UNIT-1

PC COMPONENTS AND SYSTEM BOARD

PC stands for Personal Computer, also called as Desktop Computer, which we see in Offices, Banks, and even at our homes. These are the most common form factor of computer devices we use. A computer is a combination of Hardware and Software.

The term hardware represents all the tangible (physical) components of a PC, whereas the term Software represents the application programs which run on PC. We can broadly divide the parts of a PC into the following:

- Hardware.
- Software and
- Firmware.

1.1 Hardware used for I/P , O/P & inside computer case, system board components used for communication among devices:

Hardware components are the physical parts of a computer, which we can see, touch, hear and feel. These components are mostly electronic devices, some of them being just buttons, heat sinks and aluminum cases. Hardware components are categorized into different types:

1. Components Outside the case:

1. **INPUT DEVICES:** These are the devices which are used to provide input to the programs running on a computer via signals. Different Input devices are:
   a. **Keyboard:** Keyboard is the primary and standard input device of a computer.
   b. **Mouse :** A mouse is a pointing device used to move pointer on the screen, and to make selections. Mouse works based on Optical sensor or trackball.
   c. **Light Pen**: Light pen also is a pointing device but serves different purpose, by using it we can draw diagrams in the screen directly or can drag/move objects on the screen.
   d. **Scanner:** Scanner is also an input device which scans various documents and images using **optical sensor** and sends them to the computer.
   e. **Microphone:** Microphone takes the voice as the input and sends it to the computer. (though there will be a conversion of audio from analog frequency to digital signal, but it is not the work of the microphone).
   f. **Digital camera.**
   g. **Joystick/Game controller.**

1. **OUTPUT DEVICES:** These are the devices which are used by the computer to give response to the user for the inputs given by the user. Different output devices are:
   a. **Monitor and Projector:** Monitor is a standard output device which displays output to the user, using either CRT, LCD or LED technology. Projector also used to display images on to the screen (mostly it is used as second display device).
   b. **Printer:** Printer is an output device which prints the output on a paper often called hardcopy. A printer can be of any type like Ink-Jet, Laser-Jet, and Dot-Matrix.
   c. **Speaker:** Speaker gives the output in the form of audio signals.
   d. **Plotter:** The plotter is a computer printer for printing vector graphics. Plotters were used in applications such as computer aided design(CAD).

2. Components Inside the case: Computer case is an aluminum box which contains some electronic devices which are important for a computer to run.

1) **Mother Board or System Board (Circuit board)**: It is an electronic circuitry which accommodates all the important components of a computer such as Microprocessor, RAM, Chipset and any extension boards.

All circuit boards are most often manufactured using (CMOS) complementary metal-oxide

semiconductor technology.

There are 2-types of cables inside the case:

1. **Data cable** - which connect one device to another.
2. **Power cables (Power Cords)** - which supply power.

2) **Chip Set:** Chip set is a collection of various ICs which acts as controllers for various ports, electronic components and connectors.

3) **Microprocessor:** Processor or Microprocessor is an IC (Integrated circuit) which executes instructions given by the software. It is the most important chip in the computer.

4) **RAM:** Random Access Memory or Read and Write memory is the temporary memory of the system used to hold instructions and data as they are processed.

5) **Programming and setup stored on the motherboard:** A Flash ROM memory chip is used to permanently store instructions that control hardware functions. A CMOS RAM chipis used to store configuration data.

6) **Electrical system:** Power supply connections to provide electricity to the motherboard and expansion slots. Generally it includes **SMPS** (Switch mode power supply)also.

7) **Hard disk:** Hard disk is a magnetic storage device which is used as secondary storage by the computer. It offers high volume and low speed.

8) **Expansion slots:** Extension slots are the slots which are used to add extension cards to improve performance of the system or to add additional functionality such as Graphics processing. The size and shape of the extension slot depends on the type of the bus it uses. There are different types of extension slots:

1. **PCI:** (Peripheral Component Interconnect) is used for i/p and o/p devices.
2. **PCI Express:** Same as PCI, but in several lengths and are used by high-speed i/p and o/p devices.
3. **AGP:** (Accelerated Graphics Port) is used for video card.
4. **ISA:** (Industry Standard Architecture expansion slot) for modems.

9) **Other Components:** Other components like CD/DVD drives, floppy drives, cooling fans, heat sinks and back panel connectors are also found inside the computer case.

3. Components used for communication among devices:

➢ Mother board contains many fine lines on both the top and bottom of the board surface. These line sometimes called **TRACES**

➢ TRACES are circuits or paths that enable data, instructions and power to move from component to component on motherbaord.

➢ This system of pathways used for communication and the protocols and methods used for transmission are collectively called **BUS.**

➢ Most buses used are 8, 16, 32, 64 or 128 bit wide.

Ex: a bus that has 8 lines to transmit data is called an 8-bit bus.

➢ The width of the data bus is called **data path size.**

➢ Motherboard can have more than one bus, each using different protocol, data path and soon.

➢ The main bus in the motherboard that communicates with the CPU, memory and the chipset is called System bus, memory bus, host bus, local bus or external bus, front side bus.

1.2 Software - 3 types of Software: OS, application software, ROMBIOS:

Software:

Software refers to the **set of instructions that directs the hardware to accomplish a task.** Software is a collection of programs that makes use of the hardware in the system.

Types of software in our PC's:

1. **SystemSoftware:**

   System software is a collection of computer programs whose **primary goal to make different H/w components usable for the user**.

   EX: Operating system

    Device Drivers

Operating System:

   An **operating system** (**OS**) is system software that manages computer hardware and software resources and provides common services for computer programs.

  Examples:

-   Versions of Microsoft Windows (like Windows 10, Windows 8, Windows 7, Windows Vista and Windows XP). Apple's mac OS.
-   Open source operating systemLinux.

2. **Applicationsoftware**:

   Application software is also a collection of computers programs whose **primary goal is to perform a specific task** such as document editing , calculations , making presentation etc.,

  Examples: Music players,

     Image editing programs...

3. **ROM BIOS**:(**firmware**)

- ✓ BIOS Stands for **Basic Input Output System**.
- ✓ BIOS is a basic set of instruction which are used to start the computer and to initialize some basic hardware devices such as hard disk, keyboard, monitor and search for operating system stored in the storage device such as hard disk (or) compact tdisk.
- ✓ BIOS - is the **first program that will be executed by the system whenever it is started** (or)reset.
- ✓ The main purpose of the BIOS is
  1. To initialize the system hardware
  2. Start Operating system.
- ✓ BIOS is stored in a special ROM (Read - Only - Memory) chip on the motherboard.
- ✓ Most of the current day computers come with BIOS which is updatable, in these kinds of systems BIOS is stored in EPROM (Electronically programmable ROM's) (or) flash memory...
- ✓ Software embedded into hardware is often referred as **firmware** so BIOS can also be referred as FIRMWARE.

