

---

**LEARNING RESOURCE MATERIAL**

---

**COMPUTER SYSTEM  
MANAGEMENT, PLANNING  
&  
MAINTAINANCE**

**Lect. note**

**(For 6<sup>TH</sup> Semester CSE)**

---

Prepared  
by  
Smt. Sumitra Mahapatra, PTGF, CSE/IT.  
U.C.P. ENGG. SCHOOL, Berhampur

---

---

## **CHAPTER-1**

### **Describe Need of Management in Computer Centres**

- A general-purpose computer center performs mathematical, scientific technical, and economic calculations, as well as operations dealing with the programming of problems.
- It also assists in formulating and preparing problems and carries on consultations on questions of the organization of users' own computer centers or laboratories.
- It also conducts scientific research work in the field of automation of programming and numerical methods of mathematical and technical digital computer operation.
- Computer centers for processing economic information are usually the central elements of automated control systems for enterprises or sectors of the national economy and are administratively subordinate to the corresponding control bodies (ministries, central boards, plant managements, and so on).
- These computer centers perform regulated work on plan calculations, processing of reports, financial and book-keeping calculations, and also single technical and economic calculations. To perform this work, such computer centers constantly store large volumes of normative and reference data (in the form of machine archives).
- Reports and other data from enterprises arrive in the form of ordinary documents on punched cards and tape or on magnetic tapes or along communications channels with direct input to the computer (for urgent operational information).
- Automatic readers of specially prepared printed text (written with magnetic or graphite markings) are widely used for feeding economic information to the electronic computer.

### **Types of job carried out in an organization**

#### **Systems Analyst**

The role of the systems analyst is to straddle the divide between identifying business needs and imagining a new or redesigned computer-based system to fulfill those needs. This individual will work with a person, team, or department with business requirements and identify the specific details of a system that needs to be built.

Once the requirements are determined, the analyst will begin the process of translating these requirements into an information-systems design. A good analyst will understand what different technological solutions will work and provide several different alternatives to the requester, based on the company's budgetary constraints, technology constraints, and culture. Once the solution is selected, the analyst will create a detailed document describing the new system. This new document will require that the analyst understand how to speak in the technical language of systems developers.

### **Programmer**

Programmers spend their time writing computer code in a programming language. In the case of systems development, programmers generally attempt to fulfil the design specifications given to them by a systems analyst.

### **Computer Engineer**

Computer engineers design the computing devices that we use every day. There are many types of computer engineers, who work on a variety of different types of devices and systems. Some of the more prominent engineering jobs are as follows:

- **Hardware engineer.** A hardware engineer designs hardware components, such as microprocessors. Many times, a hardware engineer is at the cutting edge of computing technology, creating something brand new. Other times, the hardware engineer's job is to engineer an existing component to work faster or use less power. Many times, a hardware engineer's job is to write code to create a program that will be implemented directly on a computer chip.
- **Software engineer.** Software engineers do not actually design devices; instead, they create new programming languages and operating systems, working at the lowest levels of the hardware to develop new kinds of software to run on the hardware.
- **Systems engineer.** A systems engineer takes the components designed by other engineers and makes them all work together. For example, to build a computer, the mother board, processor, memory, and hard disk all have to work together. A systems engineer has experience with many different types of hardware and software and knows how to integrate them to create new functionality.
- **Network engineer.** A network engineer's job is to understand the networking requirements of an organization and then design a communications system to meet those needs, using the networking hardware and software available.

## **Computer Operator**

A computer operator is the person who keeps the large computers running. Some of their duties include keeping the operating systems up to date, ensuring available memory and disk storage, and overseeing the physical environment of the computer. Since mainframe computers increasingly have been replaced with servers, storage management systems, and other platforms, computer operators' jobs have grown broader and include working with these specialized systems.

## **Database Administrator**

A database administrator (DBA) is the person who manages the databases for an organization. This person creates and maintains databases that are used as part of applications or the data warehouse. The DBA also consults with systems analysts and programmers on projects that require access to or the creation of databases.

## **Help-Desk/Support Analyst**

Most mid-size to large organizations have their own information-technology help desk. The help desk is the first line of support for computer users in the company. Computer users who are having problems or need information can contact the help desk for assistance.

A successful help-desk analyst should have good people and communications skills, as well as at least junior-level IT skills.

## **Trainer**

A computer trainer conducts classes to teach people specific computer skills. A trainer may work for a software company and be contracted to come in to conduct classes when needed. To be successful as a trainer, you need to be able to communicate technical concepts well and also have a lot of patience.

## **CIO**

The CIO, or chief information officer, is the head of the information-systems function. This person aligns the plans and operations of the information systems with the strategic goals of the organization. This includes tasks such as budgeting, strategic planning, and personnel decisions for the information-systems function.

## **Functional Manager**

These functional managers report to the CIO and manage the employees specific to their function. For example, in a large organization, there is a group of systems analysts who report to a manager of the systems-analysis function.

### **Project Managers**

A project manager is responsible for keeping projects on time and on budget. This person works with the stakeholders of the project to keep the team organized and communicates the status of the project to management. A project manager must be a good communicator and an extremely organized person. A project manager should also have good people skills.

### **Information-Security Officer**

An information-security officer is in charge of setting information-security policies for an organization, and then overseeing the implementation of those policies. This person may have one or more people reporting to them as part of the information-security team. As information has become a critical asset, this position has become highly valued. The information-security officer must ensure that the organization's information remains secure from both internal and external threats.

## **Discuss Hierarchy of position of different levels**

### **Management Levels: An Overview**

Most organizations have three management levels:

- Low-level managers.
- Middle-level managers.
- Top-level managers.

These managers are classified in a hierarchy of authority, and perform different tasks. In many organizations, the number of managers in every level resembles a pyramid.

Below, you'll find the specifications of each level's different responsibilities and their likely job titles.

### **Top-level managers**

The board of directors, president, vice-president, and CEO are all examples of top-level managers.

These managers are responsible for controlling and overseeing the entire organization. They develop goals, strategic plans, company policies, and make decisions on the direction of the business.

In addition, top-level managers play a significant role in the mobilization of outside resources.

Top-level managers are accountable to the shareholders and general public.

## **Middle-level managers**

General managers, branch managers, and department managers are all examples of middle-level managers. They are accountable to the top management for their department's function.

Middle-level managers devote more time to organizational and directional functions than top-level managers. Their roles can be emphasized as:

- Executing organizational plans in conformance with the company's policies and the objectives of the top management;
- Defining and discussing information and policies from top management to lower management; and most importantly
- Inspiring and providing guidance to low-level managers towards better performance.

Some of their functions are as follows:

- Designing and implementing effective group and intergroup work and information systems;
- Defining and monitoring group-level performance indicators;
- Diagnosing and resolving problems within and among work groups;
- Designing and implementing reward systems supporting cooperative behavior.

## **Low-level managers**

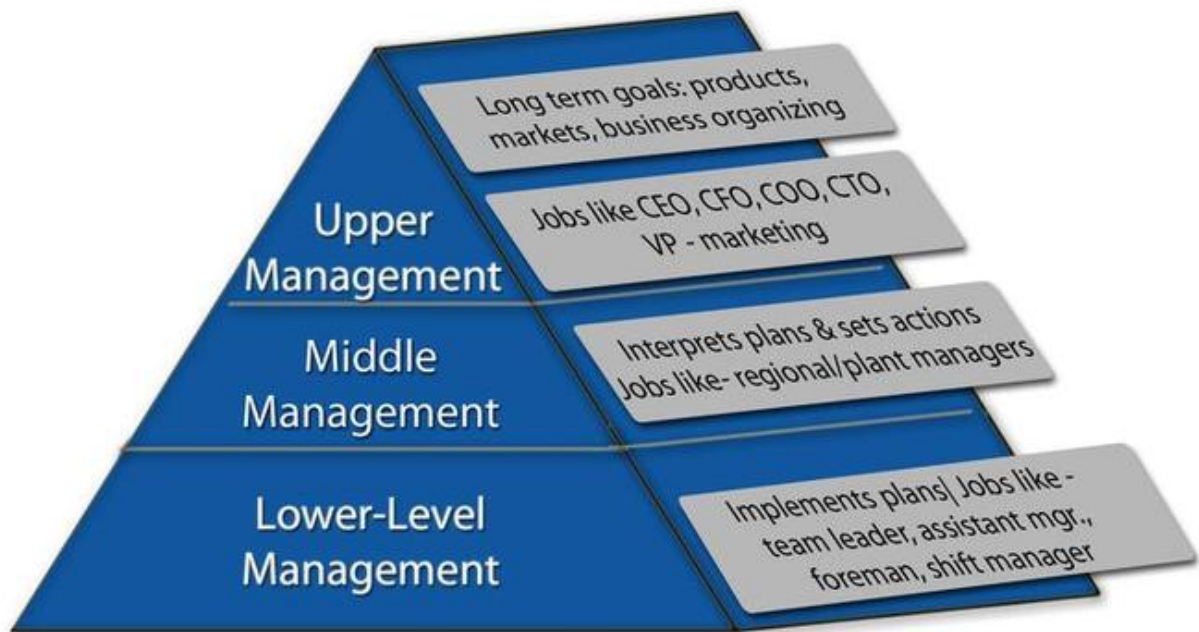
Supervisors, section leads, and foremen are examples of low-level management titles. These managers focus on controlling and directing.

Low-level managers usually have the responsibility of:

- Assigning employees tasks;
- Guiding and supervising employees on day-to-day activities;
- Ensuring the quality and quantity of production;
- Making recommendations and suggestions; and
- Upchanneling employee problems.

Also referred to as first-level managers, low-level managers are role models for employees. These managers provide:

- Basic supervision
- Motivation
- Career planning
- Performance feedback and
- Staff supervision.



- Management Levels: Hierarchical view of management in organizations

### Explain need for training of staff.

Training is crucial for organizational development and success. It is fruitful to both employers and employees of an organization. An employee will become more efficient and productive if he is trained well.

Training is given on four basic grounds:

1. New candidates who join an organization are given training. This training familiarizes them with the organizational mission, vision, rules and regulations and the working conditions.
2. The existing employees are trained to refresh and enhance their knowledge.
3. If any updating and amendments take place in technology, training is given to cope up with those changes. For instance, purchasing a new equipment, changes in technique of production, computer impartment. The employees are trained about use of new equipments and work methods.
4. When promotion and career growth becomes important. Training is given so that employees are prepared to share the responsibilities of the higher level job.

The benefits of training can be summed up as:

1. **Improves morale of employees-** Training helps the employee to get job security and job satisfaction. The more satisfied the employee is and the greater is his morale, the more he will

contribute to organizational success and the lesser will be employee absenteeism and turnover.

2. **Less supervision-** A well trained employee will be well acquainted with the job and will need less of supervision. Thus, there will be less wastage of time and efforts.
3. **Fewer accidents-** Errors are likely to occur if the employees lack knowledge and skills required for doing a particular job. The more trained an employee is, the less are the chances of committing accidents in job and the more proficient the employee becomes.
4. **Chances of promotion-** Employees acquire skills and efficiency during training. They become more eligible for promotion. They become an asset for the organization.
5. **Increased productivity-** Training improves efficiency and productivity of employees. Well trained employees show both quantity and quality performance. There is less wastage of time, money and resources if employees are properly trained.

### **Methods of Training**

Training is generally imparted in two ways:

1. **On the job training-** On the job training methods are those which are given to the employees within the everyday working of a concern. It is a simple and cost-effective training method. The inproficient as well as semi- proficient employees can be well trained by using such training method. The employees are trained in actual working scenario. The motto of such training is “learning by doing.” Instances of such on-job training methods are job-rotation, coaching, temporary promotions, etc.
2. **Off the job training-** Off the job training methods are those in which training is provided away from the actual working condition. It is generally used in case of new employees. Instances of off the job training methods are workshops, seminars, conferences, etc. Such method is costly and is effective if and only if large number of employees have to be trained within a short time period. Off the job training is also called as vestibule training,i.e., the employees are trained in a separate area( may be a hall, entrance, reception area,etc. known as a vestibule) where the actual working conditions are duplicated.

### **Idea about various computer makes in India**

India home of the world’s fastest-growing economy, is quickly becoming one of the globe’s greatest technology hubs.

That is partially thanks to the country’s abundance of highly skilled technical graduates, whose numbers are growing at a rate of 7 percent per year, according to the latest study from India’s ministry of commerce and industry.



It is also credit to India's thriving start-up scene, which is ranked third in the world, accounting for 4,750 businesses.

Companies that can attract the best talent across sectors are able to create and maintain a strong sense of community and provide capable mentorship. This is especially true of technology firms which strive to create a productive environment for their employees, ensuring optimum levels of job satisfaction.

**Here is the list of top hardware companies in India.**

Acer India Pvt Ltd– Acer was founded in August 1976 by Stan Shih. The company is offering wide array of products including Desktop, Laptop, Notebooks, Computers, Storage, Smartphones, Tablets, Televisions, LED, LCD etc.

Compuage Infocom Ltd – Compuage is India's leading IT and Mobility Distribution Company offering Global Products and Services through a strong distribution network across India & SAARC nations. It is one of the top 10 hardware companies in India.

Dell India Pvt Ltd– The company is headquartered in Round rock, Texas, United States. Dell is offering products in various categories including personal computers, servers, Peripherals, Smartphones, Televisions.

HCL Infosystems Ltd– HCL Info systems is Indian Multinational IT service company headquartered in Noida. Shiv Nadar is the founder of HCL infosystems Ltd.

Hewlett-Packard India Sales Pvt Ltd– HP is american multinational technology company headquartered in California. It is offering a huge range of products.

Ingram Micro India Pvt Ltd– It is American Electronic Company and technology distributor. It is regarded as world's leading distributor of technology products.

Intel Technology India Pvt Ltd– The company is headquartered in Santa Clara, California. Its founders are Gorden Moore and Rober Noyce.

Intex Technologies India Ltd– The Hardware company was founded by Narendra Bansal. Its headquarter is located in New Delhi, India. It was founded in the year 1996. It is offering various products like smartphones, LED Televisions etc. Its center for research and development is located in China and India.

Iris Computers Ltd – It is one of top 10 hardware companies in India. The company is offering laptop, printers, desktop, tally GST ready, Server, CCTV Camera, Web Design, System Upgrade etc.

Lenovo India Pvt Ltd– The company was founded in Beijing China in the year 1984. Its different product ranges include Smartphones, tablet computers, peripherals, televisions, printers, scanners, storage devices, desktops, smartphones, servers, netbooks.

Redington India Ltd- The company has started its operation in India since 1993. The company has presence in various other countries like Srilanka, CIS, Middle East, Turkey, Africa, Bangladesh, India.

Ricoh India Pvt Ltd– The company is offering huge range of products in the category of digital cameras, printers, software solutions, projectors, interactive whiteboards etc.

**Idea about various computer installations in India**

Computer installations in various city in India

Name	Headquarters	City
HCL Technologies	Noida	Bangalore
HCL Technologies	Noida	Chennai
HCL Technologies	Noida	Gurgaon
HCL Technologies	Noida	Hyderabad
HCL Technologies	Noida	Kochi[5]
HCL Technologies	Noida	Kolkata
HCL Technologies	Noida	Mumbai
HCL Technologies	Noida	Noida
HCL Technologies	Noida	Pune
HCL Technologies	Noida	Vadodara
Infosys	Bangalore	Bangalore
Infosys	Bangalore	Bhubaneswar
Infosys	Bangalore	Chandigarh
Infosys	Bangalore	Chennai
Infosys	Bangalore	Delhi
Infosys	Bangalore	Hyderabad
Infosys	Bangalore	Indore
Infosys	Bangalore	Jaipur

Infosys	Bangalore	Mangalore
Infosys	Bangalore	Mysore
Infosys	Bangalore	Pune
Infosys	Bangalore	Thriuvananthapuram
Larsen & Toubro Infotech	Mumbai	Bangalore
Larsen & Toubro Infotech	Mumbai	Chennai
Larsen & Toubro Infotech	Mumbai	Mumbai
Larsen & Toubro Infotech	Mumbai	Pune
Larsen & Toubro Infotech	Mumbai	Hyderabad
Larsen & Toubro Infotech	Mumbai	Navi Mumbai
Mindtree	Bangalore	Bangalore
Mindtree	Bangalore	Bhubaneswar
Mindtree	Bangalore	Chennai
Mindtree	Bangalore	Hyderabad
Mindtree	Bangalore	Mumbai
Mindtree	Bangalore	Pune
Mphasis	Bangalore	Bangalore
Mphasis	Bangalore	Chennai
Mphasis	Bangalore	Mangalore
Mphasis	Bangalore	Mumbai
Mphasis	Bangalore	Pune
Oracle Financial Services Software	Mumbai	Bangalore

Oracle Financial Services Software	Mumbai	Chennai
Oracle Financial Services Software	Mumbai	Hyderabad
Oracle Financial Services Software	Mumbai	Mumbai
Oracle Financial Services Software	Mumbai	Pune
Tata Consultancy Services	Mumbai	Ahmedabad
Tata Consultancy Services	Mumbai	Bangalore
Tata Consultancy Services	Mumbai	Bhubaneswar
Tata Consultancy Services	Mumbai	Chennai
Tata Consultancy Services	Mumbai	Coimbatore
Tata Consultancy Services	Mumbai	Delhi
Tata Consultancy Services	Mumbai	Gandhinagar
Tata Consultancy Services	Mumbai	Gurgaon
Tata Consultancy Services	Mumbai	Guwahati
Tata Consultancy Services	Mumbai	Hyderabad
Tata Consultancy Services	Mumbai	Indore
Tata Consultancy Services	Mumbai	Kochi
Tata Consultancy Services	Mumbai	Kolkata
Tata Consultancy Services	Mumbai	Lucknow
Tata Consultancy Services	Mumbai	Patna
Tata Consultancy Services	Mumbai	Mumbai[3]
Tata Consultancy Services	Mumbai	Nagpur
Tata Consultancy Services	Mumbai	Noida

Tata Consultancy Services	Mumbai	Pune
Tata Consultancy Services	Mumbai	Vadodara
Tata Consultancy Services	Mumbai	Varanasi
Tata Consultancy Services	Mumbai	Thriuvananthapuram
Tech Mahindra	Pune	Bangalore
Tech Mahindra	Pune	Bhubaneswar
Tech Mahindra	Pune	Chandigarh
Tech Mahindra	Pune	Chennai
Tech Mahindra	Pune	Hyderabad
Tech Mahindra	Pune	Kolkata
Tech Mahindra	Pune	Mumbai
Tech Mahindra	Pune	Nagpur
Tech Mahindra	Pune	Noida
Tech Mahindra	Pune	Pune
Tech Mahindra	Pune	Visakhapatnam
Wipro	Bangalore	Ahmedabad
Wipro	Bangalore	Bangalore
Wipro	Bangalore	Bhubaneswar
Wipro	Bangalore	Chennai
Wipro	Bangalore	Coimbatore
Wipro	Bangalore	Gurgaon
Wipro	Bangalore	Guwahati

Wipro	Bangalore	Hyderabad
Wipro	Bangalore	Indore
Wipro	Bangalore	Jaipur
Wipro	Bangalore	Kochi[4]
Wipro	Bangalore	Kolkata
Wipro	Bangalore	Mumbai
Wipro	Bangalore	Mysore
Wipro	Bangalore	Noida
Wipro	Bangalore	Pune
Wipro	Bangalore	Vadodara[4]
Wipro	Bangalore	Visakhapatnam

**Name few major vendors in computer hardware and software**

3i Infotech

Accel Frontline

Aditi Technologies[6]

Aftek

Atom Technologies

Blue Star Infotech

C-DAC

CMC Limited

Cognizant

Collabera

Computer Sciences Corporation

Cybage

Cyient

Cynapse

Datamatics Global Services

Eclerx

Firstsource

Flytxt Mobile Solutions

Fulcrum Worldwide

Gateway TechnoLabs

Godrej Infotech Ltd

Harbinger Systems

Honeywell

HSBC GLT India

IGATE

KPIT Technologies

Pramati Technologies

Prodapt Solutions[12]

Quest Global

Ramco Systems

Rediff.com

Samsung India Software Center

Sasken

Sonata Software

SPAN Infotech (India) Pvt. Ltd.

