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4) Input and Output devices

What is Input /Output, or I/O? It is a communication between a CPU and a computer system and the outside world. It may be any device like keyboard, mouse, scanner, modem, printer, etc.

① **Keyboard:** A keyboard's primary function is to act as an input device. Using a keyboard, a person can type a document, use keystroke shortcuts, access menus, play games and perform a variety of other tasks. A computer keyboard is a ~~peripheral~~ peripheral partially designed for the input of text and characters and also to control operation of monitor. (Refer Textbook for details).

Mainly keyboard has the following components:

- 1] Keyboard switcher
- 2] Keyboard processor or circuitry
- 3] Key matrix

Most keyboards have between 80 and 110 keys including:

- 1] Typing keys
- 2] A numeric keypad
- 3] Function keys
- 4] Control keys.

1] **Typing keys:** The typing keys include letters of the alphabet, generally laid out in the same pattern used for typewriters. According to legend, this layout is known as QWERTY for its first six letters.

2] A Numeric Keypad: The numeric keypad is more recent addition to the computer keyboard. As the use of computers in business environment increased, so did the need for speedy data entry. Since a large part of data was numbers, a set of 17 keys arranged in the same configuration was found on adding machines and calculators, was added to the computer.

3] Function Keys: - IBM further extended the basic keyboard with the addition of function and control keys. Applications and operating systems can assign specific commands to the function keys.

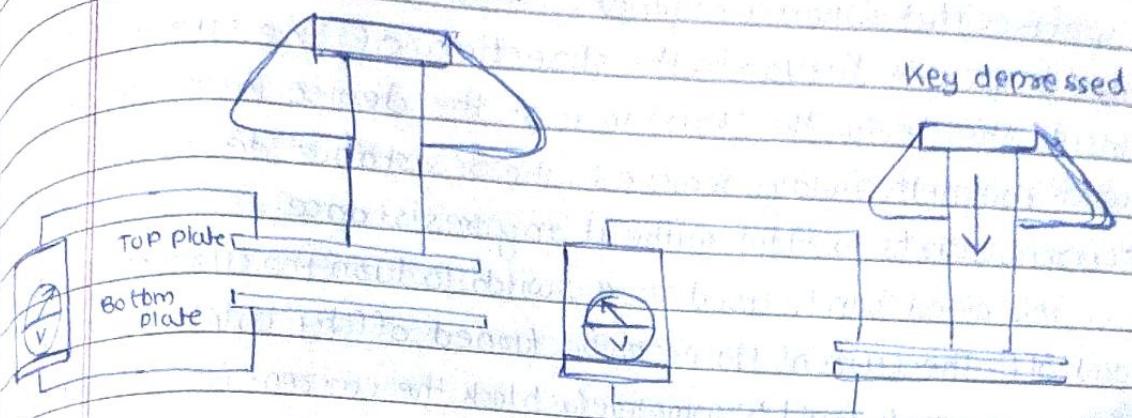
4] Control Keys: - This section includes cursor and screen control keys or arrow keys. Uses of these keys are moving the cursor on the screen.

S-09 S-10 Types of key switches: The main component of any keyboard is the key switch. These switches convert our typing action into proper signal for the keyboard interface, so that the interface will know that a key is being depressed. Today's keyboard comes with the membrane switch.

- 1] Capacitive switch
- 2] Hall effect switch
- 3] Optoelectronic switch
- 4] Membrane switch
- 5] Mechanical switch.

1] Capacitive switch

Normal Position



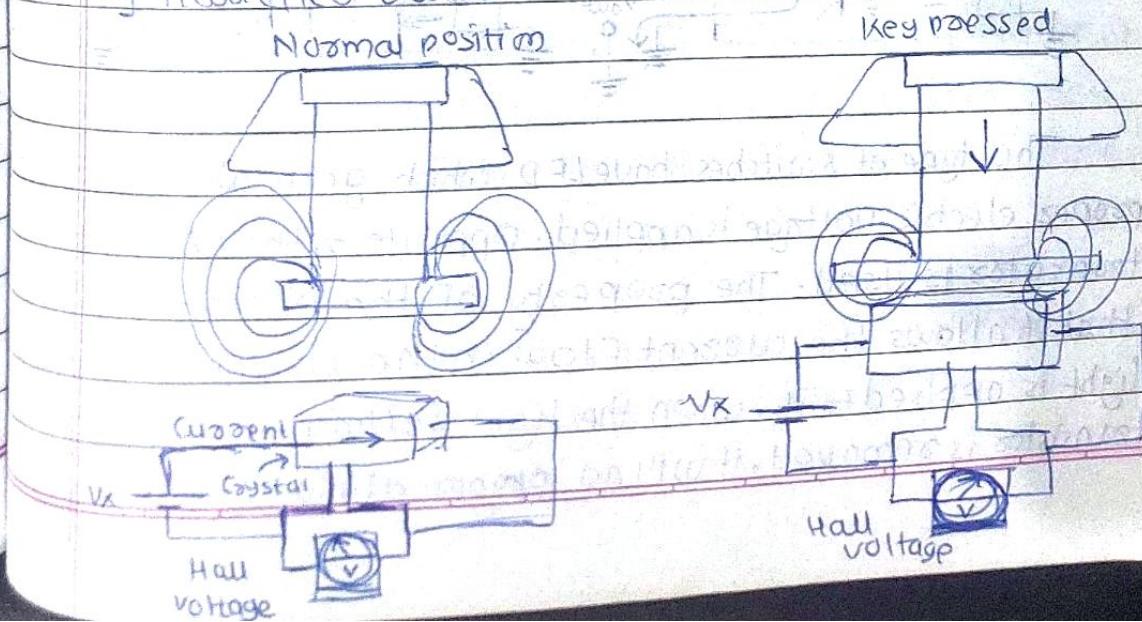
In this type of switches, have two plates of the capacitive are brought closer when the key is pressed. When plates are brought closer or moved away, the capacitance of the switch is changed and this change can be detected by measuring the voltage change across the switch by using some sense amplifiers.

The sense amplifier will receive one voltage when the switch is in open position and another voltage when switch is in close position. These voltage are converted into proper logic signals to inform the computer about the open or close switch position. These switches have a normal lifespan of about 20 million keystrokes.

2] Hall effect switch

Normal position

Key pressed



These switches are based on the "Hall effect" which specifies that when a magnetic field is applied to any device perpendicular to the direction of the current flow inside the device the resistance of the device increases and when magnetic field is removed, the resistance decreases or the current starts to flow without any resistance.

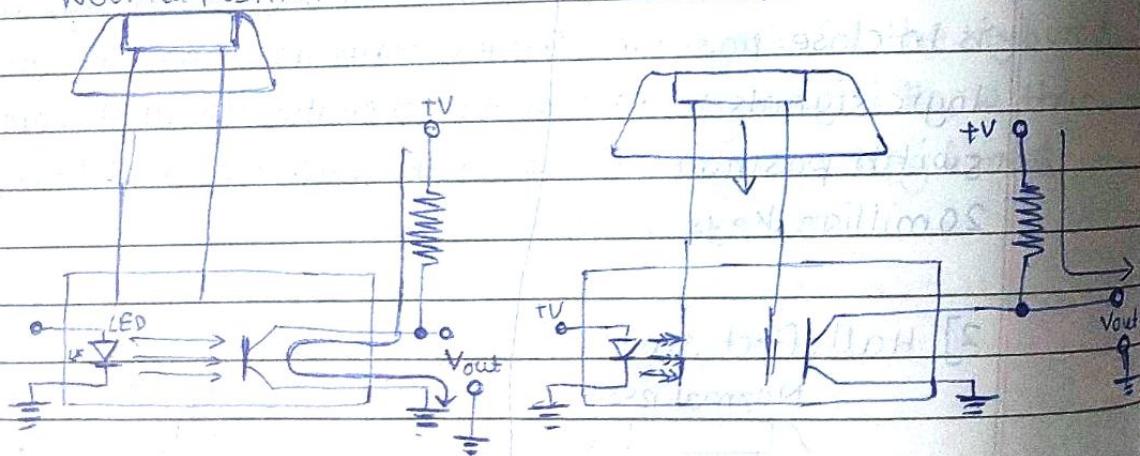
This effect can be used as a switch to turn the current flow on and off. The current flow can be turned off by applying a very strong magnetic field to completely block the current flow through the device.

