

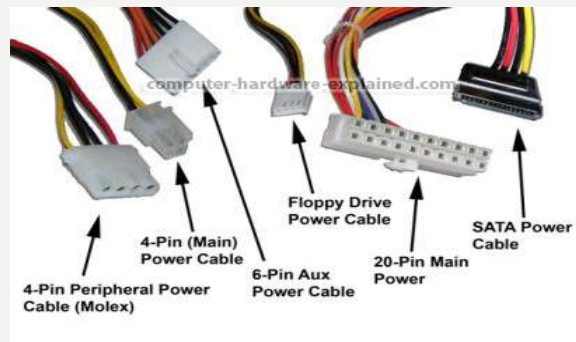
## Power cables

- A power cable is any wire that transmits power from a power source to an electronic device. For example, the power cord that connects to the computer.

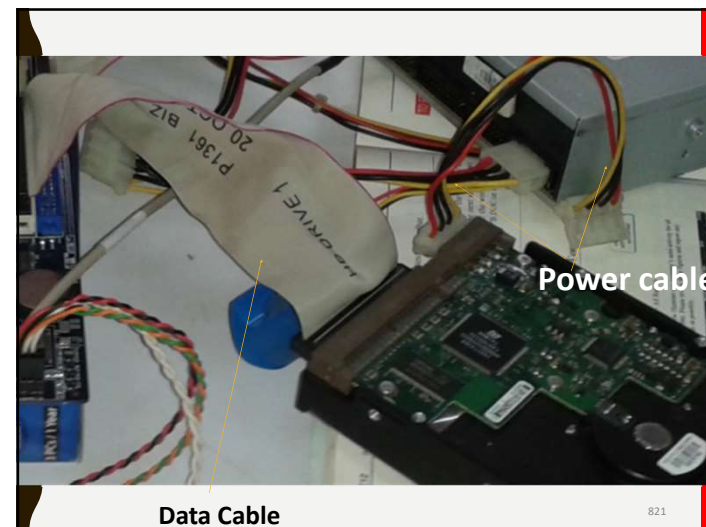
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## Data Cable

- This is a wire that provides a connection and communication between devices.
- For example, the data cable (VGA cable) that connects a monitor to the computer allows the computer to display an image on the monitor by transmitting the data from the system unit to the monitor.

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- Other examples of data cables include the Ethernet cables, IDE/EIDE, SATA, and USB cables.

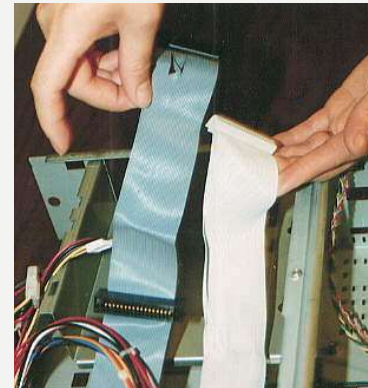
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## Ribbon Data (Parallel ATA or PATA) cables

- A ribbon cable is a cable with many conducting wires running parallel to each other on the same flat plane with a connector at each end.

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## Ribbon cables



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- Ribbon cables connect internal peripherals in computers, such as hard drives, CD drives and floppy drives.
- They are bulky making them awkward to handle and they obstruct air flow within the computer.

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## Round Data cables and SATA Data cables

- Round cables and SATA cables are used for internal connections in place of ribbon cables because they are less bulky and easier to handle.

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- Serial ATA (serial AT Attachment) is a computer bus interface that connects host bus adaptors to mass storage devices such as hard disk drives.

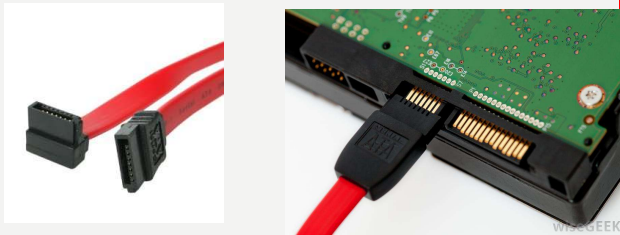
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Round cables



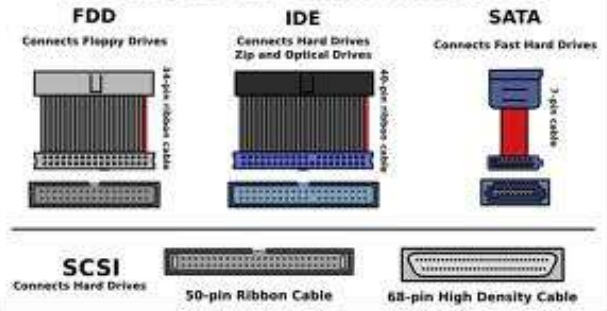
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### Serial ATA cables



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### Internal Data Cables and Ports



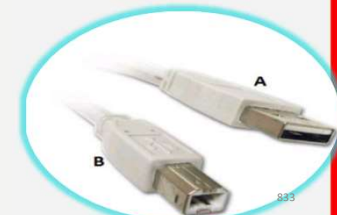
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## Cable Connectors

- A connector is a part that terminates the cable that plugs into a port or other interface to connect one device to another.
- a connector is either male (containing one or more exposed pins) or female (containing holes in which the male connector can be inserted).

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- ❑ USB can connect computer peripherals such as mice, keyboards, digital cameras, printers, personal media players, flash drives, and external hard drives onto the computer system unit.
- ❑ USB standard uses "A" and "B" connectors.



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## Outputting of information

There are two types of output:

- 1) Soft copy output which is the information in digital format, displayed on a screen or in audio or voice form through speakers.
- 2) The hard copy output or permanent output – this refers to output printed onto paper.

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## The OUTPUT DEVICES

Output devices are pieces of equipment that are used to get information or any other response out of a computer in a visual or audio format.

Some are softcopy output devices while others are hardcopy output devices

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Examples of softcopy output devices include:

- Visual Display Unit
- Voice output devices
- Sound output devices

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The main hard copy devices include:

- Printers
- Plotter
- Fax machines
- Actuators
- Robots

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### **The Monitor/Visual display unit (VDU)/computer screen**

- The visual display unit (VDU)/ monitor (also called Screen) outputs soft copy of Text and still or moving pictures for the user to see.
- Images and text are formed by many tiny dots of coloured light called pixels (short for picture elements).
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- A pixel is the smallest unit on the screen. It can be turned on or off or coloured in different shades.

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### **Uses of the display Unit**

- The screen helps the user to interface visually with the computer.
- The user is able to monitor the input.
- The user is able to receive the visual output of the computer system.

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A monitor's full capabilities depend on several factors including:

- Colour
- The graphics/video card or adaptor being used
- The monitor's size
- Its resolution
- Its image aspect ratio
- Its refresh rate.
- Response time

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#### • Colour:

Monitors can be monochrome, Grey scale or coloured.

