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Basic of Hardware:-

SCCI

Complete Basic of Computer Hardware.

Ram Singh
Poonia

Basic of Hardware

We are interested in are the general-purpose personal computers like we use at our desk, rather than the specialized computer under the hood of your car, or the big mainframe computers.

For our purposes, a computer can be defined as a machine for processing and storing information electronically. To be useful, it must have a way for us to get information into the machine, and some way to get it out afterwards so we can see it. Therefore, a computer has four basic functions:

1. Input
2. Processing
3.Storage
4.Output

Every part of a computer system, and everything it does, is connected to one or more of these basic functions. Computers can seem complex because there are many ways of doing each of these functions, and because everything has a new name, often made up of what appear to be nonsense initials like RAM or CPU.

To keep it simple, first look up any word or technical term you don't understand. There is a glossary at the back of this course pack with definitions for all the technical terms we use here or that you are likely to hear in talking to technicians. Second, when you encounter any part of a computer for the first time, find out which of these four functions it is used for.

Input:

All instructions are accepted by the CPU through electrical pulses from various kinds of input devices. The most obvious device for getting information (also called data) into a computer system is the keyboard. Another common input device is the mouse. Almost any time we use a computer we use one or both of these to get text data or instructions into the system. To get large amounts of information into the computer we would probably use a CD (compact disc), a floppy diskette, a modem connected to a phone line, or a network card connected to a network.

With the right sound equipment, a microphone or musical instrument can be used to bring in sound, and a digital camera can download visual information, so these are all being used as input. These input devices are as old as the computer although till date they have undergone a lot of changes. These are:

- Punched Card Reader (PCR)
- Keyboard
- Optical Mark Reader (OMR)
- Bar Code Reader
- Floppy
- Tape Drive
- Joystick

- Paper Tape Reader (PTR)
- Optical Readers
- Scanner
- Optical Character Recognization (OCR)
- Floppy Disk
- Mouse
- Light pen
- Magnetic Ink Character Recognization (MICR)

Keyboard:

The keyboard is the most common and simplest input device. T allows you to communicate with the computer. It consists of four main areas-the function keys. The typewriter keys, the numeric keypad and the special-purpose keys. The central area of keyboard contains the standard typing keys and the spacebar. The standard keys consist of letter, numbers and special character such as the semicolon and the Dollar sign.

The keyboard comes in a variety of sizes and shapes but most keyboards used with computer system have the following common features:

- Standard typewriter keys.
- Function keys.
- Special-purpose keys.
- Cursor-movement keys.
- Numeric keys.

Mouse:

The mouse is an input device that is used in addition to the keyboard. It is a hand-held device that controls a pointer on the screen. When we move the mouse around the desktop, the rubber-coated ball on the bottom of the mouse moves. The ball's movement is translated into signals that tell the computer how to move the screen pointer. On the top of the mouse are two buttons that are used to make selection from the menu on the screen. Mouse technology is often used with graphics-oriented microcomputer like Macintosh. With special software for graphics, the mouse can be used like a pen or a paintbrush to create figure and patterns directly on the video display screen. The keyboard, however, must still be used to type in characters and issue some commands, depending upon the software.

Scanner:

A device called s scanner lets an editor digitize pictures- that is, transform them into digital signals that can be processed by a computer. The fixed type of scanner is most commonly used in supermarkets. Housed inside a checkout counter, the fixed scanner shoots a beam of laser light up through a window in the counter's surface. Rotating mirrors direct the beam along crisscrossing path until it hits the bar code. The light that reflected from the bar code passes back through the window and is channeled by mirror to the photo detector.

OCR:

OCR stands for Optical Character Recognition. It is an input device, which was developed to read printed documented into computer readable form. It is a machine that reads from a peace of paper. Today this device used light sensitive instructions to scan bar codes, typed or hand written characters to the computer.

OMR:

OMR stands for Optical Mark Recognition. It is also an input device. It reads different marks, codes and then converts them into computer readable form. The OMR device uses high intensity to read the marks or symbols. Basically, this device is used in scholarship aptitude test or similar examination.

Light pen:

A light pen is an input device. There are two types of light pen. One type is used to draw on special screen. The other type of light pen is used to read information from Bar Codes. It sends signals to the computer according to the thickness of the black lines it passes over. A Light Pen lets the user draw on the computer.