Tata Interactive Systems

ThinkPalm Technologies

Thirdware

Thoughtworks

UST Global

WNS Global Services

Xansa

Xerox[14]

Zensar Technologies



## **CHAPTER 2**

### **Factors effecting selection and evaluation of computers**

A system must processes some basic desirable features for selection.

**The Basic Characteristics of Computer are as following Speed**

- Accuracy
- Memory
- Diligence
- Versatility
- Reliability
- Low Cost & Reduced Size
- Automatic
- No Feeling & No IQ

#### **Speed**

Computers have an incredible speed with accuracy that is beyond human capabilities, Not only they have speed but the speed with accuracy and Pinpoint solutions to every problem arises before them.

The speed of computer is considered as one of the most important characteristics of computer. As per human beings, the smallest unit of time is considered to be second, but not for computers seconds are further divided into milliseconds, microseconds, nanoseconds and picoseconds. The powerful PC can work almost 5 million instruction per seconds. When we discuss the speed of computer milliseconds are hundredth of a second, microseconds are the millionth of a second, nanoseconds are the billionth of a second and picoseconds are trillionth of a second.

Speed is primarily the main characteristic of computer, their speed is measured in terms of GIGAHERTZ and MEGAHERTZ. They can solve complex to complex numerical and logical problems with ease compared to human beings.

#### **Accuracy**

They have a great speed and are unbelievably deadly accurate. The Errors occurs due to improper or wrong or inaccurate input given to the computer system. PC primarily depends upon the inputs. Say if a user enters wrong or improper or inaccurate information to the computer obviously the output generated by them will be wrong, improper or inaccurate.

The Errors we received while using personal computer are generally called as “Human Errors” or the errors of programmers who writes program for better computer functions.

GIGO (Garbage In Garbage Out) is a well-known term used for computer accuracy, if the input is wrong the output will also be wrong.

### **Memory**

This is also one of the most essential characteristics of computer these days they can store or save almost any volume of data due to its high storage capabilities. Once the data or instruction saved to the computer memory it remains in the memory, until and unless someone deletes, users can recall or retrieve the data anytime, at any location they require, As the human being tends to forget small information given to them, but these machines store all the information was given to them permanently.

These Machines can store the data as long as user's desire. The measurement of memory are **MEGABYTES (MB), GIGABYTES (GB) And TERABYTES (TB)**. Hard disk and pen drives are examples of memory.

### **Diligence**

They can work long hours without tiredness or boredom with same speed and accuracy. As the computer is a machine it does not refuse to work and works for hours and hours with the same consistency. But on the other hand human being can get easily tired of same work repeatedly can lose their concentration, speed, and accuracy because human suffer from tiredness, laziness, unlike machines.

### **Versatility**

They can perform several tasks at the same time, such as user can play songs, work on documents, search for any documents in the hard disk, surf the net, download software, calculate, a computer can perform several functions at the same time with same speed, accuracy and with consistency. Unlike human computers are far more versatile. Therefore computers have reached to all essential part of the human society.

### **Reliability**

They are reliable machines, because of their reliability many organizations, institutions, companies rely on them hugely. They can store huge amount of data and can be recalled or retrieve quickly any time or any place as the user demands. The errors occur in the computer are all human errors. Once given a huge task or operation they complete the work without any excuses and people or users can rely on them.

### **Low Cost & Reduced Size**

The advancement in the development of computer hardware and software technology the cost of PC has been decreased drastically and has reached to the majority of the humans. Due to its low-cost hospitals, institutions, government sectors, companies, and end users have welcomed them with open hands.

## **Automatic**

They can perform Automatically when assigned a task or operation say you have started a download of movies the computer will download the entire movie in spite the user is present or not without any interruption unless there are network errors or connectivity issues.

They can perform huge numerical and logical calculation when given proper instruction automatically. Even pilots can handover the controls to a computer as they can fly huge aircrafts which are called as AUTO-PILOT Mode.

## **No Feeling & No IQ**

They do not have feeling and self IQ. They do not feel anything unlike humans i.e. tiredness, boredom, laziness, envy or jealousy. As they do not have their own IQ they entirely depend upon humans for inputs, the computer cannot take their own decisions based on logic.

PC has errors only when an input is wrong or incorrect, the Computer scientists are working on AI (Artificial Intelligence) which will make them so powerful and accurate that they will make their own decision, and logic when giving some instruction. This type of computer will have unbelievable characteristics which will change the entire Generations of computer systems.

## **Evaluating the computer**

Computer evaluation, comparison, and selection is essentially a decision process. The decision making is based on a number of worth indicators, including various computer performance indicators. The performance indicators are obtained through the computer performance measurement procedure. Consequently, in this environment the measurement procedure should be completely conditioned by the decision process. This paper investigates various aspects of the computer performance measurement and evaluation procedure within the context of the computer evaluation, comparison, and selection process based on the Logic Scoring of Preference method. A set of elementary criteria for performance evaluation is proposed and the corresponding set of performance indicators is defined. The necessary performance measurements are based on a standardized set of synthetic benchmark programs and include three separate measurements: monoprogramming performance measurement, multiprogramming performance measurement, and multiprogramming efficiency measurement. Using the proposed elementary criteria, the measured performance indicators can be transformed into elementary preferences and then aggregated with other non performance elementary preferences obtained through the evaluation process. The applicability of presented elementary criteria is illustrated by numerical examples.

## **Response Time**

A functioning computer environment comprises millions of data transmission cycles consisting of user requests and system responses. The **response time** is defined as the total time lapse between the

completion of an inquiry or demand made on a system resource and the receipt of a response. In real life, it can be compared to the time between placing an order to receiving a delivery.

### **Latency**

Latency is the term used to describe the state of existence of something in transition. Every transmitted piece of information on a computer system travels over some sort of medium. Computer latency is defined as the time it takes to communicate a message, or the time the message spends travelling the geographical distance ('on the wire') before it gets to its desired destination. This can be compared to the time one spends on an aircraft, travelling from one geographical location to another.

### **Speed**

The term speed is usually in reference to the clock speed of the processor. The clock speed is defined as the clock cycles per second, which determines the rate at which instruction processing takes place. It is usually measured in megahertz (MHz) or gigahertz (GHz). Computer speed is one of the leading parameters in assessing a computer's performance. It can be compared to the horsepower of an engine. The higher the horsepower, the faster the car can move.

### **Throughput**

Computer function consists of millions of data transmissions between devices and components. The computer's throughput is defined as the number of units of information that can be successfully processed at any given time. The throughput is commonly measured using bits per second (bps)—more specifically, megabits per second (Mbps) and gigabits per second (Gbps). For example, if the post office can receive and process a maximum of 1000 items per day, then that's its throughput.

### **Bandwidth**

Bandwidth is a measure of the maximum rate at which data can be transferred between components of the computer system, or the amount of data that is sent at any particular time across a specific connection. This term could be applied to network connections or computer performance. Consider our post office outlet again. It can process 1000 items a day, but not all of the items at the same time. There are only a few counters, and each counter can only help one customer at a time. This is similar to bandwidth.

## **Discuss different types of industries and their computer requirement**

We are discussing about small scale and large scale industry .

### **Small Scale Industry**

Entrepreneurs and other small industries utilize today's rapidly changing computer technology in many different realms of operation:

## **BOOKKEEPING**

Computer systems are heavily utilized for a variety of accounting functions, including employee payroll; cash flow analysis; job costing; tracking of vendor and customer payments and debts; federal, state, and local taxes; and other expenses and revenues that impact on the business's fiscal health. Small business owners use computers for bookkeeping more than for any other purpose, and software programs designed to help even inexperienced business owners with their bookkeeping have proliferated on the marketplace in recent years as a result.

## **BUSINESS COMMUNICATIONS**

The introduction of computer faxes and especially electronic mail systems has revolutionized the way that businesses communicate with one another. Moreover, e-mail has significantly altered how employees within the same company interact with one another. The savings, both in time and money, that have been realized through the use of this computer technology have been considerable. E-mail, for instance, not only enables users to save significant sums of money that would otherwise go to long-distance telephone and delivery charges, but also speeds up the process of information delivery. Computer faxes, meanwhile, also enable businesses to "save, labor, office supplies, and long-distance phone charges" that are associated with regular fax machines, noted Sandi Smith in the *Journal of Accountancy*. "The savings: You don't have to make a paper copy, go to the fax machine, wait to be sure the pages don't jam—and if they do, resend. The cost of sending a fax via computer is a fraction of the cost of sending a machine fax."

## **PRODUCT DESIGN**

Product design is one of the most popular computer applications in the business world today. Computer-aided design (CAD) involves creating computer models of products that are ultimately transformed into reality. CAD systems enable designers to view objects under a wide variety of representations and to test these objects by simulating real-world conditions.

## **MANUFACTURING**

Computer-aided manufacturing (CAM), meanwhile, uses geometrical design data to control automated machinery and other production processes. Since both CAD and CAM use computer based methods for encoding geometrical data, it is possible for the processes of design and manufacture to be highly integrated. Computer-aided design and manufacturing systems are commonly referred to as CAD/CAM.

In recent years, technological advances have triggered fundamental changes in many CAD/CAM systems. Whereas CAD/CAM applications used to be limited to older mainframe and workstation-

based systems, advances in personal computers and software programs have spurred a dramatic upsurge in their use among small business owners, who are now better able to afford the technology. The greater viability of personal computers for CAD/CAM applications results from their ever-increasing processing power. An important trend is toward the standardization of software, so that different packages can readily share data. Standards have been in place for some time regarding data exchange and graphics; user interfaces are rapidly going the same route. In the realm of electronic design automation software, a similar trend toward standardization has also been underway. Other improvements in software include greater sophistication of visual representation and greater integration of modelling and testing applications.

## **INVENTORY CONTROL**

Small scale industries are increasingly using computers to track all aspects of their inventory, including warehousing, ordering, receiving, and distribution. In addition, many computer systems maintain programs that integrate inventory control needs with other aspects of the business's operations, which helps the company perform in a cohesive and intelligent manner as it negotiates the various obstacles of the business world.

## **MARKETING**

Computer applications for marketing have surged in recent years. Whereas computer applications for other business needs have been a part of the picture for a decade or two now, the widespread use of computers to shape a company's marketing strategies and campaigns is a relatively new development. "Firms ...are gathering tremendous amounts of information about customers, markets, and industries by using an array of relatively inexpensive software and computerized databases," wrote Tim Mc-Collum in *Nation's Business*. "These resources can help entrepreneurs increase their effectiveness in targeting markets, cultivating leads, and closing sales....Whether it's called database marketing, smart marketing, or target selling, it boils down to using technology to delivery information that can boost sales."

Many consultants and business experts contend that it is particularly important for small business enterprises to make maximum use of this still-developing computer technology. Small business entities typically have fewer clients than do larger firms, which makes the search for new customers an essential component of future success. As analyst Martha Rogers noted in *Nation's Business*, information technologies like business and customer databases and sales force automation systems can be effective tools for small business owners looking to develop profitable and lasting relationships with customers. Indeed, smaller firms often need good customer information simply to keep pace with larger competitors.

Of course, reliable customer information is a major key to any effective marketing campaign. Consequently, database service providers such as Dun & Bradstreet Information Services (DBIS) and American Business Information Inc. (ABI) have become enormously popular with businesses of varying shapes and sizes. "These businesses," wrote McCollum, "have accumulated vast amounts of data on companies throughout the United States and Canada. Customers can buy the records on firms in specific locations or industries or of certain sizes or sales volumes. The databases make it easy to generate lists of potential customers for direct mail or telemarketing campaigns." In addition, DBIS, ABI, and other companies that provide similar services have made their information available via CD-ROMs (with regular updates). Another favorite site for finding business leads is the expanding group of CD-ROM products that provide business and residential telephone listings for various geographic regions of the United States.

- Build a database of customers and prospective customers, and update it regularly.
- Decide what marketing information is needed, and establish a plan to obtain it.
- Use demographic and geographic data to put together a profile of current customer base, which can then be used to identify potential new markets.
- Use data to identify long-term interests and buying habits of clients.
- Involve sales force (if any) in introduction of new technologies; "If salespeople don't think the automated system will benefit them, they won't use it."
- Share information throughout the company.
- Use computer resources to personalize and coordinate direct mailings and other campaigns.
- Arrange so that pertinent customer information is available to those who need it.

### **large scale industry**

#### **Inventory Tracking**

Using spreadsheets or databases, most businesses utilize some sort of computer maintained inventory tracking system.

#### **Payroll**

From printing or depositing paychecks, to applying raises and bonuses, industries have become very reliant on computer management.

#### **Web Sites**

All industries have been migrating towards the Internet over the past two decades, resulting in the need for maintained websites, requiring not only server space, but maintenance and updates to these sites as well.

#### **Customer Databases**

Customer databases are used not just to track order information for clients, but also to chronicle interactions to better serve clients in the future.

## **Cash Registers**

Modern cash registers are often networked computer systems, allowing companies to maintain much more up-to-date and accurate transaction records, as well as real-time inventory tracking.

**Data Storage and Manipulation:** Data storage includes important and confidential office documents and records. Office automation system includes data applications, which are used to create or edit a document, file, spreadsheet or an image. There are various types of word processing and desktop presentation packages available, which allow creating or editing textual data. Similarly, you can find dedicated applications for editing spreadsheets and images.

**Data Management:** Data management is one of the major components of office automation system that offers strategic advantages by simplifying the management of stored data and information. Large business organizations can monitor and control various projects and activities within the office through an electronic management system. Program schedules, tickler systems or reminder systems, and task management are some of the features, which empower businesses to have an eye on all business processes without any hassle.

**Data Exchange:** Exchange of stored or manipulated data and information is also an important component of an office automation system. Sending files or exchanging data or information between one or more than one member of an organization has become possible with an electronic transfer application. Through a network connection, all data and information, including text documents, presentations, spreadsheets, images, and videos can be sent in real-time within a few seconds. Illustrating the collaborative nature of an office automation system, this would allow your employees to collaborate in real-time and enhance their productivity.

**Save Time and Resources:** Office automation empowers businesses to save both time and money. It simplifies and automates those complex tasks, which earlier required a dedicated resource and a great amount of time. For example, with the introduction of the latest computer technologies and network communications, businesses are now not constricted by geographical limitations. And hence, they can easily save both time and money spent on traveling. Another great example is the digital storage, which eliminates the need of preserving hard copies and hence, saving paper and nature as well.

**Reduced Costs:** Since every industry process is now automated, you don't need to invest much on hiring new resources for taking care of those tasks, which can be easily executed using an office automation system. As we know that time saved is money saved, your business enterprise can easily save huge by automating various complex business processes. With saving large on the overall expenditure and investment on other resources, your profit margins are surely going to improve.



## Selection And Evaluation Of Appropriate Configuration For Different Levels Of Industry

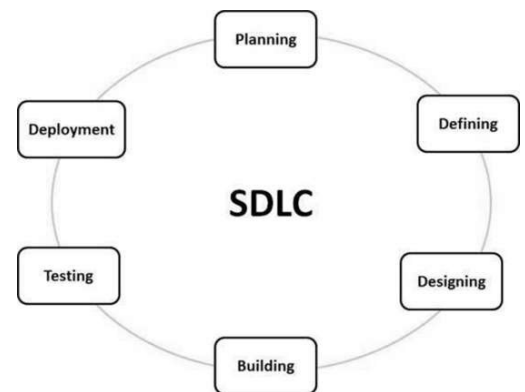
Software Development Life Cycle (SDLC) is a process used by the software industry to design, develop and test high quality softwares. The SDLC aims to produce a high-quality software that meets or exceeds customer expectations, reaches completion within times and cost estimates.