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- Monochrome monitors display images in two colours; one for the background and the other for the foreground. e.g, white, amber or green on a black background

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- Greyscale monitors display in different shades of grey
- Colour monitors display any number of colours ranging from sixteen and above depending on the video card used.
- The more colours the better the quality of the image

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## 1. Monitor Size

- This is the diagonal dimension of the screen. Common sizes include 15-inch, 17-inch and 19-inch monitors.

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## 2. Resolution

Resolution is the clarity and sharpness of an image when displayed on the screen. Resolution is determined by the number of pixels per square inch of the image.

ie. The number of pixels on the horizontal axis by the number of pixels on the vertical axis; e.g.  $1024 \times 768$

847

**Some common resolutions are:**

**VGA (Video Graphics Array) =  $640 \times 480$  pixels**

□ **SVGA (Super Video Graphics Array) =  $800 \times 600$  pixels.**

□ **XGA/XVGA (Extended Graphics Array/Extended Video Graphics Array) =  $1024 \times 768$  pixels**

□ **SXGA (Super Extended Graphics Array) =  $1280 \times 1024$  pixels .**

**UXGA (Ultra Extended Graphics Array) =  $1600 \times 1200$  pixels**

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## 3. Image aspect ratio

- This is the ratio of width to height of an image on the screen. Most monitors have a 4:3 width to height ratio.

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#### 4. Refresh rate

- This is the number of times an image is repainted or refreshed on the screen per second to give the impression that the image on the screen is still, but in fact it is being repainted continuously. If the refresh rate is slow, the screen may appear to flicker.

850

#### 5. Response time.

**This** is the amount of time a pixel in a display takes to change. It is measured in milliseconds (ms). Lower numbers mean faster transitions and therefore fewer visible image artifacts as one image translates into another.

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### Types of Monitors

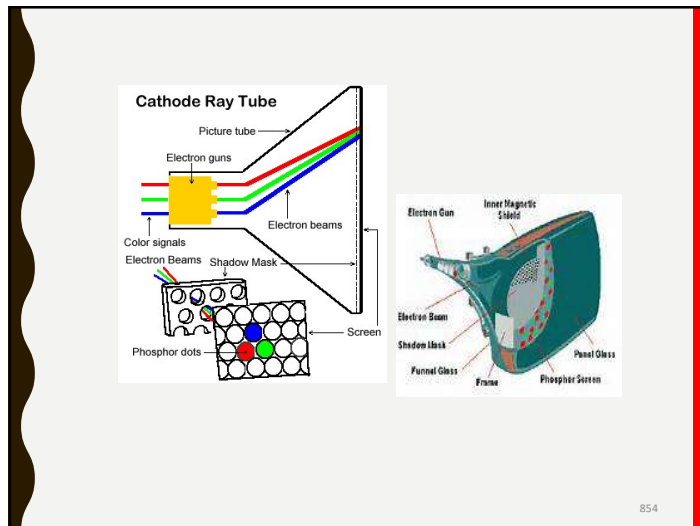
- There are two types of monitors: cathode ray tube (CRT) and flat panel display (FPD).

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Describe the nature of a CRT



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## Cathode Ray Tube (CRT)

CRT uses a tube known as the cathode ray tube, That displays a combination of Red, Green and Blue (RGB) colours. These colours light the pixels onto the screen to display the image.

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## The Advantages of CRTs

- CRTs are less expensive to buy compared to others.
- CRTs have higher contrast, which produces brighter pictures than a flat-panel display of the same display area.
- They have a very fast response time.

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## The Disadvantages of CRTs

- They can flicker which reduces image quality.
- They are subject to glares because of the glass-covered screen. Glare is the effect of too much light emitted by the computer screen
- They are bulky and occupy larger space.
- They consume more power and generate more heat.

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- They are difficult to dispose off because they have more parts to get rid of, and some of their contents can harm the environment.
- They emit harmful electromagnetic radiation if not properly shielded.

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### Flat panel display (FPD) Monitors

Flat panel displays (FPDs) are thin, flat electronic devices used to display alphanumeric data, text, graphics, and images.

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*Describe the nature of a Flat panel display Monitor*



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### The Advantages of Flat panel display monitors

- less prone to glare.
- FPDs are flicker free and this reduces the risks of headache and eyestrains.
- They occupy less space since they are much thinner and lighter.
- They are portable

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- They consume much less power than CRTs both when running and also when in standby mode.
- They have less radiation emissions than CRT display screens.
- They are much more environmentally friendly than CRTs because they have fewer parts to get rid of, hence will take up less space in landfills

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- They have relatively good resolution.
- They can easily be mounted onto a wall.
- They are usually available in larger sizes than CRTs. They come in wide screens or extra-large screen sizes.

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### **The Disadvantages of FPDs**

- They are more expensive than CRTs.
- They have a lower response rate.
- They have lower contrast and do not produce pictures as bright as those of CRT displays of the same display area.

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### **Types of FPDs**

- Liquid crystal Display (LCD)
- Light-emitting diode displays (LED)
- Plasma screen
- Organic light-emitting diode displays (OLEDs)

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## Liquid Crystal Display (LCD)

LCD are screens that consist of a layer of liquid crystal placed in between plates that are lit from behind by a fluorescent lamp to create light and images.

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## Light-emitting diode displays (LED)

- LED are flat panel display screens that use light emitting diodes (LEDs) as a backlight for the screen instead of a fluorescent lamp.

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## Plasma screen

- Plasma is a type of flat-panel display that uses electricity to excite tiny cells of gas which emit light and colour, more often are used as TVs than as computer monitors.

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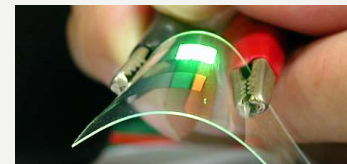
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## Organic light-emitting diode displays (OLEDs)

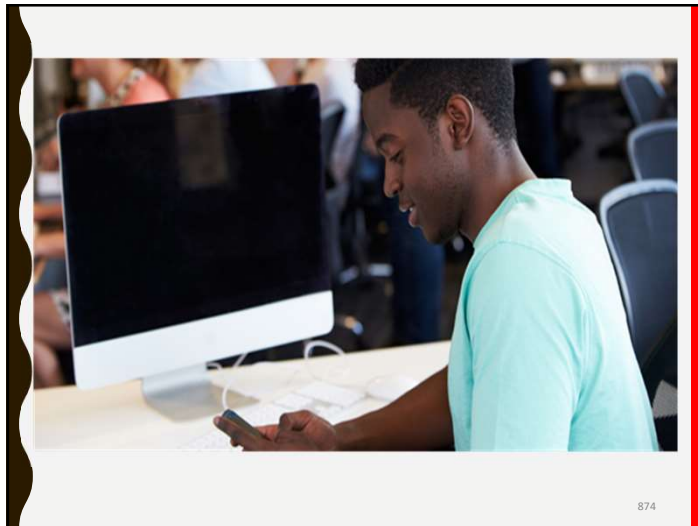
These are flat-panel displays that function by exciting organic compounds with electric current instead of a backlight to produce light.

