Chapter 1

Typical Configuration of Computer system

Objectives

- To understand various units of a computer system
- To recognize various components of the motherboard
- To analyze the configuration of todays' computer system
- Insight to assemble a computer system

1.1 Introduction:

The computer has evolved as a result of man's search for fast, accurate calculating devices. Computers have thus become an integral part of everyone's life and useful in many ways by increasing man's efficiency and enhancing his abilities.

Computers are used to perform various tasks in different fields like science, engineering, business, education, training, entertainment. The computer works at high speed, can handle large volumes of data with greater accuracy and have the ability to carry out a specified sequence of operations without human intervention.

The term **computer** basically includes a series of electrical and electronic circuits together to form a single unit to perform the required operations for the user. The computer has no intelligence of its own and thus cannot perform any task by itself. Thus it requires the hardware, software, data and users which form the computer system to perform the different operations.

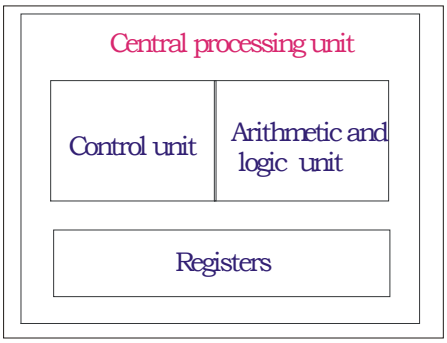
The related terms and definitions in the study of computer systems are:

- **Hardware** consists of physical devices of the computer such as keyboard, monitor, printer, processor and motherboard.
- **Software** consists of set of instructions called programs that instructs the computer the tasks to be performed and how it should be performed.
- **Data** are values or raw facts which are provided as input to the computer, then processed to generate some meaningful information.
- **Users** are people who write computer programs or interact with the computer.

Review of block diagram of Computer system

The computer system comprises of four main units which can be seen in the block diagram given below. They are,

1. Input Unit,
2. Central Processing Unit (CPU),
   i. Control Unit (CU),
   ii. Arithmetic Logic Unit (ALU),
   iii. Registers,
3. Storage Unit, and
4. Output Unit



Central processing unit

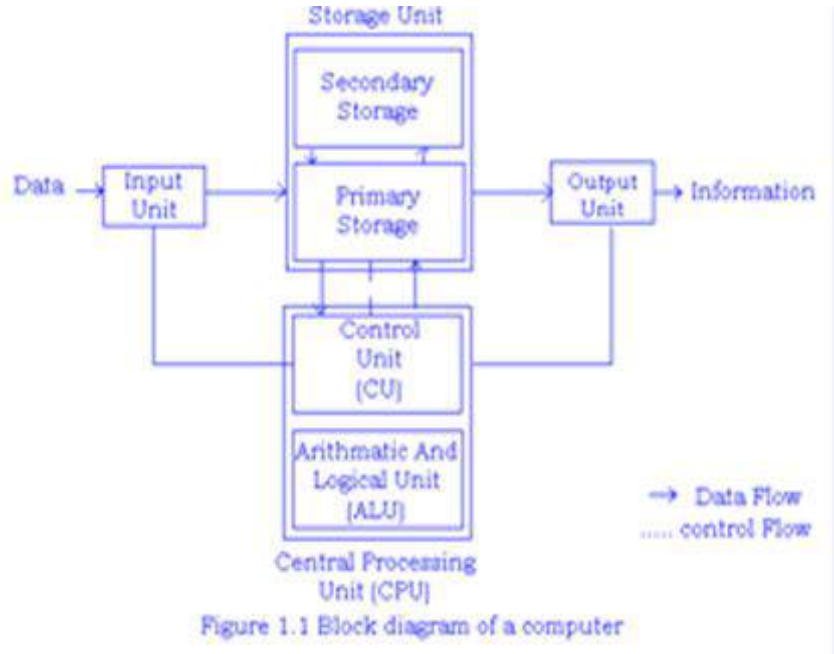


Figure 1.1 Block diagram of a computer

1. Input Unit

The user interacts with the computer via the input unit. The Input unit accepts data from the user and converts it into a form that is understandable by the computer. The input data can be characters, word, text, sound, images, document, etc. The input is provided to the computer using input devices like keyboard, mouse, joystick, trackball, microphone, scanner etc.

2. Central Processing Unit (CPU)

CPU controls, coordinates and supervises the operations of the computer. It is also responsible for processing of the input data. CPU consists of Arithmetic Logic Unit (ALU) and Control Unit (CU).CPU also has a set of **registers** for temporary storage of data, instructions addresses and intermediate results of calculation.

a. **ALU** performs all the arithmetic and logic operations on the input data.

b. **CU** controls the overall operations of the computer i.e. it checks the sequence of execution of instructions, controls and co-ordinates the overall functioning of the units of computer.

c. **Registers** are high speed storage units within the CPU, but have least storage capacity. Registers are not referenced by their address, but are directly accessed and manipulated by the CPU during instruction execution. They are referred to as the **CPU's working memory** as they are used to store data, instructions, addresses and intermediate results of processing.

3. Storage Unit

There are two types of memory associated with storage unit. They are: **primary memory** and **secondary memory**.

The primary memory also called as the main memory of the computer, consists of RAM (Random Access Memory) and ROM (Read Only Memory) memories. Main memory stores the data, instructions, intermediate results and output, temporarily, during the processing of data. The input data that is to be processed is brought into the main memory before processing. The instructions required for processing of data, any intermediate results are also stored in the main memory. The output is stored in main memory before being transferred to the output device. CPU can work with the information stored in the main memory.

The **secondary memory** also called as the **external memory** of the computer stores permanently the data, programs and the output. Magnetic disks, magnetic tapes, optical disks and flash drives are examples of secondary memory.

4. Output Unit

The output unit provides the processed data i.e. the result generated after processing of data. The output may be in the form of text, sound, image, document, etc. The computer may display the output on a monitor, sends output to the printer or plotter for printing, and also sends sound output to the speaker, etc.

1.2 Motherboard

The computer is built up around a motherboard. The motherboard is the most important part of any computer. It is a large **Printed Circuit Board** (PCB) having many chips, ports, controllers and other electronic components mounted on it.

1.2.1 Introduction to Motherboard

The motherboard or the system board is the **main circuit board** inside a computer. Every component inside the computer has to communicate through the motherboard, either by directly plugging into it or by communicating through one of the motherboard ports. The motherboard provides a platform for all the components and peripherals to communicate with each other.

The electronic components mounted on the motherboard are processor, memory chips, interfaces, various ports and all expansion cards. The motherboard is the hub, which is used to connect all the necessary components of a computer. The RAM, hard drive, disk drives and optical drives are all plugged into interfaces on the motherboard.

The motherboard may be characterized by the form factor, chipset and type of processor socket used.

- **Form factor** refers to the motherboard's geometry, dimensions, arrangement and electrical requirements. Different standards have been developed to build motherboards, which can be used in different brands. Advanced Technology Extended (ATX)) is the most common design of motherboard for desktop computers.
- **Chipset** controls the majority of resources of the computer. The function of chipset is to coordinate data transfer between the various components of the computer. As the chipset is integrated into the motherboard, it is important to choose a motherboard, which includes a recent chipset, in order to maximize the computer's upgradeability.
- The **processor socket** may be a rectangular connector into which the processor is mounted vertically, or a square shaped connector with many small connectors into which the processor is directly inserted.

