Computer Hardware Maintenance & Troubleshooting

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Computer

A Computer may be defined as an advanced electronic device that takes Input goes on processing and finally gives the desire output to the user at a very high-speed in the from of text, sound image and so on.

The Computer is man made machine. The word of **Computer** from Latin word **"Computare"**. This means to calculate. Basically, Computer is defined as one, which Computes (Calculating machine).

It helps us to solve the problems. It can be programmed to accept data (Input). Process it into useful Information (Output) and store it away in a secondary storage device for safekeeping or future use. To function, a Computer system requires four main steps: **input**, **processing**, **output** and **storage**.

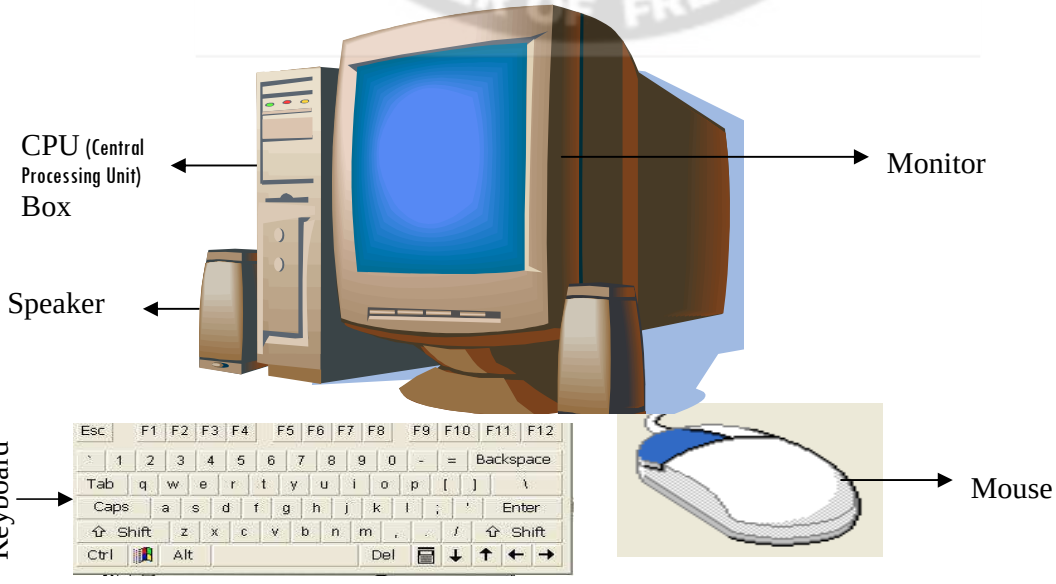
The computer can store and manipulate large quantities of data at very high speed and even though, it can't think. It can make simple decisions and comparisons. For example, a computer can determine which two numbers is larger or which of two names comes first alphabetically and then act upon that decision. Although the computer can help to solve a wide variety of problems, it is merely a machine and can't solve problem on its own. It must be provided with instructions is the form of a computer program.

To run a Computer:

- First we '**ON**' the power
- Then the Computer start then put your personal password if necessary
- Click **OK** or Press **Enter** key from keyboard.

To close the Computer:

- We close all application if we running
- Click on **Start** button
- Choose **Shut down** or **Turn Off** command
- Click **shut down** from combo list or **Turn off** button.
- Click on **OK**



Computer: Convination of Physical and Logical part of computer is computer system.

There are two field in Computer System:

1. Hardware
2. Software

Hardware:

The physical component that forms a set of Computer is called Computer Hardware. That can be touch or all the physical parts are Computer Hardware. There are two kinds of Computer Hardware:

i) Internal parts **ii) External parts**

≈ Internal parts: This part is used inside of the cassing box, We can't see in out place these parts. If we want to see these parts then we open the Computer cover. Example: motherboard, Memory (RAM, ROM), CPU fan (cooler fan), Hard Disk, VGA, power supply box, IC chips, processor, Sound card, etc are internal parts of Computer Hardware.

There are two parts define this Internal Parts of Computer Hardware: i) **primary internal parts** & ii) **secondary internal parts**: A Primary part means very importance parts of computer, when we want to operate system then nessasary to use this part is calld primary part. Like Motherboard, Hard Disk, CPU Board, CPU fan, VGA, SMPS box, etc are internal primary parts of Computer Hardware.

Secondary parts means very useful parts of computer but if we not used this part then also solve are problem. Like Sound card, TV/FM card, Modem (internal), CD Rom, Floppy Drive, NIC card etc are Internal Secondary parts of Computer Hardware.

≈ External parts: This part is used outside of the cassing box, We can see in out place and to touch our hands these parts. Example: Mouse, CPU (casing) box, Keyboard, Monitor, Mouse pad, speaker, Scanner etc are External parts of Computer Hardware.

It is also define two parts of Computer Hardware: i) **primary external parts** & ii) **secondary external parts**: A Primary external part means very importance parts of computer, when we want to operate system then nessasary to use this part is calld primary part. Like Monitor, Mouse, CPU (casing) box, Keyboard, Mouse pad are External primary parts of Computer Hardware.

Secondary external parts means very useful parts of computer but if we not used this part then also solve are problem. Like Speaker, printer, Sound box, Scanner, Modem (External Internet Card), Volt Guard, Head phone, UPS(Uninterruptible Power Supply), Digital Camera etc are External Secondary parts of Computer Hardware.

Software: All the Computer programs are called Computer Software or as a set of Instructions that enables the physical components that can't be touch are called Computer Software. Computer program is the set of sequential instructions given to a Computer to perform a particulars

task, in other word; software is collection of programs; which controls all the operations of Computer system. It checks and supervises all the peripheral of Computer.

There are three types of Computer Software:

i) **System Software** : a) **MS Windows**
b) **Linux**

ii) **Application Software** : MS Word, Ms Excel, Tally, Photoshop etc.

iii) **Utility Software** : It provides help for developing & maintaining of Software. Patrician-magic, Antivirus, Recovery software, Internet tools etc.

Relation between Computer Hardware & Software:

Hardware and Software are enter-depended to each other. The relationship between Hardware & Software can be compared with Human-body and Soul. Without Software, Hardware is useless; or they are like to death body. It means Software made Hardware alive. Without Hardware, Software cannot be excited. Therefore there are very deep relations between Hardware & Software.

Classification of Computer:

Work	Size	Model	Brand
Analog	Super	XT	IBM-PC
Digital	Mainframe	AT	IBM-PC Comparable
Hybrid	Mini	PS/2	Macintosh
(Digital/Analog)	Micro		

Analog = (Thermometer)
Digital = (Calculator)
Hybrid = (Jet plane)

XT = Extended Technology
AT = Advanced Technology
PS/2 = Personal System Two
ATX = Advanced Extended Technology
IBM = International Business Machine
P-I = Pentium One
PC = personal Computer

Analog Computer: The Computer can process analog quantities (continuous data) is called an analog Computer. They are designed to measure physical force such as temperature, pressure, speed of rotation, etc and record them as readings along a continuous scale. Ex. Thermometer, speedometer.

Digital Computer: The Computer which accepts discrete data (discontinuous data) is known as digital Computer. Basically, digital Computer counts digits, which represent numbers or letters. They are the most widely used types of Computers. They are used in preparation of reports, results, tabulation, graphics, in business, accounting, engineering and other fields.

Hybrid Computer: The data processing device, that uses both analog and discrete data representation known as a hybrid Computer. Hybrid Computer can perform the tasks of both analog and digital character. They can transfer data from analog to digital and Vice-Versa. They are also used in scientific research, industrial application, Airplanes, etc.

Super Computer: This Computer are the largest, fastest, most-powerful and most expensive Computers make like other large systems, many individuals at the same can access it. Super Computers are used primarily for the scientific applications that are mathematically intensive. The aerospace, automotives, chemical, and petroleum industries used super Computers extensively.

Mainframe Computer: Science the first UNIVACI was sold in 1951, the mainframe Computer has been cornerstor of the Computer industry IBM the giant of the Computer industry captured the mainframe market the late 1950s and made its name and fortune manufacturing mainframe Computer systems. For input/output

–intensive operations, mainframe Computers are much more suitable then supercomputer. Many modern mainframes have multiprocessing capabilities.

Mini Computer: The age of the mine started in the late 1960s. The creation of integrated circuits suitable Computers enabled designers to shrink the size of the Computer. Before Digital Equipment Corporation (DEC) released the first DEC PDP-8 Mini Computer in 1968.

Micro Computer: The Microcomputer segment of the industry is complex; there are different types of microcomputer platforms with varying capabilities. The most common type of microcomputer is a desktop computer, which is a non-portable personal Computer that first of top of a desk.

PERSONAL Computer (PC)

a) PC-8086 **b) PC/XT-8088 (Extended Technology)** **c) PC-AT (Advanced Technology)**

1) 286 *2) 386* *3) 486* *4) 586*

a) Pentium –I b) Pentium –II c) Pentium –III d) Pentium –IV

XT Computer: The Computer having 8086 microprocessor or 8086 Microprocessor is called as XT Computer. XT Computers have processing capacity 8 MB RAM and speed of 4.77 MH_Z (Mega hertz). They are comparatively slower. They cannot run advanced version of software's.

A**T Computer:** The Computer, which having 80268 Microprocessor are called as AT Computer. AT Computers are faster than XT Computers. The memory capacity of AT Computers is large the RAM and speed as 60 to 650 MH_Z (Mega hertz). They can run latest version of software's, CD-ROM (for the display of text, table, with sound and photos etc).

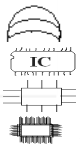
PS/2 Model Computers: IBM Company started manufacturing another model of Computers in 1990. This model is called PS/2 (Personal system-2) model Computers. Most of the Computers manufactured after 1990, including Laptop Computers belong to this model.

IBM-PC: Original IBM personal Computer

IBM-PC Comparable: Not original but similar to IBM-PC

Macintosh / Apple: Having different architecture as compared of IBM-PC

Generation of Computer:

Generation	Duration	Major Computer	Diagram
1st Generation	1946 - 1958	Valves, Tubes	
2nd Generation	1959 - 1964	Transistors	
3rd Generation	1965 - 1974	IC	
4th Generation	1975 -1990	Chips/ Processor	
5th Generation	1991 - till now	Micro-Processors parallels processing	

First Generation (1946-1958): first generation Computers were developed during 1946 to 1958. They used vacuum tubes electronic device for their hardware implementation. So these Computers were very large. For ex. ENIAC used 19,000 vacuum tubes. 1000 Capacitors, 7000 Resistors and so on. It occupied square feet of space. Since the vacuum tubes produced a large amount of heat, air condition arrangement was needed. The first generation Computers were very slow, had less internal capacity and needed a big space.

Second Generation (1959-1965): The invention of semiconductor transistors by the three physicists John Bardeen, Brattainand William Shookley at is laboratory had made a big revolution in the field of electronics transistors replaced the vacuum tubes of the first Generation Computers. The use of such transistors marked the arrival of the second-Generation Computers in the world. The transistors were made germanium semiconductor material. They were smaller, faster and more reliable.

Paper tapes and punched cards were used for auxiliary storage or external storage. During period, magnetic tape and magnetic disk had additional advantages.
As a result of these improvements, the second-Generation Computers become smaller, faster and they could store large number of data compared to the previous to the Generation.

Third Generation (1965-1975): The technological advancement responsible for the emergence of the third Generation Computers was the IC (Integrator Circuit). An IC is an electronic circuit with a large number of components built on small silicon chip. Semiconductor memories (RAMs & ROMs) also made this Generation Computers distinct from those of previous two Generations.
Small Scale Integrator Circuit (SSIC) and Medium Scale Integrator Circuit (MSIC) could replace transistors & the semiconductor memory replaced the magnetic core memory elements as primary storage medium. The magnetic disk was able to replace magnetic tapes as secondary storage medium.

Fourth Generation (1975-1990): The development of VHSI (very high scale integration) circuit & Microprocessor enhanced the performance of fourth Generation Computers. American Intel Corporation developed the first microprocessor in 1971. It was called 4004 Microprocessor. A Microprocessor is a processor built on a single chip. Today, such a microprocessor contains Nine Million transistors. This is present generation.

Fifth Generation (1991-continued): After 1990, a new Generation of Computers called the Fifth Generation has been under development stage. Leading countries for these Computers are Japan & USA. They have been undertaking different projects to design fifth Generation Computers. This Generation will be using Bio-Chips as its memory device.
These fifth Generation Computers will have their own features. They will be using ULSI (Ultra Large Scale Integration) IC Chips. Such chip will have millions of components. The special characteristics of fifth Generation Computers would be:

a. Use Intelligent Programming
b. Use high performance multiprocessor system
c. Have easy human interfaces
d. Use knowledge-based problem solving techniques.

Characteristic of Computer

There are many characteristic of Computer, which have made them so powerful and useful.

i. **Speed:** It works in the speed of light (0.04 sec. it takes). Computers operate at very speed in the fact with the speed of light. The Computer's speed at performing single operation can be measured in term of fraction of second. **Different terms that are used to denote the speed are as given below**:

Unit of Time	*Meaning*	*Part of a Second*	*In the power of 10*
Milliseconds (MS)	Thousandths of second	$^1/_{1000}$ second	10^{-3} second
Microseconds (MS)	Millions of a second	$^1/_{1000000}$ second	10^{-6} second
Nanoseconds (NS)	Thousands Millions of a second	$^1/_{1000000000}$ second	10^{-9} second
Picoseconds (PS)	Million Millionths of a second	$^1/_{1000000000000}$ second	10^{-12} second

ii. **Storage capacity**: The storage capacity of Computer has made it a special device. A large amount of data can be stored in a Computer's memory. The storing capacity of a Computer is expressed in bytes. Bytes stores one characters (e.g. A.B.1.2. etc.) of data or information.

Units: **0/1** = **1 bit**

8 bit	=	**1 byte**
1024 byte	=	**1 kilobyte (KB)**
1024 KB	=	**1 megabyte (MB)**
1024 MB	=	**1 gigabyte (GB)**
1024 GB	=	**1 terabyte (TB)**
1024 TB	=	**1 exjabyte (EB)**

iii. **Versatility (Flexibility)**: A Computer is a versatile machine and its use is limited only by your imagination. In today's fast developing technology world it would be very difficult. In some cases, inconceivable, to find an area where Computers are not being used to a great advantage. However Computers have on major limitation of Computers not originally creative and they would never be.

iv. **Accuracy**: If the program and data have no error, the result given by the Computer will be 100% accurate. If mistake accuse in any calculation. They are due to manual error like feeding wrong data or mistake in the instructions given.

v. **Consistency:** unlike human being, Computer being machines are highly consistent. They never get bored to! I am at to meet a Computer complaining of a monotonous job! Hence, they are ideal machine for the carrying out repetitive and voluminous work.

vi. **Communication Media:** It is one of the important characteristics of the Computer. Using Internet phone, Email, E-Fax etc.

vii. **Easy to Use:** Computer is very easy to use by different parts and system.

viii. **Economically:** the Computer reduces the cost in various fields. To communicate or perform many important work with lower cost.

ix. **Calculation & Comparison**: Computer deals with great calculation various field.

x. **Tending Job Handlers**:

xi. **Networking**: If necessary it can be communicate, retrieve or find solution other Computers connecting globally for us. Email, E-fax, telephone, Internet are good example.

xii. **Automatic**: Once we give the appropriate instruction, a Computer can perform the operations automatically. It carries on with the given task independently and continually.

Binary: A base-2 number system in which values are expressed as combinations of two digits, 0 and 1.

Bit (binary digit): The smallest unit of information handled by a computer. One bit expresses a 1 or a 0 in a binary numeral, or a true or false logical condition. A group of 8 bits makes up a byte, which can represent many types of information, such as a letter of the alphabet, a decimal digit, or other character. Bit is also called binary digit.

Bytes: A unit of data that typically holds a single character, such as a letter, a digit, or a punctuation mark. Some single characters can take up more than one byte.

Gigabyte (GB) :1,024 megabytes, though often interpreted as approximately one billion bytes

History of Computer

Before 16th century Chinese people developed a kind of machine call **ABACUS**, which was made of rectangle wooden frame. It has horizontal rods with beads and strung with the help of changing the position of the beads. They solve the problem of Addition and subtraction. It is still being used in China, Japan, India and Russia.

In the 5th century, Hindu Brahmin developed the natural number 1, 2, 3……9 then after Iraqi mathematician Alkhawarismi developed "0", in the mid of 1600s. In this way, to solve the Counting problem or mathematical problem there ware made "Computare" in the Latin world. Slowly the Computer has been made to solve logical & mathematical problems. Now today Computer is used in every field such as Hospital, Office, Bank ete. Today it can't thing about the

world without Computer. Human being does not need using stones, sticks, scratches. On a knock will figures counting.

i) **Blaise Pascal**:

- He was a French mathematician and developed Pascal Machine in 1642.
- It was first mechanical calculator, which adds and subtracts the number by using the series of eight rotating wheels.

ii) **Charles Babbage** :

- Father of Computer science.
- In 1822, he developed a small model machine call "Difference Engine" that was the first machine which could perform calculator without any human intervention.
- Developed "Analytical Engine" in which instruction and data were feed by means of punched cards.

iii) **Lady Ada Lovelace**:

- She is known as "Disciple of Babbage" who was the daughter of famous Poet "Loard Byrone".
- She developed Binary numbers system for Babbage's machine.
- The first programmer in world.

History of Computer in Nepal:

History of Computer in Nepal being from the entry of Second Generation Computer IB 1401. This Computer was brought in Nepal His Majesty's Government on rest the processing of census of 2028. This Computer rather purchased by the Government and used in further data processing in Bureau of statistic. In 2031 B.S. Central Bureau of statistics was established, which was later named as National Computer Center. In 2038 B.S., with the help of UNDP an UNFPA, ICL 2950/10 was imported for the data processing of Census of 2038 B.S.

In 2039 B.S. the Micro-Computer like Apple was imported. Then other brands like Victor were imported. Now companies like Computer Consultancy. Management information processing system (MIPS), Data System International (DSI) was established. Although, MIPS is the first one in providing Computer training in Nepal from private sector. DSI has boom the Computer training and awareness of Computer in Nepal. Mr. Bill Miller was the Managing Director of DSI. This was the first private Computer Company, which exported Computer software abroad.

Now there are more than 300 Computer companies all over Nepal, which deal with training programming, Computer supply, servicing or maintenance.

Computer system:

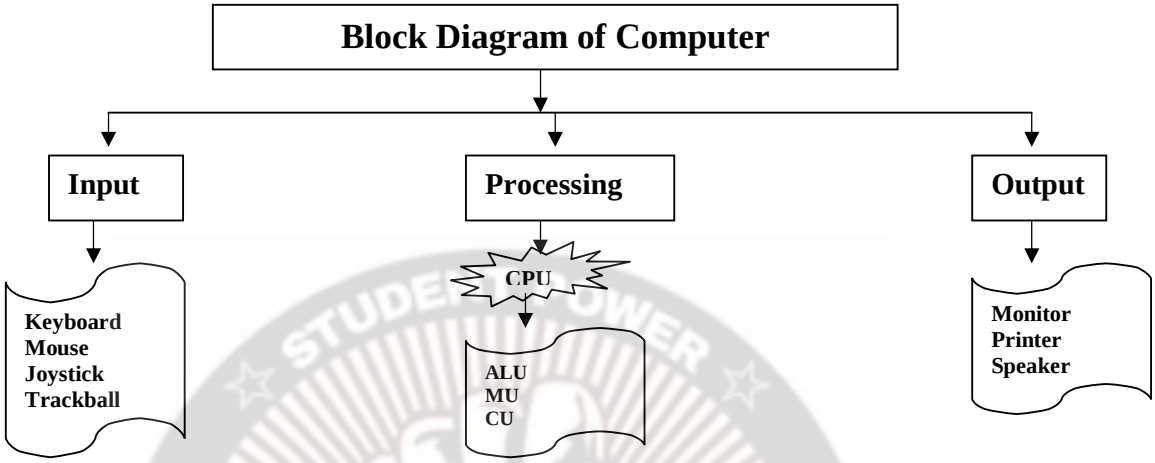
Input must be provides as data, instruction and information into the system. Then the information must be stored so that it can be used later, such information may be manipulated arithmetically, and there must be provision for the control of the processing operation. The processing of data is done to meet the requirements and obtain output on the form of reports.

This above-mentioned operations are carried out together to get the result. Such as combination which includes Input unit, Central processing unit (primary storage, arithmetic and

Logic unit, control units), Output unit together with secondary storage is known as computer system. It is also referred the Computer Architecture.

Device:

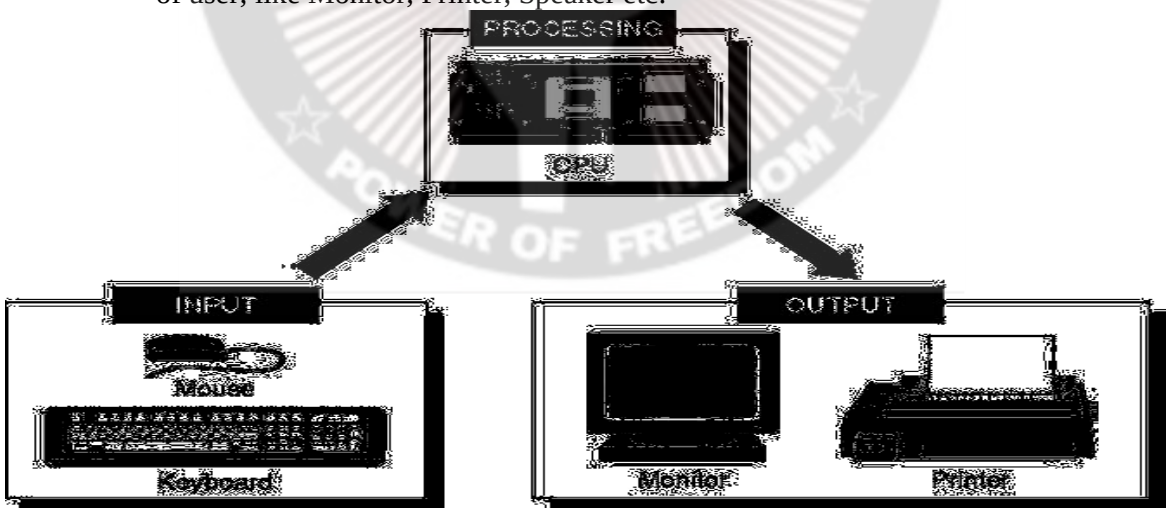
There are three device of Computer:



Input Device: It is a device that gives input to a Computer; like Mouse, Keyboard, Joystick, Scanner, and Trackball and so on.

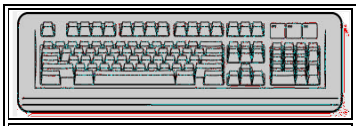
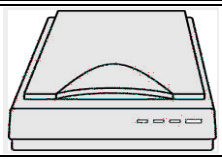
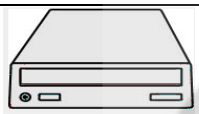
Processing Device: It is a device that filtering & giving information to a Computer. It is a brain of Computer. ALU, MU, CU in CPU processing device.

Output Device: It is a device that gives output to a Computer or it gives us a result of user; like Monitor, Printer, Speaker etc.



Input: *Input* is the first stage of computing, referring to any means that moves data (information) from the outside world into the processor—or from one component of the computer to another. Today's PC can support a wide variety of input devices. Keyboards, mouse devices, voice recognition devices, sound cards, modems, scanners, tape drives, CD/DVD drives, and digital cameras are some of the most common.

	Device	Description

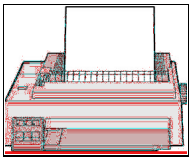
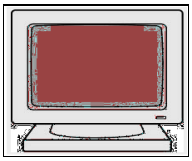
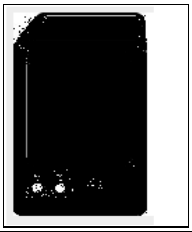
	Keyboard	The primary input device for a computer, allowing users to type information just as they once did on a typewriter.
	Mouse	Used with graphical interface environments to point to and select objects on the system's monitor. Can be purchased in a variety of sizes, shapes, and configurations.
	Scanner	Converts printed or photographic information to digital information that can be used by the computer. Works similar to the scanning process of a photocopy machine.
	Microphone	Works like the microphone on a tape recorder. Allows input of voice or music to be converted to digital information and saved to a file.
	CD-ROM/ DVD drive	This device is stores large amounts of data on a CD that can be read by a computer.

Processing : *Processing* is the second stage of computing. This is the actual manipulation of data by the computer. Processing on early computers involved the tedious task of "number crunching" and then, later, storing large amounts of often-redundant data. Today, computers process an ever-expanding list of activities, including scientific and business tasks, as well as processing information for education, entertainment, organization, and much more. Computer processing technology also hides in many everyday appliances. Microprocessors run most of our mechanical and electronic devices including cars, cameras, VCRs, microwave ovens, telephones, and even supermarket checkout systems.

Component	Description
Motherboard	The large circuit board found inside the computer. Without it, a computer is just a metal box. The motherboard contains all the remaining items in this table; for all practical purposes, it is the computer.
Chip set	A group of computer chips or integrated circuits (ICs) that, when working together, manage and control the computer system. This set includes the CPU and other chips that control the flow of data throughout the system.
Data bus	A group of parallel conductors (circuit traces) found on the motherboard and used by the CPU to send and receive data from all the devices in the computer.
Address bus	A group of parallel conductors (circuit traces) found on the motherboard and used by the CPU to "address" memory locations. Determines which information is sent to, or received from, the data bus.
Expansion slots	Specialized sockets that allow additional devices called expansion cards or, less commonly, circuit boards, to be attached to the motherboard. Used to expand or customize a computer, they are extensions of the computer's bus system.
Clock	Establishes the maximum speed at which the processor can execute commands. Not to be confused with the clock that keeps the date and time.
Battery	Protects unique information about the setup of the computer against loss when electrical power fails or is turned off. Also maintains the external date and time (not

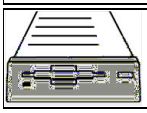
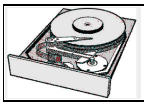
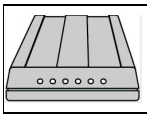
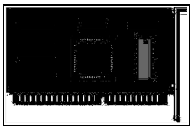
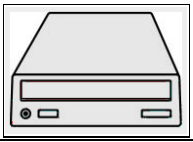
	to be confused with the CPU's clock).
Memory	Stores temporary information (in the form of data bits) that the CPU and software need to keep running.

