

**EXPERIMENT NO:1**

**DATE:**

## **FAMILIARISATION WITH COMPUTER HARDWARE**

**AIM:** Basic components of computer hardware

### **DESCRIPTION**

Computer hardware is a collective term used to describe any of the physical components of an analog or digital computer. The term *hardware* distinguishes the tangible aspects of a computing device from software, which consists of written, machine-readable instructions or programs that tell physical components what to do and when to execute the instructions. The hardware components of a computer are classified into five groups are Input unit, Central processing unit, Output Unit, Control Unit, Arithmetic & logical unit.

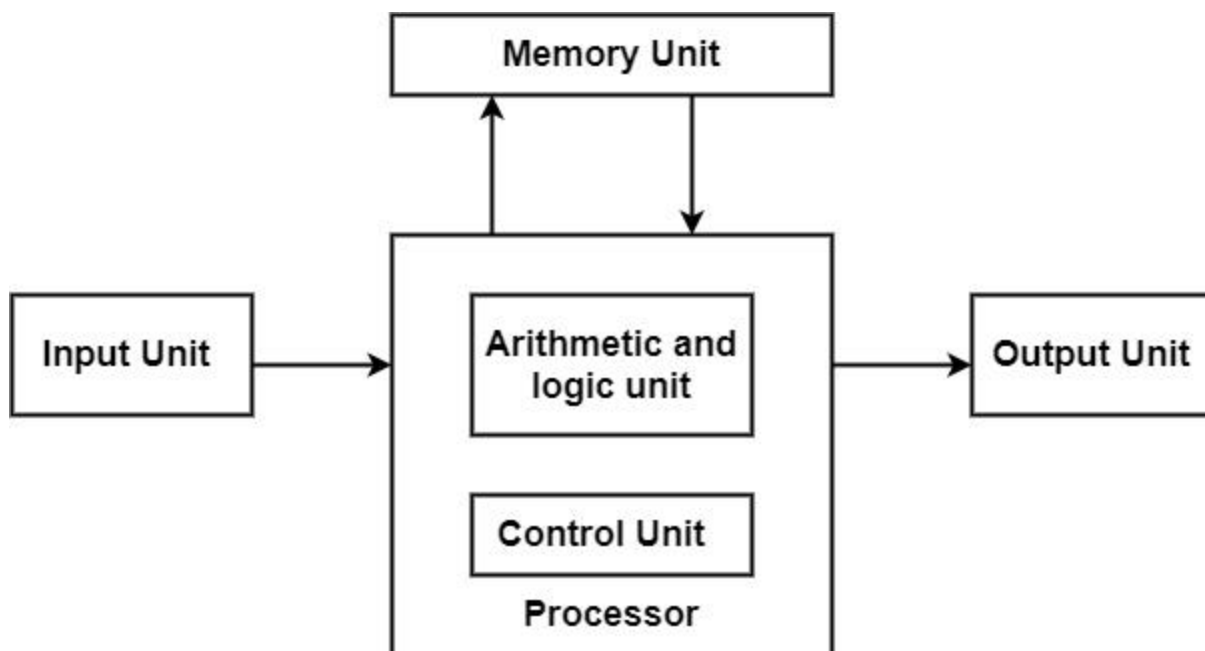


Figure 1: Components of computer

### **Input unit**

Input units are used by the computer to read the information. The most frequently used input devices are keyboards, mouse, joysticks, trackballs, microphones, and so on. Whenever a key is clicked, the matching letter or digit is necessarily interpreted into its equivalent binary code and communicate over a cable to either the memory or the processor.

### **Output unit**

The output unit is the reverse of the input unit. When the processor sends the output to the output unit. The output unit modifies the data supported by a computer system from binary language to human language. In this process, data is transmitted in an external environment such as a monitor and sound.

## Central processing unit

A central processing unit is referred to as a computer circuitry within a computer that transfers out the instructions given by a computer program by executing the basic arithmetic, logical, control, and input/output (I/O) operations determined by the instructions.

## Memory unit

The Memory unit can be defined as the storage location in which programs are stored which are running, and that includes information required by the running programs.

There are two types of Memory Unit such as follows –

- **Primary Memory** – Primary memory includes a huge number of semiconductor storage cells, suited for saving a bit of data. The word length of a computer is between 16-64 bits. It is also referred to as the volatile form of memory. It represents when the system is shut down, anything included in RAM is lost.
- **Secondary Memory** – Secondary memory is used when a huge amount of information and programs have to be saved for a permanent basis. It is also referred to as the Non-volatile memory form of memory. It represents the information is saved permanently regardless of shut down.