1.2.2 Types of Motherboard

There are various types of motherboards available depending on the processors that are used. Some of them are XT, AT, Baby AT and ATX motherboards.

XT Motherboard:

XT stands for e**X**tended **T**echnology. These are all old model motherboard. In these motherboards, we find old model processor socket LIF (Low Insertion Force) sockets, ram slots DIMM and ISA (Industry Standards Architecture) slots, 12 pin power connector and no ports.

They have slot type processors, DIMM memory modules, ISA slots for add-on card, and no ports. There are connectors and add-on cards for ports.

Example: Pentium-I, Pentium-MMX, Pentium -II and Pentium-II Processors.

AT Motherboard:

AT stands for **A**dvanced **T**echnology. Advanced Technology Motherboards have PGA (Pin Grid Array) Socket, SDRAM slots, 20 pin power connector PCI slots and ISA slots. We find the above components on AT motherboards.

Example: Pentium III Processors

Baby AT Motherboard:

Baby AT Motherboards have the combination of XT and AT. They have slot type processor sockets and PGA processor sockets, SDRAM slots and DDRRAM slots, PCI slots and ISA slots, 12 pin power connector and 20 pin power connector and ports.

Example: Pentium-III and Pentium-IV

ATX Motherboard:

ATX stands for **A**dvanced **T**echnology e**X**tended. Latest motherboards all are called as ATX motherboards, designed by ATX form factor. In this motherboard, we find MPGA processor sockets, DDRRAM slots, PCI slots, AGP slots, Primary and secondary IDE interfaces, SATA connectors, 20 pin and 24 pin ATX power connector and ports.

Example: Pentium-IV, Dual Core, Core 2 Duo, Quad Core, i3, i5 and i7 processors.

1.2.3 Components of Motherboard

The motherboard components are:

- Processor (CPU)
- BIOS
- CMOS
- Slots
- Disk Controllers
- I/O Ports and Interfaces
- BUS

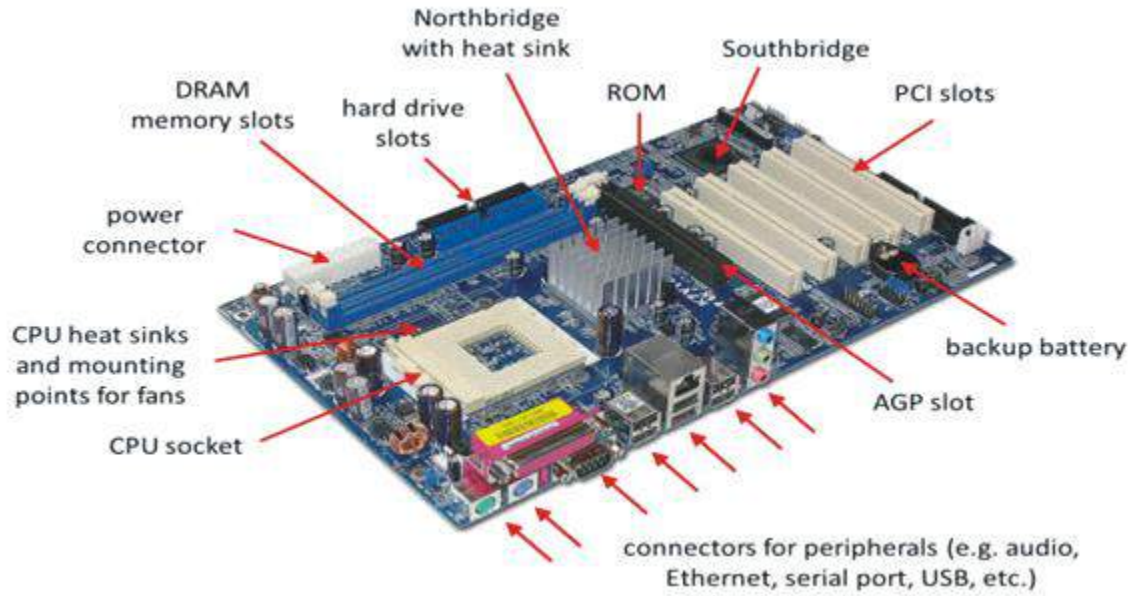


Figure 1.2 Motherboard components

Processor (CPU)

The processor or CPU is the main component on the motherboard and is called the brain of the computer. The CPU consists of Arithmetic Logic Unit (ALU) and Control Unit (CU). CPU also has a set of **registers** which are temporary storage areas for holding data, and instructions. ALU performs the arithmetic and logic operations on the data. CU is responsible for organizing the processing

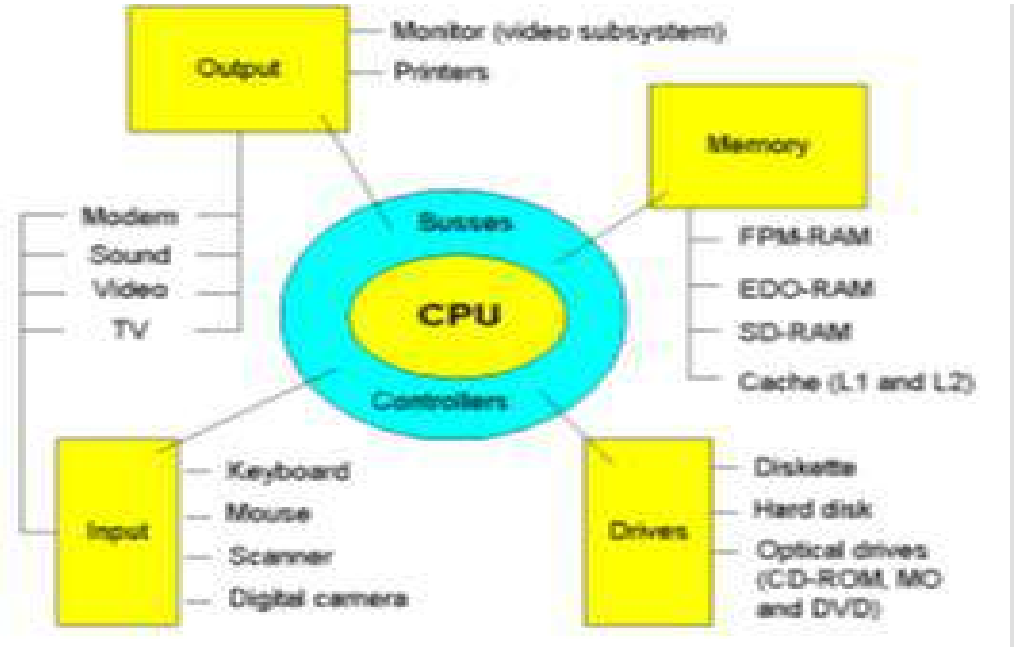
of data and instructions. CU controls and coordinates the activity of the other units of computer.

During processing the CPU gets data and instructions from the memory and interprets the program instructions and performs the arithmetic and logic operations required for the processing of data. It then sends the processed data to the memory.

