

Complete Reference Guide to Computer & Its Peripherals

Introduction to the Computers:

Computer is affecting our daily lives in many ways. Everyday, we hear about the newest way that computer is being used for. No wonder we are in the age of Computer Revolution. Computers have now become an important part of our lives.

Till now, we have been using a typewriter for drafting commercial correspondence, a calculator for performing lengthy calculations and files for maintaining records. Now, we can do all our correspondence, calculations and record maintenance on a computer at a much faster speed and less effort. Personal computers are now having lots more than that of a typewriter or a calculator or a file recorder. It has huge applications in multimedia and entertainment.

Computer as we defined are huge calculating device with high speed and reliability. All the instructions given to the computer are done correctly and with a speed that sometimes wonders us. Till 20 years ago computers are used only in scientific works or in big organizations. Now Personal computers are every where. Every one is getting benefited from it. It is a video game for young people, calculator for a scientist, file manager for office clerk, music system for listeners, TV/Video Theater for viewers or an encyclopedia for a student. Surely Personal Computer has a role in every body's life.

Again the ability to connect computer to another computer at the remote end, makes it valuable for Telecommunication, Banks, Travel Companies and other communication industries. Even common people are getting benefited from the computer network. Internet is one of the major sources of information and entertainment.

This tutorial is made with a thought that it will help those people who purchase a new computer or is planning to do so but have no primary knowledge about it. In this tutorial you can gather enough knowledge on Personal Computer and It's Peripherals to get rid of your fear for it. Again you can use it as a text-book to start your journey towards computer's world. Even technical people can get extra information from it.

If you are going to buy a new PC and going to be connected to the internet or already done so take a look in our tutorials. It will help you to understand the world of computer and Internet in a better way.

The System Unit:

Parts of a Computer



A PC is really a collection of separate items working together as a team. Some of these components are essential; others simply make working more pleasant and efficient. Adding extra items extends the variety of tasks you can accomplish with your machine. The essential and some optional components are listed below:

Basic Components:

- The System Unit.
- The Monitor
- The Keyboard
- The Floppy disk Drive
- The Hard Disk Drive

Optional:

- Mouse
- CD-ROM Drive
- Printer
- Scanner
- Modem
- Network Interface Card
- Sound Card
- UPS/CVT

The System Unit:

The System Unit holds all the system components in it. It is some times called cabinet board. The main components Motherboard, processor, memory unit, SMPS and all the ports to interface computer's peripherals. System unit comes in two different shapes the desktop and the tower type. Now a days tower type system units are very popular. Now we shall discuss several parts of a system unit.

Front of System unit:

- **Power On/Off:** Generally all PCs have a main power switch on the front of the system unit. With this switch we turn on the system and also turn off it. This is a toggle switch. Some system unit have soft touch button. With a ATX cabinet power is automatically cut-off after we shut down the computer from windows.
- **Reset Button:** This button can be used to re-start your computer, without disconnecting the power. If PC “hangs”, i.e. if it does not respond to any commands, reset button is used to restart the computer again in good condition. Pressing the reset button loses all the work that haven’t saved in that session, so it is advised to use Alt+Ctrl+Del buttons together to shut down the application which is not responding in windows then save your work and reboot the computer.
- **Lights:** There are two or three LED (Light Emitting Diodes) in the front panel indicating power, hard disk read/write status. Floppy Disk and CD/DVD Drives also have indicating LEDs. They automatically glow when data is being read from or written to that drive. In some old PCs there is a display unit where the speed of CPU is displayed in 7 Segment LEDs.
- **Floppy Disk Drive:** PC can have either 5 ¼ “ or 3 ½ “ floppy drive or both. It is used for storing or retrieving data on to floppy. Each drive has a slot at the front of the system unit, where the floppy has to be inserted for reading or writing purpose.
- **CD/DVD Drives:** These drives are inserted in the bigger drive cases above the 3 ½ “ floppy drive. Both CD and DVD drives has a tray where CDs are inserted and this tray is automatically closed or opened with a play push button on the drive, just like a drawer.

Back of the System Unit:

The back of the System unit contains all the interfacing ports to plug external devices to it.

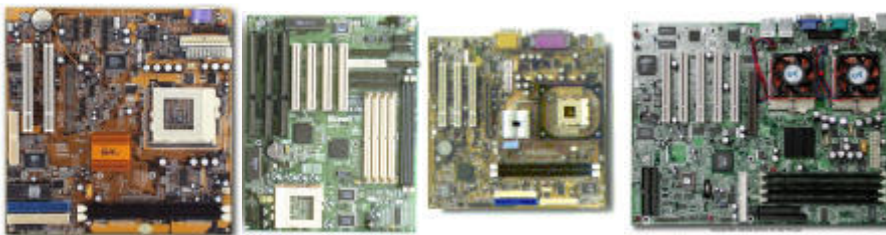
- **Power IN and OUT Sockets:** Cables plugged into these sockets carry power from the electrical outlet to SMPS (Switched Mode Power Supply) unit of the cabinet and from the SMPS unit to PC’s monitor.
- **SMPS Fan Housing:** Beside the Power In and OUT Socket there situated a cooling fan for the SMPS unit. It helps in removing hot air from the SMPS and system unit and keeps inner environment cool.
- **Key board and PS/2 port:** Keyboard cable is plugged to the system unit by a PS/2 port. This port is round in shape and all pins are arranged in circular order.
- **Serial Ports:** Serial ports are sometimes called communication port or COM port. There are two COM port COM1 and COM2. Size of COM1 is larger than that of COM2. COM1 has 25 pins and used for connecting Modems. COM2 is 9 pin port used for interfacing serial mouse. D-type connectors are used to interface those ports.
- **Parallel port:** Parallel port is like COM1 port with 25 pins. It is called LPT1. One PC may contain more than one LPT port. Printer is usually plugged to these ports.
- **Joy Stick Port:** It is like a parallel port. It is used to connect Joysticks for playing interactive games.
- **Video/Monitor port:** Video / Monitor port is very similar to COM2 port except it has more than 9 pins. This port is called AGP (Accelerated Graphics Port).
- **Audio jacks:** There are three audio jacks from sound card. One is Audio Out, one Audio In and One for MIC.