This type of switch does not contain any mechanical contacts. It is more reliable than ordinary mechanical switch. The switch will not deteriorate with the use also the contamination of the contact will not have any effect on the working of the switch.

3] Opto-Electronic Switch:

Normal position

switch pressed

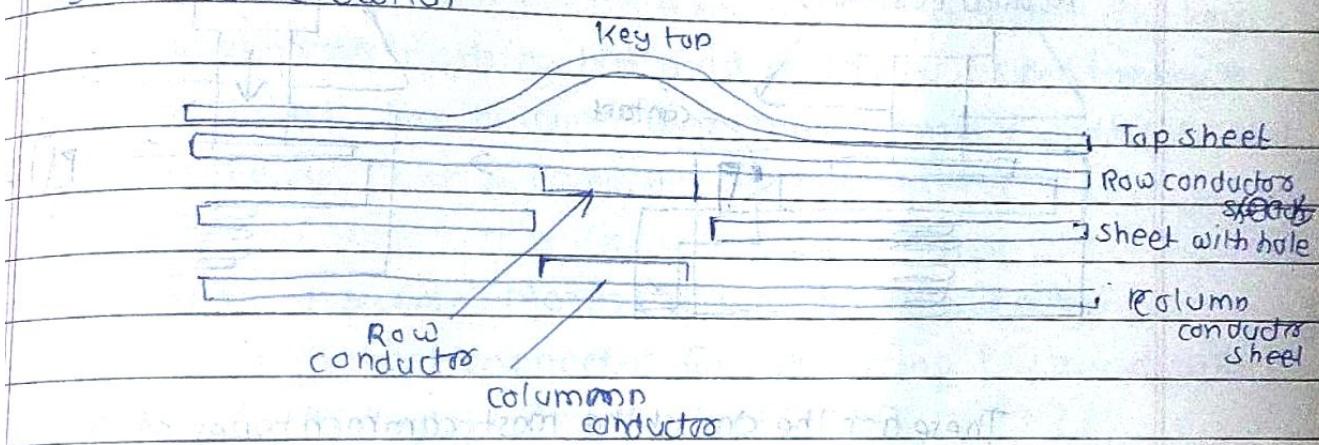


This type of switches have LED which generates light when proper electric voltage is applied. Opposite to the LED, a photo-transistor is used. The property of the photo-transistor is that it allows the current flow in the circuit, as long as light is applied to it, when the light falling on the photo-transistor is removed, it will no longer allow current to pass through it.

When the key is not pressed, the light from LED falls onto the photo-transistor. This makes the light from the LED fall onto the phototransistor. This makes the current flow through the phototransistor and produce very low voltage at the output V_{out} .

When the key is depressed, the light emitted from the LED is blocked. This will stop the current flow through the phototransistor and forces it to a cut-off condition. In this condition, the current cannot flow through the phototransistor and the different value will be produced at the output V_{out} .

4] Membrane switch:



In this keyboard, two rubber or plastic sheet is used as row conductor sheet and column conductor sheet. These row and column sheet are separated by another sheet with holes at key top position. When key top is pressed, it forces the row conductor sheet through the hole to touch column conductors of the switch.

When the row conductor lines on the row conductor sheet touches the column line on the column conductor sheet, key contact is made. This is interpreted by keyboard interface as key input.

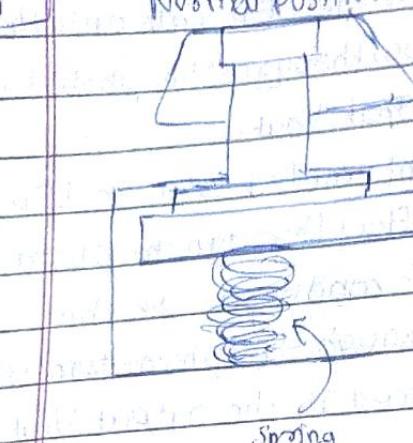
These row and column lines are made on the plastic or rubber sheet using silver or some other conductor ink for each row and column keys on the keyboard.

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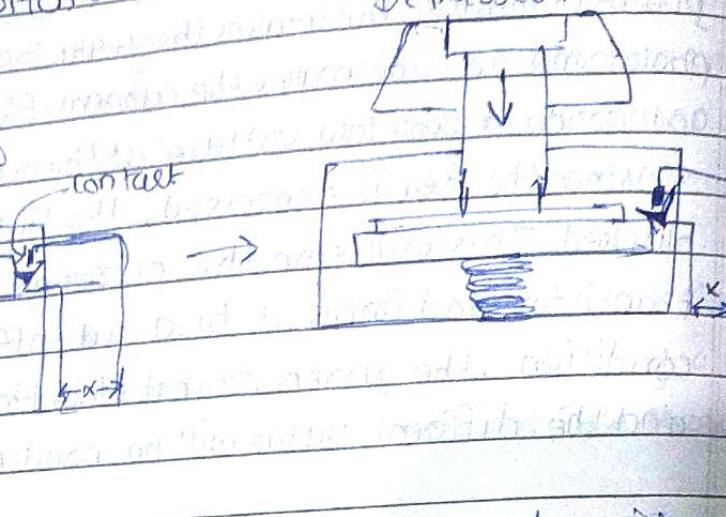
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5] Mechanical switch:

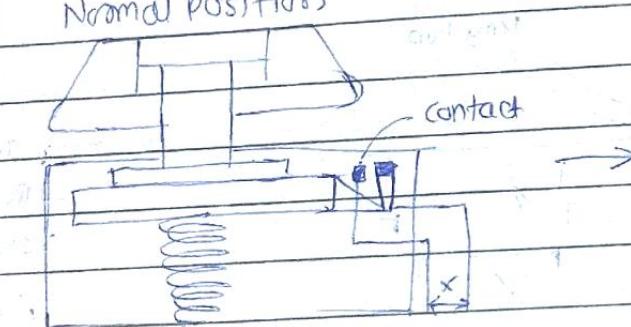
Normal position



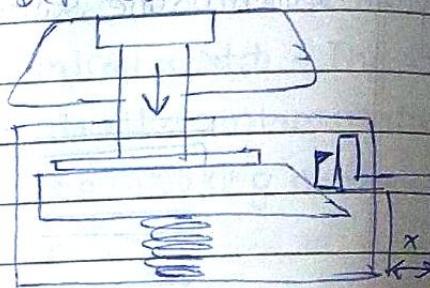
Depressed position



Normal position



Depressed position



These are one of the most common types of keyboard switches. In these type of switches, two metal piers are contacts are kept in one position and moved into close position when the switch is depressed. The above figure shows two different types of mechanical switches. When the switch is in normal position, the contact is open. When switch is pushed, some mechanical action closes the contact and this closure is sensed by keyboard interface at location X.

Rubber dome: Rubber dome key switches are very common nowadays. These type of switches is also known as polydom switches. These type of switches are formed by using polyester domes where inside bubble is coated in graphite.

Rubber dome switch keyboard called as direct switch keyboards. This type of keyboard is not suitable for

gaming purpose. This type of switch technology is commonly used in handheld controllers, mobile phones, automotive, consumer electronics and medical devices.

Keyboard interfacing :- Keyboard interfacing means, how keyboard is connected to PC. It consists of keyboard and keyboard connector. Inside the keyboard has processor and circuitry that carries information to and from that processor.

Keymatrix :- Keyboard uses a matrix with rows and columns made up of wires. Each key acts like a switch. The key matrix is nothing but grid of circuits. When the key is pressed, the column wire makes contact with the row wire and hence completes the circuit.

