UNIT - I

Basic Computer System

As you can see in this figure a and a computer configuration consists of the Monitor, Main system Unit, Keyboard and a Mouse. Initially, Mouse was not part of the basic computer configuration, but as the use of Windows and other graphical interface increased, mouse has become a part basic computer system configuration.

Main System Unit :

It contains all major components of the computer. It contains CPU (central Processing Unit, Brain of the computer) and the RAM (Random Access memory, memory of the computer), on electronic circuit board known as" motherboard" . It also contains storage devices such as floppy disk drive, hard disk drive etc .power supply which provides clean electrical power to the computer is also located inside this system unit.

The Monitor:

It is most common output device used with a computer. This is a TV like device that display information send to by the computer. A monitor can display text, as well as graphic images in multi-color or single colour, based on whether the monitor being is monitor or a monochrome (single color) monitor .

The Keyboard & Mouse:

These are two of the most common input devices used with the computer. Initially the keyboard was the only input device, but as the use of Windows and Windows like other graphical interface based software increased, the mouse has become an integral part of the computer .

other than these basic/ minimum required to use the computer, one must also have some device output on the paper ,for this a "printer" is used.

One can use a device called "Modem" to connect the computer to a number of different computers anywhere in the world, using the Internet world wide of computers.

A scanner can be used to feed any existing image, photograph, the computer drawings etc. into the computer.

Main System Unit :

Let us now take a closer look at the main system unit of the computer, The main system unit of a computer is available in basically two different styles .

1.Desktop

2.Tower

The initial Personal Computer (PC) had desktop style case, but currently the tower style case is more common with the PCs, The tower style cases based on its height is available in full size, normal size and mini size.

FRONT OF MAIN SYSTEM UNIT

The front side of the main system unit, whether it is desktop style or tower style case, contains many different switches and indicators, let us see what they are and what is their use.

Indicators :

The front side of the main system unit has many indicators to indicate different activities being done by the computer. Most of these indicators are LEDs (Light Emitting Diodes) that emit red, yellow or green light to indicate different activity.

Power

This LED indicates the power on position of the computer .

HDD access:

This LED indicates that the storage device, Hard Disk Drives is doing a read or write operation.

Turbo:

When this LED is on, it indicates that the computer is working in fast, turbo mode Non-turbo mode is also known as compatibility mode". In current generation of computers this indicator is no longer used

Speed :

This is a 2/3 digit indicator to show the current speed of the computer. This speed is shown in MHz (Mega Hertz) .

The speed shown on this indicator is not the real speed of the computer. when the computer is assembled, this indicator can be setup to show any speed by the person assembling the computer. So, one should not take the speed displayed by this indicator very seriously.

In current generation of computers this indicator no longer used .

SWITCHES

With the indicators, the front panel of the system unit contain many switches to control system.

Turbo:

This switch is used to change the computers speed from speed turbo mode to normal mode or from normal mode to turbo .

In turbo mode the turbo indicator will be on and the speed indicator will show higher MHz speed. When computer works in slow speed "normal mode" the turbo LED will be off and the speed indicator will show a slower MHz speed.

In current generation computers this switch is no longer provided.

Reset :

This switch provides an option to restart the computer without switching off the power supply of the system. Pressing of this switch will restart the computer.

This switch can be used when the computer is not responding to keyboard.

Power on/off :

Desktop style computer case provide the power on/off switch on the back side of the computer, on the power supply itself. But, the tower model computers provide the power on/off switch on the front panel of the computer.

This switch is used to turn the power supply on/off.
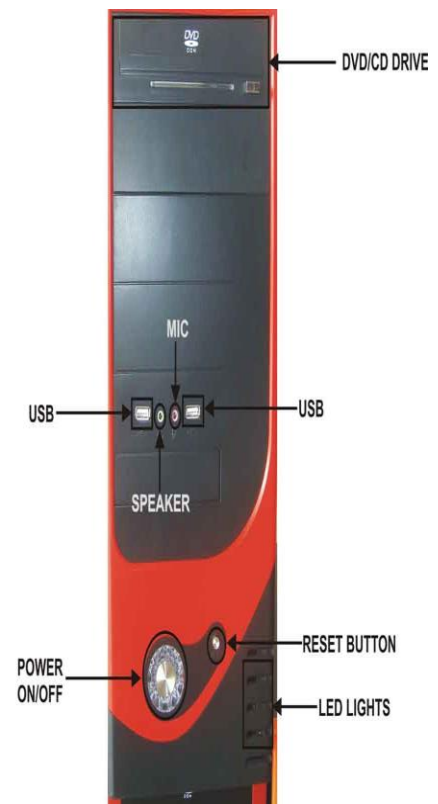
Keyboard Lock (Keylock) :

A keyboard lock is provided in most of the access to stop computer access by unauthorized persons. When this lock is off the keyboard will not function. Many computers also lock the system units cover when this lock is on, so that nobody can open the cover and override the lock. In current generation computers this lock is no longer provided.

BACK OF MAIN SYSTEM UNIT

The back of the main system unit whether it is desktop or tower style contains many different connectors. Let us see them, what they are and what is their use.

Male/ Female Connectors :

Male connectors are connectors with pins on them and female connectors are connector with holes on them.

Power in Socket :

This male socket is used to connect the power supply cable from the AC mains power supply to the computer system.

Power Out Socket:

This female socket is provided on the back of the system unit to provide power supply to the monitor.Monitor can be connected to this power output, or can be directly connected to the AC mains power supply. This depends on the type of the power connector provided on the monitor.

Power Supply Fan outlet:

The power supply, inside the main system unit, has a fan to remove the hot air generated by various components inside the unit. This fan also helps to re-circulate the outside cool air inside the system unit. The outlet for this fan is provided at the back side of the main system unit.

Keyboard Connector:

 A round opening is provided on the back of the main system unit to connect the keyboard to the computer. The actual keyboard connector is little inside on the motherboard. One can see the connector from this opening.

Peripheral Connectors:

The backside of the main system unit provide connectors for the different i/p or o/p devices used with the computer. These devices are also known as peripherals. There are different connectors for the monitor, mouse, printer ,audio etc.

3
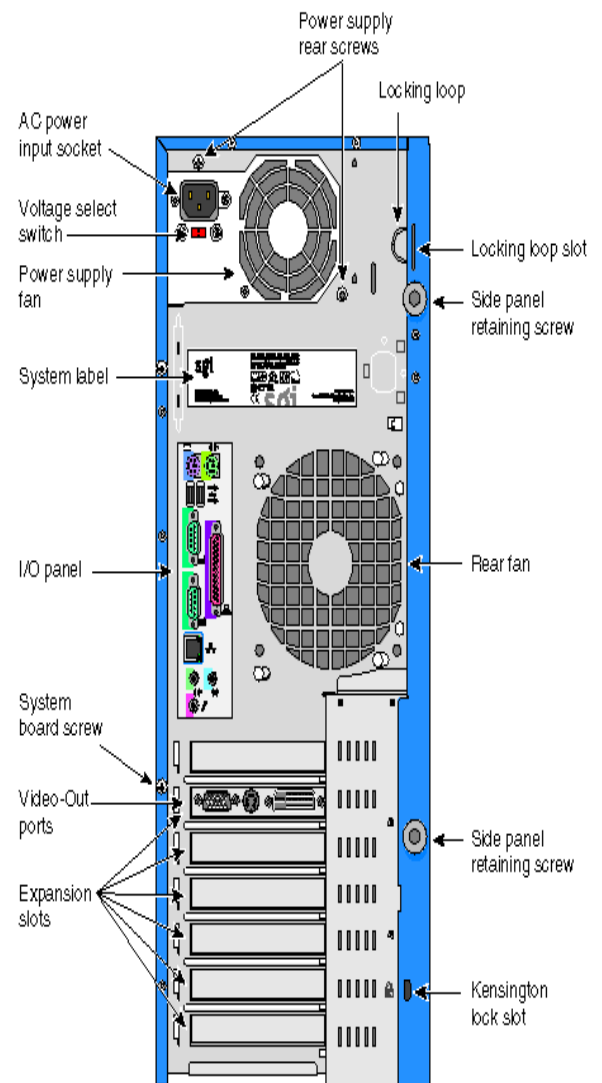
Inside the Main system Unit:

Motherboard:

The main component inside the main system unit is the motherboard. This is the biggest electronic circuit board inside the computer system, on which many other board are attached .
The boards that attach to the motherboard are known as daughterboard or expansion board .
The motherboard contains many important components. such as
- The CPU (computer's brain)
- RAM &ROM (computers memory)
- many support chips for the CPU
- and Expansion slots to Connect Peripheral.

CPU

Central Processing unit is the brain of the computer Al the mathematical operations such as addition, subtraction etc. and the logical process such as comparing of two values are done by the CPU. The CPU is also known as Microprocessor.

Memory (RAM & ROM)

For any mathematical or logical operation, CPU requires some memory.   this memory is used to store the initial values, intermediate results and the final results, during any operation.

CPU Support Chips:

With the CPU and the memory, motherboard also contain some support chips or ICs. These chips help the CPU in carrying out its various activities. some of the common support chips are DMA Controller, Interrupt Controller, Keyboard Controller, Timer etc.

Chipset:

Current motherboards provide different functions provided by the support chips on a set of chips (ICs) known as chipset. These chipsets are made by various motherboard manufacturers, such as Intel, Opti, Via etc.

Expansion Slots to Connect Peripheral :

The motherboard contains many expansion slots, long narrow connector towards the back of the computer. on these slots different expansion cards can be connected to attach various peripherals devices to the computer. These expansion slots provide path to devices connected to them to communicate with the CPU and memory on the motherboard

Storage Device:

Main system unit also contain the storage devices. These devices are used by the computer to store various information.

Some storage devices such as floppy disk and hard disk work on the principal of electromagnetism, currently storage devices that use light (laser beam) to read /write data on optical disc are becoming popular, these discs are known as CD-ROM (Compact Disc Read Only Memory) disc.

 Some of the common storage devices are

1. Floppy Disk Drive

2. Hard Disk Drive and

3. CD-ROM/DVD Drive

PRINTER :

Printers are output devices, they are used to get the computer output on a paper, envelop, OHP transparency sheet etc ..output produced by Printer is known as "hard copy" because these outputs are permanent compared to the information displayed on the monitor, which is known as soft copy .

Three types of printers are commonly used with the PC, they are

1. Dot-matrix
2. Inkjet
3. Laser

The quality of a printed output is measured in the number of dots printed by the printer, in per square inch of area. This is known is DPI (Dots Per Inch) value.

Dot-Matrix printers have lowest DPI value, laser and ink-jet printers are available for 300 and more DPI value.

MODEM:

The modem is a device which allows you to connect your computer to any other computer, anywhere else in the word using a telephone line.

This allows you to communicate with the connected person, transfer data copy software / programs from the connected computer, sent and receive mail using e-mail etc.

Currently, the modem can also be used to sent and receives fax, for this you can use modem as a fax devices. To connect to the Internet or the www (world Wide Web)one requires a modem.

The modem is available as

(i) Internal Modem and

(ii) External Modem

How modem works?

The modem is a device which is allows you to connect your computer to any other computer, anywhere else in the world using a telephone line. The sending computer's modem modulates the digital signal from the computer into analogue signal required for transmission over the telephone line. At the receiving end, the incoming analogue signal is given to the modem. This modem demodulates the analogue signal back into digital signal and gives this signal to the computer.

When the computer is switched on and it ready to transmit data it sends a data terminal ready signal to the modem. When the modem is ready to receive data or instruction from the computer, it sends data set ready signal to the computer. Both these signals must be present before the next step can happen. Next, the computer sends a command to modem to go "off Hook", to open communication with the telephone line. Next, the computer issues the command to modem to dial a phone number.

These commands are given via "transmit data TXD" line. The modem acknowledges receipt of these command by replaying to the computer on the "receive data RXD" Line. When the remote modem, the modem at the other end of line response , the local modem sends a special greeting tone to the remote modem, to inform the modem that it is being called by another modem. The remote modem responds with a higher pitched tone.

Once a communication is established between the two modems , local modem sends a "carrier detect" CD signal to the computer. Carrier is steady tone signal of a fixed frequency, which is later modulated by modem to transmit the data. Next, the two modems enter a process known as "handshake". This process decides during this process are,

- The number of bits used to represent data,
- Number of bits used to indicate start and end of data
- Use of parity bit for error checking and correction
- Transmission speed, transmission protocol, compression method etc. Being used

If the two modems, local remote do not use the same setting then they will wind up sending characters that will not make sense, or they may completely refuse to communicate with each other. Once the handshake is done, the computer sends a request to send(RTS) signal to the local modem. This signal ask the modem if the modem is free to receive data from the computer. If the modem is not busy, then the modem will send the clear to send(CTS) signal to the computer. Once the computer receives this CTS signal from the modem , then computer will send the data to be transmitted to the modem.

If the modem cannot transmit the data, as fast as it is received from the computer, then the modem will drop the CTS signal to the computer, this will stop any further data from the computer. Computer will stop data transmission to the modem until it receives CTS signal. Data received by the local modem is transmitted as different frequency sound signal to the remote modem. The remote modem converts these series of tones back into digital signal and gives it to the computer , it is connected to.

Once the data trans mission is over, modem sends a break communication command. If the connection is broken by remote modem, the local will drop the carrier detect(CD) signal. This will inform the local computer that the communication is broken.

SCANNER:

Scanner is used to input a photograph or any other existing drawing, sketch etc. Into the computer. The scanner is a photocopier like device, which scans the image put onto it and sends the image into the computer. Once the image is scanned into the computer, you can manipulate the image using graphic manipulation software such as Corel photo paint, adobe Photoshop etc.

LAPTOP/NOTEBOOK/PORTABLE COMPUTER:

A laptop or notebook computer is a portable computer that is entirely self contained. In a portable computer, a single package includes main processor, memory, the display system, the keyboard, mouse, and a set of batteries. All laptop PCs have flat panel display systems because they can fit in the computer case and also their power requirement is very small compare to standard picture tube based display. These flat-panel display can operate from rechargeable batteries common flat panel display used with portable computers are LCD displays and gas plasma display.

Almost all notebook computers use a design known as "clamshell design". In this design, the display screen folds the flat a top the keyboard this design is good to protect both the screen and key board while travelling with the notebook. Like a clamshell the two parts of the computers are hinged together at the rear Different portable computers are classified according to their size and weight, some of them are:

- Laptop
- Notebook
- Palmtop
- PDA - personal digital assistant

The laptop is the heaviest portable computer and PDA is lightest portable computer.

Regular computer cards are too heavy and use too much power to use them in portable computers. Instead, a visiting card size expansion slot and card is used in these computers. This card is known as PCMCIA cards. The term PCMCIA stands for personal computer memory card international association.

These cards are available in type -I, type-II , type-III formats

- This type-I card are 3.3mm thick and can be used in all the three type slots. Type-I card is used for memory card and software application cards.
- Type-II cards are 5mm thick and can be used in type II and type III expansions slots. Type II card is used for modem & fax cards, LAN cards and all type-I
- Type-III cards are 10.5mm thick and can be used in only types-III slots.
- Type-III card is used for miniature hard drives and for all type-I & II use.

STARTING THE COMPUTER /BOOTING THE COMPUTER :

Once all the required devices are properly connected to the main computer unit, you can switch on the computer. Start the computer on the AC switch, power conditioning device (UPS, stabilizer etc.) switch and the power-on switch provided on the front panel or the back of the main system unit. Turn on the monitor, turn on the printer, the external modem, and the speaker if you require their service.

When the main unit is turned on you will hear the main unit power supply fan's rotation sound. After some time the computer will produce a single beep sound to indicate that all its parts are working properly. Before producing this beep sound, computer does a POST (Power on Self Test) operation. During POST, computer checks most of its parts to make sure that they are working normally. During this POST, if the computer finds that a part is not working as

expected, then will display some error message or produce some combination of beep sounds some inform that something wrong with the computer. These beep sound combinations is called Error Beep Codes.

After this beep, the computer needs a software called operating system (OS) operating system or OS or Dos (for Disk operating system) stored on some storage device such as a floppy disk, hard disk drive or CD ROM and provided to the computer during the power on process. Computer reads the operating system (OS) from the storage device into its memory the RAM, This process of loading the OS from storage device into the computers is called "Booting of the Computer".

This booting process is repeated whenever the computer switched on, because every time power supply to the computer is switched off, the information stored in the computer's memory (RAM) is lost. The popular OS are (i) MS-DOS, (ii) Unix, (iii) Linux, (iv) MS-Windows, (v)OS/2,(vi) DR DOS etc….

Starting with MS-DOS/Booting with MS-DOS:

Let us see how to start a computer with MS-DOS. Based on whether the computer has a hard disk drive or not, this process is done in two different ways.

Without Hard Disk Drive:

If the computer does not contain a hard disk drive, then it must have a floppy disk drive to boot the system. To boot the system, keep a floppy disk that contains the MS-DOS (known as DOS Floppy, Boot Floppy or System Floppy) into the first drive (drive A:) and close the drive door.

Switch on the system, after some time the computer will start copying the OS from the floppy disk into the computer's memory (RAM). The computer will then display "starting MS-DOS" message on the screen. Once the OS is transferred into the computer's memory, DOS will take control of the computer and you will see the DOS prompt A: \> on the screen.

Once the Dos prompt comes on the screen, you can use Dos commands to communicate with the computer. When you are at the Dos prompt, computer will recognize DOS commands.

With Hard Disk Drive:

Our computer has a bootable hard disk drive then every time you switch on the computer, you will not be required to place a Dos or Boot floppy disk into A: drive. When Computer is switched on, it will copy the OS from the hard disk drive into its memory and make the OS active.

When booting the system from a hard disk drive make sure that the door of all floppy drives are open, otherwise if you have a floppy disk without the OS in the floppy disk A and the door of the drive A is close then because the computer cannot find the OS in that floppy disk, computer will suspend the booting process with some error message such as

Non-system disk or disk error
replace the disk and press any key.

If your hard disk drive is not bootable then you will be required to provide a bootable floppy every time the computer is switched on.

Starting With Windows 95/98 (or) Booting with Windows 95/98:

When using Windows, booting from a floppy disk will take you to the DOS prompt, to the Windows operating system. When the Windows is started from the hard disk drive, after sometime, "Starting Windows 95" or "Starting Windows 98" message appears on the screen. Now depending on the software setup with Windows, a logon screen may appeal this screen comes on then type in the user name and password, at appropriate places and press enter key.

After the enter key is pressed, the Windows is loaded into computers memory and control of computer is handed over to the Windows. After Windows is loaded, windows task-bar and start button will appear on screen. At this stage one can start using the computer.
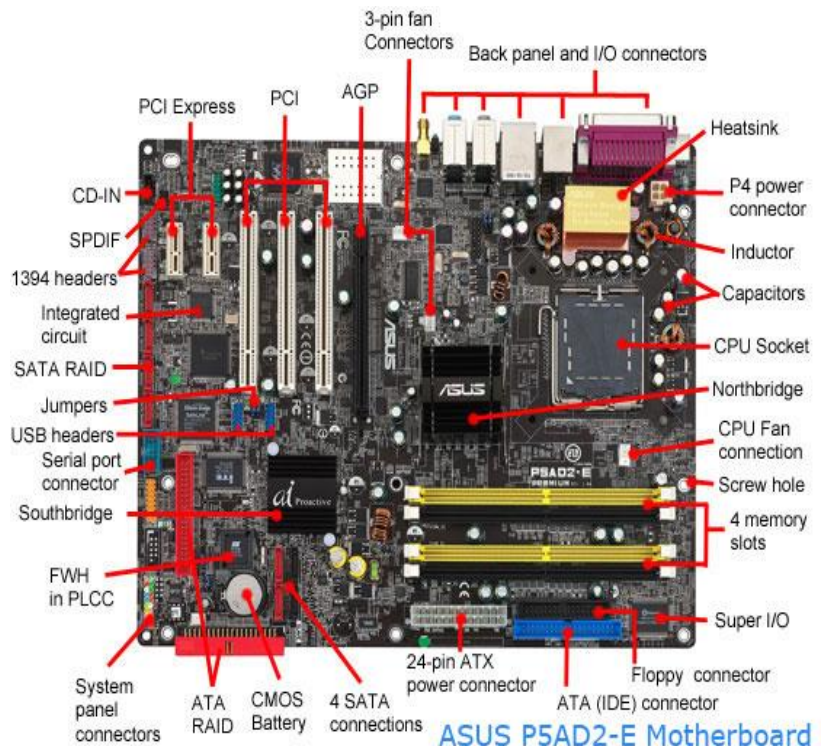
MOTHERBOARD

The motherboard is the most important component in any personal computer. It contains almost every important parts of computer system. Normally, the motherboard contains the CPU or the brain of the computer, memory and support circuits to make the computer work. Motherboard also contains many Expansion slots on which you can connect various circuit boards. These circuit boards are used to connect different devices such as monitor, printer, scanner etc... The motherboard is also called as main board because all other circuit boards inside the computer are attached to this board. The motherboard is called as main board and other boards are called as daughter board.

The motherboard contains,
  (i)   CPU
  (ii)   Co-processor
  (iii)   CMOS memory
  (iv)   Real   Time Clock(RTC)
  (v)   Memory
  (vi)   BIOS
  (vii)   Support chips
  (viii) Expansion slots

ASUS P5AD2-E Motherboard

On the motherboard printed circuit board(PCB) , the components are placed and connected with the help of copper tracks. Motherboard PCB contains many such tracks to make electrical connection between different parts of the system. These tracks are very fine and hence one should never put excessive pressure on the board while inserting or removing cards or chips. Once a track is broken, because of the multiple layers of tracks, it is almost impossible to trace the broken area and repair it.

CMOS MEMORY: In old IBM XT or compatible system, BISO with the help of jumpers detected about the components on the computer system. IBM AT and higher systems do not use these jumpers, instead they use a small CMOS memory with battery backup to store the system configuration, date and time, etc.... Here CMOS stands for complementary metal oxide semiconductor. This CMOS memory receives power from a battery accompanying it, this battery helps in retaining the information stored in it, even when the system is switched off.

BIOS – BASIC INPUTPUT SYSTEM : BIOS is an abbreviation of basic input output system. It is one of the most important program stored inside the computer. It is a firmware, as it is stored in the ROM. BIOS program lets the user application program and the hardware such as floppy disk, hard disk, video adapter etc.. communicating with each other. It is pronounced as "bye-os". The BIOS also contains a program called power on self test(POST). This POST program checks the motherboard and other devices connected to the computer during the system power on.

RAM

RAM or Random Access memory is the main memory inside the computer. It is used to store program , data and results. It is called random access because this memory is organized in such a way that any part of the memory is easily accessed without serially going through all the previous memory locations. RAM is also called as the read/write memory. One can store data in RAM and other can read the Data stored inside RAM. The two common RAMs are

        i. DRAM(Dynamic RAM)
       ii. SRAM(Static RAM)

ROM(READ ONLY MEMORY)

Read only memory as its name suggest, is a memory that can be read only , but we cannot write information into it. ROM is a non volatile memory, it does not lose its content when the power supply is cut off. ROM is also called random access memory that is we can access directly the part of ROM without serially going through the complete ROM. The ROM is classified into the following types, (i) Mask ROM, (ii) PROM, (iii)EPROM,(iv)EEPROM,(v)Flash Memory.

EXPANSION SLOTS:

The expansion slots are long thin connectors on the motherboard, near the backside of the computer. Expansion slot is the backbone of the computer. When the user want to add a new device to your computer other than what is on the motherboard, we need an expansion slot. Different expansion cards are connected to the motherboard through the data, address and control lines or buses on these slots. Depending on the width and the technology, expansion slots can be divided into following categories, they are :

- 8-bit ISA
- 16-bit ISA
- MCA
- EISA
- VESA OR VL BUS
- PCI
- AGP

UNIT - II
EXPANSION SLOTS:

The expansion slots are long thin connectors on the motherboard, near the backside of the computer. Expansion slot is the backbone of the computer. When the user want to add a new device to your computer other than what is on the motherboard, we need an expansion slot. Different expansion cards are connected to the motherboard through the data, address and control lines or buses on these slots. Depending on the width and the technology, expansion slots can be divided into following categories, they are :
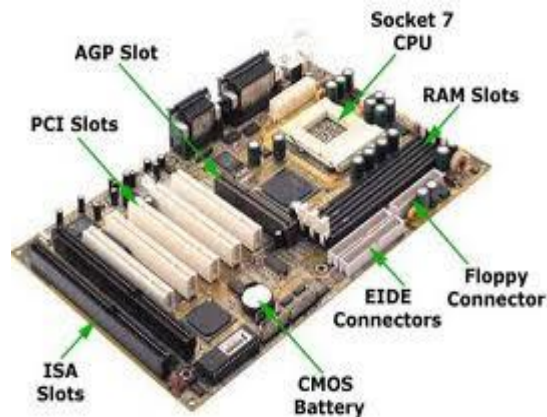
* 8-bit ISA
* 16-bit ISA
* MCA
* EISA
* VESA OR VL BUS
* PCI
* AGP

8-BIT AND 16-BIT ISA

ISA stands for industry standard architecture
and its it the first and most common bus architecture for the PC's. This type of adapter(8-bit) have a total of 62 contacts at the bottom of the adapter card , that is 31 contacts on both sides. It has 8-bit data and 20-bit address lines and power , control lines. The 16-bit ISA is available in 80286 processors. The AT architecture motherboard are equipped with 16-bit ISA bus. It has extra 36 connectors , that is 18 connector on both side, which is added with 8-bit ISA bus.

MCA- MICRO CHANNEL ARCHITECTURE

It is a bus technology based on completely new bus design introduced by IBM for their PS/2 range of computers. MCA never became a popular bus because of two main reasons:

* First reason is that it is not compatible with existing ISA technology and requires completely expansion slots..
* The second reason is IBM had made the earlier 8-bit and 16-bit ISA bus system as a open system. That is anybody could make and sell ISA cards. The MCA architecture was made a proprietary system by the IBM and they allowed only a few manufacturer to make PCA adapters and charged high license fee from them.

Two new concept is introduced with the MCA is now being made by many other newer bus technologies such as PCI etc., they are (i) Auto configure, (ii) Bus mastering.
(i) Auto configure – This allow the user to connect any device to the MCA bus without worrying about the IRQ, Interrupt and DMA channel setup problems. Its another name is Plug and Play.
(ii) Bus mastering – This allows the peripheral device to take the control of the bus from the CPU for a short time. Using this facility the device can transmit or receive large blocks of data in a short minutes.

EISA- Extended Industry Standard Architecture

EISA or Extended industry standard architecture is a bus architecture created by a group of nine computer manufacturers in response to the MCA bus design by the IBM. The advantage in favor of the EISA is that even though it is a 32 bit bus technology, it is compatible with the 8-bit ISA and 16-bit ISA adapters. It allows bus mastering and auto configure technology.

Local Bus

The major drawback of the ISA or EISA bus is they do not allow the devices connected to them to communicate with the CPU at the maximum speed that the CPU can offer. For example if you have a motherboard with 33 MHz CPU and our expansion slot is at 8 MHz, 16-bit ISA slot, than the device such as video or hard drive connected to this slot cannot operate at its full capability. It is like when we are try to send the water coming in a 6-inch diameter pipe through a one inch pipe. But a Local bus slot allows the device connected to it to communicate with the CPU at the speed, the CPU is capable of. There are many local bus design in the market. Most of the proprietary designers from one manufacturers will not work with the card from other manufacturers.

