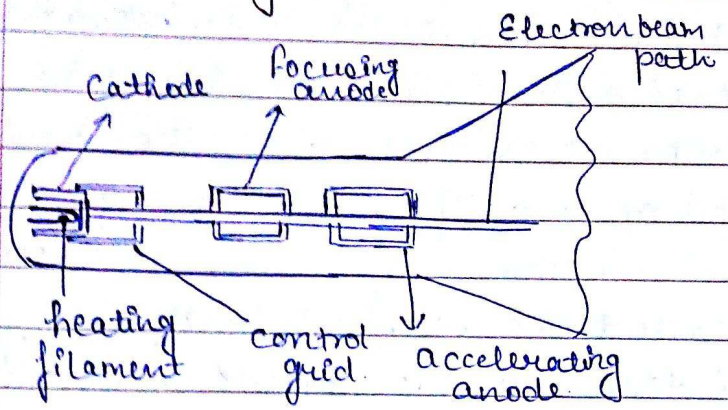
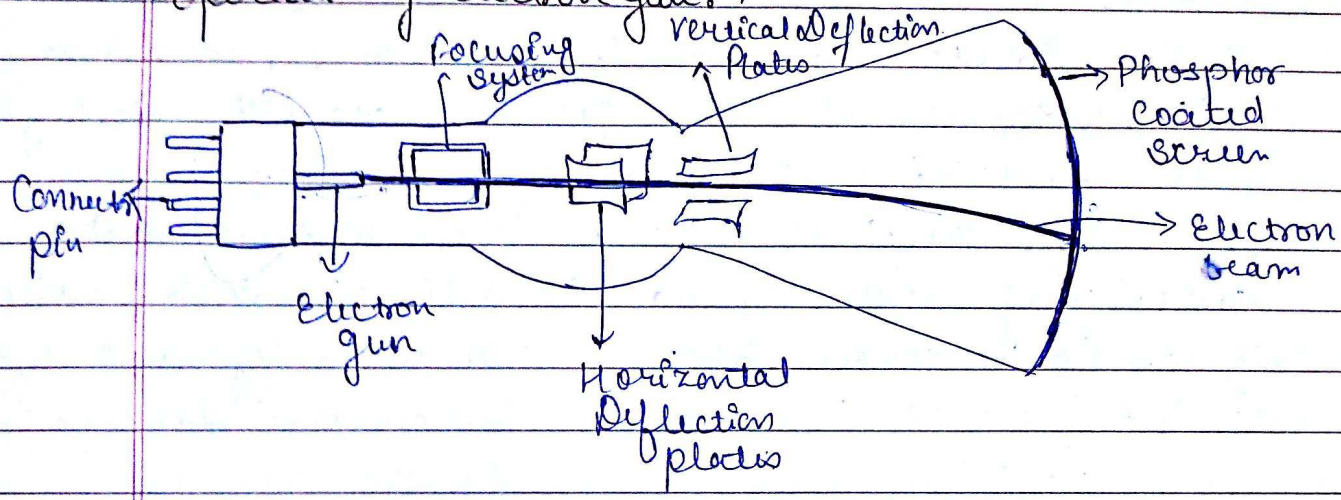
CRT:- Cathode Ray Tube

A CRT is an evacuated glass tube. An electron gun attached to the rear of the tube produce a beam of electron which is directed towards the fornt of tube. The inner side of screen is coated with phosphorous substance which gives off light when it is striked by electrons. It is possible to control the point at which the electron beam strikes the screen, and therefore the position of the dot upon the screen, by deflecting the electron beam. The beam is positioned on the screen by an deflection system of the cathode ray tube consist of two pair of parallel plates, reffers to as the vertical or horizontal deflection plates. The intensity of beam is controlled by the intensity signal in the control grid.

Cathode ray tube :



operation of electron gun :



Electrostatics deflection of the electron beam in CRT :
The voltage applied to vertical plates control the vertical deflection of the electron beam and voltage applied to horizontal plate controls the horizontal deflection of the electron beam

There are two techniques used for producing imaged on CRT Screen are
1) Vector Scan / Random scan
2) Raster Scan

Raster Scan Display :-

In this System the electron beam is Swept across the Screen one row at a time from top to bottom. As the electron beam moves across each row, the beams intensity is turned on and off to create a pattern of illuminated spots. Picture defination is stored in a memory are called the refresh buffer or frame buffer stored intensity values are then retrieved from the refresh buffer and pointed on the screen one row at a time. The capacity of raster Scan System to store intensity information for each screen point makes it well suited for the realistic display of scenes containing subtle shading & color patterns. Intensity range for pixel positions depends on the capacity of raster system. In a simple black & white system, each screen point is either on or off to only one bit for pixel is needed to control the intensity of screen position.

