EXPERIMENT NO: 1 **DATE:**

FAMILIARISATION WITH COMPUTER HARDWARE

AIM: Basic Components of Computer Hardware

DESCRIPTION

Computer hardware refers to the physical components of a computer system. It encompasses all the tangible parts that make up a computer and enable it to function. Here are some key hardware components commonly found in a computer:

1.Central Processing Unit (CPU): The CPU, often referred to as the processor, is the brain of the computer. It carries out instructions and performs calculations, making it the most important component.

2.Random Access Memory (RAM): RAM is the primary memory of a computer. It temporarily stores data and instructions that the CPU needs to access quickly. The more RAM a computer has, the smoother and faster it can handle multiple tasks.

3.Hard Disk Drive (HDD) or Solid State Drive (SSD): These are storage devices that store data on a long-term basis. HDDs use rotating magnetic disks, while SSDs use flash memory. SSDs are generally faster and more reliable but are more expensive than HDDs.

4.Graphics Processing Unit (GPU): The GPU is responsible for rendering images, videos, and animations. It is particularly important for gaming, graphic design, and video editing. Some CPUs have integrated graphics, while others use dedicated GPUs.

5.Power Supply Unit (PSU): The PSU supplies electrical power to the computer and its components. It converts the AC power from an outlet into the DC power required by the computer.

6.Peripherals: These are external devices connected to the computer, such as a keyboard, mouse, monitor, printer, speakers, and webcam. Peripherals enhance the functionality and usability of the computer.

7.Expansion Cards: These include sound cards, network interface cards (NICs), and graphics cards. They are inserted into slots on the motherboard to provide additional features or upgrade existing ones.

8.Cooling System: Computers generate heat, so cooling systems, such as fans, heat sinks, and liquid cooling, are used to prevent overheating and maintain optimal performance.

9.Cables and Connectors: Various cables and connectors are used to connect hardware components and peripherals to the computer, such as SATA cables, USB cables, HDMI cables, and Ethernet cables.

10.Mother Board:

A motherboard is the main printed circuit board (PCB) in a computer. It is a crucial component that allows different hardware components to communicate with each other and enables the overall functioning of a computer system. The motherboard provides electrical and mechanical connections for various hardware components, such as the processor (CPU), memory (RAM), storage devices (hard drives or solid-state drives), graphics cards, and other peripheral devices.The motherboard acts as a central hub, connecting all these components together and facilitating data transfer between them. It contains slots, sockets, and connectors to accommodate different hardware devices. For example, the CPU socket allows the processor to be connected to the motherboard, while memory slots hold the RAM modules.In addition to providing physical connections, the motherboard also includes a BIOS (Basic Input/Output System) or UEFI (Unified Extensible Firmware Interface), which contains firmware that initializes the hardware components during startup and provides the basic instructions for the operating system to load.Motherboards come in various form factors, such as ATX, microATX, and Mini-ITX, which determine their physical size and the number of expansion slots and connectors they can accommodate. The choice of motherboard is important as it affects the compatibility and expandability of computer system. Overall, the motherboard is a critical component that serves as the foundation for a computer system, allowing all the other hardware components to work together efficiently.

Figure 1: motherboard

PARTS OF MOTHERBOARD:

A motherboard consists of several key components that work together to facilitate the operation of a computer system. Here are the main parts of a typical motherboard:

i)CPU Socket: This is a specialized socket where the processor (CPU) is installed. The CPU is the brain of the computer and performs most of the processing tasks.

ii)Memory Slots: These slots are used to install memory modules (RAM) that provide temporary storage for data that the CPU needs to access quickly.

iii)Expansion Slots: These slots allow you to install expansion cards such as graphics cards, sound cards, network cards, and other add-on cards. Expansion slots provide additional functionality to the computer system.

iv)Chipset: The chipset is a collection of integrated circuits that manage data flow between the CPU, memory, and other devices connected to the motherboard. It includes the Northbridge and Southbridge chips, which handle different functions.

v)BIOS/UEFI: The Basic Input/Output System (BIOS) or Unified Extensible Firmware Interface (UEFI) is firmware stored on a chip on the motherboard. It provides low-level instructions to initialize the hardware during startup and helps boot the operating system.

vi)Power Connectors: The motherboard has power connectors to receive power from the power supply unit (PSU) and distribute it to various components on the motherboard.