## Control unit

The control unit is a component of a computer's central processing unit that relates to the operation of the processor. It communicates the computer's memory, arithmetic/logic unit, and input and output devices how to counter to a program's instructions. The control unit is also referred to as the nerve center of a computer system.

## Arithmetic & logical unit

There are various arithmetic and logical operations of a computer are implemented in the ALU (Arithmetic and Logical Unit) of the processor. It executes arithmetic operations such as addition, subtraction, multiplication, division, and also logical operations including AND, OR, NOT operations.

some of the most common components of computer hardware are:

### a) MOTHER BOARD

A motherboard (also called mainboard, main circuit board, mb, mboard, backplane board, base board, system board, logic board is the main printed circuit board (PCB) 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 peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

In a computer system, the motherboard is a main printed circuit. It is also called the main circuit board or mainboard. It includes several components on a single platform. It allows communication between the RAM, ROM, hard drive, and other computer hardware components. The motherboard is also called the backbone of a computer.



Figure 2:Motherboard

### The parts of motherboard

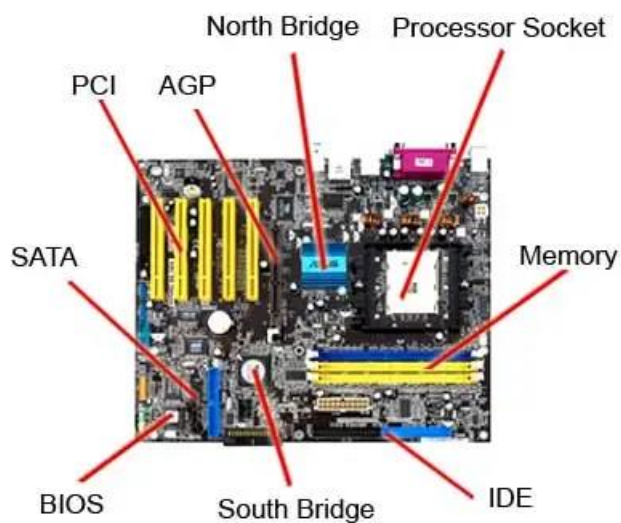


Figure 3: parts of motherboard

- Central Processing Unit (CPU)

### The Computer's Microprocessor

Also known as the microprocessor or the processor, the CPU is the computer's brain. It is responsible for fetching, decoding, and executing program instructions. It also performs mathematical and logical calculations.

The processor chip is identified by the processor type and the manufacturer. This information is usually inscribed on the chip itself. For example, Intel 386, Advanced Micro Devices (AMD) 386, Cyrix 486, Pentium MMX, Intel Core 2Duo, or Core i7.

If the processor chip is not on the motherboard, you can identify the processor socket as socket 1 to Socket 8 and LGA 775, among others. This can help you identify the processor that fits in the socket.

- Random Access Memory (RAM)

### **The Computer Memory**

RAM, usually refers to computer chips that temporarily store dynamic data to enhance computer performance while you are working.

In other words, it is the working place of your computer, where active programs and data are loaded so that any time the processor requires them, it doesn't have to fetch them from the hard disk.

Random-Access Memory is volatile, meaning it loses its contents once power is turned off. This is different from non-volatile memory, such as hard disks and flash memory, which do not require a power source to retain data.

When a computer shuts down properly, all data located in RAM is returned to permanent storage on the hard drive or flash drive. At the next boot-up, RAM begins to fill with programs automatically loaded at startup, a process called booting. Later on, the user opens other files and programs that are still loaded in memory.

- Basic Input/Output System (BIOS)

### **The BIOS**

BIOS stands for Basic Input/Output System. BIOS is a "read-only" memory, which consists of low-level software that controls the system hardware and acts as an interface between the operating system and the hardware. Most people know the term BIOS by another name—device drivers or drivers. BIOS is essentially the link between computer hardware and software in a system.

All motherboards include a small block of Read-Only Memory (ROM) separate from the main system memory used for loading and running software. The BIOS contains all the code required to control the keyboard, display screen, disk drives, serial communications, and several miscellaneous functions.

The system BIOS is a ROM chip on the motherboard used during the startup routine (boot process) to check out the system and prepare to run the hardware.