- SDLC is the acronym of Software Development Life Cycle.
- It is also called as Software Development Process.
- SDLC is a framework defining tasks performed at each step in the software development process.
- ISO/IEC 12207 is an international standard for software life-cycle processes. It aims to be the standard that defines all the tasks required for developing and maintaining software.

### **SDLC**

SDLC is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software. The life cycle defines a methodology for improving the quality of software and the overall development process.

The following figure is a graphical representation of the various stages of a typical SDLC.



#### **Stage 1: Planning and Requirement Analysis**

Requirement analysis is the most important and fundamental stage in SDLC. It is performed by the senior members of the team with inputs from the customer, the sales department, market surveys and domain experts in the industry. This information is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas.

Planning for the quality assurance requirements and identification of the risks associated with the project is also done in the planning stage. The outcome of the technical feasibility study is to define the various technical approaches that can be followed to implement the project successfully with minimum risks.

#### **Stage 2: Defining Requirements**

Once the requirement analysis is done the next step is to clearly define and document the product requirements and get them approved from the customer or the market analysts. This is done through an **SRS (Software Requirement Specification)** document which consists of all the product requirements to be designed and developed during the project life cycle.

### **Stage 3: Designing the Product Architecture**

SRS is the reference for product architects to come out with the best architecture for the product to be developed. Based on the requirements specified in SRS, usually more than one design approach for the product architecture is proposed and documented in a DDS - Design Document Specification. This DDS is reviewed by all the important stakeholders and based on various parameters as risk assessment, product robustness, design modularity, budget and time constraints, the best design approach is selected for the product.

A design approach clearly defines all the architectural modules of the product along with its communication and data flow representation with the external and third party modules (if any). The internal design of all the modules of the proposed architecture should be clearly defined with the minutest of the details in DDS.

### **Stage 4: Building or Developing the Product**

In this stage of SDLC the actual development starts and the product is built. The programming code is generated as per DDS during this stage. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle.

Developers must follow the coding guidelines defined by their organization and programming tools like compilers, interpreters, debuggers, etc. are used to generate the code. Different high level programming languages such as C, C++, Pascal, Java and PHP are used for coding. The programming language is chosen with respect to the type of software being developed.

### **Stage 5: Testing the Product**

This stage is usually a subset of all the stages as in the modern SDLC models, the testing activities are mostly involved in all the stages of SDLC. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards defined in the SRS.

### **Stage 6: Deployment in the Market and Maintenance**

Once the product is tested and ready to be deployed it is released formally in the appropriate market. Sometimes product deployment happens in stages as per the business strategy of that organization. The product may first be released in a limited segment and tested in the real business environment (UAT- User acceptance testing).

Then based on the feedback, the product may be released as it is or with suggested enhancements in the targeting market segment. After the product is released in the market, its maintenance is done for the existing customer base.

### **SDLC Models**

There are various software development life cycle models defined and designed which are followed during the software development process. These models are also referred as Software Development

Process Models". Each process model follows a Series of steps unique to its type to ensure success in the process of software development.

Following are the most important and popular SDLC models followed in the industry

- Waterfall Model
- Iterative Model
- Spiral Model
- V-Model
- Big Bang Model

## CHAPTER 3

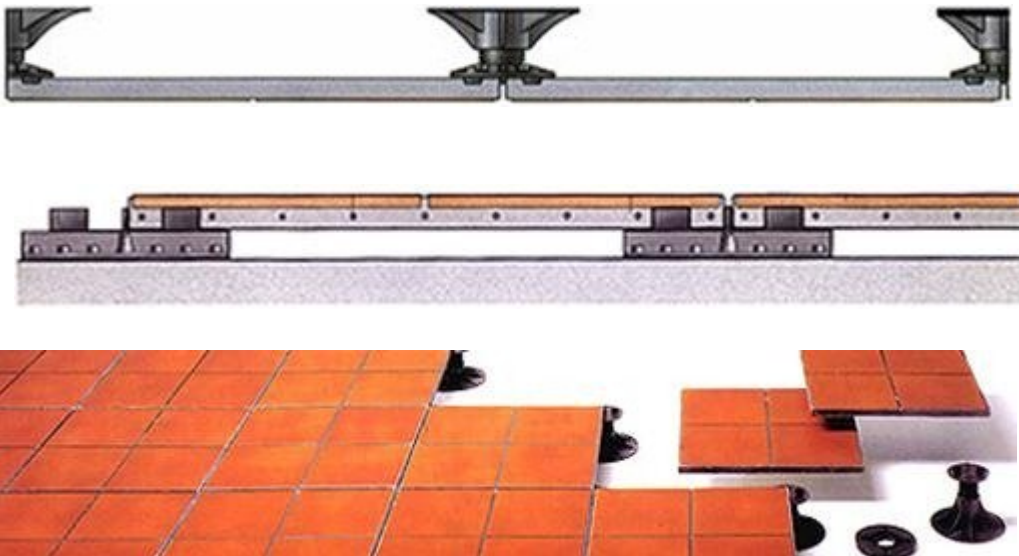
### **False Flooring**

False Flooring is flooring used for buildings with high service requirement mostly offices which carries high amount of cables etc. and sometimes Air-conditioner, water supply pipes. Additional structural support and lighting are often provided when a floor is raised enough for a person to crawl or even walk beneath.

This type of floor consists of gridded metal frame work or understructure of adjustable-height legs ("called Pedestal") that provide support for individual floor panels, which are usually by 2 X 2 feet or 60 X 60 cms in size. The height of the legs/pedestals is dictated by the volume of cable and other services provided beneath, but typically arranged for clearance of at least six inches or 15cms.

The panels are normally made of steel-clad particle board or a steel panel with a cementitious internal core. There are a variety of flooring finishes to suit the application such as carpets, high pressure laminates, marble, stone, and anti-static finishes for use in computer rooms and laboratories.

Many modern computer and equipment rooms employ an under-floor cooling system to ensure even cooling of the room with minimal wasted energy. Cooled air is pumped under the floor and dispersed upward into the room through regularly spaced diffuser tiles or through ducts directed into specific equipment.



### **False Ceiling**

A false ceiling is a ceiling made beneath the main ceiling of the room or building. In other words, it is a second layer of roof suspended from the main roof with the help of metal or wooden frame. It is also known as dropped ceiling. False ceiling has multiple advantages. It improves the aesthetics of the

room. False ceiling is provided to keep the room cool during summer and warm in winter. It is also provided to conceal the ugly mesh of electrical wires, light fixtures, air-conditioning ducts and other fixtures.

The false ceiling is hung or fixed in a framework made of Aluminium or GI sections or wooden batten fixed with the main ceiling. The false ceiling is fixed at a minimum distance of 8 inches from the main ceiling. False ceiling is made by various materials like Plaster of Paris, Gypsum board, Plywood, PVC sheets etc. The choice of material depends upon the use and design of the false ceiling. Different materials have their own advantages and disadvantages. Few of them are discussed below.



#### 1) **Plaster of Paris false ceiling:**

Plaster of Paris is smooth and suits for all types of lighting arrangements. It can be molded into any type of designs and shapes. There are preferred for ornamental design and light works. It is suspended in the framework of Aluminium T-sections. Its only disadvantage is that it is not much durable and its colour fades away with time.

#### 2) **Gypsum false ceiling:**

It is light weight, fire resistant and thermally insulated material. Gypsum boards are available in size of 600mm x 600mm with thickness ranging from 9mm to 15mm. It is fixed in the framework of GI channels.

#### 3) **PVC false ceiling:**

PVC false ceiling is attractive, durable and water resistant. Since it is made from PVC material hence its maintenance cost is almost zero. In this type of false ceiling PVC panels are fixed in the framework of Aluminium T-sections. PVC panels are available in plenty of attractive colours and designs.

### **Air Conditioning**

Computer Room Air Conditioning (and computer room air conditioners - CRAC's) help keep your data center cool. However, as equipment in your computer room becomes more complex and compact, computer rooms are watching their power draw and heat generation quickly rise. The increase in computer room power consumption, density, and heat generation requires a more exact approach to computer room air conditioning than ever before.

Cooling the computer room used to be a relatively painless affair. When data centers were expending less power and generating less heat per square foot, a technician or administrator could simply offset the heat from equipment with additional CRAC units. Simply pumping cold air in the room was enough to bring down the temperature.

### **Keeping the Modern Computer Room Cool**

To achieve an effective computer air conditioning system, many technicians are placing racks in hot and cold configurations.

They place their computers and racks on raised floors, two tiles apart, with their air intakes facing each other. CRAC unit components pump cool air through perforated floor tiles between the racks, the computers and racks intake the cool air and exhaust hot air into the opposing, hot aisle. Computer room air conditioning units on the floor then pull in the hot air exhausted into the hot aisles, and release it underneath the floor tiles, completing the cycle.

In this way, a series of CRAC units can keep cool air running through the system and help keep a steady airflow through the environment.

It's even become common to take advantage of the space above computers and racks, and make another "hot aisle" of the room's ceiling, where heat normally escapes and hovers. To keep the whole computer room cool, technicians advocate turning the area above racks into a hot air plenum by placing ducts and more CRAC units. Hot air escapes into the plenum to be pushed back into the system, below the floor, where it can be cooled and released back into the system.

This works for your computer room by both removing hot air from the data center. Bringing in more hot return-air helps the heat exchangers in the CRAC units produce colder air to pump out to the computer room floor.

### **Dust Proofing**

A clean room is a highly purified and regulated room for producing equipment sensitive to contamination. For example, the production of microprocessors is done in a clean room, since the smallest amounts of dust could create flaws in their production. Therefore, the air in a clean room is constantly filtered. Other aspects such as temperature, humidity, and pressure may be regulated as well.

A work area in which the air quality, temperature and humidity are highly regulated in order to protect sensitive equipment from contamination. Clean rooms are important features in the production of silicon chips, hard disk drives and other technologies such as satellites. The air in a clean room is repeatedly filtered to remove dust particles and other impurities that can damage the production of highly sensitive technologies.

### **Need of power conditioner equipment**

A **power conditioner** (also known as a **line conditioner** or **power line conditioner**) is a device intended to improve the quality of the power that is delivered to electrical load equipment. The term most often refers to a device that acts in one or more ways to deliver a voltage of the proper level and characteristics to enable load equipment to function properly. In some uses, power conditioner refers to a voltage regulator with at least one other function to improve power quality (e.g. power factor correction, noise suppression, transient impulse protection, etc.)

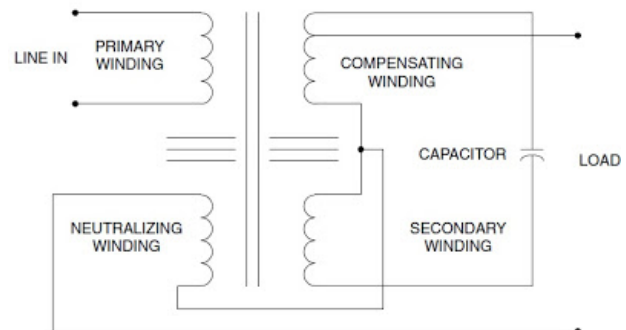
The terms "power conditioning" and "power conditioner" can be misleading, as the word "power" here refers to the electricity generally rather than the more technical electric power.

Conditioners specifically work to smooth the sinusoidal A.C. wave form and maintain a constant voltage over varying loads.

### **Constant Voltage Transformer**

Constant Voltage Transformer (CVT) or Ferroresonant Transformer (Ferro) is a non-linear transformer, which passively provides a regulated voltage output through an electromagnetic phenomenon called ferroresonance (where the term ferroresonant transformer was derived). Ferroresonance is associated with the behavior of iron cores while operating near a point of magnetic saturation, wherein the core is so strongly magnetized that further variation in the input voltage results in little or no increase in magnetic flux. Basically, the ferroresonant action is a flux limiter rather than a voltage regulator. Nonetheless, with a fairly constant supply frequency, the CVT can maintain an almost constant output voltage even as the input voltage varies widely. In fact, the output voltage of the ferro varies about 1.2% for every 1% change in supply frequency, such that even with a considerable generator frequency change (2-Hertz), results in an output voltage change of only 4%. In short, CVTs are basically 1:1 transformers that are excited high on their saturation curves, thereby providing an output voltage which is not significantly affected by input voltage variations. This special characteristic is the foundation of the application of ferroresonant transformers as power conditioners.

The Constant Voltage Transformer was invented in 1938 by Joseph Sola and continues to sell thousands of units per year. The modern units has undergone minor improvements but remains fundamentally unchanged from its original design. Also, CVTs are single phase devices, but can be used in combination of two or three to provide all of the ferro's advantages in three phase applications.



Furthermore, constant voltage transformers have an auxiliary secondary (neutralizing) winding paralleled with one or more capacitors, forming a resonant circuit tuned to the power supply frequency. The purpose of the circuit (usually called tank circuit) is to mitigate the negative effect of core saturation that results in distortion of the voltage sine wave shape. In other words, the tank circuit serves as a filter to reject harmonics produced by the core saturation and provides the added benefit of storing energy in the form of AC oscillations, which is available for sustaining output winding voltage for up to ½ cycle of input voltage loss.

### **Advantages**

- Superior Voltage Regulation
- Sag Mitigation

- Ride-through capability
- Current Limiter
- Isolation from Surges, Harmonics and Noise due to the CVT's tank circuit design.
- CVTs are durable and robust that some manufacturers offer warranties in excess of 10 years.

## Uninterruptible Power Supply (UPS)

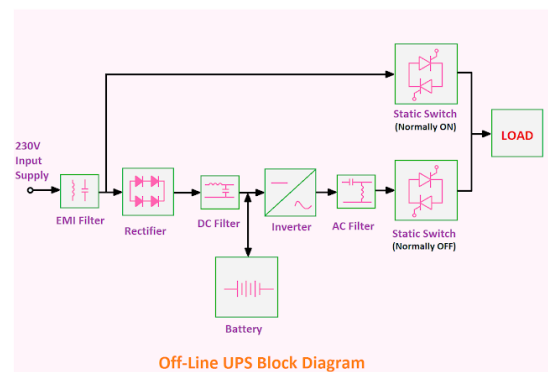
An uninterruptible power supply (UPS), also known as a battery backup, provides backup power when your regular power source fails or voltage drops to an unacceptable level. A UPS allows for the safe, orderly shutdown of a computer and connected equipment. The size and design of a UPS determine how long it will supply power.

### **UPS Topologies**

Different UPS topologies provide specific levels of power protection. A CyberPower UPS will belong to one of these three topologies: standby, line interactive, and double-conversion.

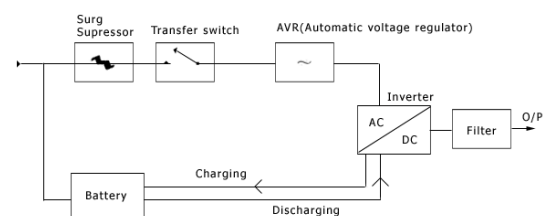
#### Standby

**Standby** is the most basic UPS topology. A standby UPS resorts to battery backup power in the event of common power problems such as a blackout, voltage sag, or voltage surge. When incoming utility power drops below or surges above safe voltage levels, the UPS switches to DC battery power and then inverts it to AC power to run connected equipment. These models are designed for consumer electronics, entry-level computers, POS systems, security systems, and other basic electronic equipment.



#### Line Interactive

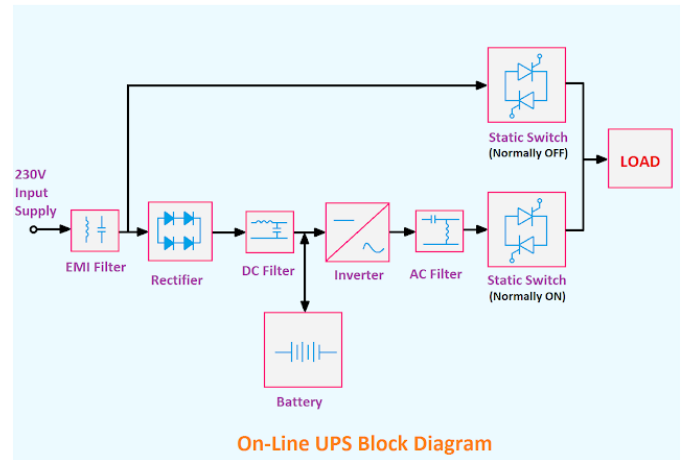
A **line interactive** UPS incorporates technology which allows it to correct minor power fluctuations (under-voltages and over voltages) without switching to battery. This type of UPS has an autotransformer that regulates low voltages (e.g., brownouts) and over voltages (e.g., swells) without having to switch to battery. Line interactive UPS models are typically used for consumer electronics, PCs, gaming systems, home theater electronics, network equipment, and entry-to-mid-range servers. They provide power during such events as a blackout, voltage sag, voltage surge, or over-voltage.





## Double-Conversion (Online)

A **double-conversion (online)** UPS provides consistent, clean, and near perfect power regardless of the condition of incoming power. This UPS converts incoming AC power to DC, and then back to AC. UPS systems with this technology operate on isolated DC power 100 percent of the time and have a zero transfer time because they never need to switch to DC power. Double-conversion UPS systems are designed to protect mission-critical IT equipment, data center installations, high-end servers, large telecom installations and storage applications,

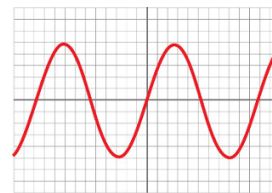


and advanced network equipment from damage caused by a power blackout, voltage sag, voltage surge, over voltage, voltage spike, frequency noise, frequency variation, or harmonic distortion.

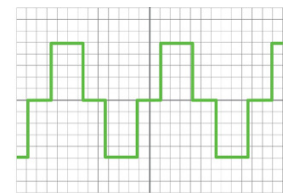
## **UPS output waveforms**

CyberPower UPS systems have either sine wave or simulated sine wave output, depending upon the model.