OLED are mainly used in small portable devices such as cell phones and mp3 players and super slim monitors/TV screens.

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## video graphics card

- The video card is a circuit board that provides an electronic link between the computer's processor and the monitor by determining the display resolution, the number of colours available and the refresh rate of the monitor.

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- The adaptor contains video RAM memory (VRAM) that supports a certain resolution. You cannot set a resolution higher than what the adaptor can support.

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### **Safety precautions that need to be taken while using computer monitors**

- Adjust the monitor/seat to eye level
- Adjust light from monitor to reasonable brightness
- Ensure that light source in room does not shine directly onto the screen.
- Work in a well lit room.
- The screen should be placed directly in front of the user
- Adjust monitor resolution to have sharp images

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- Install an anti-glare screen.
- Avoid continuous staring at the screen for a long time/ blink or regularly look away from the screen.
- Clean the screen regularly to avoid dust accumulating on it.
- It should be connected to a power stabilizer/surge protector to avoid effects of power surge.

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### **Multimedia projector**

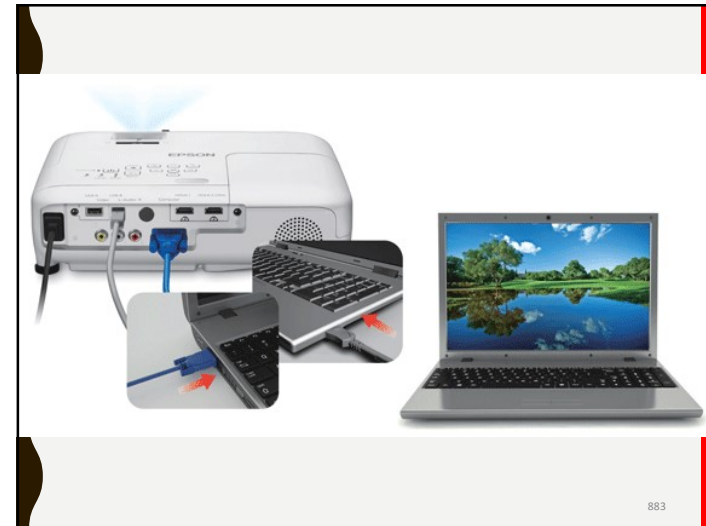
This is a device used to project dynamic multimedia presentations onto an overhead screen



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## Multimedia projector specifications

1. The type of projector technology used- LCD, DLP, CRT
2. The Picture Brightness which is measured in lumens. A good projector should not be less 3000
3. The Resolution.
4. Contrast Ratio. This refers to the difference between the brightest part of the image and the darkest.
5. The expected life of the bulb (number of hours)

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## Specifications

|                             |   |
|-----------------------------|---|
| Projection System           | DLP                                     |
| Native Resolution           | 1080p (1920 x 1080)                     |
| Brightness                  | 5500 ANSI Lumens                        |
| Contrast Ratio              | 3000:1 (Full on/Full off)               |
| Display Color               | Full 1.07 Billion Colors Palette        |
| Lens                        | F= 2.48~2.81, f= 24.1~36.15mm           |
| Aspect Ratio                | Native 16:9 (5 aspect ratio selectable) |
| Throw Ratio                 | 1.62 ~2.43 (55.7" @ 6.6 Feet)           |
| Image Size Diagonal         | 28" ~ 500"                              |
| Zoom Ratio                  | 1.5x                                    |
| Lamp Type                   | Philips UHP 330W x2                     |
| Lamp Life (Normal/Eco Mode) | 2000/3000 hours                         |

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## PRINTERS

- A printer is a hard-copy output device which produces a textual or graphical representation of documents stored in electronic form on physical print media such as paper or transparencies.

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## How to evaluate printers

- Image quality. Measured in terms of dots per inch (dpi)
- Speed. Measured in terms of pages per minute (PPM) or characters per second (CPS)
- The initial cost of the printer.
- The cost of operating the printer. This refers to the cost of supplies used by the printer.

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Generally, the print speed of printers is determined by factors such as:

1. What is being printed, that is, it takes a shorter time to print a document made up of simple characters, than a document with pictures.
2. The number of colours in the document.
3. The printer make/type of printer

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## Printer resolution

- This is a measure of the clarity of the printout of a printer. Measured in dots per inch (dpi) e.g. a dpi of 300 means that the printer prints 300 dots per inch.
- The higher the dpi the sharper the print out.
- The higher the dpi the greater the memory required by the printer to print.

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## Classification of printers

Printers are broadly classified into three types according to the basic unit of printing:

- Character printers
- Line printers
- Page printers

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## Character printers

- These are printers that print one character at a time. They are also known as serial printers.
- Daisy wheel printers and dot matrix printers are examples of character printers.
- Character printers are slower than line and page printers.

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## Page Printers

These are printers that print a whole page at a time. They are therefore even faster than line printers and deal with very large volumes of printed output.

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Printers can also be broadly classified into two types according to the basic printing technologies:

1. Impact printers
2. Non-impact printers

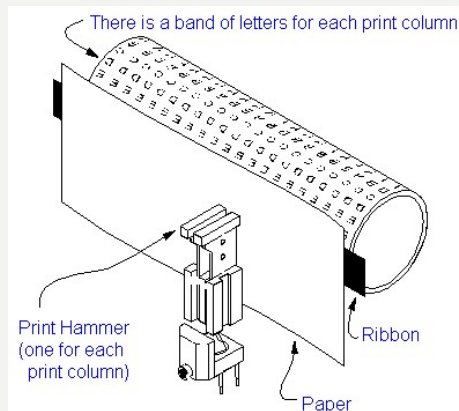
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## Impact printers

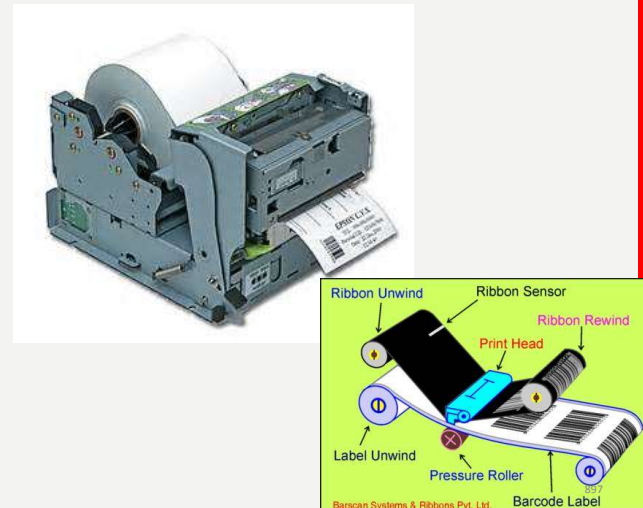
These use a print head that makes a physical contact with the print media/paper in order to print.