1.3 Functions of BIOS:

- Tests the components of the computer by running its **POST** program to make sure that they are all functioning properly.
- Configures the main components that are part of the mother boar or that are attached to it.
- **Boots the OS** from the hard disk drive or from a bootable floppy/CD/DVD disc at startup.
- Provides access to some of the computer components and features such as keyboard, mouse, when the OS is up &running.
- Setting the system clock.
- Enable or Disable system components.
- Set various password prompts.

1.4 The boot process:

BOOT Process:

 In computing, booting is also known as '**booting up'** is the **initial set of operations that a computer system performs after power on CPU (or) reset the computer.** Here, the term 'boot' is also known as '**bootstrap'** (or) '**boot strap load'**.

 It involves performing a power-on self-test, locating and initializing peripheral devices, and then

finding, loading and starting an operating system. The following diagram shows the flow of steps in a typical booting process:

Boot loader- is a computer program that loads the main operating system for the computer after completion of the Self-Tests.
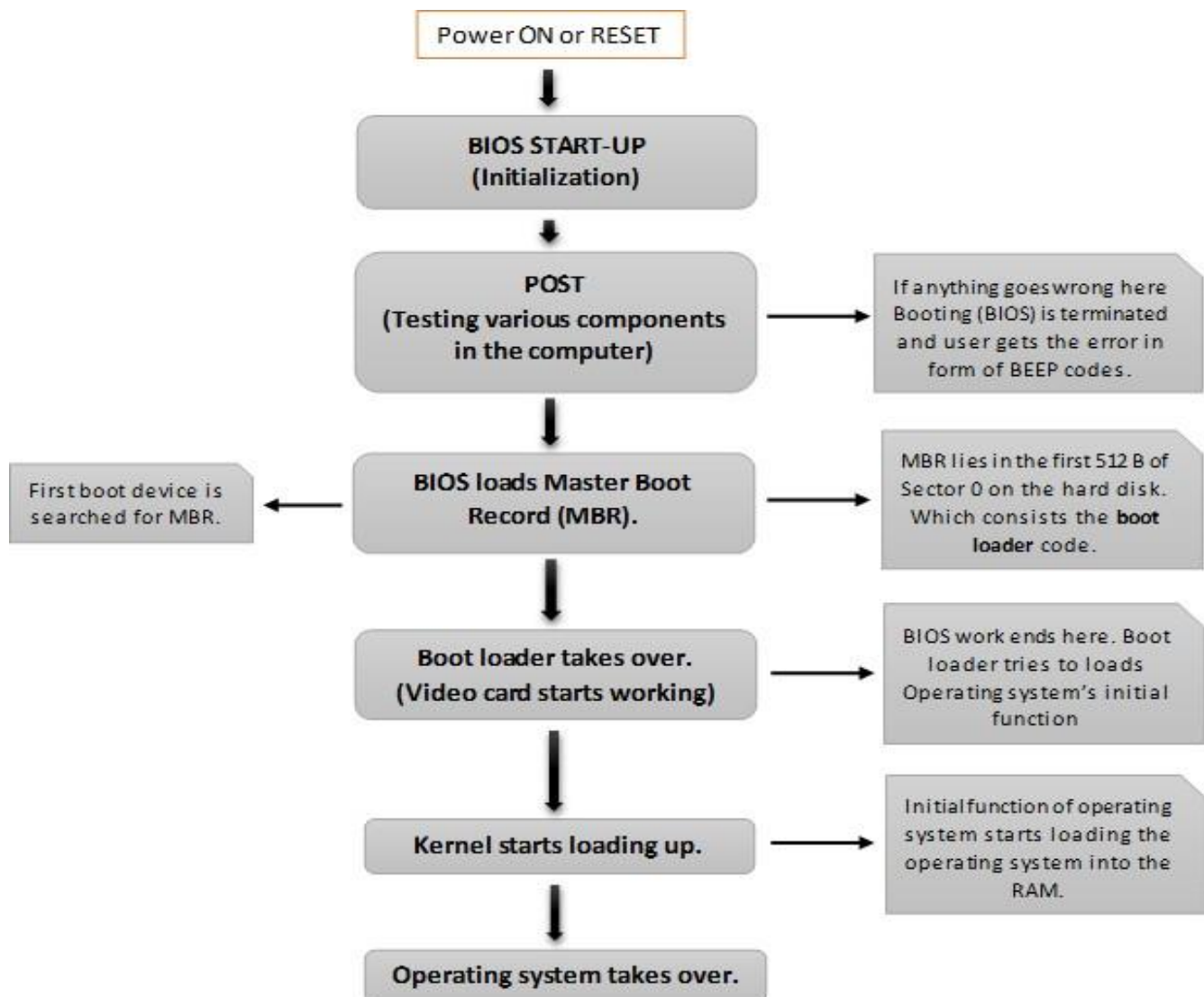

Fig: BOOTING PROCESS

We can describe the process in following steps :

- User switches on or resets the power of the computer.
- Basic Input Output System (BIOS) starts, jumpers or the circuitry is designed in such a way that when a system is powered on the first instruction to be executed is the **BIOS initialization**.
- When BIOS starts-up it performs **Power on Self-Test (POST)**, which checks or tests various components in the system. If any error is encountered, user is informed about the error in the form of beep codes from the speaker because the video card will not be initialized at that time.
- After the POST the BIOS wants to boot up an operating system, which must be found somewhere: hard drives, CDROM drives, floppy disks, etc. As we have a working hard disk which has an operating system, the BIOS tries to load the OS from it.
- In order to load the OS, the BIOS searches for **Master Boot Record** (**MBR)** which consists a tiny program called **Boot Loader.**
- The task of a boot loader is to search the Active partition on the hard disk (on which the operating system resides) and try to run the initial function of the OS which loads the kernel of the OS into the RAM.
- As the boot loader loads the initial function of OS into the RAM, the processor starts executing the

function.

- The **initial function** takes over the control from BIOS and loads the operating system from hard disk to RAM.
- As the OS is loaded into the RAM, it takes the control and starts providing services to the user.

Types of Booting

a. **Hard/Cold Boot**: This boot sequence is taken place when PC is powered on from off state.

b. **Soft/Warm Boot:** This boot sequence takes place when the PC is reset. Here the POST process doesn't takes place.

c. **Random boot:** This type of booting takes place without the knowledge of user. Generally it happens when hardware or software malfunctions.