VESA Local Bus / VL Bus

VESA stands for video electronics standard association, which is an association of video adapters and monitor manufacturers to standardize the PC video specifications. There are two main use of the local bus slot is for connecting, (i) The video adapter and (ii) the hard disk drive adapter. These two devices requires fast access by the CPU. The maximum speed limit for the VL bus specification is 33 MHz without any wait state. The VL bus can move data between the processor and the video or any other device connected to the VL bus at the 32 bit data at a time. The maximum throughput of the VL bus is rated to be about 130 Mega bytes per second, which is about 16 times faster than ISA.

PCI (PERIPHERAL COMPONENT INTERFACE) LOCAL BUS :

The VESA BUS OR VL BUS was the best option for a 486 machine, when Intel introduced the Pentium CPU, with the 64 bit data path and 60-200 MHz speed, the VL bus could not take complete advantage of these improvements.

But the VL bus has the limitation of 32-bit path and minimum of 33MHz speed.
To overcome the limitation of VL bus , Intel provides a completely different local bus specification called PCI or peripheral component interconnect or interface. With the Pentium processor the PCI is standard local bus. It supports the 130 megabyte per second bandwidth, and take the 64-bit data path of Pentium processor. It is operated 33 MHz originally a long with 32 bit side path. Now a days it is operating with 64-bit transfers at a speed of 133 MHz for 1 Gbps transfer rate.

AGP – ACCLERATOR GRAPHICS PORT

AGP stands for accelerator graphics port which is a high speed bus for display boards, some of the features are :
➢ It allows the video board to use the system memory as video memory
➢ It is four to eight time faster than PCI.
AGP slot on the motherboard can be easily distinguished because it is slightly offset from the other PCI slots, and darker in colour.

CHIPSETS

In early PCs, support circuits for main processor were constructed from a variety of small, general purpose ICs each with a specific function, such as DMA controller, Interrupt controller etc. As PCs became increasingly popular, semiconductor firms combined many of these support functions into a set of Integrated Circuits. This set of ICs are called Chipsets.

What is Chipset?
All the diverse support functions inside a PC were integrated into a few VLSI components individually termed Application-Specific Integrated Circuits or ASICs, these ASICs are collectively called Chipset.

MEMORY

Computers store programs and data on memories. Computer takes program instructions one by one from the memory and execute them. The data required for program execution are also kept in the computer's memory before transferring them onto some permanent storage device or an output device.

Computer memories can be of two types based on whether it is inside the computer or it is an external storage device.
- Primary Memory
- Secondary Memory

Primary Memory

The main memory or the memory on the motherboard is called Primary Memory. They can be further divided into two types:
- Random Access Memory (RAM)
- Read Only Memory (ROM)

RAM	ROM
[1] RAM is a volatile memory, which means it loses its contents when the power supply is switched-off.	ROM is non-volatile memory, which means it doesn't lose its content when the power supply is switched-off
[2] Temporary Storage device, Stores intermediate data during program execution	Permanent Storage device for storing system programs such as Boot Programs, OS, Compilers, DBMS..etc.
[3] Both Read and Write Capabilities	Only Read capability
[4] Two common RAMs are Static RAM and Dynamic RAM	PROM, EPROM,EEPROM Flash Memories

SECONDARY MEMORY
The Secondary memory is not a memory in conventional terms. It stores data permanently. Examples are Floppy disk, Hard disk, CD-ROM etc…

RAM(Random Access memory)
RAM or Random Access memory is the main memory inside the computer. It is used to store program , data and results. It is called random access because this memory is organized in such a

way that any part of the memory is easily accessed without serially going through all the previous memory locations. RAM is also called as the read/write memory. One can store data in RAM and other can read the Data stored inside RAM. The two common RAMs are

(i)   DRAM(Dynamic RAM)
(ii)   SRAM(Static RAM)

DYNAMIC RAM(DRAM)

A Dynamic RAM is cost wise cheaper than Static RAM. It is the main reason for using DRAM as the main memory. DRAM uses capacitors to store the information, so the problem with the DRAM is once data stored into it, it can't retain the data for long unless the data is refreshed periodically. Refreshing of a DRAM memory is done by rewriting the entire content of the memory in few millisecond. For this purpose we need special refresh circuit.

Static Random Access Memory (SRAM)
In SRAM in which the data is retained without the need to refresh.
o   Faster, larger and more expensive than DRAM.
o   It doesn't require refreshing circuitry
o   It generally use Flip Flops to store information

ROM(READ ONLY MEMORY)

Read only memory as its name suggest, is a memory that can be read only , but we cannot write information into it. ROM is a non volatile memory, it does not lose its content when the power supply is cut off. ROM is also called random access memory that is we can access directly the part of ROM without serially going through the complete ROM. ROM can be classified into following types :

(i)   Mask ROM: A mask ROM is the basic ROM chip.   In this type of chips the information is fabricated into the chip at the time of manufacturing. It is too costly.

(ii)   PROM: PROM stands for programmable read only memory , which is the ROM memory with a small difference. At the time of manufacturing, this chip is made a blank ROM chip and later using the special PROM programmers the information is stored into them. It uses burning concept which means the information is stored into ROM.

(iii)   EPROM: EPROM or Erasable programmable read only memory. It has an option to erase its content if user wants to change the information stored into it.
EPROM is easily distinguishable from other chips because of a small window in the middle of the chip. This window is covered with a transparent quartz glass.
Through this window, ultraviolet light can be shined on the EPROM to erase its content. Once the EPROM is erased it can be reprogrammed or rewritten using the EPROM programmer.

(iv)   EEPROM: It is Electrically erasable programmable read only memory. The difference between EEPROM and EPROM is the way of content erased. In EEPROM the content is erased by using electricity.

(v)   FLASH MEMORY: It is a new type of EEPROM that can be erased and reprogrammed using the normal operating voltage found inside the PC is called the flash memory. The flash memory has the same limitation of EEPROM, it an erased and programmed only for a fixed number of times and it must be erased and programmed in blocks.

 ECC- MEMORY : When we add more and more memory, the chance of data corruption due to even one bit going wrong increases. A computer with parity checking memory can only detect the error and shutdown the system, it cannot take any corrective steps. The Error correction code(ECC) memory can automatically detect and correct memory errors using special algorithms. To use ECC memory, motherboard must have this option. When ECC memory is installed on such systems, the motherboard will detect and configure the system to use it.   In a 168 pin DIMM, 64-bit variety is without ECC and 72-bit variety is with ECC, so if one wants ECC facility , one should buy 72-bit DIMM.

DIP-(Dual Inline Package): DIP or dual inline package was used to be the most common packing for the memory chips, it look like a small flat , rectangle box with metal legs on both sides. The memory chip introduced with the first PC could store only 16 Kbits of information each. Later with the AT machines 256 Kbit chips were introduced.

SIPP – (Single In Line Pin Package): SIPP or single pin package contains pins at the bottom to connect them into the memory socket on the motherboard. Most of the time these SIPPs are directly soldered onto the motherboard rather than inserting them into the socket.

To remove SIPP module one can just pull the SIPP modules from both sides using even force and remove it from the socket.

When we want to insert the SIPP module into its socket, first place the module in proper orientation on the socket and slowly press both sides down using even force, and this technique should fix the module into the socket.

 SIMM (Single Inline Memory Module):

SIMM or single inline memory module is a number of memory chips soldered onto a small expansion board. The edge connector of this expansion board is plugged into a special SIMM sockets on the motherboard. The SIMM design allows the memory to be added and removed from the computer without risk of destroying it.

It comes in different capacities. Inserting the removing the SIMM module in the socket is very easy. The following steps show how to remove or insert the SIMM as follows ,

- The SIMM is hold in the place by two metal or plastic clips on the both sides.
- Two latching holes in the module is also fixed on small round tabs on the socket.
- To remove the module, move the clips away from the module and push the module out of the tab.
- To insert the module place it on the socket and press from the both ends until the tab is in the latching hole and clips have locket the SIMM into the socket.

- It is careful about the orientation of the SIMM when inserting them into the socket. Many sockets have key tab to prevent the module from inserting reverse.

30-pin SIMM:

The 30-pim SIMM is the first SIMM introduced with the PC system. Its size is about 3.5 inches wide and one inch tall. 30-pin SIMMs use one byte wide data buses. We need multiple SIMMs to make a single memory bank with most microprocessors. PCs with 16-bit data buses will require two 30-pin SIMMs per bank. PCs with 32-bit data buses require four 30-pin SIMMs per memory bank. PCs with 64-bit data buses would require eight 30-pin SIMMs per memory bank.

72-pin SIMM:

Compared to using individual memory chips, using a 30-pin SIMMs were a big improvement. But the introduction of new processors with wider data buses a new SIMM with more pins to accommodate wider data buses were required.

This leads to introduction of 72-pin DIMMs introduced by IBM. The 72-pin SIMM uses several interlocks to prevent the user from plugging in the wrong style of SIMM or sliding in at improper orientation. The notch in the centre of the SIMM edge connector prevents one from accidentally sliding a 30-pin SIMM into a 72-pin socket.

DIMM(Dual Inline Memory Module):

Even 72-pin SIMMs fall short when it comes to Pentium and Pentium Pro PCs. With their 64-bit data buses, these chips require two 72-pin SIMMs per bank, as 486 machines required four 30-pin SIMMs. To provide easier expansion for newer 64-bit machines, memory makers developed modules with more connections to permit wider addressing. The resulting module have 168 separate connections, arrayed across two sides of the module, a design that created the first Dual inline memory modules.

Two rows of edge connectors, one on each side of the module , are divided into three groups with short gaps between. The first group runs from pin 1 to pin 10, the second group from pin 11 to pin 40, and the third group from pin 41 to pin 84, pin 85 is opposite to pin 1. Notches in the edge connector of the DIMM prevent one from sliding smaller SIMMs with fewer connections into the DIMM socket. Also instead of the notch on the side of the DIMM, the asymmetrical arrangement of the notches on the DIMM prevent its unintentional improper insertion into the socket. Some pins have holes to allow the user to latch the modules into the sockets.

RIMM(Rambus Inline Memory Module):

When Intel introduced Pentium IV processor, they wanted a very fast memory for it and there choice was RDRAM or Rambus DRAM memory. So instead of using SIMM or DIMM, RDRAM comes in a special 184-pin RIMM. RIMM cannot be used on the motherboards not designed for Rambus memory. Currently only Pentium IV motherboard on Intel 850 chipset that supports RIMM. The RIMM was not a success one, the reason behind its limited success was its cost, RIMM is very costly memory module. It makes the people unwilling to buy. Also because of its faster speed it generates more heat, an aluminum casing , called heat spreader , covers the module to protect the chips from overheating.

DDR DIMM: A much cheaper double data rate(DDR) SDRAM provides speed almost equal to the RDRAM. DDR SDRAM doubles the rate at which SDRAM process data. DDR SDRAM is costlier than standard SDRAM but it is much cheaper than the RDRAM. This resulted in most of the Pentium IV based system going for DDR DIMM, instead of RIMM It use a connector with 184 pins.

Extended (XMS) Memory

- The extended memory is the memory beyond the 1 MB limit. Any memory available after the 1 MB memory is called extended memory. The 8086/8088 cannot address memory beyond 1 MB, the extended memory is available in the 286and later processor based computers only.
- The extended memory is not much useful for the DOS users because the DOS does not know how to use this memory, for a DOS user this memory can be used only as disk cache or RAM disk.
- For Windows user, this memory is very useful as these operating systems can use this extended memory and any program specifically written for these environment can use the extended memory available in the computer system.

Cache Memory:

With each new model of the processor, the processor's speed is on the increase , but with the speed of the memory chip has to increased much compared to the processor speed. The high speed RAM chips are available in the market but they are very costly to be used as the main memory.

Cache , pronounced "cash" memory is a very small amount of very high speed memory used in between the main memory RAM and the processor. The information frequently required by the processor is kept in the cache memory by a cache controller. This cache controller always tries to make sure that the data required by the processor in the next memory access is available in the cache memory. It improves the speed of the computer The performance of the cache depends upon (i) Speed and size of the cache memory, (ii) The logic used to read the data around the memory area read by the CPU.

When the required data is available in the cache is called hit and if the required data is not available in the cache is called a miss.

(a) Internal cache: The internal cache is internal to the processor , that is it is a part of the same chip as the processor. This is also called as primary or L1 cache. This cache is sometimes divided into different types based on the function, like data cache and instruction cache. It increases the performance of the cache system.

(b) External Cache: It is a separate high speed memory in between the processor and the main memory which is controlled by cache controller.   This is known as secondary cache or L2 cache. This is called because it is external to the main processor but in the recent processors, Intel has put this cache with in the processor itself, inside the same packing.

Shadow Memory:

In 80386 and later processor copying the content of the slow BIOS ROM into faster system RAM is known s shadow memory. It is also called as shadow ROM. By copying the ROMs contents into empty area of the RAM and by redirecting any ROM read request to the RAM, the read operation can be made faster. The RAM memory is about three to five times faster than the ROM memory.

This is so called because the RAM memory contains exact copy or the shadow of the ROM. The shadow memory provides an improvement in the computer speed by providing fast response to the ROM request. It is provided in most of the BIOS setup option.

Some software that works directly with the hardware, bypassing the BIOS ROM, will not gain any speed improvement by using the shadow memory. The Windows environment directly communicates with the hardware.

POST

What is POST?

This is an abbreviation of power on self test. It is a set of diagnostic programs loaded form the bios ROM during the system power of time.

This program ensures that in a computer all the major system components are present and are working properly. This post program checks the processor, memory support circuits and other devices connected to the computer when the computer is first powered on.

If this routine finds any error or fault during this post, the error is informed to the user as an error beep or as some error message on the screen. Some errors called nonfatal errors allow user to continue, whereas fatal error will not allow the post to continue until the problem is rectified.

Once the post routine is executed successfully, BIOS goes to the boot process.

Bootstrap Loader:

After the post routine, BIOS continues with a program called bootstrap loader.

It is the job of bootstrap loader to load the operating system (OS) from the floppy disk, hard disk or CD-ROM into the computers main memory(RAM). Unless the boot process is completed successfully, i.e. the OS is copied from storage device to the main memory, user cannot use the computer. A successful transfer of thee OS into the ram or the boot process is indicated by displaying the dos prompt such as A:\> or C:\> on the computer monitor. If you have windows 95/98 ME etc. installed into your system then instead of the dos prompt, you will directly go to the windows screen.

BIOS SETUP:

The BIOS ROM or the basic input output system has an or-screen system configuration setup utility program. The setup facility by different make of BIOS differ. In this section we shall cover one of the most popular bios, i.e. the American megatrends inc. (AMI)bios.

Most of the setup facility provided on this BIOS could be found on majority of the other bios available in the market. When a system is switched on, after the successful completion of the post routines, the following message appears on the screen.

"Hit<DEL>, if you want to run setup"

If you intend to change the already existing configuration of your system or if you are configuring a new system, press the DEL key on the keyboard.

Sometimes this message is disabled using the option provided in the bios setup, if it is disabled, you can press the "Del" key just after the post memory test is completed.

After you press the "DEL" key, bios setup main menu screen will appear on the monitor. Sometimes this BIOS setup is protected with a password, and if you do not remember the password, then to enter the setup screen you must reset the BIOS.

To reset the bios and remove password, you have two options:

➢   Either you can use the bios reset jumper provide on your motherboard, check the manual of your PC or Motherboard for "Clear CMOS Memory" jumper setting.

➢   Or you can remove the CMOS setup battery and allow ten minutes for the residual power in the CMOS to drain away. Then, reconnect or reinstall the battery.

•   Once the bios setup main menu appears, in this menu appears, in this menu you can move up/down to different options by pressing the up and down arrow keys.

•   The selected option will appear in reverse color and helpline about the selected option will be displayed at the bottom of the menu.

•   F2/F3 keys can be used to change the foreground/background color.F10 key can be pressed to save the changes made in the setup and to exit to the boot process.

•   Pressing "ESC" key will continue with the boot process without saving the changes made in the setup.

MOTHERBOARD INSTALLATION :

        Always disconnect the power supply from the ac mains before you connect, disconnect, install or remove any board component. Failure to do this could result in damage to the equipment. Some circuitry on the motherboard can continue to operate even when the front panel power switch is off.

Installing AGP card retention mechanism :

If you want to use an AGP card with retention notch, as shown in the figure, with this motherboard then install the Retention Mechanism (RM) on the motherboard. Using the RM with an unmatched card may impair video operation. The RM encloses the motherboard's AGP connector and stabilizes the AGP card.

To install the RM, place the Motherboard (Component side up) on a flat, supportive surface, preferable on the anti-static bag in which the board was shipped in.

Follow the steps given below to attach the RM to the AGP connector on the Motherboard.

- Locate the AGP connector on the motherboard. Note that the screen printing on the motherboard(C) shows the correct final position of the lever (D) on the RM.
- Position the RM over the AGP connector.
  Push the lever end of the RM in the direction of the arrow until the two rearmost tables
- (E) spread over the end of the AGP connector.
- Push the free end of the RM over the other end of the AGP connection and underneath the AGP connector.

Do not apply unnecessary to avoid damaging the board.

Installing the I/O shield

This motherboard comes with an I/O shield to block radio frequency transmissions, necessary to pass the emissions (EMI) certification testing.

It also protects internal components from dust and foreign objects, and promotes correct airflow inside the chassis.

Place the shield inside the chassis as shown in the figure. Press the shield into place so that it fits tightly and securely.

Installing the motherboard

Secure the motherboard to the standoff provided on the chassis. Insert screws in the mounting holes .Do not install the four screws around the processor socket at this time. Before installing the motherboard to the chassis make sure that the chassis supports the Pentium 4 processor. You can find out this by verifying that the standoffs for the processor retention mechanism are in the correct position on the chassis.

Installing the processor retention mechanisms

Processor retention mechanisms are secured to the motherboard with four screws provided with the chassis. Location of the processor Retention Mechanism (RM) holes.
To install the RM, place RM on the board by aligning the holes in the RM with the holes in the motherboard.
Using the screws provided with the chassis, install the RM into the four holes on the chassis.

Installing the processor

To install the processor, lift the processor socket lever, place the processor into the socket so that the first pin (pin A) of the processor is aligned with the first pin location on the motherboard. Lower the lever back to its original position.

Applying thermal grease to the processor

After placing the processor into the socket apply about half of the thermal grease from the thermal grease syringe to the center of the processor surface.
Thermal grease syringe is generally included in the processor package.

Installing the processor fan Heatsink

Place the fan heat sink on top of the processor so that the fan cable is facing the right edge of the board.

Installing the fan heatsink clips

Once the fan heatsink is securely placed on the processor, secure it using the fan heatsink clips. Install the clips by attaching the opening at both ends of the clip(B) to the tabs on the retention mechanism(RM). Then connect the side clip(A) to the RM until you hear a click sound. Repeat this procedure on the opposite side of the fan heatsink.

Installing the memory modules

This board user RIMM Memory. Install the RIMMs into bank 0 first. If you want to leave the bank 1 empty then insert a continuity RIMM (CRIMM)in the bank 1.
Falling to do this may result in boot failure.

To install RIMM, high insertion force is Require, use caution to prevent the motherboard from flexing. RIMMs must be installed in identical in size and density to each other and must match the speed of the RIMM module in bank 0.
The RIMM modules in bank 0 and bank 1 need not match in size. For example, if bank 0 has two 128MB RIMMs of PC800 RDRAM, then bank 1 would also require PC800 RDRAM, however size of RIMM module could be 64MB or 128MB.

Connecting the Fans

This motherboard has four points to connect the fans. If you are installing a processor with an active fan heatsink, then connect the processor's fan cable to the board connector next to the CPU socket.
Connect the chassis fan cables to separate fan connector provided on the motherboard.

Installing an AGP card

This motherboard supports only 1.5v AGP cards.
To install an AGP card with a retention notch:
- Place the AGP card in the AGP connector
- Press down on the card until it is completely seated in the connector and the card retention notch snaps into place below the RM.
- Secure the card's metal bracket to the chassis back panel with screw.

UNIT 3

SECONDARY MEMORY/ STORAGE DEVICES:

The Hard Disk Drives are the most common storage device used with the computer system. The hard disk drive is also known as Hard disk, Hard Drive, Fixed disk drive or Winchester disk drive. The hard disk drive is used to store data and programs permanently inside the computer. The information stored in the hard disk drive does not get erased when the power supply to the computer is switched off. The information stored in the hard drive using the magnetic recording method, which is used to store the data or songs or movies on audiotape or videotape. The best example of secondary storage device is called as hard disk drive.

MAGNETIC RECORDING:

Data stored inside the computer in the form of Binary digits or bits and based on the value of this bit , a 0 or 1, the magnetic particles on the disk surface is recorded in North , South(NS) or SN orientation. When we buy the new hard disk, the magnetic particles or the coating on the disk surface   are in random orientation.   The Data is recorded on this surface by making these random magnetic particles orient in some predefined order in NS or SN orientation.

Data Recording

The magnetic recording on the disk surface is done by magnetic read/write head, which is similar to the read/record head of an audio/video tape recorder.   The read/write head of the disk is an electromagnet whose polarity can be switched by changing the direction of the electric current through it.

Hard disk drive head is basically a U-shaped conductive piece of material which is wrapped with a coil of conductor wire.   A small gap in the section of the head that touches the disk surface is used to concentrated the generated magnetic flux to the surface of the disk. Normally , this gap is filled with a nonmagnetic material like glass or ceramic. When current is passed through the coil, the magnetic field is generated on the head. This magnetic field aligns the polarity of the magnetic particles on the disk media. The polarity of the magnetic particles on the disk media will depend on the direction of the magnetic field and the direction of the magnetic field will depend on the direction of the flow of current through the head coil.

By changing the direction of the flow of current through the head coil, magnetic particles on the disk can be arranged in NS or SN orientation.   The following diagram shows the data recording by read/write drive.

Reading from a Disk Surface

When reading any information from the disk surface, the principles of the induced current on a conductor wire due to the change of magnetic field is at work. According to this principle, any change in magnetic field across coil of conductor wire produce current through the coil. This produced current is called an "induced current", because there is no direct connection between the magnet and the coil. The current is induced because of the relative motion of the magnet with respect to the coil. This property of the magnetic and coil to generate induced current is used to read the information stored on the disk surface.

When the read/write passes over the surface of the disk, an electric pulse is induced in the read/write head circuitry for each change in the orientation of the magnetic particle on the disk surface. The state of this electric pulse tells read/write head whether the information on the disk surface is 0 or 1.

Current is produced on the head only if there is a change in the direction of the magnetic particle on the disk surface. Also if all the magnetic particles of the disk surface are oriented in the same direction then there will not be any current produced on the read/write head of the drive. If bit 1 is stored as SN, then 1101 will be stored as n NS NS SN NS magnetic flux on the disk surface. When the data is read back , it will produce signal on the read/write head at only two places. In this method , without any additional information just by seeing two pulses it is very difficult to predict what is the data stored at that location.

To overcome these problem, an additional signal is stored with each data bit. This signal is called clock signal . This clock signal is always stored before the data bit. This clock bit is always stored in the opposite orientation of the data bit preceding it, so there will always be a current or pulse generation for the clock signal because of the flux reversal of the magnetism. After the clock bit, if the data is one then the next bit that is, the data bit is oriented in the reverse direction compared to the clock bit, if the data bit is zero then the next bit , that is the data bit is oriented in the same direction as the clock bit. To increase the storage density of the recording medium most of the recording or encoding schemes try to limit the number of clock pulses to the very minimum.

Hard Disk Drive(HDD):

Hard Disk Drive Components

The Hard disk drive is available in many different capacity and size, but the basic component inside them are almost same.

A typical hard disk drive contains the following components , they are

- Disk Platter
- Read/Write Head
- Head arm/Head slider
- Head actuator Mechanism
- Air filter
- Spindle Motor
- Logic Board
- Bezel
- Cable & Connectors

Disk Platter :

Hard disk drive contains a number of platters, or the circular shaped disks on which the information is magnetically recorded. The Platter size(the diameter) is called the form factor of the hard drive , and one refers the hard drive size by platter's diameter. There were many different platter sizes in use, here we see some of the common sizes are :

- ➢ 5.25 inch (but actually 5. 12 inch)
- ➢ 3.5 inch (but actually 3.74 inch)
- ➢ 2.5 inch
- ➢ 1 1/8 inch
- ➢ 1 1/3 inch

The 3 ½ inch size platter is currently most common with the Personal computers, and the 2 ½ inch is common in the portable /laptop computers. Now recently □   1 1/3 inch drive are very small , the wristwatch size , these drives are very rugged and available in 1 GB or more storage capacity. Numbers of platters on the hard disk drive can be as low as 1 and high as 10 or more, 2 or 3 platter drives are most common.

These platters were made from aluminum alloy because of their strength and light weight. Being a metal , the aluminum is not thermally stable, that is they expand and contract with the change in the temperature. This property lead the drive manufacturers to use glass and glass ceramic compound as platter on their drives. Also glass and glass ceramic platter allows the drive to be smaller with higher storage density.

Also in 3 /2 inch & 2 ½ inch hard drives almost all drives are made using glass or glass ceramic platter. Now current hard disk drives , oxide coating is replaced with thin film magnetic coating. In thin film magnetic coating , a very microscopically thin layer of pure metal , or compound of metal is bound on the platter surface.
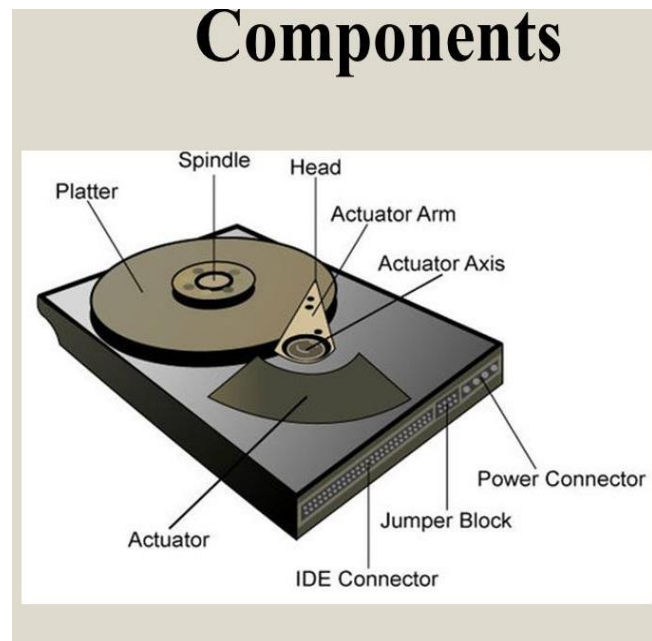
Read/Write Head

Read/Write Head is used to write any information on the disk surface and to read the written data, without any data loss. A hard disk drive contains read/write head for each side of its platter. For example if a drive contains 3 platters then total six read/write head will be used to read/write the top and bottom sides of each platter. All the head used in the disk drive system are connected together and moved in and out on the disk surface as a single unit, one cannot move different head in different order.

Also inside the hard disk, when the disk is at rest, that is not spinning, the head is in direct contact with the disk surface. as the disk starts to spin, because of its very high rotation speed, air pressure develops under the head. This pressure lifts the head from the disk surface and the head starts to float on an air cushion, 3 to 5 micro inch above from the disk surface. also hard disk drives use two types of read/write technology, they are:

- **Inductive** and
- **M**agneto-Resistive

Inductive Read/Write Head

In an inductive read/write head, the disk drive circuits sends a current through the read/write head coil which induces a magnetic field in the core and alters the orientation of the magnetic particles on the nearby platter. To read the information stored on the disk surface, when the head is moved over the platter, magnetic fields of the particles on the platter slightly magnetize the core which, in turn induces a small voltage in the coil.

Nowadays current read/write heads use a thin layer of copper deposited in coil form as a film. This type of head is called thin-film heads. This technology allows finer, lower-mass coils that are easier and less expensive to make.

