**AIM :** Introduction to Computer hardware: Physical identification of major components of a computer system such as mother board, RAM modules, daughter cards, bus slots, SMPS, internal storage devices, interfacing ports.

INTRODUCTION :

Computer hardware (usually simply called hardware when a computing context is concerned) is the collection of physical elements that constitutes a computer system. **Computer hardware is the physical parts or components of a computer**, such as the monitor, mouse, keyboard,computer data storage, hard disk drive (HDD), graphic cards, sound cards, memory, motherboard, and so on, all of which are physical objects that are tangible.
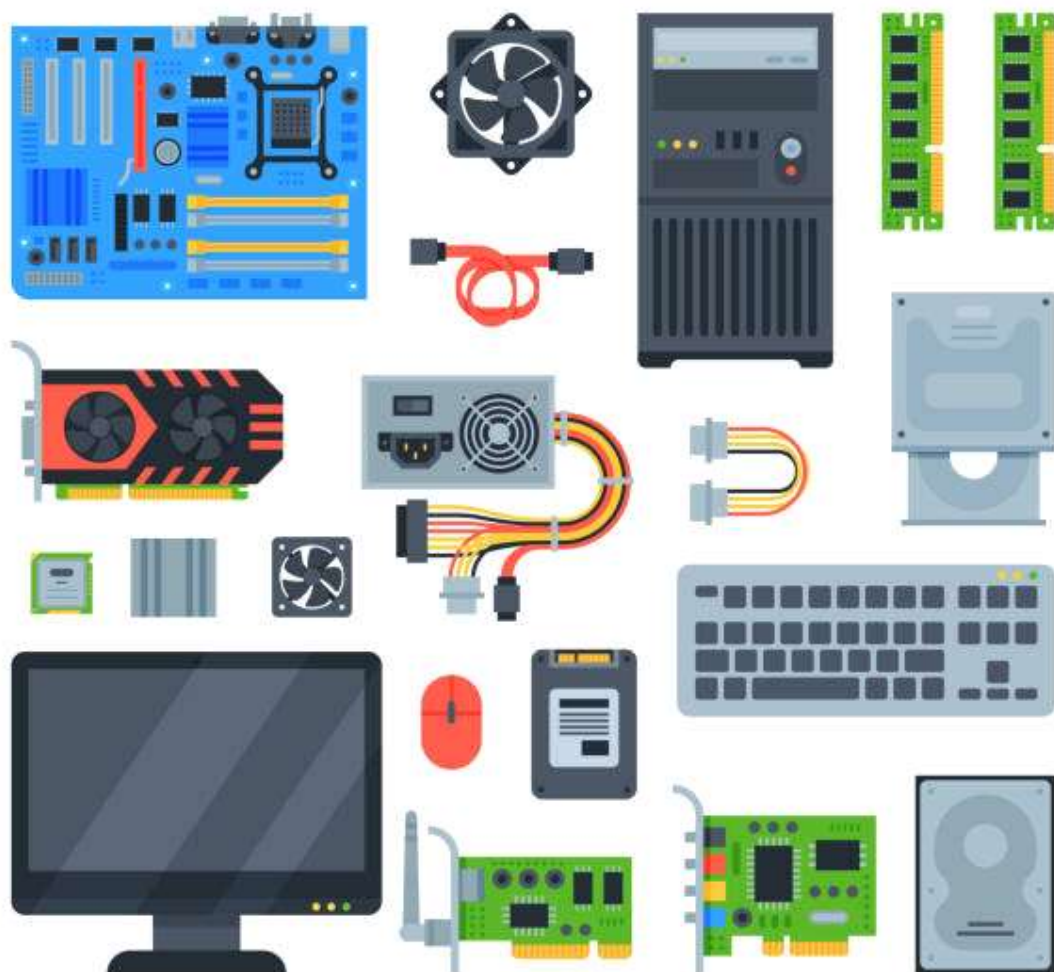
1) MOTHER BOARD :

The first motherboard is considered to be one used in the IBM Personal Computer, released in 1981. At the time, IBM called it a **"planar"** instead of a motherboard.