**Sine wave output:** The highest quality waveform output is sine wave, which is a smooth, repetitive oscillation of AC power. Enterprise-level UPS systems produce sine wave power to operate sensitive electronic equipment. Sine wave output ensures that equipment utilizing Active PFC power supplies do not shut down when switching from utility power to battery power.



Sine Wave

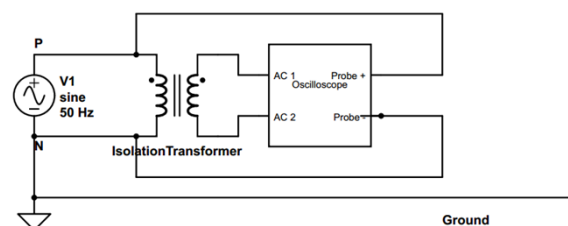


Simulated Sine Wave

**Simulated sine wave output:** An approximated sine wave output waveform. It uses pulse wave modulation to generate a stepped, approximated sine wave to supply more cost-effective battery backup power for equipment that does not require sine wave output. The technology used to produce this type of power output is less expensive to manufacture and is common in standby and line interactive UPS systems.

## Isolation Transformer

Transformers are electromagnetic devices which transform alternating current (AC) electrical energy from primary to secondary side. The energy is transformed with equal frequency and approximately equal power by means of the



transformer core magnetic field. Thus they provide galvanic isolation in the electrical system. The *isolation transformers* operate in the same way as other transformer types. But the main task is to provide the galvanic isolation in the electrical system. They can work as step-up transformer or step-down transformers but often operate with turns ratio. This means that the primary and secondary voltage values are equal. This is obtained with an same number of turns on the primary and secondary windings.

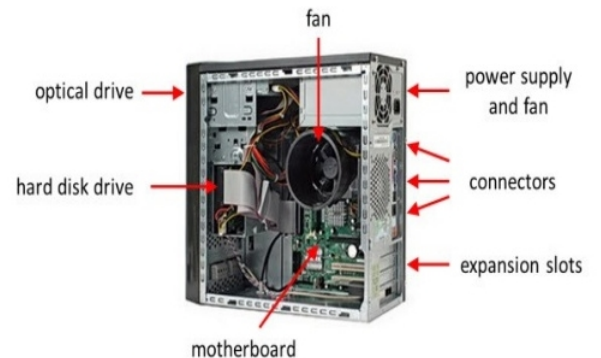
The **isolation transformers** are used in many electrical devices as computers, measurement devices or specific industry power electronic devices.

It is very important to use isolating transformers when an oscilloscope measures signals in an electrical circuit which is not galvanically isolated from the network. Because the current circuit can be closed (short-circuited) between oscilloscope common point and grounding. The main purpose of the isolation transformer is safety and protection of electronic components and the persons against electrical shock. It physically separates the power supplying from primary side and a secondary side circuit connected to electronic components and grounded metal parts which are in contact with the person. Basically, the transformer secondary side is isolated from the grounding.

## Chapter 4

### Introduction of Hardware components in computer system

There are five main **hardware components** in a **computer system**: Input, Processing, Storage, Output and Communication devices. Are devices used for entering data or instructions to the central processing unit. Are classified according to the method they use to enter data



### Explain Hardware –BIOS Interaction

**BIOS** (basic input/output system) is the program a personal computer's microprocessor uses to get the computer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, video adapter, keyboard, mouse and printer. BIOS is a firmware, in short. It is stored on a chip on the part of the computer motherboard and is basically, a set of instructions that run to help load the operating system.

### The four main functions of a PC BIOS

- **POST** - Test the computer **hardware** and make sure no errors exist before loading the operating system. Additional information on the POST is available on our [POST and beep codes](#) page.
- **Bootstrap Loader** - Locate the **operating system**. If a capable operating system is located, the BIOS will pass control to it.
- **BIOS drivers** - Low-level drivers that give the computer basic operational control over your computer's hardware.
- **BIOS setup** or **CMOS setup** - Configuration program that allows you to configure hardware settings including system settings such as computer passwords, time, and date.



**When you turn on your computer, the BIOS does several things. This is its usual sequence:**

1. Check the CMOS Setup for custom settings
2. Load the interrupt handlers and device drivers
3. Initialize registers and power management
4. Perform the power-on self-test (POST)
5. Display system settings
6. Determine which devices are bootable
7. Initiate the bootstrap sequence

## BIOS chip be upgraded or updated

Adding additional memory to a BIOS chip, as an upgrade, can only be done by physically removing it from the motherboard and replacing it with a new, more advanced BIOS chip.

The data on a BIOS chip can be updated if it's a **flash BIOS**. Using specially designed software, the BIOS can be updated to fix problems or add new features for the motherboard.

## BIOS Interaction

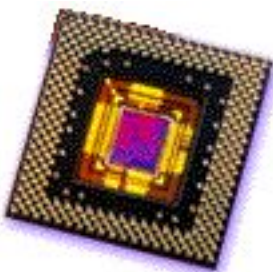


Power supply switched on.

The power supply performs a self-test. When all voltages and current levels are acceptable, the supply indicates that the power is stable and sends the Power Good signal to the processor. The time from switch-on to Power Good is usually between .1 and .5 seconds.

The microprocessor timer chip receives the Power Good signal.

With the arrival of the Power Good signal the timer chip stops sending reset signals to the processor allowing the CPU to begin operations.



The CPU starts executing the ROM BIOS code.

The CPU loads the ROM BIOS starting at ROM memory address FFFF:0000 which is only 16 bytes from the top of ROM memory. As such it contains only a JMP (jump) instruction that points to the actual address of the ROM BIOS code.



The ROM BIOS performs a basic test of central hardware to verify basic functionality.

Any errors that occur at this point in the boot process will be reported by means of 'beep-codes' because the video subsystem has not yet been initialized.



The BIOS searches for adapters that may need to load their own ROM BIOS routines.

Video adapters provide the most common source of adapter ROM BIOS. The start-up BIOS routines scan memory addresses C000:0000 through C780:0000 to find video ROM. An error loading any adapter ROM generates an error such as:

XXXX ROM Error

where XXXX represents the segment address of the failed module.

The ROM BIOS checks to see if this is a 'cold-start' or a 'warm-start'

To determine whether this is a warm-start or a cold start the ROM BIOS startup routines check the value of two bytes located at memory location 0000:0472. Any value other than 1234h indicates that this is a cold-start.



If this is a cold-start the ROM BIOS executes a full POST (Power On Self Test). If this is a warm-start the memory test portion of the POST is switched off.

The POST can be broken down into three components:  
The Video Test initializes the video adapter, tests the video card and video memory, and displays configuration information or any errors.  
The BIOS Identification displays the BIOS version, manufacturer, and date.  
The Memory Test tests the memory chips and displays a running sum of

installed memory.

Errors that occur during the POST can be classified as either 'fatal' or 'non-fatal'. A non-fatal error will typically display an error message on screen and allow the system to continue the boot process. A fatal error, on the other hand, stops the process of booting the computer and is generally signaled by a series of beep-codes.



The BIOS locates and reads the configuration information stored in CMOS.

CMOS (which stands for Complementary Metal-Oxide Semiconductor) is a small area of memory (64 bytes) which is maintained by the current of a small battery attached to the motherboard. Most importantly for the ROM BIOS startup routines CMOS indicates the order in which drives should be examined for an operating systems - floppy first, CD-Rom first, or fixed disk first.

## Operating System



If the first bootable disk is a fixed disk the BIOS examines the very first sector of the disk for a Master Boot Record (MBR). For a floppy the BIOS looks for a Boot Record in the very first sector.

On a fixed disk the Master Boot Record occupies the very first sector at cylinder 0, head 0, sector 1. It is 512 bytes in size. If this sector is found it is loaded into memory at address 0000:7C00 and tested for a valid signature. A valid signature would be the value 55AAh in the last two bytes. Lacking an MBR or a valid signature the boot process halts with an error message which might read:

NO ROM BASIC - SYSTEM HALTED

A Master Boot Record is made up of two parts - the partition table which describes the layout of the fixed disk and the partition loader code which

includes instructions for continuing the boot process.

**MBR**

With a valid MBR loaded into memory the BIOS transfers control of the boot process to the partition loader code that takes up most of the 512 bytes of the MBR.

The process of installing multiple operating systems on a single PC usually involves replacing the original partition loader code with a **Boot Loader** program that allows the user to select the specific fixed disk to load in the next step of the process.

**Partition Table**

The partition loader (or Boot Loader) examines the partition table for a partition marked as active. The partition loader then searches the very first sector of that partition for a Boot Record.

The Boot Record is also 512 bytes and contains a table that describes the characteristics of the partition (number of bytes per sectors, number of sectors per cluster, etc.) and also the jump code that locates the first of the operating system files (IO.SYS in DOS)

**Boot Record**

The active partition's boot record is checked for a valid boot signature and if found the boot sector code is executed as a program.

The boot sector's loader check the root directory of the active partition to ensure that the first two files found (DOS 6 or earlier) are IO.SYS and MSDOS.SYS (or their equivalent).

**IO.SYS**

If found in the first position on the active partition, IO.SYS is loaded into the highest region of contiguous DOS memory and the control of the boot process is handed over to it.

IO.SYS locates MSDOS.SYS (which immediately follows it on disk in DOS 6 or earlier) and loads it into low memory, overwriting the ROM BIOS initialization code that had been loaded there earlier in the boot process.

**MSDOS.SYS**

After MSDOS.SYS is loaded into memory it initializes the base device drivers, determines equipment status,

The full DOS file system is active, and the IO.SYS initialization code is given back control over the boot process.

resets the disk system, resets and initializes attached devices, and sets the system default parameters.

### CONFIG.SYS

IO.SYS reads CONFIG.SYS (if present).

If loading CONFIG.SYS, DEVICE statements are processed first in the order they appear. Then any INSTALL statements are processed in the order they appear. The SHELL statement is then processed loading the named program as the Command Line Interpreter for DOS. If no SHELL statement is present COMMAND.COM is used as the default shell.

### COMMAND.COM

COMMAND.COM is loaded into memory. It sits between the user and DOS as the command line interpreter. If AUTOEXEC.BAT is present, COMMAND.COM loads it and executes the commands it contains.

If AUTOEXEC.BAT is not found COMMAND.COM executes its internal DATE and TIME commands.

### DOS PROMPT

If everything goes well COMMAND.COM now displays the DOS prompt and awaits the users commands.

Using the prompt command in AUTOEXEC.BAT and the ANSI.SYS driver loaded by CONFIG.SYS the DOS prompt can be customized in a number of ways. The standard DOS prompt is created with the command:  
  
PROMPT \$P\$G.  
  
With the ANSI.SYS driver loaded the following command displays a two color DOS prompt:  
  
PROMPT \$E[31m\$p\$g\$E[0m\$e[32;40m





**The interconnection between subsystem of PC**

The interconnection plays an important role because information needs to be exchanged between the three subsystems. The CPU and memory are normally connected by three groups of connections, each called a bus: data bus, address bus and control bus.

Several core components and ancillary subsystems comprise PCs. The core components provide the basic functionality of the PC. Ancillary subsystems enhance the basic functionality to support different applications, such as graphics imaging, multimedia applications, and more. PCs are a package of matched components. The components are matched for speed (somewhat tuned) to provide the best overall performance. It makes little sense to have a super fast Central Processing Unit (CPU) chip and a slow fixed disk drive or slow Random Access Memory (RAM). Such a combination produces a slow system. PCs are as fast as their most used and slowest component. Sometimes fixing PC problems is making sure that the PC components are properly matched for speed. However, the best PC is always the most reliable.

The PC core components ranked from fastest to slowest are:

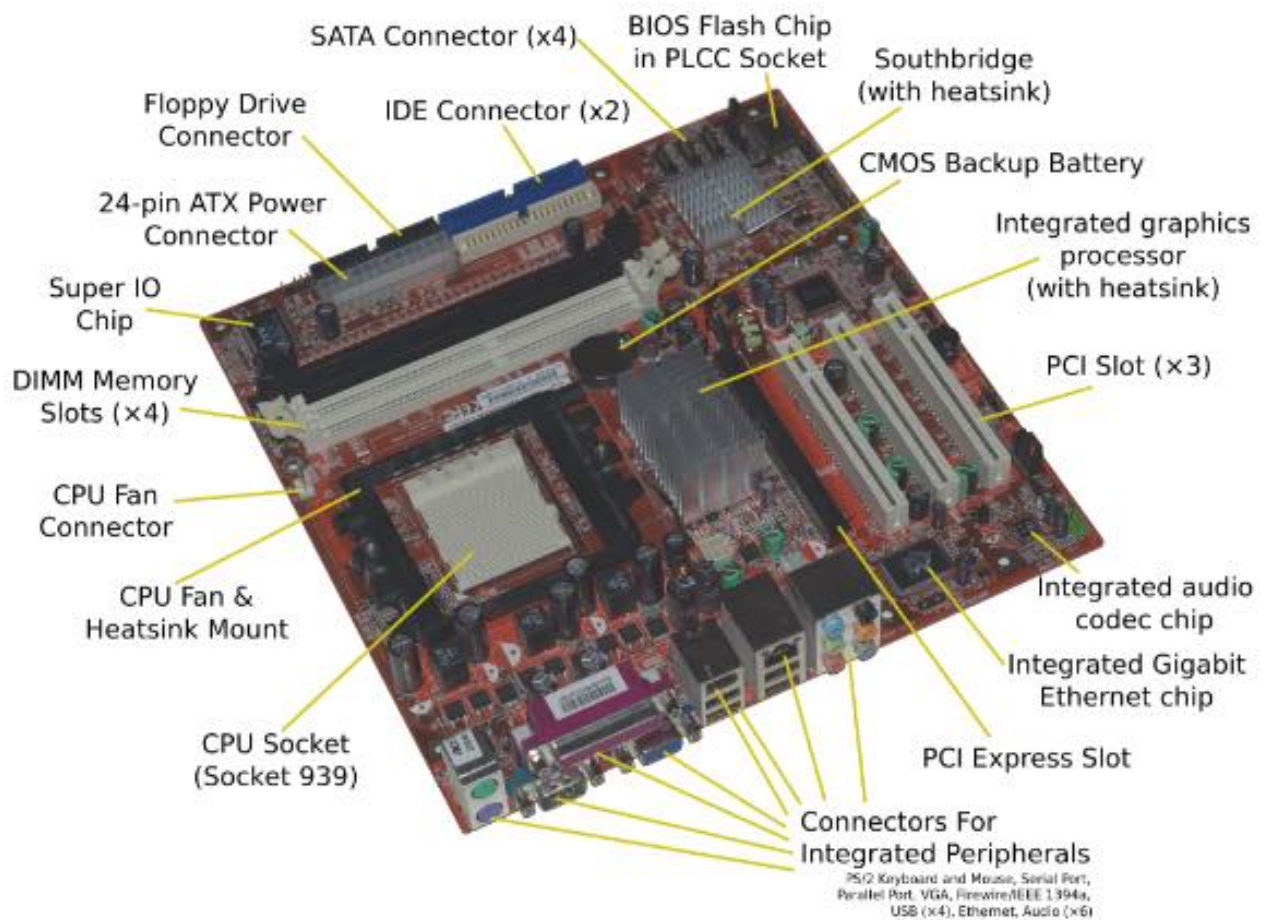
- CPU chip—fastest
- RAM
- Display adapter
- Read-Only Memory (ROM)
- Fixed disk drive
- Universal Serial Bus (USB)
- Network adapter
- CD-ROM drive
- CD Rewriteable (CD-RW) drive
- Digital Versatile Disk (DVD) drive
- Parallel port
- Serial port
- Mouse
- Keyboard
- The nut behind the keyboard—slowest

Components and subsystems fall into three categories: hardware, software, and network. Hardware components are those components physically installed in the PC or connected to it. Network connections are common components of most PC systems today.

Network connections are either dialup or Local Area Network (LAN). Cable modem and Digital Subscriber Line (DSL) connections are LAN connections as well. The network connections are attached to PC hardware components and work in conjunction with other computers and networking hardware residing somewhere on the attached network.

## **Motherboard**

A motherboard is basically a printed circuit board used to connect different parts of a computer like the central processing unit, memory, printer, mouse, keyboard, graphics card, and other peripherals through physical slots and interface connectors. If you've ever opened up your machine, you might've observed different lines going in various directions. These lines constitute a circuit used to allow communication between different hardware devices attached to the motherboard. Electrical signals carrying data information pass through these lines. The flow of current in the printed circuit board is similar to a normal circuit, though, less in voltage. The advantage is that it can be accommodated in less space than the conventional one.



## Form factor

Form Factor is the term given to the shape and size of a motherboard. Generally, all types of motherboards are designed according to predefined specifications creating a similarity between the motherboards manufactured by different companies. However, the size may differ to a small extent from brand to brand.

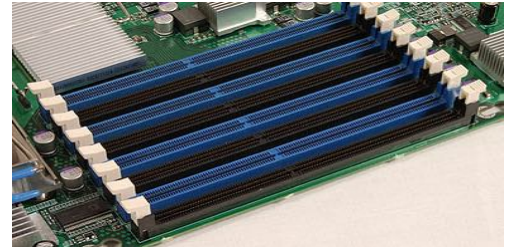
ATX, developed by Intel, is the most widely used configuration specification for desktop motherboards which is implemented by almost all the major manufacturers.

## **Inside a Motherboard**

After having a look at how motherboards have evolved over the years, we will now have a look at the components of a motherboard.

### **Memory Slots**

These are the long slots attached to the motherboard to install DIMM chips to the computer. DIMM stands for Dual Inline Memory module which consists of DRAM integrated circuits. The Dynamic Random Access Memory (DRAM) is a volatile memory that stores the data and files being executed by the CPU. Many variants of DRAM exist like DDR, DDR2, DDR3, DDR4.



Earlier machines, between the 1980s and late 1990s, used SIMM (Single Inline Memory Module) type memory modules.