## • The CMOS Battery

Motherboards also include a small separate block of memory made from CMOS RAM chips which are kept alive by a battery (known as a CMOS battery) even when the PC's power is off. This prevents reconfiguration when the PC is powered on.

CMOS devices require very little power to operate.

The CMOS RAM is used to store basic information about the PC's configuration, for instance:

- Floppy disk and hard disk drive types
- Information about CPU
- RAM size
- Date and time
- Serial and parallel port information
- Plug and Play information
- Power Saving settings

Other Important data kept in CMOS memory is the time and date, which are updated by a Real-Time Clock (RTC).



Figure 4: L2 cache on an old motherboard

## Cache Memory

### • The Computer Cache Memory

Cache memory is a small block of high-speed memory (RAM) that enhances PC performance by pre-loading information from the (relatively slow) main memory and passing it to the processor on demand.

Most CPUs have an internal cache memory (built into the processor) known as Level 1 or primary cache memory. This can be supplemented by external cache memory fitted on the motherboard. This is the Level 2 or secondary cache.

In modern computers, Levels 1 and 2 cache memory are built into the processor die. If a third cache is implemented outside the die.

PCI slots

### • The Expansion Buses

An expansion bus is an input/output pathway from the CPU to peripheral devices. It is made up of a series of slots on the motherboard. Expansion boards (cards) plug into the bus.

**PCI** is the most common expansion bus in a PC and other hardware platforms. Buses carry signals such as data, memory addresses, power, and control signals from component to component. Other types of buses include ISA and EISA.

Expansion buses enhance the PC's capabilities by allowing users to add missing features to their computers by slotting adapter cards into expansion slots.

### • The Computer Chipsets

A chipset is a group of small circuits that coordinate the flow of data to and from a PC's key components. These key components include the CPU itself, the main memory, the secondary cache, and any devices located on the buses.

A chipset also controls data flow to and from hard disks and other devices connected to the IDE channels.

### • The CPU Clock

The CPU clock synchronizes the operation of all parts of the PC and provides the basic timing signal for the CPU. Using a quartz crystal, the CPU clock breathes life into the microprocessor by feeding it a constant flow of pulses.

For example, a 200 MHz CPU receives 200 million pulses per second from the clock. A 2 GHz CPU gets two billion pulses per second. Similarly, in any communications device, a clock may be used to synchronize the data pulses between the sender and receiver.

### • The Switches and Jumpers

- **DIP** (Dual In-line Package) switches are small electronic switches found on the circuit board that can be turned on or off just like a normal switch. They are very small and so are usually flipped with a pointed object, such as the tip of a screwdriver, a bent paper clip, or a pen top. Take care when cleaning near DIP switches, as some solvents may destroy them. Dip switches are obsolete, and you will not find them in modern systems.
- **Jumper pins** are small protruding pins on the motherboard. A jumper cap or bridge is used to connect or short a pair of jumper pins. When the bridge is connected to any two pins via a shorting link, it completes the circuit, and a certain configuration has been achieved.
- **Jumper caps** are metal bridges that close an electrical circuit. Typically, a jumper consists of a plastic plug that fits over a pair of protruding pins. Jumpers are sometimes used to configure expansion boards. By placing a jumper plug over a different set of pins, you can change a board's parameters.

## b) RAM MODULE

In computing, a **memory module** or **RAM (random-access memory) stick** is a printed circuit board on which memory integrated circuits are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, workstations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer. Later, memory modules were standardized by organizations such as JEDEC and could be used in any system designed to use them.

Types of memory module include:

- Trans Flash Memory Module
- SIMM, a single in-line memory module
- DIMM, dual in-line memory module
- Rambus memory modules are a subset of DIMMs, but are normally referred to as RIMMs
- SO-DIMM, small outline DIMM, a smaller version of the DIMM, used in laptops
- Compression Attached Memory Module, thinner than SO-DIMM

Distinguishing characteristics of computer memory modules include voltage, capacity, speed (i.e., bit rate), and form factor. For economic reasons, the large (main) memories found in personal computers, workstations, and non-handheld game-consoles (such as PlayStation and Xbox) normally consist of dynamic RAM (DRAM). Other parts of the computer, such as cache memories normally use static RAM (SRAM). Small amounts of SRAM are sometimes used in the same package as DRAM. However, since SRAM has high leakage power and low density, die-stacked DRAM has recently been used for designing multi-megabyte sized processor caches.