The motherboard is a **printed circuit board** and foundation of a computer that is the biggest board in a computer chassis. It allocates power and allows communication to and between the CPU, RAM, and all other computer hardware components.

A motherboard provides connectivity between the hardware components of a computer, like the processor (CPU), memory (RAM), hard drive, and video card.

ASUS P5AD2-E Motherboard - http://www.computerhope
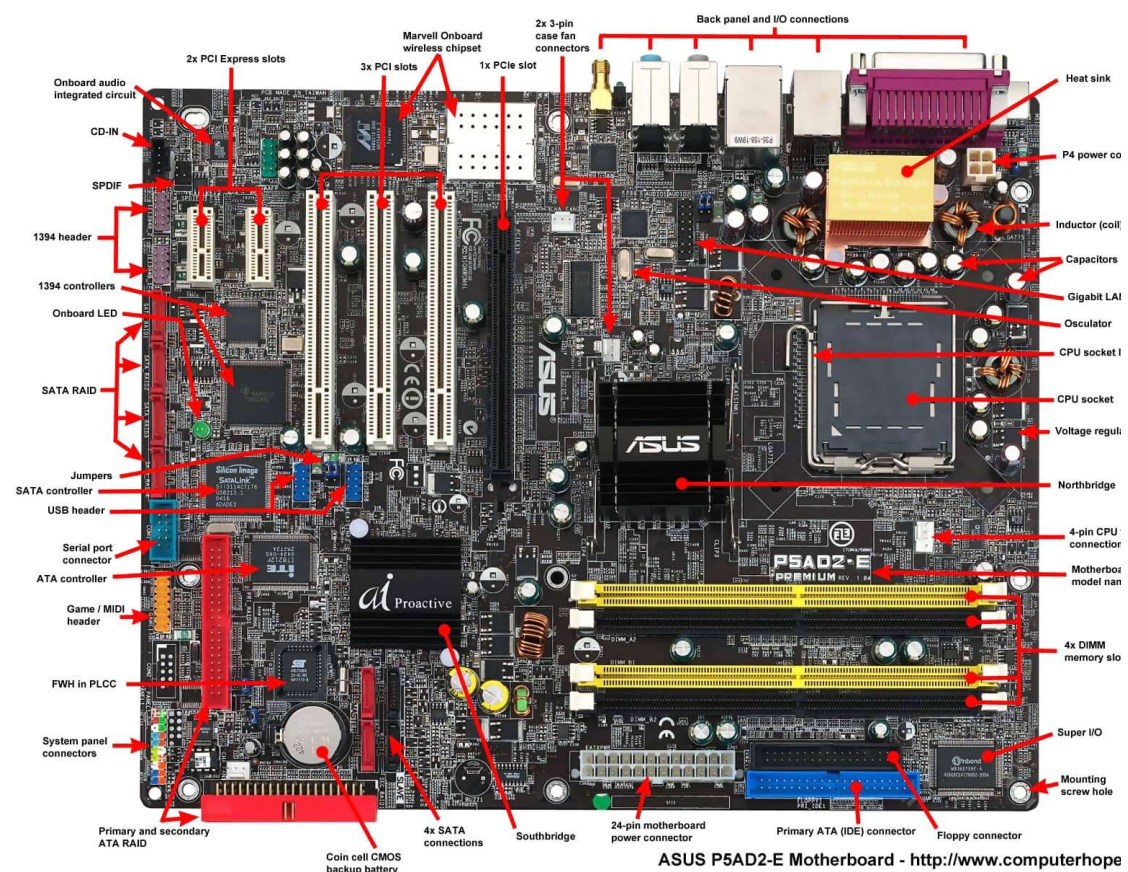
=> NORTH BRIDGE : Alternatively referred to as the PAC (PCI/AGP Controller) and nb, the Northbridge is an integrated circuit responsible for communications

between the CPU interface, AGP, and the memory.The northbridge is usually slightly larger than the southbridge, and is positioned closer to the CPU and memory.