### **Sockets**

You might've heard terms like LGA 1150 or AM3+. Getting the correct socket type for a processor is a common dilemma faced when we assemble a computer, for example, a desktop machine. So, what exactly a socket is? A socket is a place where the microprocessor or CPU sits on the motherboard. Due to the socket, a microprocessor doesn't need to be soldered to the motherboard. We can remove it anytime as per our will.

The type of sockets used are:

**LGA (Land Grid Array)** – In this, the pins are present on the socket.

**PGA (Pin Grid Array)** – In this, the pins are present on the CPU chip.

**ZIF (Zero Insertion Force)** – In this, while inserting the CPU chip the contacts on the socket are made loose by lifting a lever. Thus, the CPU gets fitted easily.

The LGA type sockets are mainly used by Intel whereas, AMD uses the PGA-ZIF type sockets. Let's take the example of Intel, they make many socket variants. The difference comes in the pin arrangement. That's why we have to be very careful while deciding the CPU and socket type.

### **Chipset**

It is an IC present on the motherboard that is responsible for the creation of a communication channel between the CPU and various components like memory, and peripheral devices connected to the motherboard. Without a chipset, all the different parts will not be able to talk to the central processing unit and this will directly affect the performance of the computer. Chipset consists of two parts:

**Northbridge** which is directly attached to the CPU through the front side bus (FSB). It uses the memory controller to contact the RAM chip to transfer data between CPU and RAM. In addition to this, it also establishes communication with the PCI Express bus.

**Southbridge** links to the USB ports, SATA interface. It doesn't directly report to the CPU, all the information has to pass through the north bridge before reaching the CPU.

### **Clock Generator**

The basic operation of a clock generator is to synchronize the operations of different components of a motherboard. It generates a clock signal that jumps between high and low frequencies, thus creating a metronome for the coordination of actions. I won't jump into its depth to tell you the technicalities.



### **Expansion Card Slots**

You might be familiar with the term PCI (Peripheral Component Interconnect). It is used to install additional components like Wireless adapters, graphics cards, etc. PCI is an expansion bus that is used to transfer data between the computer (i.e. CPU and RAM) and the connected peripheral device.

A bus can be understood as a path through which the data travels. The term refers to both the software and the hardware required to transfer data. A bus has two parts, the **address bus** which passes the information about where the data should go, and the **data bus** which carries the actual data to be transferred.

Modern motherboards include the PCIe (PCI Express) slots which are an upgrade over the conventional PCI and PCI-X expansion bus standards.

ISA stands for Industry Standard Architecture, It is the standard architecture of the Expansion bus. Its connect modem and input devices.

The Accelerated Graphics Port (AGP) is a high-speed point-to-point channel for attaching a video card to a computer system, If you have a modern motherboard, you will almost certainly notice a single connector that looks like a PCI slot. A fast port for a graphics card.

### **CMOS Battery**

Motherboards also include a small separate block of memory made from CMOS RAM chips which is kept alive by a battery (known as a CMOS battery) even when the PC's power is off. This prevents reconfiguration when the PC is powered on.

CMOS devices require very little power to operate.

The CMOS RAM is used to store basic Information about the PC's configuration e.g.

- Floppy disk and hard disk drive types
- CPU
- RAM size
- Date and time
- Serial and parallel port information
- Plug and Play information
- Power Saving settings

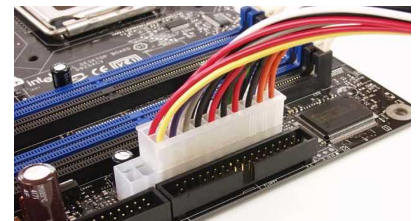
## Storage Connectors

Motherboards are equipped with connectors for attaching storage devices like magnetic hard drives, optical drives, and SSDs. These devices work through an interface known as SATA. SATA or Serial ATA is also a computer bus that enables connection between the storage media and the computer through the host bus adapters present on the motherboard.

Various SATA versions namely, SATA 3.2, mSATA, eSATA, etc exist and are used depending on the configuration of the machine. For example, mSATA or mini-SATA is used for SSDs and hard drives installed in laptops.

## Power Connectors

Computers have a main power supply unit but it is not possible to deliver power to all the components directly from it. Hence, power connectors are used to distribute the power from the main supply to various components like RAM, CPU, chipset, and expansion cards.



Some modern expansion cards like the high-end graphics cards

require more power which can't be provided by the main power connectors of the computer. So, these graphics cards come with their own power connectors to get the right amount of electrical power.

The Power supply provides the necessary electrical power to make the computer system operate.

The power supply takes standard 220-V AC power and converts into +/-12-Volt, +/-5-Volt, and 3.3-Volt DC power.

The power supply connector has 20-pins, and the connector can go in only one direction.

## Operating Temperature

Improper temperatures in case of motherboards may lead to a reduction in performance and lower life expectancy over the course of time. Hence, various devices like the heat sink and cooling fans have been designed to bring down the temperature when the heat is generated by the motherboard's components.

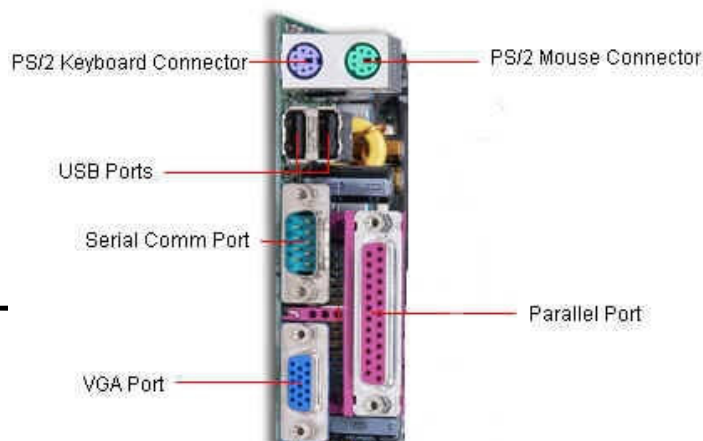
The ideal operating temperature for motherboards is around 45-degree celsius. Your computer won't be happy with you if you don't equip it with an appropriate cooling system, raising the temperature above intolerable limits. You might have heard about frying of motherboards due to high operating temperatures.

So, that's all I know about Motherboards. If I have failed to include some major point, please let me know in the











Connector Side of ATX Motherboard



comments section below.

## Connector



## Side of Motherboard

	<b>Keyboard &amp; Mouse</b> : This Port is used to connect keyboard and mouse , now a day we use USB connector for keyboard and mouse
	<b>Serial or COM</b> : It used to connect some types of modem, scanner, or digital camera
	<b>Parallel or Printer</b> : You plug your printer into the parallel, or printer, port. But now printers may use a USB port
	<b>USB</b> : Designed to replace older Serial and Parallel ports, the USB (Universal Serial Bus) can connect computers with a number of devices, such as printers, keyboards, mice, scanners, digital cameras, PDAs, and more
	<b>Video or Monitor</b> : It used to connect your monitor into the video port
	<b>Line Out</b> : It used to connect speakers or headphone into the Line Out jack
	<b>Line In</b> : The Line In jack allows you to listen to your computer using a stereo system
	<b>Microphone</b> : It used to connect a microphone into this jack to record sounds on your computer
	<b>Joystick or Game</b> : If you have a joystick, musical (MIDI) keyboard, or other gaming device, this is where you plug it in
	<b>Phone or Modem</b> : The phone or modem jack is where you plug your computer into a phone line

	<p><b>Network or Ethernet</b> : You can connect your computer to a network by plugging in an Ethernet cable in this port</p>
	<p><b>SCSI</b> : It used to connect a hard drive, CD-ROM drive, or other device to a computer</p>

**Study of functioning of SMPS(Switch Mode PowerSupply)**

SMPS stands for Switched Mode Power Supply. It converts power using switching devices by turning on and off at high-frequencies. These are used in variety of electronic equipment to provide high efficiency, regulate DC output voltage from DC input voltage i.e. it provides the supply from a source to loads.

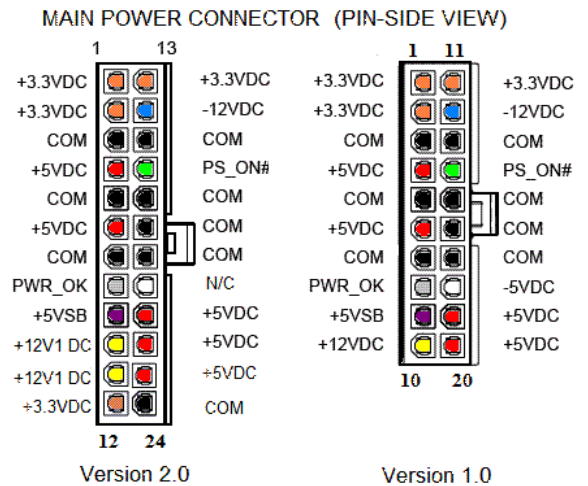
PC power supplies are of a switching rather than a linear design. Switching type power supplies convert higher AC voltage in to lower DC voltages required for PC components.

More efficient in size, weight & energy in comparison to linear design which use large internal transformer to generate various o/p.

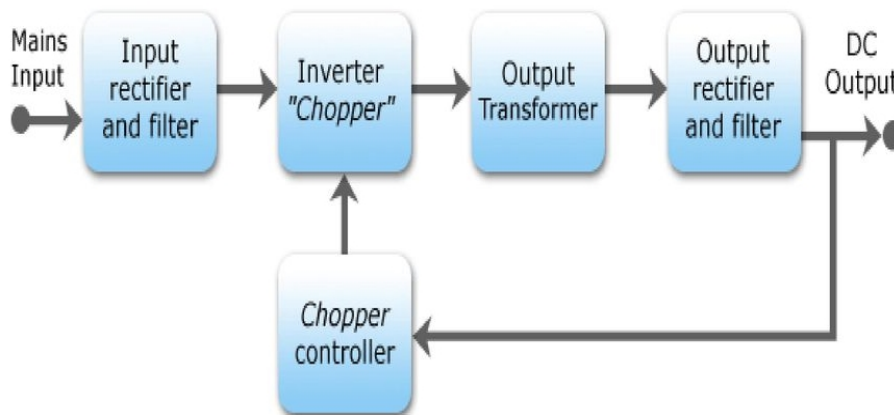
Convert the power avail to the type PC can use. Conventional desktop power supply is used to convert either 115 V(60 Hz) or 230 V(50 Hz) into +3.3 V, +5V + 12V DC power.

Digital electronic components & ccts – M.bd, adapter cards& Disk drive logic boards use - 3.3 or 5 V DC.

The motors- disk drive motors & any fans use+12 V DC.



**Block diagram of a SMPS**





1. It is used to convert an AC input to DC.
2. Inverter stage: The inverter stage converts DC, whether directly from the input or from the rectifier stage
3. Output transformer: If the output required is to be isolated from input, the inverted AC is used to draw the primary windings of a high frequency transformer. This converts the voltage up or down to the required output level on its secondary winding.
4. Output rectifier: If the dc output is required, the ac output from the transformer is rectified.
5. Regulation: Feedback circuit monitors the output voltage and compares it with the reference voltage.

## **HDD**

Hard Disk, also called Hard Disk Drive (HDD), is a non-volatile memory hardware device. Hard disk work is to permanently store and retrieve computer data. They are called non-volatile device, which can store any type of data in the computer for a long time.

That is, the computer keeps the data safe even after power off. Hard Disk is also called Secondary Storage Device. It exists inside a computer case (CPU) and is connected to the computer motherboard using data cables (PATA, SCSI, SATA).

Hard Disk uses magnetic storage to store and retrieve digital information. That is why it is also called Electro-mechanical data storage device. The hard disk consists of one or more circular rotating disks to store the data.

Each platter has a very thin strip, which is made using magnetic material. There are many tracks and sectors present in these platters and it rotates through the spindle. When the platter starts rotating, a Read / Write arm in the Hard Disk moves it from right to left.

Its job is to read data and write data from platter. The faster the spindle rotates the platter, the faster the data will be stored in the Hard Disk. Its speed is measured in RPM (Revolution Per Minute). This means how many rounds the platter took in a minute. Most Hard Disk ranges from 5400 RPM to 7200 RPM.

### **Hard disk parts**

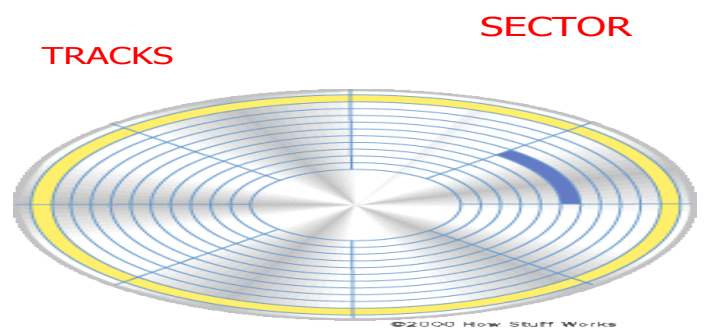
Some of the major components of Hard Disk and their functions are shown below.

1. **MAGNETIC PLATTERS** is an important part of it, in which digital information is stored magnetically. In this, the data is saved in binary form (0 to 1).
2. **READ / WRITE HEAD** is a small magnet mounted next to the read right arm. It moves the platter from right to left and works to record and store information.

3. The read-write arm rotates with the help of ACTUATOR.
4. READ-WRITE ARM is the back of the read right head, both of them are connected.
5. SPINDLE is a type of moter, it is present in the middle of the platter. With its help, the platters move around.
6. CIRCUIT controls the effect of data from the BOARD platter.
7. CONNECTOR transmits data from the circuit board to the read-write and platter.
8. LOGIC BOARD is a type of chip that controls all information input or output from HDD.
9. HSA is the parking area of the reed right arm.

### Tracks and Sectors

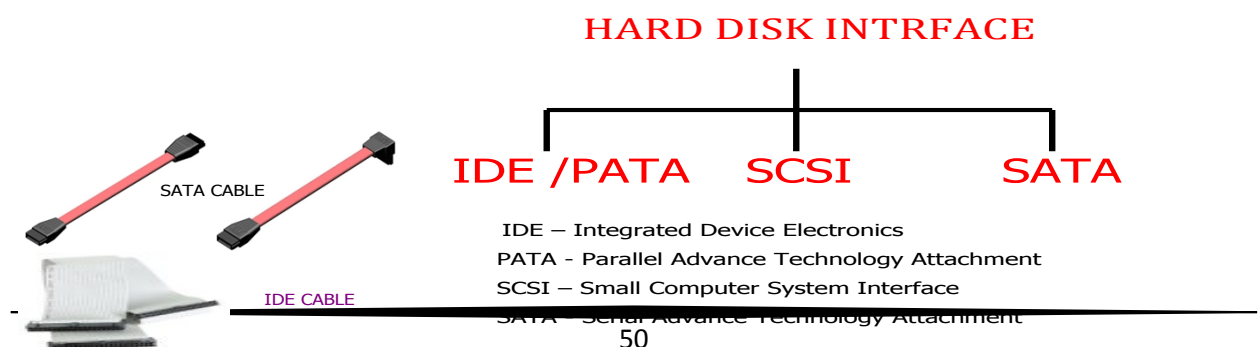
- ◆ Platters are organized into specific structures to enable the organized storage and retrieval of data. Each platter is broken into *tracks*--tens of thousands of them--which are tightly-packed concentric circles.
- ◆ A track holds too much information to be suitable as the smallest unit of storage on a disk, so each one is further broken down into *sectors*.
- ◆ A sector is normally the smallest individually-addressable unit of information stored on a hard disk, and normally holds 512 bytes of information.
- ◆ The first PC hard disks typically held 17 sectors per track.
- ◆ Today's hard disks can have *thousands* of sectors in a single track, and make use of zoned recording to allow more sectors on the larger outer tracks of the disk.



### Sizes of hard drives

The hard drive is often capable of storing more data than any other drive, but its size can vary depending on the type of drive and its age. Older hard drives had a storage size of several hundred MB (megabytes) to several GB (gigabytes). Newer hard drives have a storage size of several hundred gigabytes to several TB (terabytes). Each year, new and improved technology allows for increasing hard drive storage sizes.

### HARD DISK INTRFACE



**Master Boot Record (MBR)**

The MBR is the first and most important component on the software side of things in the boot procedure on BIOS-based machines.

Every hard disk has an MBR, and it contains several important pieces of information.

The sector which contains loader code is Main Boot Record ( *MBR* ) because this

loader code already occupies most of the free space. Besides, formatting partition commands will not erase MBR information since this special space does not belong to any partitions.

MBR Contains Three Parts ( < 512 bytes )

**Bootstrap code /Main Boot Record (446 bytes )**

The beginning of the MBR is the first stage of loader code. And the loader code is variable.

Thus, users can boot MBR from multiple operating systems. It can be found in FDISK

program. After booting the hard disk, MBR will pass the control right to the certain operating system which has been registered in the partition table.

**Disk Partition Table ( DPT )**

The partition table describes the partitions of a storage device. Disk partition table is located at the first sector ( *cylinder 0, head 0 and sector 1, MBR* ) of each hard disk. The total partition table is 64 bytes long, and each partition entry is 16 bytes long. Therefore, there is a

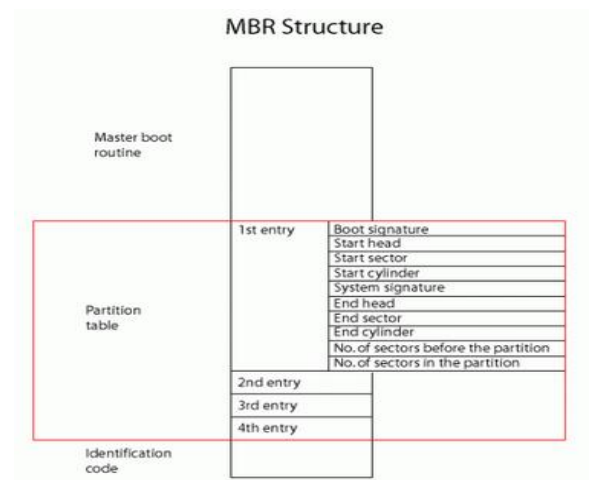
maximum of 4 partitions on MBR disk. If users need more partitions, they can create extended partition since an extended partition can be divided into several logical drives.