Additional bits are needed when color and intensity variations can be displayed upto 24 bit per pixel included in high-quality systems.

In a black and white System with one bit per pixel, the frame buffer is commonly called bit map.

For a system having multiple bit per pixel the frame buffer is often reffer to as pix map.

Refreshing takes place as 60 to 80 frames per second. At the end of each scan line the electron beam returned to the left side of the screen to begin displaying the next scan line. This process called the horizontal retrance of the electron beam. And at the end of each frame the electron beam returns

to the top left corner of the Screen to begin the next frame. Interchanging of the scan lines in this way allow us to see the entire screen display in one half the time it would have taken to sweep across all the line at once from Top to Bottom.

Random Scan Display:-

A CRT has the electron beam directed only to the part of the Screen where a picture is to be drawn Random scan monitors draw a picture one line at a time and for this reason are also referred to as. Vector displays. The Component lines of a picture can be drawn and refreshed by a random Scan System in my specified order. eg:- Pen Plotter, hard Copy device.

Refresh rate on a random Scan System depends on the number of lines to be display. Picture defination is now stored as a set of line drawing Commands. in area of memory referred to as the to as the refresh display file sometime the refresh display file Sometime the refresh display file is called display list, display program.

Random scan System are designed for line drawing application and cannot display realistic Shaded Scens. Some picture definition is stored as a set of line drawing instructions and not as a set of intensity value for all screen points, vector displays generally have higher resolution than raster System.

Raster Scan System and Random Scan System

Base of diffrence	Raster Scan System	Random Scan System
Electron beam	The electron beam is swept across the screen one row at a time from top to bottom	The electron beam is directed only to the part of screen where a picture is to be drawn
Resolution	Its resolution is poor because raster system in constrast produced zig-zag line that are plotted as discrete point sets.	Its resolution is good because this system produce smooth line drawing because CRT beam directly follows the line path.
Picture Defination	Picture defination is stored as a set of intensity values for all screen points, called pixel in a refresh buffer area	Picture definition is stored as a set of line drawing instruction in a display file
Realistic display	The capability of this system to store intensity value for pixel makes it well suited for the realistic display of scenes contain shadow and color pattern	These system are designed for line-drawing and can't display realistic shaded scenes.
Draw an Image	Screen point/pixels are used to draw an image	Mathematical fxn are used to draw an image

interference and damages.

Dead Pixel:- If one of the three cell red, bule or green is either stuck on or off. The cell is known as dead pixel. If no of dead pixel increase in the screen the LCD cannot be repaired. The manufacture generally specify the no of dead pixel after which the display can be replaced in the warntee period. however some of the bad pixel can be repaired if the problem exist only a single kind of (red, blue, green) value of a cell.

Advantages of LCD pannel over convential CRT monitor:-

1) The LCD pannel have an effectively larger viewable area than the CRT for eg 17 inches LCD is equal to a 19 inches CRT in useability.

2) The LCD cannot have common CRT display ~~monitor~~ problem like convergence error and pins problem.

3) The LCD produce a high precision image because they support direct addressing of the display and polarisation mechanism.

4) LCD pannel are economic to operate. They support low power consumption and much less heat build up than the CRT

5) The LCD pannel weight less than the comparable size CRT

ion → Selection Criteria :

1) Evaluate the pannel both at its native resolution and other resolution that are to be used.

2) To determine whether the existing video card supports the feature that are required

3) Make sure that the system has a suitable expansion slot for a recomended video card.

4) Evaluate the pannel & card combine performance on video clips and animation if the user has to work with full motion video and animated presentation program or 3D games.

5) To look for the display that support for both DVI (Digital visual interface) as well as analog, inputs in case the display is to be used on different systems.