Output : *Output* is the third stage of computing. All the input and processing in the world won't do us any good unless we can get the information back from the computer in a comprehensible and usable form. Output devices today come in many forms: monitors, printers, fax machines, modems, plotters, CD-Rs, sound cards, and more.

	Device	Description
	Printer	Generates a "hard copy" of information. Includes dot matrix, ink jet, and laser varieties.
	Monitor	The primary output device. Visually displays text and graphics.
	Speakers	Reproduce sound. Optional high-quality speakers can be added to provide improved output from games and multimedia software.

I/O (Input/Output) Device:

Some devices handle both input and output functions. These devices are called *input/output (I/O)* devices.

	Device	Description
	Floppy disk drive	Mechanism for reading and writing to low-capacity, removable, magnetic disks. Used to store and easily transport information.
	Hard disk drive	High-capacity internal (and sometimes external) magnetic disks for storing data and program files. Also called fixed disks.
	Modem	Converts computer data to information that can be transmitted over telephone wires and cable lines. Allows communication between computers over long and short distances.
	Network card	An expansion card that allows several computers to connect to each other and share information and programs. Also called network interface card (NIC).
	CD recorder	Also called CD-R. You can copy data to a CD with this device, but you can only write to a section of the disc once. Variations on this type of device include compact disc–rewritable (CD-RW) drives. These drives

		allow you to read, write, and overwrite a special CD-ROM-type disc.
	Tape drive	Large-capacity, magnetic, data storage devices. Ideal for backup and retrieval of large amounts of data. Works like a tape recorder and saves information

Component of Computer:-

The basic requirements to complete a computer system are:

Volt guard: Volt guard is the device used to supply power to the computer. It lies between the computer and main power supply point of a room. For a personal computer, voltage regulator, auto cut, voltage stabilizer or UPS (Uninterruptible Power Supply) are the most common. Uninterruptible Power Supply (UPS) supplies the power to the computer automatically when electrical power is cut off. This prevents the loss of data memory (Storage Unit). The CPU lies the main machine or chassis of the computer. The CPU performs all the functions of processing, interpretation, control, etc. in the earlier section of this chapter, the individual sections of CPU has been discussed.

Monitor:

The primary output device, which resembles a television set. It visually displays text and graphics.

Monitor is the display device connected with the CPU. It is also called Visual Display Unit (VDU). Monitors were connected to the CPU since 1964. The monitors display the data given and process result also. It is like a TV screen which displays the characters and it has a cathode ray tune (CRT). The monitors of IBM and IBM compatible computers are tilted whereas the monitors of Apple/Macintosh are fixed. A small blinking material is seen on the monitor called 'cursor'. By the movement of the cursor you can see in which point of the monitor are working.

All monitors are not of same type. There are various types of monitors classified on the basis of resolution. Some monitors have high resolution which can even display the pictures from a Video Cassette. Recorder (VCR). The monitors need an interface cart to control and send data from the CPU. The different types of display control cards are:

Keyboard:

A primary input device much like a typewriter, used for entering text and command function shortcuts into a computer.

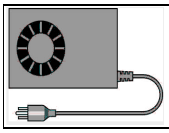
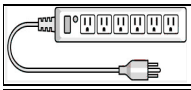
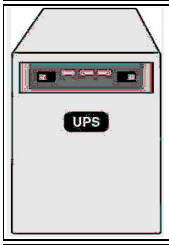
Keyboard is the main input device. All computers are attached with a keyboard. The data and instructions are given though the keyboard. When a key is pressed, the signal is interpreted and sent to the computer in the from of digital signal. These digital signals are interpreted, processed, or controlled by the main processor of the computer. The early computer had 83 keys but most of the keyboards have 101 or 102 keys.

Mouse: Mouse is also input device of computer; It used with graphical environments to point and select objects on the system's monitor. They come in a variety of shapes and sizes.

Printer:
A peripheral device that transfers computer output to paper or other form of hard copy.
Printer is the device which gives hard output. The device is attached to the main machine or CPU. Early printers were very slow and noisy. But there are printers. Which given high quality of printing and yet they are quite. Dot Matrix printer, Laser printer, Daisy wheel printer, etc, are some types of the printers. Some Dot Matrix printers print many lines in one minute and give high quality printing.

Printers of microcomputers may have 9 pins, 18 pins or 24 pins; generally a printer with higher number of pins gives better quality of printed output. There are some laser printers in connections with the mainframe computers and minicomputer which can print 64000 lines per minute.

scanner: A peripheral that converts information from the written page (or a printed graphic) to digital information that can be used by the computer. Works in a manner similar to the scanning process in a photocopy machine.

	Device	Description
	Power supply	Converts a local power source (typically 110 volts AC in the United States) to 3.3, 5, or 12 volts DC. Most power supplies also perform some basic line conditioning and surge-protection functions.
	Surge suppressor	Used to prevent large power spikes (for instance, lightning) from damaging a computer.
	UPS	Uninterruptible power supply. Acts as both a surge suppresser (to prevent high-power spikes) and a power leveler to provide the computer with a constant source of power. Can even provide power during a power failure or interruption (although the duration depends on the UPS and the computer's power consumption) so that the user can safely save data before shutting down.
	Case	The box that houses most of the system must provide an environment that minimizes electrical interference to other electronic devices in the area. It should provide a proper heat level for safe operation and bays and connections for drives, circuit boards, and I/O devices

Electronic Components

Electronic: It is a science that studies about the behaviour of electron.
Current: Current is a flow of charge per unit time. It means continues flow of energy is known as a current.
Voltage: It is a pressure to mobilize the electron from storage area.
Types of Currents: There are two types of current one AC or Alternate current and another is DC or Direct Current.

Direct Current: The Direct Current and magnitude of flow of charge will be same this type of currents is know as a DC or Direct Current. We require DC to operate the electronic devices.

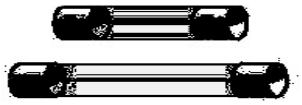
AC or Alternate Current: The Alternate Current and magnitude of flow of charge pre unit time is changing, this type of current in known as an AC or Alternate Current.

Some Definitions

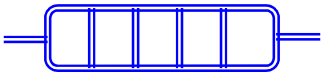
- **Electricity.** The form of energy associated with charged particles, usually electrons.
- **Electric charge.** When charged particles move in tandem, they generate fields, producing energy.
- **Electrical circuit.** The path taken by an electrical charge.
- **Electric current.** When an electric charge is carried, or flows through a conductor (like wires), it is known as a current. A current-carrying wire is a form of electromagnet. Electric current is also known as *electron flow*.
- **Power.** The rate at which an amount of energy is used to accomplish work. Electrical power is measured in watts, which is determined by multiplying voltage by current.
- **Conductors.** Materials that can carry an electrical current. Most conductors are metals.
- **Resistance.** A quality of some materials that allows them to slow the speed of an electrical current, producing heat, and sometimes light, in the process.
- **Insulators.** Materials that prevent or retard the electrical current of electrons.
- **Ohm.** A unit of electrical resistance. Ohm's law states that voltage is equal to the product of the current times the resistance, or voltage = current × resistance.
- **Volt.** The unit of electromotive force, or potential energy, that, when steadily applied against a resistance of 1 ohm, produces a current of 1 ampere.
- **Voltage.** The potential energy of a circuit.

Fuse

Before the advent of the circuit breaker, fuses were common in the home and office. A fuse serves one purpose—to fail, and thus cut the flow of power in the event of a current load that has exceeded the safe capacity that the system components can absorb. Fuses come in many shapes and sizes, but a PC fuse is almost always a small, clear, glass tube with metal caps on each end and a wire inside the tube to electrically connect the two caps. In general, the thicker the wire, the more current a fuse can conduct before failing. When a fuse fails, the wire will melt or be broken. We can check for a "blown" fuse by determining if the wire is intact or broken. The amperage (A) rating (stamped on the metal cap) indicates the maximum current the wire is rated to conduct. Be sure not to exceed to the rated limits of the PC design for a fuse, because an excess power load can damage or destroy the system.



Resistance: The force to apposed the flow of electron is known as resistance.
Resistor: Resistor is an electronic component that resists a specific amount of current when connected on a circuit. The capacity of resistor to resist the oppose current is known as resistance. Resistance is measured in ohm and denoted by Ω. The Scientific symbol of resistor is

Alphabetically representation of resistor is **R ,** Physically resister is 

There are mainly three kinds of resistor:

i) **Fixed Resister**
ii) **Semi variable**
iii) **Variable Resistor**

Fixed Resister: If the amount of Resistance in the resistor will not changed or are fixed. It is known as fixed resistor. This type of resistor are generally used a computers devices. For example: CD-ROM, floppy Disk, Hard Disk, Power Supply, etc.
Two types of Fixed resister :

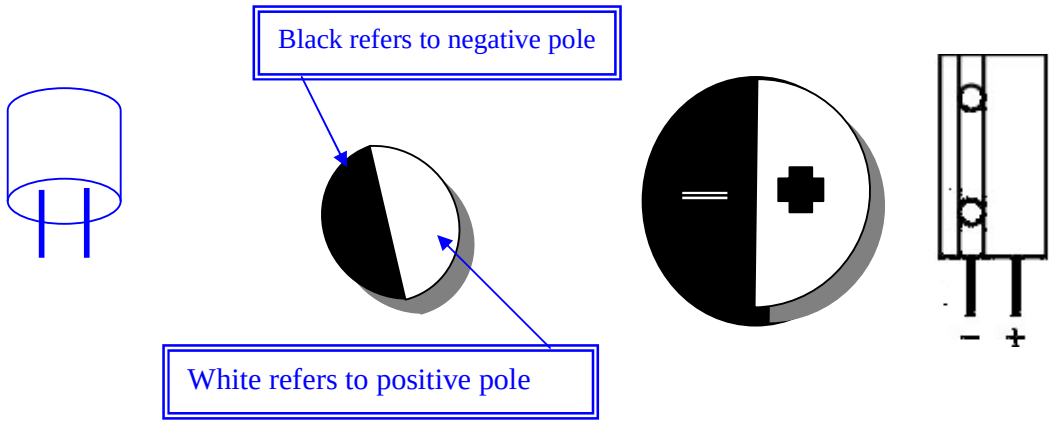
- Surface Mounted Resister
- Surface Unmounted Resister

Semi Variable: If the amount of resistance will change slowly. It is known as Semi variable. This type of resister used in Fan controler.... .

Variable Resistor:
If the amount of resistance ii a resistor directly change. It is known as Variable resistor. It is used in Radio volum controller...

Capacitors

A *capacitor* is an electrical component used to hold an electrical charge. In PCs, they are often used to regulate the flow of current to areas of the system circuits for a short period of time. Some are fixed-capacity models, whereas others can absorb or hold variable amounts of power. The amount of electrical current a capacitor can control is called *capacitance*, measured in microfarads. It is scientifically representation by —||— Alphabetically representation of capacitor is **C**, Physically :

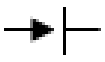


Rectifiers and Diodes

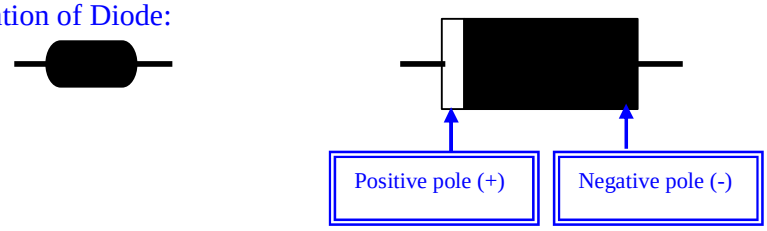
Rectifiers are devices that convert AC power into a DC form (rectification). A *diode* is a device that lets current flow in only one direction. Two or more diodes connected to an AC supply will convert the AC voltage to DC voltage.

Diode is combination of the positive type and negative type of semi conductor material.

Rectification: Rectification means the process of converting from AC is know as a rectification.



Scientifically represented the diode is , Alphabetically Symbol of **D**,The Physical representation of Diode:



Note: The main function of Diode is to convert AC to DC. Normally we used six type of Diode.

Rectifier Diode: The main function of the Rectifier Diode is to convert AC or Alternate Current into DC or Direct Current.

Zener Diode: Normally Zener Diode is used to store high electricity charge ad well as generate multiple electric signal at a time.
Note: *Zener Diode comes like as a resistor but it come in red color and there in not tolerance, as well as the color. Zener Diode specially used to store charge of electricity as well as generate multiple electric Signals at a time.*
Light Emitting Diode (LED): LED or Light Emitting Diode is used to give only electricity signal. It only changes the signal of electricity.

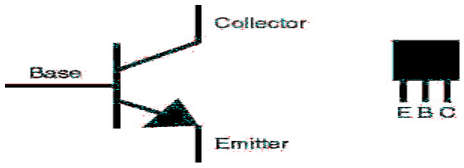
Infrared Diode: The Diode comes from wireless communication by the help of it we can remote. This type of Diode use on normal mouse.

Laser Diode: The Lazier Diode is used on optical mouse and optical instruments.

Photo Diode: The photo Diode is used to catch the image. We can take photo by the help of photo Diode. The photo Diode is mostly used in CD-ROM, Scanner, Floppy Disk, etc.

Note: *Photo Diode only used in this device which device easily catch the image or picture.*

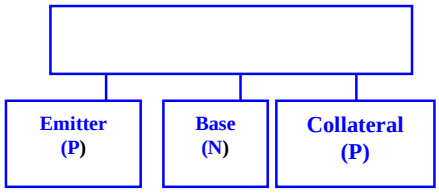
Transistors It is an electronic device which is used to store the electronic charge fast way switching. Boots of electronic signal and convert DC into AC. The process of conversion DC into AC is called Osicillation. It is constructed by positive and negitive types of sami-conductor. Alphabitically representation of transister is **Q**, physically representation of transister is :

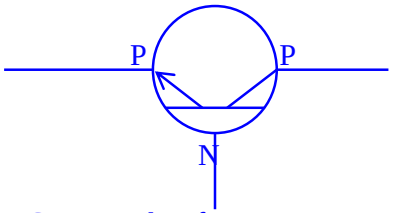


Types of transistor:

- PNP or (Positive, Negative and Positive).
- NPN or (Negative, Positive and Negative).

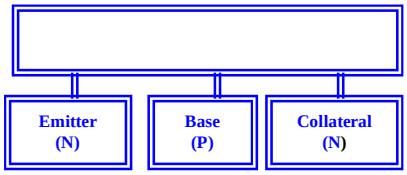
Figure of PNP or (Positive, Negative and Positive) transistor:

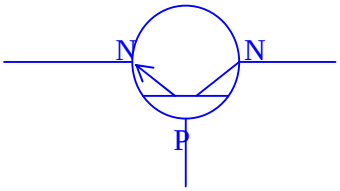




Note: In PNP or Positive, Negative and Positive: Current takes from Emitter and current flow from outside towards inside.

Figure of NPN or (Negative, Positive and Negative)





Note: In NPN or Negative, Positive and Negative: Current take place from base and current flow from inside towards outside

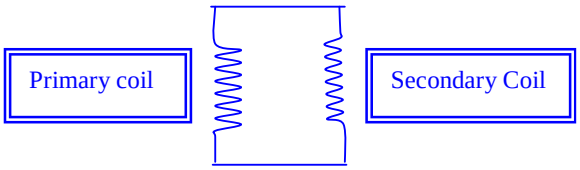
Transformers

Transformer: The Transformer is an electrical device or components that transform electrical voltage (AC) value, one value to another value. Transformer conations two coils.

1. Primary Coil
2. Secondary Coil.

The primary coil input AC voltage while a secondary output AC voltage.

The symbol of it:



Function of Transformer:

- Step up and step down AC voltage
- To input AC and output AC

Types of Transformer:

- **Step up:** Step up transformer increase output value.
- **Step down:** Step down transformer decreased output value.

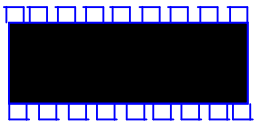
The most common forms of electrical transformers are step-down or step-up devices. A step-down transformer decreases the transformer's voltage on the output side; a step-up model increases it. Both have a primary wire coil connected to other coils (secondary coils) joining two or more AC circuits.

In the PC power supply, the transformer's secondary coils are used to provide 12-volt, 5-volt, and 3.3-volt outputs used by various components.

Inductors (Coils) : It is also electronic component which is used to full-fill the losses voltage when transfor from bord to distination. It is constructed by solinid wire coil and core. Alphabetically denoted by Inductor is **L**, The scientifically representation of inductor is  , It is physically denoted by:

Inductors, commonly called *coils* because of their shape, are loops of conductive wire. Current passing through the inductor sets up a magnetic field. This field reduces any rapid change in current intensity. Inductors can also be used to distinguish between rapidly and slowly changing signals in a circuit.

IC Chips: IC stands for Integrated Circuit.
If we combine one or more then two circuit to perform single task, it will called IC chips. The IC chips combination of multiple gates.
IC or Integrated Circuit is combination of thousand or hundred of thousand resistors, capacitors and transistors. It is always febricated with silicon chip (Silicon must be pure 99.99%). The out of the IC covered by hard plastic.
The Physical and Symbol of IC chips:

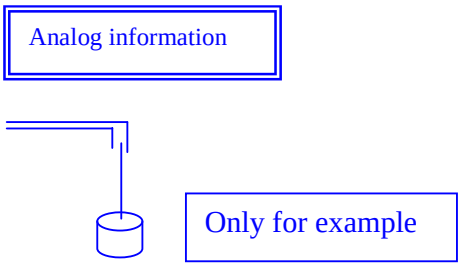


Note: The main function of IC chips is to control the current voltage but it does all things according to their functions.

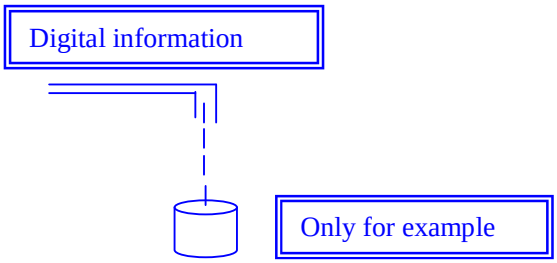
Types of IC chips:

- Analog IC chips
- Digital IC chips

Analog Signal: Analog signal means that signal which can flow continuously without breaking..
For example:

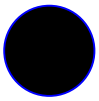


Digital Signal: Digital Signal means that signal which flow by breaking. Ti is known as Digital signal.



Note: *Analog signal gives us analog information and Digital Signal gives us digital information.*

Types of IC chips:

1. Single Edge contact: 
2. Double edge contact: 
3. Quad 
4. Printed IC chips 

Note: Normally printed IC chips are used on watch, calculator, mouse, etc.

Computer language:

Binary language is that machine language and only understands by the computer. The values of binary language are '0' or '1'. And we can say that value of binary language is binary number.

Number System:

1. Decimal Number: [0 to 9]
2. Binary Number: ['0' and '1']
3. Hexa Decimal Number
4. Octal Number

Decimal Number: The prefix of Decimal no is 10. It means the digital no is indicate by 10.

Example: $(124)_{10}$

Binary Number: The binary value will understand only by the computer. The binary number are only '0' and '1'.

Example: $(101011)_2$

Hexa Decimal Number: Hexa Decimal Number is used for store data because it can store large data to the small memory.

The prefix of Hexa Decimal number is '16'.i.e. [0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F]

A = 10, B = 11, C = 12, D = 13, E = 14 AND F = 15

In Hexa Decimal we should make four bits one character [i.e. 11111111]

Octal Number: The prefix of Octal Number is 8.i.e. $(145)_8$

In Octal Number we should make three bits one character [i.e. 111111]

Note: There are only 8 numbers in Octal they are as fallows: 0, 1,2,3,4,5,6,7

[8 is not there because we can divided 8 by 8 because results will come 1. so one we have already written so there is no 8]

Decimal Number	Binary Number	Hexa Decimal Number	Octal Number
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	8	10
9	1001	9	11
10	1010	A	12
11	1011	B	13
12	1100	C	14
13	1101	D	15
14	1110	E	16
15	1111	F	17

Note: $(15)_{10} = (1111)_2 = (F)_{16} = (17)_{18} = 15$

ASCII : *The ASCII stands for America Standard Code for Information and Interchange.*

ASCII: This is an Organization that maintains the binary value. All of the device used on the computer develops their chips on the basic of ASCII standard.

Number System

Decimal to Ascii table:

Decimal Number	*ASCII Value*	*Binary Value*
0	*48*	*110000*
1	*49*	*110001*
2	*50*	*110010*
3	*51*	*110011*
4	*52*	*110100*
5	*53*	*110101*
6	*54*	*110110*
7	*55*	*110111*
8	*56*	*111000*
9	*57*	*111001*

Character (Capital & Small) Ascii table

Character	ASCII Value	Binary Value	Character	ASCII Value	Binary Value
A	65	1000001	a	97	1100001
B	66	1000010	b	98	1100010
C	67	1000011	c	99	1100011
D	68	1000100	d	100	1100100
E	69	1000101	e	101	1100101
F	70	1000110	f	102	1100110
G	71	1000111	g	103	1100111
H	72	1001000	h	104	1101000
I	73	1001001	i	105	1101001
J	74	1001010	j	106	1101010
K	75	1001011	k	107	1101010
L	76	1001100	l	108	1101100
M	77	1001101	m	109	1101101
N	78	1001110	n	110	1101110
O	79	1001111	o	111	1101111
P	80	1010000	p	112	1110000
Q	81	1010001	q	113	1110001
R	82	1010010	r	114	1110010
S	83	1010011	s	115	1110011
T	84	1010100	t	116	1110100
U	85	1010101	u	117	1110101
V	86	1010110	v	118	1110110
W	87	1010111	w	119	1110111
X	88	1011000	x	120	1111000
Y	89	1011001	y	121	1111001
Z	90	1011010	z	122	1111010

Data Storage Capacity:

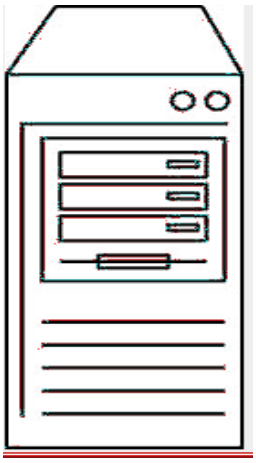
Binary 0/1	= 1 bits
4 bits	= 1 nibble
8 bits	= 2 nibble = 1 character = 1 byte
1024 byte	= 1 KB
1024 KB	= 1 MB
1024 MB	= 1 GB
1024 GB	= 1 TB
1024 TB	= 1 HB
1024 HB	= 1 TB

Case & SMPS :

Case: It is a metal or plastic body, where all components of computer situated.

Two types of Case :

- **Desktop Case**
- **Towertop Case**



Components of Case:

1. Chasis (Situated Mother board in chasis)
2. Driver Body (Situated External and Internal driver)
3. Front Panel (All buttons, LED, connector are in front panel)
4. Back Panel (all Motherboard connector are in back panel)
5. Button or Switch and connector (Power and Reset button and USB & Sound connector)
6. Body and cover (Plastic or Metal Mostly used metal body and cover)

Power Supply (SMPS):

Power supply is electronic device or component that input 220V AC and out put 12V, 5V and 3.3V DC. Just we can say the power supply input AC voltage and output DC voltage. Sometimes we used to say SMPS (Switch Mode Power Supply) for power supply.

NOTE: The main function of power supply is input AC and output DC.