- **USB Ports:** The ports are very small in size. USB (Universal Serial Bus) is also a serial port but data rate is lots more than the serial port. Mouse and modems are usually connected to these ports.
- **Compartments for Expansion Cards:** PCs are easily expandable- to provide a modem, sound or faster graphics. In the empty PCI slots internal modems, network interface card or faster graphics card can be plugged.

Inside the System Unit:

All the valuable components of PC is in side the system unit. Inside the unit all the components work together to give you the service that you need. Computer takes the input form the input device like keyboard process the data in CPU holds the data in memory and give out put in the output device like monitor.

- **Motherboard:** All the electronic components in the system unit is mounted and connected together by the motherboard. They are also called main board. Mother board is a piece of fibre glass and interconnection is made via metal lines usually fabricated by cupper. This is also called a Printed Circuit Board (PCB).



Technical information:

Mother board holds all the port, interface and essential chip like main processor. Motherboard or sometimes called main board is a multilayered printed circuit board. The system bus lines are situated in the inner layer and in the upper layers there are some IC sockets to connect the IC/ Chip to it. 810, 810E, 815, 815E are some Intel chipset available in market.

Central Processing Unit (CPU): The microprocessor, or central processing unit (CPU), is the computer's most important component. It does all the arithmetic and logical operations.

- **Math Co-processor Slot:** A math co-processor, present in some PCs, assists the CPU in performing its mathematical operations (if program have been designed to use it).
- **RAM Chips:** When a computer is switched on and is running a program, RAM (Random Access Memory) is used for purposes such as holding the program and its data. But when the PC is switched off, anything held in it is lost.

- **Empty RAM Chip Slots:** These slots are kept for adding extra RAM chips or modules to computer's memory. Usually there are three slots for RAM module, one is occupied and other two are kept for future upgrade.
- **Floppy Disk Drives:** There is two floppy disk drive drawer accept a floppy disk. There is a SCSI connector to connect SCSI drives to the Motherboard.
- **Hard Disk Drive:** There is two or three drive drawer for Hard Disk and CD/DVD Drive. There are two IDE connector, Primary and Secondary to connect four IDE devices to the mother board.
- **SMPS Box:** SMPS is Switched Mode Power Supply in the system box. It is a separate unit in the system unit. It converts 230V AC power supply to 5 and 12 V DC and give the supply to all components of the mother board.
- **Display Adapter Card:** Every computer must have a display adapter card in it. Often the card is built in the motherboard. If we want to add or motherboard has no built in display then one AGP port is there to plug the Display card. The slot is very similar to PCI slot.

Technical information:



All the multimedia PC should have a video or graphics card in it. It is actually process the digital display information and convert it to RGB signals send it to the monitor. There are several configuration of video card like CGA (color Graphics Adapter), EGA (Enhanced Graphics Adapter), MCGA (Multicolor Graphics Adapter), VGA (Video Graphics Array, SVGA (Super Video Graphics Array), XGA (Extended Graphics

Array) etc.

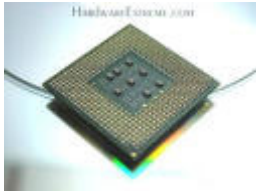
SVGA is now extensively used. SVGA supports 640x480, 800x600, 1024x768 resolution and 16, 256, 16Bit, 24Bit True color display. Video Cards are some times internally build in the mother board or can be externally plugged in an AGP (Accelerated Graphics Port) slot of motherboard.



- **Expansion Slot:** There are 5 or more PCI slots given. Internal modem, sound card or Network Interface Card can be interfaced in the slot.
- **ROM Chips:** Read only memory (ROM) chips have data written on them, during manufacturing that tells the CPU what to do when you switch on your PC. The data always there, even when you switch the PC off.
- **CPU Support Chips:** These chips help the CPU to manage all the parts of the computer.
- **Speaker:** The speaker emits the computer's sound output in the form of beeps.

Central Processing Unit (CPU):

As the name denotes, the CPU is that portion of the PC where the actual processing i.e. the mathematical as well as logical operations takes place. Hence, the CPU is the brain behind all the operations. It is also referred as the Microprocessor. The instructions written in the form of computer programs are compiled to assembly codes which are carried out by the CPU in sequence. Thus a program instruction can control can control the entire working of the PC as CPU interacts with every part of the computer.



The power of CPU lies in its ability to carry out these actions rapidly and flawlessly. The processing capability of a PC is measured in terms of amount of data processed by the CPU in one operation and the time taken for this operation.

The Speed of CPU:

The speed of a CPU is measured in megahertz (MHz) and gigahertz (GHz). A computer has a central clock that keeps all the components in time with each other. One hertz is the same time as that of a clock tick and one megahertz is equal to one million ticks per second. From the beginning CPUs were a little bit slower-100MHz (PI), now CPU are in market having speed of 2.8GHz.

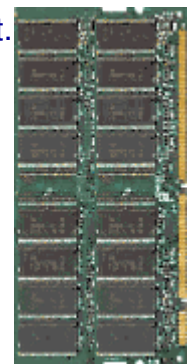


Computer's Memory:



Although CPU is the brain behind all the operation in a PC, it needs to be supplied with the data to be processed and the instructions to tell what to do. Once the CPU has carried out each instruction, it needs somewhere to store the result temporarily. The storage space is provided by the computer's primary memory. If you are using your PC to type a letter, instructions, such as those required to make words appear in bold or italic, etc. These directions tell the computer to behave like a word processor.