Keyboard connectors: Normally we find following types of keyboard connectors for interfacing keyboard with PC.

- 1] AT Keyboard connector (D16NS)
- 2] PS/2 Keyboard connector (MINI-D16NS)
- 3] USB Keyboard connector

1] AT Keyboard connector (D16NS) :

Connector Pin #	Purpose	Function
Pin 1	KBD CLK (clock)	Provide clock pulses to keyboard
Pin 2	KBDAT (data)	Send & receive the data from this pin
Pin 3	KBDRST (reset, not used)	It is used to reset keyboard internal buffer
Pin 4	GND	It provides ground of keyboard
Pin 5	Vcc (+5V)	It provides power to the keyboard

2] PS/2 Keyboard connectors (MINI-DINS)		
Connector pin #	Purpose	Function
Pin 1	KBDAT (data)	Send and receive the data from this pin
Pin 2	not used	Not connected
Pin 3	GND	It provides the ground of keyboard
Pin 4	VCC (+5V)	It provides power to the Keyboard
Pin 5	KBDCLK (clock)	Provide clock pulses to the Keyboard
Pin 6	not used	Not connected

3] USB Keyboard connectors:		
Connector pin #	Purpose	Function
Pin 1	VDC +5V	It provides power to the Keyboard
Pin 2	Data -	Carries -ve data signals
Pin 3	Data +	Carries +ve data signals
Pin 4	Ground	It provides the ground of the Keyboard.

Keyboard working: The following describes working of a keyboard:

- ① When a key is pressed, it pushes down on a rubber dome sitting beneath the key. A conductive contact on the underside of the dome touches the pair of conducting lines on the circuit below.
- ② This bridges the gap between them and allows current to flow.
- ③ A scanning signal is emitted by chip along with the pairs of lines to all the keys. When the signal in one pair

becomes different, the chip generates a "make code" corresponding to the key connected to that pair of lines.

(4) The code generated is sent to the computer either via an electric cable or over a wireless connection. It may be repeated.

(5) A chip inside the computer receives the signal bits and decodes them into the appropriate key press. The computer then decides what to do on the basis of key pressed.

(6) When the key is released, a break code (different than the make code) is sent to indicate the key is no longer pressed.

Need of key debouncing :- When the user presses a key, the contact bounces slightly in most cases. When key makes contact, there are several on/off cycles. This is called bounces. The processor in the keyboard is designed to filter this and de-bounce the keys. So de-bouncing is needed for distinguishing user's likes the key double or not.

Installation of keyboard :-

- ① Turn OFF the computer when you are connecting keyboard to the system.
- ② Observe and locate keyboard port (USB, PS/2, DIN) on a computer system back.
- ③ Plug the keyboard carefully on the keyboard port of your computer.
- ④ Turn ON your system.

Installation of keyboard driver software :-

Windows operating system has built in drivers for keyboards.

(2)

Mouse: A computer user could move on pointing devices. A user can easily move on screen, to select different options on the screen using an input device known as mouse.

construction of mouse:

The mouse consists of following components:

- 1] A roller ball which signals movement of the system
- 2] Buttons for making the selection
- 3] cable for connecting the mouse to the system
- 4] connectors for interfacing mouse to the system.

Types of mouse:

Types of mouse

Based on Technology

- 1) Mechanical
- 2) Opto Mechanical
- 3) Optical

Based on Buttons

- 1) Single button
- 2) Double button
- 3) Three button
- 4) Scroll button

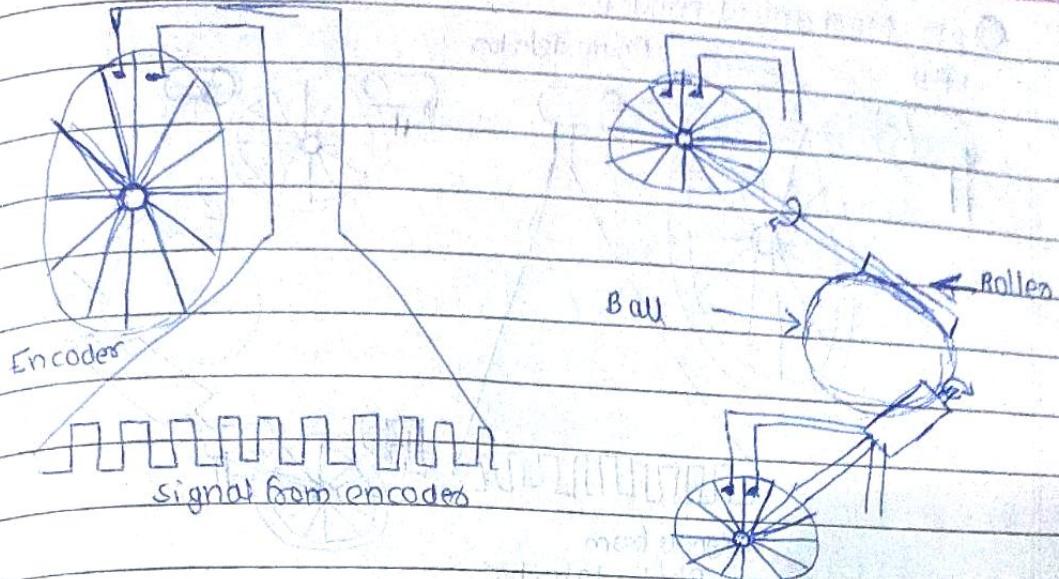
Based on interface

- 1) Serial
- 2) Bus
- 3) Proprietary / Mouse port
- 4) Wireless
- 5) USB

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Mechanical mouse: It is a mouse that operates by mechanical means. A rubber ball rolls as the mouse is moved across a table top or mouse pad.

Electrical

**Working:**

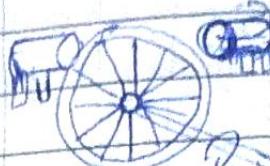
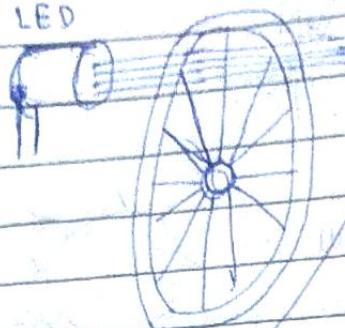
- ① A mouse is moved across a flat surface, a ball starts to rotate in the direction of the movement.
- ② As the ball rotates, it touches and turns two rollers inside the mouse. The rollers are mounted at 90 degree angle to each other. One roller is used for vertical movements and another one is used for horizontal movements.
- ③ Each roller is attached to an encoder, which is having a wheel like structure. As the rollers turns, the encoder rotates with them. Two pairs of contact bars touches the small metal contact points.
- ④ Each time a contact bar touches a point, an electrical signal is generated. The number of signals indicates number of points the contact bars have touched.
- ⑤ The direction in which mouse is moving can be found out by number of signals from these two vertical and horizontal rollers.
- ⑥ The signals generated by these rollers are sent serially to the ~~software~~ PC over the mouse cable. The mouse driver software converts these signals into the distance direction and speed necessary to move the cursor on the screen.

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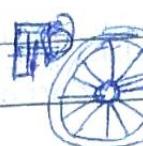
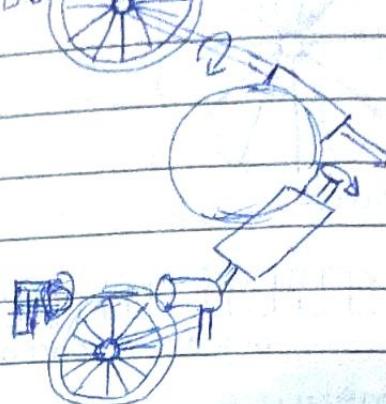
① pto-Mechanical mouse:

LED

Photo detectors



Signals from
Photo detectors



This mouse works by using a small rubber ball that rotates as the mouse is moved around the mouse pad.