Bar Code Reader:

A Bar code reader is screen of black strips of various thicknesses on a white background. Bar codes are used to keep track of large quantity of items, such as products in shops or book in a library. Bar codes are used particularly by retail trade for labeling goods and by supermarkets for labeling shelves and in stick controls.

MICR:

MICR stands for Magnetic Ink Character Recognition. Have you ever noticed a bank cheque or demand draft? That cheque contains a number at the bottom. That number uses special magnetic ink. Again you will notice that the writing style of the characters is different then other. Character in magnetic ink can read by a device, and the machine changes these characters into code, so that a computer can verify the characters for its duplication. This type of processing technique with the magnetic ink is known as Magnetic Ink Character Recognition.

Processing:

If we just put information into the computer and took it out again later, computers could be much simpler. Most of the time though, we want to do something with it or change it in some way. Doing something with it is called **processing**, or **data processing**. Central processing unit is the heart of any computer system. It consists of primary memory unit, arithmetic and logic unit and control unit. Most of this takes place in a part called the processor, or **C**entral **P**rocessing **U**nit. This is usually abbreviated to **CPU**.

The CPU is such an important part of the computer that we often refer to a system by the type of CPU it contains. My office computer is a **Pentium Dual Core** but at home I have an **AMD Athlon system**. Sometimes, you will hear the entire computer cabinet called a CPU.

To help the CPU there is another part that takes over a lot of the arithmetic. It is called the co-processor and also the **N**umerical **P**rocessing **U**nit or **NPU**.

The smallest piece of data that a computer can process is called a **bit**, and each bit will be either a one or a zero. For the sake of efficiency, the computer normally deals with a minimum of 8 bits at a time, and 8 bits together is called a **byte**. This is an important word to remember, because in working with computers you will hear about bytes frequently, and also megabytes which is one million bytes. Megabyte is usually abbreviated MB.

Circuits:

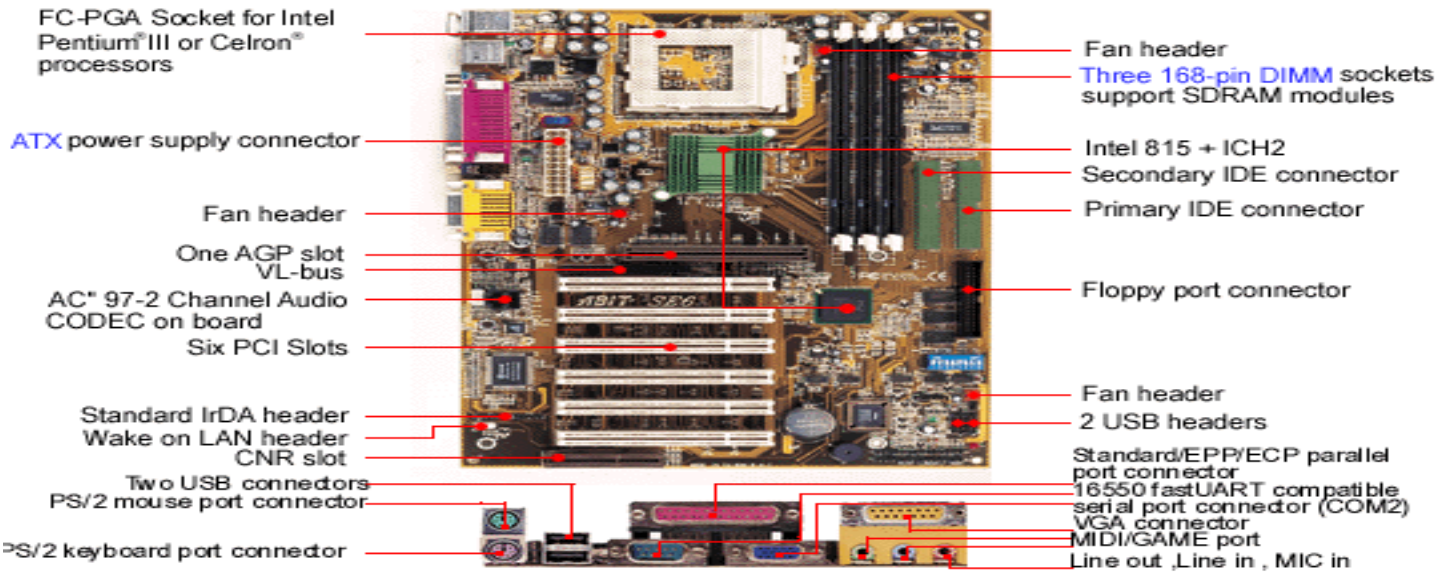
The word 'circuit' means a path something follows that goes back to where it started. In an electrical or electronic circuit, the thing following the path is of course electricity. Whatever work it does and whatever components it must go through on the way, the 'circuit' just means there is a complete path back to the starting point. The word 'circuitry' means the components, and the connections between them, that make up the path. It's as simple as that.