Magneto-Resistive Head

This is a new technology. The head works by measuring the change in electrical resistance that a magnetic field causes in some materials. The disk drive circuit sends a small current through the magneto-resistive material and measures the change in voltage across the head, when the resistance of the head goes up, the voltage goes down.

The magneto resistive material is usually an alloy or iron and nickel. This technology can be used to read the signal stored on the hard disk, it cannot be used to write on the disk surface.

Head arm/Head Slider

The arm on which the read/write head of the disk drive is located is called the head slider. These sliders are made in a catamaran sailboat shape. A small size slider has many advantages , such as the lower weight allows for faster acceleration which makes the disk access faster. Disk drive manufacturers provide special textured patterns on the head slider surface to keep the slider at a constant height from the disk surface.

Head Actuator Mechanism

The read/write head of the hard disk drive is moved on platter using different mechanism; this is referred as head actuator mechanism. Two different head actuator mechanisms, they are (i) Stepper Motor Actuator, (ii) Voice coil Actuator.

The head actuator is one of the most important part of the hard drive, because different characteristic of the hard disk such as its read/write speed, accuracy, reliability etc… depends upon the head actuator mechanism used in that drive.
The characteristics of actuator mechanisms are :
(i) Access speed of stepper motor actuator is low , but the speed of voice coil actuator is high.
(ii) Reliability is poor in stepper motor, but the reliability in voice coil actuator is very good.
(iii)Temperature sensitive is available in stepper motor is available , not available in voice coil actuator.
(iv) The stepper motor is sensitive and non sensitive in voice coil.

Air Filter

Most of the people think that inside the hard disk drive there is vacuum. But it is not true, since the hard disk drive will not work in a vacuum condition, because the read/write head needs air to float on the disk surface. also the most of the disk drives have two air filters, one is called recirculating air filter and the second is the breather air.

- Recirculating air filter is used to filter any particles dislodged from inside the drive such as scrap of disk media, removed by the read/write head during the disk operation. This filter does not circulate the external air to the inside of the disk drive.
- The breather filter on the barometric filter is the only connection of the inside of the hard disk with the outside environment , as the name suggests this filter is used to equalize the external air pressure and the pressure inside the hard disk drive.

Spindle Motor

Spindle Motor is the main motor which rotates the hard disk drive's platters. It is called the spindle motor because this motor is directly connected to the spindle on which the platters are connected. This motor works on a feedback loop to automatically adjust the disk's rotation speed. A hard disk platters rotates at around 3,600 to 7,200 RPM (Rotation per minute)or more.

On some of the new drives, the spindle motor is directly built into the platter hub, inside the sealed assembly. The advantage of this design is , more platters can be used on the same height disk drive.

Logic Board

The hard disk also contains a logic board to control different parts of the hard disk drive. The logic board is also used to interface the hard disk drive with the computer. Also the hard disk drive may contain more than one logic boards. Many times the hard disk drive is due to the failure of the logic board, power problem or some other problem may destroy the logic board on the hard disk drive.

Bezel/Front Faceplate

Bezel is the front faceplate provided on most of the hard disk drives. Nowadays, as most of the hard disk are connected internally, and is hidden behind the PC system's cover, the faceplate or the bezel is not needed. Nowadays most of the hard disk come without a bezel.

Cable & Connectors

Cables and connectors are used to connect the hard disk drive to the main computer system. All hard disk drive contains connections for,

- Data/Control Interface connector
- Power connector

Other than these two connectors one separate connector for the power ground is also provided on most of the hard disk drives. The data/control cable is the most important part of the hard disk drive and PC interfacing. Most of the hard disk drive interface such as the IDE or the SCSI use only one cable for data as well as the control signal. Other PCs use interface such as the ST-506 (or) the ESDI etc… use separate cable for data and the control signal.
The power connector used on the hard disk drive is same as the connector used for the floppy disk drive, it has four pins that provides 5 volt, 12 volt and ground signal to the disk drive.

HARD DISK DRIVE FEATURES

There are different characteristics of hard disk drive, like size, capacity, interleave , head skew, cylinder skew, etc.. The characteristics or properties are also include the hard disk drive controller used to connect the drive to the computer.

Form Factor: Drives are available in many different widths and height. The form factor is a basic unit of measurement of the size of the drive. Drives with platter width of 5.25 inch and 3.5 inch are called 5.25 inch form factor and 3.5 inch form factor.

Storage Capacity

The storage capacity of a hard disk drive can be very confusing   one. For example, if the user may see a hard disk advertised as having 301 MB capacity, with the following characteristics as ,

   1024 cylinder , 16 heads, 36 sectors and 512 bytes per sector

On entering these values in the BIOS setup the user will fine that BIOS is showing the hard disk capacity as 288 MB, and where the extra 13 MB gone. This missing MB is due to the way hard disk storage capacity is specified in different manners by different manufacturers.

A hard disk capacity can be expressed in the following ways :
* Unformatted storage capacity in million of bytes
* Formatted storage capacity in million of bytes
* Unformatted storage capacity in megabytes
* Formatted capacity in megabytes

Now let us see that the hard disk drive is advertised as having 301 MB storage capacity, and we see how his figure is reached.   That is 1024 x 16 x 36 x 512 = 301, 989,888 bytes or 301 millions of byte, is the storage capacity of the hard drive.   This same 301,989,888 when converted into megabyte by dividing it twice with 1024 will give 288.

Hence it is clear that the manufacturer has mentioned storage capacity in millions of byte in advertisement and the BIOS has reported the storage capacity in megabyte. That is 301 million byte drive is also the 288 megabyte drive.

In general the "M" is used to indicate millions of byte and "Meg" is used to indicate megabyte. Also unformatted capacity of the drives is 19 percent higher than formatted capacity. The following shows ,
➢ Formatted capacity – 301 M
➢ Formatted capacity – 288 Meg
➢ Unformatted capacity – 358 M
➢ Unformatted capacity – 343 Meg

Disk Geometry

The hard disk drive stores data as magnetic information on its surface. For example if the data is stored continuously one next to another, then at the time of interval one will have to scan the entire hard disk drive to find data. To arrange the data properly on the disk surface, the disk surface it divided into different sections called head/side, tracks, sectors, cylinders.

When information is written on the disk surface the computer writes it on some specific side on some specific tracks and sectors. The values are saved in an index like place called the directory and FAT(File Allocation Table).

Sides or Heads

When the user already specified that a hard disk drive can contain many platters, or disks. Each side of these disk can be used for read and write purpose. If there are 3 platters then we have 6 sides. Each side will have a separate read/write head to read and write information on that side. All these heads are connected to a single head rack, which is responsible for read/write heads to move together over the surface.

Track

Each side of the hard disk drives platter's surface is divided into concentric circles called tracks. These tracks are not visible marks on the disk surface instead these are magnetic information written during the formatting of the hard disk drive. The outermost track is given as track number 0, next track is 1 and so on , the innermost track will have highest number.

Cylinder

On a hard disk drive which has more than one platter , same tracks of different platters form an imaginary cylinder like structure. When data is stored on the hard disk drive, it is stored cylinder by cylinder, that is first all tracks on a cylinder is written, once the cylinder becomes full the read/write head moves to the next cylinder and writes balance data to the next cylinder.

Tracks belongs to one part of a cylinder and cylinder belongs to all the tracks having same value.

Sector

A track is very big area to store data, that is it contains 5,000 bytes of data. For example when one is storing small amount of data which is less than total bytes, then the memory is waste.

This leads to dividing the tracks or cylinders into number of sectors. Like a track, the sectors are also not visible on the hard disk surface. During the formatting of the hard disk, the formatting program divides the disk surface into different sector by writing magnetic pattern on the disk surface. The different capacity of the hard disk divide the track into different number of sectors.

As a standard almost all drives store 512 bytes of data per sector. The side number or head number or track number or cylinder number starts with 0 , but sector number is always starting with 1.

For example to calculate total sectors of hard disk, if we say that it has 6 sides, 1024 tracks and 37 sectors, then the total sectors are ,

Total sectors = Total sides x total tracks per sides x total sectors per track

                = 6 x 1024 x 37

                = 227,328

We also know that the capacity of one sector is 512 bytes, then the storage capacity of 227,328 sectors are,

      Total storage capacity = 227,328 x 512 bytes

      Total storage capacity = 116,391,936 bytes or 116.4 M(million byte) or

                        111 Meg(Megabytes)

Interleave

If the sectors on the hard disk drive are numbered sequentially from 1 to the maximum number of sectors available, then the disk read operation will be very slow. For example when the hard disk drive is given an instruction to read the complete track, that is sectors 1,2,3… After receiving this instruction, the drive starts reading when the read/write head reaches sector 1.

After reading the sector 1, the rive sends this data to the controller. The controller checks that the data has no errors. During this process the disk is continuously rotating. As the disk continuously rotating or spinning during all this process, by the time the controller gets the data checks it for error and pass it to the requested program , the read/write head passes over to the second sector. Then it passes to 3rd sector ,and so on. To read the second sector the disk will require one complete rotation. This process make the hard disk read process very slow.

Hence we use very easy solution to this problem. That is the to put the 2nd sector at the 3rd or 4th position then the 2nd sector will be at the correct position when the read 2nd sector instruction is received by the read/write head. This will save unnecessary rotation after each sector read.

During low level formatting of the hard disk drive, one can leave a gap of one or more sectors in between the consecutive sectors to solve this problem. So the numbering the sectors out of order with leaving a gap of one or more sectors in the sector numbering is called interleaving. Depending upon the speed of the system and the hard disk drive one can follow 1:2 or 1:3 or any other interleave scheme.

Skew

Most of the current hard disk drives and controllers are capable of 1:1 interleave, which means do not require any interleave. However these drive and controller combination the head skew and cylinder/track skew is a very important issue.

Seek Time

To read any data on the hard disk drive first the read/write head needs to be moved to the required cylinder. Once the head reaches the required cylinder, the disk is rotated until the required data reach under the read/write head. Then the drive starts reading the data. The time required to move the read/write head to the required cylinder is known as seek time. The drive contains number of cylinders, a seek from track 0 to track 100 will take much more time compared to seek from track 0 to 10. The seek time is measured in milliseconds.

Rotational Latency Period

The rotational latency period is the time required for the required data to rotate under the read/write head, after the read/write head is moved to required cylinder. Like seek time the latency period is also calculated as average rotational latency period. The average rotational latency period is calculated by finding out the time required for the drive to make half revolution.

If a hard disk drive rotates at the speed of 7200 rotations per minute(RPM) then one rotation will take 1/7200 of a minute or 60 / 7200 of a second. This speed of 60/7200 seconds is for one rotation, the half rotation will require only half of this time, that is 4. 166 millisecond(ms).

Access Time

Access time is the total time required by a hard disk drive to find the requested data or we can say that the access time is the time required by the hard disk drive to move the read/write head to the requested data after a read or write command is received from the CPU/controller.
The access time is the total of seek time and the rotational latency period.

Access time = Seek time + Rotational Latency period.

The time is also measured in milliseconds(ms), the initial hard disk drives had an average access time of 40 ms but currently most of the drives have 15 ms or better access time. Some of the faster SCSI drives can provide 10 ms or better access time.

Data Transfer Rate

Data transfer rate is the most important feature that one should consider when comparing two different hard disk drive systems. But most of the time this feature is not given in the hard disk drive advertisements because the data transfer rate does not depend only on the hard disk drive, but it depends on the configuration of the system and the controller used, etc…

By default the transfer rate is measured in megabytes per second or kilobytes per second. Initially the hard disk drives provide data transfer speed less than one megabytes per second, the SCSI hard disk drives provides ten megabytes per second. Currently ATA-2 types of hard disk drives have very high data transfer rate of more than 40 megabytes.

Hard Disk Drive Interfacing

To connect hard disk drive to the computer system, first the hard disk drive controller is connected to the I/O bus or I/O slot on the motherboard and later the hard disk drive is connected to this controller.

Most of the new drives have the controller built in the drive itself so they do not require a controller to connect them to the main system, but they require some kind of interface to connect the drive to the I/O bus on the motherboard. Most of the motherboard contain the interface required to connect hard disk drive directly to them. We use cable to connect hard disk drive with the connector on the motherboard.

There are different interface available to connect hard disk drive with the computer system, they are :

- ST-506/412
- ESDI
- EIDE
- SCSI

IDE

IDE or Integrated Drive Electronics stands for any drive that has controller integrated with the drive. During 1986 Compaq wanted to improve the ST-506/412 drive used in their system. So they approached the disk company called Western Digital(WD). They realized that the problem in ST-506/412 interface was its controller being away from the drive. The distance between controller and the drive increased , chance of data corruption is increased.

This leads the WD to put controller directly into the drives, removing the need for long cables to connect them. This system is reliable and allows IDE drive manufacturers to put 30 or more sectors per track on these drives. Another advantages is the cost is very less. As the controller is embedded on these drives , the IDE drive is sometimes also known as "embedded controller drive".

As the controller is on the drive itself , IDE drive/controller combination could be directly connected to the I/O bus slot on the motherboard. Currently motherboards come with connector for IDE drives and we connect IDE drive to this connector with 40 pin wire cable. The motherboard supporting the IDE connector does not contain any hard disk controller circuit.

There are basically three different IDE interface in use, its specification is based on type of system bus , and they are :

- AT attachment IDE is known as ATA IDE – working with 16 bit ISA and E ISA buses
- XT IDE (8 bit) works with 8 bit XT class ISA bus
- MCA IDE (16 bit Micro channel architecture based) works with MCA based systems.

ATA IDE

ATA IDE is the default IDE drive, if someone talks about IDE drive, without specifying the drive type, then most probably it is referred as IDE drive. The ATA IDE interface was based on the WD1003 controller by the original IBM AT systems. This made the BIOS provided on the AT systems to support the ATA IDE drives without any problem. The system BIOS provide the functions like seek, read, write etc… for the IDE interface to improve the capability. The ATA IDE interface was standardized, the other IDE and MCA was never standardized.

ATA cable connector

ATA IDE interface use 40 pin connector. Pin 20 of this connector is removed and corresponding pin is plugged on the cable connector to prevent reverse connection. A 40-line ribbon cable no longer than 18 inch is used to carry the signal from IDE drive/controller unit to the connector on the motherboard.

Here we define the following pins/signals of the connector as follows :

(i)   **Drive Reset(pin** 1) : This signal causes the drive to return to its power on state. This signal is used to initialize the hard disk drive when system is switched on.

(ii)   **Ground (Pin 2,**19,22,24,26,30,40) : These pins are scattered among signal pins to give some isolation to signals from each other.

(iii)   **D**ata (pin 3 – 18) : Sixteen pins from 3 to 18 are used to carry 16 bit data from the drive to the system and system to the drives. Odd numbered 8 pins are used for 8-bit data transfer.

(iv)   **Key Pin(pin 20) :** This pin is used for proper cable orientation. On the connector, this pin is removed and on the cable , the hole for the pin 20 is switched off. This prevents the reverse insertion of the cable on the connector.

(v)   **DMA Request (pin 2**1) **& DMA acknowledge(pin 29):** Normally this ATA IDE interface transfer data in 16 bits, but this interface is also allows DMA transfer method. During DMA read this pin is used by the drive to inform to the host computer that it is ready to transfer data in DMA mode. The computer acknowledge that is ready to accept data using the DMA acknowledge signal on pin29. During DMA operation , the I/O read/write signal is used to indicate in which direction the data , it should be read or written.

(vi)   **Write (pin 23 & I/O read(Pin 25):** During the data transfer the falling edge of the i/o write signal on pin 23 is used to indicate that the data on the bus can be written on the disk and the falling edge of the i/o read signal on pin 25 indicates to the host computer that the data bus contains valid data after a disk read operation.

(vii)   **I/O Channel Ready (pin 27):** This signal is used by the disk drive to inform to the host computer that the drive is not ready to transfer data ,that is it cannot read or write.

(viii) **Spindle Sync/Cable Select (Pin 28):** This signal is used to make the hard disk drive spindle spin synchronously when the drive is being used in a drive array. This signal is also used to make the drive to be identified as master or slave using the cable, instead of using jumpers. In the spindle synchronization mode the master drive generates a periodic pulse and the slave drive use this pulse to lock its spin with the master drive. In Cable select mode supplying a ground to the pin 28 make the drive to act as a master (drive 0) and leaving the connection open makes the drive act as a slave drive(drive 1).

(ix) **Interrupt Request(Pin 31):** This line is used by the ATA IDE drive to get immediate attention of the processor on host computer. The use of this line depends on the data transfer mode being used. In programmed transfer mode, this line is used at the beginning of each block of data to be transferred to interrupt the processor.

(x) **16 – Bit I/O (Pin 32):** This sign is used to inform whether the read and write operation is of 8 bit data or 16 bit data. A high value on this line indicates 16 bit data transfer.

SERIAL ATA

ATA is an old interface , after the introduction of ATA, its designers have tried various tricks to make it faster/better with each new faster/better hard disk drives. Today's ATA interface is around 25 times faster than the first ATA. But this improvements cannot continue as the ATA is reaching its limit. So, Intel with several drive manufacturers have announced a new ATA interface standard known as Serial ATA or SATA. The new ATA is a serial interface. Current ATA is parallel interface. It uses 16 data channels at a time. Serial ATA will use only one data channel , but it will operate at a very high speed. Initial specification for serial A*TA* talks about 150 MBps transfer rate, which is only 10 percent better than the current top speed of parallel ATA interface. The parallel ATA speed getting doubled, whereas the serial ATA speed could be increased to 300 MBps and 600 MBps in the near future. Serial *ATA is fully com*patible with the parallel A*TA* at the software level, a drive connected to the serial *ATA will function* without any problem with the current operating system and other software. Serial *ATA requires only two p*air of wires ,one to the device and one from the device , for full duplex operation.

TRACKS AND SECTORS:

To understand the way of OS maintains information on the hard disks will be useful to understand the general principle behind the hard disk storage. To read/write any information on the disk and to allow all programs to use a standard disk interface , OS uses a fixed disk format. Data on the hard disks is arranged in tracks and sectors. Tracks are narrow concentric circles, that go around the disk and sectors are pie shaped slices of the disk. Tracks are sometimes called cylinder. Because when a tracks of different platters are kept together they form a cylinder like shape.

INSTALLING/UPGRADING HARD DISK DRIVE(HARDWARE PERSPECTIVE)

Removing Old Hard Drive

Once the user decided to purchase a new hard disk drive in place of existing drive, then the user have two options , one is to remove existing hard drive and connect the new drive in place of the old drive. Removing the old hard drive will take step by step procedure as follows :

    I.   Switch off the power to the system, remove the power cable from the mains and remove the cabinet cover.
    II.   Locate the drive and remove the data/control and power cable connections from the drive. Also check the orientation of the cable when removing.
    III.   When removing the cables remember to pull the connector not the cables, pulling the cable may make the cable loose from the connector.
    IV.   Most of the current drive which are IDE type may contains only one data/control cable, olden drives have two cables.
    V.   Remove the mounting screws form the drive. Most of the drives are mounted on the system unit by using two screws on each side.
    VI.   Some AT style cases have mounting rails on the drive, with screws on either side of the drive faceplate. On this type of mounting, the drive can be removed by sliding to towards the front and removing from the rails.
    VII.   If the drive is 3.5 inch form factor, and if its mount on a 5.25 inch drive bay, then it may be mounted using special angle brackets. Remove these angle brackets and keep at some safe place.
    VIII.   Keep the drive at some safe place.

installing a hard disk drive:

Installing a hard disk in a system is not difficult process but there is a vast choice of types and sizes of drives available so treat these instructions as a guide ,which are listed as follows :
- First all collect all the parts required for installing the drives.
- We need cables, screws , mounting rails etc…
- Check the power supply has extra connector for connecting drives.
- The ST-506/412 and ESDI hard drive and the floppy drives use 34 line cables, but they are not interchangeable.

The following is the important points to install the hard drive :
- ✓ Turn off the power and remove the power cable from the wall socket.
- ✓ Remove the system unit cover.
- ✓ Remove the bay blanking plate if the user are installing a drive that has a bezel.
- ✓ Check the settings of jumpers on the hard drive to ensure that it is properly setup.
- ✓ Check the position of the drive select jumper.
- ✓ Note the location of Pin 1 of the connectors on the drives logic board.

- ✓ Attach the mounting rails to the sides of the drive.
- ✓ Attach the data/control cable to the controller card, and then attach it to the back of the drive.
- ✓ Attach the power supply cable.
- ✓ Insert and tighten the mounting screws.
- ✓ Connect the HDD LED indicator connector to the appropriate pins on your controller card or HDD.
- ✓ Power up the system, update the CMOS RAM configuration by entering BIOS setup.
- ✓ You must boot from diskette or CD-ROM.
- ✓ If BIOS detects the drive then replace the system unit cover.

Installing a Second Drive

Installing to a second hard drive is most common upgrade. This is the reason almost all Hard Disk controllers are design to handle two drives. Adding the second drive is easy process. The following is the step by step to install the second drive.

- ▪ Check that the data/control cable used with our current drive has an additional connector for a second hard disk drive.
- ▪ Check the length of the cable.
- ▪ Get another pair of mounting rails and screws for your new drive.
- ▪ Turn off the power and remove the power cable from the socket.
- ▪ Remove the system unit cover.(System unit is also called as cabinet)
- ▪ Set the jumpers on the new drive. So that it is recognized as master or slave drive by computer.
- ▪ If required then attach the mounting rails on the new drive.
- ▪ Slide the drive into position.
- ▪ Attach the data/control cable to the controller card/motherboard and then attach it to the back of the drive
- ▪ Attach the power supply cable to the drive. If your power supply does not have enough connectors, then you use "Y" splitters.
- ▪ After connecting the data/control and power cable, slide the drive all the way into the bay.
- ▪ Recheck your connections.
- ▪ Power up the system, Update the CMOS RAM configuration by entering into BIOS setup.
- ▪ If BIOS detects the new drive then replace the system unit cover.

Installing/Upgrading Hard Disk drive(software perspective)

After connecting a hard disk drive to the system, the user cannot straight away start using the hard disk drive. Properly connecting a new drive is only a small part of the complete hard disk upgrade. Once the hardware upgrade of the hard disk drive is over, one needs to setup the drive and the system to make them work together.   The setup mainly consist of installation,

partitioning, formatting of the hard disk drive. Therefore to use a new hard disk drive in a system the user need to carry out the following procedures as follows :

- ➤ Setup/Configure the system
- ➤ Initialize/Low level format the drive
- ➤ Partition the drive(FDISK command)
- ➤ High level format the drive(FORMAT command)

CHKDSK

CHKDSK (pronounced check disk) is a command that displays a status report for a volume, such as a disk, and can correct any errors found in that volume. To use CHKDSK, computers must have the Autochk.exe file already on their system. Administrators have options for what switches to run with CHKDSK. For example, using */f* tell CHKDSK to fix any errors it finds. Using */r* tells CHKDSK to look for and recover any readable information in a disk's bad sectors. The CHKDSI program are used to check the logical structure of the hard disk drive, it is used to check the FAT and directory structure for any logical errors like cross linked files, lost cluster etc… The CHKDSK program does not do any physical scan of the disk to find the defects, instead it scans the FAT to report the errors, total free space, total bad sectors areas etc… The CHKDSK perform following things :
- ➤ They check the directory entries.
- ➤ They check the size of the file
- ➤ They check clusters allocated in FAT
- ➤ They check directory structure to verify that the sub directory entries are in correct format.
- ➤ It checks the bad clusters as specified in the FAT and display these information on screen.

SCANDISK

Scandisk is a DOS utility application used to check and correct errors on hard and floppy disks. It was first shipped in DOS 6.2 and was included with Windows 95, 98 and ME. The utility scans disk surfaces for defects and marks those sections to prevent the rewriting of data and data loss. Scandisk saves recovered lost clusters as .chk files.

Microsoft originally purchased Scandisk from Symantec (formerly known as Norton). At the time, Scandisk was packaged for use in Microsoft's DOS and Windows systems. It is no longer shipped in post ME versions of Windows, as Scandisk is not able to check new technology file system (NTFS) disk drives, which became increasingly common in computer systems running post ME versions of Windows. Scandisk's close cousin, CHKDSK, which has similar functions and can check NTFS disks, is still used and has shipped with each version of Windows, to date (Windows 8).
Scandisk is automatically activated when rebooting a computer that is not properly shut down, or if it detects initial disk problems from the Power On Self Test (POST).

Scandisk is a Windows utility used to check your hard disk for errors and to correct problems that are found. These errors often occur when Windows locks up and must be restarted. To run Scandisk in Windows 95 and NT, click the Start button, select Programs, then Accessories, then System Tools, and then Scandisk. It is recommended that you run Scandisk at least once per

month. In OSR2 (a later release of Windows 95) and in Windows 98, Scandisk is initiated for you automatically following system restarts in which shutdown was not complete. The scandisk program can also check the physical surface of the drive for any bad areas. It is used to check the logical structure of the hard disk drive. The functions of CHDDSK are:
  - ➢ They check the directory entries.
  - ➢ They check the size of the file
  - ➢ They check clusters allocated in FAT
  - ➢ They check directory structure to verify that the sub directory entries are in correct format.
  - ➢ It checks the bad clusters as specified in the FAT and display these information on screen.

FDISK

FDISK is the DOS utility program that is used to partition a hard disk drive. After low level formatting a new or old hard disk drive, the user must run the DOS program FDISK to properly partition the newly formatted hard disk. Without FDISKing the drive the user will not be able to use the drive to read/write any information. Also he must run the FDISK program and partition the drive , whether the user want to use the entire drive as single partition or want to have multiple partitions on the drive. The FDISK program can be used for the following :
  - ➢ Creating a primary DOS partition
  - ➢ Creating an extended DOS partition
  - ➢ Creating logical drives in extended partition
  - ➢ Setting a partition to active
  - ➢ Deleting a partition
  - ➢ Displaying partition data
  - ➢ Selecting a hard disk drive for partitioning , when more than one hard disk drives is installed.

How to partition and format hard disk drive Using FDISK

Before doing partition , make sure that our hard disk drive is empty , as the following steps will permanently delete all of the data on that hard disk drive. To partition the hard disk , run FDISK drive,

  - • Insert the startup disk /CD in the drive, restart the computer
  - • In the BIOS setup make sure that boot from floppy disk or CD-ROM is selected
  - • When the Startup menu is displayed , select the " start computer without CD-ROM support" menu option, and press ENTER.
  - • At a command prompt , type FDISK and press Enter
  - • If our hard disk is larger than 512 MB, then we see the following message as "Your computer has a disk larger than 512 MB. This version of windows includes improved support for large disks, resulting in more efficient use of disk space on large drives, and allowing disks over 2 GB to be formatted as a single drive."
  - • Then Press Y and then press ENTER. Pressing N will give the user 'FAT 16 file system.
  - • After you press ENTER, the following FDISK options menu is displayed as follows :

Current fixed disk drive : 1
Choose one of the following :

1. Create DOS partition or Logical DOS drive
 2. Set active partition
3. Delete partition or logical DOS drive
4. Display partition information
5. Change current fixed disk drive.
Enter choice : [1]
Press ESC to exit FDISK

- Here Option 5 is available only if you have two physical hard disks installed.
- Now press 1 to select the "Create DOS partition or Logical DOS Drive" menu option, and then press ENTER.
- After you press ENTER, the following FDISK options menu is displayed as follows

----

Create DOS partition or Logical DOS Drive
Current fixed disk drive : 1

Choose one of the following :

1. Create Primary DOS partition
2. Create Extended DOS partition
3. Create Logical DOS Drive(s) in the Extended DOS partition
Enter choice : [1]

Press ESC to return FDISK options
--

- **Here Press 1 to select the "Create primary DOS partition" menu option and press ENTER**
- **After you press ENTER , you receive the following message as follows:**

Create Primary DOS Partition
Current fixed disk drive : 1

Do you wish to use the maximum available size for a primary DOS partition and make the partition active (Y/N)
--? Y
Press ESC to return the FDISK options

- After you receive this message   like:
  - ➢ If you want all of the space on the hard disk to be assigned to drive C, press Y, and then press ENTER. Press ESC, and then again press ESC to quit the FDISK tool and return to the prompt.
  - ➢ If you want to customize the size of the partitions , Press N, and then press ENTER.
- A dialog box displayed in which you can type the size that you want for the primary partition in MB or percent of disk space.   Type the size of the partition that you want to create, and then press ENTER.
- Now press ESC to return to the Options Menu.
- To assign drive letters to the additional space on the hard disk , press 1 and then press Enter.
- Now the next step is press 2 to select the " Create Extended DOS partition" menu option, and press ENTER.
- A dialog box appears that displays maximum space available for the extended partition. Then we press ENTER.
- Then we see the message like " Create Logical DOS Drive(s) in the Extended partition" menu is displayed.
- In this menu we give the size of the partition to create and press ENTER.
- After this a table lists the total size of the partitions that contain drive letter of the hard disk drive.
- Finally a message appears as "all available space in the Extended DOS partition is assigned to local drives.
- Finally press ESC to quit FDISK.