Working:

- ① When the mouse is moved, the ball of the mouse moves and it turns two separate rollers fixed at 90 degrees to each other. One roller is used for vertical movement and another one is used for horizontal movements on the screen.
- ② Each roller connected with a wheel. These wheels are rotated by the corresponding movement of the rollers.
- ③ There are small openings on the rim of each wheel. As the wheel rotates, a pair of LED and photo detectors detect the number of openings passed between them. Each opening on the wheel allows the light from the LED to fall on photodetectors and generate electrical signals.
- ④ These signals are passed to the PC through the wire connecting the mouse to the main system. The PC passes them to the mouse driver software which then converts it into distance, direction and speed required for the movement of the screen cursor.

Advantages:

- ① It combines optical and mechanical technologies
- ② It uses photodiodes and LED to find out movement of mouse
- ③ It requires less maintenance

Disadvantages:

- ① It requires periodically cleaning of mouse
- ② They required special surface such as mouse pad
- ③ It has few mechanical parts, so life of mouse is less as compare to mechanical mouse.

Optical mouse: Optical mouse is the defacto standard for mouse to communicate between the end user and the computer. It uses camera technology and digital processing to compare and track the position of mouse.

Working: First the LED produces a red light that is emitted onto a surface. The light is reflected off the surface back to the CMOS sensor. The CMOS sensor sends each image that is reflected to DSP (Digital Signal Processor) for analysis.

Using the thousands of images that the CMOS is sent to the DSP for analysis, the DSP is able to detect both patterns and images ~~and~~ and can determine if the mouse has moved and at what speed. It is able to determine coordinates which are then sent to the computer that the mouse is hooked up to.

Advantages:

- ① No moving part means less wear and lower chances of failure
- ② No way for dirt to get inside the mouse & interfere tracking sensor
- ③ Increased tracking resolution means smoother response
- ④ They do not require smoother surface, such as mouse pad.
- ⑤ Digital processing often results in smoother, more accurate performance than prior technologies.
- ⑥ Optical mice do not require a mouse pad and can be used on many surfaces.

Comparison of Mechanical, opto-mechanical & optical mouse

	Mechanical	Opto-Mechanical	Optical
1)	It uses small metal contact points for finding the movement of the mouse	It uses photo detectors and LED for finding the movement of the mouse	It uses LED and CMOS sensors for finding the movement of the mouse
2)	It requires maintenance frequently	It requires less maintenance	It requires zero maintenance
3)	It uses more mechanical parts, so life of mouse is less	It uses less mechanical parts, so life of mouse is more	It uses no mechanical parts
4)	It requires cleaning of mouse frequently	It requires less cleaning of mouse	No cleaning required.

Installation of mouse:

Installation of mouse with PC :-

- ① Turn OFF the computer, when you are attaching mouse to the system
- ② Observe and locate the mouse port (USB, PS/2, 9 pin COM1, COM2) on the computer system back
- ③ Plug the mouse carefully on the mouse port of the computer
- ④ Turn ON your system.

Installation of mouse driver software :- Windows OS has a built-in drivers for some of the branded mouse. Install respective brand software for mouse following way :

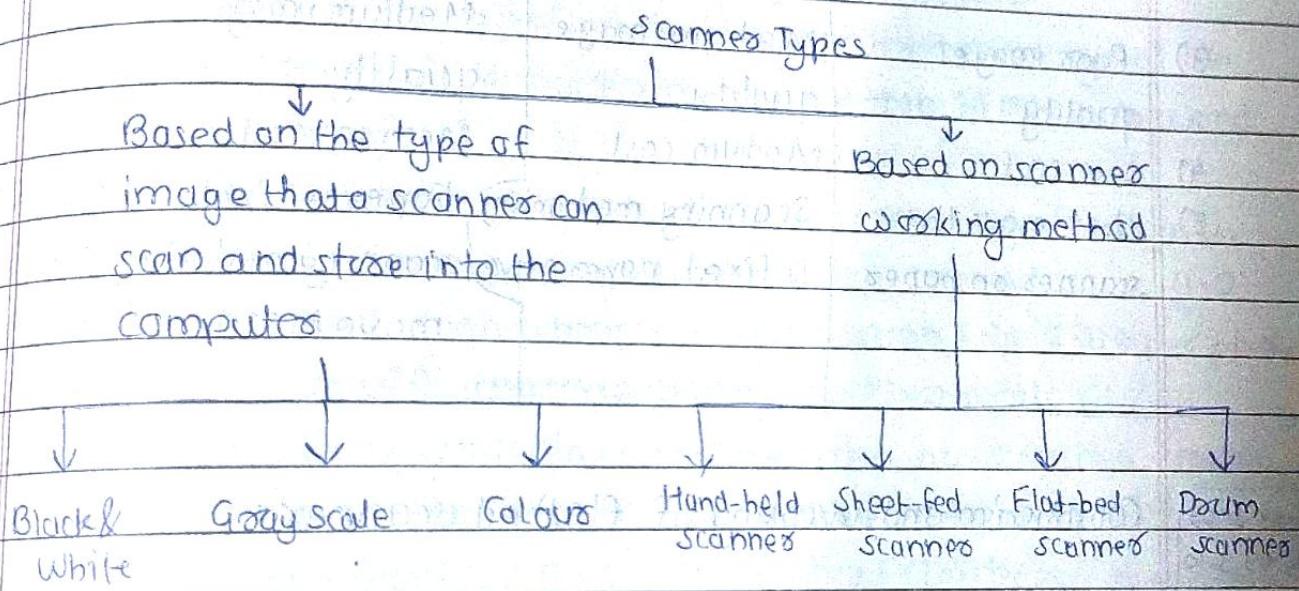
- ① Insert your drivers CD into respective drive
- ② Click on the start button on the windows task bar and select Run. The Run dialog box is displayed on the screen.
- ③ Type the setup with proper path and 'The process OK.'
- ④ Follow the on-screen installation instructions
- ⑤ After installation restart the system.

③

Scanners: The scanner is a special input device to convert both pictures and text into stream of data OR it is a device used to analyse an image and process it.

Scanner is an electronic device that scans printed or handwritten text documents, or a particular object to convert them into digital file format.

Scanners specifications: (Read from textbook) Not imp for exam
Scanners types:



These are different types of scanners for different types of documents that need to be scanned. Based on this scanners types are:

- 1] Flat bed scanner
- 2] sheet-fed scanner

- 3] Hand - held scanner
- 4] Drum scanners

(Refer textbook for detail). Not imp but read it.

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Comparison of scanners:

	Hand held scanners	Sheet fed scanners	Flat-bed scanners	Drum scanners
1) Small in size, same as barcode readers	A4 in size, same as fax machine	A4 in size, same as a Xerox machine	A3 in size, same as a plotter	A3 in size, same as a plotter
2) Hand held scanners are useful due to their portability	Used in modern offices	Used in modern offices	Professional color photo shops use due to high-end scanning.	Photo studios use due to high-end scanning.
3) Poor image quality	Medium image quality	Medium image quality	High image quality	High image quality
4) Low cost	Medium cost	Medium cost	Medium cost	High cost
5) Users move the scanner on paper	Scanning mechanism is fixed, paper moves	Paper is fixed, scanning mechanism moves to scan	Paper is fixed on drum and drum moves to scan	Paper is fixed on drum and drum moves to scan an image

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Construction and working of flatbed scanner:

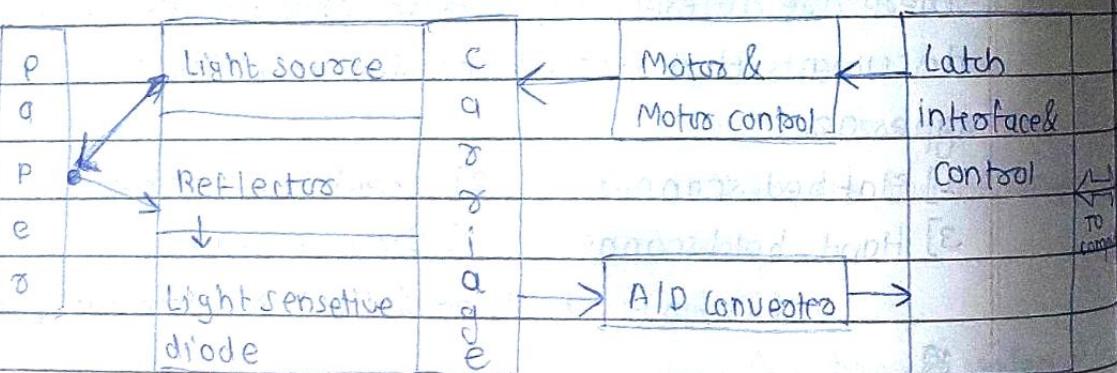
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Block diagram of

flat bed scanner

Working:

The following steps are involved to scan any type of document:

- ① A light source illuminates a piece of paper placed down against a glass window above the scanning mechanism.
- ② A motor moves the scan head beneath the page. As it moves, the scan head captures light reflected from individual areas of the page.
- ③ The light from the page is deflected through a system of mirrors. A lens focuses the beams of light onto light sensitive diodes that translate the amount of light into electrical current.
- ④ The more light that's reflected, the greater the voltage of the current. Whitespaces reflect more light than black or coloured letters or images.
- ⑤ An A-D converter converts each analog reading of voltage as digital pixel scanning representing the scanned area. A-D converter on a monochrome scanner store only 1-bit per pixel, either on or off, representing black or white.
- ⑥ If the scanner is a colour scanner then the scan head makes three passes under the image and the light on each pass is directed through red, green and blue filters before it strikes the original image.
- ⑦ The reflected signals from these three passes are converted into digital information and stored to represent red, green and blue colour value of the scanned area on the page.
- ⑧ The digital information is sent to software in the PC, where the data is stored in a format with which a graphics program or OCR work.

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OCR: Optical Characters Recognition (OCR) is a process of scanning printed pages as images on a flatbed scanner and then using OCR software to recognize the letters as ASCII text.

Ideal source material for OCR :- OCR works best with originals, very clear copies and mono-spaced fonts like Courier. If you have choices, use the following source material:

- (i) 12 points or greater font size
- (ii) Black text on white background
- (iii) A clean copy; not a fuzzy multi-generation copy from a copy machine.
- (iv) Standard Type Font (Times New Roman, etc.) Fancy fonts may not be recognised.
- (v) single column layout.

OCR limitations :-

- (i) Using text from a source with font size less than 12 points or from a fuzzy copy will result in more errors.
- (ii) ~~Except~~ Except for tab stops and paragraphs mark, most documents formatting is lost during text scanning,
(Bold, Italic and Underline are sometimes recognised)
- (iii) The output from a finished text scan will be a single column editable text file - This text file will always require spell checking and proof reading as well as reformatting to desired final layout.
- (iv) scanning plain text files or printouts from a spreadsheet usually works, but the text must be imported into a spread sheet and reformatted to match the original.

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TWAIN :- TWAIN is a standard software protocol and applications programming interface (API) that regulates communication between software applications and imaging devices such as scanners and digital cameras.

TWAIN specification :- TWAIN was designed to provide a consistent, easy integration of image data between sophisticated input devices and software application. Group goals for the specification included:

- (i) Multiple platform support
- (ii) Support for multiple devices
- (iii) Widespread acceptance
- (iv) Extensibility and revisions
- (v) Easy implementation
- (vi) Longevity
- (vii) Multi-data capacity.

(Read from textbook)

Resolution & interpolation :

Scanners vary in resolution and sharpness. Most flatbed scanners have a true hardware resolution of at least 300×300 dots per inch (dpi).

Interpolation is a process that the scanning software uses to increase the perceived resolution of an image. It does this by creating extra pixels in between the ones actually scanned by the CCD array. These extra pixels are an average of the adjacent pixels.

Installation of scanner :

Hardware installation :- In addition to software, a scanner needs a computer system to work.

- ① Turn OFF the system
- ② Connect scanner interfacing cable / parallel port interfacing cable to scanner and system.

- ③ Connect power-adapter to the AC main: **PRINT**
- ④ Turn ON scanner and system initialization
software installation: **PRINT**
- ① Double click on "My computer" icon then
 - ② Double click on "Control Panel" icon then
 - ③ Double click on "Add new hardware" icon **PRINT**
 - ④ Then it shows window "Click on other devices" and then press "Next" **PRINT**
 - ⑤ Then press on "Have a disk." **PRINT**
 - ⑥ Select scanner driver from CD/DVD disk and install
OR **PRINT**
- ① Put CD/DVD into the appropriate drive.
 - ② Click on start and select Run.
 - ③ A dialog box appears, press on Browse and select setup program from disk.
 - ④ Then press "OK" - It starts the installation
 - ⑤ After finishing installation restart the system.

④

Modem: MODEM (MODulate / DEModulate). An input/output device that converts digital data from a computer to analog data for transmission over the telephone lines by modulating it into waves; at the other end, the modem converts the analog data back to the digital form so that it can be read by the computer.

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These are two types of modem:

- 1] Internal modem
- 2] External modem

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Specification of Modem: (Read from textbook)

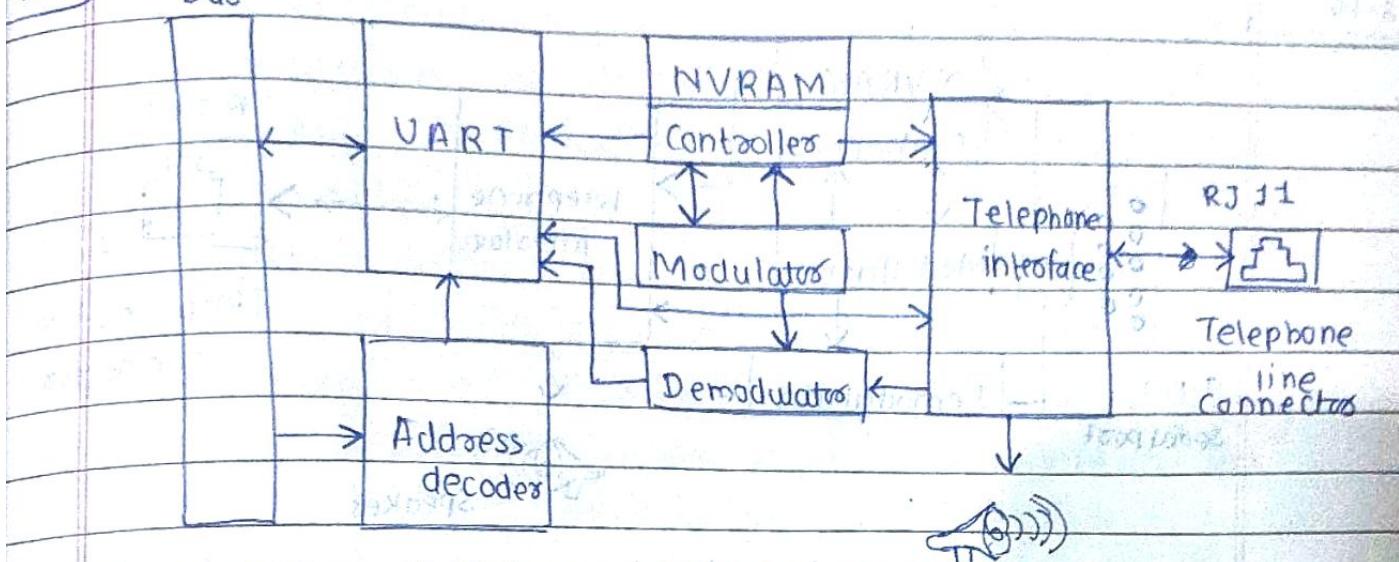
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Internal modem: Internal modem is a stand-alone board that plugs directly into an ISA or PCI expansion slot.