Monitor Selection Criteria :-

The important factor that are to be considered while selecting the monitor of the computer are

1) Resolution
2) Viewable image size
3) Dot pitch
4) Image Brightness and contrast
5) Power management and safety consideration
6) Picture controls
7) vertical & Horizontal frequency
8) Environmental factor such as light, weight, size etc

(1) Resolution :- It is the amount of detail a monitor can have. It is expressed as the no of horizontal and vertical picture element that are present in the screen.

(2) The more of pixel mean the more detail and clear image.

(3) The Amount of resolution that is desired is dependent on the type of resolution

(4) The character based application required little resolution while window, graphic based application require more resolution. The CRT are design in order to handle a large range of resolution where as the LCD pannels are built on single resolution.

(5) Higher the resolution, larger is the display size

Resolution	Minimum Recommended Size of the CRT monitor	Minimum Recommended Size of the LCD panel
800X600	15 inches	15 inches
1024X768	17 inches	15 inch
1280 X 1024	19 inch	17 inch
1600 X 1200	21 inch	18 inch

① At very high resolution the CRT can produce poor quality images where as the LCD display clear images.

② CRT monitor have low refresh rate at higher resolution

② Viewable image size: The size of the CRT that are available in the market varies from 15 inch to 42 inch.

② The larger the monitor, the higher is the price of the monitor

③ The most commonly preffered CRT sizes are 17 inch, 19 inch & 21 inch. These measurement are taken diagonally and it represent the size of the CRT tube.

③ Dot pitch: It is a specification that denote the quality of the CRT monitors. It is generally control by the designed of the shadow mask inside the CRT. A shadow mask is a metal plate that is build into the front area of the CRT and is adjacent to the phosphor layer. The shadow mask has thousand of hole. The holes are used to help

focous the beam from each electron gun so that it illuminate only one correctly coloured phosphor dot at a time

(2) The speed of rewritting (refresh rate) of screen is very fast (approximately 60-85 time/sec). ~~At~~ Hence all the dots seems to be illuminated at the same time

(3) The shadow mask prevents electron gun from illuminating the wrong dots. Generally a dot pitch defined as the distance between phosphor triods measure from the center of phosphor dot in a given triod. to the same color phosphor dot in the next ~~prior~~ triod in relation to coloured monitors.

(4) Dot pitch should be as small as possible. ~~The~~ A smaller dot pitch helps to produce clearer and sharper images.

(4) Image Brightness and Contrast: Also with Dot pitch image brightness is an important specification to be considered while judging the quality of an LCD pannel.

(2) If the CRT display is dim then it is an indication that the brightness control is not proper

(3) The brightness of the LCD pannel varies from one model to the other. The brightness is measured in candelas per sqmeter.

(4) It is symbolized by "nt" and pronounced as nit

(5) The bright~~ness~~ the display better in the view. The typical rating for a good display is between 200-400 nt

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(5) Power management and Safety Consideration :-

(1) Energy and Safety :- The CRT monitor have been design to save the energy for the no of year. All the monitor have the environment protection now a day. (environmental protection agency energy star logo is used on the CRT to indicate its Safety consideration The current of the monitor is ~~used~~ reduced such that the monitor draw 30 Watt power or even less when they are ideal.

(2) Power management :- The power management feature in the monitor is provided in the system bias. It define the signal that a computer send to the monitor and decides when to send the signals.

~~Text~~

CGA, MGA, VGA

Integrated Chipset : (i) video adapter → provide interface b/w comp & monitor
(ii) video card or graphic card, or video board
(iii) Video RAM (Memory)
(iv) Video driver
(v) Installation.

Integrated RAM & Dedicated RAM
↳ inbuild RAM for display.

- Video driver is program to provide interface b/w ~~monitor and memory~~ hardware System to the Operating System

→ Two type of video driver :-
Composite based : All the video driver are available.
Component based : In this Selected video driver is used which is necessary.