KEYBOARD ORGANIZATION :

The common organization of keyboard is as shown in this diagram. Here key switches are arranged in matrix of row and columns. This matrix organization saves a lot of complication and additional circuits required for directly connecting each key to separate sensing circuit.   Each row and column is associated with each other.

scanning: The process of finding out which key is pressed by reading the row and column value is called the keyboard scanning. The scanning is used here because the interfacing circuitry scans each row and column one by one to find out which key is pressed.   The process of keyboard scanning is divided into following steps :
  (i)   First the value 0 is output all the lines and the column lines are read over and over until all the columns show 1 value or high value. This is to ensure that all the keys are in open position before trying to read a key press. If any switch is in close position, it means the column will show the value 0.
  (ii)   Once all columns are 1, the column values are again checked until one of the column shows the 0 value. This indicates the key has been pressed. After the delay of 20 ms the column values again checked. This recheck is to ensure that the key has been pressed and the low value is not due to noise pulse.
  (iii)   IF the column is still 0 or low it indicates that a key has been pressed.

(iv)   The next step is to find out which key is being pressed. To find out the which key being pressed, initially the first row is kept 0 and all other rows are made 0. Then all columns are checked by one for a low value. If no column is found with a low values this indicates that the pressed key is not at the first row.

(v)   Now make the second row 0 and all other rows 1 or high and scan all the columns for a low value. This process of making a row 0 and checking all the columns for a 0 value is repeated until a low or 0 values in a row produce a low or 0 value in one of the columns.

(vi)   IF the second column key of the second row is pressed, this will give the user a low or 0 value at the second column, when the second row is made 0.

The value at the row input and column output at the time of the key press detection can be send as the scan code of the key being pressed to the keyboard interface.

the block diagram of keyboard organization is as shown below:
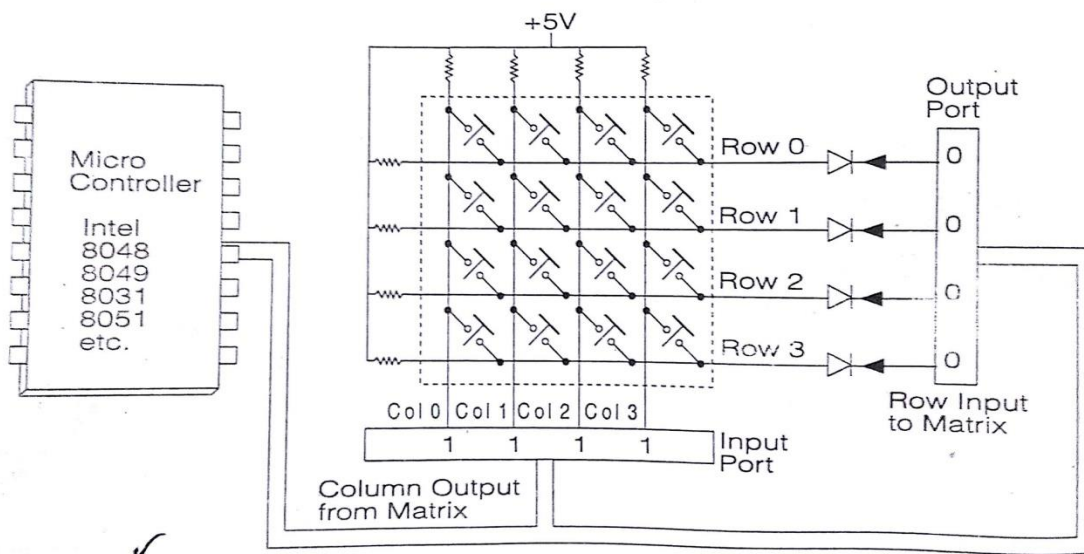
Encoding : The keyboard sends the scan code to the processor to inform about the pressing of a key on the keyboard. This scan code has nothing to do with the characters printed on top of the key switches. It completely depends on the position of the keys on the keyboard. Once the scan code is send to the processor, it is the job of the processor to convert this scan code into some meaningful format like ASCII code.

Make/Break Code: Keyboard sends different scan code for the pressing of the key and for the release of the key. This code send by the keyboard to the computer when the user press a key is called "make code" and the code send when the user release the key is called "break code".   At that time when the keyboard sends the different code of make or break, one can keep the track of the position of "shift","Alt","Ctrl" etc..   keys whose up or down position change the way other keys are interpreted by the computer.

KEYBOARD TYPES

There are different types of keyboards used in IBM PC computers. With each new model of the PC like PC-XT, PC-AT etc… , the IBM introduced a new type of keyboard. Now a day's Internet and multimedia keyboards which are used as industry standard by most of manufacturers.

Original PC/PC-XT Keyboard

The original PC/PC-XT keyboard layout had a lot of shortcomings such as the position and size of the "Enter" and "Shift" keys. In this keyboard many keys were marked with arrows instead of the word instead of the word describing them like the "Tab" or "Enter" keys. Another disadvantage of this keyboard is that there are no indicators to provide information about the status of the three toggle keys like Nums Lock, Scroll Lock and Caps Lock. This keyboard has a total of 83 keys and it is called as 83-key keyboard. The following is the layout of the PC-XT keyboard.
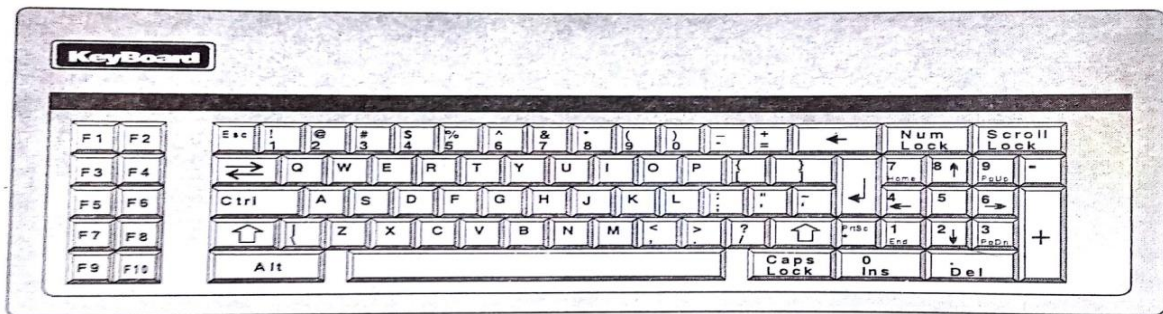

PC-AT Keyboard: The PC-AT was the improvement over PC/PC-XT keyboard. The IBM try to solve most of the problems associated with PC/PX-XT keyboard with the introduction of this new keyboard. In this keyboard there are indicators to show the status of three toggle keys. The numeric keypad is moved away from the alphabet key area for easy access during numeric data entry. The size of the "Enter" key is also increased and the word "Enter" is printed on top of the key. Here there is some electrical change provided which makes this keyboard is incompatible with other keyboard.

The connectors of the PC/PC-XT keyboard and that of the PC-AT keyboards are the same but a PC/PC-XT keyboard will not work with the PC-AT machines and PC-AT keyboard will not work with a PC/PC-XT machine. The drawback of PC-AT keyboard was it shared the same keys for the cursor movement and numeric keypads, and this makes it difficult for working the programs in MS-EXCEL. This keyboard as 84 keys. The following is the layout of the PC-AT keyboard.
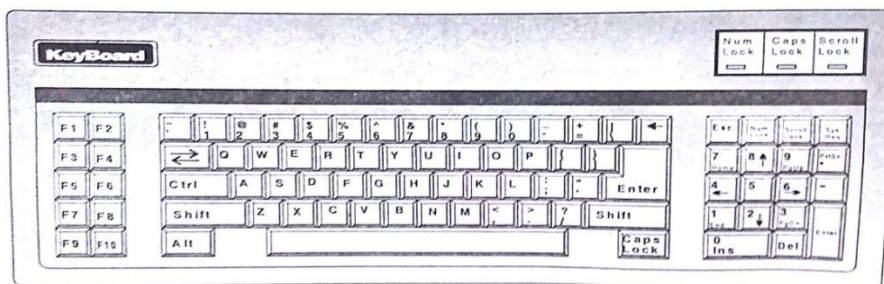
Enhanced PC-AT Keyboard : After the introduction of PC-AT keyboard, IBM made one more change into the keyboard layout and introduce an enhanced PC-AT keyboard. The enhancement of this keyboard is the movement of the function keys on top of the keyboard. In function keys two more keys F11 and F12 are added. The cursor movement in this keyboard is very easy . This keyboard provide duplicate ctrl and ALT keys on both side of the space bar .
This keyboard has a total of 101 keys and called as 101 keys keyboard. There are many variations of this enhanced PC-AT layout which are available in the market and also available in Multimedia and Internet technologies. The following diagram shows the layout of the PC-AT keyboard.
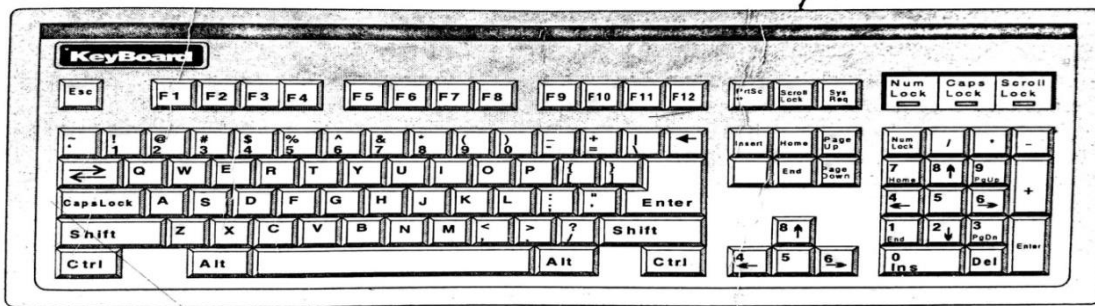
This keyboard can be divided into the following sections as follows with diagrams :

Typewriter or Alphabet Keys:

Alphabet keys are arranged in the center of the keyboard. The arrangement alphabets are same as it is on a standard typewriter, this arrangement is called "QWERTY" arrangement of the keys because the first six letters on the top row of the alphabet keys are Q, w, E, R, T and Y.
Other than the alphabets, some punctuation symbol such as, ? ! Etc. is also provided on the key board. Some punctuation symbols such as used when the provided on the keyboard, some of these punctuation symbols can be used when the key is pressed with the shift key.

Numeric Keys:

Numbers are provided on the top of alphabet area and on right corner of the keyboard. The numeric keypad on the extreme right of the keyboard can be used to enter numbers when the" NUM LOCK" indicator is on, otherwise these keys are used for cursor movement.

Cursor Movement Key:

Cursor is a blinking underline or block on the screen which shows where the next character being typed will appear.
Cursor movement keys are provided between alphabet and the numeric keypad area. In this area one upside-down T-type key arrangement is provided for the cursor movement keys and two rows of three keys each is provided for Insert, Delete, Home, End, Up and Page Down keys.

Function Keys:

Function keys F1 to F12 are spaced in group of four on the topmost area of the keyboard. These keys are user defined i.e. they do not have a fixed purpose and the user or various software assign different function to these keys.

Special Purpose Keys:

Other than the above mentioned keys, computer keyboard contains many special keys that are used for some specific jobs. These keys are:

Print Screen (Prt Scr):

This key labeled "Print Screen" or "Print Scr" or "Print Scr " is used to get a printout of the screen display. When this key is pressed the entire content of the screen is send to the printer. When this key is pressed in "Windows" environment, the screen image is captured and sent to the window clipboard, from where one can insert them into any document.

Shift:

Two shift keys on each side of the alphabet area is used to get capital letters when the Caps Lock is off, when the Caps Lock is on this key is used to get small letters.

This key can also be used to get ! @ # $ % ^ & etc. symbols on the top of some keys.

For example, if you want to type "s" symbols then press down the "shift" key then press and release and hold the screen. Once the the number 4 on the top row. This will give you symbols on" Shift" key is released keyboard will return to normal state.

Caps Lock:

This key is called a toggle key because pressing this key toggles or changes the from one state to another. Unlike the shift key one need not keep it pressed.

If the keyboard is in small letter mode then press and release this key the keyboard will go into capital letters mode and the "Caps Lock" LED on the keyboard generate Once you are in "Caps Lock" mode, pressing of any alphabet key will capital letters.

When the keyboard is in "Caps Lock" mode pressing of this key will toggle the keyboard back to normal mode. This will also switch off the "Caps Lock" LED on the keyboard. In this normal mode pressing any alphabet on the keyboard will give small letters.

One cannot get ! @ # $ etc. symbol in this mode without pressing the Shift keys.

Num Lock:

This Num Lock key is another toggle key. This key is used to toggle the state of the numeric keypad provided on the right side of the keyboard.

When the keypad is in numeric mode, pressing of "Num Lock" key will toggle it to cursor control mode and switch off the "Num Lock" LED. In this cursor control mode pressing of any key on the numeric keypad will move the cursor.

Pressing this "Num Lock" key once again will switch the keyboard back to numeric mode and the "Num Lock" LED will turn on. In this numeric mode pressing of any key on the numeric keypad will produce a number.

Scroll Lock:

This is the third and final toggle key on the PC-AT 101-key keyboard. Pressing of this key toggles the keyboard into "Scroll Lock" mode and the "Scroll Lock" LED is switched On. Pressing of this key once again returns the keyboard into normal mode and the "Scroll Lock" LED is switched off. This key has not much of use, some spread sheet programs use this key to scroll the entire spreadsheet around.

Ctrl:

CTRL or Control key is a shift like key that can be used with other keys for different purposes. For example, in WordPad, after some text is selected, if you press and Hold down the CTRL key, then if you press B, the selected text will become bold.

Pressing of any key with the Control key is indicated as CTRL +Key or Ctrl-Key or as ^Key, for example pressing the K key when the Control key is down is shown as Ctrl +K or Ctrl-K or AK.

Alt: Alt or Alternate key is another shift like key that can be used to change the way different keys are interpreted by the computer.

For example, after you press and Hold down the ALT key, if you press s key, most of the software interpret this as an indication that you want to save something.

Tab:
     The Tab key on the keyboard generates a specific ASCII code that can be interpreted by different programs in different ways.
     Most of the word processing software move the cursor five or eight spaces to the right when this key is pressed. Windows use this key to move around in a set of given options.

Enter/Return:
     This is one of the most useful key on the keyboard. When entering any value into the computer, pressing of this key informs the computer that you have finished typing and the computer can start processing the input data.
Some keyboards have "Enter" key some have "Return" key and some keyboards use symbol to show this key on the keyboard. Keyboard contain two enter keys ,one in the alphabet typing area and another on the number keyboard.

Pause:
     This key as the name suggests can be pressed to suspend any operation being done by the computer. Most of the time this key is used to stop fast multi-page display on the screen. Pressing of some other key will release the computer from this pause mode.

Break:
     Break key by itself does nothing but when pressed with the CTRL key, this key can be used to stop programs in the middle of their execution. The difference between Pause and Break key is pause key is used to temporarily stop or suspend the operation, whereas the break key is used to permanently stop the program execution. On most of the keyboard this key is shared with the Pause key or with Scroll Lock key.

Ctrl +Alt + Del:
     When the computer is not responding to any key on the keyboard, a combination of the Ctrl and Alt and the Delete key can be used to restart the computer.
     First the Ctrl key is pressed and held down, next the Alt key is pressed and held down, while holding these two keys down, the third key Delete is pressed and then all the three keys are released.
     This key combination is called a "Soft Reset" or "Warm Boot". If this soft reset does not restart the system then one need to press the Reset key on the front panel, or one can switch off the system and restart after waiting for about ten seconds.

Sys Rq:
     This key was added to the keyboard by the IBM to use the keyboard with some multi-user future version of DOS. But that version is still awaited and this key has not much of use in the current DOS or the Windows environment.

Esc:
     The Esc or the Escape key as the name suggest is used in most of the software to escape from the situation one is in.
     For example, suppose you have given the command to print 100 copies of some document to a word processor and then you want to stop after printing ten copies, in this situation you can press the Esc key after the printer has printed ten copies of the letter.

Back Space
     This key is a back arrow key " ← "located at the top right corner of the alphabet area. This key as the name suggest is used to move the cursor one character to the back i.e. to the left, and delete the character at that position.

Keyboard Ergonomic:

Ergonomic word is used to describe the design and use of a product in such a way that it can be used most efficiently comfort and minimum risk of any injury. Many ergonomic keyboards are in the market which claims to increase keyboarding comfort and decrease the risk of hand injury like "Carpal Tunnel Syndrome". The basic design of these ergonomic keyboards focus on moving the hands straight with shoulders and keeping the wrists straight.

The following tips is useful during typing.

- ➢ The wrist should not be bent outward in the direction of the little finger.
- ➢ Try to keep your wrists straight while typing.
- ➢ The hands and arms should not be angled together in front of the body, instead they should be kept at shoulder width.
- ➢ The wrist should not be bent down such that the fingers are lower than the wrist joint.
- ➢ The wrist should not be bent up and back such that the fingers are higher than wrist joint.
- ➢ Adjust the chair height , so as you type , your elbows are at the same height as your wrists.
- ➢ Every hour, rest your hands and wrists for about five minutes.

MOUSE:

The most common input device is keyboard . But for many first time computer users it is the biggest barriers in using the computer. Using the keyboard commands to carry out different works by the computer is difficult to remember and understand even for many experienced users. This problem made engineers at the Xerox Corporation's Palo Alto research center(PARC) to develop a completely different method for software operation. This concept was first explored by Doughlas C.Engelbert of Stanford Research Center.

His concept of pointing device, that a computer user could move on his desktop causing a corresponding cursor movement on the screen to select different options on the screen. Because of its shape and tail like cable, this device is called as "Mouse".

Mouse was first introduced by the Apple computers in their Macintosh range of computers. Initially the IBM rejected this idea but later the popularity of Macintosh increased and more and more Graphical User Interface(GUI) software like "Windows" , etc… IBM made "MOUSE" as a standard.

Mouse is a pointing device and its size is like palm. It rolls on a small ball and has one or more buttons on the top. When the user rools the mouse across a flat surface, the screen cursor moves in the direction of the mouse movement. When the user rolls the mouse forward and left , the screen cursor also moves up left on the screen. This means the cursor follows the user's hand movement. But mouse can never replace the keyboard, but it can supplement the keyboard by doing tasks like moving and pointing.

Trackball:

Trackball removes the space problem faced in using the mouse. Mouse needs some space in moving, but no space is required to move the trackball around.

With a trackball the screen pointer is moved by manipulating the ball with the thumb or fingers. Trackballs use the same driver software as mouse and most of them are compatible to the Microsoft mouse. Trackball is also available in two or three button type.

Currently optical trackball is popular one. It is like old optical mouse design, the ball of optical trackball contain faint lines which help the optical sensor inside the trackball to detect the ball movement. Optical trackball require less maintenance , when they get dirty remove the ball and clean the optical sensor with cotton dampened with plain water or lens cleaner liquid.

DIGITAL CAMERA:

Digital Camera can be used to capture any image and to save them on storage device such as hard disk, CD-ROM , etc… These changes can be posted on the web or printed on a colour ink-jet printer.

Some common digital camera are :
- Digital Still Camera
- Digital Video Camera
- Web Camera

Digital Still Camera

Digital still camera look like the older film based Camera. To use it one need to look through the view finder, set the image and push a button to take picture. Currently most of the digital Still camera provide high resolution images which can be printed on 8 inch x 10 inch size without any lose of image quality. Based on the memory capacity available in the camera, we can store hundreds of images onto it. It has features like 2X to 10X inch size facility to capture video clip , record audio etc… It is connected with computer also for storing the video and audio. It is treated like web camera also.

Digital Video Camera

Digital video camera is used to capture moving images digitally. It provide an image capture rate around 30 frames per second. Resolution of this camera is lower than the resolution of digital still camera. Most of the digital video camera provides 30 frames per second video at VGA mode , that is 640 x 480 pixels. Its zoom is up to 30X. It is also used as web camera.

Web Camera

 A web camera is basically a low end digital camera with low resolution having fixed focus lens. This camera is suited for webcasting , video messaging etc.. applications. It is used to capture images.

Image Sensor

Image sensor is the heart of the digital camera. It is the job of the image sensor to capture the light falling on it and convert the light into electrical signal, which can then be converted into digital data to store as the captured image. It is used by array of CCD(Charge Coupled Devices) elements which is used as image sensing device.

UNIT 4

CPU INSTALLATION:

Here we install the CPU in the Intel 915 Chipset which is designed for the Intel Pentium 4 processor with Hyper threading technology(HT) in the LGA package. This chipset brings compelling new capabilities to the mainstream desktop PC. The specifications for the CPU is used in the motherb**o**ard is , that the motherboard supports Intel 775 pin socket supporting Intel Pentium/Celeron processor in 775 land LGA package.

For the installation or Intel 775-LAND CPU please follow the steps below. Before you insert the 775 LAND CPU into the socket, please check if the CPU surface is unclean or if there is any bent pin on the socket.

Do not force to inset the CPU into the socket if above situation is found. Otherwise, the CPU will be seriously damaged.

Open the socket

    i.   Disengage(undo or unlock) the lever by depressing down and out on the hook to clear retention tab.

    ii.   Rotate the load lever to fully open position at approximately 135 degrees.

    iii.   Rotate the load plate to fully open position at approximately 100 degrees.

Insert the 775-LAND CPU:

Hold the CPU by the edges where are marked with black lines. orient the CPU with HIS (Integrated Heat Sink) up. Locate Pin1 and the two orientation key notches. For proper inserting, please ensure to match the two orientation key notches of the CPU with the two alignment keys of the socket.

Carefully place the CPU into the socket by using a purely vertical motion. Verify that the CPU is within the socket and properly mated to the orient keys.

Remove PnP Cap (Pick and Place Cap), use your left hand index finger and thumb to support the load plate edge, engage PnP cap with right hand thumb and peel the cap from the while pressing on center of PnP cap to assist in removal. It is recommended to use the cap tab to handle and avoid kicking off the PnP cap.

Close the socket:

Rotate the load plate onto the IHS. While pressing down lightly on load plate, engage the load lever. Secure load lever with load plate tab under retention tab of load lever.

<u>Installation of CPU Fan and Heat sink:</u>

This motherboard has 775-Pin socket that supports Intel 775-LAND CPU Use a heat sink and cooling fan compliant with Intel 775-LAND CPU. Before installing the heatsink, use thermal grease between the CPU and the heat sink to improve heat dissipation.

Once the CPU and heatsink are securely Apply Thermal fastened and In good contact with each other, connect the CPU fan to the CPU _FAN connector on motherboard.

Apply thermal grease onto center of IHS on the socket surface. Place the heatsink onto the socket. Ensure fan cables are oriented on side closest to the CPU fan connector on the motherboard.

Align fasteners with the motherboard through holes.

Rotate the fastener clockwise, then press down on fastener caps with thumb to install and lock. Repeat with remaining fasteners. If you press down the fasteners without rotating them clockwise, the heatsink cannot be secured on the motherboard.   Connect fan header with the CPU fan connector on the motherboard.

Serial ATA(SATA) Hard disks:
<u>Introduction</u>

Ata is an old interface, after the introduction of ATA, its designers have tried various tricks to make it faster/better with hard disk drives. Today ATA interface is around 25 times faster than the first ATA. But this improvements cannot continue as the ATA " reaching its limit. So Intel, with several drive manufacturers have announced a new ATA interface standard known as "serial ATA" or SATA.

As the name suggests this new ATA interface is a serial interface. Current ATA is Parallel interface., it uses 16 data channels at a time. Serial ATA will use only one data channel , but it will operate at a very high speed, to provide better throughput than the parallel interface. Initial specification for serial ATA talks about 150 MBps transfer rate , which is only ten percent better than the current top speed of parallel ATA interface.

But there is a chance of a parallel ATA speed getting doubled, whereas the serial ATA speed could be increased to 300 MBps and 600 MBps in future. Serial ATA is fully compatible with the parallel ATA at the software level, a drive connected to   the serial ATA   will function without any problem with the current operating system and other software.

At the hardware level serial ATA is completely different from the old parallel interface, one would require a new motherboard and a new hard disk drive to use serial ATA interface. The serial ATA requires two pairs of wires, one to the device and one from the device, for full duplex operation. Only one device connects one serial ATA port, so to connect four devices, motherboard must contain four serial ATA ports.

What is SATA Hard Drive?

Definition
Serial Advanced Technology Attachment, often abbreviated SATA or S-ATA, is a serial link - a single cable with a minimum of four wires creates a point-to-point connection between devices. As an evolution of the older Parallel ATA physical storage interface, SATA host-adapters and devices communicate via a high-speed serial cable.
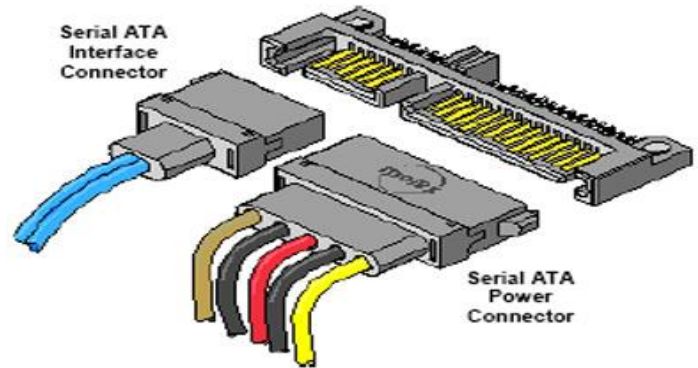
These hard drives have replaced the PATA(Parallel advanced technology attachment) drives in desktop and laptop computers. The main physical difference between the two is the interface, although their method of connecting to a computer is the same. Here are some advantages of SATA disk drives.

- SATA drives can transfer data faster than PATA types by using serial signaling technology.
- SATA cables are thinner and more flexible than PATA cables.
- They have a 7-pin data connection, with cable limit of 1 meter.
- Disks do not share bandwidth because there is only one disk drive allowed per SATA controller chip on the computer motherboard.
- They consume less power. They only require 250 mV as opposed to 5V for PATA.

The SATA computer bus, a storage-interface for connecting host bus adapters (most commonly integrated into laptop computers and desktop motherboards) to mass storage devices (such as hard disk drives and optical drives), offers several compelling advantages over the older parallel ATA/"EIDE" interface: reduced cable-bulk and cost (7 pins vs 40 pins), faster and more efficient data transfer, and the ability to remove or add devices while operating (hot swapping).