When the CPU needs data from RAM, a request is sent to the northbridge memory controller. After the request is received, the northbridge responds with how long the processor needs to wait to read memory over the front-side bus.

=> SOUTH BRIDGE : The southbridge is an IC on the motherboard responsible for the hard drive controller, I/O controller and integrated hardware. Integrated hardware can include the sound card and video card if on the motherboard, USB, PCI, ISA, IDE, BIOS, and Ethernet.

Although the southbridge handles most of the I/O devices, less prominent input/output devices, such as a serial port, keyboard, and non-USB mouse are handled by the **SIO (super input/output).**

=> CMOS : CMOS is short for **Complementary Metal-Oxide Semiconductor**. CMOS is an onboard, battery powered semiconductor chip inside computers that stores information. This information ranges from the system time and date to system hardware settings for your computer.

=> BIOS : Short for **Basic Input/Output System**, the BIOS is a ROM chip found on motherboards that allows you to access and set up your computer system at the most basic level.

The BIOS includes instructions on how to load basic computer hardware. It also includes a test referred to as a POST (Power-On Self-Test) that helps verify the computer meets requirements to boot up properly. If the computer does not pass the POST, you hear a combination of beeps indicating what is malfunctioning in the computer.

=> POST (Power-On Self-Test) :Test the computer hardware and make sure no errors exist before loading the operating system.

=> Bootstrap Loader : Locate the operating system. If a capable operating system is

located, the BIOS will pass control to it

2. RAM (RANDOM ACCESS MEMORY) :

Alternatively referred to as main memory, primary memory, or system memory, RAM (random-access memory) is a hardware device that allows information to be stored and retrieved on a computer. RAM is usually associated with DRAM, which is a type of memory module. Because data is accessed randomly instead of sequentially like it is on a CD or hard drive, access times are much faster. However, unlike ROM, RAM is a **volatile** memory and requires power to keep the data accessible. If the computer is turned off, all data contained in RAM is lost.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

3.ROM (READ ONLY MEMORY) :

ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is **non-volatile**. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as bootstrap. ROM chips are not only used in the computer but also in other electronic

items like washing machine and microwave oven.
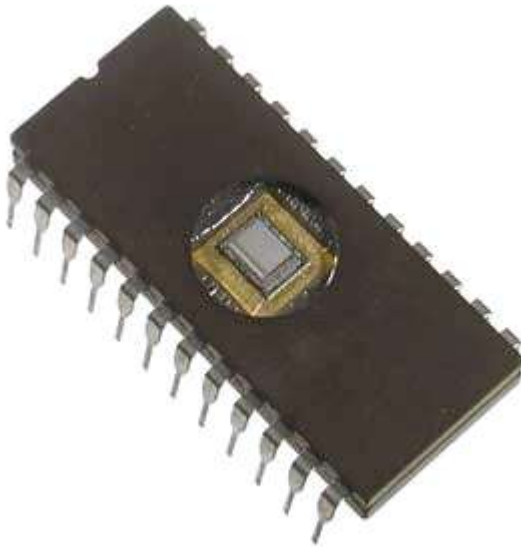
4. DAUGHTER BOARD :

Alternatively referred to as a daughter card, a daughterboard is an expansion board that connects directly to the motherboard and gives added functionality (e.g., modem).

A motherboard with daughterboard

5. BUS SLOTS :

Alternatively known as a expansion port, an expansion slot is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a hardware expansion card to be connected. For example, if you wanted to install a new video card in the computer, you'd purchase a video

expansion card and install that card into the compatible expansion slot.

An expansion slot is a socket on the motherboard that is used to insert an expansion card (or circuit board), which provides additional features to a computer such as video, sound, advanced graphics, Ethernet or memory.