Installation :

CGA → Coloured Graphic Adapter
MGA → Monochrome Display / Graphic Adapter
VGA → Video graphic Array
EGA → Extended graphic Adapter
~~XGA → X~~
HGA → Hercules graphic Card

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Types of Video Adapter :-

Adapter	Maximum Resolution/Colour	Monitor Supported	Graphic Support	Total Memory Required
CGA	640X200/2	RGB Composite	Yes	16K
MGA	720X350/3	Monochrome, TTL	No	4K
EGA	640X350/64	RGB EGA, Monochrome, TTL	Yes, No, No	256K
Hercules graphics Adapter	720X350/3	Monochrome, TTL	Yes	64K
VGA	640X480/262	Analog RGB	Yes	256K
SuperVGA	1024X768/262	Analog RGB	Yes	512K, 1024K

6) Vertical and Horizontal frequencies:

1) All the monitor that are used today are of multiple frequency type
2) The more the range of the frequency, more expensive the CRT monitor
3) Care must be taken that the video-adapter (act as an interface between monitor Card) Horizontal and vertical frequency must lies within a Range a CRT Monitor Support
4) The vertical frequency (It indicates the Refresh Rate, that determine the image Stability) Range from 50-160 Hz. However, the multifrequency monitor support different vertical frequency at different resolution for better resolution. Higher vertical frequency required.
5) The Horizontal frequency varies from 31.5 KHz - 90 KHz (It indicate the line Rate)

6) A default vertical Scan frequency of 60 Hz is used. By the video-~~adp~~ adapter to prevent the monitor from damage, the LCD monitor used lower vertical frequency than CRT, because LCD pannel uses transistor to activate all the pixel in the image at once.

→ Vertical Scan frequency: It is called Refresh Rate

- It is defined as the Rate at which the Screen display is Rewritten
- It is measured in Hz

For eg: A vertical scan frequency of 72 Hz indicate the Screen is Refreshed 72 time per second.

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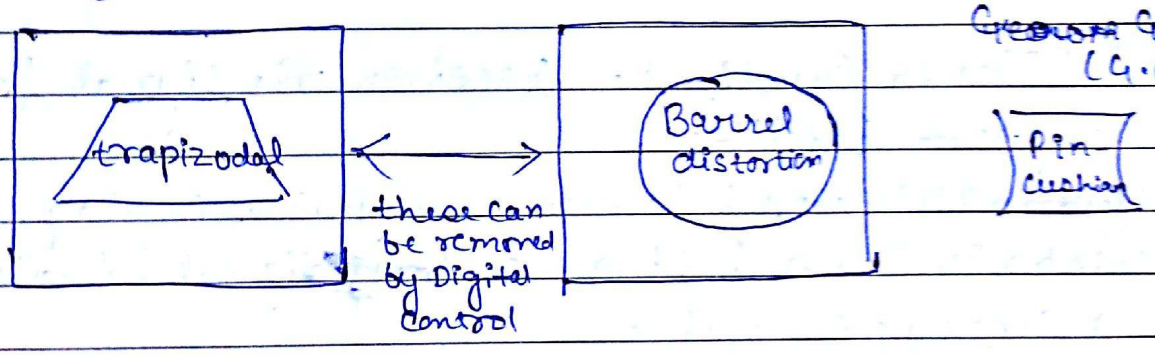
Horizontal Scan: 1) Also Known as Line Rate
2) It is defined as the rate at which, the pixels in a single line Rewritten
3) The different video resolution used different Horizontal frequency.
4) The standard VGA (Video graphic adapter) Resolution of 640 x 480 need a Horizontal frequency of 31.5KHz

7) Picture control:
1.) Most of the CRT monitor and LCD pannel uses digital control instead of Analog control (extra coding)
2) The controls enable the user to display
3) The Monitors with digital control have build in menu system (in digital control)
4) It enable the user to set various parameter like Brightness, Contrast screen size, Horizontal Shift, vertical shift, color and focus



5) Once user compels the adjustment, Monitor saves the setting in non-volatile RAM, that is located inside the monitor.

N-VRAM:
- Such a memory provides permanet storage for the setting with no other battery or the power source
- Digital control provide a much higher level of

Control over the monitor

The LCD pannel are not affected by (Geometrical error) Swing error will come in case of analog not in digital

Graphics Accelerator :-
There are three Component of Graphics Accelerator
1) Processor 2) CPU 3) Memory Bus

↓

S-RAM & D-RAM → Both are Volatile

↓ flipflop used

↓ Capacitor are used

Cache is S-RAM

In Graphics Accelerator we use D-RAM Because not to increase the Cost so that we use D-RAM.

↓

for Support 3D we use graphic Accelerator

TV Tuner Card :- It receives the signal from different satellite.