In a computer, this word 'circuit' shows up in a couple of places. Most of the components will be found soldered to a '**circuit board**', also called a **printed circuit board**. This is a thin board of fiberglass, with the connections between components (called traces) printed right on the board in copper.

The components themselves are often something called an **Integrated Circuit**, abbreviated **IC**. To integrate means to combine things together, so an integrated circuit is one that combines many circuits into the same part. These are formed on a thin wafer or 'chip' of silicon, and you will sometimes hear an IC being called a '**chip**'. This is also where we get the name 'Silicon Valley', for the area in Central California where many of them are made.

This chip of silicon is put into a case with metal legs, and tiny wires between the wafer and the legs connect those circuits with the outside world. There are now ICs containing millions of transistors and other components, all in a package that will fit in your palm with lots of room to spare.

Motherboard:



The biggest and most important circuit board in a computer is the **motherboard**. It's called the motherboard because every other part of the computer is connected to it. The CPU plugs into the motherboard, and so does the memory. And all the components that plug into the back of the case, like the keyboard and monitor, are connected from there to the motherboard. It is also called the **system board**.

There is a set of slots near the back edge of the board for plugging in other circuit boards, called **adapter cards**. These plug-in slots are for things like modems, sound cards, network cards and just about any other add-on feature you can think of. There is a set of traces connecting these slots to each other. A trace goes from Pin 1 of the first slot to Pin 1 of each of the other slots, and other traces connect each of the Pin 2s, each of the Pin 3s, etc. These traces then go on to connect to the memory, CPU, disk drives and other parts of the computer.

Buses:

The traces are called a bus, and they provide a way for each part of the system to exchange information with every other part. There are different types of bus that have been developed over the years, and your computer may have more than one. The most common one, found in every PC sold today, is called the **PCI bus**. An older version, still seen in some new computers, is the **ISA bus**. These are fairly easy to tell apart, because the connector that fits in the PCI slot has smaller pins and more of them.

One of the differences between PCI and ISA is that PCI supports a feature called **Plug-and-Play**, which allows you to add new hardware and have the system detect and configure it automatically. As anyone knows who has used the old method, plug-and-play is a great convenience.

Control Unit (CU):

Control unit controls all the hardware operators, i.e., those of input output units, storage and have the processor itself. It fetches the requisite instructions from main storage, stores it in a number of special register interprets the instructions and follows the instructions to be executed by giving signals to the appropriate hardware devices.

Arithmetic and Logic Unit (ALU):

The arithmetic and logic units in computers are capable of performing addition, subtraction, division, and multiplication as well as some logical operations. The control units tell the arithmetic and logic unit which operation to perform and then ensure that the necessary inputs are supplied. The arithmetic element can be compared to the calculating machines. An arithmetic and logic unit is a digital circuit that performs a set of mathematical micro-operations of a set of logic micro-operations. The ALU has a number of selection lines to select a particular micro-operation in the unit.

Resources:

Computer uses the bus to exchange data and **Interrupt Request**, abbreviated **IRQ** decide whose turn it is. Each component or device that will need access to the bus is assigned an IRQ level, from IRQ 0 to IRQ 15, and there are lines on the bus that correspond to these levels. When a device needs to transfer data on the bus, it tugs on the appropriate Interrupt Request line and waits until the CPU grants an interrupt for that level. It's all very nice and orderly. IRQs are an example of a **system resource**, which is a feature available in limited quantity that must be assigned to specific components.