Advantages
Transfer rates for Serial ATA begin at 150MBps. One of the main design advantages of Serial ATA is that the thinner serial cables facilitate more efficient airflow inside a form factor and also allow for smaller chassis designs. In contrast, IDE cables used in parallel ATA systems are bulkier than Serial ATA cables and can only extend to 40cm long, while Serial ATA cables can extend up to one meter.

Serial ATA (SATA) Hard Disks Installation:

Here we see how to install the SATA hard disks into the computer:

- Install the SATA hard disks into the drive bays of your chassis.
- Connect the SATA power cable to the SATA hard disk.
- Connect one end of the SATA data cable to the motherboard's SATA Connector.
- Connect the other end of the SATA data cable to the SATA hard disk.

Before you install os into the SATA hard disk, you need to check and ensure the configuration of the on Board IDE operate Mode" option in BIOs setup is correct according to the condition of your system.

Latest Hard Disk Drives:

Western Digital's (WD) HGST subsidiary today announced it has added 8TB and 10TB hard drives to its HelioSeal product line, which hermetically seals in helium in order to reduce internal drive friction and power use. WD also announced its first NVMe (non volatile memory express) product with a PCIe-attached flash drive; the company also announced a new 2.5-in solid-state drive (SSD).

Additionally, WD unveiled a new "flash fabric" software and hardware platform that acts as a multi-server volume manager, linking up to 128 servers and 16 PCIe drives for up to 38TB of pooled flash storage. HGST is rebranding Virident Solutions 2.0 software.

Diagram of HGST Drive

HGST's Active Archive platform can link up to 128 servers and 16 PCIe drives for up to 38TB of pooled flash storage. The HGST Virident Solutions 2.0 software can create a high availability, mirrored cluster that can be managed through a graphical user interface for shared storage applications like OracleRAC and Red Hat Global File System that traditionally rely on dedicated SANs.

It also provides MySQL environments with greater levels of availability and efficiency where a single stand-by server can be deployed as an alternative to dedicated replication pairs, saving as much as 37% on total server count, according to HGST.

The Virident Solutions 2.0 software can be added to HGST's already-shipping Virident ClusterCache for SAN acceleration, Virident Share for Flash pooling and remote access to Flash, and Virident HA for replication.

"Companies that invest in flash are going to want to be able to scale out and share that capacity without compromising the performance of their flash," said Mike Gustofson, a general manager at HGST. "

Massive hard drive upgrade

Last November, HGST announced its first helium-filled hard drive, the 6TB (He6) model that broke all previous records for hard drive areal density. Today, HGST said that by 2017, it plans to end production of air-filled hard drives for use in corporate data centers, replacing all of its models with helium filled products.   **Diagram of HGST Drive**

HGST's first 10TB hard drive uses shingled magnetic recording, which overlaps data tracks in order to achieve a higher areal density. Along with the thinner gas's ability to reduce power use, the helium-drives run at four to five degrees cooler than today's 7200rpm drives, HGST stated. Sealing air out of the drive also keeps humidity and other contaminates from getting in. HGST's announcement comes less than two weeks after Seagate announced its highest capacity enterprise hard drive, an 8TB model that bypassed helium for air. Instead of helium, Seagate uses a technology called shingled magnetic recording (SMR) to increase the capacity of its drives beyond 4TB. Seagate has said SMR holds the promise of creating 20TB drives by 2020.

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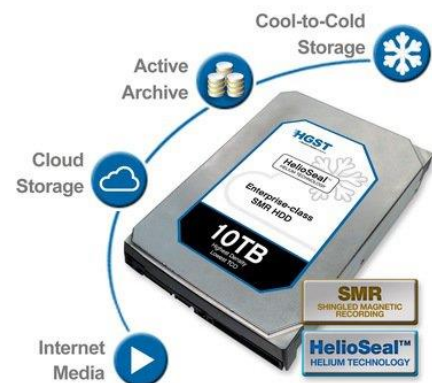
With SMR technology, Seagate has been able to increase bit density on its platters by 25% or more. Unlike standard perpendicular magnetic recording (PMR), where data tracks rest side by side, SMR overlaps the tracks on a platter like shingles on a roof, thereby allowing Seagate to squeeze more tracks together on a hard drive platter.

HGST's new 3.5-in 8TB drive uses traditional PMR technology, but the new 10TB hard drive marks WD's foray into SMR in conjunction with the helium gas. Both drives use a 12Gbps SAS interface. By using helium instead of air, HGST said it was able to stack 7 platters and reduce power usage at idle by 23% and watts per terabyte of capacity by 44% over its 6TB drive.

(HGST DRIVE)

HGST's He8 8TB hard drive uses standard perpendicular magnetic recording surrounded by helium gas to reduce friction. The 8TB drive is being marketed as nearline storage for faster access. The 10TB helium-filled hard drive is being targeted at cloud and archive "cold storage" applications because there are performance hindering implications related to the SMR technology, including file systems and software drivers, according to Dave Tang, general manager of HGST's Elastic Storage Platforms Group. Both new drives come with a 128MB cache buffer, a five year warranty and a two million hour meantime between failures (MTBF) rating. The new hard drives also come with WD's "Instant Secure Erase" feature, which overwrites data multiple times to ensure deletion. Both 8TB and 10TB drives are shipping or sampling today.

Samsung PM1633a (16TB)

If you know the basic differences between magnetic storage (HDDs) and solid-state storage (SSDs), you'll know that SSDs are generally smaller than HDDs (or cost more per GB, at least). So, you'd expect the largest drive in the world to be an HDD, but surprisingly, it's a solid-state drive. The 16 TB PM1633a was first announced in mid-2015 at the Flash Memory Summit in California, and even a couple years after, it still remains the largest storage drive in the world. Not only can it hold **16TB** of data, all of that capacity has been packed into a small 2.5″ form factor SAS drive, using 3D NAND technology. 3D NAND basically means that rows of transistors used to store information are stacked vertically like files in a cabinet, rather than laying beside one another on a flat surface

HGST Ultrastar He12 (12TB)

Western Digital is one of the two major hard disk drive manufacturers in the world, with HGST being its daughter company in charge of developing helium drives. Ultrastar He12 is their latest creation (with larger drives in the making), coming in at 12 TB of storage at 7200RPM.

Helium technology has been crucial to increasing hard disk drive capacity in the last few years. The way it works is in the name – rather than having filtered air within the drive's casing, the casing is hermetically sealed and filled with helium. The main benefit of the drive platters spinning in a less dense gas is the ability to reduce aerodynamic forces on the platters, thus allowing more platters to be put into one drive, in turn increasing its capacity. It also reduces the amount of energy required for the platters to spin, reducing power consumption, alongside a few other useful side-effects.

Same as all the other drives in this list, the main focus of the Ultrastar series is making reliable drives for work in data centers and other enterprises. The [first shipments of the drive](#) were sent out in April 2017.

Seagate Enterprise Capacity Helium Drive (12TB)

The main competitor of WD in the field of HDDs is Seagate, and it has no intentions to pass the role of industry leaders to WD. So, they have created their own line of helium HDDs, with their latest creation also reaching **12TB capacity**. While the drive itself uses the innovative technology, Seagate clearly didn't spend much time making up a catchy name, hence the name of their Enterprise Capacity 3.5″ Helium Drive.

Although WD was first to release a 12TB drive, Seagate's industry-level beast is promised to be much faster and much more reliable. In fact, its maximum sustained **transfer speeds of 261MB/s** are one of the fastest in the industry. Same as WD, Seagate plans to push forward their research in helium drive technology and release larger drives pretty much every year. Even though regular consumers won't get much use of these drives, you can still **expect 14 TB and 16 TB drives in the near future** from both manufacturers.

DDR/DDR2:

DDR MEMORY

The Double Data Rate(DDR) SDRAM provides speed almost equal to the RDRAM. DDR SDRAM doubles the rate at which SDRAM process the data. SDRAM carries information only on the rising edge of clock signal, where as the DDR RAM is able to read data on the rising as well as the falling edge of the clock signal. This results the double performance by DDR RAM. DDR SDRAM is costlier than standard SDRAM but it is much cheaper than RDRAM. This resulted in most of the Pentium 4 based system going for DDR DIMM , instead of going for costlier RIMM.

DDR DIMM use a connector with 184 pins. This connector contains a single notch near the center of the connector. Some of the variations of the DDR RAM available market are ,

- DDR 266
- DDR 333
- DDR 400 and above
- DDR2 533

DDR 266

This is one of the cheapest DDR memories available . This is the minimum one should get for a P4 motherboard. Even if the motherboard does not support dual channel DDR memory, one should install the maximum DDR 266 memory that one can find afford(pay for).

DDR 333

DDR 333 is required for those users who use powerful applications such as video processing software, latest games. Also , a good quality DDR 333 can be overclocked. To use DDR 333 memory your motherboard should support it.

DDR 400 and higher

This DDR 400 memory is recommended for some of the latest motherboards with at least P4 2.8 GHz or above or Athlon 64 processor. With the DDR 400 memory and a good board and processor combination one can easily overclock the system. To get the best performance it should be run in the dual channel mode.

DDR2 533

This is a new DDR memory standard and boards that support this new memory standard are gradually beginning to show up in the market.

DDR2 MEMORY:

DDR SDRAM or Double Data Rate Synchronous DRAM is a special type of memory which can transfer data on the rising and falling edges of a clock cycle. Unlike the normal SDRAM which carries information only on the rising edge of a clock signal, DDR is able to read data on both the rising and falling edges. This property of DDR memory doubles the memory chip data throughput. DDR2 , the newer DDR memory standard , which uses the 240-pin FBGA(Fine Ball Grid Array) packaging , compared to TSOP packaging used by DDR. This packaging offers higher scalability as it has lower resistance. But manufacturing memory in this packaged costs more than TSOP.
Also DDR-SDRAM ,consumes less power it requires like 1.8V power supply, while DDR needs 2.5V. One drawback of DDR-2 is it is not backward compatible with DDR, the user will not be able to insert DDR-2 memory modules into the DDR slot.

The memory chips which run at 333 MHz DDR has effective throughput of 667 MHz This translates into a bandwidth of 5,333 MBps-in single channel mode. In dual channel mode, the bandwidth will go up to 10666 MBps, that is 10 GB per second.
DDR2 chips are available for 400 MHz, 533 MHz and 667 MHz. These speeds are possible because of additional features such as a larger prefetch and improvised registers The bus width (64-bit), is the same for DDR and DDR2. One issue that needs to be resolved is that the motherboards need to be compatible with memory modules working at this speed. Intel's 925XE chipset is said to have this compatibility. Sis Sis5656 chipset, also has support for the DDR2 specification.

Dual Channel Mode Memory(DMM):

What is Dual-channel Mode Memory?

A motherboard can have a maximum of two memory channels controlled by the memory controller, and each of the memory channels can handle two or three slots on the motherboard. Now in single channel memory systems there only a single route for the memory to access the memory controller. But with dual-channel memory, double the bandwidth can be achieved as the memory modules are inserted in two separate channels.
Each of these channels has its own separate lane to access the memory controller and therefore the bandwidth is doubled For instance, there are four memory sots on the motherboard A, B and C, D. Now if you want to run the memory in the dual mode, you will need to insert the memory sticks in slot A and C or B and D if you are using two memory sticks.
Any normal DDR memory can be used to work under the dual channel mode, provided the
   - Motherboard chipset supports it
   - Both the memory modules are of the same density.
   - Both the memory modules are running at the same speed and are inserted In different channels (alternating slots).
If you plan to use four memory sticks, then you can utilize all four slots, provided all the memory sticks are of the same speed and density For example 256 MB x 4

RAID (Redundant Arrays of Inexpensive Disks):

As one would use DDR2 memory to increase memory speed, one can use the RAID or "Redundant Arrays of Inexpensive Disks" to improve the disk I/O speed. RAID is also used to increase fault tolerance of the disk drive system. There are different types of RAID implementation is available far different application. RAID 0 and RAID 1 are two of the common RAID implementations that one can easily implement on a PC system.

Of these implementations, RAID 0 can raise disk I/O speed and RAID 1 can enhance fault-tolerant ability. One can get both the benefits of increased disk I/O speed and fault tolerance using RAID 0+1 implementation.

RAID 0
The data is RAID 0 is also called stripe array, it implements a stripped disk array and the data is broken down into blocks in which each block written separate disk drive. The I/O performance is greatly improved by spreading the I/O load across many channels and drives.   The best performance achieved when data is striped across multiple channels.

RAID 0 is not a "True" RAID because it is NOT fault-tolerant. The failure of just one drive will result in all data in an array being lost. RAID 0 should never be used in mission critical environments.

RAID 1:
RAID 1 is also called mirror array. It provides 100% data redundancy. No rebuild is necessary in case of a disk failure, simply copy data from the remaining healthy disk to the replacement disk. We can specify a disk as the auto-selected replacement disk for a Mirror Array, this replacement disk is called Spare Disk.

RAID 0+1:
RAID 0+1 is implemented as a mirrored array whose segments are RAID 0 arrays. It has the advantages both provided by RAID 0 (high I/O performance) and RAID 1 (fault tolerance). At least four disks are needed to create a RAID 0+1 disk array.

SPAN ARRAY
Span Array is also called JBOD (Just A Bunch Of Disks), which uses a bunch of disks as a larger disk. Span provides no fault tolerance and no I/O performance enhancement; it's just a task to enlarge disk capacity.

Latest Memory Cards:

Most of the portable devices such as latest mobile phones, MP3 Player, digital camera and PDA provide a built in memory card slot. We can connect memory cards of various capacities into these slots to increase the storage capacity. Memory card equivalent of a hard drive for these portable devices. Memory cards are most popular method to store , transfer and carry all kinds of digital data.   The following are   the common types of memory cards which is used nowadays. They are :

Compact Flash Memory Cards
Compact Flash Card or CF card was introduced by SanDisk in 1954. It is mainly used in digital cameras, because of their higher capacities and faster transfer speeds. There are two types of CF cards,

- Type I and
- Type II

Type II cards typically allow higher storage capacities but are also physically thicker. When you buy the CF card, it is important to check the type of CF card that our device supports. Capacity of a CF card will range from 64 MB to a maximum of 4 GB. The most common cards come in 128, 256 & 512 MB of data stored. Suppose if the user goes for higher than 512 MB CF cards then the value per MB increase very much because the cost of producing a higher capacity is very high.

The write speed is given as 4x, 24x, 40x, and 80x. There is no indication what 1x represents, but it is generally defined as a write speed of 150n kilobytes of data per second. With a 80x card one should be able to write at a speed of 12 MBps.

SD (Secure Digital) Cards

Compared to CF cards, secure digital cards, are much smaller. These cards were mainly developed for mobile phones and other small devices where size is a very important parameter. SD card was developed by Toshiba and Matsushita. These cards offer built in encryption data stored in them, these are known as Secure Digital(SD) cards. This built in security feature makes these cards more popular than the multimedia cards.

SD cards now available in capacities between 16 MB and 1 GB. An SD memory card typically measures 32x 24x2 and weighs approximately 2 grams.

Memory Stick

Memory stick was introduced by Sony in 1998 for storing still digital images, video, music files and other type of electronic data. This is a proprietary storage standard. When launched, the memory stick was almost twice a long as a Multimedia Card (MMC), a later version known as Memory stick Duo is about the half the weight of its predecessor and is backward compatible when used with an adapter.

To launch the memory stick duo, Sony tied up with the flash memory card giant SanDisk. Memory stick pro supports higher speeds and capacities like 256 MB and above.

Sony provides its own proprietary security feature for the memory stick, known as the Magic Gate. One problem with this security is, any content written on the memory stick using the magic gate software cannot be copied or transferred to other computers or devices. Magic Gate is Sony's proprietary data encryption and authentication technology specifically made for their storage formats, including the memory stick duo pro. Currently we can buy memory sticks which is available in the capacities ranging from 128 MB to 256 MB.

Multimedia Cards(MMC)

Multimedia card or the MMC was introduced by the Flash memory card giant SanDisk and Siemens in 1997. These are small stamp sized cards, based on the flash memory. It is a cheaper alternative of the SD cards and are commonly used in mobile phones. These are cheaper than the SD cards because it does not contain the security features found in the SD cards. Also the Read/Write speed of the MMC are not as fast as the SD cards.

These cards are easily fit into the standard SD card slots, but the SC cards cannot b used in the MMC slots. The advantage of MMC is that it is smaller in size and cheaper in cost. It is available in capacities from 64 MB to 512 MB.

SmartMedia Flash Cards

SmartMedia Flash Cards, also known as SSFDC(Solid State Floppy Disk Card), were introduced by Toshiba in 1995. At that time they were very popular because of their small size and super thin architecture. With the arrival of MMC and SD cards, only a few old devices use this type of storage. Due to its limited storage capacity and slow transfer speeds it is being rapidly replaced by MMC and SD storage.

xD Picture Card

xD picture card was developed by Fuji and Olympus companies for use in their cameras. As xD cards are often sold under license, one may find different brand on the packaging. xD picture cards have a distinctive, shield style design and are roughly the size of thumb. xD picture cards are not used as a generic storage solution, Olympus and Fuji companies use the cards predominantly for their digital camera. The storage capacity of the xD picture card can vary from 8 MB to 512 MB.

DVD Drive:

What is DVD drive ?

DVD, which stands for digital video disc or digital versatile disc, is the next generation of optical disc storage disc storage technology. It is a bigger and faster CD that can hold cinema like video, better than CD audio and computer data. Using a DVD the user can have home entertainment, computers, and business information with a single digital format. The DVD will replace audio/video CD, videotape, laserdisc , CD-ROM , and video game cartridges.
There are various DVD variations, they are, DVD-ROM or DVD-R are physical formats and DVD-Video or DVD-audio are application formats. DVD-ROM is the base format that holds data.

The physical format of DVD-ROM includes recordable variations DVD-R, DVD-RAM, DVD-RW and DVD+RW. The application formats include DVD-Video, DVD-Video Recording, DVD-audio, DVD-Audio Recording , DVD Stream Recording and SACD.

DVD Data Storage Capacity

The DVD are of the same diameter and thickness as CDs, and they are made using some of the same materials and manufacturing methods. Like CD, the data on a DVD is encoded in the form of small pits and bumps(strike) in the track of the disc.

A DVD is composed of several layers of plastic, totaling about 1.2 millimeters thick. Each layer is created by injection molding polycarbonate plastic. This process forms a disc that has microscopic bumps arranged as a single, continuous and extremely long spiral track of data.

Once the clear pieces of polycarbonate are formed , a thin reflective layer is sputtered(spit) onto the disc, covering the bumps. Aluminum is used behind the inner layers, but a semi reflective gold layer is used for the outer layers, allowing the laser to focus through the outer and onto the inner layers.

After all of the layers are made , each one is coated with lacquer(polish) , squeezed(grip) together and cured under infrared light. For single sided discs, the label is silk screened onto the nonreadable area near the hole in the middle. Also if a user lift the data track off a single layer of the DVD, and stretch it out into a straight line, it would be almost 7.5 miles long, a double sided layer DVD would have 30 miles of data.

Multilayer Storage

As to increase the storage capacity , a DVD can have up to four layers, two on each side. The laser that reads the disc can actually focus on the second layer through the first layer. The following table shows the capacities of different forms of DVDs as follows :

Format	Capacity	Approximately Movie length
Single sided/Single layer	4.38 GB	2 hours
Single sided/Double layer	7.95 GB	4 hours
Double sided/Double layer	8.75 GB	4.5 hours
Double sided/Double layer	15.9 GB	Over 8 hours

The capacity of a DVD does not double when the user add a whole second layer to the disc, because when a disc is made two layers , the pits(lowest point or depth) have to be a little longer , on both layers than when a single layer is used.

Recordable DVD : DVD-R, DVD-RAM, DVD-RW, and DVD+RW

There are five recordable versions of DVD-ROM: DVD-R for general, DVD-R for authoring, DVD-RAM , DVD-RW, and DVD+RW. All the recordable drives can read DVD-ROM discs, but each uses a different type of disc for recording. DVD-R can record data once , while DVD-RAM, DVD-RW, and DVD+RW can be rewritten thousands of times. A big problem is that none of the writable formats are fully compatible with each other or even with existing drives and players.

DVD-R

DVD-R uses organic dye technology, like CD-R, and is compatible with most DVD players. First generation capacity was 3.95 billion bytes, later extended to 4.7 billion bytes. In early 2000 the format was split into authoring version and a general version.
DVD-RW
The DVD-RW , it is formerly known as DVD-R/W and also known as DVD-ER. It is a phase change erasable format. DVD-RW is playable in most DVD drives and players. Capacity is 4.7 billion bytes. DVD-RW can be rewritten about thousand times.
DVD-RAM

DVD-RAM with storage capacity of 4.7 billion bytes, uses phase change(PD) technology with some MO features mixed in. It is the best suited of the writable DVD formats for use in computers. It is not compatible with most drives and players. It can be rewritten more 100,000 times, and the discs are expected to last at least 30 years.

DVD+RW

DVD+RW is an erasable format based on CD-RW technology. DVD+RW drives ill read DVD-ROMs and CDs, and probably DVD-Rs and DVD-RWs, but will not read or write DVD-RAM discs. The drives are expected to write CD-Rs and CD-RWs. DVD+RW discs hold 4.7 billion bytes per side. It should be readable in about 70% of the existing DVD-Video players and DVD-ROM drives. The DVD+RW media can be written about 1,000 times.

How Long DO DVD Lasts

- Mass market pressed discs will last anywhere from 50 to 300 years.
- DVD-R discs are expected to last anywhere from 40 to 250 years, about as long as CD-R discs.
- The erasable formats (DVD-RAM,DVD-RW and DVD+RW) are expected to last from 25 to 100 years.

What are "Regional Code", "Country code" or "Zone lock"

The users who use DVD, requires that the DVD standard include codes that can be used to prevent playback of certain discs in certain geographical regions. Each player is given code for the region which it is sold. The player will refuse to play discs that are not coded for its region. This means that discs bought in another country. Some people believe that region codes are an illegal restraint (control) of trade. But there have been no legal cases to establish this.

The Regional codes are entirely optional for the maker of the disc. Discs without region locks will play on any player in any country. The regional codes do not apply to DVD-audio. There are 8 regions which is also called as Locales. The players and discs are often identified by the region number superimposed on a word globe. If a disc plays in more than one region it will have more than one number on the globe.

   I.   **U.S, C**anada, U.S. Territories.
  II.   **J**apan, Europe, South Africa , and Middle East.
 III.   Southeast Asia, East Asia
  IV.   Australia, New Zealand, Pacific Islands, Central America , Mexico. South America
   V.   Easter Europe, Indian subcontinent , Africa, North Korea, and Mongolia.
  VI.   **Chin**a
 VII.   Reserved
VIII.   Special International venues.

General Inspection, Cleaning, and Lubrication

One should perform the following as a general preventive maintenance on a CD-ROM/DVD drive. These procedures can also be performed when one detects behavior of CD-ROM/DVD drive. As a preventive step the lens its suspension, turning mirror, drawer mechanism, spindle, and sled drive should be checked, and cleaned and/or lubricated if necessary.

Objective Lens

When cleaning the objective lens, one should be very careful. The lens is suspended by a voice coil actuated positioned which is very delicate(weak). One can also use a lens, cleaner disc, but these discs are not of much use except for the most minor dust. These cleaning discs will not completely remove grease, grime, etc. To clean the objective lens, first, gently blow out any dust or dirt which may have collected inside the lens assembly.

An air bulb with a brush, generally used by photographers for cleaning their lens, is very good for this. One should not use compressed air source, Once the dust particles are removed, clean the lens. As the lens is made of plastic never use any strong solvents Some special cleaner are available for his, but one can use isopropyl alcohol or a lens cleaning liquid. Use a soft cotton bud and dean gently. Once the lens is cleaned, dry cleaning everything.

One should never lubricate the optical assembly. Never use strong solvents or anything with abrasives - you will destroy the lens surface rendering the entire optical assembly worthless, Once the lens is dean, it should be perfectly shiny with a blue tinge uniform over the central surface.

Drawer Mechanism

Check the drawer mechanism for free movement If the mechanism its check the belt for life it should be firm, reasonably tight, and should return to original length instantly if stretched by 25% or so.

If the belt fails these tests then one should immediately replace it, as it may give problems in the future. Clean the belt and pulleys with isopropyl alcohol (dry quickly to avoid immediately, damaging the rubber) or soap and water. When the isopropyl alcohol is used, dry it otherwise the rubber parts may get damaged.

Also, check the gears and motor for lubrication and damage and correct as necessary.

Clean and lubricate other parts that help the mechanism. For lubrication use very high quality silicone based grease. One can also use silicone based oil for lubricating most of the parts. A drop of oil in the motor bearings may cure a noisy or dry bearing.

Sled Drive

During the preventive maintenance, check the components which move the pickup including belt, worm gear, other gears, slide bearings etc. All these mechanism should move freely. If any damage is found, repair or replace as appropriate. If the there is dirty or hardened grease, clean the gears and track thoroughly with the isopropyl alcohol, as this may interfere with free movement of mechanism. One can use a sharpened toothpick or a pin to get in between each of the gear teeth. Clean and lubricate the mechanism. For lubrication use very high quality silicone based grease. We also use silicone based oil for lubricating most of the parts A drop of oil in the motor bearings may cure a noisy or dry bearing.

Power Supply:

In electronic, two kinds of power supplies are used. Linear supplies and Switching Power Supplies, switch Mode Power Supply (SMPS) is very commonly used type. Low cost, Small size and high efficiency are the major features of SMPS that has replaced the conventional Linear Power supply used in electronic equipment. Here we discuss about SMPS for the **person**al computers.

Operating Characteristics

The Power Supply Unit (PSU) described here is capable of providing continuous operation at over 110 W.   It is suitable for IBM compatible PC configuration supporting two floppy drives (360KB or 1.2MB) and one hard disk drive. Various PC configurations demand different Power supply requirements depending upon the add-on cards used in the expansion slots of the computer type and number of drives used. The latest version of PCs utilizing advanced low current devices/components consume less power as compared to their predecessor. In general, PSU capable of providing continuous power of over 300W is adequate up to a normal Pentium4 Configuration.

The PSU supplies various voltages and "power good" signal necessary for the operation of PC's system board, keyboard and other installable optional cards.

It can be operated over an input voltage range of 160V to 260V AC and provides regulated DC output voltages of +3.3V, +5V,-5V, +5VSB (standby), +12V, -12V.   AT supply also output a power good signal which used by the SMPS to indicate the motherboard outputs from power supply are at the correct level and safe that all the for use by the computer. ATX power supply adds two new signals PW_ON (power on) and +5V SB (Standby) for supply the new generation of computers. This "Power ON" signal is used by the motherboard to switch on/off the power supply. signal allows the motherboard to control the power supply. Motherboard can put the system in standby by switching off the power supply, and shift back to normal operation by restoring the power.

The +5V standby is not controlled by the "power on" signal, it is to provide power to the motherboard when the system is in standby mode and the main voltages from the power supply has been switched off.

The input portion of PSU is protected by a fuse of suitable rating. The +5V DC powers the logic ICs on the system board, the disk drives and adapters in the system expansion slots.

The +12V is used for the systems dynamic memory and disk drive motors. The -5V DC levels is designed for dynamic memory bus voltage and has a longer on power than of +5V and +12V outputs. When Power Supply is turned on, it generates a power good signal which indicates that there is adequate power for processing. When the output voltages are above the minimum sense level, a TTL compatible high level (2.4V DC to 5V DC) is generated on the power good line.

This power good signal has a turn-on delay of about 100 ms after the output voltages have reached their respective levels.