The size of this memory is the size on RAM module inserted in RAM slot. The total memory in RAM and ROM is the primary memory. A part of it is used as "base memory" by CPU when it boots up. Then some portion of RAM is used for frequently by program instructions, called "Page Memory". CPU does not fetch any extra instructions to the memory as it is already present in Page memory. Thus programs can be accessed faster. In windows size of random memory is 120MB. If any computer does not have such memory windows can make random memory from Hard Disk's free space. This memory is called the "Virtual Memory". Memory has another portion called "Secondary Memory". This memory is used for permanent storage. Hard-Disk, Floppy Disk is used as Secondary Memory. Hard Disk and Floppy disks are discussed later in this tutorial.



Computer's Monitor:



A PC's monitor works like a television, displaying text characters and graphics in colors or in shades of gray. The image, you seen on the screen, is made up of tiny dots called pixels. A monitor is also called a screen, display or a CRT (Cathode Ray Tube).

Whatever is typed on the keyboard gets displayed on the monitor screen. Also whatever a program is executed, the information is displayed on the monitor. On the screen, the results are shown only temporarily.



A cursor is a small double line that blinks rapidly indicating current position on the screen. Now, if you strike a letter key, then that alphabet will be shown at the current cursor position and the position of the cursor is shifted one position to the right. The cursor, therefore, marks the point where the next character will be displayed on the screen, when we press it on the keyboard.



There are different types of monochrome (BW) as well as color monitors available in the market. The major difference is their resolution (i.e. the sharpness of the image on the screen.) Monitors having a higher resolution are more expensive and they are used for specified jobs like creating graphics and multimedia.

Technical Information:

Monitor is basically a CRT (Cathode Ray Tube) and a circuit board. Monitors, usually a colored one operates on three signals RGB(Red, Green, Blue) information, vertical and horizontal synchronization signals. Horizontal synchronization signals are given for scanning of complete horizontal line on the screen and vertical synchronization is needed to produce one complete frame on the screen. RGB signals are the information of every dot or pixel of the screen. Monitor screen resolution may starts from 640x480, 800x600, 1024x768 or more. Standard resolution is 1024x768. Monitor supports 16, 256, 16 Bit High, 24 Bit True and 32 Bit True color RGB.

Now come to the CRT part. It is mainly a vacuum tube. At the one end it is narrow and one electron gun is placed. On the other side it has a wide screen, coded with phosphor. The beam of electron strikes on the surface of screen and produces a image by photo luminance process. There is some vertical and horizontal coil to deflect the e-beam in any position of the screen. Some focusing plates are there for proper focusing of e-beam on the screen. The brightness information is given by bias voltage to control grid plate. The monitor operates on line voltage frequency of 50-60Hz or their multiple. Normally our eye can not distinguish two consecutive frames if they are shown at a rate more than 16 frames/s. Monitor with 50Hz refresh rate will produce 50



frames/s i.s. 25 interlaced frames. So the flicker is eliminated and we get a stable image.

Computer's Keyboard:



Keyboard is like a type-writer in front of the PC. Keyboard is an Input Device. All the inputs and commands are given through a keyboard. When we press any key, the corresponding character is displayed in the screen. Every time we give a command or input, we have to complete the operation by pressing "ENTER" or "RETURN" key.

There are three different key:

- **Character Keys:** These are Alphabetical Keys. A-Z.
- **Control Keys:** Alt, Ctrl, Shift, Insert, Delete, Home, End, PgUp, PgDn, Esc and Arrow keys are control keys.
- **Numeric Keys:** There is an additional section in the right where Num keys are given. To activate this section we need to press the Num key.
- **Functional Keys:** There are 12 functional keys above the key board for additional functions offered by the application. F1 is used for windows help.
- **Toggle Keys:** Scroll Lock, Num lock, Caps Lock is three toggle keys. The toggle state is indicated by three LEDs at the right-top side of the keyboard.
- **Extra Keys:** Some multimedia key board offers extra keys above the functional keys. These keys are only activated after keyboard driver is installed in the OS.

Technical Information:

Keyboard is connected to PS/2 or serial port of mother board. There is a small operating chip inside a keyboard which does all the operations. The basic operation is to sense the pressing of a key from the keyboard matrix and send a interrupt request (IRQ) to the CPU. CPU sends an acknowledgement (ACK) signal as it granted the request. The corresponding ASCII code of the key is send to the memory where the keyboard buffer is being written. Application software reads the memory block to get the key-pressing and key status of shift, ctrl and other control key. Key board is a BIOS (Basic input output system) device, automatically installed during boot up.



Computer's Mouse:

A mouse is a hand-held pointing device that allows user to control the PC without having to type in instructions at the keyboard. Modern Applications provide menu driven options for various commands like file open, save or printing. They are easily operated by mouse.



Generally, the mouse functions as follows:

- Moving the mouse moves the pointer in any directions of the screen.
- **One single click** activates certain functions on the screen like pulling down menus, highlighting commands, submission of form.
- One click on the right button always displays a popup menu where there is some options like properties.
- One click in any icon and moving the mouse with pressing the key and then releasing it to another place is called **Drag-n-Drop**.
- One click on empty space and drag to another point can be done to select the entire icons in the rectangular area of two cursor position.
- **Double click** on any item or file opens the object in appropriate application.
- If the application is busy with CPU **"Hour-Glass"** cursor is displayed on the screen.