1.5 POST and important beep codes:

- ➢ Post -stands for "**Power - On Self-Test**".
- ➢ The post **perform a check of the system components and hardware** listed in the system setup data(CMOS) **are present and tests to see that they are functioning properly.**
- ➢ The post process is done before the BIOS begin its startup procedures.
- ➢ If the post find problem it **signals with beep codes indicating the source of the problem**.
- ➢ Each error has its own BEEP code there are several standards of BEEP codes in which IBM standard are the ones mostly used.

Standard **IBM BEEP codes:**

BEEPS	ERROR
No Beep	Power supply or system board failure
Continuous Beep	Power supply or system board failure or keyboard failure
Repeating short Beep	Power supply or system board failure
1 short Beep	Normal POST –No Error
2 short Beeps	POST ERROR – Error Code seen on screen
1 short 1 long beep	System board problem
1 long 2 short beeps	Display adapter problem
1 long 3 short beeps	Enhanced graphics adapter problem
3 long beeps	Keyboard problem

BEEP codes for AMI BIOS:

BEEPS	ERROR
1 short beep	POST is complete
2 short beeps	Memory failure.
3 short beeps	Memory/Parity failure.
4 short beeps	System time failure.
5 short beeps	Mother board failure.
6 short beeps	Keyboard failure.
7 short beeps	CPU failure.
8 short beeps	Video adapter failure.

BEEP codes for Award BIOS:

BEEPS	ERROR
1 long beep	Memory error.
1 long 2 short beeps	Video error.
1 long 3 short beeps	Video failure.

Continuous beeps	Memory or video failure.

BEEP code of PHONEIX BIOS:

BEEPS	ERROR
1-1-3	CMOS memory error.
1-1-4	BIOS failure.
1-2-1	System time error.
1-2-2	Mother board error.
1-2-3	Mother board error.
1-3-1	Mother board error.
1-4-2	Memory error.
3-2-4	Keyboard controller error.
3-3-4	Video adapter error.
4-4-1	Serial port error.
4-4-2	Parallel port error.

1.6 Know about different connectors:

- Connectors are generally called "input-output"connectors.
- Connectors are the interfaces for linking various devices by cables.
- Connectors generally have male end with pins protruding from it and female end which includes holes for accommodating the pins.

1. Back Panel connectors:

- ➢ PS/2 keyboard & mouse connectors.
- ➢ Serial port.
- ➢ Parallel Port.
- ➢ VGA port.
- ➢ USB port.
- ➢ LAN port
- ➢ Audio Jacks.
- ➢ MIDI port
- ➢ HDMI port
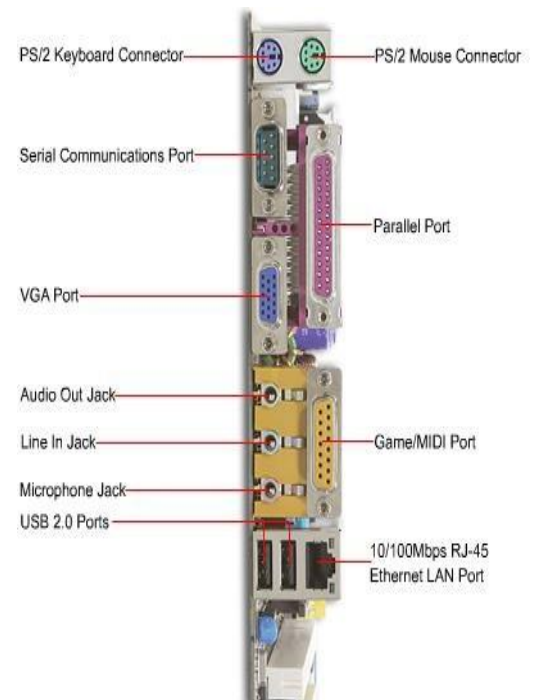
1. PS/2 connector:

- This is a 6 pin DIN connector which is used to connect Keyboard or Mouse.
- It is round in shape.
- The port which connects keyboard is in purple color and the port which connects mouse is in green color.

2. Serial Port:

- Serial port is the most common interface which is used connector by a variety of devices for connecting to the system.
- Serial port is a DB9 connector and it is an analog 9-pin plug of the D-SUBMINATURE connector family.
- DB9 connector is used for serial connections allowing asynchronous transmission of data provided by standardRS-232.
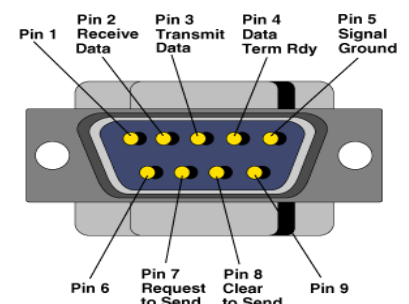
- In serial port data is transmitted serially (one bit by one bit), using a single line.
- **Devices:** that can be connected to the system using this serial port are older printers, older digital cameras, older joysticks, and older GSM mobile phones.

3. <u>**Parallel port:**</u>

- Parallel port is also called as printer port because they are primarily used to connect printers to the system.
- Parallel ports are much straight forward than serial ports because all of the characters moves over a parallel link at one time.
- It is a DB-25 connector, consisting 25 pins, and comes from D-SUBMINATURE connector family.
- IEEE 1248 standard defines the bi-directional version of parallel port.
- Types of parallel ports are:
  - o <u>Standard Parallel port:</u> Used to transmit data in single direction.
  - o <u>Enhanced Parallel port:</u> it allows data flow in both ways but only one way at at a time.
  - o <u>Enhanced capabilities port:</u> which supports bi-directional data transfer (full duplex).
- Devices that can be connected using parallel port are: Modems, Webcams, Scanners, Sound cards and external hard disks.

4. <u>**VGA port (Video Graphics Array):**</u>

- VGA connector is used to connect monitor to the system.
- This connector interfaces with built-in graphics card.
- All video ports use a female 15-pin DB port and connector.
- VGA corresponds to red, green and blue in color.

5. <u>**USBport:**</u>

- USB stands for Universal Serial Bus.
- It is an external bus standard that supports data transfer rates up to 12 Mbps.
- A single USB port can be used to connect up to 127 different devices.
- There are versions of USB based on size and speed offered by them. Some of them are USB 1.0, USB 2.0, USB 2.0 Mini, USB 3.0etc.
- USB transmit data in serial fashion but offers high speed.
- **Devices:** that can be connected to the system using USB port are Keyboard, Mouse, Digital cameras, Printers, scanners, joysticks, Mobile phonesetc.