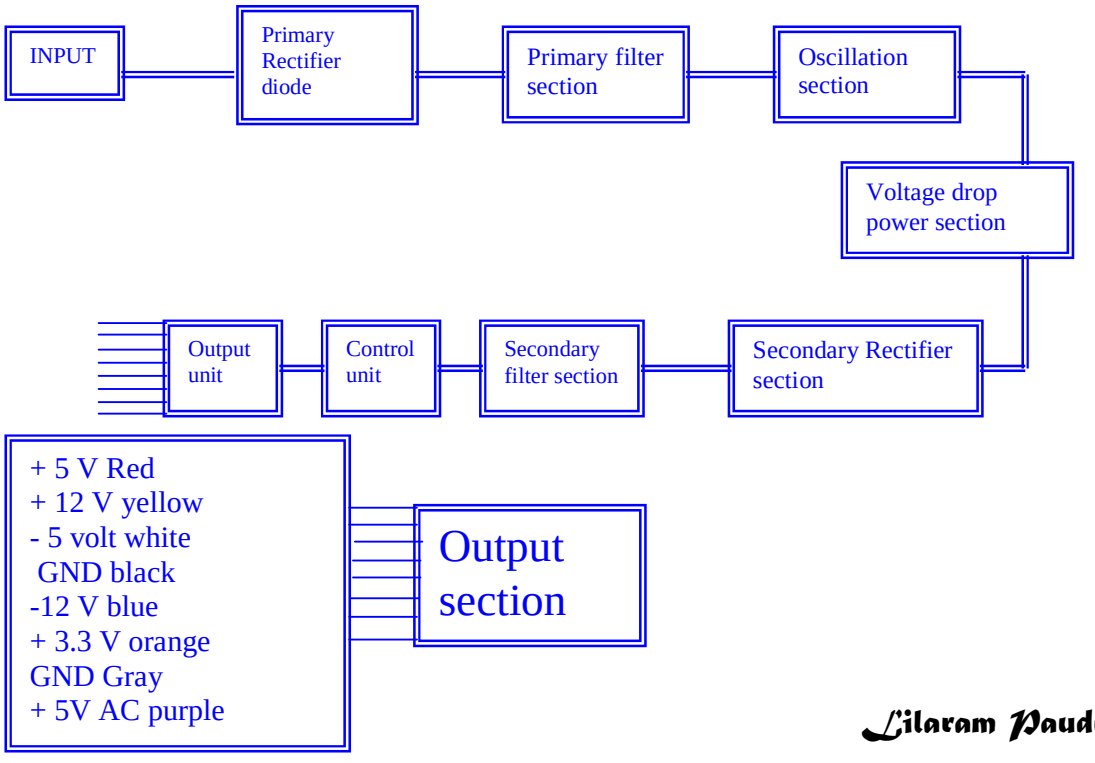
Types of power supply.

i) AT or (Advanced Technology only found in Pentium I,II,III)
ii) ATX or (Extended Advanced Technology found in Pentium IV)

Difference between AT and ATx power supply:

AT power supply	ATx power supply
-Message **Now save to turn off your computer** - One row and twelve pin connector for motherboard (2 six-six pin P8 & P9 connector) - One black twistic wire for switching. - It is only we can get on PI, PII and PIII	- No message - Two rows and 20 pin connector for motherboard (one 20 pin P1 connector) - There is no such types of wire for swiching - It is can use in PII, PII and PIV

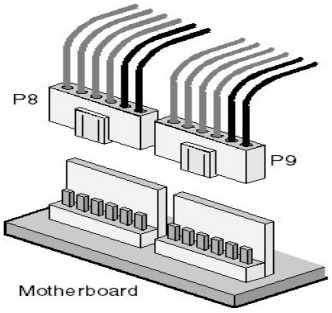
Block Diagram of Power Supply

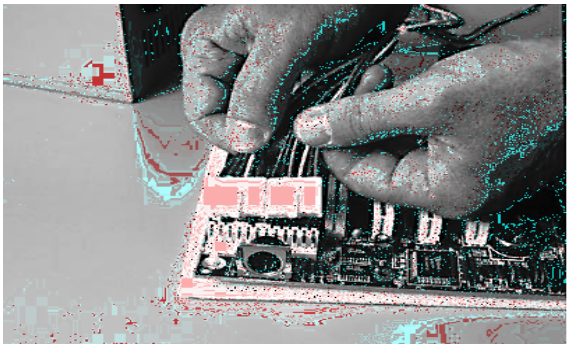


Power Supply Connectors

AT-Style Connections to the Motherboard

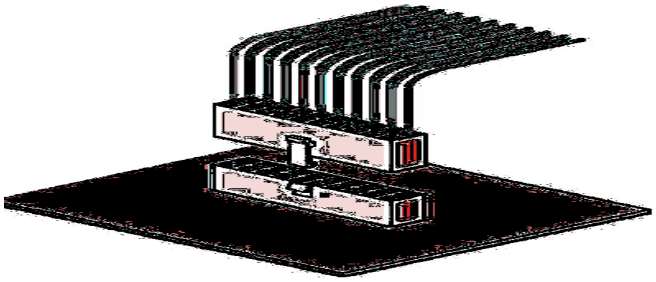
In AT Power supply, designated 6-6 pin P8 and P9 connector , links the power supply to the motherboard. These connectors are seated into a row of six pins and matching plastic guides, or *teeth*, on the motherboard. The P8 and P9 connectors *must* be placed in the proper orientation.





ATX-Style Motherboard Connections

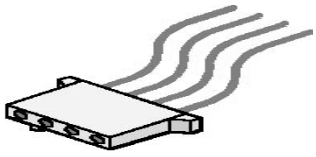
The newer ATX main power connection, found on Pentium II computers and later, is much easier to install. A single 20-pin plug is set into a fitted receptacle and secured with a catch on the side of the plug that snaps over the fitting. Figure 5.3 shows how to properly seat the connection. A small, flat-tip screwdriver is a handy tool for easing the pressure on the catch to remove the plug. In some cases, you can use a screwdriver to ease installation as well.



Connections to Peripheral Hardware

Two standard types of connectors are used to connect the power supply to peripheral hardware:

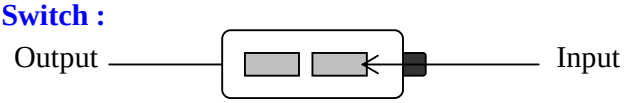
Molex connector. This is the most commonly used power connector. It provides both 12-volt and 5-volt power. Hard disk drives, internal tape drives, CD-ROM drives, DVD (digital video disc) drives, and older 5.25-inch floppy disk drives all use this fitting. The Molex connector has two rounded corners and two sharp corners to ensure that it installs properly.



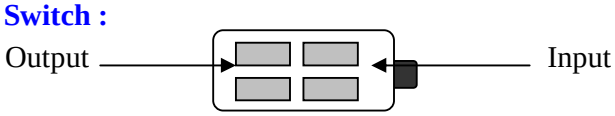
Mini connector. Most power supplies provide one or more mini connectors. The mini is used primarily for 3.5-inch floppy disk drives. It has four pin-outs and, usually, four wires. Most are fitted with keys that make it difficult, but not impossible, to install upside down. Be sure to orient the connector correctly; applying power with the connector reversed can damage or destroy the drive.

Switch for AT SMPS:

TWO PIN Switch :



FOUR PIN Switch :



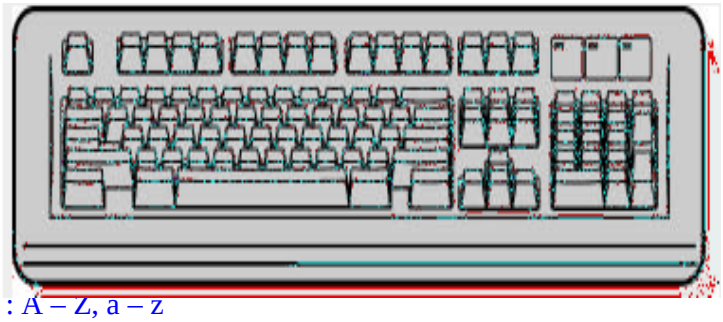
ATX Version 2.2 - 24 wire motherboard connector (color & voltage)

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12
3.3V	3.3V	Ground	5V	Ground	5V	Ground	P_OK	5VSB	12V	12V	3.3V
Orange	Orange	Black	Red	Black	Red	Black	Gray	Purple	Yellow	Yellow	Orange
Orange	Blue	Black	Green	Black	Black	Black	White	Red	Red	Red	Black
3.3V	-12V	Ground	P_ON	Ground	Ground	Ground	-5V	5V	5V	5V	Ground
Pin 13	Pin 14	Pin 15	Pin 16	Pin 17	Pin 18	Pin 19	Pin 20	Pin 21	Pin 22	Pin 23	Pin 24

Input Device

Keyboard : A primary input device much like a typewriter, used for entering text and command function shortcuts into a computer.

The most Common keyboard



101 keys enhanced keyboard
104 keys windows keyboard
82 keys Apple Standard keyboard
118 keys multimedia keyboard

Keys:

- Typing Keys (Alphabet) : A – Z, a – z
- Numeric : 0 – 9
- Function : $F_1 – F_2$
- Control key : Alt, Ctrl Shift, Del, etc.

Note: Mostly used keyboard are 104 windows keyboard and 118 multimedia keyboards.

Components Of Keyboard:

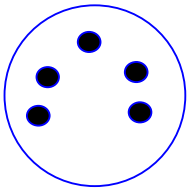
- Keys
- Key Cap
- Key guird
- Control section (IC)
- LED
- Cable and connector

Mostly Common Keyboard Connecter:

- 5 pin DIN connector
- 6 pin PS/2 connector
- Internal connector: only found in laptop.
- USB connector

5 pin key board connector:

- Green – Clock
- White – Data
- Blue/Brown – Grounding
- Yellow/ orange – volt + 5V



6 pin keyboard connector

Pin 1 = data
Pin 2 = not used
Pin 3 = GND
Pin 4 = Volt (+Ve)
Pin 5 = clock
Pin 6 = not used

Troubleshooting of keyboard:

How to save keyboard?

- Save keyboard by water (never drops any drops of water).
- Safe key board by the sun ling and dust.
- Slowly press the key.

Note: Any types of error message like, Gate 20A error indicates that the keyboard is not functioning properly.

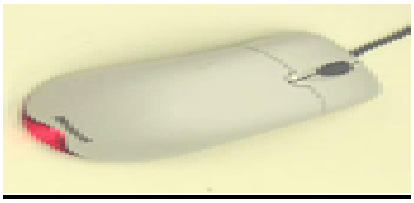
- Any message start from 300 to 399 (like 301 …… etc) indicator is error and keyboard controller.
- After storing the system, keyboard error message indicates that the keyboards is not attaching to the motherboard.
- If there is indication of ling (on Num luck) scan Device from the mouse, scan it the mouse from device manager and restart your system.

- ♣ If the error repeated after scanning the device, just up plug and plug the connectors and restart the system.
- ♣ If the problem of button then simply clean the keyboard, if the multiple buttons of keyboard is not to work then this problem is circuit problem. We simply replace the keyboard in this problem.

Mouse: Mouse is also input device. This device is used with graphical environments to point and select objects on the system's monitor. They come in a variety of shapes and sizes.

Types of Mouse:

- Mechanical Mouse
- Opto-mechanical Mouse
- Opticle Mouse (Leser Mouse)



Mouse

Components of Mouse (Mechanical & Opto-Mechanical)

- N Ball
- N Roller
- N Roller soft
- N Diode (Leser) and Sensor
- N Optical Incoading Disc
- N Buttons
- N Control Section (IC)
- N Cable and connector

Mechanical & Opto-Mechanical Mouse function

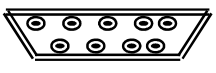
- ♣ A ball inside the mouse touches the desktop and rollers when the mouse.
- ♣ Two rollers inside the mouse touch the mouse ball. One of the roller is oriented to the X-direction and Y-direction
- ♣ Each roller are connected to shaft when the rollers rotates a disk spin
- ♣ Do another side of the disk there is on infrared LED and sincere, that is used far wireless communication.
- ♣ On bard processor ship the pulses from the infrared sincere and turns them the binary data so that the computer understand.

Components of Leser (Optical) Mouse

- N Diode (Leser) and Sensor
- N Optical Incoading Disc
- N Buttons
- N Control Section (IC)
- N Cable and connector

Types of mouse connector:

- ❖ 9 pin Serial Connector : It is Flat type connector with 9 pin.
- ❖ 6 pin PS/2 (Personal System 2) Connector
- ❖ 4 PIN USB connector



NOTE: *We can connect the wireless mouse it may be optical or scroll and we can connect wireless keyboard in our PC and other places.*

When we click mouse the cursor of mouse sends 3 bytes of data to the computer. The first byte contains 8-bits.

- Left button state
- Right button state

Troubleshooting of Mouse:

- If the mouse not read the system, we can check the cable & connector, and connect then restart the system.
- If the problem of button then simply clean the Mouse, If the problem of curcit then We simply replace the Mouse in this problem.

How to save Mouse?

- Save mouse by water (never drops any drops of water).
- slowly press the button .

Memory:

The area with in a computer where information is stored while being worked on. It stores information (in the form of data bits) that the CPU (central processing unit) and software need to keep running.. The memory of Computer helps to Boot[1] the system. If the memory is high it will operate our system very fast otherwise it will operate our system very slow.

Nonvolatile and Volatile Memory

There are two major classes of computer memory: nonvolatile and volatile. *Nonvolatile memory* is retained even if the power to the computer is shut off. The setup data held in CMOS (complementary metal-oxide semiconductor), discussed in the preceding lessons, is a good example of nonvolatile memory. If the data is lost when the computer loses power, the memory is said to be *volatile*.

Two types of Memory:

i) **Primary Memory**

ii) **Secondary Memory**

 # Primary Memory: - primary memory is used to store system information as will as to operate the system. Example: RAM, ROM.

1) **RAM** (Random Access Memory): The main memory where a computer temporarily stores data. It is a Volatile of nature Memory that can be read from or written to by a computer or other devices. Information stored in RAM is lost when the computer is turned off. This Memory is a Primary Memory of a Computer.
2) **ROM** (Read Only Memory): Non-volatile of nature An acronym for Read-Only Memory, a semiconductor circuit into which code or data is permanently installed by the manufacturing process. ROM contains instructions or data that can be read but not modified.

[1] Start

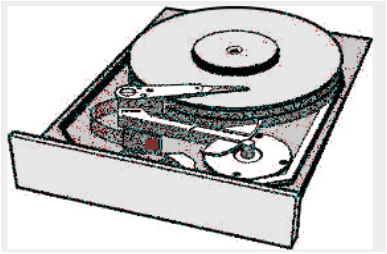
 # Secondary Memory: - Secondary memory is used to store data permanently. CD ROM, Floppy Disk, Hard Disk are the secondary memory.

Floppy Disk (A :\) or (B :\) 

Storage capacity is max. 1.44 MB.

floppy disk
A reusable magnetic storage medium. The floppy disk used today is the rigid 3.5-inch microfloppy that holds 1.44 MB. It is called a floppy because the first varieties were housed in bendable jackets.

Hard Disk Drive (C :\), (D :\), (E :\), (F :\)…. 



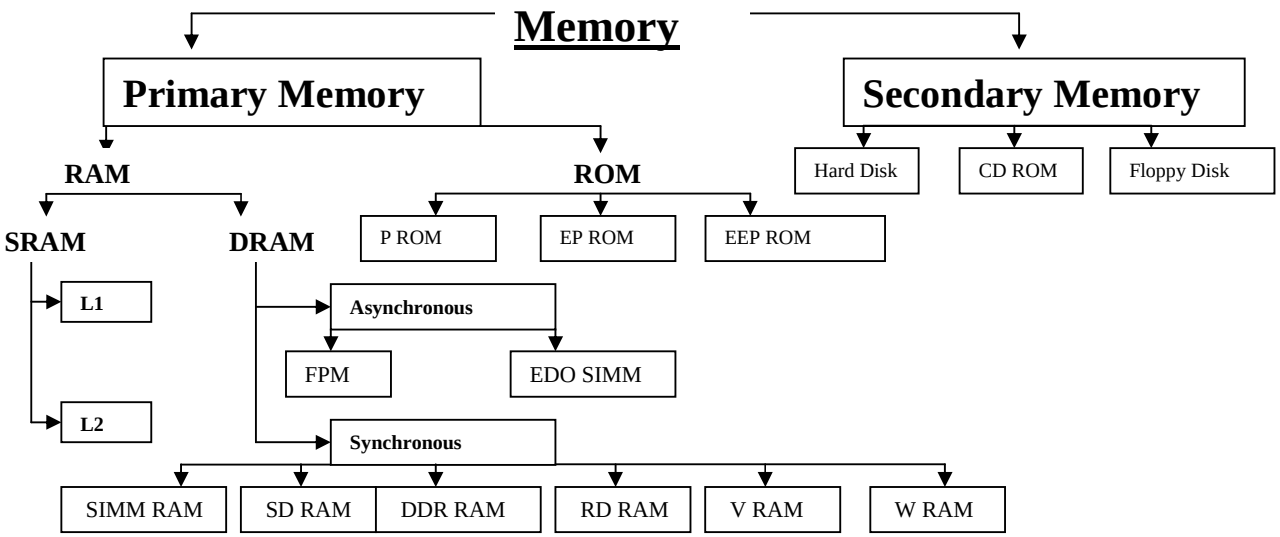
A device, also called hard disk drive that contains one or more inflexible platters coated with material in which data can be recorded magnetically with read/write heads. The hard disk exists in a sealed case that protects it and allows the head to fly 10 millionths to 25 millionths of an inch above the surface of a platter. Data can both be stored and accessed much more quickly than on a floppy disk.

- **CD (Compact Disk)** (G: \ ) 

There are two types of CD:

- **CD-R: -** Recordable compact disc. Data can be copied to the CD on more than one occasion; however, data cannot be erased from the CD.
- **CD-RW: -** Rewritable compact disc. Data can be copied to the CD on more than one occasion and can be erased.

Disk: - A storage device that is attached to a computer.
Drive: - An area of storage that is formatted with a file system and has a drive letter. The storage can be a floppy disk, a CD, a hard disk, or another type of disk. You can view the contents of a drive by clicking its icon in Windows Explorer or My Computer.
DVD drive: - A disk storage device that uses digital video disc (DVD) technology. A DVD drive reads both CD-ROM and DVDs; however, you must have a DVD decoder to display DVD movies on your computer screen. **Document: -** Any self-contained piece of work created with an application program and, if saved on disk, given a unique file name by which it can be retrieved.
Dynamic disk: - A physical disk that can be accessed only by Windows 2000 and Windows XP. Dynamic disks provide features that basic disks do not, such as support for volumes that span multiple disks. Dynamic disks use a hidden database to track information about dynamic volumes on the disk and other dynamic disks in the computer. You convert basic disks to dynamic by using the Disk Management snap-in or the Disk Part command line utility. When you convert a basic disk to dynamic, all existing basic volumes become dynamic volumes. **Writable CD: -** Recordable compact disc (CD-R) or rewritable compact disc (CD-RW). Data can be copied to the CD on more than one occasion. Rewritable compact discs can also be erased. **Expanded memory** Type of memory that can be added to IBM personal computers. The use of expanded memory is defined by the Expanded Memory Specification (EMS), which supports memory boards containing RAM that can be enabled or disabled by software.



Primary Memory:

RAM	:	Random Access Memory
SRAM	:	Static Random Access Memory
DRAM	:	Dynamic Random Access Memory
FPM	:	Fast Page Mode
EDO-SIMM	:	Extended Data Output-Single Inline Memory Module
DIMM	:	Dual Inline Memory Module
SD-RAM	:	Single Data Random Access Memory
DD-RAM	:	Double Date Random Access Memory
RD-RAM	:	Rambo's Dynamic Random Access Memory
V-RAM	:	Video Random Access Memory
W-RAM	:	Window Random Access Memory
ROM	:	Read Only Memory
P-ROM	:	Programmable Read Only Memory
EP-ROM	:	Erasable Programmable Read Only Memory
EEP-ROM	:	Electrically Erasable Programmable Read Only Memory

Types of ROM Memory :

PROM (Programable ROM): It is read only memory. It is once programmable and cannot be erased. PROM was used in old types of systems.

EPROM(Erasable PROM): The data of EPROM can be erased, by focusing with the ultra-violet rays on it. Takes about 20 minutes to erase the EPROM. When flashing the entire data's of the EPROM will be lost. We cannot delete the selected memory location only. The EPROM chip must be out of the board during the erasing process. Otherwise, the other components near by the chip may be reined.

EEPROM(Electronically EPROM): It is electrically erasable PROM. We can erase the data of EEPROM in few seconds without any hassles. We can also delete only the related data's from the

chip. It is not necessary to put off the chip from the board because we can delete the data's onboard. It takes only the few second to delete the data's of and EEPROM.

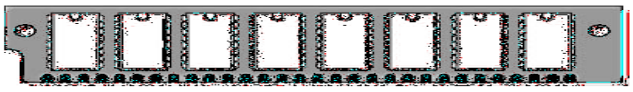
Types of RAM Memory :

SRAM: It is a fastest RAM. It is mainly used for cache memory. The data's of a static RAM need not to be refreshed because, it can be refreshed automatically. There are mainly two types of cache memory used in CPU, Level one (L1) cache memory and Level Two (L2) cache memory. L1 is faster than L2. But it is smaller in capacity than the L2 cache memory.

DRAM: Dynamic RAM is slower than the SRAM. It is used as main memory (primary memory) in the CPU. The capacity of DRAM is greater than SRAM is a PC but it is slower. The DRAM is being refreshed; the CPU cannot access the DRAM. The gapping period when the CPU cannot access the DRAM, it makes the DRAM slower. There are manly two types of DRAM. One is Synchronous and another is Asynchronous DRAM. The old types of RAM like FPM and EDO are Asynchronous DRAM and the Synchronous DRAM are SIMM. SDRAM, DDRAM, RDRAM, etc the RAM which can synchronized the data during the processing is called synchronous.

SIMMs (30-Pin)

SIMMs (single inline memory modules) quickly replaced SIPPs because they are easier to install. 30-pin SIMMs have 30 contacts in a single row along the lower edge. A 30-pin SIMM can have as few as two or as many as nine individual DRAM chips. Although SIMM modules can have pin counts as high as 200, in PCs, 30- and 72-pin versions are the most common.



The 72-Pin SIMM

With the advent of 32- and 64-bit CPUs, the bank began to take up too much space on the motherboard and added to the cost of memory. (The board that houses the chips often costs more than the DRAM chips.) Enter 72-pin SIMMs, with 72 pins on each card. One of these is four times wider than a 30-pin SIMM, which is 8 bits wide. Therefore, a motherboard requiring four rows of 30-pin SIMMs to fill one bank needs only one 72-pin SIMM. Virtually all Pentium and Pentium Pro systems use 72-pin SIMMs.

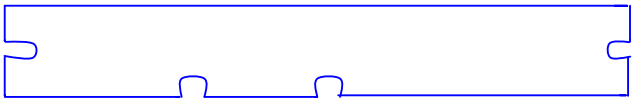
Because 72-pin SIMMs are 32 bits wide, the term *x 32* is used to describe them. A 1 MB × 32 SIMM contains 4 MB of RAM because it is 4 bytes wide (1 MB of RAM is 1,048,576 × 32, which equals 4 MB). Remember, memory is measured in bytes, and chips are measured in bits.

Dual Inline Memory Modules

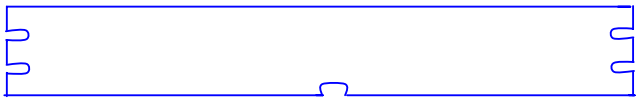
These newer modules look much like SIMMs, but come in a package with 168 pins and have a different wiring structure, so that one card can form a complete bank. These are the memory packages used on virtually all new motherboards.

DIMMS are a real improvement over older memory modules. They provide larger amounts of RAM on a single module and are easy to install. They slide straight down into a slot and are secured by a pair of locks that swing into place above the card as it seats fully in the slot. Check the motherboard manual or the vendor's Web site for the approved list of DIMM modules. There are many variations in electronic design (parity, non-parity, etc.), and you must make sure that the DIMM will actually work with the combination of motherboard and CPU you are working on. Just because the card fits does not mean it will work.

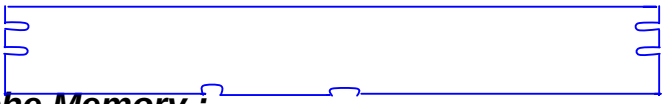
168 pin SDRAM



184 pin DDRAM (faster)



184 pin RDRAM (Faster)



Cache Memory :

A place where data is stored so that it does not need to be read from a slower device. Copies of frequently used disk sectors are stored in RAM (random access memory) so they can be accessed without accessing the hard disk.Caching, in PC terms, is the holding of a recently or frequently used code or data in a special memory location for rapid retrieval. Speed is everything when it comes to computers. Mass storage is much slower than RAM, and RAM is much slower than the CPU. The high-speed memory chip generally used for caching is called static RAM (SRAM).

SRAM :

SRAM does not use capacitors to store 1s and 0s. Instead, SRAM uses a special circuit called a *flip-flop*. The advantages of SRAM are that it is fast and it does not have to be refreshed because it uses the flip-flop circuit to store each bit. A flip-flop circuit will toggle on or off and retain its position, whereas a standard memory circuit requires constant refreshing to maintain an on state. The main disadvantage of SRAM is that it is more expensive than DRAM.

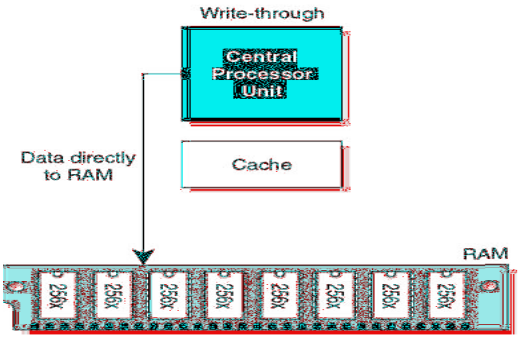
Internal Cache (L1)

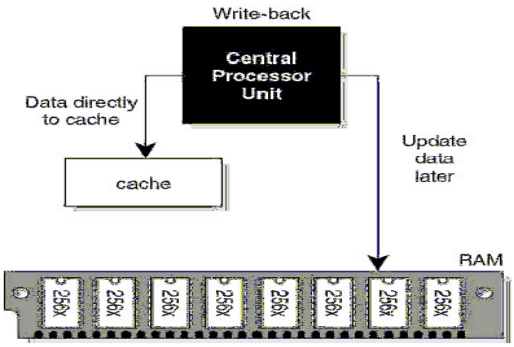
Starting with the 486 chips, a cache has been included on every CPU. This original on-board cache is known as the *L1* (level 1) or *internal cache*. All commands for the processor go through the cache. The cache stores a backlog of commands so that if a wait state is encountered, the CPU can continue to process using commands from the cache. Caching will store any code that has been read and keep it available for the CPU to use. This eliminates the need to wait for fetching of the data from DRAM.

External Cache (L2)

Additional cache can be added to most computers, depending on the motherboard. This cache is mounted directly on the motherboard, outside the CPU. The external cache is also called *L2* (level

2) and is the same as L1, but larger. L2 can also (on some motherboards) be added or expanded. When installing any L2 cache, be sure to check the CMOS setup and enable the cache. Some computer systems are now also employing a Level 3 cache.





Symptoms of Memory Problems:

- Computer Re-boot itself or Crashes the system. Over heat and other power problem also memory problem.
- Memory error display in BIOS message in screan.
- Memory address error at boot time.
- Computer apears to boot but the screan remans black.
- Computer doesnot boot . POST codes (Beep tones) are heard.

To solve this problem to check the ram slot situation, if the problem of RAM connection then we can re-connect in the slot. If the problem of RAM memory then replace good memory in system.

Note : ROM is read-only memory and cannot be changed. It is usually used for BIOS or other data that cannot be lost if the power is off. **RAM** is random access memory and is constantly changing. It is used as the main working memory for a computer. RAM memory is lost if the power is turned off.

Secondary Memory:

Floppy Disk Drive:

Floppy disk drive is data exchange media for PC and most popular backup system. IBM invented the floppy disk drive in 1967, which was 8" in size when IBM. Personal developed in 1981 its size decreased in 5.25". Today's most popular floppy is 3.5" with 1.44 MB capacity.