Technical Information:

Mouse is also a serial device. It can be connected to mother board via COM port COM2 or USB. Inside a mouse there is a rubber ball and two rollers, vertical and horizontal. The rollers are placed in such a way it touches the surface of rubber ball. When we move the mouse on mouse pad, the rubber ball rotates and the rollers are also rotated accordingly. The vertical roller tracks the vertical movement of mouse and horizontal roller tracks the horizontal movement. The rolling motion of roller is converted to electrical signal which is processed and sent to the CPU. A mouse is not a BIOS device. It is used in **GUI (Graphical User Interface)** like Windows and need Driver to install.



Computer's Printer:



Printer is a device that produces written images (numbers, alphabets, graphs, etc) on the paper. After a document been created on a computer, you can send it to a printer for a 'hard copy', generally known as a print out.

The speed of the printer is rated either by 'pages per minute' (ppm) or by 'character per second' (cps). The more the dots per inch, the more detailed is the output. Printers come with different shapes and printing technologies.

Technical Information:

Printers are connected to main board by a parallel printer cable or now USB printer is also available. There are different technologies for different printers but mechanism of printing is same. At first we make a document in any word processing tool. Then we command the operating system to print the file. Then OS finds the printer driver installed on the machine. (Now one thing is to add one machine can have more than one printer. But when ever we want to print the document in the particular printer that printer has to be plugged in the corresponding port. Its not need to connect a printer every time we boot a machine.) Now application will list the printer driver installed in the OS. We select the page size and number of pages to print then give the command 'print'. Now the hole document's printing data goes to printer spooling directory. Printer driver give a IRQ to the CPU and CPU send a signal to find out if the printer is currently plugged is or not. If the printer is present, printer itself give an ACK signal and thus its presence will be detected by CPU. Again CPU will send signal asking printing status (Paper out, Printer Ready etc). When CPU will find printer is ready with paper in it, it will send data bytes one by one for printing. Every time one byte is send by parallel bus and printer sends ACK signal for each byte. This process is called 'hand shaking'. ACK signal is a confirmation for the CPU that printer has correctly collected the byte as it send. Now there is a small processor and some memory in the printer to do all printing operation.

In the next section we shall discuss how this printing operation is performed in the printer. The commonly used printers are discussed as below:



Dot Matrix printer: The dot matrix printer prints character by character. In a dot matrix printer, the printer head physically 'hits' the paper through the ribbon which makes the speed of the printer relatively low. The printer head consist of some two dimensional array of dot called 'dot matrix'. Every time when it



strikes the paper through ribbon its dots are arranged according to the character which is going to be printed. The ink in the ribbon falls on the surface of the paper and thus the character get printed. There is no cartage need for ink only a ink filled ribbon is sufficient for printing. This is the reason which makes it cheaper. But they are slower and the quality of printing is not good and picture quality graphics can not be printed. Normally they can print at a speed of up to 360 characters per second.

Inkjet Printer: Inkjet printer is some what like Xerox machine. Printing technology is lots more different from dot matrix printer. Here instead of a ribbon one ink cartage is there to hold the ink in it. They are placed above the inkjet head. The printing head takes some ink from the cartage and spread it on the surface of the paper by the jet head. This ink is electrically charged. One electric field is created near the paper surface. Thus the small drops of ink are arranged in the surface according to the character it is going to print. These printers are fast and capable of printing good quality graphics. They also do not cost so much. Some times it is called 'poor man's laser'



Laser Printer: Laser printers are at the top-of-the line printing technology for PCs but their prices are still higher than most of the printers. A LASER printer looks like a photocopier machine. It differs from a photocopiers in the sense that instead of working photographically from a printed document, as in a photocopier, the laser printer uses a laser beam to create the image. Most laser printers are rated in 'pages per minute'. They produce the finest quality of print out. Most commercially available laser printers for PCs can print from 4 to 12 pages per minute.

Computer's Scanner:



A scanner is a device that can transfer an image of a photograph or written information to the computer. It acts like a photocopy machine. Just instead of making another copy of it on to the paper, it stores it in the computer. Scanners can scan typed or handwritten text, graphs, diagrams and photographs.

Technical Information:

Scanners are optical device. Inside a scanner there is a matrix of optical pickup cells. When light from the picture falls on the matrix cells, they collect the information from each pixel of the picture and convert it to electrical signals. Then they are further processed by DSP to get the Picture Bitmap. Photoshop, Photo editor are some common application for scanning.



Scanners are specified by the resolution. For printer it is also an important feature. Resolution is measured by dpi. Dot per inch. More the dpi the more quality of scanning or printing will be.

Floppy Disk and Drive:

Storage Media

When the PC is turned off, anything stored in the RAM is lost. Of course, a computer is of little use if you lose the letter you have just typed or the calculations you have made, every time you shut it down. In order to overcome this drawback, computer uses magnetic disks to store data permanently so that it won't be affected when you turn off your computer.

The operating system is another important software that has to be stored in permanent disk. 16-Bit Operating system like DOS can be stored in a 3½ " floppy but operating systems like Windows need at least 150 MB disk place. Fixed disks or hard disks are used to store them, the amount of data, that can be stored on disk is measured in kilobytes (thousands of bytes) or megabytes (million of bytes). Actually kilobytes for computers are not exactly thousand bytes rather 1024 bytes because everything in computer is binary (base 2) so we calculate kilobyte by $2^{10} = 1024$ bytes. So 1 KB is somewhat greater than what exactly 1 Kilo means. Again 1 mega byte is also 1024 KB.

There are basically two types of disks: removable disk and fixed disk. Floppy and CD or DVD are removable disks. Hard disks are fixed disks.

Floppy disk

Floppy disks are of course the most useful and economic storage device ever made. Floppy disks are widely used for exchanging small text and document and multimedia files. Very important information like personal documents, project report, research papers etc. which is kept in hard disk should be copied onto floppy disks for backup whenever your hard disk fails.