The clock speed of a CPU is defined as the frequency with which a processor executes instructions or the data that is processed. Higher clock frequencies mean more clock ticks per second. The computer's operating speed is linked to the speed of the system clock. The clock frequency is measured in millions of cycles per second or megahertz (MHz) or gigahertz (GHz) which is billions of cycles per second. A CPU's performance is measured by the number of instructions executed per second, i.e. MIPS or BIPS. PCs presently come with a clock speed of more than1GHz.

In Windows OS, the System Properties dialog box is selected to see the processor name and clock frequency.

The diagram of the CPU is given in Figure 1.3 CPU with Buses and Controllers



The CPU is fabricated as a single Integrated Circuit (IC) chip and is also known as the **microprocessor**. This tiny chip contains the entire computation engine. The microprocessor is plugged into the motherboard of the computer. **Intel** is one of the leading processor manufacturers in the world today.

General Structure of motherboard

The primary function of the processor is to execute the instructions given to it and to produce the results. It fetches instructions and data from the primary memory and performs the required operations. This movement of data between

the processor and memory is established by a communication path called **bus**. The processor contains number of special purpose **registers** in addition to **ALU** which is responsible for doing calculations. The different components inside the processor can be seen in the figure 1.4.

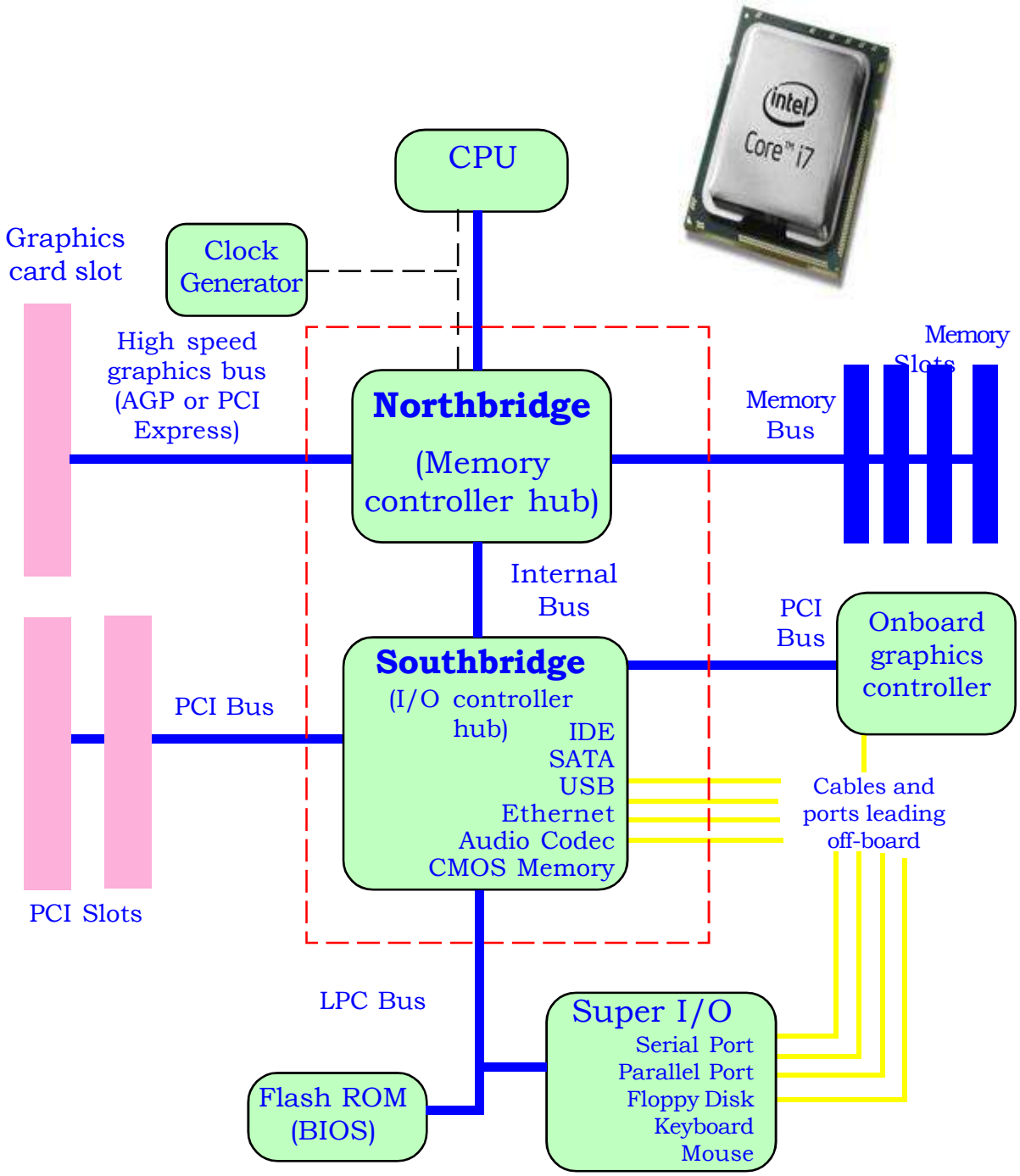


Figure 1.4 Schematic diagram of Motherboard

Figure 1.5 is the replica of the motherboard structure, except that it displays the actual devices connected to the CPU.