Figure 5: Ram module

### c) DAUGHTER CARDS

A daughterboard (or *daughter board* , *daughter card* , or *daughtercard* ) is a circuit board that plugs into and extends the circuitry of another circuit board. The daughter board is a computer hardware. It is also known as the piggyback board, riser card, daughter board, daughtercard or daughter card. A daughter board is a printed circuit board which is connected to the motherboard or expansion card. . As compared to the motherboard, it is smaller in size. A daughter board does not act as an expansion card. An expansion card adds extra new functions to the computer. But a daughter board that is connected to the motherboard adds or supports the main functions of the motherboard. The other circuit board may be the computer's main board (its motherboard ) or it may be another board or card that is already in the computer, often a sound card. The term is commonly used by manufacturers of wavetable daughterboards that attach to existing sound cards. Daughter boards are directly connected to the motherboards. expansion cards are connected to the motherboard by using the bus and other serial interfaces. But daughter board is directly connected to the board by soldering. As an update of the motherboard or expansion card, daughter boards are released to extend the features and services of the motherboard or expansion cards. A mezzanine card is a kind of daughterboard that is installed in the same plane as but on a second level above the motherboard.





Figure 6: Daughter card

#### **d) BUS SLOTS**

Alternatively known as a bus slot or 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. 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 cards can provide various functions including:

- Sound
- Modems
- Network
- Interface adapters
- TV and radio tuning
- Video processing
- Host adapting such as redundant array of independent disks or small computer system interface
- Solid-state drive
- Power-on self-test
- Advanced multirate codec
- Basic input/output system (BIOS)
- Expansion read-only memory (ROM)

- Security devices
- RAM memory

Older expansion cards also included memory expansion cards, clock/calendar cards, hard disk cards, compatibility cards for hardware emulation, and disk controller cards. The Altair 8800 was the first slot-type expansion card bus added to a microcomputer. It was developed in 1974-1975 by IBM Corp.

The expansion slot opening is generally located on the back of a PC and provides an electrical connection to the motherboard for an expansion card. Screws are then used to attach the card to the slot for added security.

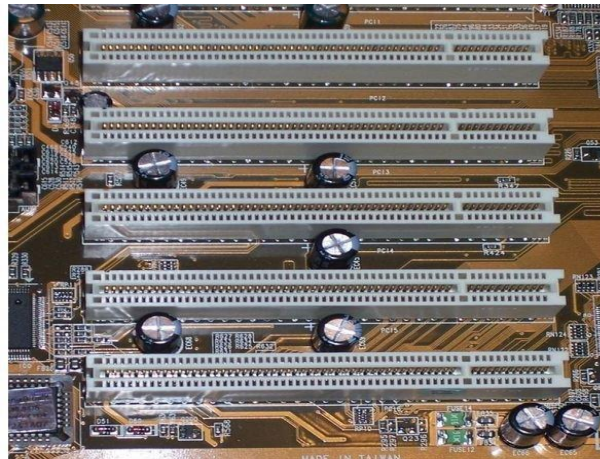


Figure 7: Bus slot

#### e) SMPS

SMPS stands for Switched Mode Power Supply. It is an electronic gadget or module that comprises a combination of inductors, capacitors and semiconductor gadgets like diodes and MOSFETs. It is utilized to change over a specific DC voltage to another DC voltage level. It is utilized rather than straight or ohmic converters since of higher efficiency. It could be a key portion an in almost all domestic electronic equipments(like portable chargers, PC control supplies, etc). It works by employing a semiconductor switch like MOSFET to switch on-off the supply voltage at a specific exchanging recurrence to control the yield voltage. Varying the exchanging recurrence will alter the yield voltage.



Figure 8:Smgs

### Types of SMPS(Switch Mode Power Supply)

- **DC-DC CONVERTER**

The power gotten from AC mains is amended and sifted as a high-voltage DC. This high DC voltage is at that point exchanged and nourished to the step-down transformer at the essential side. At the auxiliary side of the step-down transformer, the corrected and sifted yield is collected which is eventually sent as the yield to the control supply.

- **ForwardConverter**

Independent of in the event that the transistor is conducting or not the choke carries the current within the forward converter. The diode interior the transistor carries the current amid the OFF period to back the vitality stream through the stack.