Physical Structure:-

Physically floppy disks are square. They come in two sizes 5¼ inch and 3½ inch. 5¼ inch floppy is now obsolete for its size and low capacity. The name floppy came from the flexible cover of the 5¼ inch size disk. Now a days 3½ inch floppy are popular in market. They have a hard plastic cover to protect the inner magnetic disk. Whatever

the floppy 5¼ inch or 3½ inch, they have three common features, i.e. label areas, read/write opening and write protected notches.



Label Area: This Area has been assigned so that label can be fixed to the floppy which indicates the information/data stored in it. When making labels, describe the contents and put the data on the label. The stickers are available along the floppy box. It is advisable to write the label before attaching them to the disk Writing on the label after fixing, might result in loss of data, due to the pressure of your pen tip.

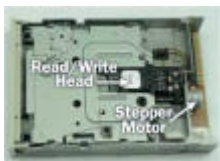
Read/ Write Openings: This is the area where read /write heads of the floppy disk drive can access the disk. This is the area through which computer is able to read contents of floppy or write in the floppy. It is advisable to never touch this area because this may lead to corruption of data stored in the floppy.

Write protect notch: Write protect notch is a small sliding tab in one of the sides of the floppy near the corner. There are two identical notch is available. One is fixed, closed. The position of other notch can be varied, when the small square hole is made covered by the notch, it is then write protected. It is the best idea to make the floppy write protected when copying the data to another computer, which has no antivirus software or not very sure of the computer.

Inside the floppy: If you can break the cover into two pieces, you probably find a thin circular magnetic disc inside it. The centre of the disc is attached with a metal support and some hole on it. This hole is tightly fitted to the spindle of the




floppy drive when we insert any floppy to the drive. Then the spindle rotates the disc and read/write head collect information from the disc surface.




Inside Floppy Drive: Floppy drive is inserted in one of the drive in the system unit. They are connected to mother board by a parallel SCSI (SMALL COMPUTER SYSTEMS INTERFACE) cable. There is also power cord from the SMPS unit. Inside it there is a spinning motor which rotates the spindle. One stepper motor which moves the read/write head to any

position of the disc surface. There is also one circuit board for the complete electronic operation.

Technical Information: Now we shall discuss how the information are stored and the logical structure of floppy. The information from the CPU comes through the parallel bus.  These signals are binary – means there are only two values possible, either 1 or high and 0 or low. The electrical voltage or current is converted to magnetic field by an electromagnet inside the read write head. When this magnetic field comes near the disc surface, the atoms in the magnetic disc are induced. Thus information is stored in the forma of magnetic energy.

The above process is all about writing information on the disc. The reading of information from the disc is exactly the opposite of the writing processor. Now the magnetic field of the disc makes the magnetic induction in the coil of reading head. Thus some voltage is produced in the electromagnetic coil and this voltage is identical to that which is being written during write operation. Thus the information is retrieved.

 Now we all know how information is exchanged by read/write head. But there are some particular areas in the disc where information is stored. Those are the logical structures of floppy. There are circular paths called tracks on the disc where information can be stored. For 1.44 MB floppy there are 80 such tracks for each side. Again tracks are divided into smaller sectors and clusters. This sectors and clusters are the smallest units that can be allocated for storage. Typical sector size of 1.44 MB floppy is 512 bytes.

Types of Floppies: Floppies come in different size and varying capacities. They are square-shaped and either 5¼ inch or 3½ inch in size. Storage capacities of floppies are measured in Kilo-Bytes (kB), 1 kB = 1024 Bytes and Mega-Bytes (MB), 1MB = 1024 kB. One byte is one ASCII character.

The commonly used floppies are:

Sl. No.	size	Storage capacity	Technical Notes
1	5¼"	360KB	DSDD (Double-sided double density)
2	5¼"	1.2MB	DSHD (Double-sided high density)
3	3½"	720KB	DSDD(Double-sided double density)
4	3½"	1.44MB	DSHD(Double-sided high density)

Measuring of storage capacity



You can store information in your computer on the hard disk or a floppy drive in the form of “files”. These files may contain a letter you typed in a word processing software program or any database created, using a data-base software program. As you create these “files” you are taking up spaces on these disk drives. The amount of information that can be stored on a disk is called the disk drive capacity. Capacity in the computer world is measured in terms of “Bytes”. Bytes describe the file size. Basically, a byte the amount of space required to store a character of information. For example the word “Computer System” is made of 15 characters. If we write and store it on the disk it will occupy 15Bytes.

Hard Disk Drive:



For storing personal information of large size permanently or setup a Operating system and Application Software needs a permanent storage device. Hard-Disk is the only one choice as permanent storage. They are attached to the drive



case permanently and connected to the mother board by IDE cable. Typical hard disk capacity is from 4.3GB to 80GB available in the market. Thus information storage capacity is at least 1000 times the floppy disk. Again they are lots faster (7200 r.p.m.) than that floppy drive.

Physical Structure:

If we remove the case of a hard disk, we can find magnetic disc and read/write head as similar to floppy disk (It is advised not to open a hard disk which is in good condition, because this attempt may cause data loss or damage of disk sectors. Try it if any damaged disk is available). But there are more than one disc and they are arranged one up on another on a single spindle support. They are called disc platters. All the system is enclosed in a dust proof solid metal case. Probably for this hard cover they are called hard disk. There are more than one read/write head near the platters and there is one head for each disc. The head moves so fast on the surface of the disc collecting and writing information that produces metal sound. The disc is also rotates at very high speed at 7200 r.p.m. producing lots of heat.



Read/Write Head and Disk surface



Inside a Drive



Heads in a Drive



Drive Head

As they are fixed disks, the discs can not be removed from the spindle. The drive circuit board is also attached behind the drive section. All the unit is placed in a metallic case called system box. The box is permanently attached to the disk drive drawer of the system unit by screw. There are also some removable hard-disk available and variation of such a hard disk is the SyQuest disk.