Bus



A modulator circuit converts the serial digital data from the computer into analog signals to be transmitted over the telephone line.

On the receiver side, serial signals are received from the telephone line. The telephone interface separate received signals and passes them to the demodulator. The demodulator converts analog signals into digital form and send this serial data to the UART. The UART convert serial bit data into parallel byte and placed on the system data bus.

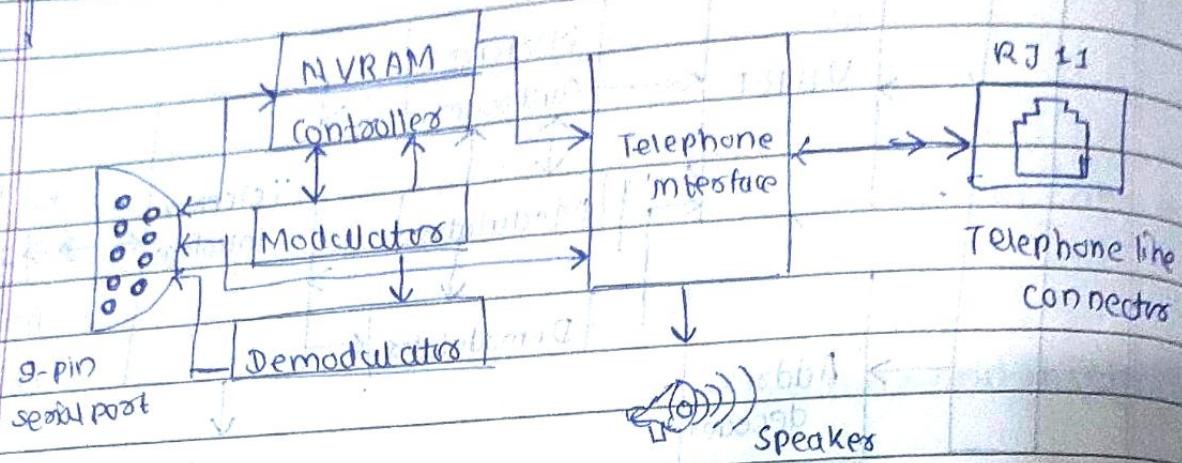
The speaker is used to hear a dial tone, dialling signals and audio negotiation between the two modems. Once a connection is established, the speaker is usually disabled.

A controller circuit manages the overall application of modem. Generally it is used to manage modem between in control and data operating modes.

The NVRAM is non-volatile RAM, it is used to store modem parameters.

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External modem: External modem is a standalone device connected to serial port (COM1 or COM2) of system.



Working of external modem is same as internal modem. The difference is that it uses standard serial interface RS232C, so that it uses motherboard UART for serial bit to parallel byte or parallel byte to serial bit conversion.

Advantages:

- ① Installation modem is easy & will not need to modify hardware.
- ② Not required / needed to open the system.
- ③ No worry about IRQ and I/O address conflicts.
- ④ Easy to configure.
- ⑤ Front panel LEDs of external modem shows status of communication.

Disadvantages:

- ① Externally powered.
- ② Serial interfacing cable generates a problem.

Comparison of external modems vs Internal modems:

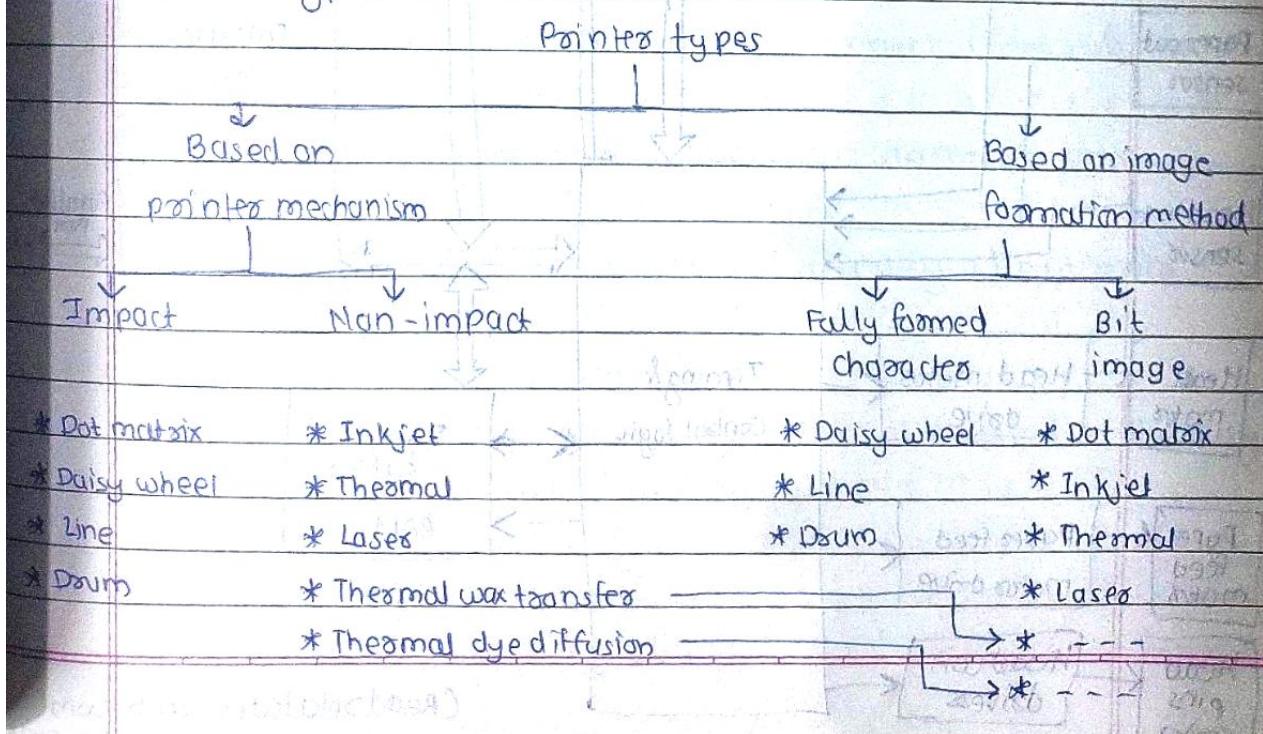
Features	External modems	Internal modems
1) Built in UART	No	Yes
2) Price comparison	Higher	Lower
3) Extras to buy	RS 232 modem interface cable	Nothing
4) Easy to move to another computer	Easy	difficult
5) Power supply	Plugs into wall	None-powered by PC
6) Reset if modem hangs	Turn modem OFF then ON again	Restart computer
7) Monitoring operation	Easy external signal	Difficult
8) Interface type	RS 232 serial or USB port	PCI or ISA

S-12] Modem installation:

(Read the introductory part from text book).

⑤ Pointers: A pointer is used to get hard copy of the results.