History of Floppy:

In 1972, IBM developed the first floppy disk drives for its System 370 machines. These drives used 8-inch floppy disks. Other companies, such as Wang, adapted the same basic design for its dedicated word processing machines used in the 1970s and 1980s. The actual disks came pre-formatted, and only worked on a given operating system or computer. This resulted in high-cost drives and reduced the ability to use floppies as a quick means of transporting files from one system to another.

When IBM introduced the personal computer (PC) in 1981, it came standard with a 5.25-inch floppy disk drive. Floppy disks were included in PCs before hard disk drives, mostly out of economic considerations. The cost of an early PC hard disk drive was more than the total cost of a system today and took half of a day to prepare and install. Some very old PCs may have a 5.25-inch drive installed. The only reason a newer machine might need one is to maintain compatibility with an old program or data stored on such disks.

Today's 3.5-inch floppy disks (see Figure 9.1) are made of flexible plastic and coated with a magnetic material. To protect the disk from dust and physical damage, it is packaged in a plastic or coated paper case. The main reason for the popularity of floppy disk drives and disks is that they provide inexpensive read/write (R/W) removable media. The data stored on a floppy disk can be moved from one computer to another, provided both have the same type of drive. In general, it is a good idea to protect your data by always keeping two copies of any data file that you create (the original and a backup), and the floppy disk is an excellent medium for backing up, storing, or distributing copies of relatively small files, such as word processing documents.

Role of Floppy Disk Drive:

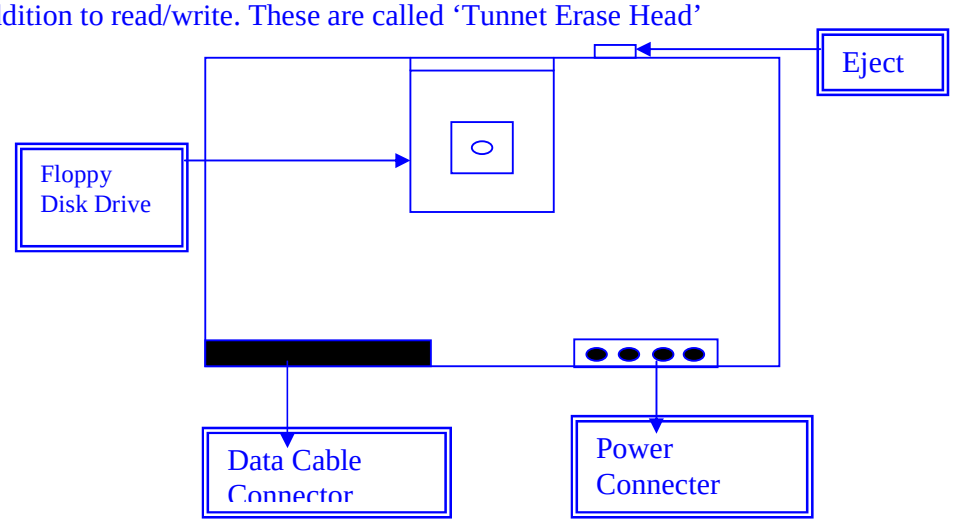
- Data transfer
- Small file storage and backup
- Software installation and driver update.

Floppy Disk Drive Construction and Operation:

Read/Write Head Media: The read/write head on the floppy disk are used to convert binary data to electromagnetic pulses, when writhing the disk and the reverse when reading.

Floppy disk used the ferrite style head. The head is an iron core with wire wrapped around it to form a controllable electromagnet. The floppy drive is a contact recording technology, it mean head directly contact the disk media, instead of using floating head.

Floppy disk drive spins typically 300-600 RPM. The magnetic oxide the dirt on the head maker it be periodically cleaned. The floppy disk also used a special design that incorporates two heads in addition to read/write. These are called 'Tunnet Erase Head'



Head Actuator:

Head Actuator id device that physically positions the read/write had over the current track on the surface of the disk. Floppy disk generally has 80 tracks pre side. Stepper motor drives the

actuator as the stepper motor turns it moves through various stop position. Each one of these position defines a track on the surface of the disk. The head actuator on a floppy disk are very slow which their seek time much higher.

Spindle Motor: The spindle motor drives the floppy disk. When disk is inserted, clamps come down on the middle of the disk to motor, which turn disk as it spins. The speed of spindle of spindle motor depends on the type of floppy drive.

Floppy Disk Size and capacity	360 KB 5.25"	1.2 MB 5.25"	720KB 3.5"	1.44MB	2.88MB 3.5"
Spindle speed	300RPM	360RPM	300RPM	300RPM	300RPM

Disk Change Sensor: Modem floppy drives incorporate sensor and signal on the floppy that work in conjunction to tell the floppy controller when a disk is ejected and a new one is inserted. This signal is sued for performance reason as keeping track of when the disk is changed.

Logic Board: The floppy disk contains an integrated logic board that act as the drive controller. This controls the read/writes head. The spindle motor, head actuator and other components. The circuit on this board also talks to the floppy disk controller over the floppy interface.

Media Density: The density of the disk surface refers to the amount of data that can be stored in a given amount of space. This is a function of two basic factors:

- How many tracks can be fit on disk (track density)
- How many bits can be fit on each track (bit density)

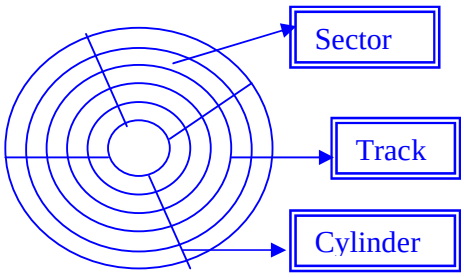
Density Characteristics	360KB 5.25"	1.2MB 5.25"	720KB 3.5"	1.44MB 3.5"	2.88MB 3.5"
Track Density	48	96	135	135	135
Bit Density	8876	9869	8713	17434	34868
Density Name	Double Density (DD)	High Density (HD)	Double Density (DD)	High Density (HD)	Extra Density (ED)

Data Encoding and Decoding: Data encoding is the process of converting binary information into magnetic pulses that can be stored on the magnetic surface of disk. Floppy disk uses the MFM (modify Frequency Modulation) for encoding. Data decoding is the process of converting magnetic pulses binary information.

Low Level and High Level Format: Low level format involves the creation of the actual structure of the surface of the media that are used to hold data. This means recording the tracks and marking the start of each sector on each track is called low level formatting.
The next level or step is high level format. In this process it crates the logical structure of the disk. Such as file allocated table, Root Directory.

Floppy Disk Technology:

- Floppy disk is known as diskette and the common size is 3.5"
- Floppy disk drive: The electro mechanical device that read and write the data
- Track: Concentric ring of data on side of a disk.



Floppy Disk:

- It uses a plastic based material coated with Iron Oxide. This oxide is a Ferro-magnet material.
- It can record information instantly
- It is inexpensive and easy to use.

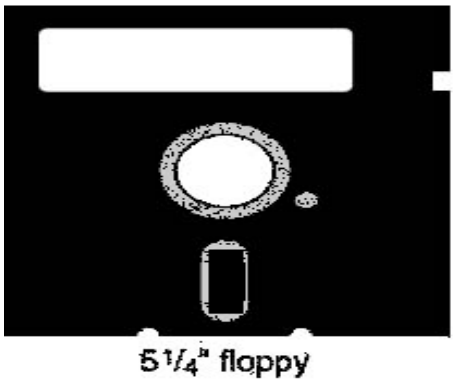
Floppy Disk Geometry:

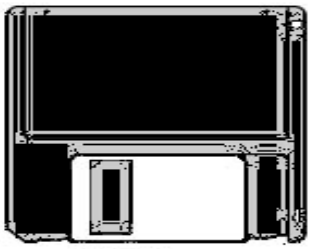
The term geometry refers to the organization of the structure. It refers to the numbers o disk surface. The number of track per surface and number of track per sector.

Geometry Specification	360 KB 5.25”	1.2MB 5.25”	720KB 3.5”	1.44MB 3.5”	2.88MB 3.5”
Track	40	80	80	80	80
Sector per track	9	15	9	18	36
Total sector per disk	720	2400	1440	2880	5760

Note: Floppy use 512 byte per sector

Mini floppy = 5.25” in size
Micro floppy = 3.5” in size


5¼" floppy


3½" floppy

Note : The IDE (Integrated Drive Electronics) drive was introduced in the early 1990s. The IDE quickly became the standard for general-purpose computers. The purpose of the IDE specification was to increase data throughput, support non-hard disk drive storage devices, increase the capacity of hard drives beyond the 528-MB barrier, and allow connection of up to four devices instead of only two.

Hard Disk Drive (Fix Disk Drive) HDD / FDD:

Hard disk drives are mass storage devices. Virtually all of today's PCs have at least one hard disk drive. The first hard disk drives were small in capacity, physically large, and expensive when compared to the cost of drives today. They were about 4 inches tall, 5.25 inches wide, and 8 inches long, and they weighed almost 10 pounds. In 1981, IBM introduced the XT computer with a 10-MB hard drive, and new owners wondered what they would do with all that space. Today, a new hard disk drive can fit in your pocket.

- The first hard disk drives for personal computers used the **ST-506/412** interface. The ST-506/412 was the only hard drive available for the IBM computer and the first to be supported by the ROM BIOS chip on the motherboard.
- The Enhanced Small Device Interface **(ESDI)** was introduced in 1983 by the Maxtor Corporation. Beginning with this drive, most controller functions were incorporated directly onto the hard disk drive itself.
- The Small Computer System Interface **(SCSI)** has been around since the mid 1970s in one or another form. Apple adopted the SCSI as its expansion bus standard. The SCSI bus functions as a communications pathway between the computer system bus and the SCSI device controller.

Hard Disk Drive Types

ST506 : The very first hard disk drives for personal computers used the ST-506/412 interface. It was developed by Seagate Technologies in 1980 and originally appeared with the 5-MB ST-506 drive. The ST-506 was priced at $3,000 and had a capacity of 5 MB. The ST-506/412 was the only hard drive available for the IBM computer and was the first to be supported by the ROM BIOS chip on the motherboard.

ESDI : The ESDI (Enhanced Small Device Interface) was introduced in 1983 by the Maxtor Corporation. This technology moved many of the controller functions directly onto the hard disk drive itself. This greatly improved data transfer speeds. Some ESDI controllers even offered enhanced command sets, which supported automatic sensing of the drive's geometry by the motherboard's ROM BIOS. The installation of ESDI drives was almost identical to the installation of ST-506 drives. Their high performance made them the darlings in their day for power users and network servers, but the high cost of ESDI drives and advances in other drive technologies spelled their doom.

IDE/EIDE : The IDE (Integrated Device Electronics) drive arrived on the scene in the early 1990s and incorporated the benefits of both its predecessors. IDE quickly became the standard for computers. It supports the ST-506 standard command set, and its limited controller functions build directly on the drive's logic board. This results in a much less expensive design. Most new motherboards have the IDE connections built in; thus, the chips are part of the board design.

Western Digital and Compaq developed the 40-pin IDE ISA (Industry Standard Architecture) pinout specification. ANSI (American National Standards Institute) standards committees accepted the standard as the Common Access Method (CAM) Advanced Technology (AT). The official name for these drives is now ATA/CAM (Advanced Technology Attachment/Common Access Method). The terms IDE and ATA/CAM are interchangeable.

Enhanced IDE (EIDE) adds a number of improvements to the standard IDE drives, including:

- ✓ Increased data throughput.
- ✓ Support of storage devices other than hard disk drives.
- ✓ Up to four IDE devices instead of just two. This actually allows the BIOS to support two controllers (each with two drives).
- ✓ Support for hard disk drives larger than 528 MB.

SCSI : SCSI (Small Computer System Interface) has been around since the mid-1970s in one or more forms. It is the most robust of the hard disk drive interfaces, and it is popular on network servers and high-performance workstations. Apple adopted SCSI as its expansion bus standard. The original SCSI standard allowed up to seven peripheral devices to be daisy chained (connected in a series) to one common bus through a single host adapter connected to

the computer bus. SCSI-2 upped that to 15, and some adapters allow multiple chains for even more devices.

The SCSI bus functions as a communications pathway between the computer system bus and the SCSI device controller. That improves performance, because the card takes over the low-level commands and frees the system bus during operations that do not involve RAM. A SCSI adapter uses its own BIOS and firmware to talk to its devices, then uses a software interface layer and drivers to communicate with the operating system. There are two software interface layers: ASPI (Advanced SCSI Programming Interface) and CAM. CAM is now obsolete, and ASPI drivers come with Windows and other operating systems. In most cases, you won't have to worry about loading the drivers unless you are updating them or installing a new card that does not have native drivers available to the operating system.

Components of HDD:

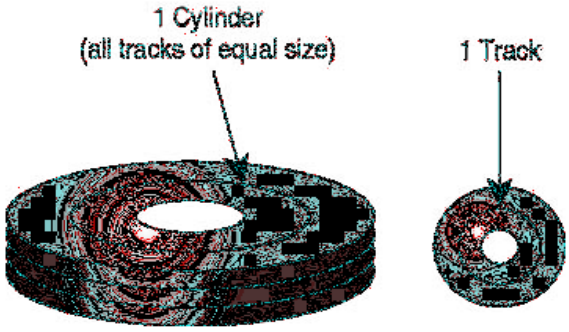
- ✍ **Platter** : It is a disk media with mainfacture by Almunium & coted with magnatic substances like iron oxide.
- ✍ **Spindle & Spindle Motor** : Spindle is the shaft in with the platter mounted. Spindel motor is a motor to rotate the platter.
- ✍ **Read/Write Head** : It is located on the Actuating arm that situated just above and below the platter. It main function is to convert electronic energy to magnatic energy.
- ✍ **Actuationg Arms**: It is used to move R/W head into platter.
- ✍ **Voice coil Actuator Motor** : It is special types of motor that moves the actuator arm line only.
- ✍ **Power connecto**r : It is used to supply the power into disk.
- ✍ **Jumper** : It determind drive is to be made master or slave when two HDD are connecting in single connector.
- ✍ **Data cable connector :** It is used for data communication between HDD & Motherboard. SATA HDD 7 pin & PATA HDD 40 pin data cable is used .
- ✍ **Logic Board :** It is control part of HDD. It control over all the function of HDD.

Main components of storing data:

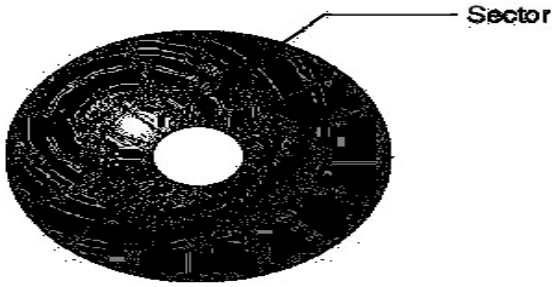
Heads: The number of heads is relative to the total number of *sides* of all the platters used to store data . If a hard disk drive has four platters, it can have up to eight heads. The maximum number of heads is limited by BIOS to 16. Hard disk drives that control the actuator arms using voice coil motors reserve a head or two for accuracy of the arm position. Therefore, it is not uncommon for a hard disk drive to have an odd number of heads.Some hard disk drive manufacturers use a technology called *sector translation*. This allows some hard drives to have more than two heads per platter. It is possible for a drive to have up to 12 heads but only one platter. Regardless of the methods used to manufacture a hard drive, the maximum number of heads a hard drive can contain is 16.

Cylinders : Data is stored in circular paths on the surface of each platter. Each path is called a track. There are hundreds of tracks on the surface of each platter. A set of tracks (all of the same diameter) through each platter is called a cylinder. The number of cylinders is a

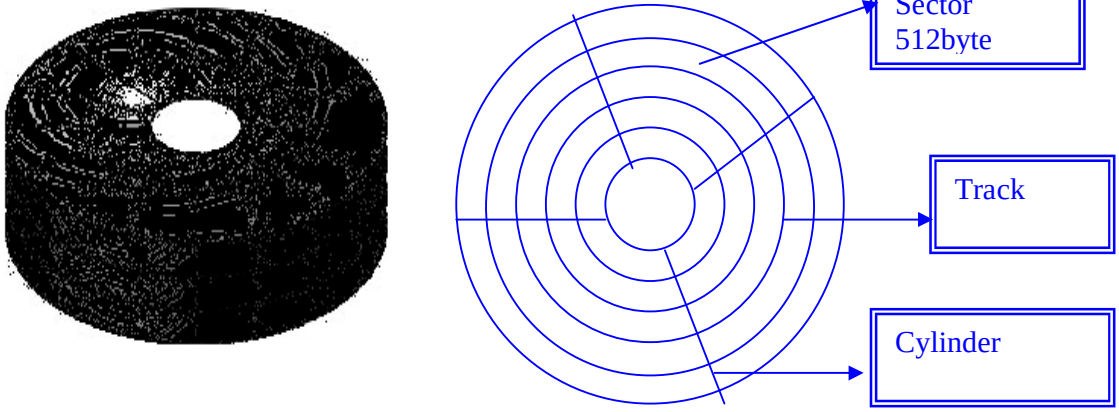
measurement of drive geometry; the number of tracks is not a measurement of drive geometry.



Sectors per Track: A hard disk drive is cut (figuratively) into tens of thousands of small arcs, like a pie. Each arc is called a sector and holds 512 bytes of data. A sector is shown in Figure 9.7. The number of sectors is not important and is not part of the geometry; the important value is the number of sectors per track. BIOS limitations set the number of sectors per track at 63.



CHS : Cylinders, heads, and sectors per track are known collectively as the CHS values. The capacity of any hard disk drive can be determined from these three values.



NOTE: One sector can store the data 512 byte, one cycle there will be 63 sectors, and clusters are located inside the sector. If the amount of cluster high then computer system will be slow. It the amount of the cluster is low then the computer system will be fast. We can not make more or few cluster they will make by the file system while we install the Operating system.

Different terms and technology used in hard disk:

- **Speed:** Speed is rotation of the spinal motor which can rotates 3600 revolution per minutes or servo control motor use to maintain a constant or accurate rotation rate. That is a sensor

in the disk drive constantly monitors how fast the drive spines. Modern hard disk has spins at 5400 to 7200 up to 10000 RPM.

- **Latency:** This term describes how long after the command to read or write from the hard disk rotates to locate the specific data needed. A modern drive with 5400 RPM speed achieves a latency of 506 milliseconds.
- **Platter:** The circular disk in which the digital data is stored in Magnetic domains is termed as platter. The number of platter onside a hard disk influence the speed at which data stored on the drive can be found.
- **Substrate:** Substrate is the material on which magnetic materials are coated form platters. The most common substrate material is Aluminum. A near alternative is Glass.
- **Track:** One complete cycle of the platter.
- **Cylinder:** The vertical portion of each track in different platters in known as cylinder.
- **Sector:** The small arch section of the track is known as sector. It can hold 512 byte of data. It is the smallest unit of data storage.

Read and Write Mechanism: Each platter has two read and write head moves synchronously by head actuator. The hard disk data can only be attained via one head at a time. The read and write head has metal coil winded in iron rod. If a current is applied to a coil, head will become magnetic. This magnetism will orient the micro magnetic in the track which is write mode. If the had moves along the track without current applied to the coil it will sense micro magnetic in the track. This is read mode.

Addressing: Method of Read and Write data:

- **CHS** (Cylinder Head Sector) [1024 cylinder -8 GB]
- **LBA** (Logical Block Address) [where all system information will store in memory so LBA is very fast then CHS to read and write the data.]

Interface: Interface provider communication channel between drivers and the controller of the motherboard. The primary job of the controller or the interface is to transfer and transmit or receive data from drive.

There are three types of interface:

- IDE (Integrated Device Electronic – 40 pin): It is the generic term applied to any drive with an integrated disk controller. We can connect maximum four devices (i.e. Hard Disk or CD-ROM) in this interface.
  - IDE 1: **Primary**
  - IDE 2: **Secondary**

ATAPI (Advance Technology Attachment Package Interface): This technology is used only on optical medium i.e. CD, DVD, Combo drive. The file system of ATAPI is CDFS and has 40 pins

Types of Hard disk:

- **PATA** (parallel Advance Technology Attachment)
- **SATA** (Serial Advance Technology Attachment)

Main manufacture of HDD

- **Seagate:** world wide famous
- **Maxtor:** world wide famous
- **Samsung:** few famous (Malaysia Company)

Note: Hard Disk is the most popular and basic storage device, that storage device is secondary memory. The storage devise is used to store the data.

- Identify by any drive letter by capital letter
- The device (drive) should be reorganized or format by any file system.

Device	Device letter	File system
Floppy	A :\> or B :\>	MS-DOS FAT
Hard Disk	C :\>, D :\>, E :\>.....	FAT, FAT 12, FAT16, FAT32, NTFS
CD-ROM	... F :\> ...	CDFS file system
DVD	... G :\>...	CDFS file system
Pen drive (PD)	... H :\>...	FAT

CDFS: Compact Disc File System (Only for CD-ROM)
NTFS: Network Technology File System (for HDD)
FAT: File Allocation Table (For HDD, FLOPPY, PENDRIVE)

Storage Principle:

- **Magnetic Principle:** In magnetic principle can read and write the data magnetic pulses. i.e. (Head) floppy and hard disk.
- **Optical principle:** That used lens. Instead of head to read and write the data. I.e. CD-ROM, DVD ROM, COMBO, etc.

We can use the platter of hard disk glass or aluminum. If we used the platter of hard disk of glass it will be optical and we use aluminum it will be magnetic

Problem

- ✓ If the logic board is damage than the drive not detect in BIOS system
- ✓ During the time of booting it display the Message **"1701" or 1702 error** or Display **Hard Disk Failler** message than we identify the problem of HDD logic board.
- ✓ If the problem of platter & R/W head than we cannot solve this types of problem, so we can simply replace the Hard Disk.

Note: The disk is damage but the data of disk is most importance then we can get the data to open the platter & fit the R/W head & platter then connect the Drive into other system & copy all the data into other disk. (If we open HDD pack then it is used only one time, then the disk is used less.)

File System: File system helps to store the data in the hard disk by sequential order. To store data on the hard disk the file system breaks down the hard disk on the group of the cluster can be drawn any where on the hard disk.

FAT (File Allocated Table)[FAT 12 and FAT 16]: The standard file system recognized by DOS, Win 9X and win NT is FAT. FAT partition support file name up to 11 character DOS and 255 character on the windows. It can format maximum 2 GB of partition. FAT system use 10-16 bit number of clustering size to store the data.
FAT 32: An optional file system for Win NT, Win 2000 and beyond is FAT 32 used 2 bits of data to identify clustering size FAT 32 support maximum 2 TB of partition.

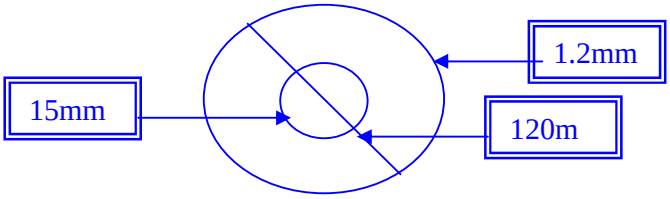
NTFS (Net Technology File System): The native file system for Win NT, Win 2000 and beyond is NTFS. It supports 256 characters for the file name. It can support maximum 16 hex byte partitions. The main features of the NTFS file system and folder level.

Optical Disk(CD ROM/DVD ROM)

CD Drive: CD-ROM (Compactable Disc Read Only Memory)

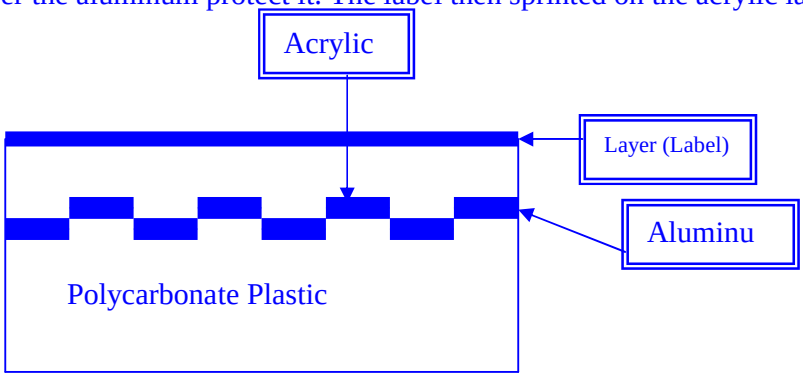
It is a read only memory optical storage medium capable of holding up to 700MB of data. CD/R and CD R/W are expanding the compact disc capabilities by making them variable a new technology such as DVD's.

In 1978 Sony and Philips companies jointly invented audio CD that was 12 inches Disc. In 1982 the companies announced the standard 4.72 inch format i.e. 120 mm whole in center and 1.2mm thick.



CD technology:

Most of CD consists of an injected molded piece of clear polycarbonate plastic. During manufacturing the plastic is impressed with microscopic bumps arranged as a single continuous extremely long spiral track of data. Once the clear piece of polycarbonate is formed, a thin reflecting aluminum layer is spotted onto the disc covering the bumps. Then a thin acrylic layer is sprayed over the aluminum protect it. The label then sprinted on the acrylic layer.



You will after read "Pits" on a CD instead of bumps. The appear on pits in the aluminum site but on the layer reads, they are bumps

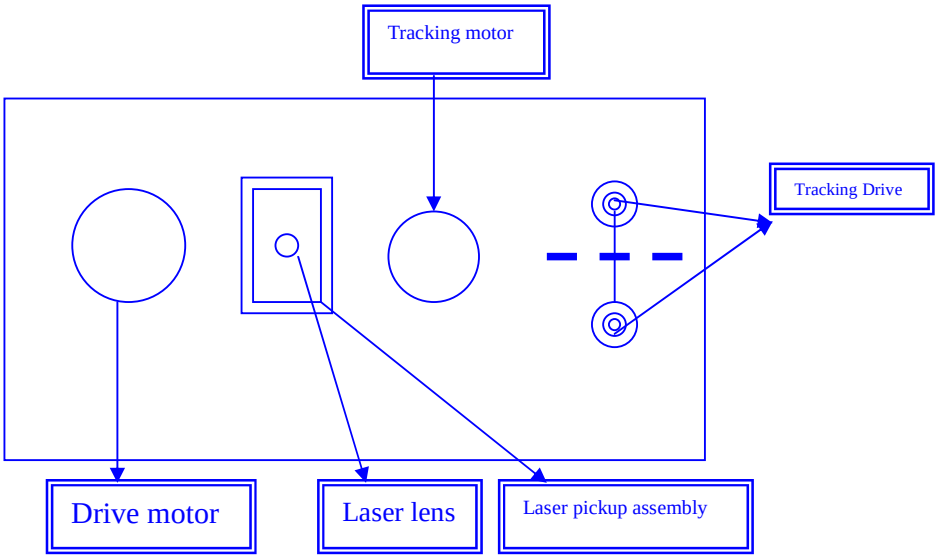
The increasable small dimension of bumps makes the spiral track on a CD extremely long. They spiral track of the data is about 5 kilo meter long.
Construction and operation: The CD-ROM is an optical storage device and use circular spinning the media. The big different is that they way of information is recordable on the media and the way that is read from the media is same.