The expansion card has an edge connector that fits precisely into the expansion slot as well as a row of contacts that is designed to establish an electrical connection between the motherboard and the electronics on the card, which are mostly integrated circuits. Depending on the form factor of the case and motherboard, a computer system generally can have anywhere from one to seven expansion slots. With a backplane system, up to 19 expansion cards can be installed.

Expansion slots

6. SMPS (Switched Mode Power Supply) :

SMPS is the Switched Mode Power Supply circuit which is designed for obtaining the regulated DC output voltage from an unregulated DC or AC voltage. A SMPS is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. SMPS provide improved efficiency & space saving over traditional linear supplies, but care has to be taken to ensure noise on the output is low. Switch mode power supplies are widely used because of the advantages they offer in terms of size, weight, cost, efficiency and overall performance.

The advantages of SMPS include :

- The efficiency is as high as 80 to 90%.

- Less heat generation; less power wastage.

- Reduced harmonic feedback into the supply mains.

- The device is compact and small in size.

- The manufacturing cost is reduced.

- Provision for providing the required number of voltages.

SMPS DIAGRAM

- Interior view of a switched-mode power supply.
- A -bridge rectifier
- B -Input filter capacitors
- C -Transformer
- D -output filter
- E -output filter capacitors

7. Internal Storage Devices :

Some storage devices are classed as 'internal' which means they are inside the computer case.Most computers have some form of internal storage. The most common type of internal storage is the **hard disk.**

At the most basic level, internal storage is needed to hold the operating system so that the computer is able to access the input and output devices.
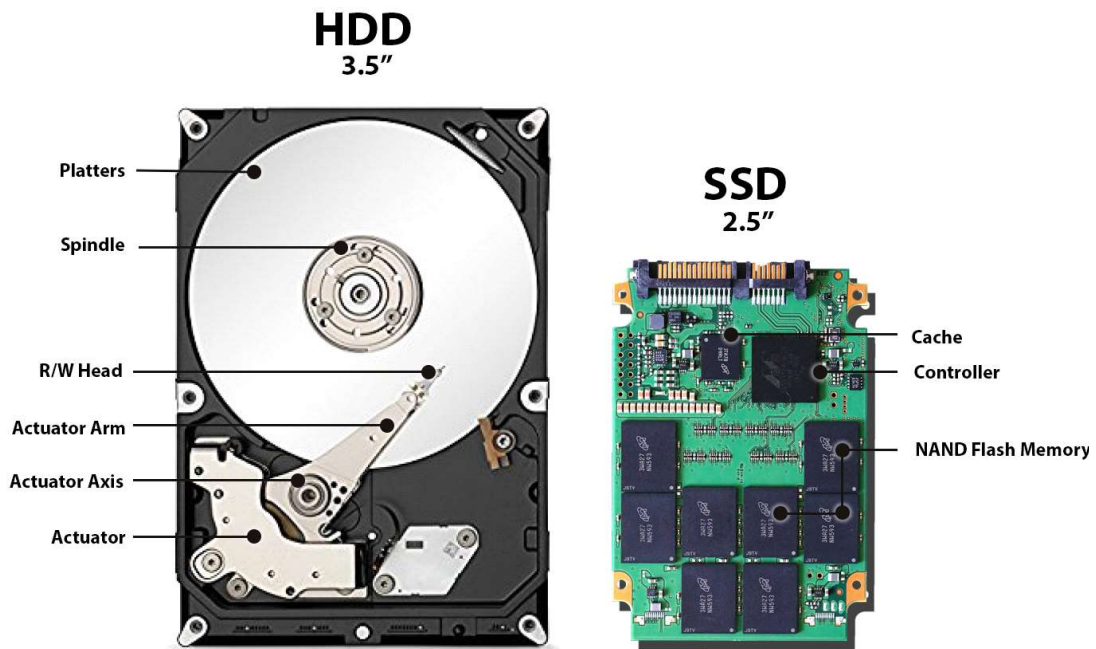
It will also be used to store the applications software that you use and more than likely, the original copies of your data files.