S-08] Pointer types:



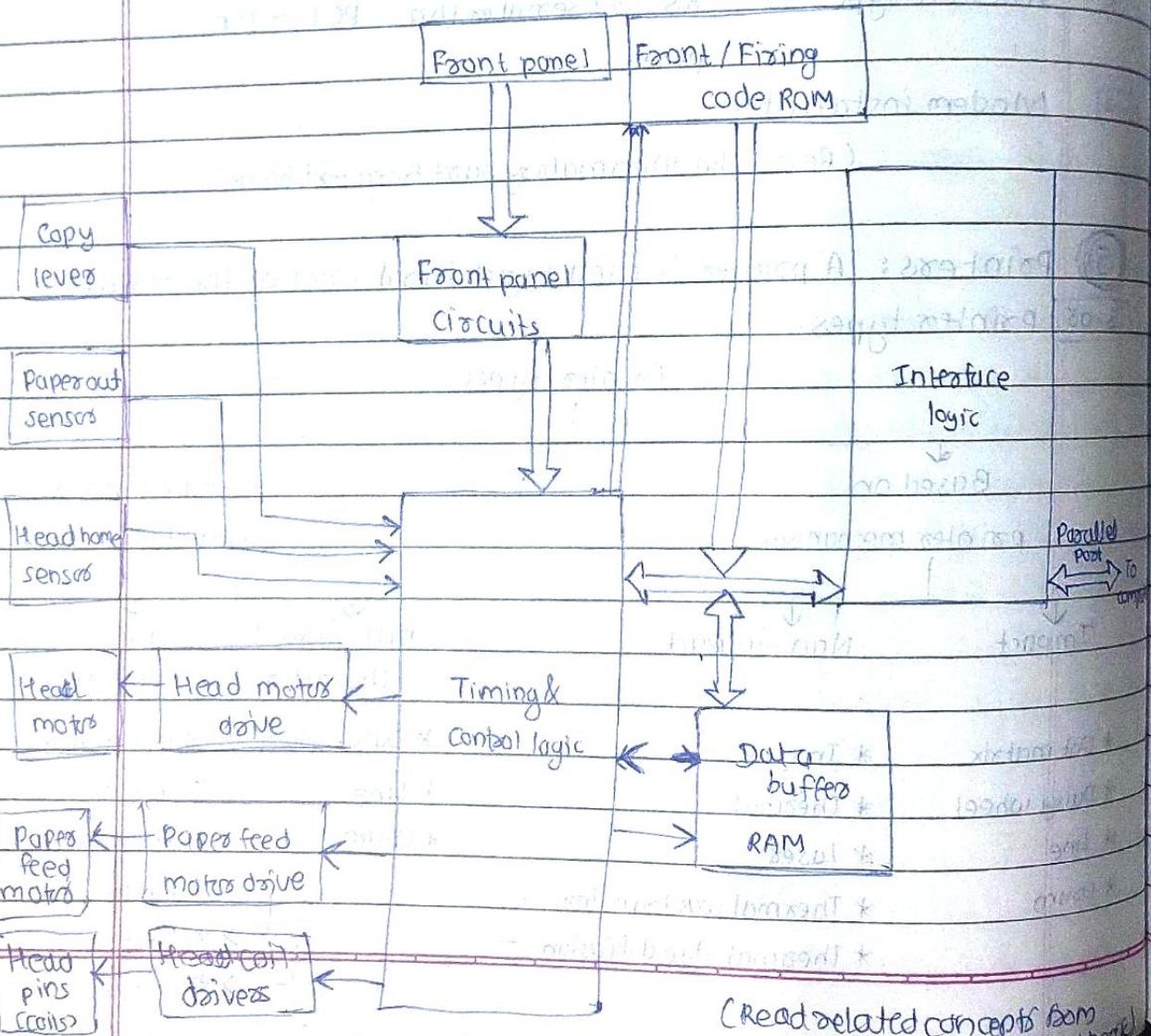
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Printer characteristics: Main characteristics of printer are
 (Read info from textbook)

- (1) SPEED
- (2) QUALITY
- (3) CHARACTER SET
- (4) INTERFACE
- (5) BUFFERSIZE
- (6) PRINT MECHANISM
- (7) PRINT MODE
- (8) PRINT SIZE
- (9) PRINT DIRECTION

Dot matrix printer:- Dot matrix printers are bit image type of printers. These printers form characters and images by placing the pattern of dots on the paper by striking inkjet ribbon with a number of small pins.

Block diagram of Dot Matrix Printer:



(Read related concepts from textbook)

Working:

- ① The PC sends a series of ASCII code to the printer through serial or parallel cable. PC also sends some printer information movement such as tabs, carriage, returns and form feeds, etc., which controls the position of the print head & print carriage.
- ② The ASCII code received by the printer is stored inside a buffer i.e. inside RAM of a printer.
- ③ The processors inside printer select a particular dot pattern for the ASCII code received from the PC. The dot pattern stored in to inside printer ROM.
- ④ The printer's processor takes the dot pattern information from the bit-map table (ROM) and sends signals to the print head. Based on this information, the print head fixes different pins on the print head. The printer processor also controls the movements of the print head and the platen to move the paper.

Advantages:

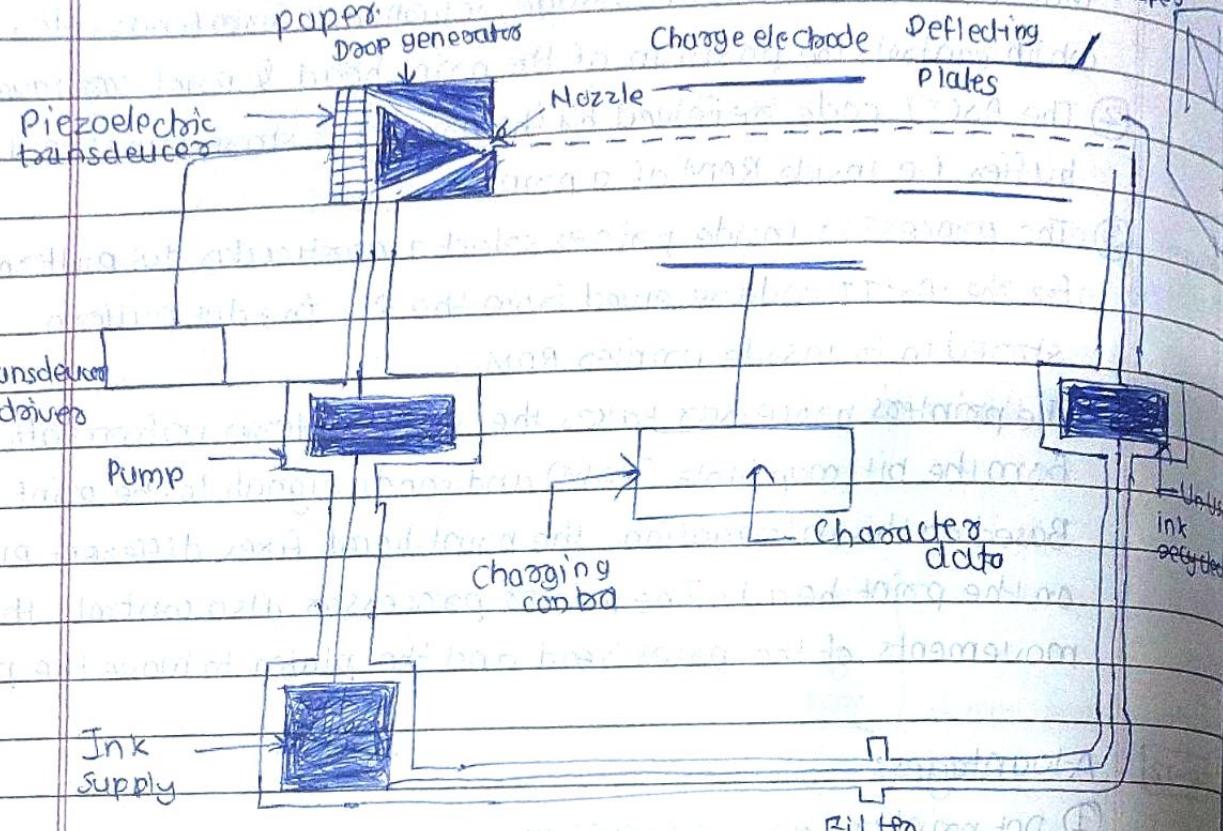
- ① Dot printers are inexpensive.
- ② Small in size.
- ③ Light weight.
- ④ It is very versatile i.e. it produces graph, charts & even pictures.
- ⑤ They are impact devices, so they can use multi-purpose stationery.
- ⑥ Ribbon cartridges can be refilled at a very cheap price.