Optical Head Assembly: CD-ROM is read only memory or device and cannot be written. CD drive cannot use head in the conventional sense. The head is a lens sometimes called pick up that moves from inside to outside of the surface of the CD-ROM disc to access the different data as disc spins.

Operation:

- A beam of light is emitted from an infrared (750nm wave length) diode and aimed toward mirror. The mirror is part of head assembly, which moves linearly along with the surface to the disc.
- The light reflects off the mirror and through a focusing lens it shines out a specific point on the disc.
- A certain amount of ling is reflected from the disc. The amount of the light reflected depends on which part of the disc the beam strikes each position on the disc is encoded as "1" or "0" based on the presence and absence of "pits" in the surface of the disc.

- A series of collectors mirror and lens accumulates and focuses the reflected light from the surface of the disc and send it towards photo detector.
- The photo defector transforms the light energy onto electrical energy. The strength of the signal is depended on how much light was reflected from the disc.



Drive Motor: A drive motor spins the disc. The drive motors preciously control and rotate the disc between 200 up 500 RPM depending ton which track is being read.

Laser and Lens: A laser and Lens system focus on the disc and read on bumps.

Tracking Motor: A tracking mechanism moves the laser assembly so that the laser beam cam flow the spindle track.

Single Motor: The spindle motor of a standard CD-ROM is very different from Hard Disc floppy disk drive because it doesn't spin at a constant speed. The speed of the drive depends on what part of the disk is being read.

CD Format

Single Session: In this session once we write the data we cannot rewrite next time if there is remaining space.

Multi Session: In this session we can re-write the data if black space is remain.

Different CD Format:

- **CD-AD (Compact Disc Digital Audio):** First CD format was audio. This CD use simple rate of 44.1 KHz and 16 bit inside. Audio Data is stored on the disc on blacks. Each block holds 2352 bytes data.
- **CD ROM**
  - Model 1: This CD format broken down the size of data 2352 into 2048 byte remaining 304 byte is used for error detection.
  - Model 2: It used 2048 bytes data in a single block and omitted the 304 byte.
- **Video CD:** It supports for a special CD-Format for the storing of compressed video information. Through the use of "mpeg" format it is possible to store 74 min of full motion video in the same space of audio.

- **DVD (Digital Versatile Disc):** DVD use the same form factor as CD-ROM. DVD players uses smaller, thinner infrared that can be read more packet data at a time. The logical format is different in DVD and it can store 7 times of data in one side of the compact disc.
- **CD-R:** CD-R drives are especial drive which is very different then a standard CD player because it must include a special laser. The lasers in key component format the drive perspective because it burns out data or image into the CD-R drive. It uses ATAPI interface.
- **CD-R/W:** It is new technology which allows CD to be both written and re-written. It is similar to CD-R drive and different thing is the laser.

Development of the CD

- In 1979, the CD, as a storage medium, was introduced in the audio industry.
- In 1985, the CD came to the computer industry. Development was slow because the hardware was too expensive for most manufacturers and users.
- In 1991, the CD-ROM/XA standard was enhanced, and multimedia requirements for hardware were specified.
- In 1993, high-quality video playback came to the computer.

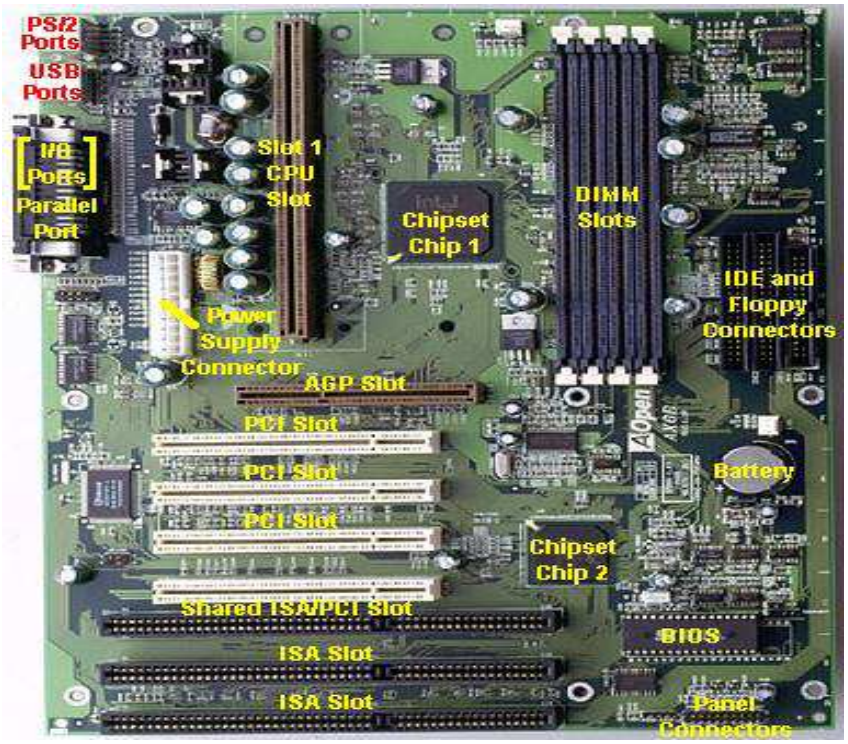
Today, the price of CD-ROM drives continues to drop, while their speed climbs. Almost all new computers include an internal CD-ROM drive as standard equipment. Most software packages are shipped in CD-ROM versions (3.5-inch floppy disk versions are available but usually only by special order, and often they do not contain all the extras of the CD version).

MotherBoard

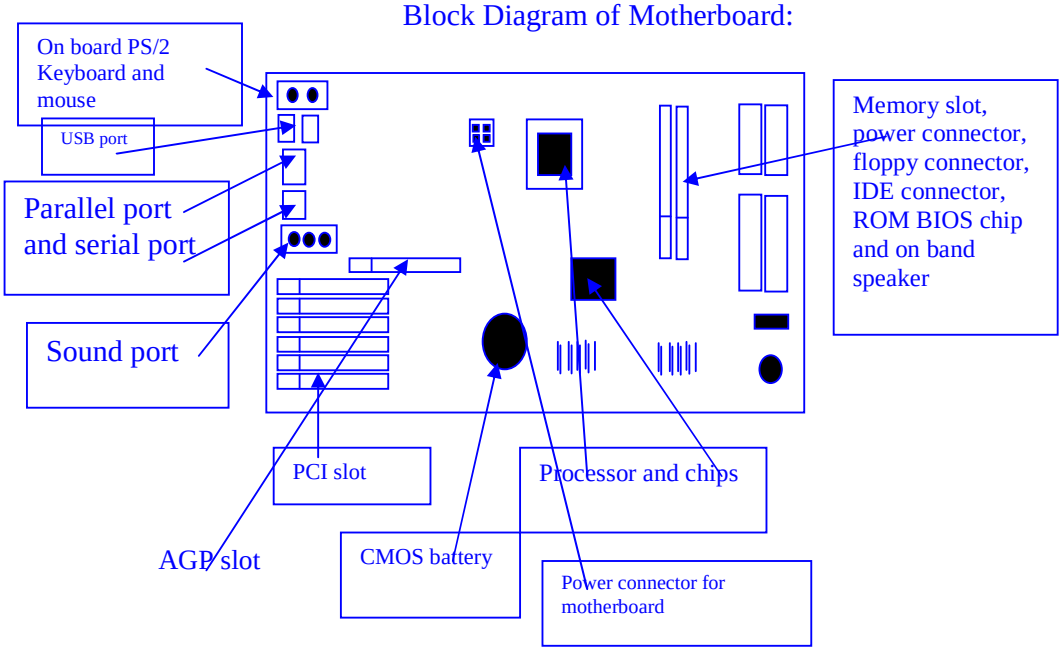
It is the main circuit board of the computer where all of the system devices will attached, like keyboards, mouse, printer, scanner e.g., monitor, hard disk, CD-ROM, FDD, HDD, etc.
The motherboard is constructed by ferrite glass. We just called system board or main board. The main components of the motherboards are:

Slot and Socket:

- Memory slot or bank.
- ROM (BIOS) Chip
- Jumper
- IDE controller and connector
- Power connector
- Floppy Disk Drive controller and connector
- IC chips
- Data bus etc
- Address bus



Block Diagram of Motherboard:



AGP = Accelerated Graphic Port
CNR = Communication Network Rises
ZIF = Zero Insertion Force
PGA = Pin Grid Array

Slot: Slot is the place where the cards are attached. The slot is also called expansion slot and the cards also known as expansion cards. The display card, sound card, modem card, network card, TV card, etc will attach to the slot.

There are some slots as follows:

VESA = Very Extended Standard Architecture
EISA = Extended Industry Standard Architecture
ISA = Industry Standard Architecture.
PCI = Peripheral Component Interconnect.
CNR = Communication Network Resist

The 3D card or AGP card always is placed on AGP slot.
The color of AGP or VGA slot is brown, in the place of the VGA card we can put 3D card

The name of the modem port is RJ 11, and Network Port RJ 45

If 3D card is no in the computer in that time we play game, then our computer will hang and computer will move very slowly.

VESA and EISA cart only read 8 bit data at a time
ISA card read 8 or 16 bit data at a time. It comes on black color slot.
PCI card read 32 bit data at a time it comes white cart color.
AGP cart read 64 bit of data at a time.
CNR card comes in brown color it is most expensive.

Socket: Socket is the place where we can install or attach to the processor. We can use either slot or socket to install the processor

The number of socket or slot is identifying what type of processor is being used on the motherboard.
Slot = SEC
Socket = PGA or ZIF

NOTE: *Socket types of processor will be very fast than slot type processor*
Memory bank slot: Memory bank or memory slot is used to install or attach the memory (main memory).

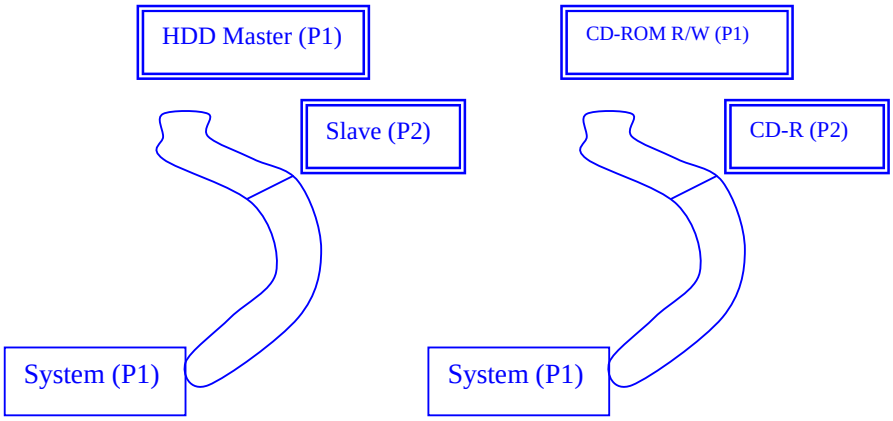
CMOS battery: CMOS battery helps us to check our system.

IDE: (Integrated Device Electronic) is an interface that established between the hard disk and motherboard

In our motherboard we can get two IDE connectors

IDE1 = Primary IDE
IDE2 = Secondary IDE

We can connect two devices that i.e. Hard disk and CD-ROM by single connector
If we connect two devices then: One device will be master and another device will be slave.
We connect the device with data cable if you connect the data cable on primary master and slave.
If you connect to secondary IDE, then it will called secondary master and secondary slave.
Primary IDE: I) Primary master
a. Primary Slave.
IDE2: Secondary IDE: I) Secondary master
ii) Secondary slave.



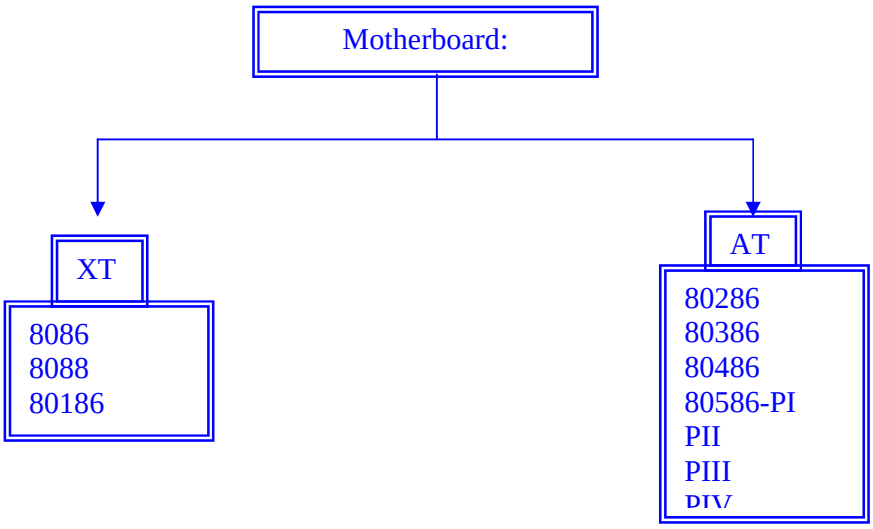
Here, Primary master : HDD
Primary slave : Not installed

Secondary master : CD-R/W
Secondary slave : CD-R

NOTE: The jumper helps to define master or slave. The hard should be primary master.

The Types of Motherboard

There are mainly two types of motherboard.

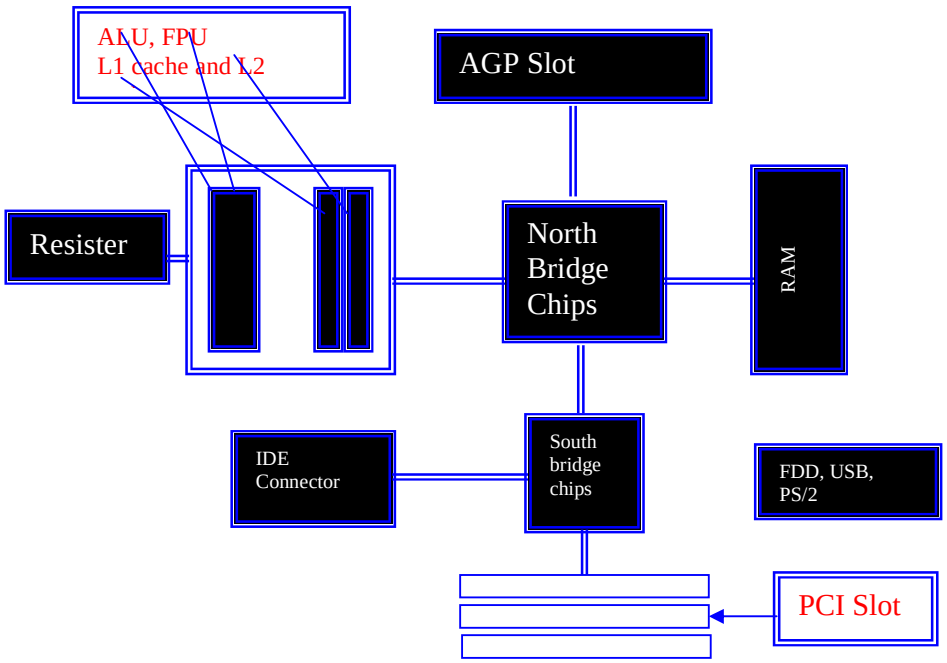


Different between AT and ATx

XT	AT
Developed around : 8086	80286
Addressable RAM: 4 MB	16MB
Configured by: switch	Jumper
Data path : 8 bit	16 bits

NOTE: PIV processor can process the data 32 bits at a time

Architecture of Motherboard



FPU: Floating Point Unit
ALU: Arithmetic Logic Unit

NOTE: FPU only 3D calculation and programming, ALU only arithmetic calculation, all are located inside the processor.

Resister: Resisters are the main circuit where data resist. Resisters are memory circuit located inside the CPU that hold data before and after the processing. The CPU used 94 bit and 128 bit resister size.

FPU (Floating Point Unit): The FPU is the CPU component that handles calculation based on the IEEE floating point standard. FPU is the part of CPU it process calculation.

IEEE: *Industry of Electrical and Electronic Engineering.*
NOTE: FPU process the application of 3D

ALU: Arithmetic Logic Unit: ALU is the part of CPU that actually processes the data. The ALU takes data from the CPU resister process it and copies it break into the resister before moving on to the next batch of data.

Pipeline: The term pipeline refers to the discrete series of steps that the CPU follows to process command.

Clock Speed: The CPU clock speed is measurement of cycle per second.

One calculation cycle per second is equal to one hertz (Hz)
Thousand hertz = One kilo hertz (1 KHz)
Thousand Kilo Hertz = One Mega hertz (1 MHz)
Thousand Mega Hertz= One Giga hertz (1 GHz)

Multiplier (speed of clock): Clock multipliers are the mechanism that CPU uses to run at even faster speeds that sit by the system crystal clock.

NOTE: Multiplier increase the external speed of clock

Cache Memory: Cache memory is special memory that located inside the processor, which the processor process the data. First it store to the cache memory then after send to the other devices. There are two types of cache memory one is Level one memory and another is Level two memory.

The Level one cache memory it first and faster cache memory. It is round KB in size.

The Level two cache is the second cache. It is always large than lever one cache it around 156 KB to 7 MB in size.

NOTE*: In old types of computer cache memory located outside the processor. But modern computer cache memory located inside the processor.*

Xeon: These types of computer contain lever one, two and three cache memory. It is very expensive.

Northbridge chips: Northbridge chips (main controller chips) that Northbridge chips are special types of memory controller chips that are directly mounted on the motherboard that assist the CPU. The Northbridge chips connect the CPU to the system RAM.

Back side bus: The back side bus connected Lever one memory and Level two memory as well as the processor and Northbridge chips.

Front side Bus: There are two types of front side bus

i) Data Bus
ii) Address Bus

Data Bus: the data bus is the channel that the CPU across the data in RAM
Address Bus: Address bus is the path that the CPU used to talk to the Northbridge chips.

Motherboard: (How to identify the mother board)

- Pentium I = AT power connector
- Pentium II = SEC types of processor slot:
- Pentium III = ZIF or PGA types of processor in socket
- Pentium IV = ATx power connector

NOTE: Pentium one only has AT power connector and Pentium IV only has ATX power connector, and PI and PII have both types of power connector.

Motherboard by Chipset:

Intel chipset = Intel Board
VIA chip set = Tomato Board

NOTE: Normally we can identify the board by looking their color in the case of color, Intel board comes in Green color and Tomato board comes in red color.

Chipset means main controller chip.

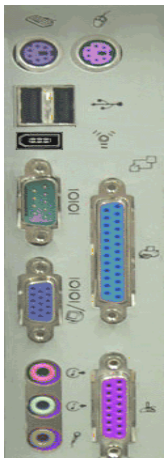
How we can identify model motherboard on the brand?

Intel Original	GL/GLY	VIA	MSI (Microstar International)
-Intel Chipset -No onboard display -Intel processor -AGP card	-Intel Chipset -On board Chipset -Intel processor -AGP slot (not there)	-VIA chipset - Onboard Display - Intel Celeron processor. -AGP slot is not there.	-Intel chipset - Intel, Intel Celeron processor. -AGP slot is not there.

Note: SRAM located inside the processor DRAM located memory slot or memory bank that is known as a RAM

Port and Connection:

- Serial port = Pin number 9
  Notification = Com1, Com2
  Data transfer rate = 1 bit at a time and maximum thoughtful 115 Kbps at a time
- Parallel port = Pin number 25
  Notification = LPT 1
  Data transfer rate = Maximum thoughtful 8 bit at a time and 115 KBps



- ♣ Game port = Play joystick game
- ♣ Mouse = 9 pin serial and 6 pin PS/2
- ♣ Keyboard port = 5 pin DIN & 6 pin PS/2
- ♣ Video port = 15 Pin (CRT) and 15 pin (LCD)
- ♣ Network port = RJ – 45 (it comes on 8 pin)
- ♣ Modem port = RJ-11 (it comes on 4 pin)
- ♣ Audio port = Speaker, microtek and sound in

Note: CRT stands for cathode ray tube and LCD liquid crystal display.

LCD mostly use on laptop computer and it is also come different types of desktop computer.

Modem multifunction port

- ♣ Modem = Modulation and Demodulation
- ♣ USB = It contains four pin (flavor 1.1 and 2.0)

-Flavor 1.1 = 120 mbps

-Flavor 2.0 = 480 Mbps

Note: USB port support 127 devices and we can used 6 USB device at a time in our Pentium four computer

Chip Sets

A motherboard comes with a variety of support chips soldered in place. The primary elements constitute the *chip set* and are designed to work with the CPU. These chips are highly complex and coordinated ICs that help the CPU manage and control the computer's system. When replacing a CPU, you must make sure that it is compatible with the chip set and supported by the motherboard. If not, the computer won't work. A basic chip set consists of a

- Bus controller
- Memory controller
- Data and address buffer
- Peripheral controller

On modern motherboards, you will find specialized chips to control things such as cache memory and high-speed buses. You will also find boards with fewer individual chips because the manufacturer has incorporated several functions into one chip.

Keep in mind that there is a wide range of features (with attendant cost increases for extras) available when selecting a motherboard. You will need to keep up to date on the types of processors, memory design, CPUs, and expansion slots available to recommend and obtain the right product for your customers.

Be careful in choosing motherboards with components like display adapters and sound cards on board. These are components that may not have all the features of their expansion card versions, and customers may decide to upgrade, leaving them with motherboard-based elements that could cause conflicts.

Note:

- There are two major categories of motherboards: AT and ATX. The main difference between them is the type of power supply and main power switch each requires. When you order a new motherboard, be sure to first verify that it is compatible with the case and power supply to be used.
- If you are working on a brand-name computer, you might be required to purchase a new motherboard or other custom components from the same manufacturer.
- Before buying a motherboard, check its technical references to be sure that the new board will fit and will be compatible with any of the RAM and expansion cards the owner intends to use. Often, this information can be found in the owner's manual. If not, check the manufacturer's Web site, if one is available, or check other online resources such as technical libraries. A Web search using the keyword "motherboard" will yield sites dedicated to computer hardware.
- For all practical purposes, you cannot repair motherboards. They should be replaced if physically or electrically damaged. Your customer will get new technology, usually for a price lower than the cost of the repair.
- Because it is often the most difficult part of a system to replace (you have to remove all the equipment that is connected to it), check all other internal and external components before removing or replacing the motherboard.
- When obtaining a replacement, be sure to factor in the cost of all critical options found on the existing motherboard. Some have a built-in SCSI (Small Computer System Interface) Host Adapter or display adapters that might not be common. In that case, either make sure the new board offers the same level of support or install the appropriate add-on card(s) to bring the system up to the existing level of operation.

Motherbord manufacturer

1. Intel
2. Anus
3. MSI –Standard quality
4. VIA – Sony Chinese company

Processor: The processor is the brain of the computer. The processor processes the data before and after access. The processors are constructed million of transistor. The processor is some times called CPU.

The CPU

The CPU is the part of a computer in which arithmetic and logical operations are performed and instructions are decoded and executed. The CPU controls the operation of the computer. Early PCs used several chips to handle the task. Some functions are still handled by support chips, which are often referred to collectively as a *chip set*.

Components of CPU:

Transistors: *Transistors,* the main components of microprocessors, are small, electronic switches. The on–off positions of the transistors form the binary codes discussed earlier in this lesson. Although transistors might seem simple, their development required many years of painstaking research. Before transistors were available, computers relied on slow, inefficient vacuum tubes and mechanical switches to process information. The first large-scale computers took up a huge amount of space, and technicians actually went inside them to "program" by turning on and off specific tubes! Many materials, including most metals, allow electrical current to flow through them; these are known as electrical conductors. Materials that don't pass electrical current are

called insulators. Pure silicon, which is used to make most transistors, is a *semiconductor*; its degree of conductivity can be adjusted, or modulated, by adding impurities during production.

Transistor switches have three terminals: the source, the gate, and the drain. When positive voltage is applied to the gate, electrons are attracted, forming an electron channel between the source and the drain. Positive voltage applied to the drain pulls electrons from the source to the drain, turning the transistor on. Removing the voltage turns it off by breaking the pathway.

In the late 1950s, a major development in transistor technology took place. A team of engineers put two transistors on a silicon wafer, creating the world's first IC and paving the way for the development of compact computers.

Integrated Circuits: An IC is an electronic device consisting of a number of miniature transistors and other circuit elements (resistors and capacitors, for instance). An IC functions just as a large collection of these parts would, but it is a fraction of the size and uses a fraction of the power. ICs make today's microelectronics possible. The original transistors were small plastic boxes about the size of a peanut that could handle only one function. The word *integrated* denotes that IC devices combine many circuits—and some of their functions—into one package. A prime example of this technology is the microprocessor.

Microprocessors: On November 15, 1971, Intel shipped the commercial microprocessor Model 4004. It ran a product called the Busicom calculator. The 108-KHz 4004 had 2300 transistors and a 4-bit data bus and could address 640 bytes of RAM. Computer engineers quickly took advantage of the potential this new type of chip offered, leading the way to the first personal computers.

A year later, the Intel 8008 appeared. *Radio Electronics Magazine* reported that hobbyist Don Lancaster used an 8008 to build what was considered the first personal computer. The article called it a "TV typewriter."