There are other resources too. Each device must have a unique memory location where their data is stored as it is transferred to and from the bus. These locations are called **I/O Ports**. For the BIOS and any other devices that use ROM, there must be a range of memory set aside, so that ROM and RAM are not trying to use the same addresses. These **ROM addresses** are a resource just like the IRQs and I/O Ports. Some devices need to

transfer large amounts of data directly to and from memory without using an interrupt for each little piece of data. These devices, such as disk drives, are assigned a resource called **DMA**, for **D**irect **M**emory **A**ccess. Like IRQs, there are 16 DMA levels.

Ports:

In addition to the I/O ports mentioned in the last section which are really addresses, there are physical connections on the back of the computer that are also called **ports**, and various devices connect to the computer through cables attached to these ports. One of these connections is called the **Serial Port** because data goes over a single signal line as a series of bits, one right after the other. Serial port connectors have either 9 or 25 pins, with the male connector on the back of the computer and a female connector on the cable. The 9-pin version is more common, and is often used to connect a mouse if there is not a separate mouse connection.

Another connection is called the **Parallel Port** because its cable has 8 parallel signal lines to transmit 8 bits at a time. The computer has a 25-pin female connector on the back, so it won't be confused with the 25-pin male serial connector. The parallel port is most often used to connect a printer. Computers sold in the last few years will probably also have a connection called **USB**, for **U**niversal **S**erial **B**us. It is a bus because several devices can be connected on the same cable, but it's also a port because data goes into and out of the computer cabinet through its connector. There is USB1 and USB2. USB2 is newer and much faster.

BIOS:

As we mentioned earlier, the computer knows what to do by taking instructions from programs stored in RAM. The main instructions come from a program called the operating system, and those instructions direct traffic for other programs called applications. When the computer is turned off, all the instructions copied into the RAM are gone. When the system is turned on again, it needs to go out to the disk, get the operating system and load it into RAM, but there are no instructions in the RAM to tell it how to do this. The solution to this problem is a set of instructions that stay in memory and don't get lost when the computer is turned off.

This set of instructions is called the **BIOS**, for **B**asic **I**nput **O**utput **S**ystem. Since the instructions don't need to change, they can be stored in a different kind of chip than we use for RAM. It's called **ROM**, for **R**ead **O**nly **M**emory. We say that the instructions in the BIOS are **hard-wired**, and instead of software they are called **firmware**.

The computer goes through a process called **booting up** when it is first turned on. This involves executing the BIOS instructions, loading the operating system from disk into RAM, and then turning control of the computer over to the operating system after everything checks out OK. The term refers to somebody pulling themselves up by their own bootstraps (without outside help, in other words). Any computer term that includes 'boot' will have something to do with this start-up process.

CMOS and RTC:

There is other start-up information that normally stays the same but that we might want to change once in a while. This includes info about the various pieces of hardware connected to the system, which disk drive to check first for the operating system and that sort of thing. This data can't be stored on the hard drive because we need it to boot up. It can't be stored in RAM because it will be lost at power-off, and it can't be stored in the BIOS because we might need to change it.

The problem is solved by a type of RAM chip that uses very low power, and it is connected to a battery. This type of low-power memory chip is called **CMOS**. It stands for the type of technology used in the chip, which is **C**omplementary **M**etal **O**xide **S**ubstrate. This is probably more than you need to know, but I'm a fanatic about defining things. By the way, since batteries don't last forever, if you leave your computer unplugged for about 5 years you'll find it needs a bit of trickery to get it to boot again, because the CMOS information will be gone.

There is another feature in the computer that has the same requirements as CMOS, and that is the date and time function. This obviously needs to change very minute, but we don't want to lose track when the computer is turned off. The circuitry for this is called the **RTC** or **R**eal **T**ime **C**lock, and for convenience it is usually included in the same chip with the CMOS. A little trickle of juice from the CMOS battery keeps the clock running, and when you turn the computer on again it knows exactly what time and day it is.