**END Signature**

Its value is AA55. But it may look like 55AA since the low value will be in front of the high.

**PARTITIONING OF HDD**

To store data and applications on hard disk, users should partition it at first. When we create a partition, the physical parameters of the hard disk have been set, and the hard disk master boot record ( *generally referred to the MBR* ) and the storage location of the boot record backup have been



determined. As for the file system as well as other information required by operating system to manage hard disk, they are completed after advanced Format.

Disk partitioning means that users use the partition editor to divide a hard disk into several logical parts. After that, they can store different directories and files into different partitions. The more partitions, the more different storage places. Thus, users can store files into different partitions. But, users may encounter some unexpected troubles and difficulties if they divide their

hard disk into many partitions. Space management, access permissions and directory searching ways depend on the file system saved on the partition. Therefore, when users change something (*like converting FAT16 to FAT32 files system*), they have to carefully consider the size of the partition.

### Extended Partition and Logical Partition

DOS and FAT file system originally were designed to support 24 partitions on a hard drive at most, using 24 drive letters from C to Z. But the master boot record can contain up to 4 partitions records. To solve this problem effectively, FDISK command of DOS partition allows users to create an extended partition where 23 logical partitions can be created. Each of these logical partitions is assigned with a drive letter alone, and can be used by the computer as a separate physical device. Information about the logical partition is stored in the extended partition, while the primary partition and extended partition information is store in the MBR of hard disk. This means no matter how many partitions the disk contains, the master boot record includes information of 4 primary partitions or 3 primary partitions and 1 extended partition.

On a GPT disk, all partitions are primary partitions. Besides, the partition number can reach up to 128.

### Types

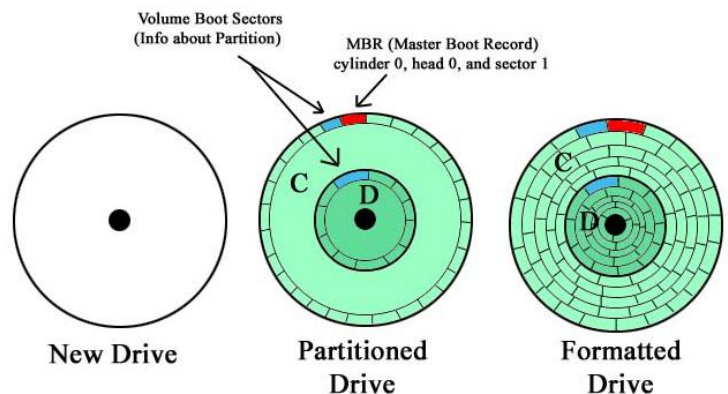
After the hard disk is partitioned, there will be three kinds of partitions, namely primary partition, extended and non-DOS partition.

### Non-DOS Partition

Non-DOS partition is a special partition, and it is a separate space on the hard disk, which can be used by another operating system. For the operating system saved on the primary partition, non-DOS partition is just a storage space divided out from the hard disk. Besides, only operating systems installed on non-DOS partition can manage and use this storage area.

### Primary Partition

Primary partition is a relatively simple partition which is usually located in the top of hard disk area to constitute the logical C disk. It provides master boot program to check the correctness of the hard disk



partition and determine the active partition. Besides, this master boot program will help to pass the boot right to the DOS or other operating systems saved in the active partition. The system cannot boot from the hard disk if this program is damaged, but the disk can be read and written after we boot computer from floppy or CD-ROM.

### **Extended Partition**

The concept of extended partition is a little more complicated. Actually, an extended partition can be divided into multiple logical partitions. Thus, users are allowed to create multiple partitions in hard disk.

### **FORMATTING of HDD**

#### **Formatting Definitions:**

To divide (a disk) into marked sectors so that it may store data.

To determine the arrangement of (data) for storage or display.

Strictly, formatting is organizing and marking the surface of a disk into tracks, sectors, and cylinders. It is also sometimes (incorrectly) a term used to signify the action of writing a file system to a disk (especially in the MS Windows/MS DOS world).

The act of writing a file system on a disk drive. Preparing a disk to receive data. Formatting software organizes a disk into logical units, like blocks, sectors, and tracks. The process of organizing a disk so that it is usable in a particular operating environment.

#### **1. Low-Level Formatting**

This type of formatting writes normally zeros on the hard disk thus over-writing everything on the HDD and it also destroys any partitions. You should get a low-level formatting utility or a zero-fill utility from the HDD manufacturers' web site.

Low-level formatting is the process of outlining the positions of the tracks and sectors on the hard disk, and writing the control structures that define where the tracks and sectors are. This is often called a "true" formatting operation, because it really creates the physical format that defines where the data is stored on the disk. The first time that a low-level format ("LLF") is performed on a hard disk, the disk's platters start out empty. That's the last time the platters will be empty for the life of the drive. If an LLF is done on a disk with data on it already, the data is permanently erased and lost.

#### **2. High-Level Formatting**

This type of formatting prepares the HDD for an Operating System.

After low-level formatting is completed, the disk is only with tracks and sectors and nothing written on them. High-level formatting is the process of writing the file system structures on the disk that let the disk been used for storing programs and data. If you are using DOS, for example, the DOS FORMAT command performs this work, writing such structures as the master boot record and file allocation tables to the disk. High-level formatting is done after the hard disk has been partitioned, even if only one partition is to be used.

## **Distinction between high-level formatting and low-level formatting**

It is not always necessary to low-level format the hard disk to erase and clean it. High-Level Format is good for Operating System re-constructive purposes or HDD data management. High-Level Formatting is done by wiping out the control structures and writing new ones, so that the old information seems to be lost and the disk appears as new. Most of the old data is still on the disk, but the access paths to it have been wiped out. This deleted data remains recoverable at all the times until HDD has been filled to the point that the old data is automatically over-written with the new data. Under certain circumstances such as viruses, Trojans, software marked bad sectors, just to mention some, a high-level format won't fix problems. Low Level Formatting is needed to clean and destroy the remaining data that is left behind on the hard disk.

Different operating systems use different high-level format programs, because they use different file systems. However, the low-level format, which is the real place where tracks and sectors are recorded, is the same.

## **Different standards of expansion units**

### **ISA**

Short for **Industry Standard Architecture**, **ISA** was introduced by IBM and headed by Mark Dean. ISA was originally an 8-bit computer bus that was later expanded to a 16-bit bus in 1984. When this bus was originally released, it was a proprietary bus, which allowed only IBM to create peripherals and the actual interface. However, in the early 1980s other manufacturers were creating the bus. ISA peripherals such as a modem or sound card. Using the PnP technology.

### **EISA**

Short for **Extended Industry Standard Architecture**, **EISA** or **Extended ISA** is a standard first announced in September 1988 for IBM compatible computers that competed with the MCA bus. The EISA bus is found on Intel 80386, 80486 and early Pentium computers and was designed by nine competitors. These competitors were AST Research Compaq, Epson, Hewlett Packard, NEC, Olivetti, Tandy, WYSE, and Zenith Data Systems.

The EISA bus provided 32-bit slots at an 8.33 MHz cycle rate for use with 386DX or higher processors. EISA can also accommodate a 16-bit ISA card in the first row.

### **VESA**

Short for **Video Electronics Standard Association**, **VESA** is a group of monitor and video card manufacturers that set video display and bus standards. VESA was originally founded by NEC and is most known for the VL bus standard.

### **PCI**

Short for **peripheral component interconnect**, **PCI** was introduced by Intel in 1992. The PCI bus came in both 32-bit (133 MBps) and 64-bit versions and was used to attach hardware to a

computer. Although commonly used in computers from the late 1990s to the early 2000s, PCI has since been replaced with PCI Express.

Revisions came in 1993 to version 2.0, and in 1995 to PCI 2.1, as an expansion to the ISA bus. Unlike ISA and other earlier expansion cards, PCI follows the PnP specification and therefore did not require any jumpers or dip switches.

### PCI Express

Originally known as **3rd Generation I/O (3GIO)**, **PCI Express**, or **PCIe**, was approved in July 2002 as a serial computer expansion bus standard. PCI Express was designed as a high-speed replacement for the aging PCI and AGP standards and is available in different formats. The data transmitted over PCI Express is sent over wires (called lanes) in full duplex mode (both directions at the same time). Each lane is capable of transfer speeds around 250 MB/s and each slot can be scaled from 1 to 32 lanes. With 16 lanes, PCI Express supports a bandwidth of up to 4,000 MB/s.

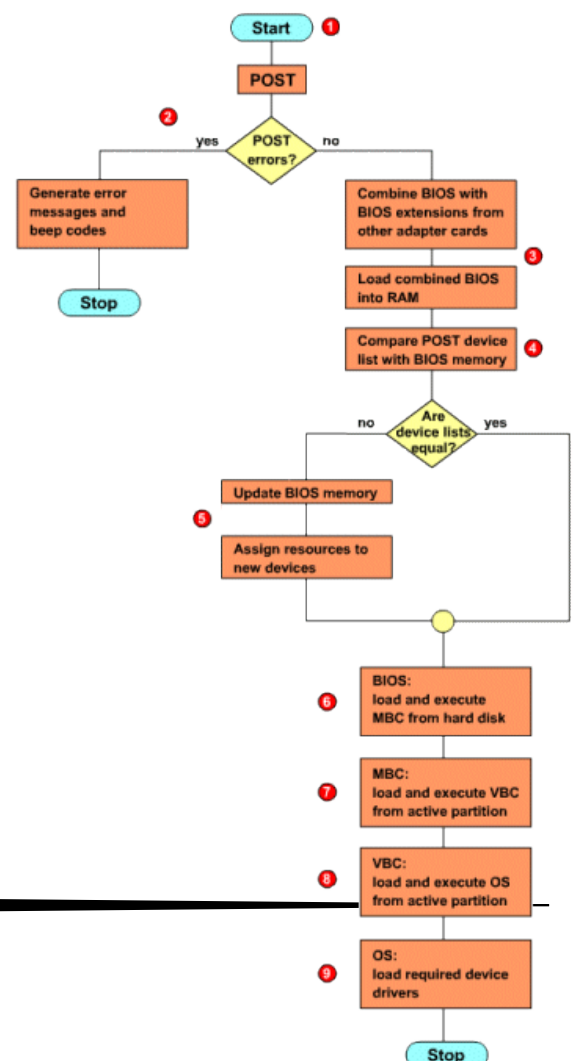
### Discuss POST sequence

**Power-on self-test**, the **POST** is a test the computer must complete verifying all hardware is working properly before starting the remainder of the boot process. The POST process checks computer hardware, like RAM (random access memory), hard drive, CD-ROM drive, keyboard, etc., to make sure all are working correctly.

If all hardware pass the POST, the computer will continue the boot up process and may generate a single beep sound as well. If POST is unsuccessful, it generates a **beep code** to indicate the error encountered and the computer will not boot up. All POST errors are relating to hardware issues with one of the components in the computer.

Both Macs and Windows PCs run a POST each time the computer is booted up or restarted. The scan checks the hardware and makes sure the processor, RAM, and storage devices are all functioning correctly. If an error is encountered during the POST, the startup process may pause or halt completely and the error may be displayed on the monitor.

On PCs, POST errors are often displayed on the BIOS information screen. They may be output as cryptic codes, such as "08" for bad memory, or as a system message, such as "System RAM failed at offset." On Macs, POST errors are often indicated



by a simple graphic, such as a broken folder icon that indicates no bootable device was found. In some cases, the computer screen may not even turn on before POST errors take place. If this happens, error codes may be output through flashing LED lights or audible tones. For example, an Apple iMac will sound three successive tones, followed by a five second pause, then repeat the tones when bad RAM is encountered during startup. Most PCs also emit beeps when POST errors are detected, though each manufacturer uses its own codes.

POST is rather technical term that only computer technicians use on a regular basis. However, it is a good acronym to know, since it will help you better understand error messages that may pop up on computers or other electronic devices. If your computer won't start up because of a POST error, you can use a different device to look up the meaning and cause of the error, possibly from the manufacturer's website. Then you can take the appropriate action, such as removing a memory module or reseating the video card, then you can try starting up your computer again.

### **Describe Keyboard Interface**

The keyboard uses a special, dedicated interface to talk to the PC. The basic design and operation of this interface is largely unchanged since the days of the old IBM PC/AT of the mid-1980s. Only in the last few years has the availability of the universal serial bus (USB) on newer systems created an alternative way of attaching a keyboard to the PC. The conventional keyboard interface is still used in almost all PCs, however, despite USB's growing popularity.

The traditional keyboard interface is in some ways similar to a "stripped-down version" of a regular serial (COM) port. Communication between the keyboard and the PC is accomplished over the lines in the keyboard cable, which connect the internal controller in the keyboard with a matching device on the motherboard, called the keyboard controller. This is really a misnomer of sorts, since it's arguable that the chip within the system doesn't control the keyboard; the chip within the keyboard does! It would probably be better if it were called the keyboard interface controller, actually.

Motherboards in older PCs, which were designed before the invention of integrated chipsets, used an Intel 8042 chip for their keyboard controller. This became the standard on virtually all PCs. Today, motherboards don't necessarily include a physical 8042 chip, but they emulate its functionality for the sake of compatibility. The keyboard controller is also responsible for other tasks within the PC.

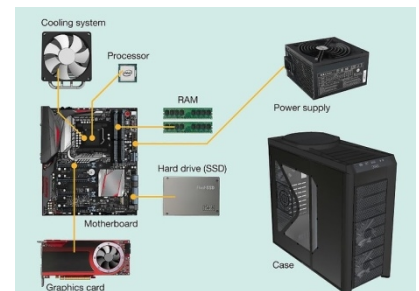
All keyboards that use standard keyboard connectors to attach to the motherboard use the regular keyboard interface. This is true whether they use the larger 5-pin DIN connector, or the smaller, 6-pin mini-DIN. Communication over the interface is accomplished using two signaling lines, and is governed by a number of special rules and protocols, as described in the page on interface signaling. On modern PCs the communication is bi-directional, with the keyboard's internal controller and the motherboard's keyboard controller each able to send and receive commands over the interface



## **Study the steps for Assembling of a computer**

Before you buy any components or establish a budget, you'll need to know what you plan on using the computer for. Standard desktop PCs which are used for things like browsing and minor programs (e.g., Microsoft Word and Excel) can use older, less expensive parts, while gaming- or editing-focused computers will need more powerful, up-to-date parts.

It's too easy to start buying attractive parts without sticking to a budget, only to realize that you're out of money and don't have all of the necessary equipment to build your PC.



**Know which components you need to buy.** No matter how expensive your computer, you will need the following components

- Processor — Acts as the "brain" of your computer.
- Motherboard — Serves as an interface between all of your computer's components and the processor.
- RAM — Random Access Memory. More RAM will provide more "workspace" to increase your computer's performance. Think about the RAM as a table: more RAM gives you more room for doing things on that table. Less RAM is like having a smaller table!
- Hard drive — Stores data. You can buy a traditional hard drive, or you can opt for a more expensive solid state drive (SSD) if you want an exceptionally fast drive.
- Power supply — Powers all of your computer's individual components. The power supply is also the interface between your computer and the wall socket into which you plug your computer.
- Case — Necessary for storing and cooling your components.
- Graphics card — Used to render images on your computer. While most processors have a built-in graphics processing unit (GPU), you can buy a dedicated graphics card if you plan on gaming or using your computer for intensive editing.
- Cooling system — Keeps the inside of your case at a safe temperature. Only necessary for gaming and editing PCs—regular PCs should be fine with a stock cooler.

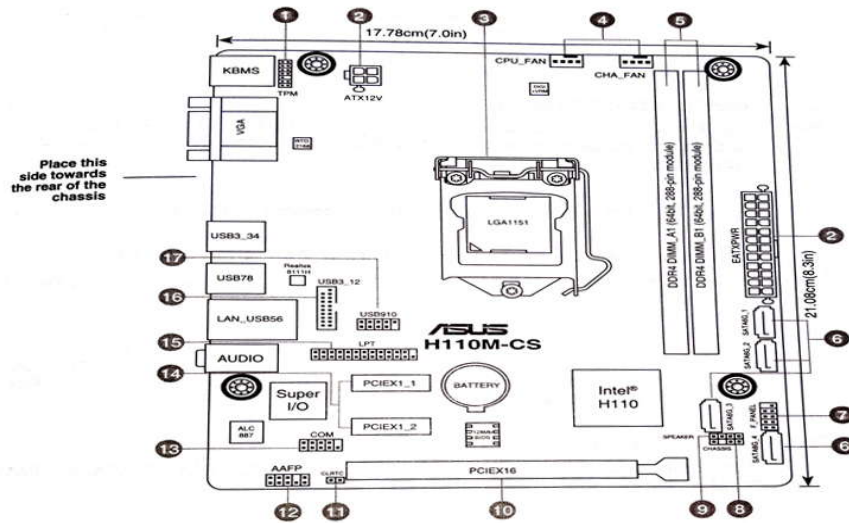
## **Precaution measures used before assembling of PC**

Ground yourself.

Use an antistatic wrist-strap cable to prevent electrostatic discharge (ESD) which can be deadly to computer electronics. Alternatively, touch a large metal body like a radiator to discharge yourself.