Disadvantages:

- ① These are light duty printers. They cannot be used continuously for more than one hour.
- ② Quality is not so good.
- ③ These printers are noisy.
- ④ Requires more servicing.

N-10
S-12
W-12

Inkjet Printer: Inkjet printers are bit image non-impact type of printer. These printers produce a character shape and images by spray ink from tiny nozzles onto the paper.



In this, ink is pumped through a nozzle and is then passed through a charged electrode. Due to a charged electrode the ink coming out through nozzle breaks into fine droplets to become negative charged.

Working:

- ① An ink-filled print cartridge attached to the Inkjet's print head moves sideways across the width of sheet of paper.
- ② A print head is made up of small ink-filled chambers each attached to a nozzle smaller than human hair.
- ③ An electrical pulse flows through a heating element i.e thin resistors located at the back of ink chambers.

- ④ When an electrical current flows through the resistor, the resistor heats a thin layer of ink at the bottom of the chamber to more than 900°F for a very short duration. This makes ink boil and forms a small bubble of vapour.
- ⑤ As this vapour bubble expands, it pushes the ink through the nozzle to form a droplet at the tip of the nozzle.
- ⑥ When the bubble further expands, the ink droplet overcomes the surface tension of the ink and the pressure of the bubble forces the droplet on the paper.
- ⑦ As the resistor cools, the bubble collapses and the resulting suction pulls the fresh ink from the attached reservoir into the ink chamber.

Advantages and disadvantages:

Advantages:

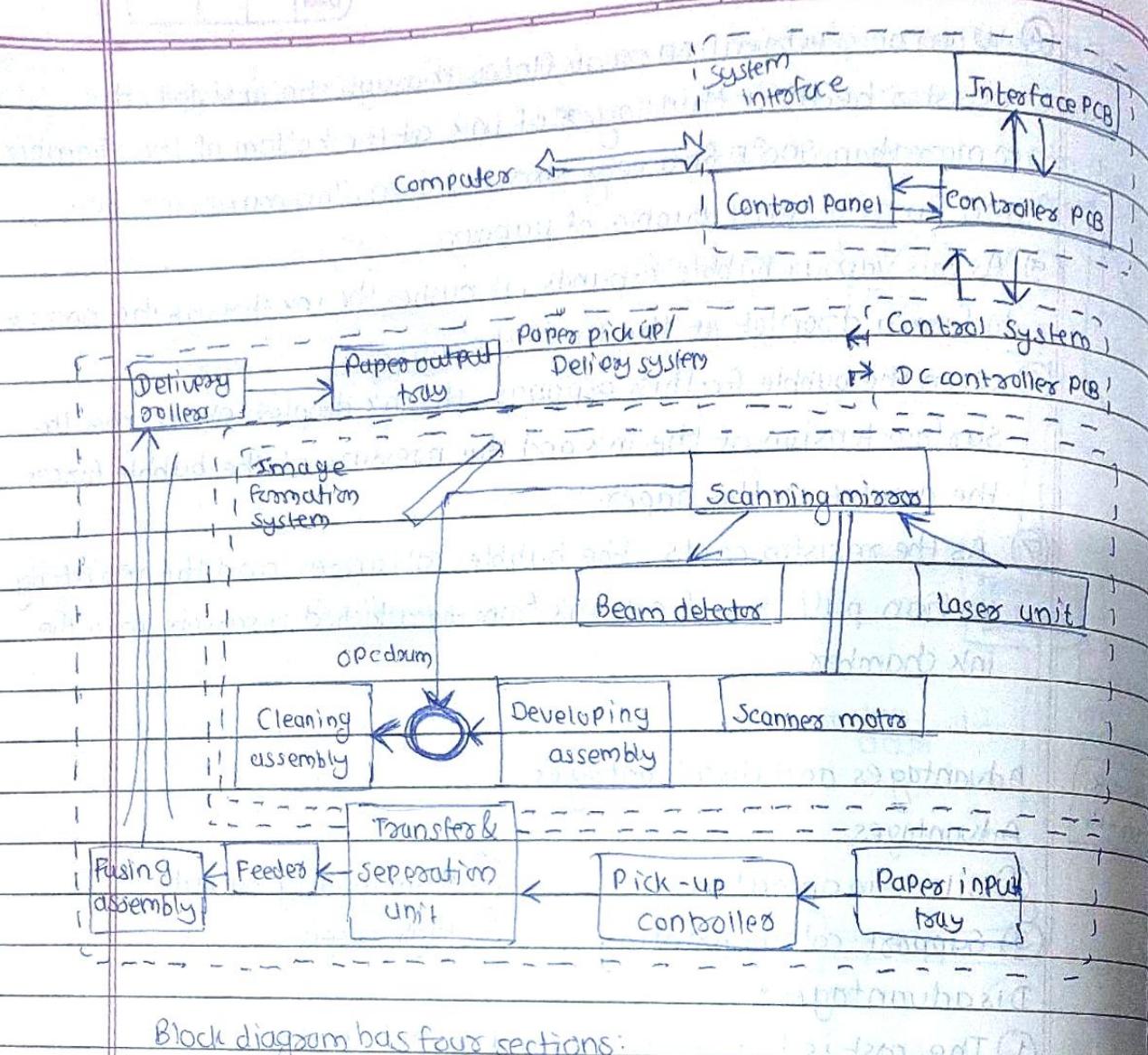
- ① silent in operation
- ② High quality output
- ③ Support colour printing
- ④ High speed

Disadvantages:

- ① The cost is high as compared to Dot-matrix
- ② It requires periodic maintenance
- ③ Ink cartridge are costly than ribbon
- ④ Not support multi-part stationery
- ⑤ Requires special quality paper for best quality.

Laser printer: (specification read from textbook)

Block diagram of Laser Printer



Block diagram has four sections:

- 1) System interface
- 2) Control system
- 3) Image formation system
- 4) Paper - pickup / Delivery system.

1) System interface : The use of system interface :

* Communicate with the host computer through I/O ports

* Store configuration information

* Store font information

* Communicating with the DC controller assembly

* Provide printer emulation such as post script emulation

2) Control system : It is responsible for :

* Coordinating all the activities of the printer, required for printing process



* Focusing the laser beam

* Properly coordinate the image data from the image data form the interface assembly. With paper size, drum sensitivity, and laser beam motion information.

3) Image formation system:

* To form an image on the paper a laser requires electronics, mechanical, optical, electro-photographical etc. many different technologies.

* Inside a laser printer the image formation process revolves around an OPC drum (Organic Photoconductive)

* The complete image formation process consists of 6 steps as shown in fig:-

1] Cleaning of the OPC drum

2] Conditioning of the OPC drum

3] Electro statically writing the image onto the OPC drum

4] Developing the image on the OPC drum

5] Transferring the image from OPC drum to the paper

6] Fusing the image on the paper

4) Paper pickup / delivery system:

This system is responsible for

* Picking the paper from the input tray

* Delivering the paper to the image formation system at the right time.

* Feeding it to the fusing station and

* Delivering it to the output tray.

Advantages & Disadvantages:

Advantages: ① High quality printing

② Speed is high ③ Support text and graphics

④ No mechanical motion is involved so it is quiet in operation

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Disadvantages:

- ① The cost is more.
- ② Cost of toner is high.
- ③ The expert person requires for maintenance.

Comparison between Dot-matrix, Inkjet & Laser:

S-09 W-09	Features	Dot matrix	Inkjet	Laser
S-11	1) Point mechanism	Impact	Non-impact	Non-impact
	2) Image formation method	Bit image	Bit image	Bit image
	3) Multi-post stationary	Support	No	No
	4) Point quality	Good	Better	Best
	5) Cost	Low	Moderate	High
	6) Cost of Cartridge	Low	High	Highest
	7) Noise generated	Yes	No	No
	8) Speed	Low	High	Good
	9) Maintenance required	High	Low	Low form experts required
	10) Support colour printing	No	Yes	Yes

Installation of printer:

(Read from textbook not imp for exam)