The print head of an impact printer contains a number of metal hammers which strike an inked ribbon placed between the print head and the paper.

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- The main types of impact printer are:
- Dot matrix printer
- Daisy wheel printer
- Drum, chain or band printer.

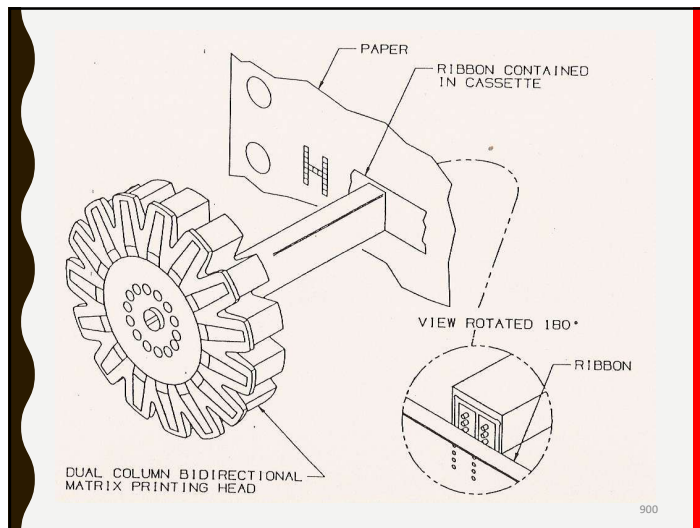
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## Dot matrix printers

- This is a type of printer that produces characters and illustrations by striking pins against an ink ribbon to print closely spaced dots in the appropriate shape to create characters on paper.



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- They are not good for printing shaded graphics or photographs
- They are useful for low-quality carbon copy printing of text, or for printing text on continuous sheets of paper.

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### **Daisy wheel printers (character printers)**

This uses a daisy wheel which is a disc made of plastic or metal on which characters stand out along the outer edge.

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Daisy-wheel mechanism



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- To print a character, the printer rotates the disc until the desired letter is facing the paper before the hammer strikes the disc, forcing the character to hit an ink ribbon, creating the character on the paper.

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## Drum printers (line printers)

- This has a rotating drum that contains a full character set for each printing position used to print directly on paper and ink ribbon.

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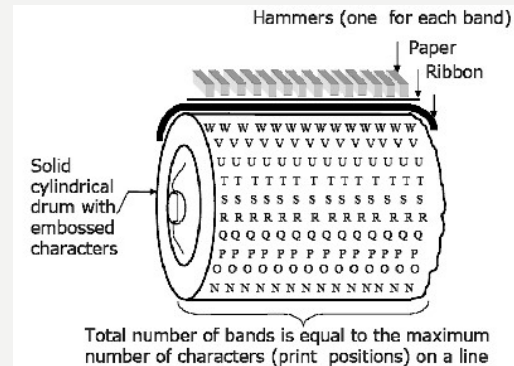


Fig. 5.17 Printing Mechanism of a Drum Printer

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### **Advantages of impact printers**

- They Can produce multiple/carbon copies using carbonated paper.
- They are relatively cheaper to use.
- Can print on continuous stationary.

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### **Disadvantages of impact printers**

- They are relatively slow
- They produce relatively poor quality print
- They are generally noisy printers
- Not good for printing graphical images.

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### **The Non-impact printers**

- A non-impact printer, is one where there is no physical contact of the print head with the paper or ribbon in order to print.

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### **The advantages of non-impact printers**

- They are much quieter since the print head of a non-impact printer does not strike the paper
- They have much faster printing speeds
- They Produce high quality print
- They can print colour output

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### **Disadvantages of non-impact printers**

- They cannot print on multi-paper.
- They are relatively expensive to use compare to impact printers due to the need to preplace cartridges once they are empty.
- They are less resistant to dust and heat.

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The main types of non-impact printers are:

- Thermal printers
- Laser-jet printers
- Ink-jet printers

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### **Thermal printers (character printers)**

This is a printer that uses heat to transfer an image or characters onto paper. There are two types of thermal printers.

- i) Direct thermal printer
- ii) Thermal wax transfer printer

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### **Direct thermal printer**

This printer uses heated elements/pins that burn dots into heat sensitive paper to form the characters.

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## Thermal wax transfer printer

The print head of this printer melts a wax-based ink from a transfer ribbon onto ordinary paper.

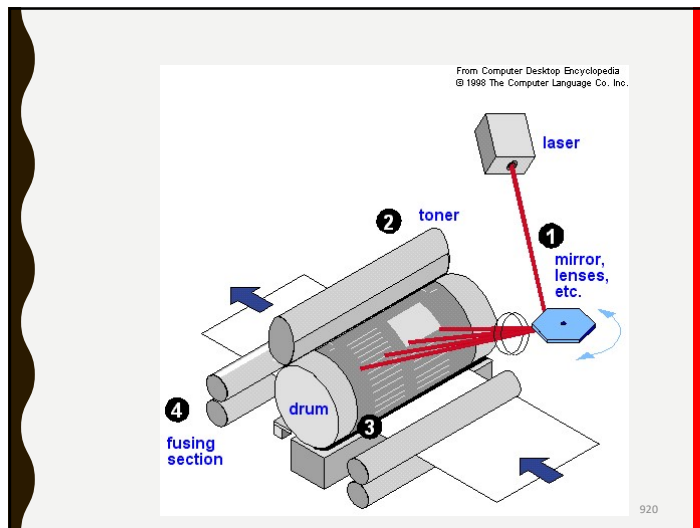
Thermal printers are used in battery-powered equipment such as portable calculators, fax machines and ATMs.

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## Laser jet printers

These printers use laser beam to alter the electrical charge on a heated rotating drum that picks up toner (ink powder) from a reservoir, the toner is then transferred to the paper through a combination of heat and pressure.

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## Ink-jet printers

- Ink-jet printers produce an image by spraying ionized ink onto the paper in a dot matrix pattern using ink cartridges and a printing head.
- Colour graphics can be produced by spraying cyan, magenta, yellow and black ink onto the page.

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## Plotters

These are devices used to produce specialised printouts such as technical drawing and survey maps, construction maps, engineering drawings, architectural plans and business charts, usually on large paper.

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## Failure to print.

- Some times you may give a print command, but the printer fails to print. In such a situation, you need to determine whether the printer is faulty or if it is not receiving a print message from the computer.