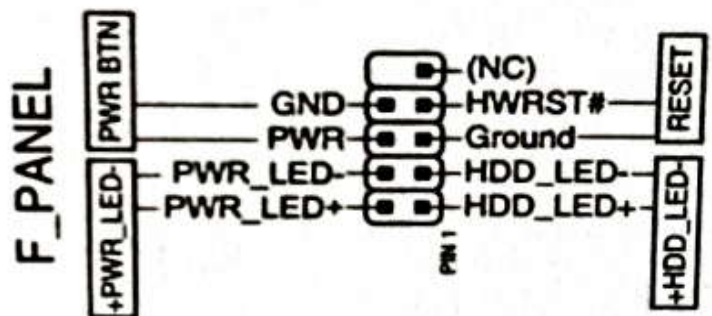
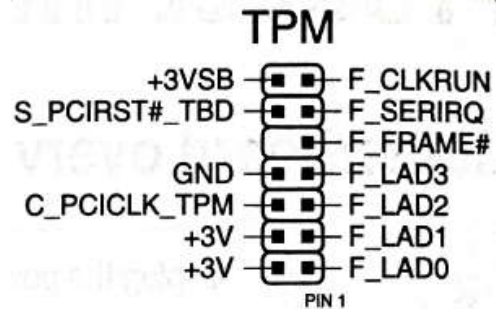
- Working area should be dry.
- Working surface must be non conductor.
- Use proper tools for assembling of PC.

Below Diagram show component of motherboard



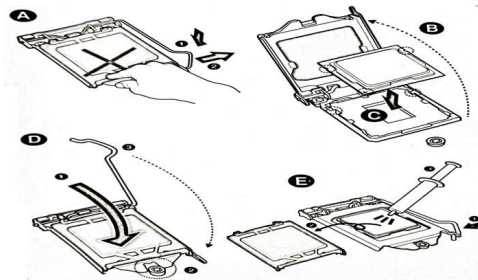
Here we are using Asus H110M-cs motherboard

- (1) TPM connector (14-1 pin TPM**
- (2) ATX power connector (3) CPU socket (4) CPU and chassis fan connector (5) DDR4 DIMM slots (6) Serial ATA connector (7) System Front panel connector (8) Chassis intrusion head (9) Speaker Connector (10) PCI Express (11) Clear RTC RAM (12) Front panel audio connector (13) Serial port connector (14) PCI Express slots (15) LPT connector (16) USB 3.0 connector (17) USB 2.0 connector**

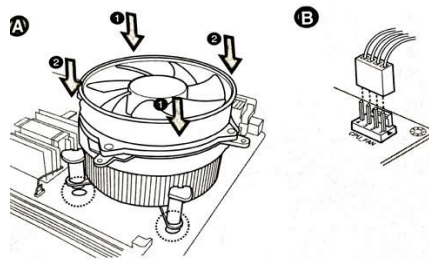


# Installing components of motherboard

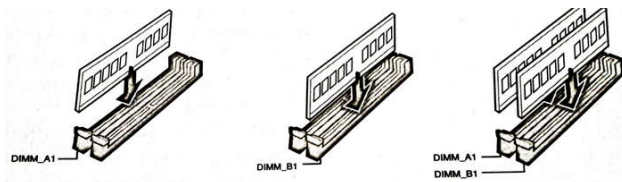
## Step 1 ) Install CPU



## Step 2 ) Installing CPU Fan



## Step 3 ) Install RAM

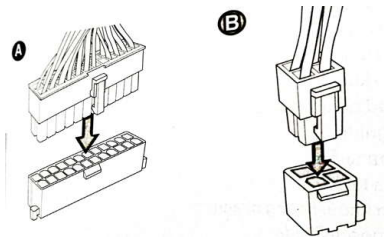


## Step 4 ) Install SATA devices

## Step 5 ) Install Expansion cards

## Step 6 ) Install system panel connector

### Step 7 ) Install ATX power connector



### Step 8 ) Connecting input/output devices

### Step 9 ) Power On the system .

## Software setting computer after installations

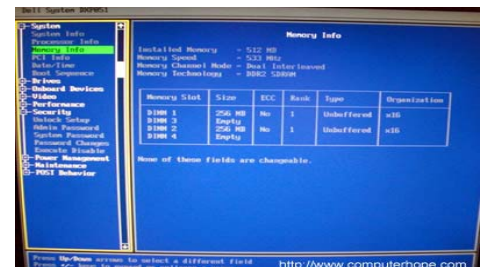
After assembling of hardware components of PC ,now the time to install the software. Before installation of software ,we have to customize the Motherboard.

To customize the Motherboard we have to customize the cmos-setup

## COMS Setup

How to enter the BIOS or CMOS setup.

- [F1](#)
- [F2](#)
- [DEL](#)
- [ESC](#)
- [F10](#)
- A user will know when to press this key when they see a message similar to the below example as the computer is booting. Some older computers may also display a flashing block to indicate when to press the F1 or F2 keys.
- Press <F2> to enter BIOS setup



Once you have successfully entered the CMOS setup, a screen similar be appears. Your CMOS setup may look different, depending on the manufacturer, but should still share a lot of the same options and information.

## **change and save changes in CMOS setup**

Once in CMOS setup, the method for changing the settings often depends on the BIOS manufacturer. You may use the arrow keys along with the Enter key to select categories and change their values. Some manufacturers may have you press the Page up and Page down keys to change the values.

- Install the OS as your required
- Install the drives as your required
- Install application software as your required
- Install the antivirus to protect from virus.

## Chapter 5

### **BASIC MAINTAINANCE OF COMPUTER AND TROUBLE SHOOTING PROCEDURE**

#### **Discuss Basic Maintenance concepts**

maintenance is essential for computer system .Problem occurs if we does not maintain in proper way .There are three types of maintenance

#### **PREVENTIVE MAINTENANCE**

Preventive maintenance can be defined as “an equipment maintenance strategy based on replacing, or restoring, an asset at a fixed interval regardless of its condition. Scheduled restoration tasks and replacement tasks are examples of preventive maintenance tasks.”

Preventive maintenance is basically a type of maintenance that is done at a regular interval while the equipment is still functioning with the objective of preventing failure or reducing the likelihood of failure.

Preventive maintenance can be time based i.e. every week, every month or every three months. But preventive maintenance can also be based on usage e.g. every 150 cycles, every 10,000hrs or like your car: service every 10,000km.

There are several preventative measures you can take, including installing Windows updates, scanning for viruses and malware, and running cleaning programs.

Anti-virus and anti-malware scans should be run at least once a week. Be sure to run updates for these programs whenever they're released, as new viruses and malware spring up constantly.

Keeping your network secure, installing a firewall, and using safe downloading practices can protect your computer and any information on it from being compromised.

Power surges and overheating can destroy electronic equipment, so protect your hardware by investing in a surge protector and cleaning your equipment periodically to remove dust.

Should any preventative measures fail, it is always a good idea to have a backup for important files:

Invest in an external hard drive to save any important files should your computer need replacing

Apart from the regular interval approach (time based maintenance) there are also other types of maintenance that fall within the category of preventive maintenance:

- Time Based Maintenance (TBM)
- Failure Finding Maintenance (FFM)
- Risk Based Maintenance (RBM)
- Condition Based Maintenance (CBM)
- Predictive Maintenance (PDM)

### **Corrective Maintenance**

- Corrective maintenance, commonly referred to as "repair," is the correction of a problem after the computer has already broken down. The goal of this form of maintenance is to restore operability to the system by either correcting the problem or replacing the damaged components. Common corrective measures involve removing viruses and malware, uninstalling harmful programs, reformatting, and running a system restore, among others. Many common computer problems are easily fixed and don't require an IT professional. To perform corrective maintenance, it is important to first diagnose the problem and figure out the root cause. If you are unsure of the cause or how to fix your problem, consulting an IT professional would be the best course of action

### **Online Maintenance**

In online maintenance only software maintenance carried out by using different application software.

The following software maintenance carried out given as below

- Update of BIOS.
- Update/repair of OS.
- Update/repair of antivirus such as latest malwares, virus definition, quarantine of virus etc.
- Update/repair of drivers.
- Disk Fragmentation and backup of data.
- Repair of Hard disk by using online software.
- Installation of diagnostic tools.
- Diagnoses the system and peripherals using online software.

### **Computer Faults**

Computer faults in computer system affect the normal operation.

Such faults are given below.

1. The Computer Won't Start
2. The Screen is Blank
3. Abnormally Functioning Operating System or Software
4. Windows Won't Boot
5. The Screen is Frozen.
6. Computer is Slow
7. Strange Noises
8. Slow Internet
9. Overheating
10. Dropped Internet Connections
11. PC not using a portion of RAM
12. PC isn't powering on.
13. Blank monitor
14. Monitor goes black after few seconds

### **Nature of fault**

Computer faults can be broadly classified into following types

1. expected or familiar faults.
2. intermittent faults .
3. novel or unfamiliar faults.

### **Expected Or Familiar Faults**

Familiar or expected failures are possibly the easiest type of failure for trouble shooters to cope with. In many cases it is straightforward to write a manual or a set of algorithms to deal with these problems.

### **Intermittent Faults**

Intermittent faults are not easily repeatable because of their complicated behavioural patterns. These are also sometimes referred to as "soft" failures, since they do not manifest themselves all the time and disappear in an unpredictable manner. Intermittent failures can be a cause of no-fault-found (NFF) occurrences in a system. Intermittent faults are notoriously difficult to identify and repair.

### **Novel Or Unfamiliar Faults**

Unfamiliar fault occurs rarely. it is very difficult to identify this type of fault. If this type of fault occurs then we replace the whole system.

### **Types Of Fault**

#### **Hardware fault**

The hardware in a computer is the physical and touchable components of the system. The typical hardware components of any computer include the keyboard, mouse, speakers, RAM,

cords and anything else in the computer that the owner can touch. It differs from software -- the programs installed on the hardware.

- Keyboard faults
- Mouse faults
- Power Cord faults
- Motherboard faults
- Hard disk Drive faults
- SMPS faults
- RAM fault ect

### **Software faults**

- Due to some malware too many start-up items or buil up of temporary files.
- Automatic os update proble due to malware or virus.
- Driver may cause problems.
- Software uses for only one application.

### **Diagnostics Tools**

Computer diagnostics tools are pieces of software that give you the knowledge you need to be able to potentially repair your own computer. Some of these tools come built in to your operating system while others come from 3rd party software developers. Either way, these tools help save you time and money.

Computer diagnostic tools can be used scan your computer's hard drive, check your ram for errors, check cpu temp and give you information about any other devices connected to your computer. These tools are made to find problems that may be disrupting your computer's normal performance. Once a problem is found, you can then plan your repair.

Diagnostics programs may be simple or complex, operating unknowingly within everyday devices or awaiting their invocation to make more complex performance assessments.

Some users would like to run a PC health check. However, this check can't help you identify specific hardware problems or give you solutions. To identify the specific hardware problem, you need hardware diagnostic tools.

All of the parts in a computer will affect its performance. However, what affects the computer performance most is the CPU, the hard drive, and the memory. CPU, memory, and I/O devices (including hard drives) are referred to as the three core components of the computer. If possible, you should run a hardware test tool to diagnose them regularly so that you can make sure they work well.

As for PC diagnostic tools, you can read on to get them. Some of them are PC diagnostic software. The rest of them are built-in Windows utilities.

1. Intel Processor Diagnostic Tool, used for checking CPU.
2. CPU-Z, used for checking CPU.



3. Windows Memory Diagnostic, used for checking RAM.
4. Mini Tool Partition Wizard, used for checking disk.
5. Windows Performance Monitor, used for checking system performance.

### **Firmware**

Firmware is a software program permanently etched into a hardware device such as a keyboards, hard drive, BIOS, or video cards. It is programmed to give permanent instructions to communicate with other devices and perform functions like basic input/output tasks. Firmware is typically stored in the flash ROM (read only memory) of a hardware device. It can be erased and rewritten.

Firmware was originally designed for high level software and could be changed without having to exchange the hardware for a newer device. Firmware also retains the basic instructions for hardware devices that make them operative. Without firmware, a hardware device would be non-functional.

Firmware, which is added at the time of manufacturing, is used to run user programs on the device and can be thought of as the software that allows hardware to run. Hardware makers use embedded firmware to control the functions of various hardware devices and systems, much like a computer's operating system (OS) controls the function of software applications. Firmware may be written into read-only memory (ROM), erasable programmable read-only memory (EPROM) or flash memory. Firmware that is embedded in flash memory chips can be updated easier than firmware written to ROM or EPROM, which makes it more adaptable.

Today, embedded firmware exists in everything from smartphones to internet of things (IoT) devices that are so simple you might not imagine they had computer control. While the firmware in a smart light bulb may not need frequent updates, the firmware on a smart thermostat may need to be updated periodically to remain compatible with smartphone operating system updates.

Firmware updates are often issued to fix bugs, roll out new features and improve security. Some internet-capable devices regularly check for new firmware and automatically download and install it, while other device manufacturers require the user to visit the manufacturer's website to download firmware updates and install them manually.

### **Trouble Shooting**

Trouble shooting is the process of tracing and correcting faults in a mechanical or electronic system.

Trouble shooting in a computer is an intelligent and sophisticated process. Successful trouble shooting depends on the following four factors:

- Problem solving approach
- Techniques adopted in trouble shooting
- Tools and test equipment used
- Diagnostics aids in PC

### **Computer Faults:**

A fault in a computer system affects the normal operation of the computer, i.e, the computer malfunctions. The symptoms of malfunction are almost unlimited and vary with the nature of the fault. The types of symptoms we often come across are listed below:

- A program has given wrong results.
- A program is looping continuously
- The CPU has lost control
- There is a junk display on the CRT monitor
- The hard disk drive is not working
- Opening more than one window causes the system software to hang
- Computer intermittently cancels job with any of the following messages:
  - o Spurious Interrupt
  - o Memory parity error
  - o File not found
  - o Divide by Zero
  - o Overrun
- A program gives different results at different runs.

### **Nature of faults: solid and intermittent**

Computer faults can be broadly classified into 2 types based on the frequency of occurrence of the program.

- **Permanent or Solid fault:** When there is a permanent fault in a computer the computer misbehaves consistently. Any number of times the program is run, the result or symptoms will be same
- **Intermittent fault:** When there is an intermittent fault, the computer's behavior is not consistent. Sometimes it works properly and suddenly it malfunctions. After a certain period of time, it recovers from the fault automatically and again starts functioning properly.

### **Types of Faults: (Hardware & Software):**

A hardware which works now may fail even in the next second. But a software one proven always works. Hence if there is a software fault in a computer, it is because of one of the following two reasons:

- The program is not proven. It is a new program which is not yet debugged thoroughly

**Logic Prob:** it is handheld pen-like-test probe used for analyzing and troubleshooting the logical states(Boolean 0 or 1) of a digital circuit. These are usually differently coloured LEDs on the probe's body:

- Red and green LEDs indicate high and low states respectively
- Amber LED indicates a pulse

#### **Trouble Shooting Tools:**

There are 2 types of trouble shooting tools:

- Nodal testers: Nodal testers are simple conventional test equipment used for probe in and around the fault circuit. These testers include oscilloscope, logic probe, logic clip, logic pulser, current tracer and comparator
  - o Logic Probe- logic probe is a handheld low cost test equipment with which nearly ninety percent of the fault can be diagnosed, without an oscilloscope which is 10 to 20 times costlier. It is used to find out the logic state of any node in a circuit including steady states and pulses. The internal circuit in a logic probe is powerful to detect even very narrow pulses.
  - o Logic Pulser: is a handheld tool used to inject pulses at the input of a gate under test. A single pulse or a stream of pulses at different frequencies is issued as per the user choice.  
It is capable of delivering pulses of various computations, to any type of circuit we wish to test. It is needed to properly test and locate a fault in digital circuits. It becomes very useful when a tricky fault comes in. It becomes useful when circuits require to be tested in sections. This means the input waveform is not present and we require to know if the circuit will process the signal when it all goes together. It is capable of delivering pulses to a circuit so that the result(s) can be detected, even though the circuit may not be complete.
  - o Current Tracer: is a handheld tool which detects current flow in electronic circuits. It is useful in locating shorted components, track shorts, solder bridges, Vcc to ground shorts etc.  
It detects current activity on Logic nodes. It can be used to identify current paths and relative magnitudes. The electromagnetic field generated by a change in current is detected by the inductive pick-up on the tip of the tracer. The tracer only responds to a change in current, not DC current. A lamp indicator shows the relative magnitude of current going through the node. The brighter the light gets, the more current is going through the node.
  - o Oscilloscope: helps to resolve almost any problem in a PC.  
It is a type of electronic test instrument that allows observation of constantly varying signal voltages, usually as a two-dimensional plot of one or more signals as a function of time. Non-electrical signals (such as sound or vibration) can be converted to voltages and displayed. The observed waveform can be analysed for such properties as amplitude, frequency, rise time, time interval, distortion etc.  
It is useful in these levels of testing:

- The program works only for certain types of data. This is due to the incomplete testing of the software.

Software errors may appear to be hardware errors. One must clearly understand that a working software can never malfunction.

A Hardware problem is classified as a fault in an actual component or in the configuration of that component.

**Hardware problems are of many types:**

- Electronic Problems
- Mechanical Problems
- Environmental problems
- Media problems

Each of these types may cause both solid and intermittent problem. They may cause a similar problem. In practice, it is easier to identify the cause of solid problems. An intermittent mechanical problem may give symptoms that may mislead the engineer to conclude it as an electronic problem. The symptoms caused by the media problems make one think that they are either hardware or software problems. Hence an intermittent problem needs a very careful and systematic approach.

**Diagnostics Programs and Tools:** Computer manufacturers supply special diagnostic programs. These programs contains test routines to verify the various functions of the computer hardware. Running these programs help one to decide whether the hardware is faulty or not. In order to verify the presence of intermittent problems, it is necessary to run the diagnostics multiple times. These test programs very often help us to confirm whether a problem in a computer is related to hardware or software. If diagnostic programs runs successfully without pointing out any problems. Then the chance of a hardware fault is remote. But there are two exceptions to this:

- Intermittent problems may play a hide and seek game.
- Some problems may be too complex to be detected by simple diagnostic programs. These faults may occur only when several subsystems work simultaneously. Unless diagnostic programs simulate the above two situations, then faults may not be caught by the diagnostics programs. (If these two exceptional cases are neglected, the service engineer will be looping indefinitely in wrong areas). In this cases, the engineer has to look for alternative ways of troubleshooting.