Technical Information:

As discussed earlier the reading and writing technique of a hard disk is same as that of floppy drive. Hard disk is connected to the mother board by IDE cable and power cord from SMPS unit. One mother board can support two IDE slot –one primary and one secondary. Again primary cable has two end point master and slave. Secondary cable also has these two end points. Thus there are four IDE disk drives that can be attached to main board. The identity or configuration of a hard disk like “Cylinder, Head, and Sectors” is kept inside a ROM chip and transferred to the system during booting. Thus the BIOS detects the presence of a Hard-Disk when it is first plugged to the system. The configuration of hard disk should match to the BIOS of the hard-disk other wise hard-disk may not be detected. Again when connecting two IDE drive (Integrated Device Electronics (IDE) .A type of disk-drive interface in which the controller electronics reside on the drive itself, eliminating the need for a separate adapter card. IDE offers advantages such as look-ahead caching to increase overall performance.) say one CD-ROM drive and one Hard-Disk together in Primary cable then one should be in master and another in slave. The jumper in the back of a hard-disk should be

properly configured before boot up.

Before we can use a hard disk we should properly format it. FAT 16/32, NTFS are some file formats. When we use the disk we should regularly check up using scandisk. The size of the files stored in hard disk is not equal and some times large in size. The information are scattered around the disk because one sector size is 512 Byte. Disk becomes slow when it is fully loaded with information. It is recommended to defrag information with Defrag tool to speed up the application.

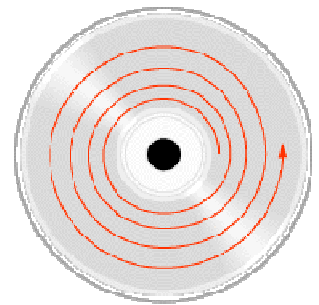
CD-ROM Disc and Drive:



CDROM means Compact Disc Read Only Memory. CDROM drive is one of the useful removable drives on the computer. CD-ROMs are widely used for exchanging software and backup of personal information. The disadvantage of this drive is once the information is written on the disk can not be altered again until it is a rewritable disc. CD-ROMs are becoming popular because of its low price and high storage capacity. 500-750MB of information can be stored in one disk. They are normally used for setup disks and Backup of personal documents. It is becoming more popular because it can store 90 minutes of PCM sound tracks or hundreds of MP3s or even one hour of full-screen MPEG video.

Physical structure:

CD-ROMs come with no cover on it like that of floppy and also the technology behind CDROM are totally different from Magnetic disk. They are based on Optical Laser Principal. Inside a CD drive there is a Laser source, one spinning motor and stepper motor for the disc, one stepper motor for movement of the read/write head, one circuit board and some additional gear and motor for the drive tray eject operation.

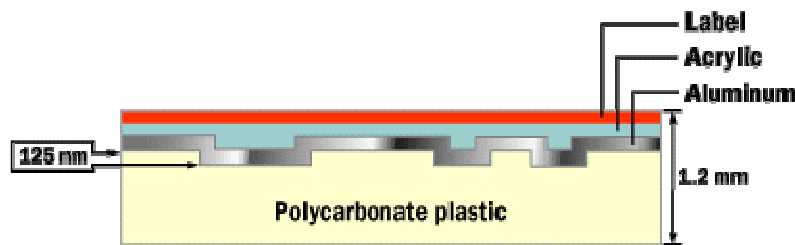


Technical Information:

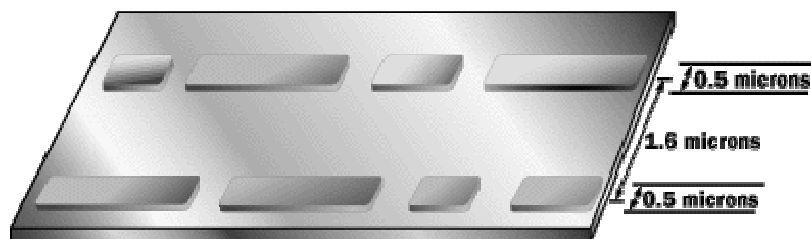
The information bit on a CD-ROM surface is coded by some ups and downs or pits and dumps,

created by infrared heat. The disc is made up of polycarbonate or some plastic. Thus it is easy to create those disorders by head. Then one Aluminum coating is placed on it. The light thus can be reflected from the surface like the mirror. If we take a blank CD, we can find it as it is as smooth as a plane glass mirror. When information is written by a writer drive, some microscopic pits are created on the surface of the CD. We can easily find those as it looks hazy to that of clear empty surface of the CD.

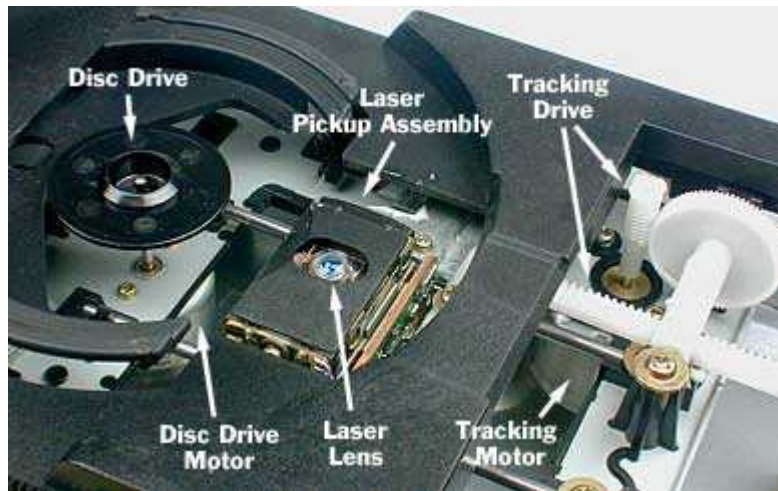
The reading of information from the CD is a very interesting phenomenon. There is one laser diode on the reading head. Laser rays are focused on the surface and some portion of light is reflected from the aluminum surface and falls on the optical pickup or a photo detector. If the light falls on the pits, light is reflected towards another direction, otherwise it falls on the optical pickup. Thus, according to the information written, light is detected and information is retrieved. This information is binary (digital) in nature, either on or off. For this CDs are called digital audio. The bits are retrieved sequentially and processed by registers to get parallel bytes, then passed to digital to analog converter (DAC) to get the analog audio in sound cards.