6. <u>**LAN port:**</u>

- It is a **RJ-45** connector used to connect the computer to a network.
- It interfaces with the Network Interface Card (NIC) built into the motherboard.
- RJ45 connector is one of the main connectors used with Ethernet network cards.
- These connectors transmit information over twisted pair cables.
- It's also called Ethernet port.
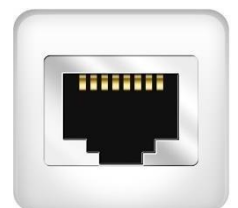
7. <u>**Audio Ports:**</u>

- **Line In** (**Blue**) (Arrow pointing into waves)**:** Line in connector can be used to connect audio sources such as tape players, DVD players etc. depending on soundcard.
- **Line out** (**Green**) (Arrow pointing out of waves)**:** It is used for connecting audio components such as speakers, headphones.

- **Microphone** (**Pink**): This port is used to connect microphone, which is a Voice input device. All these ports accommodate 3.5jacks.
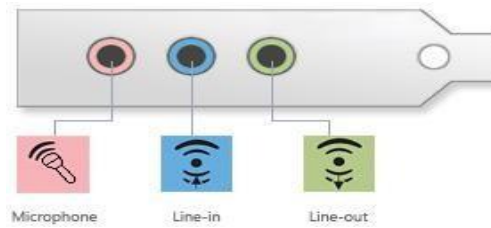
8. <u>MIDI ports:</u>
    - These ports are used to connect Musical instruments to thesystem.
    - **MIDI** short for **Musical Instrument Digital Interface** is a technical standard that describes a protocol, digital interface and connectors and allows a wide variety of electronic musical instruments, computers and other related devices to connect and communicate with one another.

2. Front panel connectors:

- Front panel of the system case can have a variety of LED's and buttons that are attached to the motherboard for power or signals that indicate various activities.
- Most mother boards include:

    Power On and RESET buttons, Hard disk and Power indicator LED's and Connectivity ports like USB, Audio which are continued on back panel.

A computer accommodates many other connectors depending on its design. Every system will have an ATX power connector to provide AC power supply to the computer

1.7 Types of System boards:

System boards:

➢ System board or Mother Board is an electronic circuitry which acts as a central component of a computer, it is a multi-layer Printed Circuit Board (PCB).

➢ System board accommodates various electronic components that make a computer work.

➢ It contains various components, such as CPU, ROM, memory, expansion slots, serial ports, PCI ports, and all the controllers, such as IDE controller, SCSI Controller etc.

The <u>characteristics that determine motherboard are:</u>

- Form Factor.
- Chipset.
- Expansion slots and
- Components.

FORM FACTOR: Form factor of a motherboard determines physical shape and size of motherboard, mounting-hole placement, type of case and power supply connectors.

Components of a motherboard:

1. **Processor Slots/Sockets:** A motherboard contains one or more processor sockets/slots in which you can install the processor. The type of the socket determines the type of the processor.
2. **Memory socket:** A memory socket is used to install RAM (primary memory) using Single inline Memory module or Dual Inline Memory Module.
3. **Motherboard Chipset:** Motherboard chipset controls the data flow between various components on the motherboard, such as RAM and Cache, system buses and peripherals etc. It consists of various Controller ICs to control various components on the motherboard.
4. **Cache:** Cache is a high speed memory. Cache can be Internal (within the processor housing) or External (embedded on the mother board).
5. **BIOS:** The Basic Input Output System is a built-in software. It is placed on a ROM chip on your

motherboard.

6. **Slots for expansion cards:** The expansion slots are available on the motherboard to provide additional functionality or to improve performance by adding audio or video cards etc. Various types of expansion slots that are available are: PCI, ISA, AGP etc.

7. **Power Connector:** A motherboard contains a socket to attach power cables coming from power supply (SMPS: Switch Mode Power Supply). The motherboard distributes the power to every device that is on the mother board.

8. **Various Device connectors:** Motherboard also have different connectors that are used to connect Keyboard, Mouse, Monitor, printer etc. Generally these connectors are found on the rare side of the motherboard.

9. **CMOS Chip:** Complimentary Metal-Oxide Semiconductor chip controls the real-time clock that maintains data and time on your computer. BIOS is also stored in the same chip.

10. **Battery:** Every PC has a low-power battery to preserve certain information, such as BIOS settings, the current date and time etc.

Types of system boards:

The mother board is an integral part in a computer. There are primarily two types of mother boards:-
1. AT mother board. 2. ATX motherboard.

1. *AT MOTHER BOARD:*

✓ AT is a very old standard that was created by IBM for their own computers
✓ AT mother boards were much bigger in size.
✓ AT boards only had the most minimal amount connectors in order to maintain compatibility with AT cases.
✓ AT computers had their power switches connected directly to the powers upply.
✓ AT uses **p8** and **p9** power connections.
✓ AT power supply delivers +5v, +12v,-5v,-12v using 2-six –pin connectors.
✓ At mother board is in size of 30.5cm X 33 cm(12 inches x 13inches)

2. *ATX MOTHERBOARD:*

✓ ATX was developed by Intel to address some of the short comings of AT standard that makes it unsuitable for the varied demands of personal computing.
✓ ATX mother boards are smaller in size.
✓ ATX mother boards works faster.
✓ ATX cases allowed manufacturers to produce their own back panels to suit their motherboards.
✓ ATX power system uses single p1 power connector.
✓ ATX mother board supply ±5v, ±12v, ±3.3v using 20- pin connector with optional 4-pin auxiliary power connector.
✓ ATX mother board is in size of30.5cmX24.4cm.

❖ **Mother boards can be divided into different types based on formfactor:-**

Form factor:-

The form factor of the mother board describes its general size, shape, what sorts of cases and its physical organization. The following table summarize different boards and their form factor:

Type of system board	Description
AT	Oldest type of mother board, still used in some systems. It uses P8 & P9 power connectors. It measures 30.5cmX33cm.
BABY AT	Smaller version of AT and is compatible with ATX cases. Uses P8 & P9 power connectors. It measures 33X22cm

ATX	Developed by Intel for Pentium systems. Includes extra power connections for extra fans and processor voltagesneeds. Uses a single 20-pin P1 power connector with optional 4-pin auxiliary power connector. Measures 30.5X24.4cm
ENHANCED ATX	Improved ATX, specified in ATX version 2.2. Uses a 24-pin P1 power connector. Supports PCI express.
MINI ATX	An ATX board with a more compact design. Measures 28.4X20.8cm
MICRO ATX	A smaller ATX design intended to reduce overall system cost. Measures 24.4X20.8cm A smaller power supply and an ATX 2.1 case can be used.