Storage:

The memory or storage section of the computer consists of the devices used to store the information that would be used during the computations. The memory section of the computer is also used to hold both intermediate and final result as the computer proceeds through the program. The memory unit that communicates directly with the CPU is called the main memory and devices that provide backup storage are called auxiliary memory device. Only programs and data currently used by the processor reside in the main memory. A memory system is considered to be consisting of three groups of memories. These are:

- **Primary Memory or Main Memory:** It is large memory that is fast but not as fast as internal processor memory. This memory is accessed directly by the processor. It is based mainly on integrated circuits.
- **Secondary Memory/Auxiliary Memory/ Backing Store:** Auxiliary memory, larger in size than main memory, is slower than main memory. It normally stores programs, other instructions, programs and data files. Secondary memory can also be used as an overflow memory in case the capacity of main memory has been exceeded. Secondary memories are not accessed directly by processor.

Main Memory:

Memory, also called primary storage, is where data and instructions are stored during processing by the microprocessor. The memory or the storage section of the computer consists of the devices used to store the information that would be used the computations.

The memory unit that communicates directly with the CPU is called the main memory and devices that provide backup storage are called the auxiliary memory. Only program and data currently used by the processor reside in main memory.

There are two types of memories, Read Only Memory (ROM) and Random Access Memory (RAM).

Read Only Memory (ROM)

A Read Only Memory (ROM), as the name implies, is memory unit that performs the read operation only; it does not have a write capability. This implies that the binary information stored in ROM is mage permanent during the hardware production of the unit and cannot be altered by writing different words into it. A ROM is prepared by the manufactured and cannot be altered once the chip has been made. Another disadvantage of ROM is that it is slow. The ROM memory could be better classified as follows:

PROM: There are some types of read only memory called Programmable Read Only Memory (PROM). Critical or lengthy operations that are slowly carried out by software can be converted into micro programs and fused into a programmable read only memory chip. Once they are in hardware form these tasks take a fraction of the time. each bit can be individually programmed to a"1" or "0" by burning out a fusible link within the selected cells. A fused cannot be restored. Operations once written cannot be erased. PROM can be programmed only once.

EPROM: The Erasable Programmable Read Only Memory makes it possible for the user to repeatedly erase and reprogram the ROM. Erasing is done by exposing the EPROM to Ultra Violet rays of the specific frequently.

EEPROM: An Electrically Erasable Programmable Read Only Memory can be programmed through use of special electrical pulses. It is possible to integrate the circuitry into the computer, so that the EPROM does not have to remove from its socket for programming. Devices such as PROMs, EPROMs, and EEPROMs are all used in computers with the later versions being used in newer models. A ROM is used when its contents are thoroughly debugged through the use of EPROMs and do not require changes. EEPROM on the other hand, are especially useful in process control equipment, in which a real-time response is necessary, but when the software is being continuously modified.

Random Access Memory (RAM):

RAM chip is made with Metal Oxide Semiconductor (MOS). We can select any location on this chip randomly and can use it to store, retrieve data and instructions directly. For information being used at the moment, the system needs to be able to get to any part of that information very quickly. The storage for this information is RAM, which stands for Random Access Memory. Random access means the system can ask for any piece of stored data at random and get it immediately, without waiting for to come up in sequence.

Random access is faster than sequential access. The main reason that computers don't just store everything in RAM is that information in RAM is lost whenever the power is turned off. So, the computer needs both RAM and disk storage. Everything stored long-term is on the disk, and whatever is needed at the moment is copied into RAM. If changes are made to the data in RAM, the changes must be copied back to the disk before that computer is turned off so those changes are not lost.

A memory unit is a collection of storage registers, together with the associated circuits, needed to transfer information in and of the registers. Memory registers can be accessed for information transfer as required and hence, the name Random Access Memory, abbreviated as RAM.
RAM Chip is classified as: (1) Dynamic RAM and (2) Static RAM

Secondary Memory:

Secondary Storage devices provide a facility for permanently storing the information contained in temporary memory. There are several types of secondary storage devices. The most common type of secondary storage device is disk. The disk is the permanent storage medium for either data or a software program. The amount of data a disk can hold is called disk capacity. Disk capacity, like memory, is measured in Kilo Bytes (KB), Mega Bytes (MB) and Giga Bytes (GB).