Cross-Section of CD



CD Pits and its dimension



Inside a CD-ROM Drive

Data Formats

If you have a CD-R drive, and want to produce your own audio CDs or CD-ROMs, one of the great things you've got going in your favor is the fact that software can handle all the details for you. You can say to your software, "Please store these songs on this CD," or "Please store these data files on this CD-ROM," and the software will do the rest. Because of this, you don't need to know anything about CD data formatting to create your own CDs. However, CD data formatting is complex and interesting, so let's go into it anyway.

To understand how data are stored on a CD, you need to understand all of the different conditions the designers of the data encoding methodology were trying to handle. Here is a fairly complete list:

- Because the LASER is tracking the spiral of data using the bumps, there cannot be extended gaps where there are no bumps in the data track. To solve this problem, data is encoded using EFM (eight-fourteen modulation). In EFM, 8-bit bytes are converted to 14 bits, and it is guaranteed by EFM that some of those bits will be 1s.
- Because the laser wants to be able to move between songs, data needs to be encoded into the music telling the drive "where it is" on the disc. This problem is solved using what

is known as **subcode data**. Subcode data can encode the absolute and relative position of the laser in the track, and can also encode such things as song titles.

- Because the laser may misread a bump, there need to be **error-correcting codes** to handle single-bit errors. To solve this problem, extra data bits are added that allow the drive to detect single-bit errors and correct them.
- Because a scratch or a speck on the CD might cause a whole packet of bytes to be misread (known as a burst error), the drive needs to be able to recover from such an event. This problem is solved by actually **interleaving** the data on the disc, so that it is stored non-sequentially around one of the disc's circuits. The drive actually reads data one revolution at a time, and un-interleaves the data in order to play it.
- If a few bytes are misread in music, the worst thing that can happen is a little fuzz during playback. When data is stored on a CD, however, any data error is catastrophic. Therefore, additional error correction codes are used when storing data on a CD-ROM.

DVD (Digital versatile Disk):



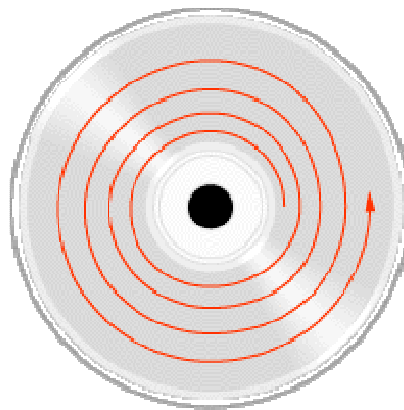
DVD or Digital Versatile Disc is an extension of CD-ROMs. They are very similar to the CD-ROMs. They are also based on optical principle of storage. The main difference between the CD and DVD are the storage capacity. One single DVD can store from 4.3 GB to 17 GB of data. Thus one high resolution MPEG2 encoded full-screen motion picture can



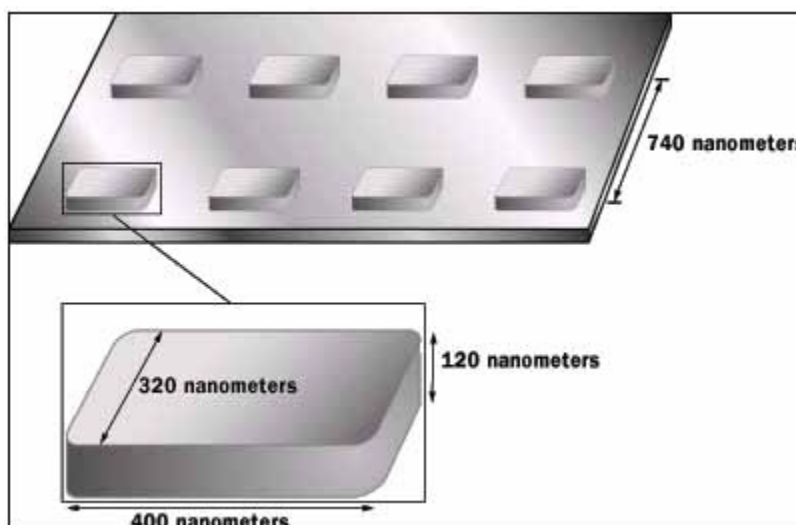
be fitted in one disc. Again the sound quality would be more accurate as theater like Dolby Digital Surround Sound. Sound can be decoded in 15 regional languages.

Technical Details:

All of the above things are possible because of high information density on DVD. Information storage on the DVD is very similar to the CD-ROM but there is more than one layer. Even DVDs are coded in both sides. When there is two layer of coating the inner layer is of aluminum and upper or external layer is of semitransparent gold. Two different intensity of LASER beam is used to detect the information from two layer.