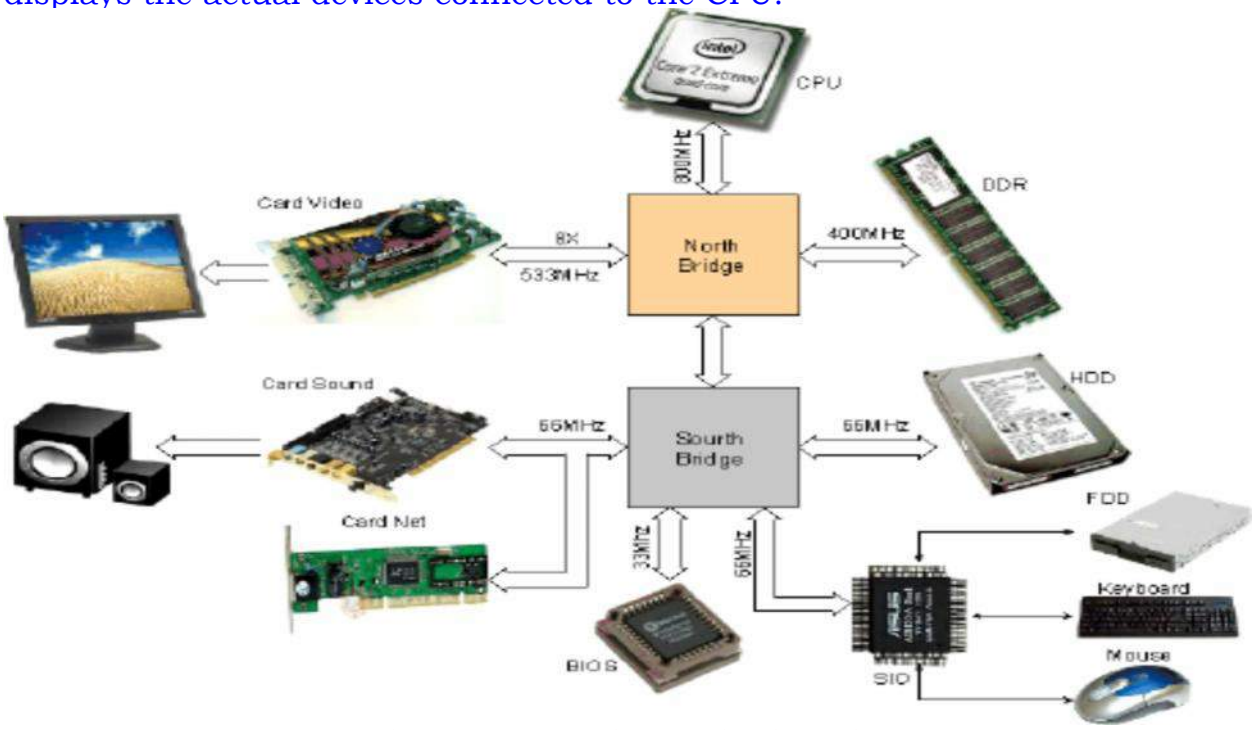


Figure 1.5 Overview of the motherboard structure

The **north bridge** or **host bridge** is one of the two chips in the core logic chipset on a PC motherboard, used to manage data communications between the CPU and motherboard. It is supposed to be paired with a second support chip known as a **south bridge**.

North Bridge or north Chipset is responsible for control of high speed components like CPU, RAM, and Video Card. Chipset BUS speed control and switch control data, ensuring data back and forth between the components is a smooth and continuous, fully exploit the speed of the CPU and RAM. It can be a chipset like the traffic in an intersection, as drivers switch traffic lights to allow each data stream passes through a period of time, while speed control is a BUS different directions of the intersection, the vehicle must run on a specified speed.

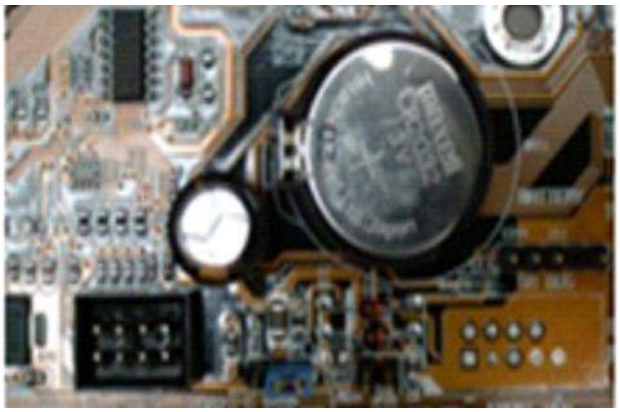
South Bridge or south Chipset is similar as north chipset, but the south bridge driver chipset components slower as: Sound Card, Net Card, hard disk, CD ROM drive, USB port, SIO and BIOS IC etc.

BIOS (Basic Input Output System)

BIOS is a small chip on the motherboard that holds a set of instructions to load the hardware settings required to activate various devices like keyboards, monitors or disk drives. The BIOS runs when the computer is switched ON. It performs a **P**ower **O**n **S**elf **T**est (POST) that checks if the hardware devices are present and functioning properly. BIOS invoke the bootstrap loader to load the

operating system into memory. Most new PCs come with Flash BIOS-these BIOS can be software upgraded to support new devices.

CMOS (Complementary Metal Oxide Semiconductor)



CMOS is a type of memory chip to store the date, time and system setup parameters. These parameters are loaded every time the computer is started. That is why we observe, when the computer is turned ON, the system still displays the correct clock time. BIOS as well as CMOS are kept powered by a small lithium Ion battery located on the motherboard It can be seen in the figure 1.6 below.

Figure 1.6 CMOS battery

Slots

A slot is an opening in a computer where you can insert a printed circuit board. Slots are often called ***expansion slots*** because they allow you to expand the capabilities of a computer.

- **Expansion Slots** These slots are located on the motherboard. The expansion cards are inserted in the expansion slots. These cards give the computer new features or increased performance. There are several types of slots:
- **ISA (Industry Standard Architecture) slot** – ISA slot is used to connect modem and input devices.
- **PCI (Peripheral Component Inter Connect) slot** – PCI slots are used to connect graphics accelerator cards, sound cards, internal modems or SCSI cards. They are much faster than ISA cards.
- **AGP (Accelerated Graphic Port) slot** – AGP slot is meant to provide faster access to a graphics accelerator card, thus enhancing the visual experience for the user. All Celeron and Pentium-III motherboards come with an AGP slot.
- **RAM slot** – RAM slot is used to install memory and is of two types. They are SIMM (Single Inline Memory Module) slot and DIMM (Dual Inline Memory Module) slot. The original Pentium systems typically have either four 72-pin SIMM slots, or two 168-pin DIMM slot to install memory.

- **Processor slot** – Processor slot is used to insert the processor chip which is the largest chip on the motherboard. It can be identified, as a heat sink or fan is located on top of it.
- **PCI Express slot** – It has faster bus architecture than AGP and PCI buses.
- **PC Card** – It is used in laptop computers. It includes Wi-Fi card, network card and external modem.

Disk Controllers

Disk controller is the circuit that enables the CPU to communicate with a hard disk, floppy disk or other kind of disk drive. Modern disk controllers are integrated into the disk drive.

Hard disk controller (HDC)

The hard disk controller is the interface that enables the computer to read and write information to the hard drive. Today, hard drives have the controller built on to them.

The first standard hard disk controller developed is the IDE standard drive also known as Advanced Technology Attachment (ATA). This drive is attached to the motherboard by means of 40-wire ribbon cable. The IDE standard also allows two drives to connect in a daisy-chain fashion. The enhanced IDE (EIDE) standard followed shortly. The EIDE standard is a specification that allows four drives to be connected to a dual channel controller.

Floppy disk controller (FDC)

A floppy-disk controller is the interface that directs and controls reading from and writing to a computer's floppy disk drive (FDD). The floppy disk controller usually performs data transmission in direct memory access (DMA) mode.

A single floppy-disk controller board supports a 33-wire ribbon cable and can connect up to four floppy disk drives to the motherboard. The controller is linked to the system bus of the computer and appears as a set of I/O ports to the CPU.

I/O Ports and Interfaces

The ports and interfaces are used to connect external devices like printers, keyboards or scanners to the computer, which gets connected to the computer's motherboard. These ports and interfaces are found on the rear side of a computer. There are several types of ports like serial port, parallel port, USB port, and AGP port etc. which is given in figure 1.7.

Serial port

Serial port is also known as communication (COM) ports or RS-232-c ports. They are used for connecting communication devices like mouse and modem. This port transfers data serially one bit at a time. It needs a single wire to transmit 1 bit of data. Hence it takes 8 times longer to transfer a byte. There are two varieties of Com ports, the 9-pin ports and 25-pin ports.