The Intel 8080 appeared in 1974. It sold then for $400 and now sells for about $1. It powered traffic lights, but of more interest to our discussion, it formed the core of the Altair computer of 1975. It was sold in kit form for $395 and was named for a world in the *Star Trek* TV series. Figure 4.4 shows a picture of the 8080 die. By today's standards, it was very weak: 6000 transistors, an 8-bit bus, and a 2-MHz clock speed. It could address 64 K of RAM (random access memory), and users programmed the Altair by throwing manual switches located on the case.

Microprocessor Design

Before going further into the history of microprocessor development, it is important to discuss in general terms how microprocessors operate. Microprocessors are usually divided into three subsystems: the control unit (CU), the arithmetic logic unit (ALU), and the input/output (I/O) unit. The term *CPU* is used to denote a combined CU and ALU, contained in a single package.

The advent of the CU marked a radical improvement in processor design, allowing CPU operations to be based in part on code provided by an external program like a BIOS (basic input/output system). This extended the ability of a PC to use new hardware components that were not part of the original design.

The ALU is just what its name implies—the part of the IC that handles the basic math functions of computation. The I/O unit fetches data from the outside and passes data back to the external bus.

Registers

Registers are temporary memory storage areas used during data manipulation. Physically, registers are rows of microscopic switches that are set on or off. Each row forms a binary number: off = 0

and on = 1. Hence (reading from right to left) off.off.on equals the number 1. Off.on.on equals the number three (0 + 2 + 1). The CPU uses registers, like scratch pads, to hold data while it works on a task. Changes in data during an operation are also stored in a register, then sent out to other components as the job is finished. The number and width of a register vary from one type of machine to another. The wider the register, the more bits the machine can handle at one time—just as with the width of the external bus. As register width moved from 4 to 8 to 16 to 32 to 64 to 128 bits, PCs increased in performance.

The Clock

Timing is essential in PC operations. Without some means of synchronization, chaos would ensue. Timing allows the electronic devices in the computer to coordinate and execute all internal commands in the proper order.

Placing a special conductor in the CPU and pulsing it with voltage creates timing. Each pulse of voltage received by this conductor is called a *clock cycle.* All the switching activity in the computer occurs while the clock is sending a pulse. This process somewhat resembles several musicians using a metronome to synchronize their playing, with all the violinists moving their bows at the same time. Thanks to this synchronization, you get musical phrasing instead of a jumble of notes.

Virtually every computer command needs at least two clock cycles. Some commands might require hundreds of clock cycles to process.

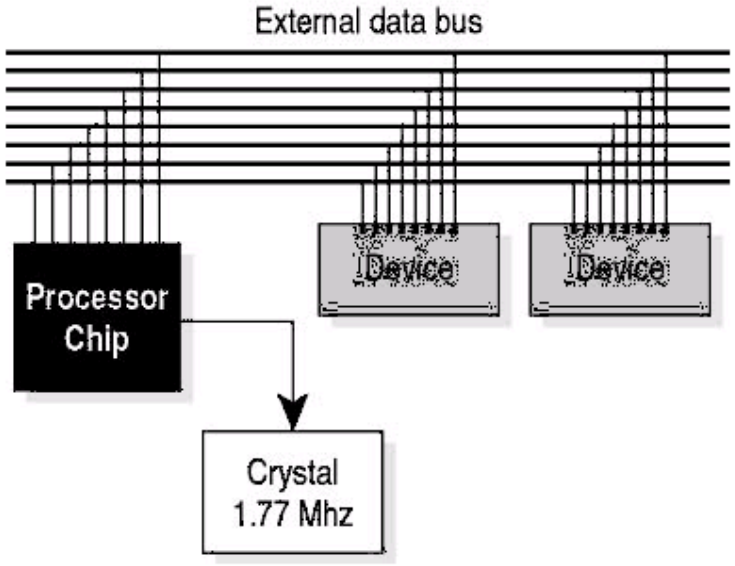


Figure *CPU with clock*

Clock Speed

It is common for computers to be marketed to consumers based on features that show off their best points. One main selling point is the system clock rate, which is measured in megahertz (MHz), or millions of cycles per second. The clock rate suggests how many commands can be completed in two cycles (the minimum time required to execute a command). The process of adding two numbers together would take about four commands (eight clock cycles). A computer running at 450 MHz can do about 44 million simple calculations per second.

Clock speed is determined by the CPU manufacturer and represents the fastest speed at which the CPU can be reliably operated. The Intel 8088 processor, as used in the original IBM PC, had a

clock speed of 4.77 MHz. Today's processors have clock speeds that run up to and, in some cases, exceed 750 MHz.

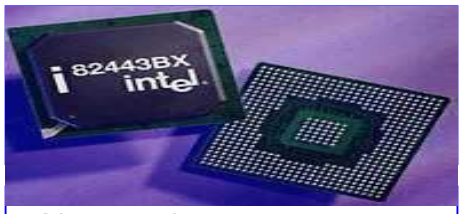
Main Processor manufactures Company :

- Intel (Intel, Intel Celeron)
- Xeon
- AMD Athlon

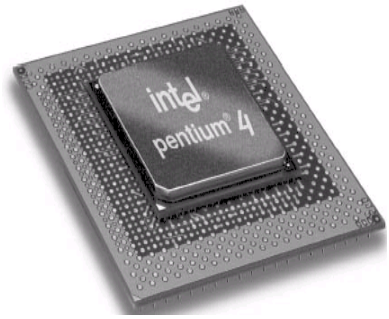
Main processor Package:

- PGA or ZIF
- SEC

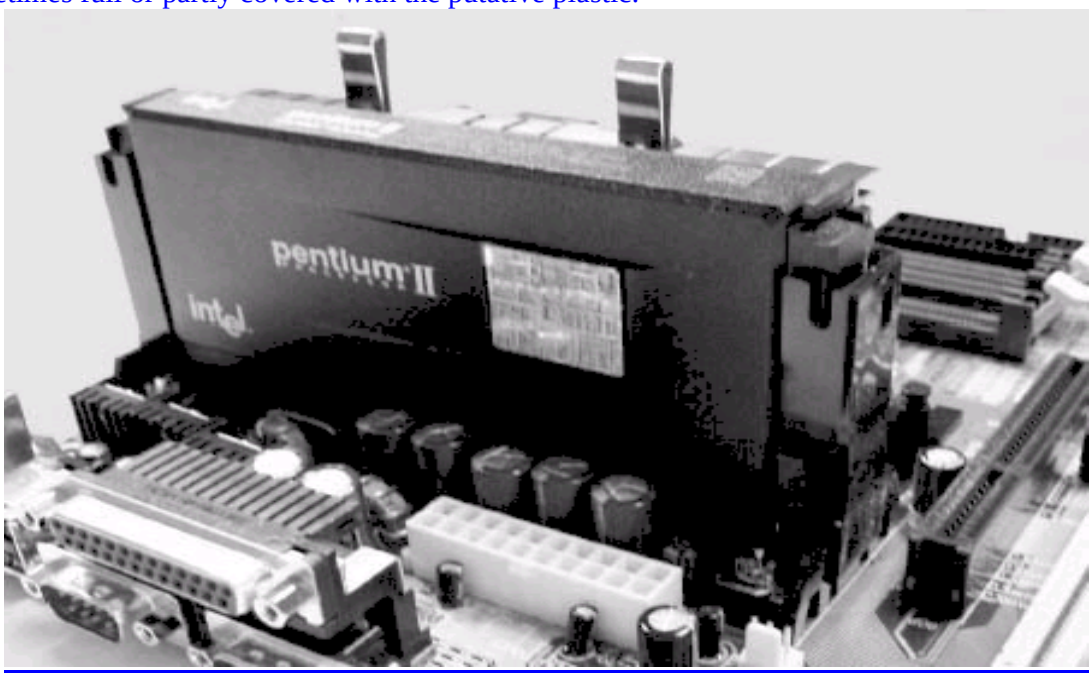
PGA: Pin Grid Array is square and roughly (around) 2.5" length and width. This package also knows as a ZIF (Zero Insertion Force) in this package all of the processor pins are directly mounted on the motherboard. These sockets no define the number of the pin of the processor.



PGA or ZIF=478



SEC: Single Edge Contact is rectangular and roughly (about, around) 2.5" tall and 5" length. In this package processors all pin are takes places on the bottom side of the processor. This package is sometimes full or partly covered with the putative plastic.



Note: *Package is the place where we place the processor.*

CPU voltage: Old processor was run at 5 volt and 3.3 volt but modern processor run at 3 volt.

Heat sink and fan assembly: At the time of processing data the processor becomes heat. The heat is absorbed by the heat sing and fan or cooler protect the processor from the heat.

Liquid cooling system: The liquid cooling system is same of car engine. These types of cooling system are used only on Xeon processor.

Major Processor Specification:

- 4004 = 4 bit data at a time
- 8008 = 8 bit data at a time
- 8086 = 8 bit data at a time
- 8088 = 8 bit data at a time
- 80186 = 16 bit data at a time
- 80286 = 16 bit data at a time
- 80386 = 32 bit data at a time
- 80486 = 32 bit data at a time
- 80586 = 32 bit data at a time
- Pro = 32 bit data at a time
- Pentium = 32 bit data at a time
- Pentium I = 32 bit data at a time
- Pentium II = 32 bit data at a time
- Pentium III = 32 bit data at a time
- Pentium IV = 32 bit data at a time

Major Processor Package

Socket	Pins	Volt	CPU
Socket 1	169	5V	486 SX
Socket 2	236	5V	486DX, DX_2, DX_3
Socket 3	237	3V/5V	486X, DX_2, DX_4
Socket 4	273	5V	60/66MHz (Pentium)
Socket 5	320	3V	75/90/100 MHz (Pentium)
Socket 6	335	3V	486 DX_4
Socket 7	321	2.5V/3.5V	75/90/10 MHz
Socket 8	378	2.5V	Pentium Pro
Slot 1	242	3.0V	Pentium II and III
Slot 2	330	3.0V	Pentium II and III Xeon
Socket -370	370	3.0V	Pentium III Celeron
Socket -423	423	3.0V	Pentium IV
Socket – 478	478	3.0V	Pentium IV
Socket A	462	3.0V	AMD Athlon
Slot A	242	3.0V	AMD Athlon

Notes:

- The CPU—a microprocessor—is the centerpiece of today's computers.
- Clock speed is only one determining factor in identifying overall performance of a processor.
- Processors are generally defined by their speed, the size of the external data bus, and the size of the address bus.
- The development of the 80286 processor introduced the concepts of real and protected modes and allowed the use of up to 16 MB of memory.

- The development of the 80386 processor brought about 32-bit processing and allowed up to 4 GB of memory.
- The 80486 processor is a "souped-up" version of the 80386 and it introduced the use of cache memory.
- The Pentium chip began a new line of processors and technology, incorporating RISC and true multithreading capabilities in an Intel microprocessor for the first time.
- The Pentium II chip further extended the power of the PC and introduced a new packaging method that made handling the CPU and performing upgrades much simpler.
- The Intel Pentium III further extended PC performance with advanced cache technology and streamlined code handling.
- Today's standard processor is the Pentium IV, with processor speeds of 2.5 GHz and faster (Core2 Deo, Dual Core is also standerd & best quality Processor.)

Display system :

The display system is main out put system of computer. Normally we have to use display using display adopter (VGA) and monitor.

1. LCD or CRT
2. Monitor size and resolution
3. Acceleration and multimedia

LCD or CRT

LCD flat panels for desktop use have obsoleted CRTs because of their advantages; however, you can purchase a new or used CRT for peanuts. Flat panels take up less room on the desk; emit less radiation and use less current. Best yet, they provide a very crisp and pleasing display.

Two recommendations for LCD displays. Firstly, purchase a monitor and display adapter that are both DVI (digital). Then, the signals will be created in digital and remain digital. Otherwise, signals are created in digital, converted to analog and then back to digital again. Even though most flat panels come with both VGA (analog) and DVI (digital) inputs, most computers still come with analog VGA output and require installation of a third-party DVI display adapter to keep everything digital.

Secondly, be sure that the flat panel display's maximum resolution is the one you want to work with all the time. The sharpest resolution on an LCD display is its maximum resolution .

Beware a too-good-to-be-true ad for a computer with a "flat screen." CRT screens became flatter over the years, providing more uniform sharpness at the edges. A "flat screen" may mean a CRT, not a "flat panel" LCD screen.

Monitor Size and Resolution

The standard resolutions are 640x480, 800x600, 1024x768, 1280x1024 and 1600x1200, the latter three being the most commonly used. For example, 1024x768 means there are 1,024 columns and 768 rows of pixels on screen. The higher the resolution, the more material is viewable on screen; however, a high resolution on a small screen makes text very small.

The graphical user interface (GUI) on today's computers simulates an office desktop, but when is the last time you worked at a desk one foot wide? Computer stores may advertise a 15" monitor as part of a package, but a 17" monitor is really bare minimum for viewing.

CRT Monitor:

CRT stands for *cathode ray tube*, describing the technology inside an analog computer monitor or television set. A CRT monitor or TV is readily recognizable by its bulky form. LCD monitors and plasma television sets, or flat panel displays, use newer digital technologies.

The CRT monitor creates a picture out of many rows or lines of tiny colored dots. These are technically not the same thing as pixels, but the terms are often used interchangeably. The more lines of dots per inch, the higher and clearer the resolution. Therefore 1024 x 768 resolution will be sharper than 800 x 600 resolution because the former uses more lines creating a denser, more detailed picture. Higher resolutions are important for displaying the subtle detail of graphics. For text, resolution isn't as critical.

LCD Monitor

LCD stands for *Liquid Crystal Display*, referring to the technology behind these popular flat panel monitors. An LCD monitor is distinguishable from a traditional CRT monitor as the latter has a bulky footprint with a depth of several inches and a weight of 30 - 50 pounds (13 - 23 kilograms) or more, while LCDs are commonly 1 - 3 inches (2.5 - 7.5 cm) thick and weigh less than 10 pounds (4.5 k).

LCD displays were used on laptop computers before the technology improved enough to make the jump to desktop monitors. An LCD monitor consists of five layers: a backlight, a sheet of polarized glass, a "mask" of colored pixels, a layer of liquid crystal solution responsive to a wired grid of x, y coordinates, and a second polarized sheet of glass. By manipulating the orientations of crystals through precise electrical charges of varying degrees and voltages, the crystals act like tiny shutters, opening or closing in response to the stimulus, thereby allowing degrees of light that have passed through specific colored pixels to illuminate the screen, creating a picture.

Format:

Format is the process of changing the logical structure of hard disk. We can format hard disk in two ways one is high level formatted and another is low level format.

Low-Level Formatting

Low-level formatting means creating all the sectors, tracks, cylinders, and head information on the drive, and this is the third step in installing hard disk drives; generally, it applies only to older drives. Low-level formatting by the end user has virtually been eliminated with today's drives (it's done at the factory).

A low-level format performs three simultaneous functions:

- It creates and organizes the sectors, making them ready to accept data.
- It sets the proper interleave (records the sector header, trailer information, and intersector and intertrack gaps).
- It establishes the boot sector.

Every hard disk drive arrives from the factory with bad spots on the platters. Data cannot be written to these areas. As the sectors are being created, the low-level format attempts to skip over these bad spots. Sometimes, it is impossible to skip over a spot, so the sector is marked as "bad" in the ID field.

High-Level Formatting

The high-level format is simply called **Format** (the program used to perform a high-level format is called FORMAT. COM). This is the same format command used to prepare floppy disk drives. The high-level format performs two major functions:

- It creates and configures the file allocation tables (FATs).
- It creates the root directory, which is the foundation on which files and subdirectories are built.

File Allocation Tables

The base storage unit for drives is a sector. Each sector can store between 1 byte and 512 bytes of data. Any file less than 512 bytes is stored in a single sector, and only one file can be assigned a sector. Therefore, any part of a sector left unfilled is wasted. When files are stored in more than one sector (if they are greater than 512 bytes), MS-DOS needs a way to keep track of each location and the order in which data is stored. MS-DOS also needs to know which sectors are full and which sectors are available for data, so it uses the FAT to keep track of this information.

There are several versions of FAT, as well as other disk allocation schemes used by operating systems like Windows NT, 2000, and various versions of LINUX and UNIX. We will consider these versions in later chapters as we examine operating system issues. For our current discussion we will focus on the basics of FAT to show how data is stored on a disk drive. All operating systems must use some well-defined method of writing, addressing, and reading data in a way that is compatible with the drive technology being used. In some cases, as with SCSI drives, the hardware may actually "pretend" to use a system like FAT but translate its own addressing scheme into FAT when it communicates with the operating system.

The FAT is simply an index that keeps track of which part of the file is stored in which sector. Each partition (or floppy disk) has two FATs stored near the beginning of the partition. These FATs are called FAT #1 and FAT #2. They are identical. Each FAT can be looked at as a two-column spreadsheet.

Left Column	Right Column
Gives each sector a number (in hex) from 0000 to FFFF (65,536 sectors). The left side contains 16 bits (4 hex characters = 16 bits). This FAT is called a 16-bit FAT. Floppy disk drives use 12-bit FATs because they store substantially less data.	Contains information on the status of the sector. During formatting, any bad sectors are marked with a status code of FFF7 and good sectors are marked 0000.

Sectors and Clusters

As mentioned, the CHS values limit the maximum size of a hard disk drive to 504 MB under the older PC operating systems. The 16-bit FAT can address 64,000 (2^{16}) locations. Therefore, the size of a hard drive partition should be limited to 64,000 × 512 bytes per sector or 32 MB. With this limitation, you might ask, how are larger hard drives possible?

There are two solutions to this problem. The first method, used with earlier drives (under 100 MB), was to use fdisk to break the drive up into multiple partitions, each less than 32 MB.

The second method is called *clustering*. Clustering means combining a set of contiguous sectors and treating them as a single unit in the FAT. The number of sectors in each cluster is determined by the size of the partition. There can never be more than 64,000 clusters. To determine the number of sectors in a partition, divide the number of bytes in the partition by 512 (bytes per sector). Then divide the number of sectors by 64,000 (maximum allowable clusters). The following table provides an estimate of sectors per cluster.

Partition (in MB)	Total Bytes	Total Sectors	Sectors per Cluster	Bytes per Cluster
32	33,554,432	65,536	1	524
64	67,108,864	131,072	2	1,049

128	134,217,728	262,144	4	2,097
256	268,435,456	524,288	8	4,194
512	536,870,912	1,048,576	16	8,389
1,000	1,048,576,000	2,048,000	32	16,384
2,000	2,097,152,000	4,096,000	64	32,768
4,000	4,194,304,000	8,192,000	128	65,536

How the File Allocation Table Works

When a file is saved:

1. MS-DOS starts at the beginning of the FAT and looks for the first space marked "open for use" (0000). It begins to write to that cluster.
2. If the entire file can be saved within that one cluster, the code FFFF (last cluster) is placed in the cluster's status field and the filename is added to the directory.
3. The cluster number is placed with the filename.
4. If the file takes more than one cluster, MS-DOS searches for the next open cluster and places the number of the next cluster in the status field. MS-DOS continues filling and adding clusters until the entire file is saved.
5. The last cluster then receives the end-of-file code (FFFF).

FAT32

Windows 95 (OSR2—the final version of Windows 95, available only on new machines, also called version C), Windows 98, and Windows Me support the new FAT32 file system. FAT32 can create partitions of up to 2 terabytes (TB; equivalent to 2 trillion bytes) in size (much larger than the 2-GB limit of FAT16) and uses smaller clusters than FAT16. This results in a more efficient use of space on a large hard disk.

When deciding whether to use FAT32, take the following into consideration:

- Don't use advanced file allocations systems (FAT32, NTFS) on any partition shared by other operating systems unless they can specifically support it.
- MS-DOS, Windows 3.*x*, the original release of Windows 95, and Windows NT clients can read FAT32 partitions shared across a network.
- If you dual boot between Windows 98 and another operating system (such as Windows NT 4.*x*), the drive C partition cannot be FAT32.
- You cannot compress FAT32 partitions.
- Windows 98 MS-DOS mode fully supports FAT32, so you can run most MS-DOS-mode games and applications from FAT32 partitions.
- Some older applications written to FAT16 specification might not display disk space larger than 2 GB.
- Do not use any utilities that do not support FAT32. This could result in data loss and might corrupt the file system on the hard drive.

Operating System:

Operating System may be defined as a master control program that provides interface to on user. Manage Hardware and different other activities.

Types of Operating System:

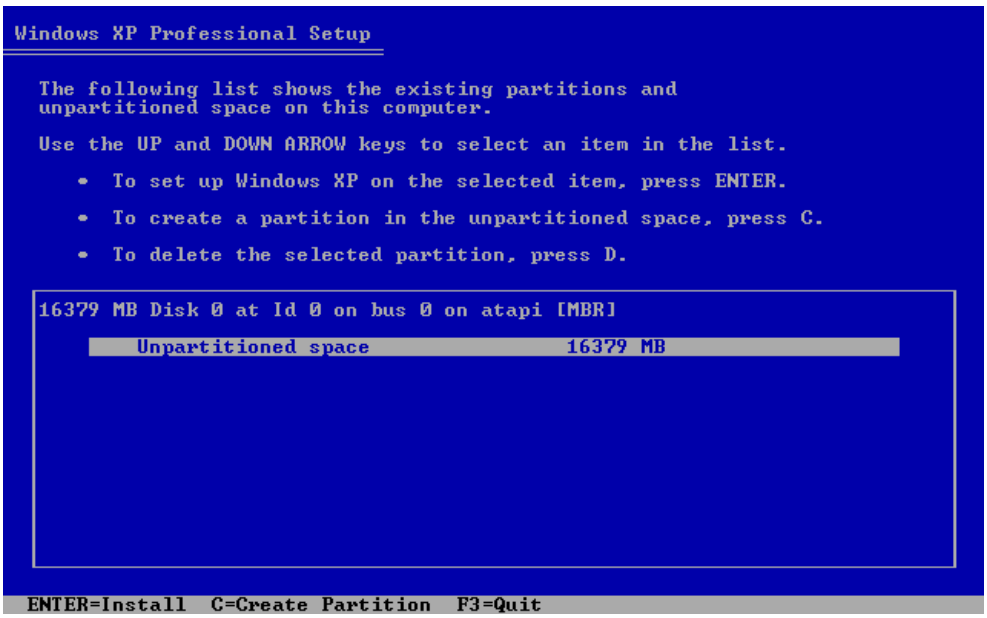
1. Windows - 3.x 3.0 3.I 3.II
2. Windows - 95/ 98 / 2000 / 2003...
3. Windows - Server / Advanced Server
4. Windows XP (Extra Professional) -2000/2005…
5. Linux
6. Unix
7. Novell

Computer formatting & OS Installing process of windows XP

Partitioning A Blank Hard Drive During XP Installation

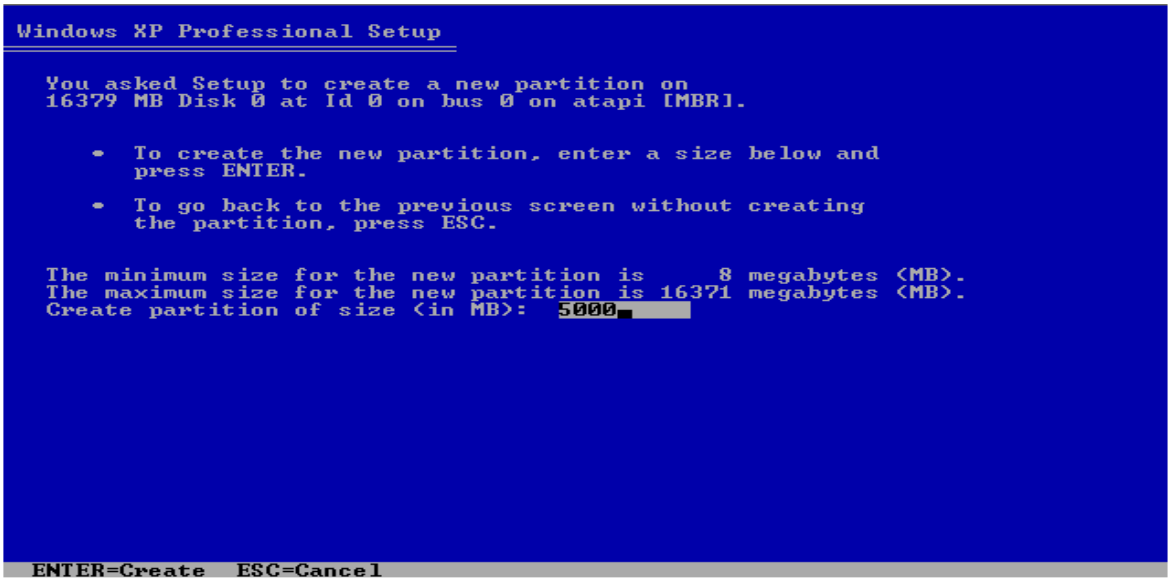
The assumption here is the partition scheme will be created on a hard drive using a bootable Windows XP CD. After booting from the CD and the initial setup files have loaded the screen in Fig. 01 will be displayed. If there is no existing operating system on the drive the space will be listed as Unpartitioned in the lower half of the screen. If there is an operating system installed, the existing partitions will be listed in the lower half of the screen. Selecting an existing partition and using the D key will delete it, along with any data and program files it contains. From this point there are a number of different partitioning possibilities.

If ENTER is pressed the entire unpartitioned space (in this case, 16379MB) will be used to create a C: partition. There will be no other options offered and the process will move forward to where you'll be asked to choose what file system will be used to format the partition.