vii)Storage Connectors: These connectors, such as SATA or M.2 slots, allow you to connect storage devices like hard drives or solid-state drives to the motherboard.

viii)I/O Ports: The motherboard provides various input/output ports for connecting external devices. These include USB ports, audio jacks, Ethernet ports, display ports, and more.

ix)CMOS Battery: A small battery powers the CMOS (Complementary Metal-Oxide-Semiconductor) memory, which stores BIOS settings and system configuration information. It ensures that these settings are retained even when the computer is powered off.

x)Heat Sinks: The motherboard may have heat sinks or heat pipes to dissipate heat generated by the CPU, chipset, or other components to prevent overheating.

These are some of the main parts of a motherboard. The specific components and their arrangement may vary depending on the motherboard model and its intended use.

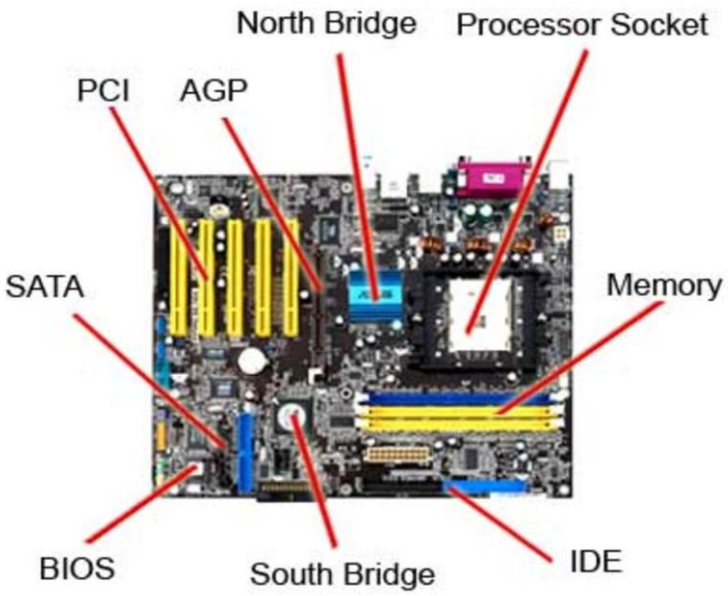

Figure 2: parts of motherboard

11.RAM MODULE:

A RAM module, also known as a memory module, is a small circuit board that contains memory chips used for temporary data storage in a computer system. RAM stands for Random Access Memory, and it plays a crucial role in providing fast and temporary storage for data that the CPU needs to access quickly.

Here are some key points about RAM modules:

Form Factors: RAM modules come in different form factors to match the corresponding memory slots on the motherboard. The most common form factors for desktop computers are DIMM (Dual In-Line Memory Module) and SO-DIMM (Small Outline Dual In-Line Memory Module) for laptops and small form factor systems.

Capacity: RAM modules are available in various capacities, typically measured in gigabytes (GB) or terabytes (TB). Common capacities for consumer systems range from 4GB to 32GB or more, depending on the system requirements.

Speed: RAM modules have a specified speed rating, measured in MHz (megahertz). The speed rating represents the maximum frequency at which the RAM can transfer data. Higher speed RAM can provide better performance, especially in tasks that involve frequent data access.

Generation: RAM modules are classified into different generations based on the technology used. DDR (Double Data Rate) is the most common type, with generations such as DDR3,

DDR4, and DDR5. Each generation offers improvements in speed and efficiency compared to its predecessor.

Installation: RAM modules are installed into dedicated memory slots on the motherboard. The slots are usually labeled and arranged in pairs or banks to accommodate multiple modules. It is important to ensure compatibility with the motherboard and follow the recommended configuration for optimal performance.

Dual Channel/Quad Channel: Many modern motherboards support dual-channel or quad-channel memory configurations. This means that when installing multiple RAM modules, they can work together in parallel, increasing the overall memory bandwidth and performance.

Upgradability: RAM modules are relatively easy to upgrade in most desktop and laptop systems. By adding or replacing RAM modules with higher capacities or faster speeds, you can increase the amount of available memory and poten tially improve system performance.

Figure 3:RAM Module

12.DAUGHTER CARDS:

Daughter cards, also known as expansion cards or daughterboards, are additional circuit boards that are connected to the main motherboard of a computer or electronic device. These cards are designed to provide extra functionality or expand the capabilities of the base system. Daughter cards are typically inserted into slots or connectors on the motherboard, allowing them to communicate with the main system and share resources.