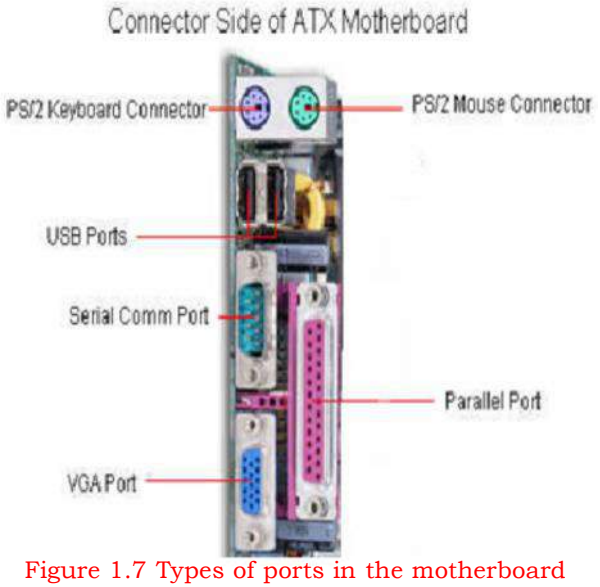


Figure 1.7 Types of ports in the motherboard

Parallel port:

Parallel ports are used to connect external input/output devices like printers or scanners. This port facilitates the parallel transfer of data, usually one byte (8-bits) at a time. Parallel ports come in the form of 25-pin connector.

IDE (Integrated Digital Electronics) port

IDE devices like CD-ROM drives or hard disk drives are connected to the motherboard through the IDE port.

USB (Universal Serial Bus) port

USB port gives a single, standardized, easy-to-use way to connect a variety of newer peripherals to a computer. These devices include printers, scanners, digital cameras, web cameras, speakers etc. USB supports a data speed of 12 megabits per second, supporting up to 127 devices. USB is a plug- and-play interface between a computer and add-on devices. i.e. a new device can be added to the computer without adding an adapter card or even turning the computer off. The figure 1.8 shows the symbol used to represent a USB port.


Figure 1.8 USB port

PS-2 port (Personal System-2 port)

The PS-2 port was developed by IBM to interface keyboards and pointing devices like mouse, trackballs and touch pads. This port is also called as mouse port as most computers now have a PS-2 port to connect a mouse. This port uses synchronous serial signals to communicate between the keyboard and a mouse to the computer.

AGP (Accelerated Graphics Port) port

The AGP port is used to connect to graphic card that provides high-speed video performance typically required in games and other multimedia applications.

SCSI (Small Computer System Interface) port

This port is used for adding external devices such as high-speed hard-disks, high-end scanners and CD-ROM drives. It does fast data transfers and I-O operations. These ports are expensive, as they provide faster access at very high speeds and need separate dedicated adapters to function.

VGA (Visual Graphics Adaptor) port connects monitor to a computer's video card. It has 15 holes and is similar to serial port connector, but serial port connector has pins, this has holes.

Power Connector has three-pronged plug. It connects to the computer's power cable that plugs into a power bar or wall socket.

Firewire Port transfer large amounts of data at very fast speed. It connects camcorders and video equipment's to the computer. The data travels at 400 to 800 megabits per second. It is invented by Apple. The three variants of firewire port are 4-Pin firewire 400 connector, 6-Pin firewire 400 connector and 9-Pin firewire 800 connector

Modem (Modulator demodulator) connects a PC's modem to the telephone network.

Ethernet Port connects to a network and high speed Internet. It connects network cable to a computer. This port resides on an Ethernet Card. Data travels at 10 megabits to 1000 megabits per second depending upon the network bandwidth.

Game Port connects a PC to a joystick. It is now replaced by USB.

DVI (Digital Video Interface) port connects a Flat panel LCD monitor to the computer's high-end video graphic cards. It is very popular among video card manufacturers.

Figure 1.9 MIDI port

Sockets are used to connect microphone, speakers to sound card of the computer.

MIDI (Musical Instrument Digital Interface) port is a system designed to transmit information between electronic musical instruments. A MIDI musical keyboard can be attached to a computer and allow a performer to play music that is captured by the computer system as a sequence of musical notes with

the associated timing (instead of recording digitized sound waves). The port and interface are required for connectivity.

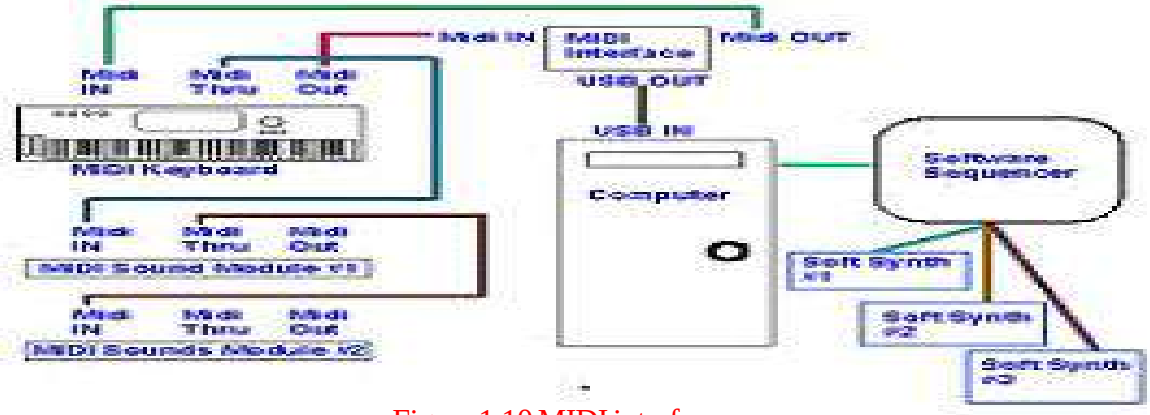


Figure 1.10 MIDI interface

BUS

The different components of computer, i.e. CPU, I/O unit, and memory unit are connected to each other by a **bus**. The data, instructions and the signals are carried between the different components via a bus.

A bus is a collection of parallel wires that form a pathway to carry address, data and control siagnals

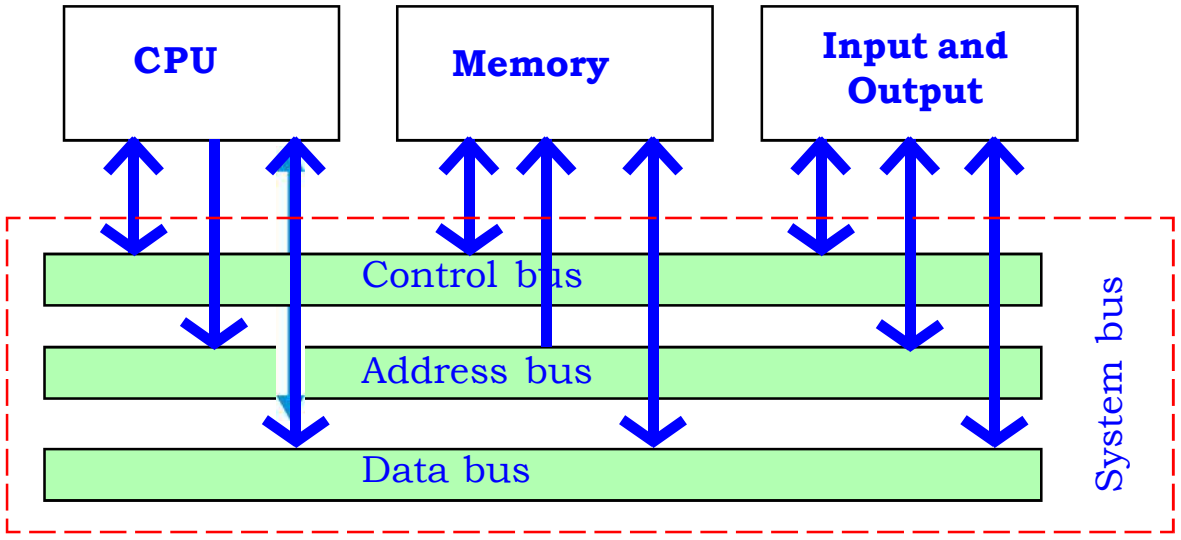


Figure 1.11 Bus structure

The functional features of a bus are:

- A bus is a set of wires and each wire can carry one bit of data.
- A bus width is defined by the number of wires in the bus.