Internal storage allows the data and applications to be loaded very rapidly into memory, ready for use. The data can be accessed much faster than data which is stored on an external storage device. This is because internal storage devices are connected directly to the motherboard and its data bus whereas external devices are connected through a hardware interface such as USB, which means they are considerably slower to access.

Internal storage also means that if the computer is moved around, it will still retain its most commonly used data.

The main disadvantage of internal storage is that when the hard disk fails (and it will), all the data and applications may be lost.

This can be avoided to some extent by using more than one hard disk within the machine. Each hard disk has a copy of all the data, so if one fails the other can carry on. This is called a RAID array. An alternative is to use external drives for backup.

HDD
3.5"

Platters

Spindle

R/W Head

Actuator Arm

Actuator Axis

Actuator

SSD
2.5"

Cache

Controller

NAND Flash Memory

8. Interfacing ports :

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

A port has the following characteristics :-

- External devices are connected to a computer using cables and ports.

- Ports are slots on the motherboard into which a cable of external device is plugged in.

- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc
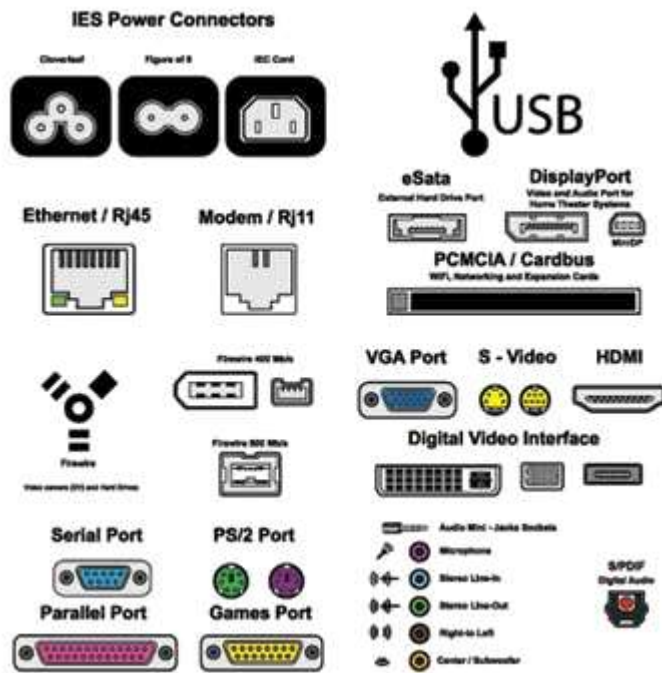
8.1 Serial Port :

- Used for external modems and older computer mouse.

- Two versions: 9 pin, 25 pin model.

- Data travels at 115 kilobits per second.

8.2 Parallel Port :

- Used for scanners and printers.

- Also called printer port.

- 25 pin model.

Parallel port

8.3 PS/2 Port :

- Used for old computer keyboard and mouse.

- Also called mouse port.

- Most of the old computers provide two PS/2 port, each for the mouse and keyboard.

8.4 Universal Serial Bus (or USB) Port :

- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.

- It was introduced in 1997.

- Most of the computers provide two USB ports as minimum.

- Data travels at 12 megabits per seconds.

- USB compliant devices can get power from a USB port.

8.5 VGA Port :

- Connects monitor to a computer's video card.

- It has 15 holes.

- Similar to the serial port connector. However, serial port connector has pins, VGA port has holes.

VGA cable

VGA connector

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8.6 Firewire Port :

- Transfers large amount of data at very fast speed.

- Connects camcorders and video equipment to the computer.

- Data travels at 400 to 800 megabits per seconds.

- Invented by Apple.

- It has three variants: 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector, and 9-Pin FireWire 800 connector.

8.7 Modem Port :

- Connects a PC's modem to the telephone network.

8.8 Ethernet Port :

- Connects to a network and high speed Internet.

- Connects the network cable to a computer.

- This port resides on an Ethernet Card.

- Data travels at 10 megabits to 1000 megabits per seconds depending upon

the network bandwidth.