1. Hybrid TV Tuner :- It act as digital or Analog ~~atna~~
2. Combo TV Tuner :- It act as both digital & Analog in a single period of time

1. HDMI Connector
2. DVI Connector
3. VGA
4. S-Video Card :- Super-video card, 4 pin Connnector

It does provide any signal for audio. ~~to~~ It ~~Co~~ only carry signal for video

HDMI :- 19pin connector. It can transmitt compressed & uncompressed audio & video. Better resolution

VGA :- It is basically in computer, 15 pin & can only transmitt video signal

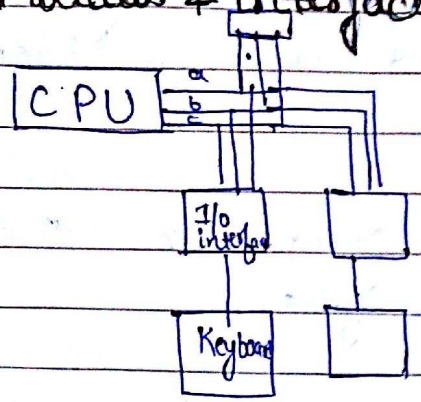
DVI - Digital video interface, Rectangle shape, 24 pin, It is designed to transfered

5 Mark
Troubleshooting Monitoring & video card problem:-

1. No picture display on the screen
2. Poor Picture quality :- 1. In case of CRT we check resolution
   2. plasma panel → firstly we check cable connection then further we check Brightness & contrast.

Multiple Monitor :-

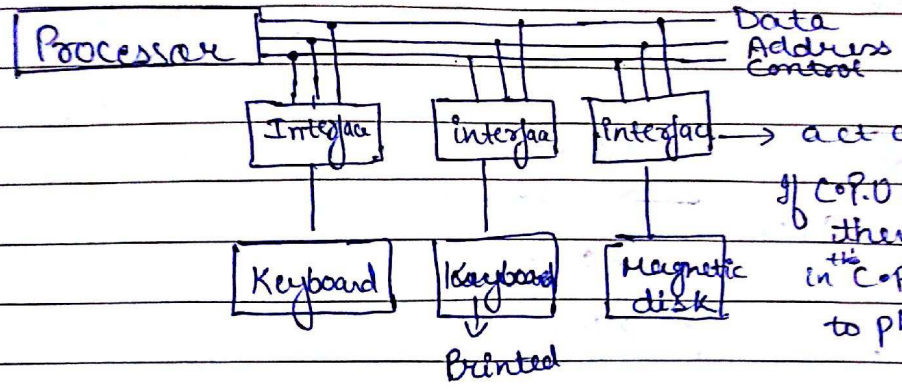
→ I/O Modules & interfaces :→



Serial or Parallel Data transfer :-
Serial is ~~more~~ best than Parallel for transferring of data. But for ~~pass~~ transfer the data for small region parallel bus is ~~more~~ mainly preffered.

I/O Ports :- The input output section of the Cabinates Consist of I/O ports for Input as well as output devices. It allows the Computer to take the data from the user & send the data to the outside world, the devices like keyboard, printer, modem are called as peripherals. They are connected to input output Connect sections & these peripherals establish Communication between the user & the computer. The actual physical devices that are used for interfacing the computer buses with computer system are I/O ports. I/O port allows connections of data from keyboard or some other source to the computer. The computer reads the information connected through the input ports such as reading take place under the control of the CPU. An output port is used for connecting data from computer to the outside world the processed data is send from the computer to a peripheral or a video terminal. Physically the simplest type of I/O port is a set of parallel D-filp flop

I/O interface and I/O modules :



→ act as buffering
If C.P.U & peripheral → mismatch then buffering take place in the C.P.U give more info to pheriperal device

Control signal ~~used~~ which are used during interfacing I/O device to CPU

Suppose Keyboard ~~want to com~~ have Address then it act as clock & media communication b/w C.P.U & Peripheral device

1. I/O command → give Addressing info to the interface
2. Status Command → If the device is busy with other memory status is 1 if the device is not busy then memory status 0
3. Control command
4. Output data command ~~wri~~ read.
5. ~~Input~~ Input data command → ~~read~~ write

Two type of buses :
1) I/O buses
2) Memory Bus :

Asynchronous : No clock is used to transfer data.
In this Start Stop bit is used
Start → 1 indicate Start bit
Stop → 0 indicate Stop bit.