A computer bus can be divided into two types: **Internal bus** and **External bus.**

- The **Internal bus** connects major computer components like, processor, memory and I/O. It is also called as **System bus.**
- The **External bus** connects the different external devices, peripherals, expansion slots, I/O ports and drive connections to the rest of computer. The external bus allows various devices to be attached to the computer, thus expanding the computer's capabilities. It is also called as **Expansion bus** and is slower than the system bus.

A system bus or expansion bus comprise of three kinds of buses: **data bus**, **address bus** and **control bus** shown ins figure 1.11.

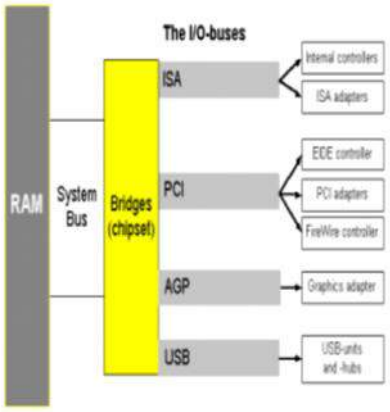


Figure 1.12 I-O Buses

- **Data bus** provides a path to transfer data between CPU and memory. The data bus may consist of 32, 64, 128 lines of wire. The number of lines is referred to as the width of the data bus. The data bus width affects the speed of computer. In a 16-bit line bus can transfer 16 bits of data. The bus speed is measured in MHz and higher the bus speed, faster the processer speed.
- **Address bus** connects CPU and RAM with a set of lines of wire similar to data bus. The address bus width determines the maximum number of memory locations the computer can address. Pentium Pro, II, III, IV have 36-bit address bus that can address 2^{36} bytes or 64 GB of memory. PCs presently have a bus speed varying from 100 MHz to 400 MHz.

- **Control bus** is used to control the access to and the use of the data and address lines.

1.3 Memory

A computer memory refers to the electronic storing space for instructions and data where the computer's processor can reach quickly. The computer storage refers to permanent computer memory that stores all the data files and instructions even after the computer system is turned off.

A computer processor has very limited memory. Thus it has to rely on other kinds of memories to store data, instructions and results.

The memory in a computer can be of two basic types: **Internal memory** and **Secondary memory** shown in figure 1.13

- **Internal memory**

Internal memory includes **registers**, **cache memory** and **primary memory** which can be directly accessed by the processor. It is used for temporary storage

of data and instructions on which the processor is currently working. This memory is the fastest among all other memories and is expensive. Therefore a very small part of internal memory is used in the computer system. The features of internal memory are:

- Temporary storage
- Limited storage capacity
- Fast access
- High cost

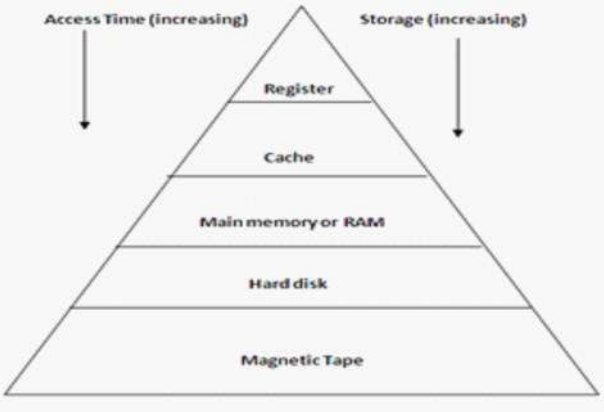


Figure 1.13 Memory accessing levels of the processor

Registers

The registers are high speed temporary storage areas located inside the CPU. After the CPU gets the data and instructions from the cache or RAM, the data and instructions are moved to registers for processing. These registers work under the direction of the control unit (CU) to accept, store and transfer instructions or data, and perform arithmetic or logical comparisons at high speed. Since CPU uses registers for the processing of data, the number of registers in a CPU and the size of each register affect the power and speed of a CPU.

Cache memory

The cache memory is a very high speed memory placed in between RAM and CPU. Cache memory stores data that is used more often, temporarily and makes it available to CPU at a fast rate. Hence it is used to increase the speed of processing. During processing, the CPU first checks cache for the required data. If data is not found in cache, then it looks in the RAM for data.

The Cache memory is a high speed memory available inside CPU to speed up access of data and instructions stored in RAM memory.

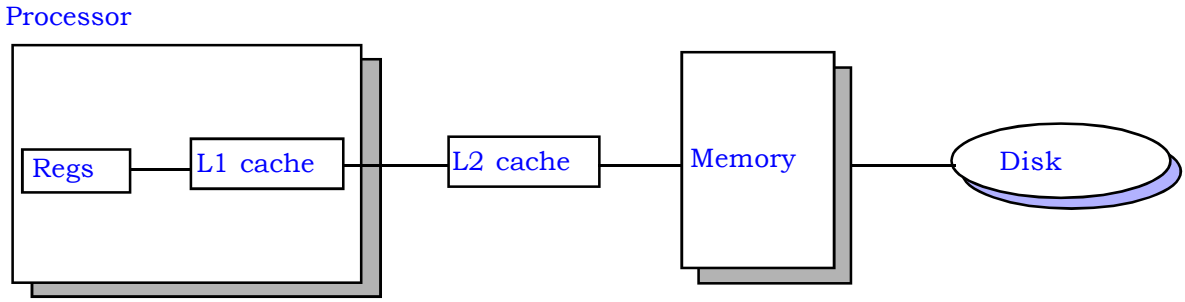


Figure 1.14 Illustration of cache memory

Cache memory is very expensive, so it is smaller in size. Generally, computers have cache memory of sizes 256 KB to 2MB.

Cache memory is built into the processor, and may also be located next to it on a separate chip between CPU and RAM. Cache built into the CPU is faster than separate cache, almost at the speed of the microprocessor itself. However, separate cache is roughly twice as fast as RAM.

The CPU has a built-in Level1 (L1) cache and Level2 (L2) cache, as shown in figure 1.14 below. In addition to the built-in L1 and L2 cache, some CPUs have a separate cache chip on the motherboard called Level3 (L3) cache. These days, high-end processor comes with built-in L3 cache, like in Intel core i7. The L1, L2 and L3 cache store the most recently executable instructions, the next ones and the possible ones, respectively. Typically, CPUs have cache size varying from 256KB (L1), 6MB (L2), to 12MB (L3) cache.

Primary memory

Primary memory is also known as main memory. This memory is of two types: Random Access Memory (RAM) and Read Only Memory (ROM)

- **RAM** temporarily stores the computer's operating system, application programs and current data so that the processor can reach them quickly. RAM is a faster memory and volatile in nature. i.e. when the power is switched off, the data in this memory is lost.

- **ROM** is a small memory, which stores the boot firmware (called BIOS). BIOS hold enough information to enable the computer to check its hardware and load its operating system into its RAM at the time of system booting. ROM is non-volatile in nature. i.e. even when the computer is switched off, the contents of ROM remains available.