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The possible causes of print failure include:

- If it is not receiving power/not switched on
- If the data cable between the printer and the computer is not properly connect or is faulty.
- If the computer is not configured properly to work with the printer

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- If the printer connected to the computer is not the one selected to print.
- If there is a paper feed/paper jam problem
- If there is no paper in the printer tray.

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## Possible solutions

- make sure the printer cable is firmly fixed in both the computer and the printer.
- check the ends of the printer cable to make sure that none of the pins are bent.

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- Check that there is paper in the printer tray.
- Check that there is no paper jam in the printer that may prevent it from printing.

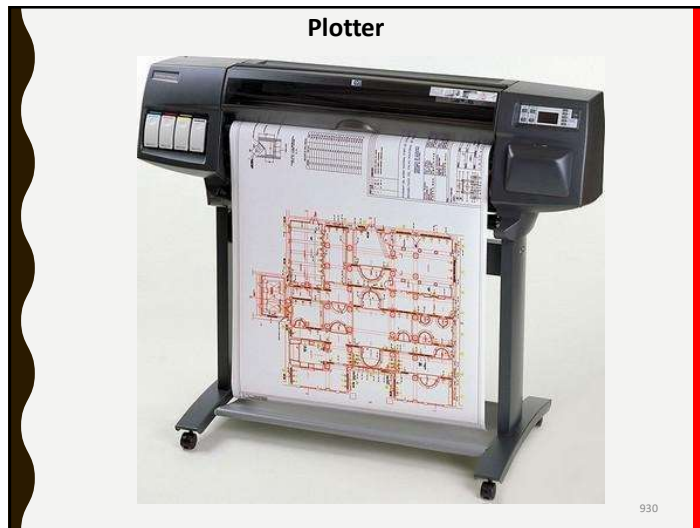
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- Print a test page by holding down the feed button for a few seconds. The power button will begin to flash and a test page will print.
- If the printer self-test fails, the problem is with the printer itself rather than the printer cable or computer.

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uninstall then reinstall the drivers for the printer.

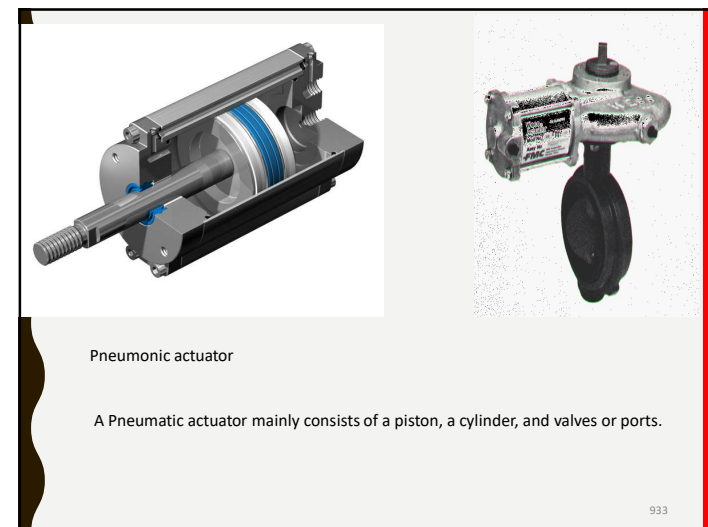
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## Actuators/motors

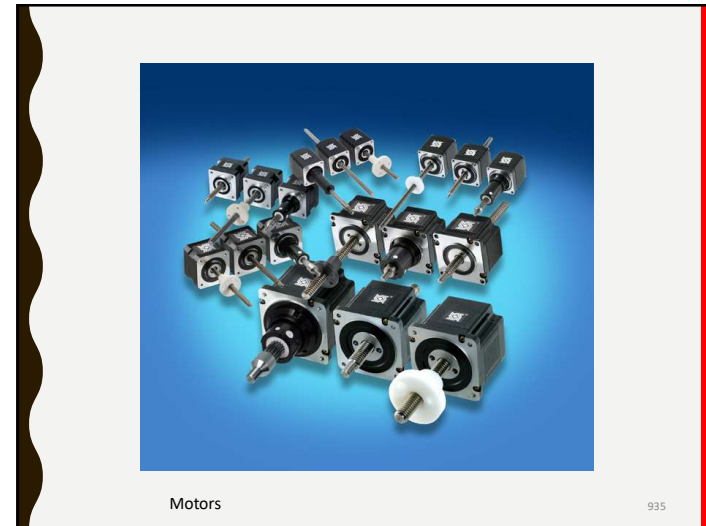
- This is a mechanical device for moving or controlling a mechanism or system.
  - They generate physical movements of devices from signals sent by computers.
- There are at least four types of actuators and these are:

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Motors

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## Robotics

Robotics is the branch of technology that deals with the design, construction, operation, and application of robots.

A Robot is an electro-mechanical machine that is guided by a computer program or electronic circuitry to perform specific tasks.

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- Used of Robotics in all fields. Largely controlled by computer microchips.
- used to perform a wide range of physical tasks in the following fields:
- Manufacturing robots (used to perform repetitive tasks such as welding)
- Carrier robots (used in moving or installing heavy objects e.g. by the military to carry heavy loads over dangerous terrain)
- 

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- Domestic robots (used in homes to perform cleaning tasks such as vacuuming)
- Exploration robots (used to visit and send images from places such as Mars and used in extreme environments)
- Used to do Dangerous jobs E.g. disposing of bombs, spray painting or cleaning up nuclear waste.

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1. in the automotive industry used for welding, paint spraying, assembling and loading.
2. To do jobs that need high-precision.
3. To perform specialised tasks.

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## Impact of using Robotics

- Domestic robots free up time for individuals to do other things.
- More efficient and fast manufacturing operations.
- Safer working environments because robots are employed the dangerous tasks.
- Loss of jobs.

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## Control systems

- Control systems use sensors to measure physical quantities, Sensors send input to the processor of the controlling computer, which responds by sending an output signal to activate the hardware.

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- An example of a sensor is a smoke detector; once smoke is detected, the sensor can send a signal to the sprinklers in the building or to an alarm.

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## Sound/audio output devices

Sound is audio output which includes Computer-generated sound, music output, computer-synthesised voice and the normal speaking voice.

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## Sound synthesis

- This system converts written text into computer-generated speech ('text to speech'). Usually used by speech-impaired people to aid speaking or by sight-impaired people, to be able to interact with and use ICT equipment or for converting conversations or text from one language into another.

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## SPEAKERS and Earphones

Speakers are devices that output sound.

Computers with sound cards are able to





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## Storage devices

Storage devices are the media used to keep data available on a more permanent basis for immediate or later use.

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Storage Devices are chosen for a particular use based on the following factors:

- The Storage capacity of the medium (how much data the device can store)
- The Access speed (the time needed to locate the data and transmit it to the CPU)
- The Size of the medium (necessary for storage on shelves or portability)

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- Portability of the medium (ability to be easily removed and used on another system)
- The Cost of the medium.