Synchronous Data Transfer Scheme.
→ Programmable I/O
→ Interrupt initiated I/O
→ DMA transfer

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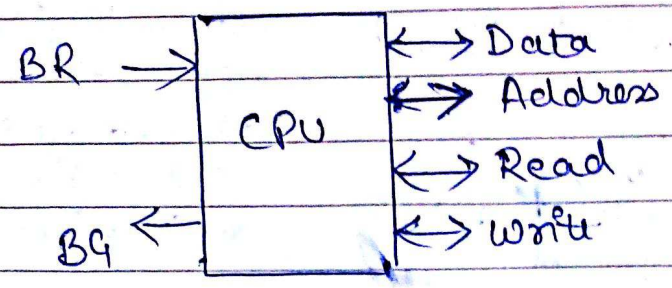
(1) Programmed I/O :- Concept of Polling.



Asynchronous data Transfer Technique :-

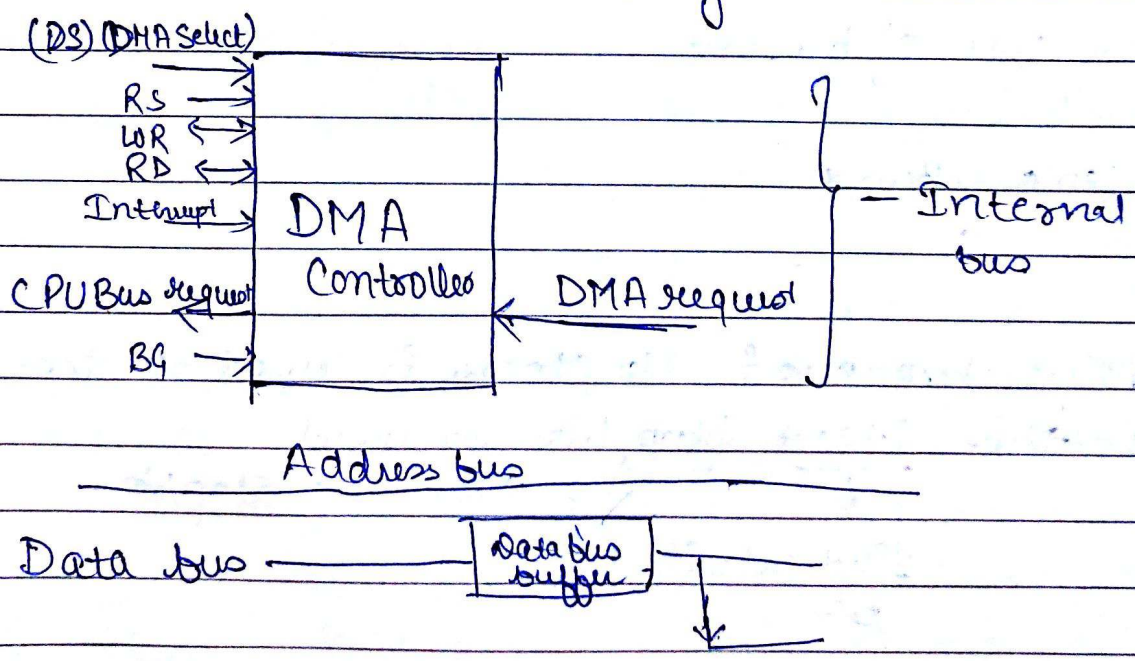
→ Handshake

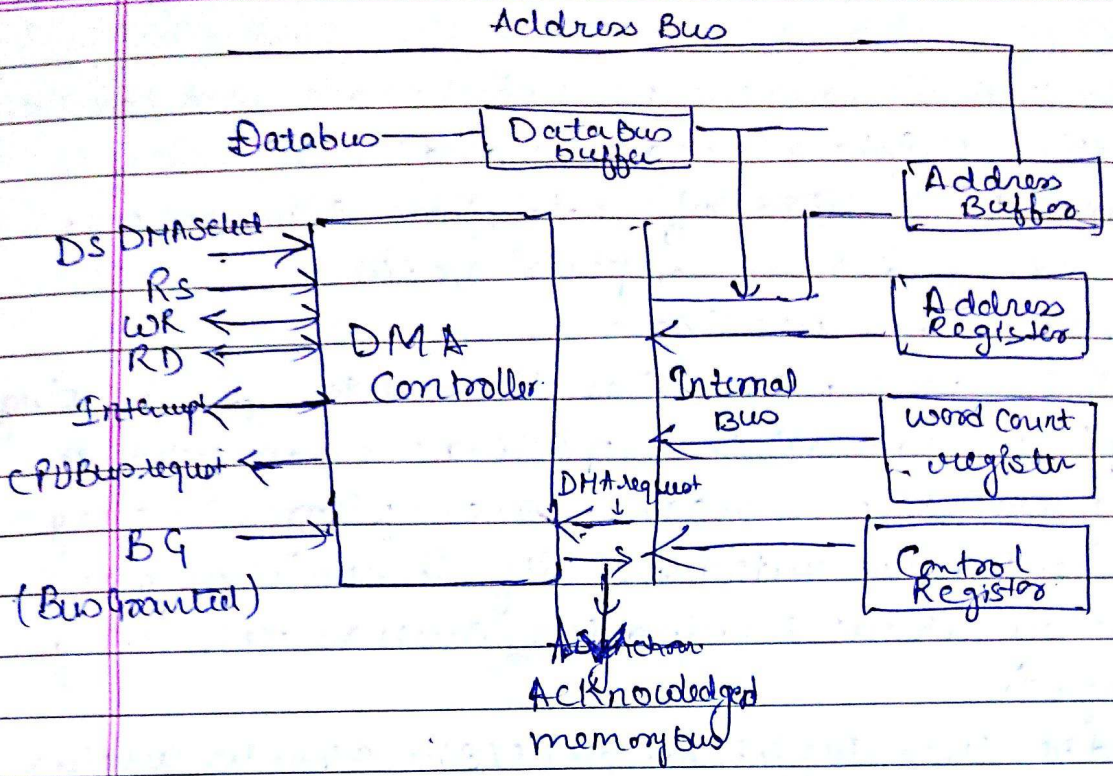
→ Stobe

Use of Handshake ~~use~~ & Stobe ~~use~~ in DMA.

Sender Initiator — Receiver Initiation.

~~Only~~





