add new disk. So, the storage capacity of disk pack is unlimited as compared to Winchester Disk.

3] Winchester Disk:

- It consists of two or more disks i.e. platters.
- All these disks i.e. platters are connected to the central shaft (rod).

When the shaft rotates, then the disks (platters) also rotates at high speed.

- Every disk has a separate read/write head. This read/write head moves in and out of the disk, either to read the data from the disk or to write the data into the disk.
- In Winchester Disk the number of disk are fixed i.e. we cannot remove the disk and also add new disk. So, the storage capacity of Winchester disk is limited i.e. very less as compared to Winchester

Type of RAM:

RAM means Random Access Memory.

It is called as Random because at any time, any way and any location of this memory can be accessed by the user.

It is a Read/Write memory, means the user can read the data as well as write the data into this memory.

In this memory the data is stored temporary.

The data of this memory gets erased, when the power supply is switched off, so this memory is called as „Volatile memory“.

It is faster in operation as, that's why it is costly, but its storage capacity is less as compared to compared to secondary memory.

The CPU access the data directly from this primary memory i.e. RAM. It stores the data, which is required for the current operation of the CPU.

In RAM we can write the data again and again i.e. many times and also we can correct the data.

Types of RAM: There are two types of RAM:

1] S-RAM

2] D-RAM

S-RAM:

S-RAM means Static Random Access Memory or Static RAM. In short Static RAM is called as S-RAM.

In Static RAM data gets erased, when the power supply is switched off, so it is „Volatile Memory“.

It is Faster in operation as compared to D-RAM.

But its storage capacity is less and it is costly as compared to D-Ram.

It is also complex in design as compared to D-RAM.

Hence it also requires refreshing circuit.

It consumes very less power as compared to D-RAM.

D-RAM:

D-RAM means Dynamic Random Access Memory or Dynamic RAM. In short Dynamic RAM is called as

D-RAM

In Dynamic RAM data does not get erased, even if the power supply is switched off, so it is „Non-Volatile Memory“

It is slow in operation as compared to D-RAM

But its storage capacity is larger and it is less costly as compared to DRam

It is also simple in design as compared to D-RAM

Hence, it does not require refreshing circuit

It consumes very high power as compared to D-RAM.

Chipsets:

A chipset is a group of interdependent motherboard chips or integrated circuits that control the flow of data and instructions between the central processing unit (CPU) or microprocessor and external devices.

A chipset controls external buses, memory cache and some peripherals. A CPU is unable to function without impeccable chipset timing. A chipset is specifically designed for a motherboard. The chipset and motherboard must be compatible with the CPU to prevent system failover. Most chipset drivers are manually updated and installed.

Type of Chipsets:

A chipset has two type

1 Southbridge

2 Northbridge

- with specific sets of functions that communicate between the CPU and external devices.

1 Southbridge :

The Southbridge, which is not directly connected to the CPU, is also known as the input/output controller hub. Southbridge handles the motherboard's slower connections, including input/output (I/O) devices and computer peripherals like expansion slots and hard disk drives.

2 Northbridge :

The Northbridge connects the Southbridge to the CPU and is commonly known as the memory controller hub. The Northbridge handles a computer's faster interaction requirements and controls communication between the CPU, RAM, ROM, the basic input/output system (BIOS), the accelerated graphics port (AGP) and the Southbridge chip. The Northbridge links I/O signals directly to the CPU. The CPU uses the Northbridge frequency as a baseline for determining its operating frequency.

A chipset and device drivers are compatible when an operating system is initially installed. However, device drivers eventually become

outdated due to subsequent hardware and software installations.
Outdated or incompatible device drivers create compatibility issues,
lack of features and sub-par device performance

A chipset includes the circuit board layout/functionality and circuit mechanisms. Varieties include microprocessors and modem card chipsets. In addition, a CPU has several different chipsets that vary according to architecture.

Microprocessor and its type:

A microprocessor is basically the brain of the computer. We can also call it simply a processor or CPU. Furthermore, a microprocessor is basically a computer processor that is mounted on a single IC (Integrated Circuit). It means that all the functions of the processor are included on a single chip. Furthermore, the basic task of a microprocessor is to input the instructions from the memory, decode, and process them and produce the output. It performs three basic tasks while processing the information

There are three types of microprocessors:

namely, CISC, RISC, and EPIC

We have three basic types of microprocessors. They are as follows:

1. CISC (Complex Instruction Set Computer)

As the name suggests, the instructions are in a complex form. It means that a single instruction can contain many low-level instructions. For example, loading data from memory, storing data to the memory, performing basic operations, etc. Besides, we can say that a single instruction has multiple addressing modes. Furthermore, as there are many operations in single instruction they use very few registers

Examples: of CISC are Intel 386, Intel 486, Pentium, Pentium Pro, Pentium II, etc.