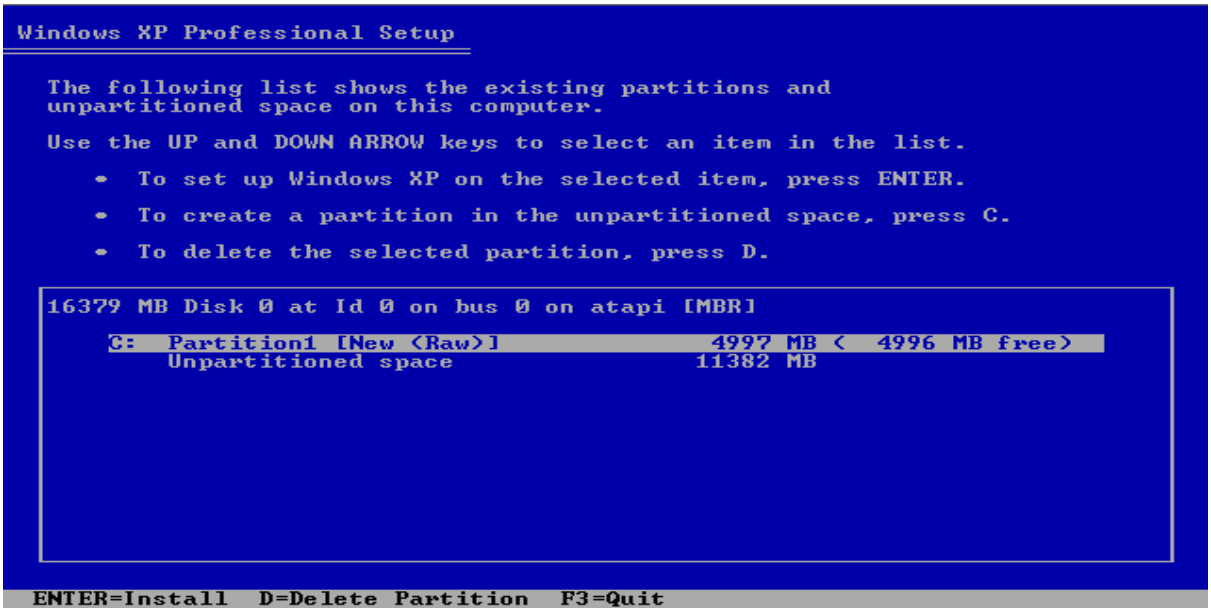


If the C key is pressed to create a partition in the unpartitioned space you will be taken to the screen shown in Fig. 02 where a custom size partition may be created. The minimum and maximum sizes

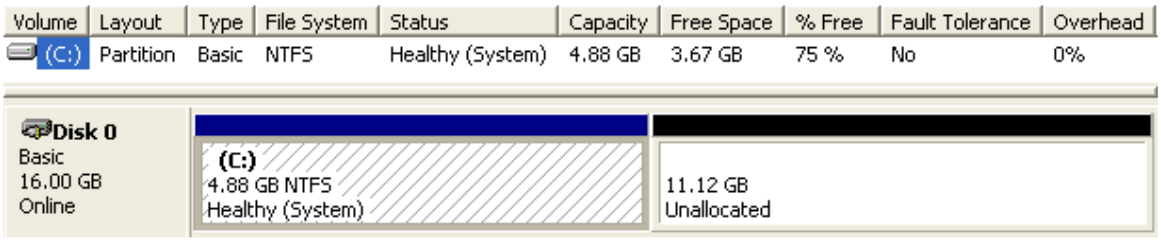
allowed for the new partition are displayed for easy reference along with a line where the new partition size is entered. In this case I changed the default to 5000MB but any size may be entered that falls between the minimum and maximum allowed. Pressing Enter completes the creation process for that partition and returns you to the Fig. 01 screen.



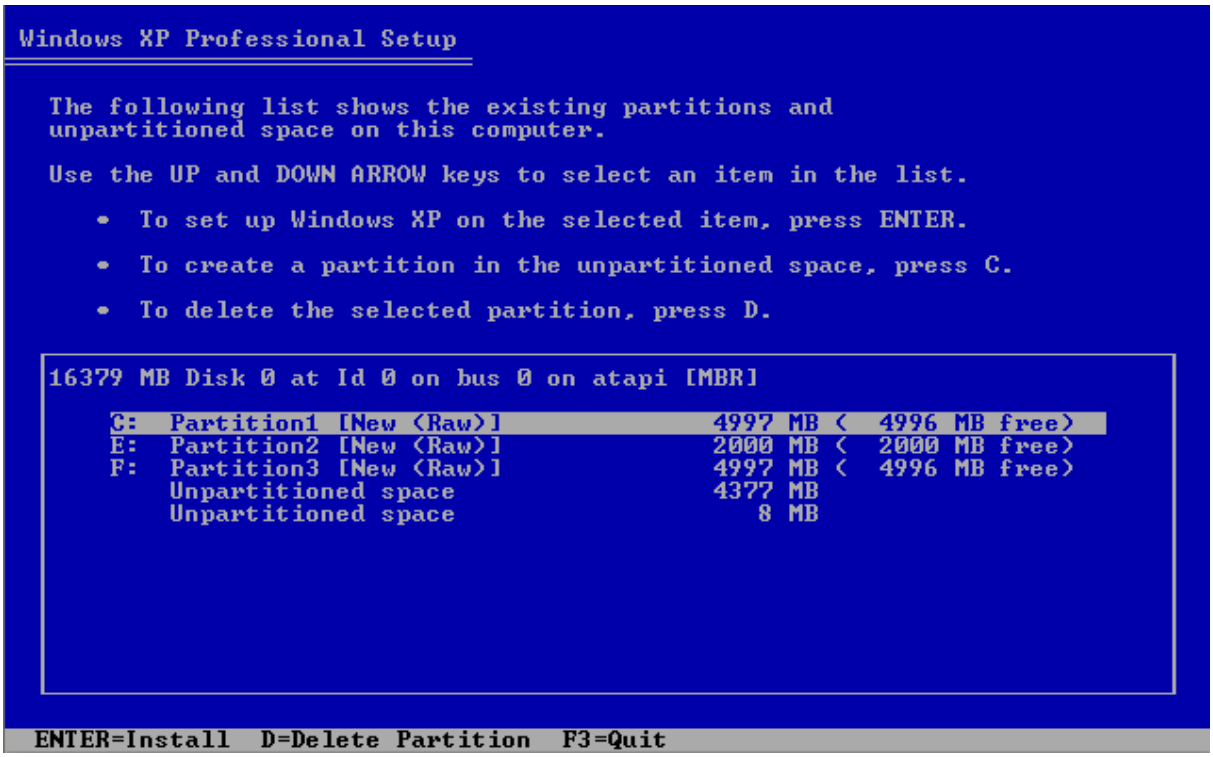
As you can see in Fig. 03 there is now a C: partition that is defined as Partition 1 and is 4997MB in size even though the size I entered in Fig. 02 was 5000MB. There's a reason why the sizes vary but it's outside the scope of this article so just accept that this is the way things work. If it's critical that you have a partition that's precisely sized, use the D key option to delete the partition then go in and try a slightly larger/smaller size than was entered previously. There's no guarantee you'll ever hit the partition size right on the nose but you should be able to get relatively close.



If the partitioning process was stopped at this point, the newly created C: partition highlighted, the ENTER key selected and the installation of XP allowed to complete you would end up with a partitioning scheme as shown in Fig. 04 below. While this is a very elementary partitioning scheme it's not without some merit. The most important aspect of this scheme is that rather than committing the entire hard drive space to partition C:, it leaves the balance of the free space as Unallocated so it can be effectively divided up into additional Primary or Logical partitions after XP is installed.

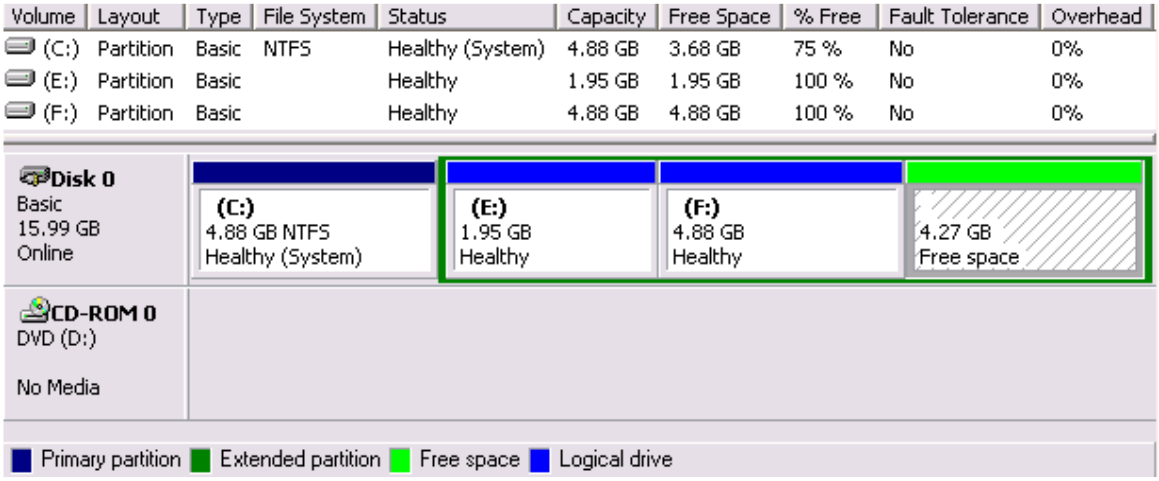


However, suppose you already have a partitioning scheme in mind that's a bit more extensive? Rather than merely having a C: partition you'd like to have additional partitions created. Simple enough. Refer back to Fig. 03 and rather than selecting the ENTER key, use the down arrow key to highlight the Unpartitioned Space entry and then press the C key. Once again you'll enter the size of the desired partition and hit Enter. Repeat the process as many times as needed until all the partitions have been created or you run out of Unallocated space. In Fig. 05 I have created two additional partitions (E: and F:) and there remains 4377MB of Unpartitioned Space that could be used for additional partitions.



I stopped at this point, highlighted the newly created C: partition, selected the ENTER key and allowed the installation of XP to complete, ending up with a partitioning scheme as shown in Fig. 06 below. If you compare Fig. 04 with Fig. 06 you'll see some differences that are worth noting.

- There is no difference between the C: partitions. Both are 4.88 GB, NTFS Primary partitions designated as System.
- Once the first partition has been created, in this case C:, subsequent partitions created will be placed within an Extended partition and created as Logical drives. In the screen capture below they are identified by the brighter blue color and assigned drive letters E: and F:. You have no control over the drive letter assignment nor the fact the partitions will be logical drives.
- Once an Extended partition has been created any Unpartitioned space left on the drive will no longer be left as Unallocated as in Fig. 04 above, but will now be identified as Free Space and contained within the Extended partition. Again, you have no option available to modify this default behavior.



Advantages and Disadvantages of Partitioning Method

Advantages

- Quick
- Simple to use and understand
- Uses the built in partitioning utility supplied with Windows XP

Disadvantages

- Only available when installing from the CD or a network location.
- Lack of advanced control features for creating anything other than very elementary partition schemes.

Reformatting your Windows XP computer or OS Installetion Process (windows XP)

Reformatting your Windows XP computer will erase everything on your hard drive and reinstall the operating system. To avoid losing your data (documents, pictures, music, etc.), you will want to backup your information prior to reformatting. After you have reformatted your computer, you will need to reinstall all of your personal data, as well as any software products you may use (for example, Microsoft Office, iTunes, Symantec AntiVirus, etc.).

Reformatting your Windows XP computer has three main parts:

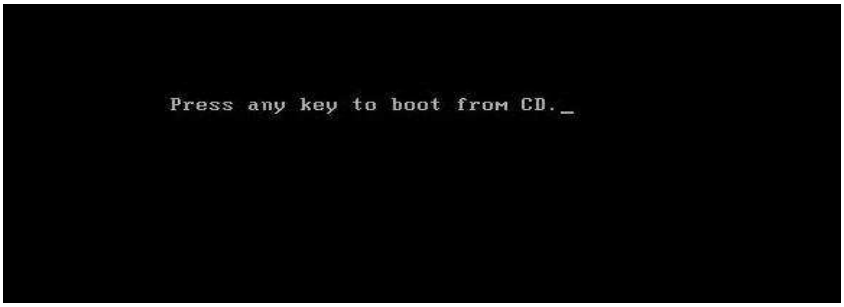
- Reformatting the computer from your operating system CD.
- Reinstalling the drivers that came with your computer.
- Running Windows Update to reinstall all security updates and patches.

NOTE: If you have a network connection, please unplug from the network **before** starting installation.

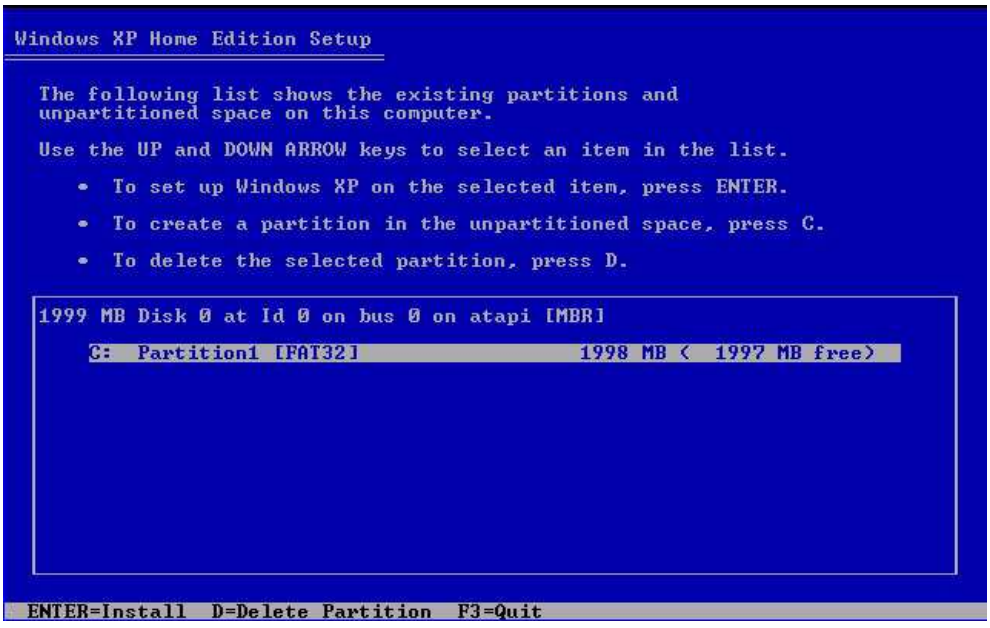
1. First, make sure that your computer is set to **Boot to CD**. This is a different procedure depending on your computer. When your computer first boots look for an option to enter the BIOS settings. Under the BIOS settings find the "Boot Order" and make sure the CD-ROM is set to boot first.

2. With the Windows XP CD in the CD-ROM drive, save your BIOS settings and exit.

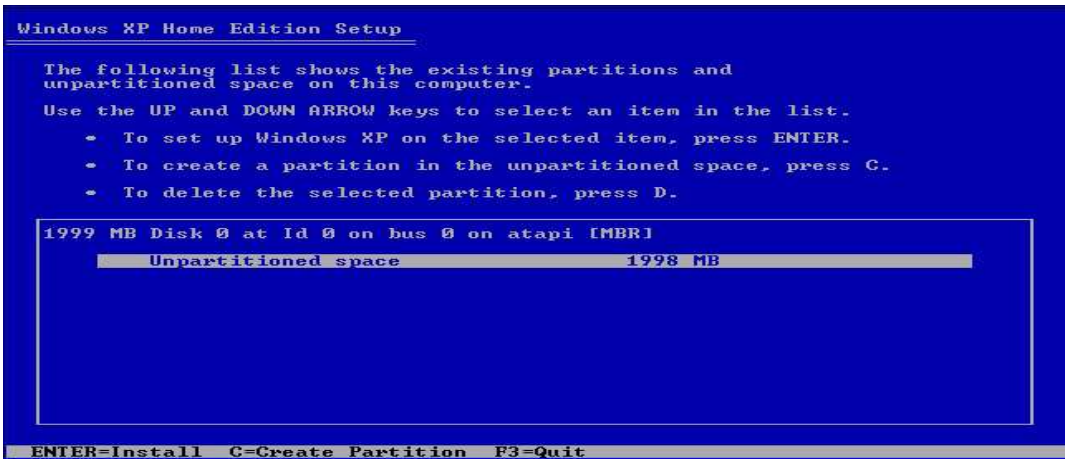
3. If you've done everything correctly you should be asked to "Press Any Key to Boot from CD".



4. After installing the necessary setup files, Windows XP will display your partitions. Delete any existing partitions by selecting the desired partition with the arrow keys, press **D** to delete and then **L** to confirm the deletion.



5. You should now have only one option, "Unpartitioned Space". Press **Enter** to install Windows XP to the unpartitioned space.

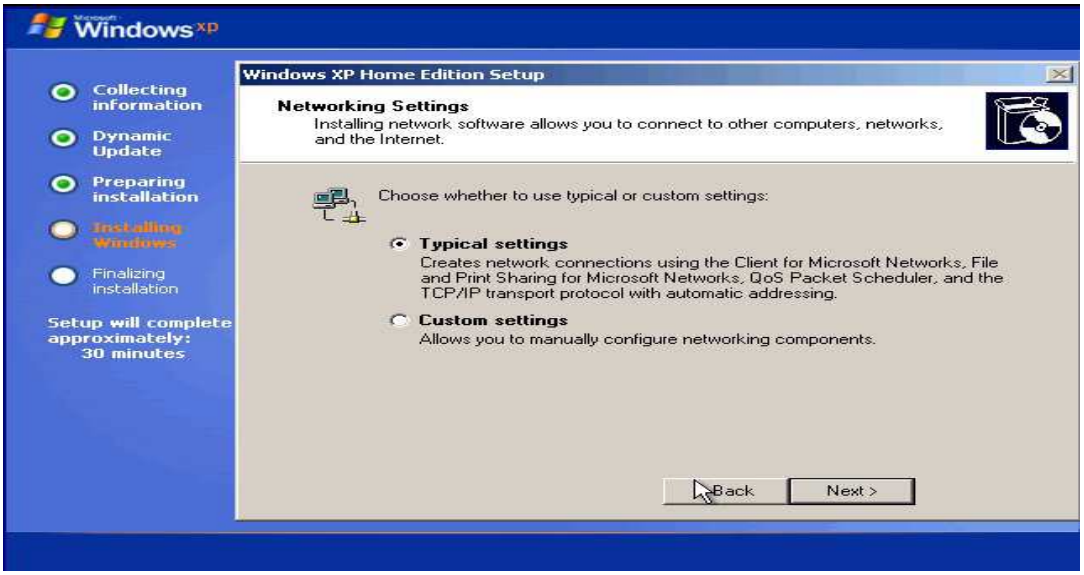


6. When asked how you would like to format the partition, select "Format using the NTFS file system".

7. After the partition is formatted, Windows XP will begin installation. The computer will reboot. While the computer is rebooting, please do not touch any keys. From now on the screens will look like the following:

8. Enter your product key. If you purchased Windows XP from the IMU Bookstore, the product key will be located on the back of the sleeve your CD came in. If you are reformatting using a Windows XP CD that came with your computer, the product key may be located on a sticker somewhere on your computer case.

9. When asked for Network Settings, choose "Typical Settings".



10. Windows XP will now complete installation. Upon completion you will need to re-install the drivers for your hardware (Modem, Sound, Video, etc). Many PC companies such as Dell, Gateway, and HP will include a "Driver Installation CD" with the computer. Simply insert the CD and follow the instructions. Otherwise, you can download current drivers from many

manufacturer's support web sites.
11. Next turn on the Internet Connection Firewall. Instructions to turn on the Internet Connection Firewall can be found

12. Reconnect your computer to the Network.

13. Run Windows Update by opening Internet Explorer, then clicking on Tools -> Windows Update. Follow the on-screen instructions for installing critical updates.

14. Restart your computer.

After creating partition, formatting disk & installing Operating system then we need to install Hardware Driver software (VGA, Sound, NIC, and others situated driver), Security software (Antivirus), Utility software and Application software when we need.

Computer Managements

1. Managing Users

- When you open Computer Management, you will tabs and functions on the left side. To manage user accounts, open the "Local Users and Groups" tab and select the "Users" option. A list of all user accounts set up on your computer will be displayed on the right side of the window. You can create a new user account by right-clicking anywhere in the window and selecting the "New User" option. Then enter the desired user name and password and click "OK" to add the account to the user list. If you need to delete a user account, right-click on the user name, choose "Delete" and confirm your decision in the dialog box. If a user on your computer is having difficulty logging in, you can right-click on the appropriate user name in Computer Management and choose the "Set Password" option. Then enter a new password for the account and save the changes.

Configuring Drives and Partitions

- The Disk Management tab in the Computer Management window gives you the ability to control hard drives connected to your computer. When you click on the Disk Management tab, a list of all the hard-drive volumes and partitions recognized by your computer will be displayed. If one of the drives is not showing up in the My Computer window, you can right-click on it here and choose "Assign Drive Letters or Paths." Choose an unused letter to assign to the drive, and Windows will recognize it the next time you open My Computer. If you want to remove all the data from a specific hard drive or partition, you can right-click on the item and choose the "Format" option. When you right-click on a volume and select "Properties," a window will open that contains information about the drive.

Managing Services

- At the bottom of the Computer Management window, you will see a tab labeled "Services." Clicking here will bring up a long list of all the system services installed on your computer. You should use this function if a program on your computer is not working properly and you have exhausted other troubleshooting methods. Scroll down to the application or service that is not functioning correctly and right-click on it. Then choose the "Restart" option to instruct Windows to reboot the selected process. Right-clicking on a service's name and selecting "Properties" will open a window with information about the service's use and purpose.

Troubleshooting

Monitor

Here is some basic trouble shooting tips for new monitors:

1. **The picture does not appear**
   - Check to make sure the signal cable is firmly connected in the socket.
   - Check to see if the computer system's power is ON.
   - Check that the Brightness Control is at the appropriate position, not at the minimum.
2. **The Screen is not synchronized**
   - Check to make sure the signal cable is firmly connected in the socket.
   - Check that the output level matches the input level of your computer.
   - Make sure the signal timing of the computer system is within the specification of the monitor.
3. **The position of the screen is not in the center**
   - Adjust the H-Size, H-Phase or V-Size, V-Center controls.
   - Check if the signal timing of the computer system is within the specification of the monitor.
4. **The screen is too bright or too dark**
   - Check if the Brightness or contrast control is at the appropriate position, not at the maximum or minimum.
   - Check if the specified voltage is applied
   - Check if the signal timing of the computer system is within the specification of the monitor.
   - Especially, check the horizontal frequency.
5. **The screen is shaking**
   - Move all objects that emit a magnetic field, such as a motor or transformer, away from the monitor.
   - Check if the specified voltage is applied.
   - Check if the signal timing of the computer system is within the specification of the monitor.

Hard Disk

Based on Seagate IDE hard drives.

If you have installed your drive and it does not function properly, perform the following **basic checks**:

Warning: Always turn off the computer before changing jumpers or unplugging cables and cards. Wear a ground strap or use other antistatic precautions while working on your computer or handling your drive.

- **Verify compatibility**. Verify that the host adapter and drive are appropriately matched to each other and to your computer. Refer to the relevant documentation for details.
- **Check all cards**. Verify that all cards are seated in their slots on the motherboard and secured with mounting screws.
- **Check all connectors and cables**. Make sure all ribbon and power cables are securely connected. Ribbon cables are easily damaged, especially at the connector. Try a new cable that you know is

good. Make sure no connector pins are bent. Verify that pin 1 on the interface cable is aligned with pin 1 on the drive and host adapter (see Figure 2 on page 6).

- **Verify jumper settings**. Review the instructions in this guide and in your host adapter installation guide. Make sure all appropriate jumpers are installed or removed as necessary.
- **Check your power-supply specifications**. Each time you add a new device to your computer, make sure your cornputer's internal power supply can support the total power demand. If necessary, consult your dealer for a new power supply.
- **Verify the drive-type settings in the system setup program**. The drive-type settings in the system BIOS must not exceed the physical specifications of your drive. Also, the settings must not exceed the limitations set by the operating system and BIOS.
- **Check for viruses**. Before you use someone else's diskette in your system for the first time, scan the diskette for viruses.

After you install your new drive, your computer will not boot, and no error message appears on the screen.

Check your computer manual or BIOS manufacturer to determine whether your BIOS supports drives that have more than 4,092 cylinders. If your system has this limitation, use the following procedure to configure your computer:

a. Turn off your computer, open the case, and remove your new drive.

   CAUTION: To avoid electrostatic discharge damage to your computer or hard drive, make sure you are well grounded before touching the drive, cable, connector or jumpers.

b. Move the jumper on the alternate-capacity jumper, as shown in Figure 6. This causes the drive to appear to your BIOS as having a 2.1-Gbyte capacity (4,092 cylinders, 16 heads, 63 sectors per track). You may need third-party partitioning software, such as Disk Manager, to achieve full capacity of the drive.
c. Remount your drive in the computer and replace the computer cover.
d. Insert a bootable system diskette into drive A and turn on the computer. It should boot from drive A and automatically detect the new drive as a 2.1 -Gbyte drive.
e. Insert your DiscWizard diskette into drive A and type A:XDM. Then press ENTER. This runs the Disk Manager program.
f. Follow the Disk Manager instructions to install the dynamic drive overlay and to partition and format your new drive to its full capacity.
g. After Disk Manager is done, reboot your system. You should see the Disk Manager banner and be able to access the full capacity of your new drive.

- **The screen remains blank when you power up the system.**

If the steps listed above do not remedy this problem, try the following:

- Make sure the monitor is plugged in and turned on.
- Check all cards.
- Make sure the video card is seated in its slot and secured with mounting screws.
- Turn off the computer and remove the drive host adapter. If the screen turns on after you reboot, the host adapter may be incompatible or defective. If so, see your dealer.

- **The system does not recognize the drive.**

- Check all cables.
- Make sure the power supply is adequate for system needs.
- Reboot the computer and listen to make sure the drive motor starts up. If the drive is very quiet, it may be difficult to hear its discs reach operating speed. If the drive motor does not start up, recheck all drive cables.