1.8 The CPU & the chipset – CPU form factor, CPU slots and sockets:

CPU & CHIP SET:

CPU:-

Central processing unit is the core component of a computer. The main functionality of a CPU is to perform Comparisons and Calculations. It takes information from the input unit and processes according to the instructions. The instructions are given by programs which are written in the language which computer can understand.

❖ *Functions ofCPU:*

✓ Making arithmetic calculations and logical decisions.

✓ Manipulating alphabetical or alphanumeric data like word processing, letter writing.

✓ Converting data from one form to another form.

✓ Communicating data to other systems.

✓ Storing the data temporarily and retrieving it as when required.

Components of CPU:

• **Control unit:**the control unit controls the functions of the CPU and it tells the other parts of the CPU how to operate.

• **Protection test unit:**PTU works with the control unit to monitor whether or not functions are carried out correctly.

• **Arithmetic and logical unit:**The ALU performs all of the calculations and comparative logic functions for the CPU.

• **Floating point unit:**It handles all floating point operations for the ALU and CU. Floating point operations involve arithmetic on numbers with decimal places and high math operations like trigonometry and logarithms.

• **Memory management unit:**It handles the addressing and cataloging of where data is stored system memory.

• **Bus interface Unit:**It supervises the transfer of data over the bus system between the other components of the computer and the CPU.

• **The Pre-fetch unit:**This unit preloads the instruction registers of the CPU with instructions from memory whenever the BIU is idle.

• **Decode unit:**The decode unit does just about what its name suggests, it decodes incoming instructions to their simple form.

- **Registers:**It built into the CPU are a number of holding areas and buffers that are used to temporarily hold the

Components of CPU
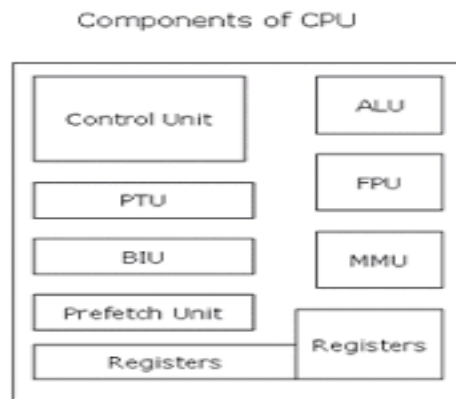
data ,addresses and instructions being passed around b/w the CPU's components.

Chipset:"

"A group of microchips on the motherboard that control the flow of data and instructions to and from the processor providing careful timing of activities. A number of integrated circuits designed to perform one or more related functions." A chipset is embedded on the mother board.

- ❖ **Functions ofchipset:**
  - ✓ The chipset controls the bits that float between the CPU and devices.
  - ✓ The chipset controls system memory.
  - ✓ The chipset controls the motherboard buses & peripherals devices.
  - ✓ Provides support for the expansion bus and any power management features.

- Beginning with the Intel i800 series of chipsets, the interconnection between buses is done using a hub interface architecture, in which all I/O buses connect to a hub, which connect to the system bus.
- The hub is called Hub Interface, and the architecture is called Accelerated Hub Architecture(AHA).
- The **fast end** of the hub, which contains graphics and memory controller, connects to the system bus and called the hub's **NorthBridge**.
- The **slower end** of the hub, called the **South Bridge**, contains I/O controller hub. All I/O devices connects to the hub by using the slower SouthBridge

Block diagram depicting North Bridge & South Bridge
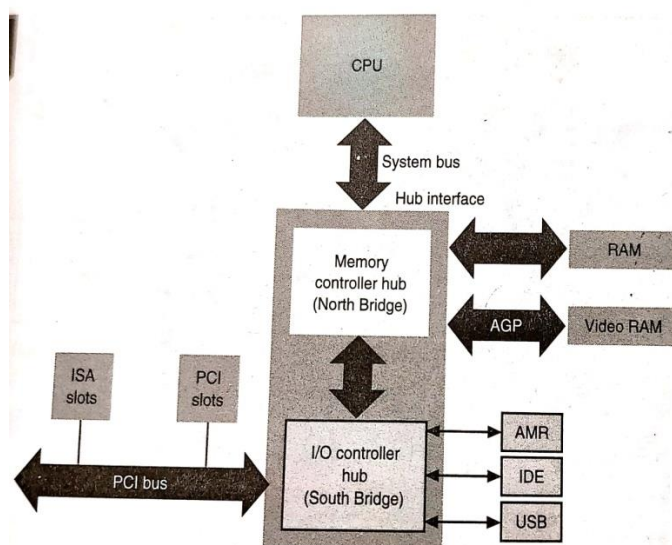
- ❖ **Chipset types:** In this objective we will look at the chipsets used with the Intel Celeron, Pentium III and Pentium 4processors.
  - Intel810chipset.　　　　Intel 915chipset.

- Intel845chipset.　　　　Intel 945chipset.
- Intel815chipset.　　　　Intel 965chipset.
- Intel 850chipset.

1. **Intel 915chipsetfeatures:**

Features
Serial ATA (SATA) 3 Gbps
Dual-channel DDR2 Memory Support
Intel High Definition Audio(Intel HD Audio)
4 PCI Express* x1 Interface
Intel Matrix Storage Technology
PCI Express* x16 Interface

2. **Intel 945 chipsetfeatures:**

Features
Serial ATA (SATA) 3 Gbps
Dual-channel DDR2 Memory Support
Intel High Definition Audio (Intel HD Audio)
6 PCI Express* x1 Interface
Intel Matrix Storage Technology
PCI Express* x16 Interface

3. **Intel 965 chipset features:**

| Features	
Supports Intel Viiv Technology	Intel Matrix Storage Technology
1066/800/533 MHz System Bus	Serial ATA (SATA) 3 Gbps
PCI Express* x16 Interface	Dual-channel DDR2 Memory Support
PCI Express* x1 Interface	Intel High Definition Audio (Intel HD Audio)
Intel Fast Memory Access	Intel Flex Memory Technology
USB Port Disable	Intel Quiet System Technology (Intel QST)

CPU Form Factor:

"The form factor of the CPU describes its general shape, what sorts of sockets and slots used and how heat sink is arranged, and its physical organization."