- **Flyback Converter:**

In a Flyback converter, amid the On period of the switch attractive field of the inductor stores vitality. When the switch is within the open state the vitality is purged into the yield voltage circuit. The Duty cycle within the Flyback converter is decided by the yield voltage.

- **Self-oscillating FlybackConverter:**

It is based on the Flyback guideline. Amid conduction, a current through the transformer essential begins to slope up directly with the incline  $V_{in}/L_p$ . Due to the voltage initiated within the input winding and the auxiliary winding, the fast recovery rectifier begins to function in switch one-sided and hold the conducting transistor ON.

### f) INTERNAL STORAGE DEVICES

A storage devices is an integral part of the computer hardware which stores information or data to process the result of any computational work.

Internal storage is a storage devices that's internal(inside the case) and is not a removable storage or external storage.

for example, the hard drive inside your computer is an example of internal storage.

## HDD

A **hard disk drive (HDD)**, **hard disk**, **hard drive**, or **fixed disk**, is an electro-mechanical data storage device that stores and retrieves digital data using magnetic storage with one or more rigid rapidly rotating platters coated with magnetic material. The platters are paired with magnetic heads, usually arranged on a moving actuator arm, which read and write data to the platter surfaces. Data is accessed in a random-access manner, meaning that individual blocks of data can be stored and retrieved in any order. HDDs are a type of non-volatile storage, retaining stored data when powered off. Modern HDDs are typically in the form of a small rectangular box.

## SSD

A **solid-state drive (SSD)** is a solid-state storage device that uses integrated circuit assemblies to store data persistently, typically using flash memory, and functioning as secondary storage in the hierarchy of computer storage. It is also sometimes called a **semiconductor storage device**, a **solid-state device** or a **solid-state disk**, even though SSDs lack the physical spinning disks and movable read–write heads used in hard disk drives (HDDs) and floppy disks. SSD also has rich internal parallelism for data processing.

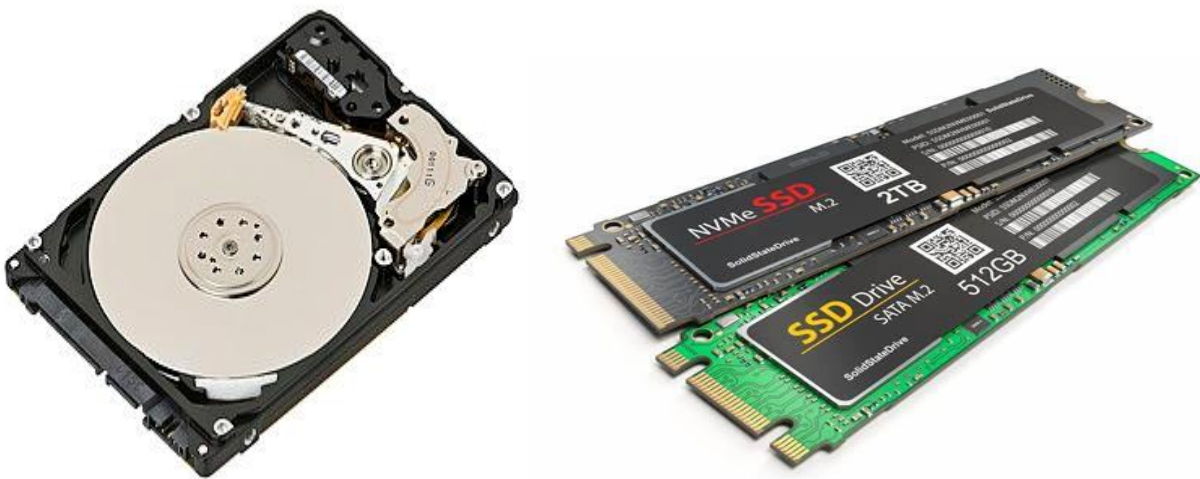


Figure 9: i) HDD ii) SSD

**g) SPECIFICATIONS OF DESKTOP AND WEB SERVER**

**Desktop**

Processor	Core i5
Processor speed	3.90 GHz
Number of cores	4
Typical Memory	32GB
Cache size	L1:8KB -1MB, L2:256KB - 3MB
memory type	DDR4

**Web Server**

Processor	Intel® Xeon® Bronze 3206R Processor(Multiple Processors)
Processor speed	1.90 GHz
Number of cores	8
Typical Memory	512GB
Cache size	L1:1-2MB, L2:8MB, L3:32-64MB
memory type	DDR4