The input AC supply is first filtered to suppress any spikes/surges entering the power supply circuit. This is an important part of the circuit and helps in preventing data loss or erroneous working during power line disturbances. Filtered mains supply is then rectified by a full-wave bridge rectifier to produce +150V DC for the power converter section. The input supply is switched with the help of this power converter and the energy transferred to the output through a high frequency ferrite transformer. The power converter consists of two external driver transistors operating in push-pull configuration these are driven by converter driver.

Circuit Description

The following are the basic SMPS components:
- ➢ Control IC
- ➢ High frequency power transistor
- ➢ Fast recovery switching power diode
- ➢ Low ESR capacitor
- ➢ Low loss & high frequency ferrite cores transformers
- ➢ Cooling Fan

The input mains supply is applied to the circuit through an on-off switch to fuse F1. Resistor R1 limits the inrush of the current. Power converters operating directly "off-line" like this one draw heavy current when switched on. This inrush of current causes great stress on input components, switches, rectifiers and capacitors. For low power applications, simple series resistor is used to limit the initial high voltage and high current.

Special high current surge rated resistors are best suited for this application. However adequately rated wire wound resistor also serves the purpose and is frequently used.

Capacitors C1,C2,C3,C4 and transformer X1 form a balanced input filter. X1 has two separate inductors wound on a single core. Such that the two windings are in antiphase. When the two windings are connected in this way the magnetic field that results from the normal supply currents is cancelled. Hence the low frequency line current will not saturate the core and a high permeability material may be used without the need for an air gap.

The noise which appears on both the lines at the same time with respect to ground, the two windings are in parallel and in phase. A very high inductance is presented to common mode currents. This arrangement prevents any significant interference circuits from being conducted back to the input supply lines. Filtered AC mains lines are then connected to diodes D1 through D4 acting as a full wave rectifier. C5 and C6 are the smoothing capacitors. This arrangement provides the +/- 150V DC to the power converter transformer with respect to the center point.

The power converter has been configured in half bridge push pull configuration. This is preferred topology for direct offline switch mode supplies because it causes reduced voltage stress on

switching devices. Switching transistors T3 and T4 form only one side of the bridge circuit , the remaining half being formed by capacitors C5 and C6.

Under steady state conditions , the current will increase in X4-3 and L3 during on period and decrease during off period with a mean value equal to the output current. The output voltage can be maintained at a constant by controlling on and off times. This is done in the circuit with the help of PWM IC TL494 which forms the heart of the controller section of PSU. The TL494 is a fixed frequency, pulse width modulation controller. The TL494 incorporates an error amplifier, additional functions include over current detection, dead time control, a precision 5V reference regulator and control logic which allows push pull operation of the two switching transistors.

Pen Drive:

At the beginning, when the file sizes were small, people used 1.44MB floppy disk for backup/storage and data transfer purpose. As the file sizes stand today, one cannot use the floppy disk for backup or storage purpose. Currently most of the files are above 30 to 40 MB size and to take backup of a 40MB file on a floppy disk, one would require around 35 floppy disks. Backing up and restoring 35 disks is an impossible task.

One can use CD for this purpose, but CDs are generally considered more appropriate for backup /storage than as a portable media. On a normal CD-R we cannot delete or change any data. A CD-RWs allow one to change the data , but they rewrite data at very slow speeds. Another problem with these devices is they are not very reliable. Floppy disk is very unreliable media, but the CD is also prone to damage.
So one can use a thumb drive for backup/storage and as a portable media without worrying about the problems associated with floppy disk or the CD. With a thumb drive, we can add, change or remove data as it we use in computer folder.

A thumb drive , also known as flash drive, pen drive or USB drive is a small portable device in the shape of the thumb, which can be connected to USB port of the computer.
Today the use of flash memory is very common in the electronic industry. One will find flash memory in, mobile phone, digital camera, PDA (personal digital Assistant) etc.

Flash memory is basically a type of Electrically Erasable Programmable Read Only Memory (EEPROM), the only difference being that Flash memory can delete a chunk of data at a time, which makes the job of reading and writing much faster as compared to EEPROM, which can only erase data byte by byte. As the data stored in the flash memory is changed by a sudden 'flash of voltage, it is known as flash memory. Motherboard BIOS programs are also stored in flash memory. This is why one says flashing a BIOS' when BIOS program is updated.

Expansion/Extension Cards:

Expansion Cards

The expansion cards are the different types of cards or adapters which are used in computer to improve the performance and compatibility of any system. This means that they are used to expand the working performance of the system. These cards can be available in modular form so that we can attach or remove them from the slots or they are integrated on the motherboard and are fixed. There are many types of expansion cards used in the computer system and I will talk about the four basic types of these which are:

- **Video Card**
- **Audio Card**

.Video Card

This card is used to provide the graphical interface like images, videos etc. to the user. It requires a high processing power to convert the instructions to their graphics. It is also called the *Graphic Card or Display Card*. Video card has its own processor which provide the interface between the Operating System and the Monitor to display. It is attached to the motherboard through its pins at the bottom and it has also different kinds of ports which are used to connect different kinds of the output display devices like monitor, projector etc. It is connected to the high data slots like PCIe slot or AGP slot on the motherboard. The following figure shows the video expansion card with its different parts.
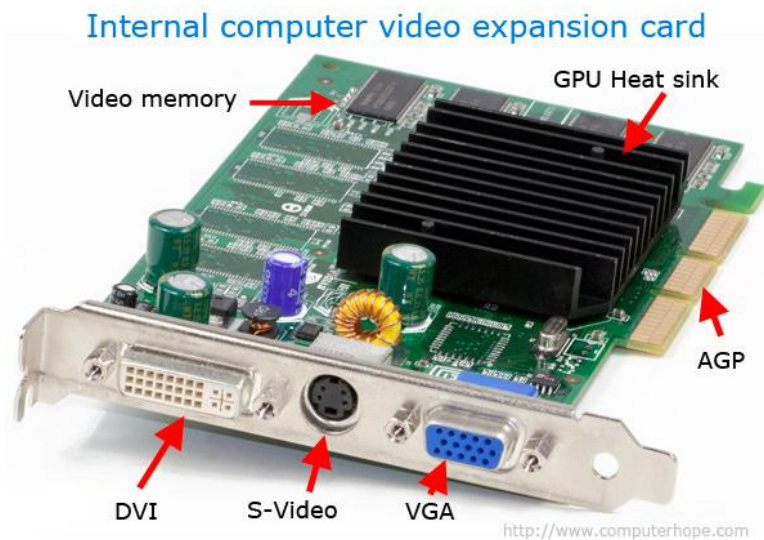

Figure: Video card with different ports

Audio Card

Audio card is used to convert the electrical signals to the audio signals or sound which we can hear. The audio cards has different kinds of ports or jacks attached to it and these ports are used to connect the headphone, Microphone, speakers and other digital audio devices. The following figure shows the Audio card and its different ports.
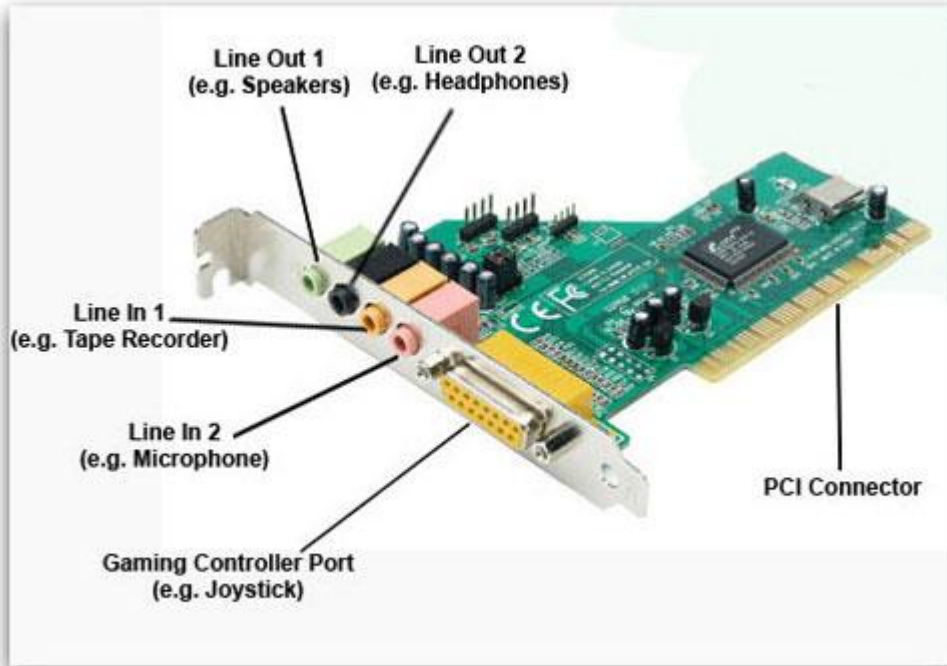

Figure: Audio card with different jacks

UNIT - V

Printers:

Printers and monitors are two of the most common output devices used with the computer. A monitor provides us with a "soft copy of results, i.e. the result being displayed on the monitor is not permanent, the moment output is changed or the power supply to the monitor is switched off, a result being shown is lost. The printer is used to get a "Hard Copy" of the results, i e. it provides permanent output (which can be viewed, filed, and used at a later stage) on the paper or some other medium such as the overhead projector (OHP) film.

Today, printers are capable of high-quality monochrome , that is single color and multicolor printout at very high speed. They are also capable of producing graphic i.e. images other than plain text on the paper.

Printers are categorized based on the mechanism used by the printer to print the image and they can also be categorized based on the image formation m used them. Based on the image formation method printers can be categorized as:

    (i)   FULLY FORMED CHARACTER printer and
    (ii)   BIT IMAGE printer as

and based printing mechanism, printers are categorized as,'

    (i)   IMPACT printer and
    (ii)   NON-IMPACT printer.

PRINTING MECHANISM:

We can categorize printers, based on the image formation method, one can also categorize printers based on their printing mechanism. Based on printing mechanism, printers can be classified into two groups, they are:

- Impact Printer
- Non-Impact Printers

Impact Printer

Impact printers, use impact to create an image on the output media. All impact printers smash a hammer of some kind against an inked ribbon to squeeze ink from the ribbon onto the paper. The advantage or impact printers is that they can be used to print on multipart forms. Because the impact printers strike the media to create an impression, they can print not just through ribbon but through the several sheets of paper by using carbon sheet.

Disadvantage of impact printers is they produce too much of noise during printing.

The common impact types of printers are,

- Daisy-Wheel Printer
- Dot-Matrix printer
- Chain printer
- Drum Printer, etc….

Non-Impact Printers

Non-impact printers do not strike any ribbon or paper to produce the image, instead they use ink spraying ,electrostatic magnetization or heat process to produce the required image.

Soundless operation and very high quality output of these printers are making them very popular. Its advantage is its lower cost compared to dot-matrix printers. In non impact printers, the Laser printer is the most common printer. The disadvantages of these printers is they cannot be used to print carbon copies or multiple copies in a single pass. Some common non impact printers are ,

- o   Inkjet Printer,
- o   Laser Printer,
- o   Thermal Printer

Dot-Matrix Printer :

Dot-Matrix printers (also known as matrix printers) are bit-image impact type printers. These printers form characters and images by placing pattern of dots on the paper.

This pattern is placed by striking an inked ribbon with a number of small pin.. These printers use a print head that shuttles back and forth across the width of the paper and a number of thin print wires on the head act as hammers that strike the ribbon and squeeze ink from ribbon to the paper.

These are one of the most common printer in the computer industry because of their simple operation, low-maintenance, low running expense, ruggedness, facility to print on almost any type of paper, and easy serviceability.

As these are impact type printers, one main drawback of these printers is the noise generated by them. The per page printing cost of Dot-Matrix printers are very low, because the printer ribbon can be re-inked or refilled at a very cheap price. The speed of these printers is expressed in Characters Per Second or CPs. Printing speed ranges from 100 CPS to 1000 CPS. Many of the Dot-Matrix printers offer color-printing option, either using a single multicolor ribbon or using complex multiple color ribbons.

To speed up the printing operation, most of the Dot-Matrix printer print bi- directionally, I e. they print one row from left to right and then the next row from right to left The Dot-Matrix printer available in the market can also be classified according to the number of pins used in their print head, they are :

- The 9 pin print head is most common and low cost printers but their print quality is very poor These picture have nine pins in a single vertical column .
- The 24 pin point head is highest quality Dot-Matrix printers These printers produce very high quality print. The 24 pin heads usually have three offset columns of eight pins each.

InkJet Printer:

Inkjet printers are bit image non impact type of printer. These printers produce character shape and images by spraying ink from tiny nozzles onto the paper. This process places pattern of dots on the paper to generate the required image As the Inkjets printers do not use any ribbon and the Ink is directly released to the paper, image looks much smoother then the image generate using the Dot-Matrix impact printer.

On these printers the force that drive ink out of the ink cartridge can be a piezoelectric crystal or a small resistor. A sharp, digital pulse of electricity causes the piezoelectric crystal to twitch and force ink through the nozzle onto the paper.

The same electricity when applied to a resistor makes the resistor hot creating a small air bubble, to force ink out through the nozzle. These printers are lightweight and small. They produce very good quality print for relatively low price. Because Inkjets are non-impact printers, they are much quieter than ordinary Dot-Matrix printers. For all their advantages, Inkjet printers do have a few shortcomings. unless proper care is taken, the ink in the nozzle can dry out and clog, making the printing very difficult. To avoid such problems, better Inkjets have built-in routines that clean the nozzles with each use. Nowadays most Inkjets have nozzles that are sell-sealing so that when they are not used, air can't get to the ink.

Laser Printer

Laser printers are becoming very popular as a high-end printer because of its exceptionally clear and sharp images. Almost all Laser printer have various built-in fonts and also drawing, graphs, charts etc. can be printed very easily and quickly using these printers.

These printers provide fast output up to 16 PPM (page per minute) without producing noise associated with the Impact Dot -matrix printers.

Initially a cylindrical photosensitive drum inside the Laser printer is given an even electrostatic charge all over its surface. A Laser beam- focused to a tiny spot-scans across the cylindrical drum from left to right.

The laser beam is switched on and off according to the image to be printed on the paper, as it scans drum surface. The drum is coated with a special photoconductive layer, which makes the drum to lose its charge from those areas wherever the Laser beam strikes.

The area which are exposed by the Laser beam, attract a black colored toner to the drum's surface, which is then transferred to the paper to form the image. This sheet of paper is later passed through a fuser roller assembly to melt the toner and permanently fuse the image onto the paper.

Laser printers can produce images 300 to 1200 DPI or more resolution. This with higher resolution allows Laser printers to produce very clear good quality images.

Thermal Printers:

 Thermal printers use heat to produce image on the printing media. These printers use special heat sensitive paper. Heating elements on its print head are heated by passing current through them and then this heated print head is pressed on the heat sensitive paper.

When the heat is applied to the heat sensitive paper, the paper changes color. Using the required image can be drawn as a dot-matrix image by selectively applying the heated print head pins to the paper.

The heat sensitive paper used with the thermal printer will not retain the printed image for longer than six months to one year, as the atmosphere heat will slowly change the paper color. One should take a photocopy of the thermal printer output to make permanent copy.

PRINTER SHARING:

In an organization, one does not need a printer for each computer. of the additional printer one can share the printer between two or more computers Several printer sharing devices are available in the market, some of them are hardware based and some are software based.

Sharer Switch: One of them is called "Printer Sharer switch" or a "AVB Switch". This device is most commonly used to share the printer between two computers, one can also connect more than two computers to one printer using this type of switch. This device works like a simple multipole switch, when the switch is in A" position the information from the computer A is routed to the printer and when the switch is changed to position "B" then the output from the computer B is send to the printer.

This process is almost equal to removing the data cable from the computer of and connecting it to the computer B, only difference is one is saved the printer. removing and reconnecting the cables every time another computer need the printer.

This type of printer sharer is available for both serial a well as parallel interfaces. One can get them to share one printer with 2, 3 or 4 computers.

Sharing through Network I

If your computer is connected to a network, most of the networks provide printer sharing facility. If your computer is connected to the local area network and you are using Windows 98 then follow the below given steps to share your printer.

- Click Start, point to settings, and then click Printers.
- Click the printer you want to share. Click shared As, type a name you want the others to see for your printer. On the File menu, click Properties.
- Click the sharing tab, and then You can only share a printer that is connected to your computer

If the Sharing tab is not visible, you need to enable "file and print sharing services" as explained below.

- Open the Network dialog box by clicking Start, pointing to Settings, clicking Control Panel, and then double-clicking Network.
- Click "File and Print sharing".
- Select the check box for the sharing options you want.
- A check mark indicates the feature is activated. Click OK

PRINTER TROUBLESHOOTING:

Ninety percent of the printer problems can be easily rectified by a non-technical person, because most of the time the problem is not because of the electronics inside the printer. Instead, most of the fault reported about the printer is due to some mechanical fault of the printer, or due to some fault in the printer cable, it could also be due to printer not being setup properly, or even it could be due to some problem in the software being used to print on the printer. Once you know the working of different printers, you should be able to diagnose and rectify most of the problems. Printers by different manufacturers have some variation in the working and electronic circuit inside them but their basic working principle remains same.

Preventive Maintenance

Before going to troubleshooting first we see some of preventive maintenance steps that one should take to keep the printer in good working condition. For example when one opens a Dot Matrix printer, one may find many small pieces of paper inside the printer, especially if continuous stationary is used in the printer. So one should periodically vacuum out these paper scraps.

Clean the printer paper path, ribbon path and the head assembly movement path with a dry, soft cloth. Also clean the outer surface of the printer with soft cloth, damp with warm soap water.

If you print on self sticking labels and envelops with gum, than the printer rollers may have attracted some glue from these materials.

Next comes lubricating, lubricating of the head assembly movement mechanism can be done periodically to have a smooth movement of the print head. When applying lubricants one should be careful that they should not be applied to wrong places, otherwise printer damage can occur. When we use lubricant it should be a silicone or Teflon based. One should apply just enough lubricant so that the extra lubricant will not accumulate dust and create problem for the printer.

For ling life of printer head, keep the print head as cool as possible. Do not stack up thing on and around the printer that may stop proper airflow.

Also for the print head's life you should not use cheap ink to re-ink the ribbon cartridge, the cheap ink used for the re-inking contains acid which corrodes the printer head pins.

Troubleshooting Dot-Matrix Printers

Problem 1: Print Quality Poor:

Reasons : Ribbon worn out or damaged.

Actions : Remove the ribbon and check to see if the ribbon appears to be dried out, damaged or rotation has seized. Hence replace the ribbon with new one.

Reasons : Print Head Too close to platen

Actions : Adjust the print head lever to ensure that the print head is not too close to the platen and hence the paper.

Reasons: Ribbon drive assembly faulty

Actions: Print self test. When it is happening, observe that the ribbon is turning in both directions. If the ribbon is not turning or only turning in one direction then the ribbon drive assembly could be at fault and require replacement.

Problem 2 : No Power to Printer

Reasons : Fuse has Blown

Actions: Check the fuse with meter and replace the fuse.

Reasons: Faulty power on-off switch

Actions: Check with a meter and replace the switch. Ensure the correct voltage is coming to the printer.

Reasons: Internal power supply has failed

Actions: Most common fault. Repair the circuit carefully. Chances are there is multiple damage, replace one or two components will only allow power to circulate temporarily causing greater damage.

Problem 3 : Power But Not Printing.

Reasons: Printer cable not installed properly

Actions: Ensure that both ends of the cable are correctly installed.

Reasons: Printer cable is faulty

Reasons: Check for possible pin damage and replace if necessary.

Reasons: No paper or paper not installed properly

Actions: No paper will result with the printer going into alarm, not coming "on-line" or "ready".

Install some paper. If there is paper, ensure it is correctly installed. Also check the tractor fed paper needs to be properly aligned and drive up to the start of the platen roller. Ensure that the "on-line" button is selected.

Reasons: Printer port connection at PC is faulty.

Actions: Try printing plain text through DOS mode. If it still not printing, refer the printer manual and perform self test. If the printer prints OK, the fault is more likely with the computer or printer cable, not with printer.

Problem 4 : Grinding Noises

Reason : Obstruction along paper path.

Actions : There might be something caught along the paper path or blocking the print head from correctly moving from side to side.

Reason : Ribbon Drive Assembly Faulty

Action : If the noise appears to be coming from the ribbon drive assembly , stop the printing , remove the ribbon drive assembly and visually inspect for worn or broken gearing.

Reason : Ribbon Carriage Assembly Dirty

Action : Inspect the carriage assembly, remove any dust or paper particles. Also lubricate when necessary.

Problem 5 : Paper Jamming/Misfeeding

Reason: Paper Quality Poor

Action: Ensure that the paper you introduce into your printer meets with the standards of the printer manufacturer and replace if necessary.

Reason: Sensors Faulty

Action : Faulty sensors along the paper path will not provide the printer with the correct information about the paper's position in the printer and hence the printer will fall into a false paper jam mode. Inspect and test the sensors and replace if necessary.

Reason: Main Logic **Bo**ard is faulty

Action: The main logic board could be the cause of going into a false paper jam alarm mode.

TROUBLESHOOTING LASER PRINTERS

Problem 1: Print Quality Poor

Reason : Toner Cartridge Faulty

Action : Remove the toner cartridge and check to see if the toner cartridge appears to be leaking, damaged or rotation has seized.

Reason: Drum Unit Faulty

Action: Some LaserJet printers have a separate drum unit, remove the drum unit being careful not to allow direct sunlight or continuous exposure to daylight and do not touch it even if it appears to have residue of toner on it.

Reason: Fuser Unit Assembly Faulty

Action: The most common place to cause poor print quality and paper jamming. Inspect the fuser unit assembly for scratches on the fuser roller. Ensure that the printer has been turned off for at least one hour as extreme temperatures exist within this item. It is always better to replace the entire assembly.

Reason: High voltage Power Supply Faulty

Action: Classic signs are blank pages or faint print. So replace the high voltage power supply.

Problem 2 : No Power to Printer

Reason: Fuse has blown

Action : Check the fuse with a meter and replace the fuse. Ensure the correct voltage.

Reason: Faulty power on-off switch

Action: Check the switch with a meter and replace the switch. Ensure the correct voltage .

Reason: AC Power supply has failed

Action: Replace the AC power supply, try to repair only if you are sure about what you are doing. Chances are there is multiple damage, replacing one or two components will only allow power to circulate temporarily causing greater damage.

Reason: DC power supply is faulty

Action: Repair or replace the DC power supply. DC power supply feeds the DC controller.

Problem 3: Power but not printing

Reason: Printer cable not installed properly

Action: Ensure that both ends of the cable are correctly installed.

Reason: Printer cable is faulty

Action: Check for possible pin damage and replace if necessary.

Reason: No paper or paper not installed properly

Action: No paper will result with the printer going into alarm, not coming "on-line" or "ready". Install some paper. If there is paper, ensure it is correctly installed. Ensure that the "on-line" has been selected. There are sensors along the paper path , if these are defective they will cause the printer to not print.

Reason: Printer port connection at PC is faulty

Action: Try printing plain text through DOS command. If still not printing, refer to the printer manual and perform self-test. If printer prints OK, which means printer is OK , and the problem related to Machine.

Problem 4 : <u>Grinding Noises</u>

Reason: Main motor faulty

Action: Inspect the main motor gearing and rotation and replace if found to be faulty.

Reason: Fuser unit assembly faulty

Action: With faults having poor print quality and paper jamming , the fuser unit assembly will also cause grinding noises. Grinding noises coming from the user unit assembly is a sure sign of worse things to come. Hence replace the fuser unit assembly.

Reason: Cooling Fans

Action: Grinding Noises coming from the cooling fans tell you only one thing. It is about to stop. Seized fans will lead to the printer to overheat and cause possible extensive damage and hence costly rrepair bills. Replace the faulty fan immediately when this occurs.

<u>NETWORKING:</u>

If a user having more than one computer under his/her disposal then those computers can be connected together using a network. A network allows CD-Writer, hard disk Drive, printer etc. connected to one computer on the networks to be shared by all other computers connected to the network.

<u>Setting up a Network:</u>

Sometimes back, network installation was a complex job, but with the arrival of Plug and Play (PnP) devices, PnP operating systems and simple network such as 10Base-T this process has become quite easy.

The hardware setup, software setup is a very important part of the network installation. Nearly all networks use software drivers to enable their networking features, giving access to shared resources, passing data through the network adapter, and accessing data from remote computers etc.

When using a network, hardware and software at the sending and receiving end must match. The two ends of the network must speak the same language to understanding one another. That is, they must use the same networking protocol. The protocol defines,

- The size of the blocks of bytes transferred between computers,
- The addresses added to each block of bytes
- The means of controlling network access and routing the data, and
- Ways   to   recover   when   an   error   appears   in   the   data.

If your use is simple sharing of data between computers and sharing of hardware devices, such as printer, scanner, CD-ROM drive etc. then use Windows operating system (Windows-98 or higher) as your networking software, it will meet all these requirements.

PREPATION FOR NETWORK INSTALLATION (COMPONENTS):

The first step in installing any network is planning-deciding exactly what you want the network to do-then you need to find out how to do it. The hardware for putting together a peer to peer 10Base-T network comprises three parts.

- Network/host adapters in each computer
- A hub and
- Wire/cable that links them together.

Network/Host Adapter

Your will need one10Base-T network adapter for every computer you want to connect to the network. The network adapter provides the connection between computer and the network cable. All 10Base-T network adapters provide the same basic function, although some have more feature than others. Any 10Base-T adapter can be used, provided it is supported directly by the windows or it has a windows driver.

Some network adapter have facility for placing optional boot ROMs, which allow computers to boot up from a remote disk drive, but this feature is more applicable to client-server type installation, rather than to the peer to peer type networks. 10Base-T network is a peer network system, in this network system every PC is equal. Each computer can share files and other resources(such as printers) among one another. The share equally, each as the peer(equal) of the others, so this scheme is called peer-to-peer networking. In this peer-to-peer scheme there is no dedicated file server, all computers can have their own, local storage, and each computer can be granted access to the drives and printers connected to the others.

Wiring

A simple 10Base-T network use unshielded twisted pair (UTP) cabling. Ordinary modular telephone cables are unsuitable for 10Base-t Because these cables are flat and lack the needed twists. The twist in the twisted pair cable minimize noise and interference.

Ordinary modular telephone cables use four-Wire RJ-11 connectors that will fit into 10Base-T connectors but won't connect with all of the necessary signals. A 10Base-T jack is designed to accept eight-Wire RJ-45 connectors even though only four of the connections are active.

If all your PC are in one room or reasonably close to each other then the best choice is to buy ready-made RJ-45 cables, which are available in standard length(for example 10,25,50 and 100 feet). After making the connection, any extra cable can be loosely coiled up without any problem. The only restriction imposed by 10Base-T is that the length of cable between PC and hub cannot exceed 100 meters(328 feet).

Hubs

If you want to network more than two computers then you will need at least one hub for your network. A hub is simply a box with circuitry inside and a number of jacks for RJ-45 plugs on the back. The circuitry inside links the 10Base-T cabled together. Hubs are distinguished by the number of features they offer. But most of those features are designed to make the network administrator's job easier and are unnecessary in a small(five or less computers)peer to peer network. For such smaller system. A simple hub will be all one needs.

The first step in wiring your network is to determine the most convenient location to put the 10Base-T hub. One can always set the hub on or under a desk, adjacent to a PC, or wherever is convenient. The important consideration with locating the hub is that it should be put in a convenient location, out of the way but easy to reach. Ideally, it should be kept at the exact center of the computers it serves. This will minimize wiring hassles.

As long as one does not violate the 10Base-T wiring limitations, the hub can be placed anywhere.

Cable installation

Once you have set a location for each computes and the hub, you can start the wiring. You need to take one cable from each computer to the hub. One can use ready-made cables with modular connectors crimped on each ends, or using special crimping tool to crimp modular connectors on the cables, one can make their required cables.