Here are some examples of daughter cards commonly used in computer systems:

Graphics Cards: Graphics cards, also known as video cards or GPUs (Graphics Processing Units), are daughter cards that are added to enhance the computer's graphics rendering capabilities. They typically have their own processors, memory, and connectors for connecting monitors or display devices.

Sound Cards: Sound cards are daughter cards that provide enhanced audio capabilities to a computer system. They typically include audio processors, input/output connectors for speakers and microphones, and sometimes additional features like surround sound support.

Network Interface Cards (NICs): NICs are daughter cards that add networking capabilities to a computer system. They enable the system to connect to a local area network (LAN) or wide area network (WAN) and facilitate communication with other devices on the network.

RAID Controllers: RAID (Redundant Array of Independent Disks) controllers are daughter cards used to manage multiple hard drives in a RAID configuration. They provide improved data storage performance, fault tolerance, and data redundancy.

TV Tuner Cards: TV tuner cards allow computers to receive and display television signals. They often include features like video capture capabilities and can be used to watch or record TV programs on a computer.

Modems: Modems are daughter cards that enable a computer to connect to the internet using a telephone or broadband connection. They convert digital signals from the computer into analog signals that can be transmitted over phone lines or other communication channels.

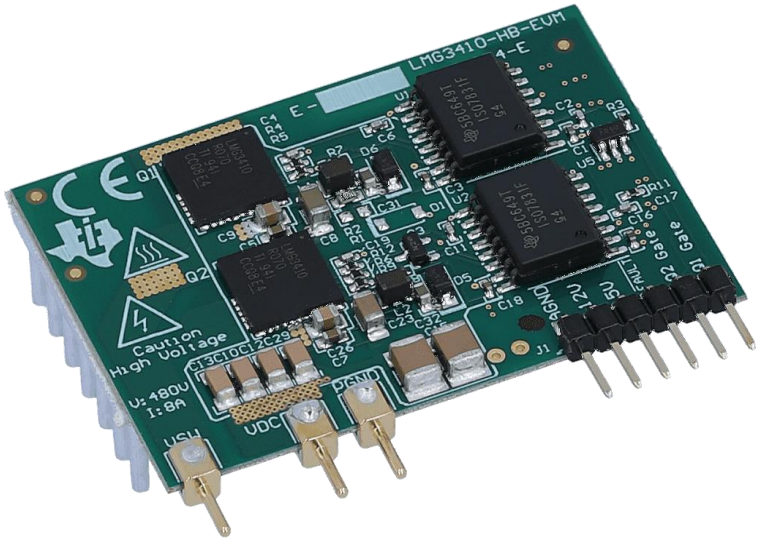

Figure 4:Daughter Card

13.BUS SLOTS:

Bus slots, also known as expansion slots or expansion ports, are physical connectors on a computer motherboard or system that allow for the installation of expansion cards or daughterboards. These slots provide a way to add additional functionality or upgrade the capabilities of a computer system by connecting various expansion cards or peripherals.

Different types of bus slots have been used over the years, each with its own characteristics and compatibility. Here are some commonly used bus slot types:

Peripheral Component Interconnect (PCI): PCI slots were widely used in older computers and are still present in some modern systems. They come in different versions, such as PCI, PCI-X, and PCI Express (PCIe), with varying data transfer rates and electrical specifications.

PCI Express (PCIe): PCIe is the most common and widely used bus slot in modern computer systems. It offers faster data transfer rates and improved performance compared to PCI. PCIe slots come in different sizes: x1, x4, x8, and x16, representing the number of lanes available for data transfer.

Accelerated Graphics Port (AGP): AGP slots were specifically designed for connecting graphics cards. They provided a dedicated high-speed connection between the graphics card and the motherboard, allowing for better graphics performance. AGP slots are now obsolete and have been replaced by PCIe for graphics card connectivity.

Industry Standard Architecture (ISA): ISA slots were used in older computers, primarily during the 1980s and 1990s. They supported various expansion cards, such as sound cards, modems, and network cards. ISA slots are no longer commonly found in modern systems.