Types of RAM

There are different types of RAM, depending on the technology used to construct a RAM. Some of the common types are:

DRAM or Dynamic RAM is the most common type of memory chip. DRAM is mostly used as main memory, since it is small and cheap. It uses transistors and capacitors. The transistors are arranged in a matrix of rows and columns. The capacitor holds the bits of information 0 and 1. The transistor and capacitor are paired to make a memory cell. The transistor acts as a switch that lets the control circuitry on the memory chip read the capacitor or change its state.

DRAM must be refreshed continually to store information; otherwise it will lose what it is holding. The refresh operation occurs automatically thousands of times per second. DRAM is slow because the refreshing takes time. Access speed of DRAM ranges from 50 to 150 ns.

SRAM or Static Random Access memory chip is usually used in cache memory due to its high speed. SRAM uses multiple transistors (4 to 6), for each memory cell. It does not have a capacitor in each cell. A SRAM memory cell has more parts, so it takes more space on a chip than DRAM cell. It does not need constant refreshing and therefore is faster than DRAM. SRAM is more expensive than DRAM, and it takes up more space. It stores information as long as it is supplied with power. SRAM is very fast and easier to use. The access speed of SRAM ranges from 2 to 10ns.

SDRAM or Synchronous Dynamic Random Access Memory is a special type of DRAM that is synchronized to the system clock. Since it is synchronized to the CPU, it knows when the next cycle is coming, and has the data ready when the CPU requests it. This increases efficiency by reducing CPU waiting time.

DDR-SDRAM or Double-Data Rate SDRAM works the same way as does ordinary SDRAM. Data transfer rate is double when compared to SDRAM.

1.4 Power Supply to a Computer System

Electric power is the main source of supply for the operation of electronic components of a computer. Therefore continuous power supply is essential for the computer to prevent them from failures, breakdown or shutdown. All computers come with a power supply.

There are two types of power supply connected to a computer system. They are, Switch Mode Power Supply (SMPS) and Uninterruptable Power Supply (UPS).

- **SMPS**

An SMPS converts AC power from an electrical outlet to the DC power needed by system components. An SMPS is a metal box in the rear of the system that is attached to the computer chassis and to the system board. The power supply contains the power card plug and a fan for cooling, because it generates a lot of heat. An SMPS with a rating of more than 300 watts is needed; any less will not reliably power modern components. In a PC the SMPS converts 230 volts of AC to 5 to 12 DC volts and the wattage is around 180 to 300 watts, 450 watts and 500 watts.

- **UPS**

An UPS is a power supply that includes a battery to maintain power in the event of a power failure. Typically, an UPS keeps a computer running for several minutes to few hours after a power failure, enabling us to save data that is in RAM and then shut down the computer gracefully.

Many UPS now offer a software component that enables us to automatically backup and shut down procedures in case there is a power failure while we are away from the computer.

- **Types of UPS**

There are two types of UPS: **Online UPS** and **Standby UPS**

Online UPS – An online UPS avoids those momentary power lapses by continuously providing power from its own inverter, even when the power line is functioning properly. Online UPS is more costly than Standby UPS. For a PC with color monitor 15", requires an UPS of 500VA and for a PC with color monitor 17", requires an UPS of 600VA.

Standby UPS – A Standby UPS (or off-line UPS) monitors the power line and switches to battery power as soon as it detects a problem. The switch over to battery, however, can require several milliseconds, during which time the computer is not receiving any power.

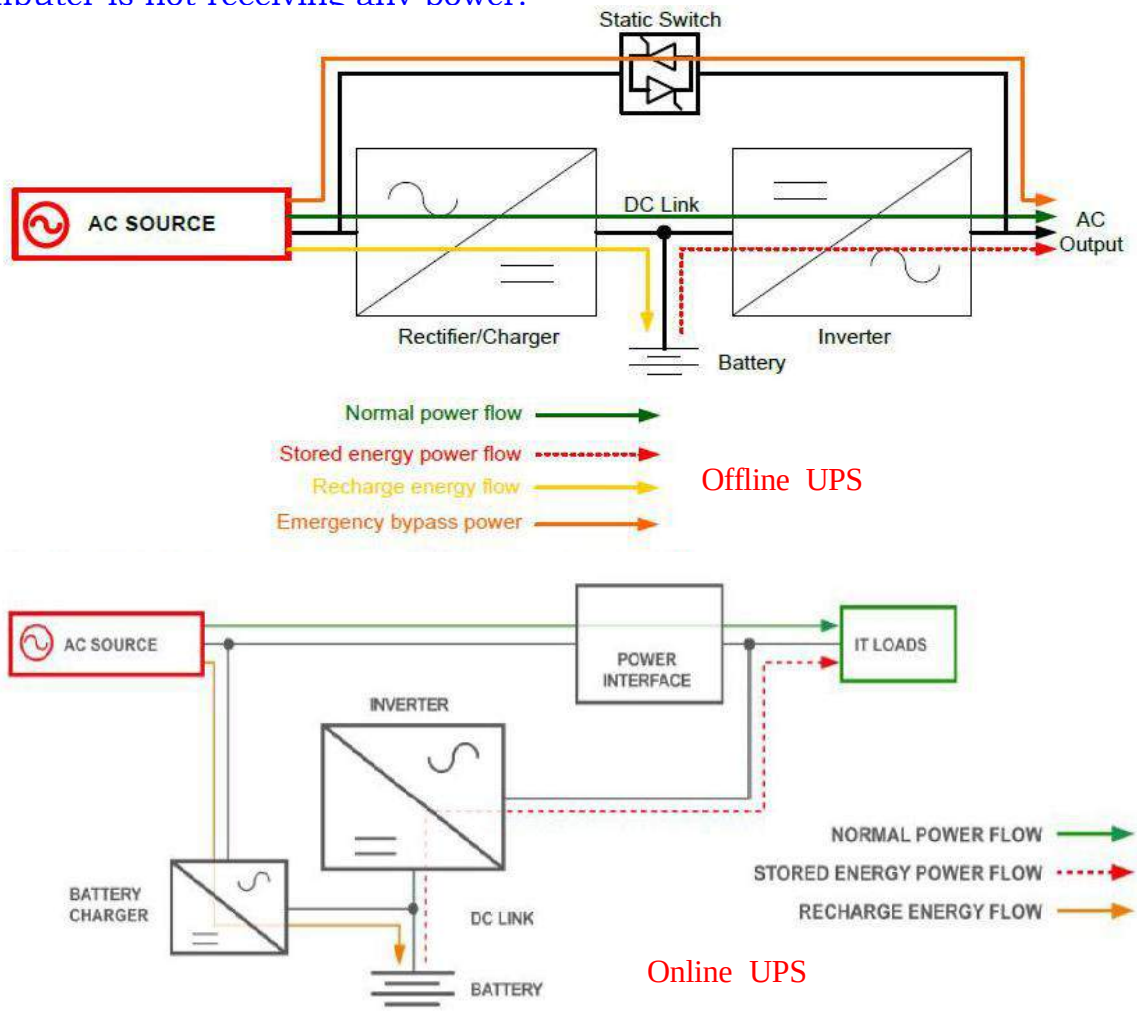


Figure 1.15 Types of UPS

1.5 Assembling the Computer System

Computer configuration is the process of setting up your hardware devices and assigning resources to them so that they work together without problems. A properly-configured system will allow you to avoid nasty resource conflict problems, and make it easier for you to upgrade your system with new equipment in the future. An improperly-configured system will lead to strange errors and problems, and make upgrading a nightmare.