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## Examples of secondary storage medium

- Magnetic storage (magnetic tapes and magnetic disks)
- Optical storage such as (CD-ROM, CD-R, CD-RW, DVD-ROM, DVD-R, DVD-RW, and Blu ray)
- Magneto-Optic disks (MO Disks)
- Solid state memory (flash memory and USB drives).

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## Magnetic storage media

These are storage devices that use different patterns of magnetization/tiny magnetised dots on a magnetisable material to store data.

Examples of magnetic storage media include magnetic tapes, floppy disks, hard disks and Zip disks

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## Magnetic tapes

- Magnetic tape is a ribbon/reel of plastic material coated with a metal oxide film on which data is recorded as magnetised or unmagnetised spots(magnetised pattern).

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## Advantages of using magnetic tapes

- They are relatively durable compared to floppies.
- They can store large amount of data
- They Can store data for a long period of time.
- They are relatively cheap
- They are used for back up purposes.
- They are reusable i.e. can be overwritten
- Easy to transport and store

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## Disadvantages of Magnetic tapes

- Magnetic tape is not suitable for data files that are revised or updated often because it stores data sequentially(serially).
- Accessing of data on a magnetic tape is very slow. This is because the read/write head cannot go directly to an item of data on the tape since data is retrieved in the order in which it was stored (in a sequency).

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- Data stored on magnetic tape can be distorted if the device is exposed to a strong magnetic field.
- They have Limited shelf-life (2 years)
- They Must be stored in a suitable environment (smoke, dust, temperature and humidity must be carefully controlled)
- It is Difficult to update files (cannot make changes to a record without writing over the entire tape)

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## Magnetic disks

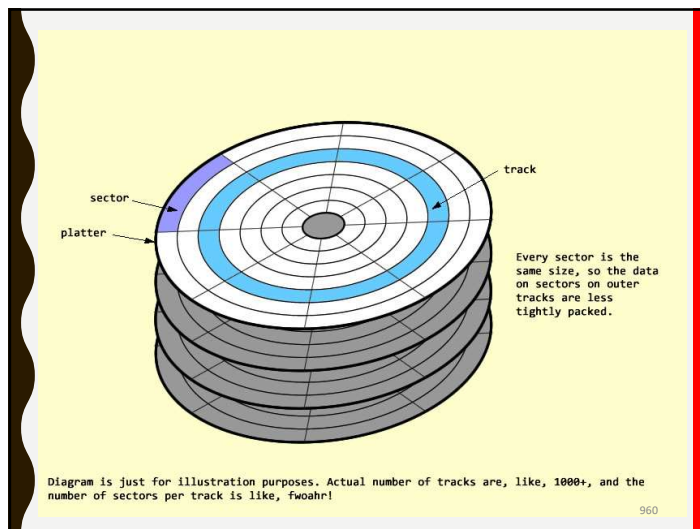
These are disks made up of a circular flat surface covered with a magnetic coating on which information is stored.

magnetic disks provide direct access to data stored. (This means that the disk reader can go directly to a specific piece of data without having to access any other data either before or after the data you want.)

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- Each disk surface contains a set of numbered concentric rings known as tracks. The tracks are also divided into sectors.(wedge shaped sections).

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- A sector is a location that can be read from or written to on a disk by the computer in one read/write operation. Data is stored as magnetised spots on the tracks.

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- Magnetic disks include floppy disks (diskettes) and hard disks.

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## Floppy disks (diskettes)

A diskette or floppy disk is a removable portable cheap low capacity (1.44MB) storage medium. Used to transfer small amount of data between computers.

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## Advantages of floppies

- They are portable
- Data on the floppy can be protected by use of the write protect notch.
- They are cheap
- Floppy disks are useful for transferring data between computers and for keeping a backup of small files.

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## Disadvantages of floppies

- They have a very small storage capacity
- They have a slow access speed
- They are easily damaged if exposed to magnetic fields.
- They spread viruses

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## ZIP OR FLIP DISKS

- These are like a floppy diskette but with an external zip drive. They are used for data back-up and can take up to 120 MB.
- Their advantage is that they can be disconnected, and stored in a different site from the computer, so they are ideal for remote site back-ups.

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## Hard disks/hard drives

The Hard disk/hard drive (HDD) is a high capacity storage device containing a read/write mechanism plus one or more disks coated with magnetic material inside a sealed unit.

Data and information are stored magnetically on the surface of the disk that rotates at a very high speed, which can be stored or retrieved randomly (in any order).

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- Hard disks access time is much slower than internal memory.
- hard disks must be formatted before any data can be stored on it.

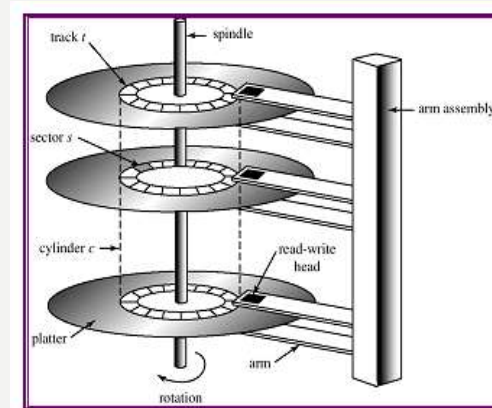
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## Dismantling a hard disk

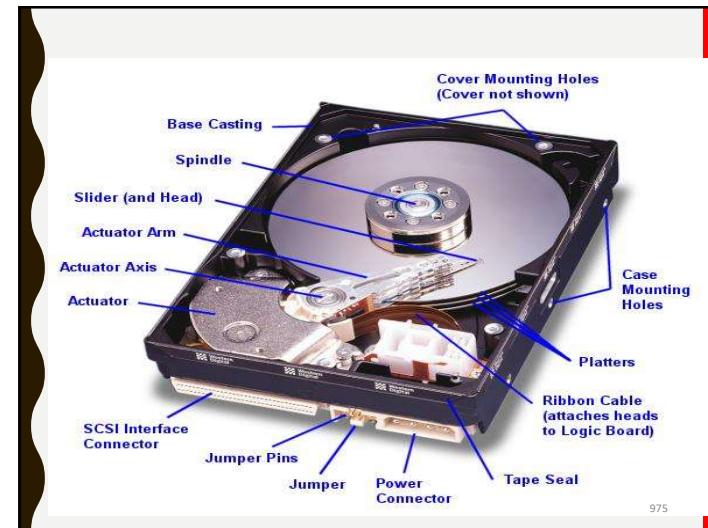
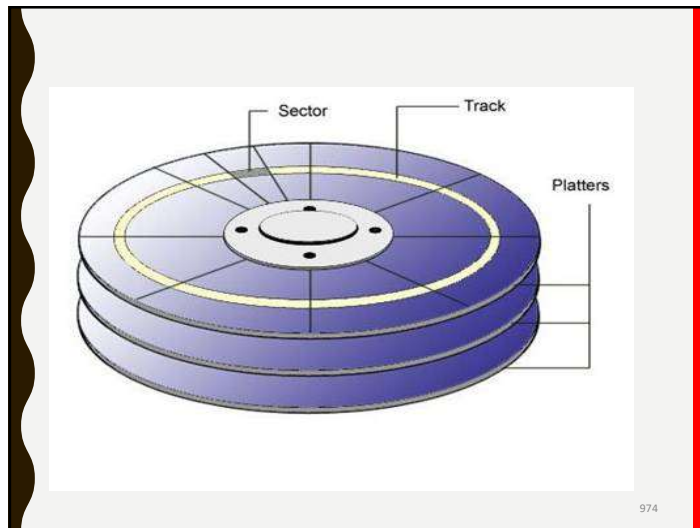
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## The Advantages of Hard disks