2. RISC (Reduced Instruction Set Computer)

As per the name, in this, the instructions are quite simple, and hence, they execute quickly. Moreover, the instructions get complete in one clock cycle and also use a few addressing modes only. Besides, it makes use of multiple registers so that interaction with memory is less

Examples: are IBM RS6000, DEC Alpha 21064, DEC Alpha 21164, etc.

3. EPIC (Explicitly Parallel Instruction Computing)

It allows the instructions to compute parallel by making use of compilers. Moreover, the complex instructions also process in fewer clock frequencies. Furthermore, it encodes the instructions in 128-bit bundles. Where each bundle contains three instructions encoded in 41 bits each and a 5-bit template. This 5-bit template contains information about the type of instructions and that which instructions can be executed in parallel.

Examples: are IA-64 (Intel Architecture-64), etc.

IDE and SATA Cables other part on motherboard:

IDE (Integrated development environments):

Integrated development environments (IDE) are applications that facilitate the development of other applications. Designed to encompass all programming tasks in one application, one of the main benefits of an IDE is that they offer a central interface with all the tools a developer needs, including

Code editor: Designed for writing and editing source code, these editors are distinguished from text editors because work to either simplify or enhance the process of writing and editing of code for developers

Compiler: Compilers transform source code that is written in a human readable/writable language in a form that computers can execute.

Debugger: Debuggers are used during testing and can help developers debug their application programs.

Build automation tools: These can help automate developer tasks that are more common to save time.

SATA Cables:

SATA means **Serial Advanced Technology Attachment** or **Serial ATA**. SATA is an interface that connects various storage devices such as hard disks, optical drives, SSD's, etc. to the motherboard.

SATA was introduced in the year 2000 to replace the long-standing PATA (Parallel ATA) interface. We all know, in serial mode, data is transferred bit by bit and in parallel, there are several streams that carry the data. Despite knowing this fact, there is a drawback in PATA. PATA is highly susceptible to outside interferences and hence allows SATA to operate at high speeds than PATA. SATA cables are thinner, more flexible and compact as compared to the PATA cables.

There were several industry groups that began their development in SATA late in the 2000s. It was only in the year 2003 that SATA-IO (SATA International Organization) was formed and it laid out the first SATA specifications.

A SATA controller is a device that is used to connect the computer's motherboard to the storage drives.

SATA operates on two modes –

- 1. IDE mode:** IDE stands for Integrated Drive Electronics. This is a mode which is used to provide backward compatibility with older

- hardware, which runs on PATA, at the cost of low performance.
2. **AHCI mode:** AHCI is abbreviation for Advanced Host Controller Interface. AHCI is a high-performance mode that also provides support for hot-swapping.

Characteristics of SATA cable

- **Low Voltage Requirement:** SATA operates on 500mV (0.5V) peak-to-peak signalling. This help in promoting a much low interference and crosstalk between conductors.
- **Simplified construction:** PATA cables had 40-pin/80-wire ribbon cable. This was complex in construction. In comparison, SATA had a single 7 pin data cable and a 15 pin power cable. This cable resulted in a higher signalling rate, which translates to faster throughput of data.
- **Differential Signalling:** SATA uses differential signalling. Differential signalling is a technology which uses two adjacent wires to simultaneously the in-phase and out-of-phase signals. Thus, it is possible to transfer high-speed data with low operating voltage and low power consumption by detecting the phase difference between the two signals at the receiver's end.
- **High data transfer rate:** SATA has a high data transfer rate of 150/300/600 MBs/second. This capability of SATA allows for faster program loading, better picture loading and fast document loading.

Advantages of SATA

- Faster data transfer rate as compared to PATA.
- SATA cable can be of length up to 1 meter, whereas PATA cable can only have length of maximum 18 inches.
- SATA cables are smaller in size.
- Since, they are smaller in size, they take up less space inside the computer and increase the internal air flow. Increased air flow can decrease heat build-up and therefore increases the overall life of computer.
- Most modern computer motherboards today have SATA ports more than PATA ports.
- Low power consumption (0.5V).

Disadvantages of SATA

- Special device drivers are required sometimes to recognize and use the drive. However, a SATA hard drive can behave as a PATA drive. This eliminates the need for a specific driver to be installed.
- SATA cable supports only one hard drive to connect at a time, whereas PATA cable allows up to two PATA drives per cable.
- SATA is costlier as compared to PATA.