Floppy Disk

It is a circular thin plastic jacket coated with magnetic material. A hard plastic as outer cover protects this plastic disk. It stores information magnetically on one or both surfaces. These disks are very useful in transferring data from one computer to another. There are floppy disk drives in which floppies are inserted or writing data. The floppy is made of plastic with magnetic coating on it. It is round in shape and it is covered by square plastic jacket.

Hard disk

The hard drive can store huge amounts of information, and it can keep this information when the computer is turned off. The only problem with hard drives is that it takes too long to get the data from them, because the system must wait as the disk spins until the right part of the disk surface comes under the read heads, and then the drive transfers a block of data in sequence. It is solid, rounded disk or number of disks. The disks are made up of a magnetic material and are sealed inside a case. It is used to store lot of programs and data. You can see this from outside but it can store more information than a floppy disk. When we purchase a computer it has Hard disk, which is called Drive C: and is placed inside the computer case (CPU).

Other Drives

Most systems today, especially home systems, have additional storage drives that use CD or DVD discs. The technology for both is similar but DVDs hold much more data. These drives do not store data magnetically but use optical markings that are read with a laser. They are mostly used just to read data and not to write it. The full name for CD in fact is **CD-ROM**, which stands for **C**ompact **D**isc - **R**ead **O**nly **M**emory. However, there are versions that can be used to write also, and these are called **CD-RW** and **DVD-RW**. Even so they are mostly used to write just once for permanent storage, and are not practical for constantly changing data.

Like hard drives, CD-ROM drives can use either an IDE or SCSI interface. The version of IDE for CD-ROM drives is called **ATAPI**, and for SCSI the CD-ROM version is **ASPI**.

Because the discs can be removed, CD-ROM and DVD are considered removable media. There are other types of removable media also that are not as common, such as **tape drives** and **Zip disks**, which are similar to floppies but with a storage capacity of 100 or 250 MB. Zip disks and tape drives also use the ATAPI interface.

Output:

There are a number of ways to get data back out of the computer. One of them is right there in front of your face, and that's the **monitor**. It has a screen that shows you information from the computer, so it is an **output device**. Computer converses with the user through output devices. They carry the results of various operations performed to the use, but before disclosing them to the operator, they interpret them into communicative language of man to machine i.e., the High Level Language. These are:

- Visual Display Unit (VDU)
- Card and Tape Punch
- Digitizer
- Computer Output Microform (COM)
- Printers
- Graph Plotter

Some devices are both input **and** output, like the floppy diskette mentioned earlier. If you have a modem or network connection, information can go both ways over the line so it's both input and output. In many cases it is practical to consider input and output together, in which case they are called **Input/Output** and abbreviated as **I/O**.

Monitor

Printer

VDU:

The VDU is also called as monitor or screen. A VDU is an output device used to show or display information. The Visual Display Unit (VDU) is a device used for interactive processing data that is being keyed in, is

displayed on the screen or monitor. Messages and processed information are also displayed on the screen. The combination of key board and the VDU is usually referred to as Video Display Terminal (VDT), which is an input/output device. There are two type of display terminals used:

- Alphanumeric display
- Graphic display

The monitor is a passive device that just displays the video output from the system. However, so much data is needed for the constantly changing screen display that special provisions are made for it.

The video card (or video circuitry on the motherboard) has its own RAM memory just to hold the display information, and its own ROM BIOS to control the output. Some motherboards even have a special high-speed connection between the CPU and the video. It's called the **AGP**, or **A**ccelerated **G**raphics **P**ort.

The important numbers in evaluating a video display are how many distinct colors can be displayed and also the **resolution**, which is how many pixels the image contains across and from top to bottom. Each dot of color making up the image is one **pixel**. As video technology evolved there have been a number of standards, and each one has its own set of initials like EGA, CGA or VGA. A common one is **SVGA**, which stands for **S**uper **V**ideo **G**raphics **A**rray and has a resolution of 800x600 (that's 800 pixels across and 600 down). Some high-performance monitors use **SXGA** (1280x1024) or even **UXGA** with a resolution of 1600x1200.