CPU Slots and Sockets:

As we have already studied, a CPU or a processor has to be installed on the mother board. Mother boards have different Slots and sockets for a processor. Older mother boards support processor slots called **Cartridge processor packages**. We have three different types of Cartridge Packages:

1. **SECC (Single Edge Contact Cartridge):** The processor is completely covered with black plastic housing and a heat sink and fan are attached to the housing and it is fixed on the mother board in a special slot. It looks like following.
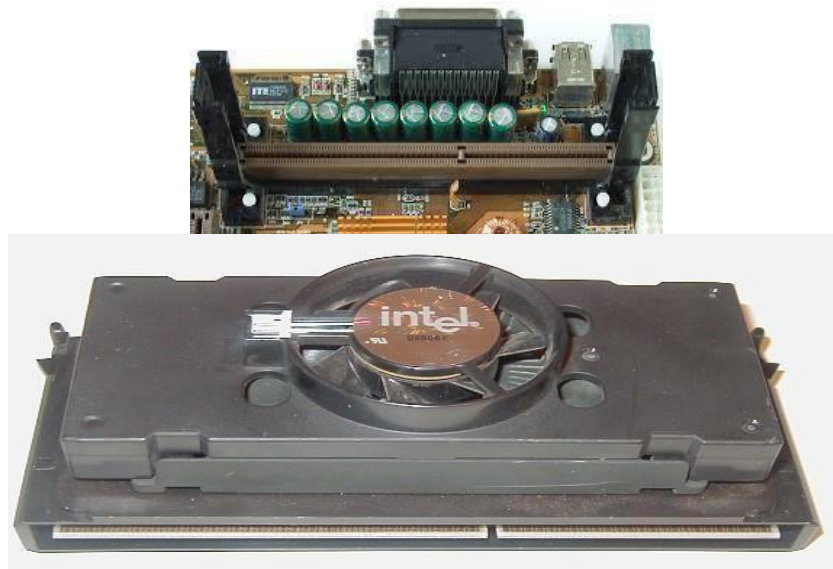
2. **SECC 2 (Single Edge Contact Cartridge Version2):** Like the SECC form factor boxed processors in the SECC 2 form factor have a plastic housing with an active heat sink and a fan. The most noticeable

difference is that the contacts are exposed on the SECC 2 form factor and some changes may be seen whenever it is fixed in motherboard.

3. **SEP (Single Edge Processor):** The single edge processor. The processor is not covered by the black plastic housing making the circuit board visible at the bottom. It is fixed on the mother board in a specialslot.

In all the above packages the Processor is embedded on a separate card and the entire card is installed on the mother board, and the mother board will have holders to hold the card in its place.

Now we will go through various sockets which install a processor directly on to the mother board.

4. **DIP (Dual Inline Package):**It is an electronic component package with a rectangular housing and two parallel rows of electrical connecting pins. DIP type of sockets is used by the oldest processors. Because of the difficulties while installing the processors in it is been faced by other methods. Even now normal IC's use this package.

5. **PPGA (Plastic Pin Grid Array):** Here the processor is housed in a square box designed to fit flat. Pins are on the underside of the flat housing, and heat sinks or fans can be attached to the top of the housing.

6. **SPGA (Staggered Pin Grid Array):** SPGA is almost same as PPGA but with different positioning of pins on the processor housing. It consists of two square arrays of pins, balanced in both directions by half the minimum distance between pins in one of the arrays.

To avoid damage to the processor and the motherboard the processor sockets include a technology called Zero Insertion Force (ZIF) which makes it easy to install the processor into the socket with the help of a lever.

7. **LGA (Land Grid Array):** In LGA there are no pins on the processor housing, rather than pins the housing incorporates Lands which make contact with the grid. In order to secure the processor in its socket we will be having an aluminum case around it.
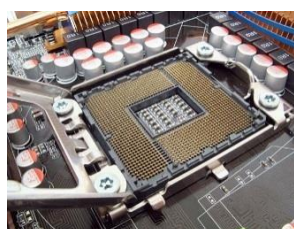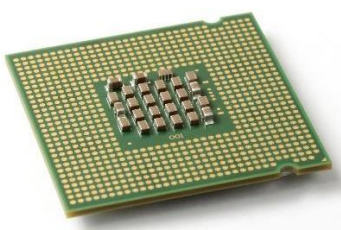
Following table shows various CPU sockets:

Connector name	Design type	Used by the CPU
SOCKET 0	PGA	486 DX
SOCKET 1	SPGA	486 DX ,486 SX
SOCKET 2	PGA	486 SX, 486DX2
SOCKET 3	SPGA	486 DX ,486 SX, 486DX2
SOCKET 4	PGA	Classic Pentium 60/66
SOCKET 5	SPGA	Classic Pentium 75/90/100/120
SOCKET 6	PGA	Not used
SOCKET 7	SPGA	Pentium MMX, Fast classic Pentium AMD KS, AMD K6, Cyrix M
SOCKET 8	SPGA	Pentium Pro
SOCKET 370	SPGA	Pentium 3,FC-PGA 370 socket , Celeron PPGA ,Cyrix 3

Following table shows various CPU slots:

Connector name	Used by the CPU
Slot1 or SC 242	Pentium 2, Pentium 3
Slot A	AMD Athlon
Slot 2 or SC 330	Pentium2 Xeon, Pentium 3 Xeon
Slot M	Itanium

1.9 Different types of RAM:

RAM stands for Random Access Memory. RAM is the place where your computer temporarily stores its OS, application programs and current data

✓ RAM is a **volatile**. Volatile means that when you turn off your computer anything in ram disappears or is erased. Computers usually come with 16 or more megabytes of RAM usually increasing in multiples of 8 megabytes. If you use graphic applications you probably have to 32,64 or more megabytes of memory

✓ If you add more RAM to your computer, you reduce the number times your processor must read data from yourdisk.

RAM types:

Two main basic types of RAM used in a PC are ***SRAM, DRAM*** and other two types are also present they are used on basis of the systems.

The types of RAM are:

1. Static RAM.

2. Dynamic RAM.

3. Parameter RAM.

4. Pseudo-staticRAM.

5. Video RAM.

1. StaticRAM:

- SRAM is only refreshed when data is written to it.
- SRAM that retain information without the need for refreshing as long as the computers power ison.
- 4 to 6 transistors to store single bit of data
- Static RAMs are more expensive than dynamic RAMs.
- Static rams maintains data till the power is off.
- Static RAMs used in cache memory and in PCMCIA memory cards.

2. DynamicRAM:

- DRAM needs to be refreshed every few million seconds.
- DRAM is refreshed by the memory controller.

- DRAM is slower than SRAM.

- DRAM is expensive and stores large amount of bits in a small amount physical space

- The average transfer speeds of 50ns or higher.