Why Read/write is bidirectional

USB: USB Stand for Universal Serial Bus. It is a Set of interface specification for high speed wired Communication In between electronic System peripheral & devices with or without Computer

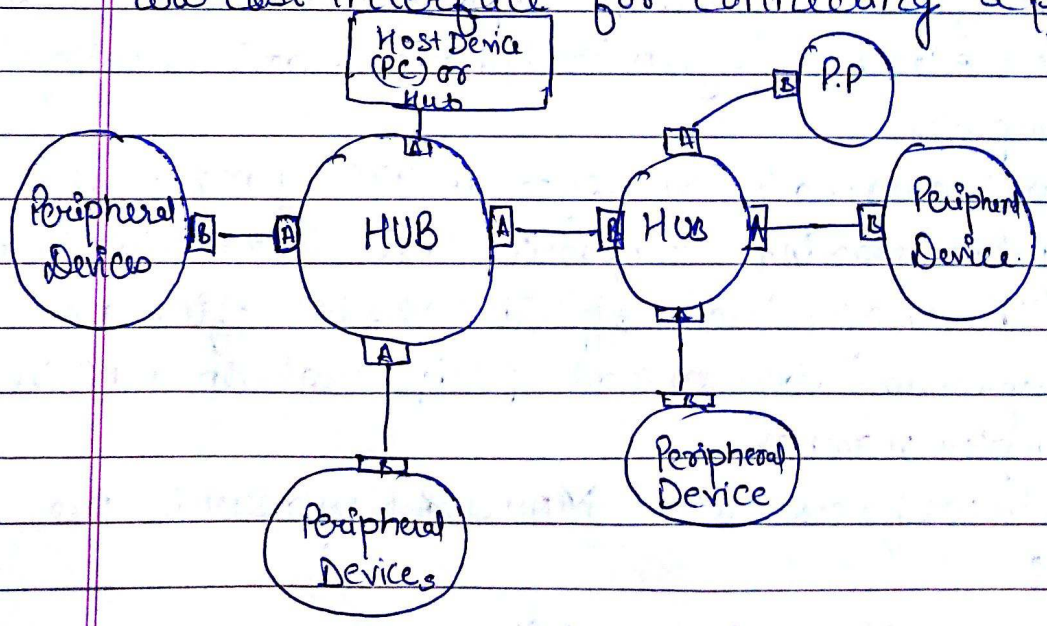
The USB was originally developed in 1995 by many of industry top leading Companies like intel Microsoft Compact, The major role of USB was to define an external expansion bus to add peripheral to a PC in easy & Simpler manner