Universal Serial Bus (USB): USB ports are not exactly bus slots but are worth mentioning. USB ports provide a versatile and widely supported method for connecting external devices, including keyboards, mice, printers, storage devices, and more. USB ports are typically built directly into the motherboard and are not expansion slots.When installing an expansion card, it is essential to ensure compatibility between the card and the available slot on the motherboard. The card should physically fit the slot and be supported by the system's specifications and operating system.

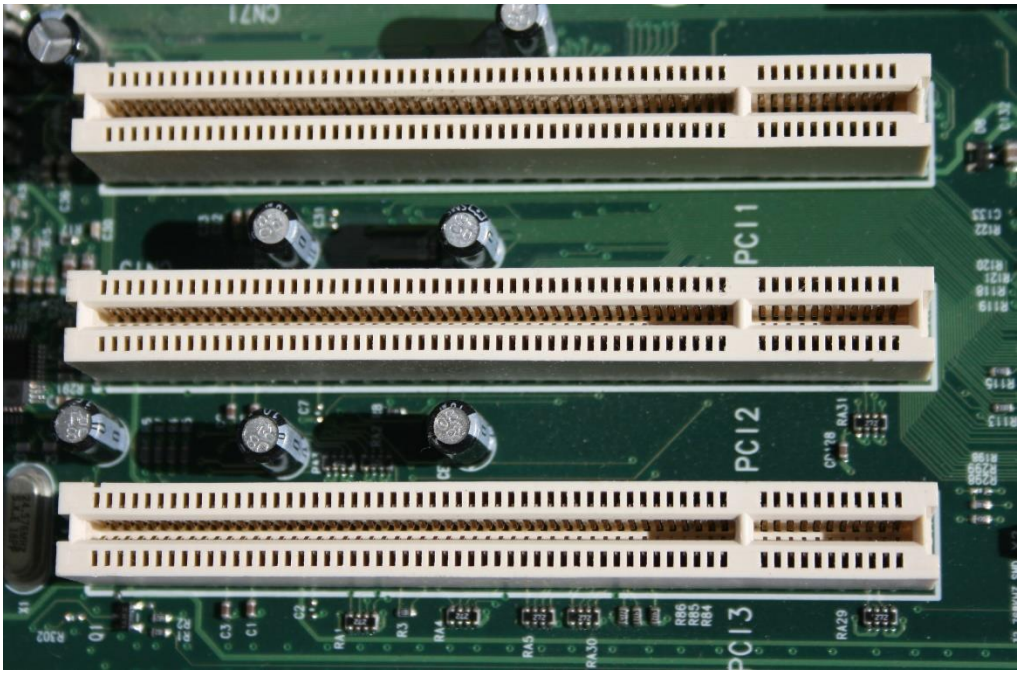

Figure 5:Bus Slots

14.SMPS:

SMPS stands for Switched-Mode Power Supply. It is a type of power supply unit used in computers and electronic devices to convert and regulate electrical power from the mains AC (alternating current) supply to the DC (direct current) voltage required by the computer components.

Here are some key points about SMPS:

Function: The primary function of an SMPS is to convert the high-voltage AC power from the mains into lower-voltage DC power that can be used by the computer's internal components. It performs this conversion through a switching circuit that rapidly turns the power supply on and off.

Efficiency: SMPS power supplies are known for their higher efficiency compared to older linear power supplies. This is because the switching circuitry enables them to regulate voltage levels more efficiently, resulting in less power loss and heat generation.

Components: An SMPS typically consists of several components, including a rectifier to convert AC to DC, a transformer to step down the voltage, a switching circuit with power transistors, a controller or regulator to control the switching operation, and output filters to smooth the DC voltage.Multiple Voltage Outputs: SMPS units commonly provide multiple

voltage outputs to meet the different power requirements of various computer components. These outputs include +3.3V, +5V, +12V, and sometimes negative voltage rails like -12V.

Form Factors: SMPS units come in different form factors to fit the specific computer case or device. Common form factors include ATX (Advanced Technology Extended), MicroATX, and Mini-ITX, among others. The form factor determines the physical size, shape, and mounting points of the power supply.

Connectors: SMPS units have various connectors that provide power to different computer components, such as the motherboard, CPU, graphics card, hard drives, and peripherals. The connectors may include the main 24-pin ATX connector, 4/8-pin CPU connector, SATA power connectors, and PCIe connectors.