Network Configuration

Once wiring is done, prepare the network adapter for each computer. Typically, a network adapter requires an interrupt number an base address from your system resources. If the adapter you choose does not follow the plug-and play standard, you can assign resources using DIP switches or jumpers on each network adapter or through the setup software accompanying the adapter.   If you are using a plug and play(PnP) network host adapter then windows will automatically assign these resources values to the adapter. In a non-PnP adapter card, configure the card to match the settings you have chosen. This could be done with jumpers or switches provided on the card.

- After configuring the card, shut down the computer and install the network adapter in your computer. Unplug the computers power able, remove the cover, and remove a blank retaining bracket from the empty expansion slot you want to use for the adapter board.

- Now, simply slide the adapter board into the empty expansion slot. Be sure to screw the card tightly to retaining bracket. The screw will prevent board from dislodging when plugging in the network cable, it will also provide a better ground which will improve network reliability.

Before reinstalling system cover, plug it in and switch it on to make sure that the network adapter card does not accidentally interfere with some other system function. Once you are sure all is well, shut down and turn off the system and reinstall its cover. Repeat this process for each computer in your network.

Next step is network software/driver installation.

Under windows 98, you install the network adapter in two ways.

- You can step through the add new hardware wizard from control panel.
- Or you can use the network properties sheet, available from the control panel.

To use the network properties sheet, double click on the network icon under control panel. From the next screen, click on add, and you will see a "Select Network Component" menu.

Click on adapter ad click the add button. Windows will then let you choose a manufacturer and model of network adapter to install. Select the board you want to install or choose a suitable compatible board.

Once you have selected an adapter, click ok. Windows will immediately install all the drivers required not by the adapter but also all the services and protocols required to get your network working.

When windows finishes with the installation, you will see a revised network sheet listing everything that the operating system has installed.

If windows does not prompt you for the names you want to use for your computer and the workgroup, then select the identification tab and enter the names like your own choice. Once you have finished, click ok. Click ok on the next screen as well, and windows will tell you to reboot/restart your system.

Finally you are ready to link your network together. Slide the RJ-45 plug at one end of the cable into the RJ-45 jack at the back of each computer, in your network card. Then plug the other end of each cable into the hub. switch on the hub, and all the computers are now a part of the network.

Now you need to setup the windows operating system to share printer, disk drives and other resources among the computers connected to the network.

Enabling Sharing

Before you can set up your network software for resource sharing, you must have a working network. Once the network hardware is installed you must then configure your networked computers to share various hardware and software installed on different computer connected to the network.

Let us see how this can be done in windows operating system.

Click on start, point to setting option, in the settings click on the control panel selection. In the control panel, double click on the network icon to t open the network folder.

You will see a screen that tells you about all the network components that windows has installed for you.

If your network is operating, you don't have to worry about all the entries in this screen. In this screen our present interest is the "File printer sharing" button towards the bottom of the screen. Clicking on this button will open a small windows giving you the choice of whether to share file and printer on this system. You have two choices, sharing files and sharing files and sharing printer. In most cases, you will want to share files as well share an printer connected to the computer. For this select both the options.

Sharing Computer

To enabling for a disk drive, e it a hard disk, floppy, or CD drive, highlight the drive's icon in My computer window. Then choose sharing from the file menu. If you do not see the sharing option then haring abilities of your computer is not properly enabled, you will have to go back to the network folder to enable sharing.

Once you have enabled a drive for sharing, its icon will appear in the network neighborhood of the computers that have access to it on the network. To enable sharing the drive you only need to click on the "Shared As" button and give the drive a name. Other options allow you to limit

access s other networked computers cannot alter the content of your drive or can alter it only after giving a password provided by you.

Once you have made all the entries, click ok and your computer is now ready to share its files with all other computers on the network.

Mapping Shared Drive

Shared drives automatically appear under windows, but if you want to use them as drive letters through a DOS box, then your will have to map them to the computer on which you want to use them. To map a drive on some other networked system as a local drive, first open network neighborhood and click on the name of the server containing the drive you want to map.

Now, windows will display the names of the sharable disk drives on the server. Highlight the drive you want to map, then select the File menu and select map network drive entry. Windows will assign a drive letter to the selected drive and give you the opportunity to automatically remap the drive every time system boots up. Use the drive letter that windows has assigned to the remoter drive in your DOS box to access the remote drive.

Sharing Printer

Similarly, to share a printer, you have to change the printer's properly on the computer to which the printer is connected. For this double click on the printers icon inside the control panel. Windows will display icons for each of the printers installed in your PC, as well as giving you the option to install a new printer.

Now, you can right click on a printer's icon and select properties form the popup menu.

Alternately, double click on the printer icon, opening the printer menu. From the printer menu, select properties. In either case, you'll have a variety of tables to choose from. Among them you should see a sharing tab.

If you do not see the sharing option the sharing abilities of your computer is not properly enabled, you'll have to go back to the network folder to enable sharing.

Installing Network Printer

On each computer that want to share the networked printer, you must install the network printer exactly as you would install a local printer.

Enabling printer sharing on a computer is a bit more complex. Start by double clicking on the printer icon from control panel. This should be done on the computer in which you want to install the networked printer. Windows will respond by showing a list of already installed printer with the option to add a new printer.

- Doubly click on "Add Printer" option. This will activate the add printer wizard, while will step you through the complete printer installation process.
- When the add printer wizard starts, your first choice will be whether to install a local or networked printer. The wizard defaults to installing a local printer, so select network printer option and then click on the next button.
- In order to install a printer, you have to tell the wizard which printer to use. The wizard identifies a printer by its assigned name, and it prompts you to type in the name of the printer to install
- If you don't remember the complete name and path of all he printers in your network, you can ask the wizard to find the available printers for you by clicking on the browse button and looking in the likely places on the network.

ETHERNET:

For several decades, Ethernet has proven itself as a relatively inexpensive, reasonably fast, and very popular LAN technology. This tutorial explains the basic functionality of Ethernet and how it can be utilized on home and business networks.

The History of Ethernet

Engineers Bob Metcalfe and D.R. Boggs developed Ethernet beginning in 1972. Industry standards based on their work were established in 1980 under the IEEE 802.3 set of specifications. Ethernet specifications define low-level data transmission protocols and the technical details manufacturers need to know to build Ethernet products like cards and cables.

Ethernet technology has evolved and matured over a long time period. The average consumer can generally rely on off-the-shelf Ethernet products to work as designed and to work with each other.

Ethernet Technology

Traditional Ethernet supports data transfers at the rate of 10 megabits per second (Mbps). As the performance needs of networks increased over time, the industry created additional Ethernet specifications for Fast Ethernet and Gigabit Ethernet. Fast Ethernet extends traditional Ethernet performance up to 100 Mbps and Gigabit Ethernet up to 1000 Mbps speeds. Although products aren't yet available to the average consumer, 10 Gigabit Ethernet (10,000 Mbps) also exist and are used on some business networks and on Internet2.

Ethernet cables likewise are manufactured to any of several standard specifications. The most popular Ethernet cable in current use, Category 5 or CAT5 cable, supports both traditional and Fast Ethernet. The Category 5e (CAT5e) and CAT6 cables supports Gigabit Ethernet.

To connect Ethernet cables to a computer (or other network device), a person plugs a cable directly into the device's Ethernet port.

Some devices without Ethernet supports can also support Ethernet connections via dongles such as USB-to-Ethernet adapters. Ethernet cables utilize connectors that look much like the RJ-45 connector used with traditional telephones.

For students: In the OSI model, Ethernet technology operates at the physical and data link layers - Layers One and Two respectively. Ethernet supports all popular network and higher-level protocols, principally TCP/IP.

Types of Ethernet

Often referred to as Thicknet, 10Base5 was the first incarnation of Ethernet technology. The industry used Thicknet in the 1980s until 10Base2 Thinnet appeared. Compared to Thicknet, Thinnet offered the advantage of thinner (5 millimeters vs 10 millimeters) and more flexible cabling, making it easier to wire office buildings for Ethernet.

The most common form of traditional Ethernet, however, was 10Base-T. 10Base-T offers better electrical properties than Thicknet or Thinnet, because 10Base-T cables utilize unshielded

twisted pair (UTP) wiring rather than coaxial. 10Base-T also proved more cost effective than alternatives like fiber optic cabling.

Numerous other lesser-known Ethernet standards exist, including 10Base-FL, 10Base-FB, and 10Base-FP for fiber optic networks and 10Broad36 for broadband (cable television) cabling.

All of the above traditional forms, including 10Base-T have been made obsolete by Fast and Gigabit Ethernet.

More About Fast Ethernet

In the mid-1990s, Fast Ethernet technology matured and met its design goals of a) increasing the performance of traditional Ethernet while b) avoiding the need to completely re-cable existing Ethernet networks. Fast Ethernet comes in two major varieties:

- 100Base-T (using unshielded twisted pair cable)
- 100Base-FX (using fiber optic cable)

By far the most popular of these is 100Base-T, a standard that includes 100Base-TX (Category 5 UTP), 100Base-T2 (Category 3 or better UTP), and 100Base-T4 (100Base-T2 cabling modified to include two additional wire pairs).

More About Gigabit Ethernet

While Fast Ethernet improved traditional Ethernet from 10 Megabit to 100 Megabit speed, Gigabit Ethernet boasts the same order-of-magnitude improvement over Fast Ethernet by offering speeds of 1000 Megabits (1 Gigabit). Gigabit Ethernet was first made to travel over optical and copper cabling, but the 1000Base-T standard successfully supports it as well. 1000Base-T uses Category 5 cabling similar to 100 Mbps Ethernet, although achieving gigabit speed requires the use of additional wire pairs.

More About Ethernet Devices

As mentioned earlier, Ethernet cables are limited in their reach, and those distances (as short as 100 meters) are insufficient to cover medium-sized and large network installations. A repeater in Ethernet networking is a device that allows multiple cables to be joined and greater distances to be spanned. A bridge device can join an Ethernet to another network of a different type, such as a wireless network. One popular type of repeater device is an Ethernet hub. Other devices sometimes confused with hubs are switches and routers.

Ethernet network adapters also exist in multiple forms. Newer personal computers and game consoles feature a built-in Ethernet adapter. USB-to-Ethernet adapters and wireless Ethernet adapters can also be configured to work with many newer devices.

Ethernet Card

UTP (Unshielded Twisted Pair) Cable:

Unshielded Twisted Pair (UTP) cable is most certainly by far the most popular cable around the world. UTP cable is used not only for networking but also for the traditional telephone (UTP-Cat 1). There are seven different types of UTP categories and, depending on what you want to achieve, you would need the appropriate type of cable. UTP-CAT5e is the most popular UTP cable which came to replace the old coaxial cable that was not able to keep up with the constant growing need for faster and more reliable networks.

<u>characteristics of UTP</u>

The characteristics of UTP are very good and make it easy to work with, install, expand and troubleshoot and we are going to look at the different wiring schemes available for UTP, how to create a straight through UTP cable, rules for safe operation and a lot of other cool stuff !

So let's have a quick look at each of the UTP categories available today along with their specifications:

Category 1/2/3/4/5/6/7 – a specification for the type of copper wire (most telephone and network wire is copper) and jacks. The number (1, 3, 5, etc) refers to the revision of the specification and in practical terms refers to the number of twists inside the wire (or the quality of connection in a jack).

CAT1 is typically used for telephone wire. This type of wire is not capable of supporting computer network traffic and is not twisted. CAT1is also used by telco companies providing ISDN and PSTN services. In such cases the wiring between the customer's site and the telco's network is performed using CAT 1 type cable.

CAT2, CAT3, CAT4, CAT5/5e, CAT6 & CAT 7 are network wire specifications. This type of wire can support computer network and telephone traffic. CAT2 is used mostly for token ring networks, supporting speeds up to 4 Mbps. For higher network speeds (100 Mbps or higher) CAT5e must be used, but for the almost extinct 10 Mbps speed requirements, CAT3 will suffice.

CAT3, CAT4 and CAT5 cables are actually 4 pairs of twisted copper wires and CAT5 has more twists per inch than CAT3 therefore can run at higher speeds and greater lengths. The "twist" effect of each pair in the cables ensures any interference presented/picked up on one cable is cancelled out by the cable's partner which twists around the initial cable. CAT3 and CAT4 are both used for Token Ring networks -- where CAT 3 can provide support of a maximum 10Mbps, while CAT4 pushed the limit up to 16Mbps. Both categories have a limit of 100 meters.

The more popular **CAT5** wire was later on replaced by the CAT5e specification which provides improved crosstalk specification, allowing it to support speeds of up to 1Gbps. CAT5e is the most widely used cabling specification world-wide and unlike the category cables that follow, is very forgiving when the cable termination and deployment guidelines are not met.

CAT6 wire was originally designed to support gigabit Ethernet, although there are standards that will allow gigabit transmission over CAT5e wire.. It is similar to CAT5e wire, but contains a physical separator between the four pairs to further reduce electromagnetic interference. CAT6 is able to support speeds of 1Gbps for lengths of up to 100 meters, and 10Gbps is also supported for lengths of up to 55 meters.

Today, most new cabling installations use CAT6 as a standard, however it is important to note that all cabling components (jacks, patch panels, patch cords etc) must be CAT6 certified and extra caution must be given to the proper termination of the cable ends.

In **2009, CAT6A** was introduced as a higher specification cable, offering better immunization to crosstalk and electromagnetic interference.

Organizations performing installations using CAT6 cabling should request a thorough test report using a certified cable analyzer, to ensure the installation has been performed according to CAT6 guidelines & standards.

CAT7 is a newer copper cable specification designed to support speeds of 10Gbps at lengths of up to 100 meters. To achieve this, the cable features four individually shielded pairs plus an additional cable shield to protect the signals from crosstalk and electromagnetic interference (EMI).

Due to the extremely high data rates, all components used throughout the installation of a CAT7 cabling infrastructure must be CAT7 certified. This includes patch panels, patch cords, jacks and RJ-45 connectors. Failing to use CAT7 certified components will result in the overall performance degradation and failure of any CAT7 certification tests (e.g using a Cable Analyzer) since CAT7 performance standards are most likely not to be met. Today, CAT7 is usually used in DataCenters for backbone connections between servers, network switches and storage devices.

WIRING THE UTP CABLES

We are now going to look at how UTP cables are wired. There are two popular wiring schemes that most people use today: the **T-568A** and **T-568B**. These differ only in which color-coded pairs are connected -- pairs 2 and 3 are reversed. Both work equally well, as long as you don't mix them. If you always use only one version, you're okay, but if you mix A and B in a cable run, you will get crossed pairs.

UTP cables are terminated with standard connectors, jacks and punchdowns. The jack/plug is often referred to as a "RJ-45," but that is really a telephone company designation for the "modular eight-pin connector" terminated with the USOC pinout used for telephones. The male connector on the end of a patch cord is called a "plug" and the receptacle on the wall outlet is a "jack."
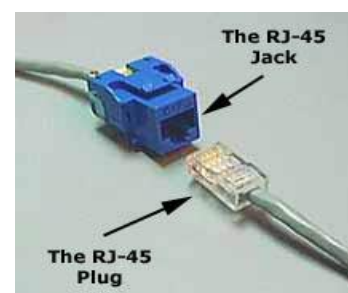

F RG-45 Jack and RJ-45 Plug / Connector

As already mentioned, UTP has **four twisted pairs** of wires. The illustration shows the **pairs** and the **color codes** they have. As you can see, the f**our pairs** are labeled:

. Colour codes & Pairs of UTP CAT 5, CAT 5e, CAT6, CAT7 Cable

Pairs 2 and 3 are used for normal 10/100 Mbps networks, while pairs 1 and 4 are reserved. In **Gigabit Ethernet**, **all four pairs are used**.

The picture below shows the end of a **CAT5e cable** with an **RJ-45 connector**, commonly used to connect computers to a switch. It also shows a stripped CAT5e cable and identifies the **four twisted pairs**:

.
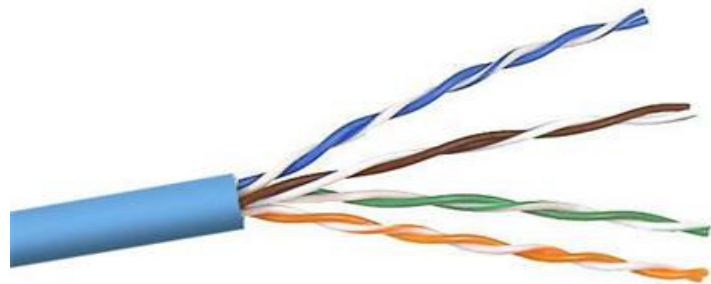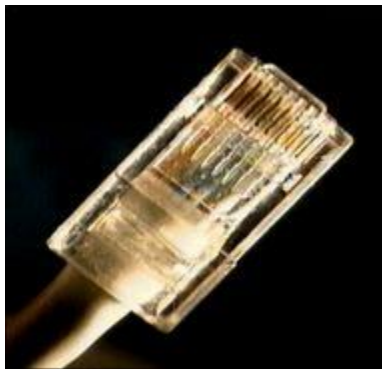
UTP CAT5e cable and stripped twisted pairs

T-568A & T-568B 4-PAIR WIRING

Ethernet is generally carried in eight conductor cables with eight-pin modular plugs and jacks. The connector standard is called "RJ-45" and is just like a standard RJ-11 modular telephone connector, except it is a bit wider to carry more pins.

Note: Keep in mind that the wiring schemes we are going to talk about are all for straight-through cables only.

The eight-conductor data cable contains four pairs of wires. Each pair consists of a solid colored wire and a white wire with a stripe of the same color. The pairs are twisted together. To maintain reliability on Ethernet, you should not untwist them any more than necessary (about 1 cm). The pairs designated for 10 and 100 Mbps Ethernet are orange and green. The other two pairs, brown and blue are used when Gigabit Ethernet is supported or can be used for a second 10/100 Ethernet line or for phone connections. It should be noted that running a second Ethernet or

phone line over an existing UTP cable, is not recommended as UTP wasn't designed for such applications.

There are two wiring standards for UTP cables, called "T568A" (also called "EIA") and "T568B" (also called "AT&T" and "258A"). The only difference between the two standards is the wiring of two out of four pairs, which are swapped, as shown below.

T-568A is supposed to be the standard for new installations, while T-568B is an acceptable alternative. However, most off-the-shelf data equipment and cables seem to be wired to the T568B specification. T568B is also the AT&T standard. It's perfectly right to use either wiring standard, however special consideration should be taken so that the same standard is used throughout the whole cabling infrastructure. For existing installations, its best to first check which of the two standards is being used and continue with that standard.

PIN NUMBER DESIGNATIONS FOR T568B

Note that the odd pin numbers are always the white with stripe color (1,3,5,7). The wires connect to RJ-45 8-pin connectors as shown below:
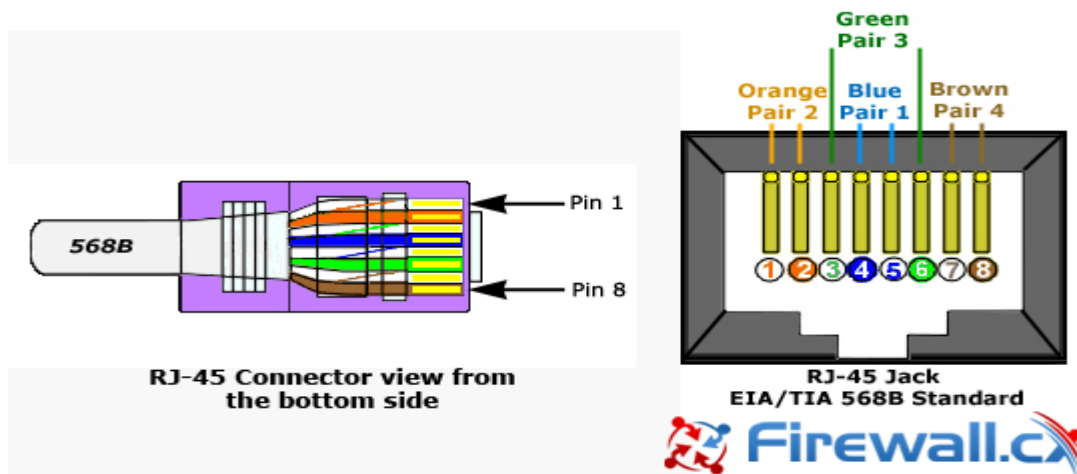
RJ-45 Connector and Jack with EIA/TIA 568B pinouts

The following table provides the color codes, pair numbers and their function, for the T568B wiring specification:

Pin No.	Colour	Pair No.	Function
1	white/orange	2	TxData +
2	orange	2	TxData -
3	white/green	3	RecvData +
4	blue	1	
5	white/blue	1	
6	green	3	RecvData -
7	white/brown	4	
8	brown	4	

T568B Pin out configuration, color code, pairs and their functionality

The wall jack may be wired in a different sequence because the wires are often crossed inside the jack. The jack should either come with a wiring diagram or at least designate pin numbers.

Note that the blue pair is on the center pins; this pair translates to the red/green pair for ordinary telephone lines which are also in the centre pair of an RJ-11 (green=white/blue, red=blue).

Cross-over cable

The cross-over (or crossover) CAT5 UTP cable has to be one of the most used cables after the classic straight-thru cable. The cross-over cable allows us to connect two computers without needing a hub or switch. If you recall, the hub does the cross-over for you internally, so you only need to use a straight thru cable from the PC to the hub. Since now we don't have a hub, we need to manually do the cross-over.

## WHY DO WE NEED AN CROSS-OVER CABLE?

When sending or receiving data between two devices (I.E. computers) one will be sending while the other receives. All this is done via the network cable and if you look at a network cable you will notice that it contains multiple cables. Some of these cables are used to send data, while others are used to receive data and this is exactly what we take into account when creating a crossover cable. We basically connect the **TX** (**transmit**) of one end to the **RX** (**receive**) of the other!
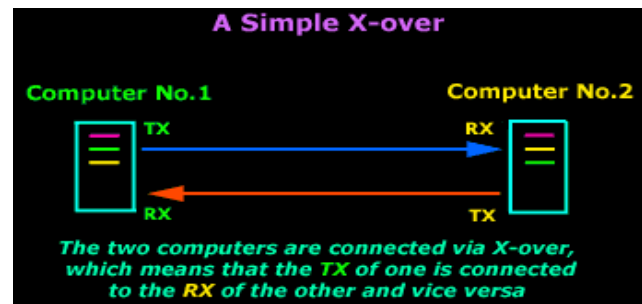
The diagram above shows this in the simplest way possible:

CAT5 CROSS-OVER

There is only one way to make a **CAT5e crossover cable** and it's pretty simple. Those who read the "Wiring UTP" article know a crossover cable is a **568A** on one end and a **568B** on the other. If you haven't read the wiring section, don't worry because we'll provide enough information to help understand about the concept. As mentioned previously, the purpose of a crossover cable to connect the **transmitting side (TX)** from one end, to the **Receiving side (RX)** at the other end, and vice versa.
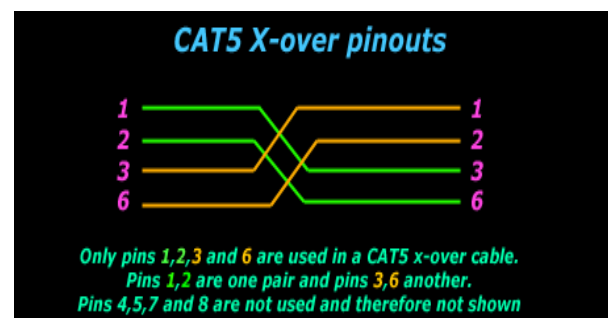
Let's now have a look at the pinouts of a typical crossover CAT5e cable:

As you can see, only four pins are needed for a crossover cable. When you purchase a crossover cable, you might find that all eight pins are used, these cables aren't any different from the above, as the rest of the pins are not used. Whether your crossover cable has 4 or 8 pins connected, it won't make any difference in performance. Here are the printouts for a crossover cable with all eight pins connected:

It is important to note that Gigabit Ethernet does not require crossover cables. Straight-thru cables are used and the two ends are automatically crossed over by the network cards (Auto-MDIX).
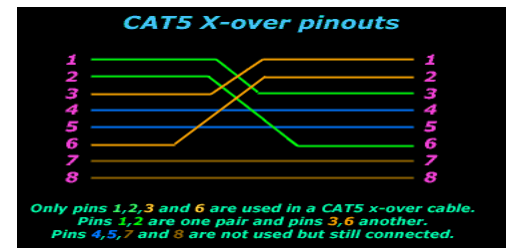
INTERNET:

The Internet is generally defined as *a global network connecting millions of computers*. More than 190 countries are linked into exchanges of data, news and opinions.

The Internet is Decentralized

Unlike online services, which are centrally controlled, by design, the Internet is decentralized. Each Internet computer, called a *host*, is independent. Operators can choose which Internet services to use and which local services to make available to the global community. Remarkably, this anarchy(disorder) by design works exceedingly well. There are a variety of ways to access the Internet. Most online services offer access to some Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP).

Is Web and Internet **are** *the Same?*

The *Internet* is not synonymous with *World Wide Web*. The Internet is a massive network of networks, a networking infrastructure. It connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the Internet. The World Wide Web, or simply Web, is a way of accessing information over the medium of the Internet. It is an information-sharing model that is built on top of the Internet.

Who Owns the Internet?

No one actually owns the Internet, and no single person or organization controls the Internet in its entirety. The Internet is more of a concept than an actual tangible entity, and it relies on a physical infrastructure that connects networks to other networks.

Number of Worldwide Users

According to Internet Live Stats, as of August 12, 2016 there was an estimated 3,432,809,100 Internet users worldwide. The number of Internet users represents nearly 40 percent of the world's population. The largest number of Internet users by country is China, followed by the United States and India. In September 2014, the total number of websites with a unique hostname online exceeded 1 billion. This is an increase from one website (info.cern.ch) in 1991. The first billion Internet users worldwide was reached in 2005.

Internet Protocols:

TCP/IP
In windows, TCP/IP protocol is used to connect computer to the internet. During windows 98 installation if you have installed networked components then most probably you have installed TCP/IP protocol on you computer. TCP/IP stand for Transmission Control Protocol.

IP Address
IP address is the actual Internet address of any computer on the Internet, its format is 999.999.999.999, where each number 999 is in the range of 0 to 255.

Netmask
TCP/IP uses the netmask to determine the size of the local area network, so that it can broadcast date across the entire local area network, when it needs to. The netmask indicates what range of IP address are on the local area network and therefore, what addresses your computer can receive data from.
- The netmask usually in the format of 255.255.0.0 or 255.255.255.0 Individual numbers are always in the range of 0-255.

File Transfer Protocol

File Transfer Protocol, generally known FTP is a service that enables you to transfer files to and from other computers on the internet. This service allows you to connect to a computer on the internet, browse through the list of files on that computer and copy files to your computer.FTP can be user to transfer any of files, programs, text, pictures sound etc.

FTP is an example of client/server system. You use a program on your computer called client to talk to a program on remoter computer, caller server. The serves is designed to let you download and upload files. Initially using FTP often involved giving cryptic UNIX commands, but in windows, software with windows explorer like graphical interface allow one to explorer remote computer very easily and allows to copy files to the local computer.

When connected to a remote computer using FTP, you must log into an account on the remote computer. If you have an account o the remote computer then you can log into your account to download/upload from remote computer.

Anonymous FTP
If you have no account on the remote computer then a common method is to use anonymous FTP log in. In this anonymous log in, the user name is given as anonymous and the your E-Mail ID is given as password. Most of the FTP servers allow anonymous FTP log in.