**Rest out of Diagnostic Programs:**

**Methods of operation eg.**

- **Black box**, which is testing of a mechanism without knowing how it works, and merely focusing on the accuracy of output data based on a known input.
- **White box**, which uses knowledge of a mechanisms inner functions to direct testing.
- **Background diagnostics**, that perform testing of systems components during idle-time of a system.

**Rest out of nodal testers:**

- Test logic level
  - Measure the signal characteristics such as frequency, pulse width, rise and fall time, ringing, noise etc.
  - To measure the timing relationship between 2 or more signals
- System Testers: are sophisticated test equipment which are useful to quickly isolate the faulty system. The system testers include emulators, functional testers, signature analyzers and logic analyzers.

#### **Fault Elimination Process:**

Fault finding is a technique. Some faults can be easily traced out if one proceeds systematically, starting from the symptoms. Some faults show complex symptoms with no clue at all. For such faults there are no defined starting points. In such case, service engineers should try out an appropriate elimination process.

The steps of fault elimination procedure are common to any computer. Some of these can be omitted depending on the symptoms. Intuition is necessary for the progress of troubleshooting.

**Dead System:** A computer is said to be dead when an absolutely essential signal is absent. It is easy to confirm whether a system is dead or alive. Following are some of the symptoms of a dead computer:

- dc voltage is absent
- dk signal is absent
- ROM output is inactive
- Microprocessor is faulty or dead
- The ac fuse is blown

**Spurious Problems:** Sometimes the computer malfunctions randomly. Logical and systematic trouble shooting may not yield any clue. In such cases the engineer should look for symptoms of spurious problem. Some of the hidden symptoms of spurious problems are-

- dc voltage has excessive ripples
- dc voltage is noisy
- dk signal is not stable
- loose contacts of cables and connectors
- there is noise pick up on the next input or on other bus signals

**Security Failures:** In any computer, sometimes there are abnormal symptoms, due to malfunctioning of special hardware meant for error detection.

Three types of problems are caused by such security logic:

- When there is no error, the error detection logic (Eg. ECC ch..) raises a false alarm.
- When there is an error, the security guard sleep without catching it. The error propagates and creates confusion.

- The error detection hardware malfunctions in generating appropriate coding. For example, the parity generator may generate a wrong parity bit. This goes unnoticed immediately when the parity checker detects an error, the OS wrongly considers it a genuine error.

#### **Heart Beats:**

We have seen some of the symptoms of a dead PC earlier. These are the general symptoms applicable to any computer. In addition, there are some more check points which are the heart beats of PCs. By sensing these, the engineer can predict the problem type and determine how to proceed with diagnosis. Two such effective check points are-

- o **Memory Refresh Request:** Refresh in DRAM IC is done at regular interval. For this purpose, refresh signal is generated once every 15  $\mu$ sec. if this pulse is present it indicates the following-
  - Microprocessor is alive. Initial start-up is successful. Reset sequence had been completed.
  - Microprocessor firmware has successfully initialized the refresh counter
  - The refresh logic is functioning properly
  - The data bus, address bus and control bus are reasonable error free
- o **Timer 0- Ticks:** The PC maintains the time of day. This time is periodically updated by the cooperation between timer 0 and timer interrupt service routine. The timer 0(PIT) raises Tick periodically and the system uses these interrupt signals to update the time. The generation of the Tick can be monitored by probing IRQ0 signal from PIT.

#### **Systematic Troubleshooting**

Adhoc techniques of troubleshooting don't always help an engineer. Systematic trouble shooting is a logical approach. It is a scientific and analytical process. The systematic troubleshooting approach can be divided into the following steps:

- Symptoms Observation
- Symptoms Analysis
- Fault Diagnosis
- Fault Rectification

#### **Symptoms Observation:**

The first step in troubleshooting a system or peripheral is observing all the symptoms caused by the fault in the system. For some problems, especially for problems due to multiple faults, it will be impossible to locate the exact fault or it will take a long time & thus the downtime will be increased. The time spent on symptoms observation in turn will yield proportional return during fault locating. Clean mind and concentration is essential while troubleshooting a problem. Certain complex problems can be understood only if the engineer has an overall idea of the system functioning of various software routines, and sequences performed by POST, BIOS and OS

#### **Symptoms Analysis:**

A careful analysis of the symptoms will give a clue to the fault location process. When there are multiple symptoms the engineer should try to correlate the various symptoms to identify the problem. If any relationship or clue is found, several steps can be skipped during fault location, thereby reducing the downtime considerably. In cases where there is no interrelation between the symptoms of a problem, the engineer should proceed with the fault location, without wasting time in attempting to establish the relationship.

If multiple faults are present, then we may be minted by mixed symptoms. It is difficult to predict the presence of multiple faults. Two probable clues are

- Symptoms are not consistent but keep changing
- Certain Symptoms vanish suddenly

Troubleshooting a system with multiple faults is a tough task. We may have to repeat the test multiple times. Once multiple fault is suspected, one should be strictly systematic.

#### **Fault Diagnosis:**

It is a highly sophisticated scientific process. The most important point here is the multi-dimensional view to be applied by the hardware engineer while troubleshooting problems. The main dimensions are-

- **Architecture:** Certain problems can be visualized properly only when you analyze the problem and the behavior of the computer as a system consisting both of hardware and software. Software may be either a system software or an application software. It is not necessary that we should be a programmer. But we should know what the programs do, when they start and stop some activities and when they interact with hardware.
- **Organization:** Different faults may create the same external symptom. The engineer must distinguish the different faults by a deep analysis of the internal machine status. Every computer has certain unique organizational aspects. Before trouble shooting a computer, the engineer should understand the specific details of organization of the computer. The computer with the same architecture need not have the same organization. The hardware organization refers to functional and physical distribution of various subsystems in the computer. It is decided by the computer designers based on the status of computer technology during the design stage.

Hardware engineer should know the organizational aspects including detailed timing relationships and signal sequences. Even if the engineer forties all the signals in a computer system, he won't be able to locate the fault if he does not know how to correlate the various signal conditions.

**Engineering Layout:** Certain problems are caused by mere physical layout faults:

Faulty cable, loose connection, open wire, track short, etc.

To catch these problems, one must thoroughly analyze the physical aspects.

The layout documents related to a computer are-

- Circuit diagram
- Board layout diagram
- Cable signals list
- Connector signals list
- Jumper settings

**Environment:** Certain problems are caused due to environmental conditions and are listed below:

- High Temperature
- DUST
- Magnetic fields
- Humidity

**Fault Rectification:** Once a problem is diagnosed thoroughly and the fault is traced, the rectification involves skilled mechanical work rather than analytical work. This step may involve performing one or more of the actions depending on the result of fault diagnosis.

- Replacing a defective IC or other components
- Replacing a defective PCB
- Cleaning the R/W heads
- Formatting a diskette or hard disk
- Adjustments: mechanical or electrical
- Controlling temperature or improving cooling.

**Microprocessor:**

The microprocessor is a boon for designers. At the same time it is a headache to service engineers and technicians. Troubleshooting any microprocessor based equipment needs special skills because of the sophisticated capabilities of the microprocessor. The microprocessor is a smart and intelligent component. Unlike non-intelligent ICs, its outputs cannot be simply correlated to inputs. A microprocessor behaves according to the instruction it has fetched.

A microprocessor's internal activity can be guessed to some extent by carefully analyzing its output signals but an overall picture can be gained only if we know the instruction being executed by the microprocessor. One must know the program sequence in a microprocessor based equipment in order to troubleshoot faults systematically and meaningfully.



## **Chapter 6**

### **Basic Networking Devices and their Interconnection**

#### **Network Interface Card**

Network interface card( NIC) is a hardware component, where network controllers are integrated on to a circuit board that uses standard OSI model of 7 layers to communicate and it acts like a trans-receiver, where it can transmit and receives at the same time while communicating with other devices. Suppose if we want to communicate with another device, let us assume the case of client and server, where the communication between them takes place by firstly sending signals to the physical layer, and then transmitting data packets to the network layer which is an interface at TCP/IP. Connection to the motherboard is made using any one of the following via

- PCI connector
- ISA connector
- ISA connector
- PCI-E
- FireWire
- USB
- Thunderbolt.

The connection to the network is made via any one of the following

- Ethernet
- Wi-Fi
- Token – Ring
- ATM

#### **Functions of NIC**

- It acts like a translator, which converts data into a digital signal.
- Communication can be either by using cable wire or by the router which is wireless over the server network
- To communicate over a long distance a network adapter is used.

#### **Types of Network Interface Cards**

There are two types NIC they are,

- Ethernet NIC
- Wireless Network NIC

#### **Ethernet NIC**

Ethernet NIC card is a slot for a cable where we have to plug one end of the ethernet cable into the slots of the computer and another end of the cable is plugged into the modem, likewise, various

devices are connected to make a communication set up between them. There are three standards in Ethernet they are

- **5-Base T:** It was developed in 1973, which can transmit, paragraphs using coaxial cable up to a distance 1000mts.
- **10-Base T:** It was developed in 1987, it uses twisted cables like telephonic cables for communication.
- **100-Base T:** It is also known as fast ethernet, the speed of data transmitted is very high.
- **Gigabit Ethernet:** It is also named as 1000-Base T ethernet, the special feature of this is it increases the network bandwidth up to 10 times, which can transmit up to 1000mbps of data.

#### Wireless Network NIC

Wireless network NIC cards consist of a small antenna integrated onto the card, where the communication between various devices is set up wirelessly using the router and various network protocols. One such example of a wireless network NIC card is fiber data digital interface FDDI. In a case where data has to be transmitted over long distances, in such cases, a fiber data digital interface FDDI concept is used which translates data into digital pulses and communicates using optical fiber. FDDI is ring-type architecture, which is of 100mbps, transmission, and retransmission for a long distance is an advantage of FDDI.

#### Network Interconnection Devices

Many interconnection device are required in a modern network, from the interface that allows a single computer to communicate with other computers via a LAN cable or a telephone line, to the large and complex switching devices that interconnect two or more entire networks. The main categories of interconnection device used in computer networks are listed below.

- Hub
- Switch
- Router

#### Hub

A hub is basically a multiport repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. In other words, collision domain of all hosts connected through Hub remains one. Also, they do not have intelligence to find out best path for data packets which leads to inefficiencies and wastage.

#### Types of Hub

- **Active Hub:-** These are the hubs which have their own power supply and can clean, boost and relay the signal along with the network. It serves both as a repeater as well as wiring centre. These are used to extend the maximum distance between nodes.



- **Passive Hub** :- These are the hubs which collect wiring from nodes and power supply from active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend the distance between nodes.

## Switch

A switch is a multiport bridge with a buffer and a design that can boost its efficiency (a large number of ports imply less traffic) and performance. A switch is a data link layer device. The switch can perform error checking before forwarding data, that makes it very efficient as it does not forward packets that have errors and forward good packets selectively to correct port only. In other words, switch divides collision domain of hosts, but broadcast domain remains same.



## Router

A router is a device like a switch that routes data packets based on their IP addresses. Router is mainly a Network Layer device. Routers normally connect LANs and WANs together and have a dynamically updating routing table based on which they make decisions on routing the data packets. Router divide broadcast domains of hosts connected through it.

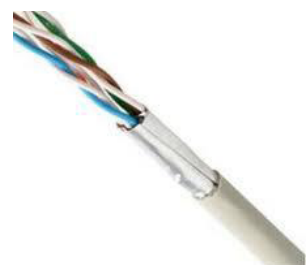


## **Networking cables**

Networking cables are networking hardware used to connect one network device to other network devices or to connect two or more computers to share printers, scanners etc. Different types of network cables, such as coaxial cable, optical fiber cable, and twisted pair cables, are used depending on the network's physical layer, topology, and size. The devices can be separated by a few meters (e.g. via Ethernet) or nearly unlimited distances (e.g. via the interconnections of the Internet).

## **Twisted pair**

Twisted pair cabling is a form of wiring in which pairs of wires (the forward and return conductors of a single circuit) are twisted together for the purposes of cancelling out electromagnetic interference (EMI) from other wire pairs and from external sources. This type of cable is used for home and corporate Ethernet networks.



There are two types of . Twisted pair cable

## **Shielded Twisted Pair (STP)**

Is more common in high-speed networks. The biggest difference you will see in the UTP and STP is that the STP use's metallic shield wrapping to protect the wire from interference.

-Something else to note about these cables is that they are defined in numbers also. The bigger the number the better the protection from interference. Most networks should go with no less than a CAT 3 and CAT 5 is most recommended.

-Now you know about cables we need to know about connectors. This is pretty important and you will most likely need the RJ-45 connector. This is the cousin of the phone jack connector and looks real similar with the exception that the RJ-45 is bigger. Most commonly your connector are in two flavors and this is BNC (Bayonet Naur Connector) used in thickenets and the RJ-45 used in smaller networks using UTP/STP.

### **Unshielded Twisted Pair (UTP)**

This is the most popular form of cables in the network and the cheapest form that you can go with. The UTP has four pairs of wires and all inside plastic sheathing. The biggest reason that we call it Twisted Pair is to protect the wires from interference from themselves. Each wire is only protected with a thin plastic sheath.

### **Connector for twisted pair cable**

RJ-45 (Registered Jack)

The acronym for **Registered Jack-45** is RJ-45. The **RJ-45** connector is an eight-wire connector that is commonly used to connect computers to a local area network (LAN), particularly Ethernet LANs. Although they are slightly larger than the more commonly used **RJ-11** connectors, RJ-45s can be used to connect some types of telephone equipment.



To install these types of wiring connectors, a stripping tool is used to expose the twisted pairs of wires from the cable, which are then positioned into the appropriate slots on the terminal plug. The connector is then crimped to the cable using a crimping tool.

### **Coaxial cable**

Coaxial cable is a type of transmission line, used to carry high frequency electrical signals with low losses. It is used in such applications as telephone trunklines, broadband internet networking cables, high speed computer data busses, cable television signals, and connecting radio transmitters and receivers to their antennas. It differs from other shielded cables because the dimensions of the cable and connectors are controlled to give a precise, constant conductor spacing, which is needed for it to function efficiently as a transmission line.

### **Coaxial Cable Connectors**

#### **BNC connector**

The BNC connector (initialism of "Bayonet Neill–Concelman") is a miniature quick connect /disconnect radio frequency connector used



for coaxial cable. BNC connectors are a type of F-series connectors commonly found in households. This type of connector for RG59 or RG6 coaxial cable is used for cable television equipment, broadcast TV antenna applications and CCTV security camera installations. They are easy to connect and disconnect from equipment and provide inexpensive, stable connections to these communications devices and other cables.

To install a BNC connector, a stripping tool is used to remove protective shields from the cable. The connector is pushed onto the end and then squeezed around the conductive material using a special compression crimper.

Twist-on F-connectors are also available for making quick and easy repairs to TV equipment without the need for special tools.

### **F connector**

The **F connector** is a type of RF connector commonly used for cable and universally for satellite television. They are also used for the cable TV connection in DOCSIS cable modems, usually with RG-6 tri-shield cable. The F connector is inexpensive, yet has good performance up to 1 GHz. One reason for its low cost is that it uses the center wire of the coaxial cable as the pin of the male connector. The male connector body is typically crimped onto the exposed outer braid. Female connectors have a 3/8-32 thread. Most male connectors have a matching threaded connecting ring, though push-on versions are also available.



### **Optical Fiber Cable**

An optical fiber cable consists of a center glass core surrounded by several layers of protective material. Optical fiber deployment is more expensive than copper but offers higher bandwidth and can cover longer distances. There are two major types of optical fiber cables: shorter-range multi-mode fiber and long-range single-mode fiber.

### **Connectors for fiber optic**

#### **ST (Straight Tip) and SC (Subscriber Connector or Standard Connector)**

Fiber network segments always require two fiber cables: one for transmitting data, and one for receiving. Each end of a fiber cable is fitted with a plug that can be inserted into a network adapter, hub, or switch. In the North America, most cables use a square SC connector (Subscriber Connector or Standard Connector) that slides and locks into place when inserted into a node or connected to another fiber cable, Europeans use a round ST connector (Straight Tip) instead.



#### **SC connector**

## ST connector



## Fiber LC (Local Connector)

These connectors are used for single-mode and multimode fiber-optic cables. FC connectors offer extremely precise positioning of the fiber-optic cable with respect to the transmitter's optical source emitter and the receiver's optical detector. FC connectors feature a position locatable notch and a threaded receptacle.



## Questions of CMPM

VI-Sem/CSE/CMPM		
Sl no.	Questions	Marks
A.	Define Motherboard.	2
B.	Define POST.	2
C.	Define CMOS.	2
D.	Define LC and SC	2
E.	Why we use false Flooring in computer centre?	2
F.	Write down any four computer installation in India.	2
G.	Define NIC.	2
H.	Advantages of optical fiber cable in networking.	2
I.	Define firmware.	2
J.	Define solid fault and intermittent fault.	2
K.	Define PATA and SATA.	2
L.	Name two formatting types.	2
M.	How to reset cmos?	2
N.	Write down the two fiber optic connectors.	2
2.	Answer any five	
i.	What do you mean by SMPS? Explain it with neat diagram.	6
ii.	Write down isolation circuit used for power conditioning.	6
iii.	Write down slots present in motherboard. Explain any four.	6
iv.	Explain different types of job carried out in an organization.	6
v.	Define UPS? Explain its type.	6
vi.	Write down factors effecting for selection of a computer system.	6
vii.	Explain different components available in back panel connector.	6
viii.	Write down different types of networking devices used in networks.	6
3.	Explain step by step procedure for assembling of a computer system.	10
4.	Explain evaluation of computer system in different organization.	10
5.	Define trouble shooting. Explain steps used for systematic troubleshooting.	10
6.	Define HDD. Explain each component with neat diagram.	10
7.	Write down short notes.	10
	<ul style="list-style-type: none"> <li>a. Preventive maintenance.</li> <li>b. Corrective maintenance.</li> <li>c. BIOS.</li> <li>d. Connectors used for coaxial and twisted pair cable.</li> </ul>	