Printer:

Printers are the primary output devices used to prepare permanent downloads. Along with the computer screen, a printer serves as a medium for the computer to tell us what we have sent in as an input and what it has done in response to the same. The only difference is that the printer generates a permanent hard copy of our work on paper. A basic classification of printer

- Character printer that print one character at a time.
- Line printer that print that print whole lines at a time.
- Page printer that print whole pages at a time.

Impact or Non-impact Printer

Impact printers operate like a typewriter, pressing a typeface against paper and link ribbon. Impact printer often uses a daisy wheel or a dot matrix printer mechanism. Foe example, in the dot matrix printer, an arrangement of tiny hammers strikes on the ribbon to produce a desired character. Each hammer prints a small dot on the paper. Thus, the letters are formed. There are also non-impact printers available that use thermal, electrostatic, and chemical and inkjet technologies. For example, thermal-transfer printer has ribbons that hold ink is a wax binder. A dot matrix can also be used to produce a whole picture or an image.

Dot Matrix Impact Character Printer

These are most popular and widely used low-speed printers. They are often referred to as "Dot matrix printers". All character printers copy the action of typewriter by printing single characters at a time in lines across the stationery. The print produced by a small "print head" which moves to and fro across the page, stopping momentarily is each character position to strike a print ribbon against the stationary with an array of wires. According to the number of wires in the print head, the character matrix may be 7*5, 7*7, 9*7, 9*9 or even 24*24 the more dots, the better would be the image. Line widths are typically 80, 120, 132, 160 or 240. Speeds are typically from 30 cps to 200 cps. Multiple print copy may be reduced by the usage of carbon paper.

Daisy Wheel Printers

It is an impact shaped-character printer. These printers are fitted with unchangeable print heads called daisy wheels. To print each character, the wheel is rotated and the appropriate spoke struck against a linked ribbon. Speed is around 45 CPS. Similar to the dot matrix printers in term of page size and multiple copy printing.

Thermal Printers

These are non-impact character matrix printers, which print on to special paper whose surface is designed with a chemical so that a dot is produced, based on the reaction of the chemical to the heat. No ribbon or ink is involved. For users, who want the highest-quality desktop color printing, available thermal printers would be ideal. They are very quiet this gives them a big advantage for some special applications.

Ink-jet Printers

These are non-impact character matrix printer, which fire ink droplets on to the paper by using an "Electrostatic field" they too are being used in offices.

High-Speed Printers

There are two basic types of high-speed printers:

- Line Printers.
- Page Printers.

Both types operate with continuous stationery.

- **Line Printers:** These are impact shaped-character printers, which as their names suggest, print one line at a time. There are three main types of these printers.
- **Page Printers:** The printers print an image of a whole page at a time. The image may consist of conventional print, diagrams, pictures or a combination of these.

According to technical features, these printers are also known as optical printers, laser printers or xerographic printers. An electronically controlled laser beam mark out an electrostatic mage on the routing surface of a photoconductive drum. Ink toner is attached onto the electrostatic pattern on the surface of the drum. The toner is then transferred onto the stationary as it comes into contact with the drum.

A typically high-speed laser printer would print 146 pages per minutes. The printer prints at normal 6 lines per inch vertically. This represents a speed of 10,500 lpm but with smaller spacing, speeds of up to 30,000 lines per minute may be achieved in some models.

Software

Instructions are called software, and when these are organized into sets to perform any specific function, these are called **programs**. If you want to play a game on the computer, the computer must have a program with the instructions for that particular game. If you want to send e-mail, there must be an e-mail program.

One program called the **operating system** contains the instructions for actually running the computer. Certain things need to be done no matter what you are using the computer for. These are things like getting data on and off the disk, getting information to the monitor screen, and so forth. A program called **Windows** is the most common operating systems for PCs, and the one used in this office. It comes from a little company called Microsoft. Perhaps you have heard of it.

Anyway, the operating system takes care of the basic details of running the computer, and allows other programs to concentrate on their particular tasks. These other programs are called **applications**, because their job is to ***apply*** the computer to a specific task. When we say software, which can mean the applications, the operating system, or both.

There are other little chunks of software that attach to the operating system and tell it how to run particular hardware components or applications. These little chunks are called **drivers**, and anytime you add a piece of hardware to a system or upgrade to a new version of a device, you will need to have the right driver for that new piece of hardware.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