There is a large pool information available on anonymous FTP servers, after free of charge. Most of FTP sites do not have a listing of all their available files. So most of the time, to locate the required file, you will have to click on the folders and look through them. As the format of file and directory name depends on the operating system used on the machine that is being used as FTP server, what you see depends on the type of system you are connected to.

For example, if the server you are connected to is running UNIX operating system then the file names will appear with any combination of upper and lower case letters of any length. If it is a DEC VMS based system then the file name will appear in only uppercase. PC, Mac etc. display files and directory name in their standard format.

Name Server

Name server address is the IP address machine that translates textual internet addresses into their number formats (IP Address). The internet user numeric IP address value because the value of each machine connected to the internet is unique. People use textual addresses because they are more easier to read remember.

Time Server

Time server is the IP address of the computer that carries correct time. Most network systems ask a server the time and set your local computer's internal clock to that time.

When your computer is connected to another computer, the two computers often use the date and time for keeping track of messages and files. By insisting that your computer have the same date and time as the network, the time server ensures that the computer carry out transactions accurately.

Domain Suffix

The domain suffix is part of your e-mail address, without the user name, @ symbol and the host name. in the e-mail address " lotia@hotmail.com", the .com is domain suffix.

SLIP

SLIP is a protocol that was designed to allow internet protocol to be run over serial telephone lines. SLIP stands for serial line internet protocol.

PPP

PPP stands for point to point protocol. PPP protocol is superset of SLIP protocol and is slightly faster. PPP protocol is generally considered to be a better developed standard than the SLIP protocol. SLIP and PPP use full TCP/IP protocol, so they actually allow your computer to be part of the internet network.

Concept of Internet

The internet is worldwide network of many small computer networks, that grew out of a 1960 project by American Department of Defense. This project was executed by an advanced research projects agency(ARPA) and an Internet like system developed by them was called ARPAnet.

This ARPAnet was later joined by other government agencies, research institutions, educational institutions etc.. and slowly emerged as today's Internet.

Today the Internet is so large and complex that no one knows exactly how many computers are on it and how many people are actually using it. Internet is known as Network of networks. In June 1993, the web had just 130 sites. A year later , the number had risen to nearly 3,000. By April 1998, there were more than 2.2 million sites on the Web and nearby 2001end the web will have more than a billion sites.

World Wide Web

 The www is so large and complex but no one controls it or owns it. The standards of Web technology World Wide Web Consortium(W3C) was formed by Berners-Lee in 1994. In W3C, an international group of industry and university representatives promotes the Web by developing common protocols for transmitting information over the Internet. IT provides information , reference code and proto types and sample applications to developers and users.

It is hosted by the Massachusets Institute of Technology's Laboratory for Computer Science in United States.

Applications of Internet

The internet was started as a military project, but currently Internet's main use is in education /research activities and in business applications. The advantages of Internet are,

- Information or Marketing material stored in it can reach lots of potential customers quickly and inexpensively.
- It can be used to sell products and services online
- It helps to reduce advertisement and promotion expenses
- It helps to reduce customer service cost
- It helps to do business round the clock
- It helps quick update of information
- It helps in immediate feedback receiving
- It helps in enhanced customer service.

Browsing:

What does *Browsing* mean?

Browsing is the act of looking through a set of information quickly, without a specific sense of purpose. In the context of the internet, it usually refers to using the world wide web. The term may imply a sense of aimlessness, with the user just wasting time on the internet.

Browsing

Browsing in the context of the internet typically means using a web browser. This can be with a specific purpose, such as using email or updating one's status on a social media site, or just using the web with no purpose in particular, as in, "Oh, I'm just browsing."

One advantage of hypertext systems like the world wide web is that it lets users find information without specifically looking at it, the way they might find a new book to read by looking at a library's bookshelves. Browsing is typically contrasted with more methodical search strategies, such as using advanced options in a search engine.

The term "browsing" can also be applied to other hypertext systems, such as help systems or the earlier Gopher protocol.

Simple Browsing

Surfing can be interesting and fun, but it is frustrating if you do not find what you are looking for. There are popular web sites that you can go to that provide a lot of information on topics such as these. We find out about these types of web sites in various ways, such as from TV, radio and magazines. For browsing we need good web browser, eg. Google chrome, internet explorer, etc…

Search Engines

Search engines find information for us by matching specific words to information on the Internet. While it can be tricky to learn how to use them well, search engines can locate obscure information that does not appear in a directory.

Basic functions of web browser

- o Provide a way for users to access and navigate Web pages
- o Display Web pages properly
- o Provide technology to enable multimedia features
- o Provide access to Internet services (such as FTP and e-mail)
- o Perform authentication and encryption functions

Installing web browser

- ✓ Windows Internet Explorer 9 (IE9) is packaged with Windows 7
- ✓ Most browser software is available on the Web or through a vendor CD-ROM
- ✓ ISPs provide browser software on installation CD-ROMs
- ✓ You should install the latest version of a browser because it will have the most recent security features
- ✓ Look for and install browser updates as they become available

Web addresses

- • Every Web page has a unique address called a Uniform Resource Locator (URL)
- • URLs typically include the protocol, the Internet resource (server or host name) and the domain name
- • You enter absolute URLs into your browser's Address or Location box
- • Relative URLs can be used for coding Web sites

How browsers work

1. You enter a URL into the browser
2. Browser divides the URL into three parts: protocol, server and domain name, and file name
3. Browser contacts a domain name server to translate server name into an IP address
4. Browser uses IP address to connect to server
5. Browser uses HTTP to request a page from the server
6. Some level of authentication takes place
7. Server sends the requested page (coded in HTML) to the browser
8. Browser reads and interprets the HTML, and displays the Web page

Browser choices

Most popular browsers in use today are Windows Internet Explorer, Google Chrome and Mozilla Firefox. Alternative browsers include:

1. Safari
2. RockMelt
3. Opera
4. Konqueror
5. Lynx

<u>**Example - Google Chrome**</u>

Google uses the Greenfield approach to software and Web development . Greenfield – a project that lacks any constraints imposed by prior development

Chrome features:

- Clean interface
- Automatic crash recovery
- Multi-threading
- Improved sandboxing
- Isolated tabs
- Privacy mode

<u>**Browsing Techniques**</u>

Techniques available to make your browsing sessions more efficient:

- ✓ **Using Bookmarks and Favorites**
- ✓ **Using multiple windows and tabs**
- ✓ **Following links**
- ✓
- ✓ **Browser Elements**
- ✓ **Rendering engine**
- ✓ **Interpreter**
- ✓ **Sandbox**
- ✓ **Thread**
- ✓ **Window**
- ✓ **Tab**
- ✓ **Cache**
- ✓ **Supplements**
- ✓ **Network programming**
- ✓ **Download controls**
- ✓ **Plug-in**

<u>**Web Browser Preference**</u>

Browser preferences you can configure to suit your working style include:
- ▪ **Browser fonts**
- ▪ **Home page**
- ▪ **History folder**
- ▪ **Blockers for pop-up and pop-under windows**
- ▪ **Browser cache settings**

Types of Network Connections

Technology changes at a rapid pace and so do Internet connection speeds. We reviews connection speeds ranging from dial-up to T3 and everything in between. As technology grows, so does our need for bigger, better and faster Internet connections. Over the years the way content is presented via the Web has also changed drastically. Ten years ago being able to center, bold, and produce text in different colors on a webpage was something to admire. Today, Flash, animations, online gaming, streaming video, database-driven websites, ecommerce and mobile applications (to name but a few) are standards.

The Need for Speed
The need for speed has changed the options available to consumers and businesses alike in terms of how and how fast we can connect to the Internet. The connection speeds listed below represent a snapshot of general average to maximum speeds at the time of publication. This is no doubt will change over time and Internet connection speeds also vary between Internet Service Providers (ISP).

Analog: Dial-up Internet Access
Also called dial-up access, an analog Internet connection is both economical and slow. Using a modem connected to your PC, users connect to the Internet when the computer dials a phone number (which is provided by your ISP) and connects to the network. Dial-up is an analog connection because data is sent over an analog, public-switched telephone network. The modem converts received analog data to digital and vice versa. Because dial-up access uses normal telephone lines the quality of the connection is not always good and data rates are limited. Typical Dial-up connection speeds range from 2400 bps to 56 Kbps. Today, analog has been widely replaced by broadband (Cable and DSL).

ISDN - Integrated Services Digital Network

Integrated services digital network (ISDN) is an international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires. Typical ISDN speeds range from 64 Kbps to 128 Kbps.

B-ISDN - Broadband ISDN
Broadband ISDN is similar in function to ISDN but it transfers data over fiber optic telephone lines, not normal telephone wires. SONET is the physical transport backbone of B-ISDN. Broadband ISDN has not been widely implemented.

DSL – Digital Subscriber Line
DSL is frequently referred to as an "always on" connection because it uses existing 2-wire copper telephone line connected to the premise so service is delivered simultaneously with wired telephone service -- it will not tie up your phone line as an analog dial-up connection does. The two main categories of DSL for home subscribers are called ADSL and SDSL. All types of DSL technologies are collectively referred to as xDSL. xDSL connection speeds range from 128 Kbps to 9 Mbps.

ADSL - Asymmetric Digital Subscriber Line
ADSL is the most commonly deployed types of DSL in North America. Short for asymmetric digital subscriber line ADSL supports data rates of from 1.5 to 9 Mbps when receiving data

(known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate). ADSL requires a special ADSL modem.

ADSL+2 - ADSL Extension

An extension to ADSL broadband technology that provides subscribers with significantly faster download speeds when compared to traditional ADSL connections. ADSL+2 works in the same fashion as ADSL a special filter is installed on a subscriber's telephone line to split existing copper telephone lines (POTS) between regular telephone (voice) and ADSL+2. ADSL2+ service is most commonly offered in highly-populated metropolitan areas and subscribers must be in close geographical locations to the provider's central office to receive ADSL2+ service.

SDSL - Symmetric Digital Subscriber Line

Short for symmetric digital subscriber line, SDSL is a technology that allows more data to be sent over existing copper telephone lines (POTS). SDSL supports data rates up to 3 Mbps. SDSL works by sending digital pulses in the high-frequency area of telephone wires and cannot operate simultaneously with voice connections over the same wires. SDSL requires a special SDSL modem. SDSL is called symmetric because it supports the same data rates for upstream and downstream traffic.

Cable - Broadband Internet Connection

Through the use of a cable modem you can have a broadband Internet connection that is designed to operate over cable TV lines. Cable Internet works by using TV channel space for data transmission, with certain channels used for downstream transmission, and other channels for upstream transmission. Because the coaxial cable used by cable TV provides much greater bandwidth than telephone lines, a cable modem can be used to achieve extremely fast access. Cable providers typically implement a cap to limit capacity and accommodate more customers. Cable speeds range from 512 Kbps to 20 Mbps.

Wireless Internet Connections

Wireless Internet, or wireless broadband is one of the newest Internet connection types. Instead of using telephone or cable networks for your Internet connection, you use radio frequency bands. Wireless Internet provides an always-on connection which can be accessed from anywhere — as long as you geographically within a network coverage area. Wireless access is still considered to be relatively new, and it may be difficult to find a wireless service provider in some areas. It is typically more expensive and mainly available in metropolitan areas.

T-1 Lines – Leased Line

T-1 lines are a popular leased line option for businesses connecting to the Internet and for Internet Service Providers (ISPs) connecting to the Internet backbone. It is a dedicated phone connection supporting data rates of 1.544Mbps. A T-1 line actually consists of 24 individual channels, each of which supports 64Kbits per second. Each 64Kbit/second channel can be configured to carry voice or data traffic. Most telephone companies allow you to buy just one or some of these individual channels. This is known as fractional T-1access. T-1 Lines support speeds of 1.544 Mbps. Fractional T-1 speeds are 64 Kbps per channel (up to 1.544 Mbps), depending on number of leased channels.

Bonded T-1

A bonded T-1is two or more T-1 lines that have been joined (bonded) together to increase bandwidth. Where a single T-1 provides approximately 1.5Mbps, two bonded T1s provide 3Mbps or 46 channels for voice or data. Two bonded T-1s allow you to use the full bandwidth of 3Mbps where two individual T-1s can still only use a maximum of 1.5Mbps at one time. To be

bonded the T-1 must run into the same router at the end, meaning they must run to the same ISP. Typical Bonded T-1 (two bonded T-1 lines) speed is around 3 Mbps.

T-3 Lines – Dedicated Leased Line
T-3 lines are dedicated phone connections supporting data rates of about 43 to 45 Mbps. It too is a popular leased line option. A T-3 line actually consists of 672 individual channels, each of which supports 64 Kbps. T-3 lines are used mainly by Internet Service Providers (ISPs) connecting to the Internet backbone and for the backbone itself. Typical T-3 supports speeds ranging from 43 to 45 Mbps.

OC3 - Optical Carrier
Short for Optical Carrier, level 3 it is used to specify the speed of fiber optic networks conforming to the SONET standard. OC3 is typically used as a fiber optic backbone for large networks with large voice, data, video, and traffic needs. Speeds are 155.52 Mbps, or roughly the speed of 100 T1 lines.

Internet over Satellite
Internet over Satellite(IoS) allows a user to access the Internet via a satellite that orbits the earth. A satellite is placed at a static point above the earth's surface, in a fixed position. Because of the enormous distances signals must travel from the earth up to the satellite and back again, IoS is slightly slower than high-speed terrestrial connections over copper or fiber optic cables. Typical Internet over satellite connection speeds (standard IP services) average around 492 up to 512 Kbps.

Connecting to the Internet
There are many ways you can connect to the Internet. Once you have access to the Internet, you can retrieve information   from millions of resources, including school/college libraries, government records, businesses, and individuals.   To connect to the Internet we use the Dial-up networking provided with the windows 98. The following are the basic steps required for connecting to the Internet using Dial-up networking, they are :
- Get an Internet account from an Internet Service Provider(ISP).
- Set up your communication hardware.
- Make sure Dial-up Networking is installed.
- Install Windows 98 TCP/IP protocol   and bind it to the Dialup networking.
- Setup TCP/IP protocol
- Setup a connection to your Internet provider in dial up networking
- Dial your Internet service provider and type the user name and password at prompts.
- Get connected to the Internet.

Get an internet account
To setup an internet account call an ISP and sign up for an Internet account. We need following information from our ISP. They are :
- User Name
- Password
- Access to Phone number
- Your host name and domain name
- Domain Name System(DNS) address

Also the Provider may also supply the following information.
- IP address and subnet mask
- DNS search order

- Gateway address.
- Authentication Procedure
- POP 3 and SMTP mail server name, port number, etc..

Setup Communication Hardware

We need Modem having 28,800 bits per second or faster modem to connect Internet.

Make sure that Dial-up Network is Installed

If you didn't see the dial-up networking icon, then it is installed by using the following procedure ,

- Click start
- Go to settings
- Click Control Panel
- Select add/remove programs and select windows setup tab.
- Now select Communications from the list and click on details button.
- In the communication window , select Dialup networking check box.
- Click OK , which brings the Dial-up connection icon to the desktop.

Install the Windows 98 TCP/IP protocol

- Click start
- Go to settings , click on control panel
- Select Network icon in control panel and select configuration tab window in network icon
- Click add command button
- Click protocol , and click add.
- Click Microsoft and click TCP/IP and click OK.
- Click Dial-up adapter and click Properties,
- Click on bindings tap and make sure that TCP/IP check box is selected and click OK.

INSTALLING COMPUTER/MAKE YOUR OWN COMPUTER(ASSEMBLING):

Assembling computer is a very easy job, on just need to select the proper components and then connect them properly. Now let us see how to build the PC. To do this, first, buy components required to make the PC and keep them ready.

- **Monitor, M**ain case, Power supply , Keyboard and mouse
- **Motherbo**ard, Processor and RAM
- Display Card, Sound Card, Modem Card, LAN Card
- Floppy Drive, Hard Disk Drive, CD/DVD Drives
- Speaker/Microphone, External Modem.

Also keep the following hardware tools for assembling, they are , (i) Star/Philips Screw Driver set , Nose pliers. Before starting the assembling process, touch the metallic grounded object, to make sure that you are free from any static charge. Also handle Motherboard, CPU, RAM etc… carefully.

Now the following the step by step procedure to assemble or make the computer as follows :

1. Remove Cover of the Main System Unit

- Open the four screws at the back of the system's main unit.
- Slide the top cover off the main unit.

2. Remove Base Plate from the main unit

- Remove the screws holding the base plate to the main unit
- Lift the base plate out of the main unit.

3. Mount the Motherboard to the base plate

- Place the motherboard on the base plate using the spacers and screws provided.
- Tighten the screws provided to fix the motherboard to the base plate. Do not completely tighten the screws, leave a little room to make any adjustments when some new expansion card is installed. Tighten the screws only after you mount all the cards to the motherboard. One can place foam pieces or old newspaper between motherboard and base plate, so that motherboard components will not touch the base plate and short circuit.

4. Attach the processor to the motherboard

- Attach the CPU to the motherboard, based on the CPU used, may use socket 370.
- Attach CPU fan to the power connector.
- Set any jumpers to configure the motherboard for the CPU type, this information should be available in the motherboard manual. On most of the new motherboards, the board automatically detects the processors clock speed and core voltage, without any need for setting up the jumpers.

5. Attach the RAM modules to the motherboard

- To attach RAM module, properly align both ends of the module with the slot given on the motherboard and push the module into the slot with a smooth push. Based on the motherboard, you may need to install SIMM or DIMM type memory module.

6. Mount the motherboard into the computer Unit

- Once the CPU and memory is attached to the motherboard you can mount the back plate into the main system unit. Remember to tighten the screw only lightly. You can fully tighten them after the expansion cards are mounted on the motherboard.

7. Attach Storage devices (Floppy/HDD/CD drive) to the main unit

- Place the floppy disk drive, hard disk drive and CD/DVD drive etc… to their respective bays , tighten the side holding screws only after power and data cables are attached.
- CD/DVD and floppy drive need to be inserted into their bays from the opening at the front of the system unit.

- IF your motherboard and HDD support ATA/66 , then use new ATA/66 cable.; Connect blue connector of ATA/66 cable to the IDE channel to the motherboard.

8. Connect cables (reset, speaker, power indicator LED etc…) to the Motherboard

- Connect the power cable to the motherboard. If you have ATX power supply then the connector will fit in only one direction. When connecting AT power cable, make sure that black ground lines on both connector are placed next to each other.
- Attach various front panel connectors to the motherboard. As a rule attach red wire to pin 1 and black wire to pin 2. Information for attaching the front panel connectors to the motherboard are given in the motherboard manual.

9.Attach drive data cable and power connectors to the storage devices

- Connect primary IDE channel to the master/boot hard disk drive. Primary IDE channel is indicated as Pri-master , or IDE0 on the motherboard. When attaching data cable, red/dotted wire on the cable should align with pin 0 of the connector.
- Attach power connector to the hard disk drive
- Connect secondary IDE channel to the CD/DVD drive.
- Attach power connector to the CD/DVD drive.
- Connect floppy drive to the motherboard connector.
- Attach power connector to the floppy drive.

Connecting CD/DVD drive to secondary IDE channel will improve the speed of the primary IDE hard disk drive, compared to connecting the CD/DVD as slave to the primary IDE channel hard disk drive. A HDD/CD/DVD can be made master/slave by changing the position of jumper provided on its back.

10. Connecting external port cables

- Connect serial, parallel , game , infrared, etc.. ports to the motherboard. Connectors for this are provided with the motherboard. ATX motherboard does not require this, as these ports are built into the motherboard itself. Position of these connectors, on the motherboard, is generally provided in the motherboard manual.
- Arrange these connectors with the help of some rubber band or tie wrap so that they do not obstruct the airflow inside the system case and keep the system cool.

11. Connect Display Card and Sound card

If your motherboard does not have integrated display/sound card then you need to connect these cards to your system. When handling these cards remember to handle them by edges to prevent any damage due to static charge.

- To connect the cards find an empty slot
- Insert the card by first aligning card's edge connectors to the slot on the motherboard.
- Slide in the card into the slot by gently rocking the card back and forth and pushing down. Never try to force a card into the slot.
- Tighten the screw to fix the card to the motherboard.

12. Connect CD audio cable

- To use your CD drive to hear audio CD's connect the audio out socket on the CD/DVD drive to the CD in connector on the soundcard/motherboard . To cable required to make this connection is generally provided with the CD/DVD drive.

13. Connect Peripherals

- Connect the keyboard to the round opening provided at the back of the system
- Connect the mouse to the serial port connector provided at the back of the system.
- If you have PS/2 keyboard then connect it to the lower PS/2 port , upper PS/2 port is used to connect the mouse.

14. Connect External Cables

- Connect data cable from the monitor to the connector at the back of the display card.
- Connect mains power supply cord to the system's power supply.
- Connect your power cord from the monitor to the power supply.

15. Check Connections

Now you are ready to switch on the system, but before switching on the system, check all Connections; make sure that there is no loose contact anywhere. Check that all cards are seated Properly into their sockets.

16. Switch on the system

- Turn the mains power on
- Switch on the power supply/UPS
- Press the power on button on the front panel.

    Now check the hard drive spinning and a single beep sound will heard from the system. This indicates that everything is functioning properly. Make sure that CPU fan and power supply fan are spinning. Make sure that CPU speed indicated during the system startup matches with the original CPU Speed.

17.Configure BIOS

Once things are working properly you can make changes in the BIOS setup to make the system function in a better way.

18. Switch off the system and close system unit cover

Ones your system is running without any problem, the system cover is closed.

19.Install the required Software /Programs

Once your machine is ready , you need to install the operating system like Windows98,XP,ME , NT, Linux , etc… into our system. Once the operating system is installed, install the software required for our work, like Microsoft Office, Tally, DTP software's like CorelDraw , Page Maker, Ventura, etc…

<u>**Windows Setup(Example Windows 98)**</u>

<u>**Running Setup**</u>

To install Windows OS on a computer with a new or reformatted hard disk, we start setup from the MS-DOS. The setup procedure is as follows :

- Start our computer with a Windows 98 CD which is bootable.
- The Windows 98 Startup Menu is Displayed like "Start Computer out CD-ROM support".
- When a command prompt is appeared or displayed, type SETUP and press Enter.
- This prompt the start the Windows 98 setup, and setup performs routine check of computer.
- It runs the scandisk and check the errors on the hard disk, File allocation table and the system.
- If scan disk is not performed, it does not check the physical errors. If it finds the error let the user to know about the error, like bad sector, etc…
- After , the setup displays the Windows 98 setup screen, this will give information on the left hand side will displays the five steps and shows the time remaining to complete the installation.
- To begin the setup process, click continue.
- Now setup prepares the Windows 98 Setup Wizard, then setup starts five step installation process.
  - ➢ Preparing to run Windows 98 setup
  - ➢ Collecting information about your computer
  - ➢ Copying Windows 98 files to our computer
  - ➢ Restarting your computer
  - ➢ Setting up hardware and finalizing settings.

<u>**Preparation to run Windows 98 Setup**</u>

During this process , setup prepares the Windows 98 setup wizard, which guides through installation.
- ➢ Setup displays the Windows 98 setup dialog box.
- ➢ Creates the setuplog.txt file in the root directory, (root directory is C:\)
- ➢ Identifies the device where the Windows 98 being installed and source drive where the Windows 98 installation files are located.
- ➢ Creates a temporary directory C:\Wininst0.400 and copies the Mini.cab into it. Mini.cab contains the mini windows program files required for setup.
- ➢ Extracts all the files in Precopy.cab and Precopy2.cab to C:\Wininst0.400.
- ➢ These files are necessary for running a setup.

<u>**Step Two : Collecting Information about the Computer**</u>

During this step , the setup collects the information about out computer and prepares it for copying Windows 98 files through different phases , they are :
- ✓ Presents the License agreement
- ✓ Prompts for the Produce Key
- ✓ Informs the user with the preparing directory , where the installation files are stored.
- ✓ Choose the type of setup we want

- ✓ Prompts to enter the name of the computer and organization.
- ✓ List to install the most common components .
- ✓ Lets the user to add or remove components
- ✓ Prompts the user to identify our computer on the network
- ✓ Prompt to choose the location
- ✓ Prompts to create Start up Disk
- ✓ Start copying files

- ▪ The License agreement when prompts, we must accept the license agreement to continue.
- ▪ When the setup asks the product key, enter the 25 digit key to continue.
- ▪ After enter the product key, now select the directory where setup files is installed. The default directory is "C:\Windows"
- ▪ After we choose the directory , the preparing directory dialog box appears, now setup checks the installed components and then checks whether there is adequate space for the files. Then it finally creates the Windows directory structure, under the folder C:\Windows directory.
- ▪ Now Setup Options prompts, it contains a specific set of components to install. When we choose setup options, the setup dialog box appears and we click Next. The "Typical" setup option is selected as default, also there are different setup options is available, they are
    - • **Typica**l -- Default components is installed
    - • **Portable** – It is for portable computers
    - • **Compact** – It is the smallest possible installation , for example when we choose compact installation if our hard disk does not have much free space, setup will install optional components.
    - • **Custom** --- When we choose custom, the windows will install all the components of Windows 98 OS.
- ▪ After setup options, Windows 98 setup asks the user to type our name and company name, which Windows 98 user to identify the user for various operations.
- ▪ After we give user information, setup displays the Windows component dialog box, and we install the components as we need.
- ▪ Our Next step is to choose the location, in Windows 98 We choose the location like "Mumbai/Calcutta/Delhi/Chennai" and select Next.
- ▪ Now the we enter the phase of "Startup Disk". Here setup prompts the user to create a Windows 98 Startup disk by displaying the startup disk dialog box. The startup disk is a bootable system disk with a collection of real mode Windows 98 commands and utilities that the user to restart out computer , if you have the troubleshooting Windows 98 or to run diagnostic programs. To create a startup disk during the setup, we have following step by step procedure as follows :
    - ➢ Click next on the startup disk dialog box
    - ➢ Setup starts creating the startup disk
    - ➢ Label a floppy disk " Windows 98 Startup disk" and insert into the drive A:
    - ➢ Click OK to create the disk.

Suppose if you cancel a startup disk now, you can make the startup disk later by choosing the add/remove programs in control panel , as,
- ➢ In control panel click add/remove programs
- ➢ Click the startup disk tab
- ➢ Click create disk

> ➢ Then follow the instructions in the screen.
- ▪ After setup finishes creating the startup disk , start copying files dialog box appears. Now click Next to start copying Windows 98 files to your computer.

Step 3 : Copying Windows 98 files to your computer

After setup has collected the information it needs, it begins copying the Windows 98 files to your computer. During this phase , Windows 98 setup does not require any input.

During this phase do not interrupt the file copying. If setup is interrupted during this file copying phase , Windows 98 will not run. If you interrupt setup during this phase, you must run setup again.

Step 4 : Restarting your computer

After setup finishes copying the Windows 98 files to your computer, you are prompted to restart your computer. You can click the restart now button to restart your computer immediately. If you do not click the button, setup restarts automatically.

After setup restarts your computer, the following message appears in your screen like :
"Getting ready to start Windows 98 for the first time"

Step 5 : Setting up Hardware and Finalizing Settings

During this phase, setup configures the following :
- ❖ Control Panel
- ❖ Programs on the start menu
- ❖ Windows Help
- ❖ MS-DOS program settings
- ❖ Tuning up application start
- ❖ Time zone
- ❖ System configuration

When setup finishes setting up hardware and configuring settings, setup restarts your computer and

asks the user to log in. Suppose if your computer is connected to the network, you may be asked for a

domain name and a network password, after you log on, setup :

- ♦ Builds a driver information database
- ♦ Updates the system settings
- ♦ Sets up personalized settings such as settings for Internet Explorer browsing software, Start Menu, online services , volume control panel and channels.

After this Setup displays the **"Welcome to Windows 98 "** dialog box.