- They have large storage capacities
- They have relatively faster/short access time
- A hard disk on a stand alone computer is relatively safe from viruses.
- Hard disks are relatively cheap in terms of cost per unit of storage compared to smaller storage devices.
- Hard disks provide more security to data than other storage media.

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- HDD are more durable than other media.
- Hard disks supplement RAM by providing virtual memory
- The internal hard disks are safer from physical damage because they are protected by the system unit casing

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## **The Disadvantages and limitations of hard disks**

- An internal hard disk is not portable, that is, cannot be moved along like other storage devices.
- The platters when exposed to heat can lead to expansion and cause head crash.
- Hard disks are Fairly expensive compared to other storage media

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## **Disk partitioning**

- Disk partitioning is the act of dividing a disk into multiple smaller logical storage units referred to as partitions, e.g. Local Disk C, local Disk D.

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## **The Benefits of disk partitioning**

- Enables user to keep different types of files in separate partitions.
- Disk partitioning makes it possible to install more than one Operating system on a computer system.

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- It enables having a separate area for the operating system from other files stored by the user, if a problem occurs with the OS partition it can be completely formatted and the operating system reinstalled without affecting the data partition.

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- Protecting or isolating files, to make it easier to recover a corrupted file system or operating system installation. If one partition is corrupted, other file systems may not be affected
- A user may decide to split a hard disk into multiple partitions in order to organize his/her data more effectively.

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## The Disadvantages of Disk partitioning

- It reduces the total space available for the user storage on the disk, as it forces the operating system to duplicate certain file system administration areas on the disk for each partition.
- It reduces overall disk performance on systems where data is accessed regularly and in parallel on multiple partitions, because it forces the disk's read/write head to move back and forth on the disk to access data on each partition.

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- It slows down moving data between different parts of the same physical disk.
- It increases disk fragmentation. (because it lowers the average size of continuous free blocks on each partition - as compared to a single partition of the same overall size)

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## The Optical disks

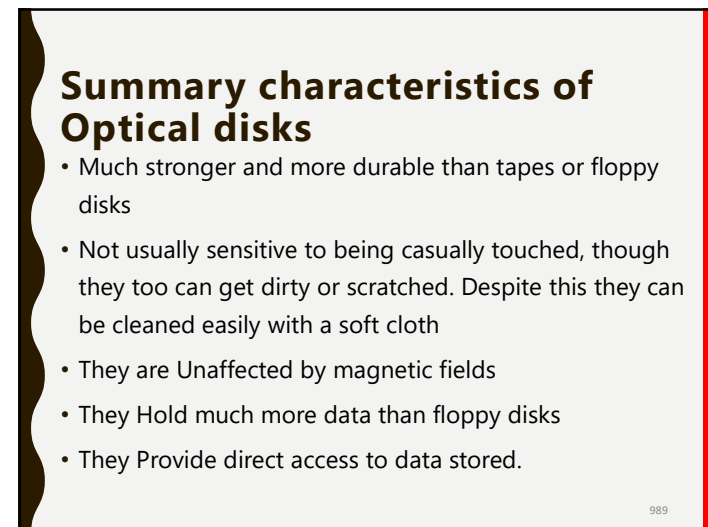
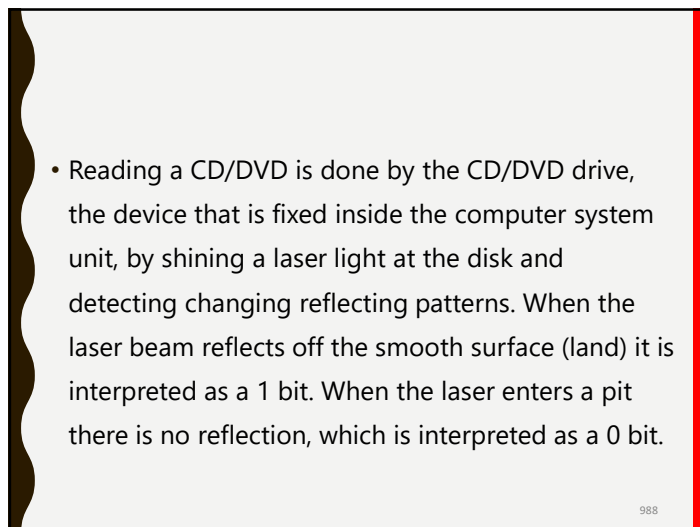
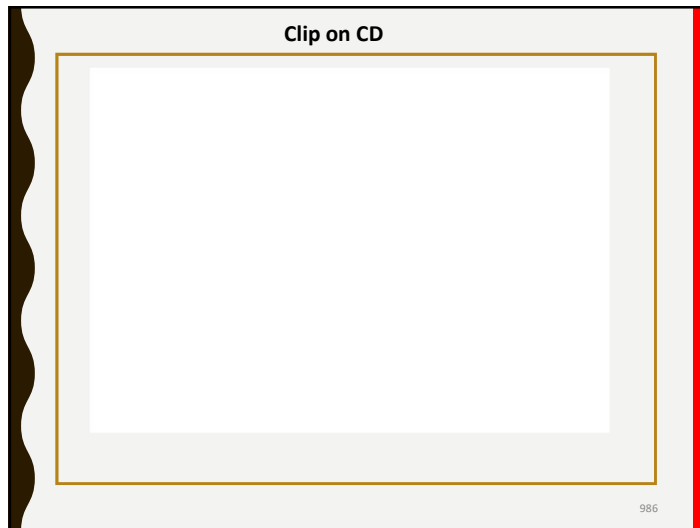
Optical disks are the circular disks that are written and read by laser light(optical). The main types of optical disks are CDs and DVDs.

The data is stored as a series of pits and lands under the plastic surface of the disk.

A pit is a little depression formed by the laser burning into the data layer when the CD is created.