- Data storage elements are capacitors.

- In current Pc's DRAM is always stored in DIMM and RIMM modules

DRAM has the following types of RAMs:

1. SYNCHRONOUS DYNAMIC RAM

2. DOUBLE DATA RATE DRAM

3. RAMBUS RAM

1. **SYNCHRONOUS DYNAMIC RAM (SDRAM):**
   - ✓ SDRAM is currently the most popular memory type.
   - ✓ SDRAM operates in synchronous with system clock. It works with 66/100/133/150MHzbuses.

   SDRAM is in 3 variations:

   ▪**Regular SDRAM:** It runs at the same speed as the system bus and SDRAM data path is 64 bit wide

   ▪**SDRAM 2:** Sometimes it is called as double data rate SDRAM. It runs twice fast as regular SDRAM. Instead of processing data for each pulse of the system clock as regular SDRAM does. It process data at when pulse raises and again when it falls doubling the rate of memory

   ▪**Sync link DRAM:** It improved on regular SDRAM by increasing the number of memory banks that can be accessed simultaneously from four to sixteen.

2. **Double data rate DRAM(DDRDRAM):**
   - ✓ It is a faster version of SDRAM and it is designed for systems with bus speeds over 200 MHz.
   - ✓ It operates at double speed than SDRAM, because it performs a operation for every change in the clock pulse (i.e. for every raise and fall in the pulse) whereas SDRAM performs an operation for every T-sate (raising edge to raising edge or falling edge to falling edge).

3. **Direct Rambus Dynamic RAM (DRDRAM):**
   - ✓ It used the principle of narrow the data path , and improve the rate of speed ofdata.
   - ✓ The data path is 16 bits with this narrows data paths they managed speeds of 400mhz to 800mhz.so this design concept is totally different fromothers.
   - ✓ RDRAM is house on a RIMM and uses a faster systembus.

3. **Parameter RAM:**
   - ▪ Macintosh computers stores their internal configuration data such as the system date and time and other system parameters .that must be stored between system boots in what is called parameter RAM.

4. **Pseudo-static RAM:**
   - ▪ Specially made for use in portable computers and mainly used in note books and other PC's.

5. **VideoRAM:**
   - ▪ Used on video adaptor cards for buffering between the PC system and the video display.

1.10 Buses – ISA, MCA, EISA, USB, Fire wire, AGP,PCI:

In computers, the front side or system bus is a term for the physical bi-directional data bus that carries all electronic signal information between the CPU and other devices with in the system such as RAM, AGP, video cards, and PCI expansion cards. Hard disks the memory containing the system BIOS etc.

The **bus** is a series of interconnecting electrical leads which carry signals. The bus design can further be broken down into bus sections.

All buses have:

Size: Known as width, in bits like 8bit, 16bit, 32bit, or 64bit data path.

Clock speed: Measured in MHz66 MHz and 100 bus speeds are common today.

Location: On the printed integrated circuit of the mother board on adaptor/expansion cards.

Personal computer has many kinds of buses-ISA, MCA, EISA, USB, Fire wire, AGP, PCI etc.

1. **ISA BUS:**
   - ✓ The most common bus in the pc world is ISA.
   - ✓ ISA is used to connect older or slower devices it is black in color.
   - ✓ It was introduced as an 8-bit bus with the original IBM PC in1981.
   - ✓ 8bit ISA runs at 4.77 MHz and
   - ✓ It has throughput 1mb/sec.
   - ✓ In 1984 it was extended to 16bit data bus used in IBM PC/XT, Intel80286.
   - ✓ 16bit ISA runs at 8.33mhz and has throughput8mb/sec

2. **MCA (MICRO CHANNELACHITECTURE:**
   - ✓ THE MCA bus was IBM's attempt to replace the ISA bus with something "bigger and the better.
   - ✓ The 80386 DX was introduced in the mid 80's with its 32bit data bus.
   - ✓ MCA is 32bit wide and the offers several significant improvements over ISA
   - ✓ MCA runs at 12 MHz and has throughput up to40mb/sec.

3. **EISA (EXTENDED INDUSTRY STANDARD ARCHITECHTUREBUS:**
   - ✓ The ISA is developed by Compaq as answer to IBM's MCA bus and followed a similar path of development.
   - ✓ *Key features:*
     - o *ISA COMPATIBILITY*: ISA cards will work in EISA slots.
     - o *32 BIT BUS WIDTH:* Like MCA, the bus expandedto32bits
     - o *PLUG ANSD PLAY:* EISA automatically configures adaptors cards, similar to the plug and play standard of modern systems.
   - ✓ EISA runs at 12 MHz and has throughput up to32mb/sec.

4. **USB (UNIVERSAL SERIALBUS):**
   - ✓ Nowadays, if you buy any computer it will come with universal serial bus connectors. These USB connectors let you attach everything from mice to printers to your computer easily and quickly.
   - ✓ The USB gives a single standardized, easy-to-use way to connect up to 127 devices to a computer.
   - ✓ USB devices are printers, scanners, keyboard, mouse, modems ,telephones, videophones, joysticks , mice's, digital cameras etc.,
   - ✓ USB runs at 3 MHz and has throughput 12 to 480 mbps and data path is1-bit.

5. **FIREWIRE (OR) I-LINK1394:**
   - ✓ Fire wire is a method of transferring information between digital devices especially audio &video equipment.
   - ✓ It is also known as I-link,ieee1394.
   - ✓ A high speed serial bus developed by apple and Texas instruments that allows for the connection up to 63devices.
   - ✓ Fire wire is the fast –the latest version achieves speeds up to 800mbps and in future expected to jump to 3.2gbps .and data path is 1bit.

6. **PCI (PERIPHERAL COMPONENT INTERCONNECTS)BUS:**
   - ✓ It specifies a computer bus for attaching peripheral devices to computer motherboard.
   - ✓ These devices can take any one of the following forms:
     - • An integrated circuit fitted on the motherboard itself called planar device.

- An expansion card that fills in socket.
- ✓ The original PCI specification did not support expansion slots. Later on request from many industries, Intel upgraded PCI specification to support expansion slots.
- ✓ The PCI bus is either 32bit s or 64 bit wide .and runs at 33.66 MHz and have throughput up to 528mb/sec which is 42 times faster than ISA.

7. **AGP (ACCELERATED GRAPHICS PORTS)BUS:**

- ✓ It is a high speed point –to-point channel attaching a graphics card to a computers motherboard. Primarily to assist in the acceleration of the 3D computer graphics.
- ✓ AGP has almost completely been phased out in favor of PCI express.
- ✓ AGP has data path of 32bits and runs at 66.75, 100 MHz.
- ✓ It has throughput up to 528 mb/sec.
- ✓ AGP allows textures to be stored in main memory.