Today USB interfaces called Mouse & Keyboard are preffered:

- USB offers user simple Connectivity
- It eliminates the mix of different connectors for different devices like printer, keyboard mouse & other peripheral that mean USB Bus allows many peripheral to be Connected using a Single standerised

Socket

- Also in USB environment dip switches are not necessary for setting peripheral addresses and IRQ
- It support all kind of data from slow mouse I/P to distized audio or compress vedio
- USB allow hot swaping:
  The Hot swaping mean that the device can be pluged or unpluged without the reporting the Computer or turning the device i.e means when pliged in every thing configures automatically So the user need not worry about termination such as Rebooting the Computer.
- Onces the user is finishing. He/She simply unplug the cable from the system.
- The USB system is made up of multiple no of USB port and multiple ~~devices~~ peripheral devices with a single port. The USB system is passed bidirectional low cost interface for connecting a peripheral.



Three tier topology of USB

USBport: It Refers to the PC their is only one host in a USB System. All other PC's or HUB's are Known as Client System. USB host manage the flow of data between the USB device and host itself

→ It detects the presence and removal of USB device
→ It provide power to the low power USB that are attach to the host.
→ It Collects activity and status information of USB devices to expand the no. of peripheral attach to the host. The USB hub's can be included
→ The max No of hubs including host can be upto 5

USB Cable: All the USB devices have their own power Supply on which they works.
USB Cable Consists of 4 wires. It Consist the signal

$\underbrace{D^+ \; D^-}_{\text{Data line}}$, $\underbrace{VBVS}_{\text{Voltage Supply}}$, $\underbrace{GND}_{\text{Ground}}$

The Data line D^+ & D^- indicates ~~whether~~ weather the data being receive or transmitted USB Connector are of 2 ~~two~~ types
Connector A & Connector B:
The PC use type A while peripheral uses type B Connectors.
The above 3 tier topology have some benifit
① Power to Rich device can be monitor and even Switch off if and over current condition occur without interrupting other USB device
② Both high, full & low speed devices can be Supporting with the hub filtering technology

This technology filter out high speed and full speed transaction so lower speed devices do not receive them

The Host in the USB System. It is the master & controls, schedules all communication activity peripheral or devices control by the USB are slaves corresponding to commands from host. the USB devices are linked in series through hub. There always exist one ~~hp~~ hub known as route hub which built into the host controller.

Limitation of USB ports:-

(1) When we use a Keyboard or mouse ~~the~~ USB interface on our computer it ~~has to spen~~ require C.P.U to spend time to poll the bus to check, to see if there is traffic on the Keyboard or mouse terminal. In order to check the status more polling is done which increase the response time, and this process take more C.P.U time. After a certain point increase the polling rate does nothing but waste the CPU cycle because most of the modern Keyboard have a built in buffer which of limited size. less no of bytes can be stored in buffer. In polling process after certain point no traffic can be detected and stored in the buffer and it only waste C.PU time

However in case PS/2 connector the computer does not need to poll the PS/2 ~~ccus~~ poll instead when a Keyboard is pressed the keyboard will send a signal to the computer causing hardware interrupts This force the CPU to register every key press in this way all the key press are registered and no C.P.U time is wasted

Comparision b/w IEEE1394 (Firewire) & USB

- Hotswapping is done in both.
- In IEEE 1394 attach only 63 device where as USB attach 127 device
- Hot ~~pe~~ PC is not required in IEEE 1394.
- IEEE 1394a → 400megabit per sec. } Cable length 4.5m
  1394b → 100MBps
- USB 1.1 – 12 Mbps or 1.5 Mbps } → Host pc is require
  USB Cable length 5m
- USB 2.0 – 480 Mbps or 60 Mbps

Benifit of USB:

1. USB port can have upto 127 device communicating at 1.5 Mbps over a four wire cable
2. USB describe both hardware & software protocol, window 98 & Window NT have a full support for USB interface.
3. USB is a fast and low cost interface
4. No manual configuration is required for establishing USB interface