The land is the part between the pits or the smooth surface.

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## The Advantages of Optical disks

- They are portable
- They are relatively cheap to buy
- It allows faster random access to data stored on the disk compared to tapes.
- Relatively large amount of data storage capacity.
- they are not affected by magnetic fields.

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## Limitations of Optical disks

- They become unreadable when cracks form on the surface of the disk.
- They have limited storage capacity compared to hard disks
- Cannot scan to recover or repair bad sectors
- Some cannot allow deleting of unwanted content.
- Their access time is slower than that of hard disks.

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## CD-ROM (compact disc)

CD-ROM stands for Compact Disc–Read Only Memory. These are optical storage circular disks where the user can only retrieve/ read (access) what is on the disk, but cannot add or change anything.

They are used to store multimedia (text, graphics, sound and videos) and application software packages such as encyclopedias, word processors, training programs, games and graphics packages.

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CD/DVD Drive

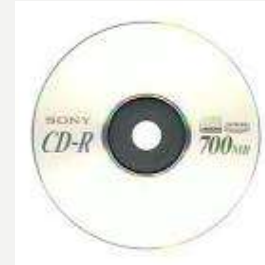


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## CD-R

- CD-R stands for Compact Disc–Recordable. They are referred to as “Write Once Read Many” (WORM) optical medium.
- They are optical storage circular disks that allow the user to record data onto the disc once only using a CD recorder (burner). Which can be done in different sessions until it is full.

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## CD-RW

- CD-RW (Compact Disc–Re-Writable) these are optical storage circular disks where data can be written, erased and replaced by new data.

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## DVDs



- DVD stands for Digital Versatile Disc. These are circular optical storage devices that can hold about 4.7 GB or more of information. They are used mainly for storing movies.
- The main types of DVDs are DVD-ROM (read only), DVD-R (recordable) and DVD-RW (rewritable).
- DVD drives can be used to read/write CDs

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## Blu ray disk (BD)

- Disks that enable reading and writing of high definition videos as well as storing very large quantity of data up to !



## How to take Care of Optical disks

CDs must be handled with care otherwise data may be lost. Data loss results from:

- Physical damage (breaking, melting, scratching, etc.)
- Blocking of laser light by dirt, paint, ink and glue
- Corrosion of the reflecting layer.

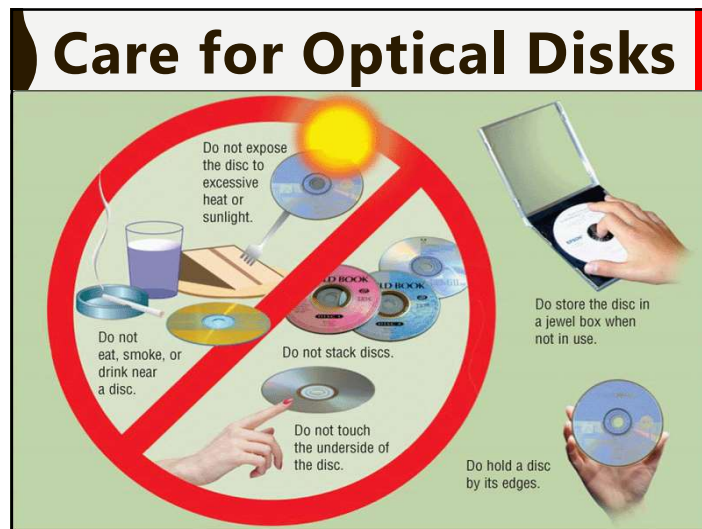
## Some guidelines for the proper handling of CDs and DVDs:

1. CDs and DVDs should be stored in their cases when not in use to prevent them from being scratched or getting dirty.
2. Avoid soiling the surface of a CD – hold it by the edge or by the centre hole.
3. Keeping CDs clean by gently wiping both sides with a clean damp cloth from the centre to the outer edge.

4. Do not write on the top side of the CD with a ballpoint pen or other hard object as this can damage the data layer on the other side. Use a CD marker instead.
5. Don't write on the top side with a fine-point marker or with any solvent-based marker. (Solvent may dissolve the protective layer.)
6. Do not expose a CD to high temperature or humidity for an extended period of time, as the CD may warp.

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- Do not eat, smoke or drink near a disc.
- Do not stack disks.
- Do not touch the underside of the disk.
- Always hold a disc by its edges.
- Do not drop the disk to the ground.
- Don't bend the disk.



### Magneto-Optical Disks (MO Disks)

- A magneto-optical disk is a rewritable disk that makes use of both magnetic disk and optical technologies.
- It is similar to a magnetic diskette except for its larger size. Magneto-optical disks are seldom manufactured and used due to the advent of flash drives and DVD/CD drives, which are less expensive and have better writing time and reliability.

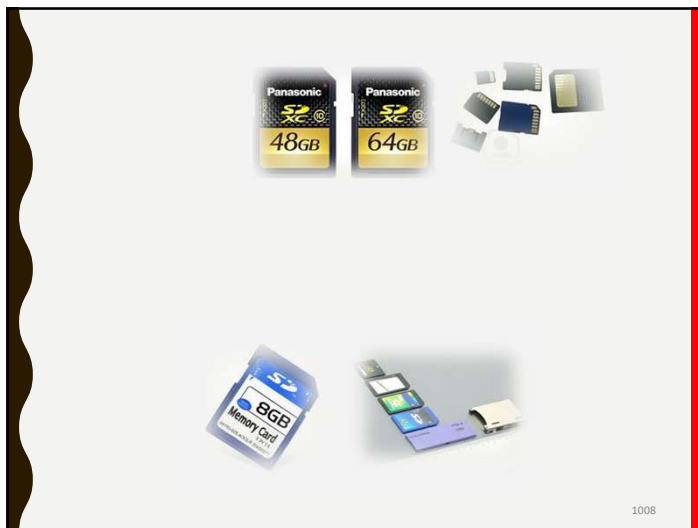
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## Solid state storage devices

A type of computer storage media made of silicon microchip data is stored electronically with no moving parts.

- It offers fast read and write access time and can be.
- It is widely used in a wide range of devices such as digital cameras, phones, etc.
- Solid state storage includes CompactFlash (CF), SmartMedia (SM), Multi-Media Card (MMC), Secure Digital (SD e.g. micro SD) and xD Picture cards.



- Flash memory are used in many electronic devices, including digital cameras, mobile phones, computers, MP3 players, etc.
- Flash disks are solid state (no moving parts)

### **Summary characteristics of solid state storage medium**

- They are Physically very small
- They are Highly portable
- High data storage capacity, ranging from 16 MB to 2 GB, and even more
- High data transfer speed to the device they are part of or attached to (camera, PC, etc.)

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- They are prone to virus attack because they easily moved and used between a number of computers some of which may have viruses
- They are plug and play that connect through the USB



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