1.11   Setting the CPU & Bus speeds:

System bus Speed or Frequency:

- Bus frequency is the frequency or the speed at which data is placed on the bus.

- Mother board has several buses and every bus may have its own speed, some are faster than others.Only the fastest bus connects directly to the processor.

- It is called Front-Side bus or External bus or System Bus or Motherboard Bus.
- Common speeds of the system bus are 1066 MHz, 800 MHz, 533 MHz, 400 MHz, 200 MHz, 133 MHz and 100 MHz, although the bus can operate at several other speeds, depending on the processor and how the motherboard is configured.

Processor Speed or Frequency:

- Processor Frequency is the speed at which the processor operates internally.
- The first processor Used in IBM PC was the 8088, which worked at about 4.77 MHz, or 4,770,000 beats per second.
- An average speed for a new processor today is about 3.5 GHz, or 3,500,000,000 beats per second.
- If the processor operates at 3.2 GHz internally but 800 MHz externally, the processor frequency is 3.2 GHz and system bus speed is 800MHz.

In this case the processor operates at four times the system bus speed. This factor is called ***MULTIPLIER***.

System bus frequency x Multiplier = Processor frequency.
Example: 800 MHz x 4 = 3200 MHz (3.2 GHz).

In some mother boards the users have to set the system bus frequency and the processor speed. This can be done by knowing the multiplier value. But most of our current motherboards come with a feature of configuring and setting these speeds automatically.

You can set the speed of your processor and the bus speed through the BIOS settings, if it permits. Setting the speeds greater than the normal results in improved performance. This process is called ***OVERCLOCKING***.

1.12 CMOS setup and data protection:

❖ **CMOS SETUP:**

- When you make changes to your BIOS configuration, the settings are not stored on the BIOS chip itself.
- Instead they are stored on a special memory chip, which is referred to as CMOS.
- **Complementary metal–oxide–semiconductor-** it's the name of a manufacturing process used to create processors, RAM, digital logic circuits, and is also the name for chips created using thatprocess.

- Chip that stores BIOS settings is manufactured using the CMOS process.
- It holds a small amount of data, usually 256bytes.
- The information on the CMOS chip includes- what types of disk drives are installed on your computer, the current date and time of system clock, computer boot sequence.
- CMOS has its own dedicated power source, which is the CMOS battery.

Following table shows important CMOS settings and their purpose:

Category	Setting	Description
Standard CMOS	Date and time	Used to set system date and time.
	Primary display	Used to tell type of video being used.
	Hard disk type	Used to record size and mapping of the drive.
	Floppy disk type	Choices for using 3 ½ inch and 5 ¼ inch.
Advanced CMOS setup	System boot sequence	Used to establish the drive the system first check for an OS.
	External c, ache memory	Uses to enable L2 cache.
	Password checking	Uses to establish a set up password.
	Boot sector virus protection	Gives warning when something is being written to the boot sector of the hard drive.
	Memory parity error check	It enables parity checking to ensure that memory is correct.
	Plug and play	Enables for windows 9x, which uses for bios disable for windows 2000/XP which does PnP configurations.
Advanced chipset setup	AGP capability	Switches between 1x,2x,4x,8x versions to accommodate different AGP video cards
	AGP aperture size	Adjusts the amount of system memory AGP can addresses
	AGP voltage	Sets AGP operating voltage according to video card requirements
	Serial port	Sets beginning I/O address and IRQ
	Parallel port	Used for ECP or EPP
Power management menu	Power management	Disables or enables all power management features.
	Video off method	Sets which way video to the monitor will be suspended
	HDD power down	Disables or enables the features to shut down the hard drive after a period of inactivity
Hardware device settings	External clock	Sets the system bus speeds
	I/O voltage	Sets the appropriate I/O voltage for the processor
	Core voltage	Sets the appropriate core voltage for the processor
	Processor operating speed	Sets the appropriate speed for your processor
Hard drive	IDE HDD auto select	Detects HDD's installed on either IDE channel

	Serial ATA	Configure to IDE or RAID
settings	Smart monitoring	Monitors the HDD for failure

Data protection:

- ✓ Backup your data files and test your backup's.
- ✓ Never share your passwords with others. If you suspect some one knows your passwords change it immediately.
- ✓ Use strong passwords & Lock your computer when unattended.
- ✓ Power off your computer at the end of the day.
- ✓ **Use firewalls:** Firewalls should be used on any computer that connects to a network or the internet to stop any viruses files
- ✓ **Use anti-spy ware program:** spy ware applications are typically are bundled as a hidden component of freeware or shareware programs that can be downloaded from internet .once installed the spy ware monitors user activity on the internet and transmits that information in the background to someone else.
- ✓ Use and update antivirus software.
- ✓ Use **email responsibly:** Many viruses and worms are spread via emails an attachment should not be opened unless it was specifically requested or expected.

❖ **Protecting sensitivedata:**

To protect hardware and software following things are to be followed:

Frequency	Component	Activity
Daily	PC	Perform a virus scan of memory and hard disk.
	Windows	Restart and shut down windows.
	Hard disk	Create a differential /incremental backup.
Weekly	Hard disk	Remove all temp files and clear C:\temp and c:\windows\temp.
	Hard disk	Create a full/achieve backup.
	Web browser	Clear web browser cache, history and temporary internet files.
	Antivirus s/w	Update antivirus software.
	Windows desktop	Empty the windows recycle bin.
	Inkjet printer	Run print head nozzle cleaning utility.
Monthly	Hard disk	Defragment the drive and recover lost clusters.
	Hard disk	Uninstall all necessary applications.
	Keyboard	Clean keyboard with compressed air and check for repairs and struck keys.
	Mouse	Clean ball and rollers.
	Monitor	Turnoff and clean screen with soft cloth.
	Dot matrix printer	Clean with compressed air to remove dust & bits of paper.
On failure	Floppy disk drive	Clean floppy drive hear.
	System	Trouble shoot& replace failed component if necessary.
As required	Motherboard	Check chips for chip creep and reseat if needed.
	Adapter cards	Clean contacts with contact cleaner and reseat.
	CMOS	Record and back up CMOS setup configuration.
	PC	Keep written record of hard ware and software configuration of the system.
	Printer	Check ink and toner cartridges or ribbons &replace it.
	Hardware	Clean the keyboard, mouse, monitor and case.