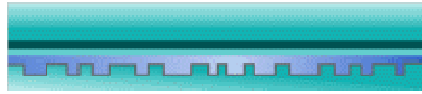


Track in a CD/DVD

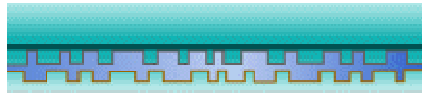


Dimension of DVD pits

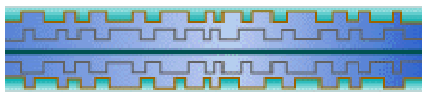
Single-sided, single layer (4.7GB)



Single-sided, double layer (8.5GB)



Double-sided, double layer (17GB)



Information capacity in DVD

Data Storage: DVD vs. CD

DVDs can store more data than CDs for a few reasons:

- Higher-density data storage
- Less overhead, more area
- Multi-layer storage

Higher Density Data Storage

Single-sided, single-layer DVDs can store about seven times more data than CDs. A large part of this increase comes from the pits and tracks being smaller on DVDs.

Specification	CD	DVD
Track Pitch	1600 nanometers	740 nanometers
Minimum Pit Length (single-layer DVD)	830 nanometers	400 nanometers
Minimum Pit Length (double-layer DVD)	830 nanometers	440 nanometers

Let's try to get an idea of how much more data can be stored due to the physically tighter spacing of pits on a DVD. The track pitch on a DVD is 2.16 times smaller, and the minimum pit length for a single-layer DVD is 2.08 times smaller than on a CD. By multiplying these two numbers, we find that there is room for about 4.5 times as many pits on a DVD. So where does the rest of the increase come from?

Less Overhead, More Area

On a CD, there is a lot of extra information encoded on the disc to allow for error correction -- this information is really just a repetition of information that is already on the disc. The error correction scheme that a CD uses is quite old and inefficient compared to the method used on DVDs. The DVD format doesn't waste as much space on error correction, enabling it to store much more real information. Another way that DVDs achieve higher capacity is by encoding data onto a slightly larger area of the disc than is done on a CD.

Multi-Layer Storage

To increase the storage capacity even more, a DVD can have up to four layers, two on each side. The laser that reads the disc can actually focus on the second layer through the first layer. Here is a list of the capacities of different forms of DVDs:

Format	Capacity	Approx. Movie Time
Single-sided/single-layer	4.38 GB	2 hours
Single-sided/double-layer	7.95 GB	4 hours
Double-sided/single-layer	8.75 GB	4.5 hours
Double-sided/double-layer	15.9 GB	Over 8 hours

You may be wondering why the capacity of a DVD doesn't double when you add a whole second layer to the disc. This is because when a disc is made with two layers, the pits have to be a little longer, on both layers, than when a single layer is used. This helps to avoid interference between the layers, which would cause errors when the disc is played.

Computer's SMPS:

Inside a system unit there is a power converter which converts the AC main 230V supply to 5 and 12V DC as needed by various parts of the computers. The full form of SMPS is Switched Mode Power Supply.



Technical Information:

Normally an AC voltage can be converted to DC by the steps like Step Down > Rectification > Filtering > Regulation. But with this process if we want to convert AC voltage to different level of DC voltage then we need Step down transformer for each level of DC voltage. Say for example, we need 5 and 12V DC from 230V AC so we have to add two step down transformer or convert the voltage to 12V DC then use some voltage divider to get 5V from the 12 V. first process needs two transformer which makes the power supply bulky and in the second process power is wasted in voltage divider resistor. If we need 3 or higher levels more transformers we have to add. Again efficiency of the power supply is not good. Thus Switched Mode Power Supply is used as an alternative. Here the voltage is chopped by electronic switches like Power transistor or Thyristor. Changing the frequency or Duty Cycle of the chopping we get DC voltage at different level. Here we get better efficiency and the size of the circuit is reduced because only one transformer is needed.

SMPS is a Power Electronic Device. A lot of heat is generated in this transformer and other components. One cooling fan is attached at the back of the unit as a heat sink.

Computer's CVT and UPS:

CVT:



This device gives a constant voltage even if load voltage is varying. Domestic power supply is not good for a delicate device like a computer. Voltage level is not constant and often fluctuates. This fluctuation of voltage may cause damage to the SMPS and other valuable units of the system. So computer is connected to a stabilized power supply for reliability and security. CVT is a voltage stabilizer.

Technical information:

Inside a CVT there is a feedback control system in which an electronic comparator is there

which compares the present voltage level to a reference voltage and produces some output. As the supply gets more fluctuated the more output is obtained at the output. According to the output of comparator the input voltage is step downed or step upped to get a stabilized reference voltage at the output.

UPS:



UPS or Uninterrupted Power Supply, as the name suggest is a power supply that keeps the power supply voltage uninterrupted during the power cuts. It automatically turned on during the power cuts and prevents the unsaved document to be lost.

During power cuts computer's hard disk is the most common device which is going to be affected. Hard disks may get damaged or some portion of stored data may be lost by power cuts. With an UPS, computer is safe and no more loss or damage of data or device in the system. UPS also acts as a CVT.

Technical information:

The mechanism in an UPS is served by an electronic switch (a Power Transistor or a Thyristor). It switches from off to on in millisecond or microsecond time during power cuts. This time is called transition time. The switching is so fast that no interruption in power is felt by the computer. When power goes off the UPS switches on and goes to inversion mode. The energy in the Battery is now used to fid as a supply. The voltage produces by the Battery is DC voltage. It has to be inverted to get the AC voltage for the system unit. The maximum time UPS can hold the supply during power cuts is the "Back Up time of that UPS". This Battery is automatically charged when main supply is on.



Network Interface Card:



Network interface card or NIC is one type of modem. It can be used for local area network connection. It can not be interfaced with a telephone line. The normal data rate for NIC are 1Mbps, 10Mbps and 100Mbps. 10Mbps NIC are called Ethernet. These are based on CSMA/CD (Carrier Sense Multiple Access with Collision Detection) network topology. 100Mbps NICs are called Fast Ethernet.