Safety Features: SMPS units often incorporate safety features like overload protection, overvoltage protection, and short-circuit protection to safeguard the computer components from damage due to power fluctuations or faults.

Figure 6:SMPS

15.INTERNAL STORAGE DEVICES:

Internal storage devices are components within a computer system that provide long-term storage for data, applications, and operating systems. These devices store information even when the computer is powered off. Here are some common types of internal storage devices:

Hard Disk Drive (HDD): HDDs are mechanical storage devices that use spinning platters coated with magnetic material to store data. They offer high storage capacity at a relatively lower cost. HDDs are widely used in desktop computers, laptops, and servers.

Solid State Drive (SSD): SSDs are faster and more reliable than HDDs because they use flash memory technology instead of spinning disks. SSDs have no moving parts, resulting in faster data access and reduced power consumption. They are available in various form factors, such as SATA SSDs for traditional storage and NVMe (Non-Volatile Memory Express) SSDs for high-performance storage.

Hybrid Drives: Hybrid drives combine the features of both HDDs and SSDs. They have a traditional spinning HDD with a small amount of built-in SSD cache. The SSD cache holds frequently accessed data, which improves overall performance compared to a standard HDD.

M.2 SSD: M.2 is a form factor for solid state drives that connects directly to the motherboard. M.2 SSDs are smaller in size and offer higher data transfer speeds than traditional SATA SSDs. They are commonly used in laptops and small form factor desktops.

PCIe SSD: PCIe (Peripheral Component Interconnect Express) SSDs connect directly to the motherboard via PCIe slots, providing even faster data transfer rates compared to M.2 or SATA SSDs. They are commonly used in high-performance systems, including gaming PCs and workstations.

eMMC: eMMC (embedded MultiMediaCard) is a type of internal storage commonly found in smaller devices like tablets, smartphones, and some low-end laptops. It is a non-removable flash memory storage integrated into the device's motherboard.

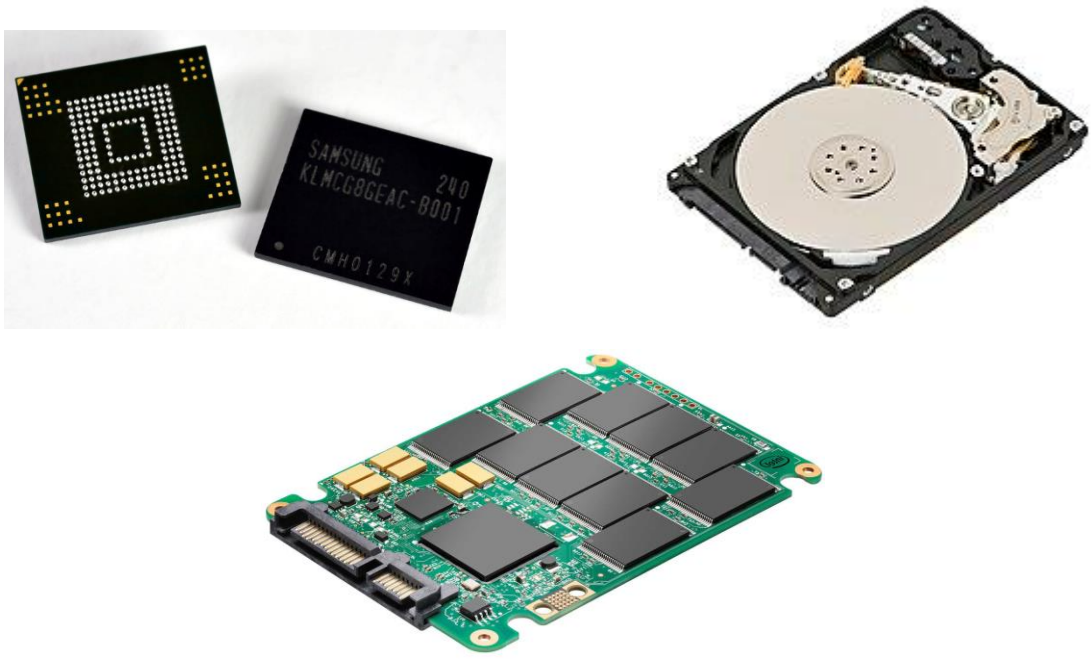

Figure 7: i) eMMS ii)HDD iii)SSD

SPECIFICATION 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