Basic components for assembling a new computer system

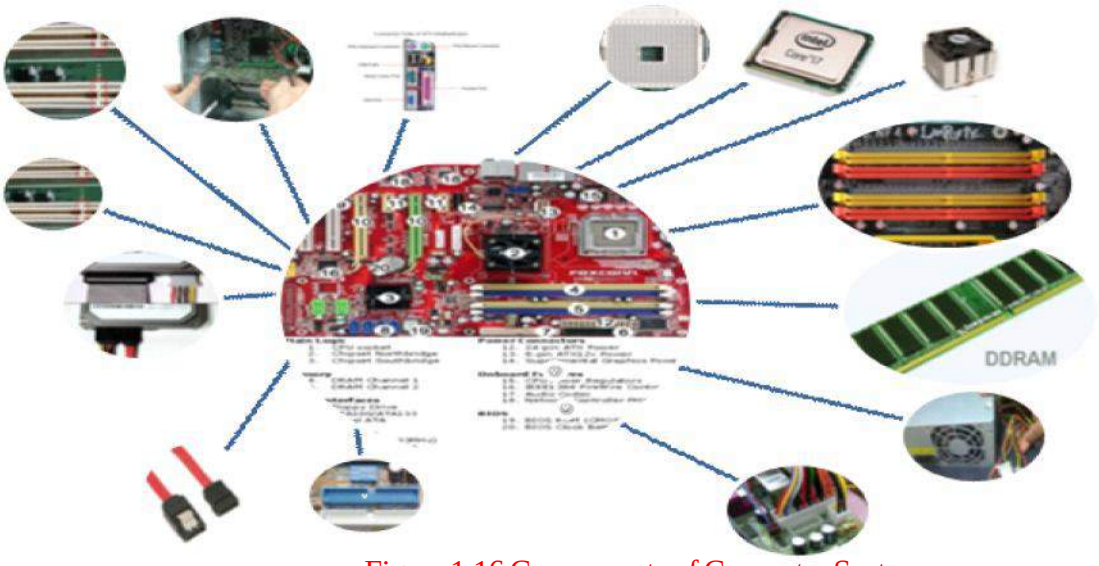


Figure 1.16 Components of Computer System

Sl.No	Component Name	Specifications	Brand	Amount
1.	Processor	Dual core,i3,i5,i7	Intel/ AMD/ Motorola	
2.	Mother Board	XT/AT/AT Baby/ATX		
3.	Primary Memory (RAM)	DDRAM1 DDRAM2 DDRAM3 1GB/2GB/4GB/8GB/16GB		
4.	Secondary Memory (HDD)	IDE/SATA/SCSI 500GB/1TB		
5.	Cabinet with SMPS	SMPS with 450W/500W/550W		
6.	Keyboard	PS2/USB/Wireless		
7.	Mouse	PS2/USB/Wireless		
8.	Monitor	CRT/LED/TFT 14”/18”		
9.	Printer(optional)	Dot-matrix/inkjet/Laser		
10.	Camera(optional)	High resolution		
11.	Mike(optional)	Analog		
12.	UPS(atleast 20minutes)	Online /Offline		
13.	Speaker	2.1 /5.1		

Points to remember

- The **motherboard** is the main circuit board inside a computer which provides a platform for all the components and peripherals to communicate with each other.
- The motherboard may be characterized by the **form factor**, **chipset** and **type of processor socket** used.
- The **motherboard types** are XT, AT, Baby AT and ATX motherboards.
- The **motherboard components** are Processor (CPU), BIOS, CMOS, Slots, Disk Controllers, I-O Ports/Interfaces and BUS
- The **processor** is the main component on the motherboard and is called the brain of the computer.
- The **clock speed** of a CPU is defined as the frequency with which a processor executes instructions or the data is processed.
- The **north-bridge** and **south bridge** are the two chips in the core logic chipset on a PC motherboard, used to manage data communications between a CPU and a motherboard.
- **BIOS** is a small chip on the motherboard that holds a set of instructions to load the hardware settings required to activate various devices like keyboards, monitors or disk drives.
- **CMOS** is a type of memory chip to store the date, time and system setup parameters.
- A **slot** also called as expansion slots, allows expanding the capabilities of a computer to give the computer new features or increased performance.
- The **disk controller** is the circuit which enables the CPU to communicate with a hard disk, floppy disk or other kind of disk drive.
- The **ports** and **interfaces** are used to connect external devices like printers, keyboards or scanners to the computer, which gets connected to the computer's motherboard.
- A **bus** is a collection of parallel wires that form a pathway to carry address, data, and control signals.
- A **system bus** or expansion bus comprises of data bus, address bus and control bus
- A **computer memory** refers to the electronic storing space for instructions and data where the computer's processor can reach quickly.
- The **parts of internal memory** are registers, cache and primary memory-RAM and ROM.
- **Cache memory** is a high speed memory available inside CPU in order to speed up access to data and instructions stored in RAM memory**.**
- The **types of RAM** are DRAM, SRAM, SDRAM and DDR-SDRAM.
- **Power supply** is essential for the computer to prevent computers from failures, breakdown or shutdown.
- **Types of power supply** connected to a computer system are SMPS or UPS

Review questions

One marks questions:

1. What is a motherboard?
2. What is microprocessor?
3. What is the purpose of registers in the CPU?
4. How does the computer communicate with other devices?
5. What is system bus?
6. What is the function of control bus?
7. What is a data bus?
8. What is a port?
9. What is an interface?
10. Expand PCI.
11. How many bits of data are sent in a serial port?
12. Expand USB.
13. Give one feature of USB port.
14. What is meant by plug and play device?
15. Name any one USB device.
16. Is device controller a hardware or software?
17. What is cache memory?
18. Where is L1 cache located?
19. Where is L2 cache located?
20. Expand SDRAM.
21. Give the expansion of DDRRAM.
22. Expand SMPS.
23. What is the use of SMPS?
24. What is the approximate power consumed by a PC?
25. Expand UPS.
26. What is the use of UPS?
27. List the types of UPS.

Two marks questions:

28. Name any two types of motherboard.
29. Mention any two characteristics of motherboard.
30. Mention the components of motherboard.
31. Explain system bus.
32. What is data bus and address bus?
33. What is the purpose of expansion slot?
34. What is the purpose of AGP slot?
35. Name the different types of I/O ports.
36. Explain serial port.

37. Explain parallel port.
38. Explain USB port.
39. What is meant by plug and play card?
40. What is the purpose of ports and buses?

Three marks question questions:

41. Explain the different components of motherboard.
42. Explain the characteristics of motherboard.
43. Explain the Schematic diagram of Motherboard.
44. Explain different types of I/O ports.
45. Give the features of USB port.
46. Explain cache memory.
47. Explain the types of power supply.
48. What is the purpose of ports, buses and controllers in the I/O system?
49. What is a Slot? mention any two types.
50. Name the different components of North bridge.

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