- Verify that for each drive, a drive-type is listed in the system setup program.
- Try rebooting your computer by pressing the CTRL, ALT and DELETE keys simultaneously. If the drive is recognized after you reboot the system, the computer BIOS test may be completing before the drive is ready.
  One solution is to slow the processor speed during startup. If your computer has a turbo switch, set it to slow speed before turning the computer on. If there is no turbo switch, you may be able to use keyboard commands; see your computer manual for details. After the computer is up and running, return the processor to the fast speed.
  Another solution is to warm-boot your computer after every power-on.
- Check for I/O address conflicts. To isolate the conflict, verify that the drive and host adapter are compatible with your computer. Turn off the computer and remove all the peripheral adapter cards except for the video card and host adapter. If the computer recognizes the drive when you reboot the computer, turn off the computer. Reinstall the other peripheral cards, one at a time, until the conflict reoccurs. After you have isolated the source of the address conflict, you can resolve the conflict by changing the 1/0 address of the peripheral that appears to cause the conflict.
- If Disk Manager has installed the DDO on your hard drive and you have booted directly from a diskette, the information in the boot record for the drive may not have been loaded. Make sure there is no diskette in drive A and reboot. If you want to boot from the diskette, follow the "Booting with a Diskette" instructions under "Advanced Disk Manager Options" on page 20.

- **The dealer partitioned and formatted the drive for you in the store, but the drive does not respond when you install it.**

  - Reboot the computer and make sure the drive spins up.
  - Check all cables.
  - Make sure the power supply is adequate for system needs.
  - Make sure the DOS or Windows version the dealer used to partition and format the drive is the same version you have installed in your computer. If it isn't, see your dealer.
  - Verify the drive-type values in the system setup program. You must install the drive using the same drive-type values your dealer used to partition the drive.
  - Check for 1/0 address conflicts between peripheral cards.
  - Check for viruses.

- **The system hangs in FDISK or fails to create or save the partition record.**

  - Check all cables.
  - Your setup system diskette may be corrupted. Try using a backup diskette.
  - Make the partitions smaller.
  - Change the interrupt jumper setting on the host adapter.
  - Some BIOS have a Track 0 protection feature that protects Track 0 from viruses. This may cause FDISK to hang the system. You must disable this feature in the system setup program before you can use FDISK. See your computer reference guide for assistance. Be sure to re-enable this important feature when FDISK is done.

- **The system error message, "Drive not Ready," appears.**

  - Check all cable connections. Make sure pin 1 of the drive is connected to pin 1 of the hard-disc controller or host adapter.
  - Make sure the power supply is adequate for system needs.
  - Reboot the computer and make sure the drive spins up.

- **The FDISK error message, "No Fixed Disk Present," appears.**

  - Make sure the power supply is adequate for system needs.

- Verify the drive-type values in the system setup program.
- Check for 1/0 address conflicts.

- **The drive does not format to full capacity.**

  - Verify the drive-type values in the system setup program. One of the following problems may have occurred:
  - The values may be set with an incorrect translation characteristic.
  - You may have entered a parameter value that exceeds the physical capacity of the drive.
  - You entered a translation characteristic that does not take full advantage of the drive's capacity.
  - The drive's physical specifications exceed the translation limits imposed by the BIOS.

    CAUTION: If you change the drive-type values in the system setup program, you must partition and format the drive again. **This erases data on the drive.**

  - If you have partitioned the drive into individual logical drives, you may need to make the partitions smaller to access the full drive capacity.
  - If your computer supports LBA mode, you may need to enable LBA mode in the system setup program to access the full capacity of the drive. Refer to your computer's reference guide to find out how to enable LBA.
  - Your computer may not support drives that have more than 4,092 cylinders. Follow the instructions on page 25 for After you install your new drive, your computer will not boot, and no error message appears on the screen.

- **The DOS message "Disk Boot Failure," "Non-System Disk" or "No ROM Basic - SYSTEM HALTED" appears.**

  - Reinstall the DOS system files using the DOS SYS utility.
  - Check all cables.
  - Use FDISK to verify that the primary partition is active.
  - Check for viruses.

- **The system error message, "HDD controller failure" appears.**

  - Confirm the jumper settings on the drive.
  - Verify the drive-type settings in the system setup program.

Sound :

No sound is heard from audio (music) CDs

Various conditions may cause this problem. To troubleshoot, check the following:

- Microsoft Volume Control or your mixer program mute options and volume sliders.
- Connect headphones to the stereo phone jack on your CD-ROM drive’s front panel; adjust the volume control settings on the drive. If there is sound from your headphones, check the CD audio cable connection from the CD-ROM drive to the audio card.
- Ensure the speakers are properly connected to the audio card’s output connector.

Computer hangs or restarts during installation

A hardware conflict may cause the computer to hang or restart during the installation procedure. Check the following to resolve the conflict:

- A hardware conflict with another device in your system.

- Previously installed sound card hardware or software needs to be removed.
- The audio card is not seated in the slot properly.
- PCI bus mastering devices may be interfering with the operation of the audio card. Temporarily remove non-essential PCI bus mastering devices.

Resolving hardware conflicts

Hardware conflicts occur when two or more devices contend for the same resources. Conflicts between your audio card and another device may occur regarding the I/O address, IRQ line, or DMA channel:

1. Right-click the *My Computer* icon on your desktop, and select *Properties*. The System Properties dialog appears.
2. Click the *Device Manager* tab. In the Device Manager, a plus sign(+) represents an expandable list of items. A minus sign (-) represents an expanded list. A circled exclamation mark denotes a conflict.
3. Double-click *Sound, video, game controllers*. A list of multimedia devices appears.
4. Select your audio card.
5. Choose the *Propertis* button.
6. Click the *Resources* tab.
7. Uncheck the *Use automatic settings* option.
8. Change "Settings based on:" if alternate settings are available.
9. Determine the conflict by reviewing the "Conflicting device list".
10. Select the conflicting item in the "Resource Settings" list.
11. Click the *Change Settings* button.
12. Use the mouse to select a new setting.
13. Select OK to close each of the properties windows, and restart your computer.

Audio card is not automatically detected

To manually configure your audio card for Windows 95/98:

a. Click "Start" on the taskbar, and select *Settings* from the Start menu.
b. Select *Control Panel*. The Control Panel group appears.
c. Double-click the *Add New Hardware* icon. The Add New Hardware Wizard dialog appears.
d. Select *Next* to continue.
e. Choose *Yes* to have Windows search for new hardware, then select *Next*
f. Select *Next* to continue.
g. Select *Finish*, and follow the prompts to complete the new hardware installation.

CD does not automatically run when you insert it in the drive

To enable the "Audio insert notification" feature:

1. Right-click the *My Computer* icon on your desktop, and select *Properties*. The System Properties dialog appears.
2. Click the *Device Manager* tab. A list of devices appears.
3. Double-click *CD-ROM*, and select your CD-ROM drive.
4. Choose the *Properties* button. The CD-ROM drive properties dialog appears.
5. Choose the *Settings* tab.
6. Click the "Auto insert notification" option to enable.
7. Select OK until all Properties dialogs are closed, and restart Windows for the changes to take effect.

No sound is heard from speakers

Verify the following:

- Check the Microsoft Volume Control or the Audio Mixer Program mute options and volume sliders.
- Ensure the speakers are properly connected to the audio card's output connector.
- Check the volume control and power connection of the speakers, if they are amplified. (Refer to the speakers documentation for detailed information).
- Ensure a hardware conflict does not exist between your audio card and another device in your system.

- PCI bus mastering devices may be interfering with the operation of the audio card. Temporarily remove non-essential PCI bus mastering devices. If the device is a display card, upgrade the display card drivers, or set the card to the default Windows VGA mode.

Others Troubleshooting tips:

System has no power at all. Power light does not illuminate, fan inside the power supply does not turn on, and indicator light on keyboard does not turn on.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Power cable is unplugged.	Visually inspect power cable.	Make sure power cable is securely plugged in.
Defective power cable.	Visual inspection, try another cable.	Replace cable.
Power supply failure.	Power cable and wall socket are OK, but system is still dead.	Contact technical support
Faulty wall outlet;circuit breaker or fuse blown.	Plug device into socket know to work and test.	Use different socket, repair outlet, reset circuit breaker or replace fuse.

System inoperative. Keyboard lights are on, power indicator lights are lit, and hard drive is spinning.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Expansion card is partially dislodged from expansion slot on the motherboard.	Turn off computer. Take cover off system unit. Check all expansion cards to ensure they are securely seated in slots.	Using even pressure on both ends of the expansion card, press down firmly on expansion card.
Defective floppy disk drive or tape drive.	Turn system off. Disconnect the cables from one of the floppy drives. Turn on the system, check to see if the keyboard operates normally. Repeat until you have located defective unit.	Contact Technical Support.
Defective expansion card.	Turn computer off. Remove an expansion card.	Make sure expansion card is secure in expansion socket.

System does not boot from hard disk drive, can be booted from floppy disk drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Connector between hard drive and system board unplugged.	When attempting to run the FDISK utility described in the HARD DISK section of the manual you get a message, INVALID DRIVE SPECIFICATION.	Check cable running form disk to disk controller on the board. Make sure both ends are securely plugged in; check the drive type in the Standard CMOS Setup (in your motherboard manual).
Damaged Hard Disk or Disk Controller.	Format hard disk; if unable to do so, the hard disk may be defective.	Contact Technical Support.
Hard Disk directory or FAT is scrambled.	Run the FDISK program, format the hard drive(See HARD DRIVE section of manual). Copy your backup data back onto hard drive.	Backing up the hard drive is extremely important. All Hard Disks are capable of breaking down at any time.

System only boots from Floppy Disk. Hard Disk can be read and applications can be used, but booting from Hard Disk is impossible.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Hard Disk boot program has been destroyed.	A number of causes could be behind this.	Back up data and applications files. Reformat the Hard Drive as described in the Hard Drive section of the manual. Re-install applications and data using backup disks.

Error message reading "SECTOR NOT FOUND" or other error messages indication certain data is not allowed to be retrieved.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION

A number of causes could be behind this.	Use a file by file backup instead of an image backup to backup the Hard Disk.	Back up any salvageable data. Then do a low level format, partition, and high level format of the hard drive(see Hard Disk section of your manual for instructions). Re-install all saved data when completed.

Disk formatted on IBM PS/2 will not operate with this system.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
The IBM PS/2 uses a different format than other computers.	IBM PS/2 disk format will not work in an AT type computer.	Format disk in the AT type computer insert disk into the IBM PS/2 and copy the files you wish.

After install an expansion card (network card, tape drive card, etc.) the system no longer works properly.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
No power to monitor.	All or part of the system may be inoperable. The new card may work but a mouse or COM port may not work.	Change the interrupt or RAM address on the new expansion card. See the documentation that came with the new card in order to change pin settings. many expansion devices come with proprietary software that will assist you in doing this.

Screen message says "Invalid Configuration" or "CMOS Failure."

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Incorrect information entered into the configuration (setup) program.	Check the configuration program. Replace any incorrect information.	Review system's equipment. Make sure correct information is in setup.

Screen is blank.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
No power to monitor.	Power connectors may be loose or not plugged in.	Check the power connectors to monitor and to system. Make sure monitor is connected to display card, change I/O address on network card if applicable.
Monitor not connected to computer.		See instructions above.
Network card I/O address conflict.		See instructions above.

System does not boot from hard disk drive, can be booted from floppy disk drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Connector between hard drive and system board unplugged.	When attempting to run the FDISK utility described in the HARD DISK section of the manual you get a message, INVALID DRIVE SPECIFICATION.	Check cable running form disk to disk controller on the board. Make sure both ends are securely plugged in; check the drive type in the Standard CMOS Setup (in your

Problem

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Memory problem, display card jumpers not set correctly.		Reboot computer. Re-install memory, make sure that all memory modules are installed in correct sockets. Check jumper and switch settings on display card. See display card section for information of settings.
Computer virus.		Use anti-virus programs (McAfee/PC-cillin, E-port, etc) to detect and clean viruses.

Screen goes blank periodically.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Screen saver is enabled.		Disable screen saver.

Keyboard failure.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Keyboard is disconnected.		Reconnect keyboard. Check keys again, if no improvement, replace keyboard.

No color on screen.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Faulty Monitor.		If possible, connect monitor to another system. If no color, replace monitor.
CMOS incorrectly set up.		Call technical support.

Floppy drive lights stays on.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Floppy Drive cable not connected correctly.		Reconnect floppy cable making sure PIN1 on the Floppy Drive corresponds with PIN1 on floppy cable connector.

Error reading drive A:

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Bad floppy disk.		Try new floppy disk.
Floppy disk not formatted		Format floppy disk(type ENTER)

C: drive failure.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
SETUP program does not have correct information.		Boot from drive A: using DOS system disk. Input correct information to SETUP program.
Hard Drive cable not connected properly.		Check Hard drive cable.

Cannot boot system after installing second hard drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Master/Slave jumpers not set correctly.		Set master /Slave jumpers correctly.
Hard Drives not compatible / different manufacturers.		Run SETUP program and select correct drive types. Call drive manufactures for compatibility with other drives.

Missing operating system on hard drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
CMOS setup has been changed.		Run setup and select correct drive type.

Certain keys do not function.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Keys jammed or defective.		Replace keyboard.

Keyboard is locked, no keys function.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Keyboard is locked.		Unlock keyboard

Cases and Power Supplies

- The most important part of a computer case is its power supply. Unfortunately, it's also the part that has

most of the problems for a case. There are two situations when a new power supply may appear dead on arrival (DOA) when they are actually working as described below:

- Most cases and power supplies these days are made and tested in China and other Asian countries where 220V electricity is used. Desktop computer power supplies do not switch the power voltage automatically. (Most notebook computers do!) If the factory forgets to turn the manual switch back to 110V for the North American market after testing, the power supply would appear DEAD if you use on a 110V-outlet. Therefore, ***always check the voltage setting on the back of a new power supply FIRST*** if it appears dead.

- Do not expect an ATX power supply to work by simply plugging the power and turning on the switch. ATX power supplies are soft-switched on and off by the motherboard and BIOS. Therefore, you must plug it to a working motherboard with a working microprocessor, memory and video card to work. If your computer does not turn on after you turn on the power switch, it may not necessarily mean a dead power supply. ***The problem might be with the motherboard, microprocessor, memory or video card instead.*** You must examine all these components to isolate the problem.

- The most effective technique to tell if a power supply is causing any problem is to use a different one to see if it solves the problem. If everything works with a different power supply, then the new power supply is most likely the troublemaker. Alternatively, you can plug the new power supply to an existing, working computer to see if it works there.

- Computer cases are highly modular. If your computer case is still under warranty, you don't have to send the entire case back if only one part of it is defective. For instance, send only the power supply back for exchange if only power supply is dead. The same is true for the face panel and cover. This would save you quite a bit of shipping and sometimes downtime.

- More than 70% of all computer problems are related to cabling and connections. Ensure that you all the power plugs are connected firmly, including power connections to your motherboard and all the drives.

- Make sure the cooling fan inside the power supply is working all the time. Reach out to feel the fan behind your case often. Clean the fan if necessary. If your case feels warmer than room temperature, check the power supply fan first. Most power supply fans are difficult to replace. You are better off to replace the entire power supply since the new one comes with a brand-new warranty.

How to partition and format a hard disk in Windows XP

How to partition and format your hard disk by using the Windows XP Setup program

Important If you follow these steps on a hard disk that is not empty, all the data on that hard disk is permanently deleted. We recommend that you back up your hard disk before you follow these steps.

To partition and format your hard disk by using the Windows XP Setup program:

1. Insert the Windows XP CD-ROM into your CD-ROM drive or DVD-ROM drive, or insert the first Windows XP Setup disk into the floppy disk drive, and then restart the computer.

Note To start your computer from the Windows XP CD-ROM (or from the startup disk), your computer must be configured to start from the CD-ROM drive, the DVD-ROM drive, or the floppy disk drive. In some cases, you may have to modify your computer's BIOS settings to set this configuration. For information about how to configure your computer to start from the CD-ROM drive, the DVD-ROM drive, or the floppy disk drive, see the documentation that is included with your computer, or contact the computer manufacturer.

2. If you are starting the computer from the Windows XP CD-ROM, select any options that are required to start the computer from the CD-ROM drive if you are prompted to do this.

Note If your hard disk controller requires a third-party original equipment manufacturer (OEM) driver, press F6 to specify the driver.

For additional information about how to use F6 to supply a third-party OEM device driver while the Windows Setup program is running, click the following article number to view the article in the Microsoft Knowledge Base:

314859 Limited OEM driver support is available with F6 during Windows XP Setup If you are starting from the Windows XP Setup disks, insert each of the additional disks when you are prompted, and then press ENTER to continue after you insert each disk.

3. At the Welcome to Setup page, press ENTER.

4. Press F8 to accept the Windows XP Licensing Agreement.

5. If an existing Windows XP installation is detected, you are prompted to repair it. To bypass the repair, press ESC.

6. All the existing partitions and the unpartitioned spaces are listed for each physical hard disk. Use the ARROW keys to select the partition or the unpartitioned space where you want to create a new partition. Press D to delete an existing partition, or press C to create a new partition by using unpartitioned space. If you press D to delete an existing partition, you must then press L (or press ENTER, and then press L if it is the System partition) to confirm that you want to delete the partition. Repeat this step for each of the existing partitions that you want to use for the new partition. When all the partitions are deleted, select the remaining unpartitioned space, and then press C to create the new partition.

Note If you want to create a partition where one or more partitions already exist, you must first delete the existing partition or partitions, and then create the new partition.

7. Type the size in megabytes (MB) that you want to use for the new partition, and then press ENTER, or just press ENTER to create the partition with the maximum size.

8. Repeat Steps 4 and 5 to create additional partitions if you want them.

9. If you want to install Windows XP, use the ARROW keys to select the partition where you want to install Windows XP, and then press ENTER. If you do not want to format the partition and install Windows XP, press F3 two times to quit the Windows Setup program, and then do not follow the remaining steps. In this case, you must use a different utility to format the partition.

10. Select the format option that you want to use for the partition, and then press ENTER. You have the following options:

- Format the partition by using the NTFS file system (Quick)
- Format the partition by using the FAT file system (Quick)
- Format the partition by using the NTFS file system
- Format the partition by using the FAT file system
- Leave the current file system intact (no changes)

The option to leave the current file system intact is not available if the selected partition is a new partition. The FAT file system option is not available if the selected partition is more than 32 gigabytes (GB). If the partition is larger than 2 GB, the Windows Setup program uses the FAT32 file system (you must press ENTER to confirm). If the partition is smaller than 2 GB, the Windows Setup program uses the FAT16 file system.

Note If you deleted and created a new System partition, but you are installing Windows XP on a different partition, you will be prompted to select a file system for both the System and startup partitions. 11. After the Windows Setup program formats the partition, follow the instructions that appear on the screen to continue. After the Windows Setup program is completed, you can use the Disk Management tools in Windows XP to create or format more partitions.

For additional information about how to use the Windows XP Disk Management tools to partition and format your hard disk, click the following article number to view the article in the Microsoft Knowledge Base:

Computer Management

How to create a new partition or a new logical drive

To create a new partition or logical drive on a basic disk:

1. In the Disk Management window, complete one of the following procedures, and then continue to step 2:
   - To create a new partition, right-click unallocated space on the basic disk where you want to create the partition, and then click **New Partition**.
   - To create a new logical drive in an extended partition, right-click free space on an extended partition where you want to create the logical drive, and then click **New Logical Drive**.
2. In the New Partition Wizard, click **Next**.
3. Click the type of partition that you want to create (either **Primary partition**, **Extended partition**, or **Logical drive**), and then click **Next**.
4. Specify the size of the partition in the **Partition size in MB** box, and then click **Next**.
5. Decide whether to manually assign a drive letter, let the system automatically enumerate the drive, or do not assign a drive letter to the new partition or logical drive, and then click **Next**.
6. Specify the formatting options you want to use by using one of the following procedures:
   - If you do not want to format the partition, click **Do not format this partition**, and then click **Next**.
   - If you want to format the partition, click **Format this partition with the following settings**, and then complete the following procedure in the **Format** dialog box:
     a. Type a name for the volume in the **Volume label** box. This is an optional step.
     b. Click the file system that you want to use in the **File system** box.

     You can change the disk allocation unit size, and then specify whether to perform a quick format, or enable file and folder compression on NTFS volumes.

     Click **Next**.

     7. Confirm that the options that selected are correct, and then click **Finish**.

The new partition or logical drive is created and appears in the appropriate basic disk in the Disk Management window. If you chose to format the volume in step 6, the format process now starts.

How to repair the boot.ini file on Windows XP

1. Insert your Windows XP Disc into your cd-rom drive
2. Boot pc from cd-rom drive
3. When you enter the Setup screen press ‘R’ to enter the recovery consol.
4. Once at the command prompt for the recovery consol type the following command:
   - bootcfg /rebuild <enter>
5. Follow the instruction and when asked “Add installation to boot list? (Yes/No/All)” be sure to type Y and hit enter.

Restoring the NTLDR and Ntdetect.com files from the Windows XP CD

- In order to restore the NTLDR files you must first boot your computer into the Windows XP Recovery Console. Once at the command prompt, type in the following commands:
- copy d:\i386\ntldr c:\
  copy d:\1386\ntdetect.com c:\
- (D: being hour cd rom drive letter and C: being your main hard drive)
- If you are prompted to ovewrite the existing files press Y. At this take out the cd and restart your computer and your problem should be solved.

Repairing the Master Boot Record on a Windows XP Machine

- Filed Under *(Boot Up Issues) by nickc on 29-08-2007*
- You will need your windows xp reinstallation disc. Boot your pc from the cdrom (xp install disk). once the set up screen comes up hit "r" to enter the recovery console.
- At the command prompt type on "fixmbr" and hit the ENTER key.
- The fixmbr utility repairs the naster boot record on the hard drive from which you are booting into windows. This should take care of any corruption or damage that the master boot record may have.

Diagnostics with Beep Codes

- 1 short beep specifies a normal post
- 2 short beeps tells about POST errors that can be find on screen.
- Continuous beeps indicates power supply and other cards errors.
- One long and short beep indicates system board problems
- 3 long beeps defines keyboard errors
- No system beep tells about power supply errors.

AC	alternating current	HRR	horizontal refresh rate
AGP	Accelerated Graphics Port	HTTP	Hypertext Transfer Protocol
ALU	arithmetic logic unit	I/O	input/output
ANSI	American National Standards Institute	IDE	Integrated Device Electronics
ASCII	American Standard Code for Information Interchange	IOR	input/output read wire
ASPI	Advanced SCSI Programming Interface	IOW	input/output write wire
BBS	bulletin board system	ISDN	Integrated Services Digital Network
BIOS	basic input/output system	ISO	International Organization for Standardization (often incorrectly identified as International Standardization Organization)
BPS (bps)	bits per second	ISP	Internet service provider
CAM	Common Access Method	ITU-T	International Telecommunications Union—Telecommunication Standardization Sector
CCITT	Comité Consultatif International Télégraphique et Téléphonique	KB	kilobyte
CD-ROM	compact disc read-only memory	LAN	local area network
CGA	Color/Graphics Adapter	LBA	Logical Block Addressing
CHS	cylinder, head, and sector	LIM	Lotus/Intel/Microsoft
CISC	complex instruction set computing	LPT	line printer, now refers to a parallel printer port
CMOS	complementary metal-oxide semiconductor	MB	megabyte
COM port	serial communications port	MCA	Micro Channel Architecture
CPU	central processing unit	MCC	memory controller chip
CRT	cathode-ray tube	MDA	Monochrome Display Adapter
DC	direct current	MDRAM	Multibank DRAM
DDE	Dynamic Data Exchange	MFM	modified frequency modulation
DIMM	dual inline memory module	MHz	megahertz
DIP	dual inline package	MMC	Microsoft Management Console
DLL	dynamic-link library	MOS	metal-oxide semiconductor
DMA	direct memory access	MSD	Microsoft Diagnostics
DOS	disk operating system	MTBF	mean time between failures
Dpi	dots per inch	NDIS	Network Driver Interface Specification
DPMI	DOS Protected Mode Interface	NetBIOS/ NetBEUI	Networked Basic Input/Output System/NetBIOS Enhanced User Interface
DPMS	Display Power Management Signaling	NIC	network interface card
DRAM	dynamic random access memory	NTSC	National Television Standards Committee
DTE	Data Terminal Equipment	OLE	object linking and embedding
DVD	digital video disc	PC	personal computer
EDB	external data bus	PCI	Peripheral Component Interconnect
EDO	extended data out	PDI	post DMA-IRQ card
EGA	Enhanced Graphics Adapter	PDL	page-description language
EIDE	Enhanced Integrated Drive Electronics	PGA	pin grid array or Professional Graphics Adapter
EISA	Extended Industry Standard Architecture	PIO	Programmed Input/Output
EMI	electromagnetic interference	PLCC	plastic leadless chip carrier
EMS	Expanded Memory Specification	PM	preventive maintenance
ESD	electrostatic discharge	POST	power-on self test
ESDI	Enhanced Small Device Interface	POTS	Plain Old Telephone Service
ETX	end-of-text	PPP	Point-to-Point Protocol
FAT	file allocation table	PPTP	Point-to-Point Tunneling Protocol
FPM	fast page-mode	PQFP	plastic quad flat pack
FTP	File Transfer Protocol	RAID	redundant array of independent disks
GB	gigabyte	RAM	random access memory
GDI	Graphical Device Interface	RISC	Reduced Instruction Set Computing
GPF	General Protection Fault	RLL	run-length limited
GUI	graphical user interface	ROM	read-only memory

HMA	high memory area	SCSI	Small Computer System Interface
SDRAM	synchronous dynamic random access memory	TSR	terminate-and-stay-resident program
SGRAM	synchronous graphics RAM	UART	universal asynchronous receiver-transmitter
SIMM	single inline memory module	UMB	upper memory block
SIPP	single inline pinned package	UPS	uninterruptible power supply
SMM	System Memory Management	USB	universal serial bus
SPA	Software Publishers Association	VESA	Video Electronics Standards Association
SRAM	static random access memory	VGA	Video Graphics Adapter
TB	terabyte	VLB	VESA local bus
TCP/IP	Transmission Control Protocol/Internet Protocol	VOM	volt-ohm meter
WFP	Windows File Protection	VPN	virtual private network
WRAM	window random access memory	VRR	vertical refresh rate
XMS	extended memory specification	WAN	wide area network
ZIF	zero-insertion-force		

Thank You