COMPUTER MAINTENANCE

By Eng. Abel Mehari

+2917247119

WHAT IS COMPUTER?

Computer is an electronic device that can store, organize and process data. It is purpose is vast in various application or fields, in services like Research, Medicine, Education, Military and Personal Use also. Using this electronic machine eases our daily activity by saving time, Man power and Unnecessary human mistakes, which this will increase our efficiency and profit from simple to complex jobs.

What do you thing is the difference between Laptop / Notebook/Tablet/Palmtop and PDAs?

What do you think is the difference between those names? Laptop computers and notebook computers are the same thing but you can decide that notebook computers are smaller than laptops. Tablets are like notebooks without the keyboard. The top panel of the device consists solely of a large LCD panel. Except for a few buttons accompanying the screen, all input is accomplished via a stylus on a touch-sensitive panel that covers the tablet's screen. PDAs are now known as Pocket PC or Windows Mobile designed only for simple management of personal information, data such as might be found in an address book or a daily calendar.

Advantages of Laptops:-

1. Ideal for People with Multiple Workplaces

2. Flat-Panel Displays

3. Low-Energy Consumption

4. Built-in UPS

Compiled By Eng. Abel (07247119)

5. Integrated Design

6. More Space Efficient

The Problems of Using Portables:-

1. More Expensive

2. Increased Risk of Loss

3. Smaller Screens and Keyboards

4. Slower System Speed

5. Upgrades Are More Difficult

WHAT IS COMPUTER MAINTENANCE?

* Is nothing but when you keep something in good condition.

* It is the basic care of computers.

But how do you keep something in good condition?

* You are supposed to keep it clean

* check it regularly,

* Keep it updated with antivirus programs.

* Fix it when it is broken…etc.

Preventive Maintenance:-

The two types of preventive maintenance procedures are passive and active. Passive preventive maintenance includes steps you can take to protect a system from the environment, such as using power-protection devices; ensuring a clean, temperature-controlled environment; and preventing excessive vibration. In other words, passive preventive maintenance means treating your system well.

Examples of passive maintenance are:-

1. The Operating Environment

2. Temperature, Humidity, and Altitude(41°–110°F (5°–43°C))(8%-95%)(41°–110°F (5°–43°C) resp

3. Static Electricity

4. Radio-Frequency Interference (Living next door to a 50,000-watt commercial radio station is one sure way to get RFI problems

5. Dust and Pollutants

6. Tips for Transporting Your System.

Compiled By Eng. Abel (07247119)

An active preventive maintenance program includes procedures that promote a longer, trouble-free life for your laptop. This type of preventive maintenance primarily involves the periodic cleaning of the system and its components.

Examples of active maintenance are:-

The following is a sample weekly disk-maintenance checklist:

1. Back up any data or important files.

2. Delete all temporary files, such as the following:

a. *.tmp— Files with a .tmp extension

b. ~.*— Files beginning with a tilde (~)

c. *.chk— Files with a .chk extension

d. Web browser history and temporary Internet files

3. Empty the Recycle Bin.

4. Check for and install antivirus software updates. If you have a broadband Internet connection, you might prefer to configure your antivirus software program to check automatically for updates daily.

5. Finally, run a disk-defragmenting program.

The following are some monthly maintenance procedures you should perform:

6. Create an operating system start up disk.

7. Check for and install any BIOS updates.

8. Check for and install any updated drivers for the video, sound, modem, and other devices.

9. Check for and install any operating system updates.

10. Clean the system, including the LCD screen, keyboard, and especially the cooling vents.

11. Check that the cooling fans are operating properly. Most laptops have only a single fan, but some have more than one.

What All Computers Have in Common?

- Digital Operation
- Hardware and Software
- User Input
- Processing
- Output

Compiled By Eng. Abel (07247119)

COMPUTER LANGUAGES:-

-Analog

- Continuously variable
- No precisely defined values
- Often associated with sound (waveforms)
- Examples: radio, television broadcasts, telephone

-Digital

The PC is an electric unit. Therefore, it can only deal with data, which are associated with electricity. That is accomplished using electric switches, which are either off or on. You can compare with regular household switches. If the switch if off, the PC reads numeral 0. If it is on, it is read as numeral one. See the illustration below:

- Precise values
- Numeric data
- Quantifiable
- Not continuously variable

Binary Numbering:-

The binary number system is made up of digits, just like our common decimal system (10 digit system). But, while the decimal system uses digits 0 through 9, the binary system only uses digits 0 and 1.

Bits: - Each 0 or 1 is called a bit. Bit is an abbreviation of the expression Binary digit. It is called binary, since it is derived from the binary number system, Binary numbers can have any number of digits, but because we're using binary, the number of digits will typically be a multiple of 2.

Bytes: -The most basic data processing is word processing. Let us use that as an example. When we do word processing, we work at a keyboard similar to a typewriter. There are 101 keys, where we find the entire alphabet A, B, C, etc. We also find the digits from 0 to 9 and all the other characters we need :,.-;():_?!"#*%&etc... All these characters must be digitized. They must be expressed in 0's and 1's. Bits are organized in groups of 8. A group of 8 bits is called a byte. These bits can be 8 0's or 8 1's or combination of 0's and 1's.

ASCII: -ASCII means American Standard Code for Information Interchange. It is an industry standard, which assigns letters, numbers, and other characters within the 256 slots available in the 8 bit code.

Compiled By Eng. Abel (07247119)

Conversions:-

Decimal to Binary: -

Example one:-

1.1 Convert 12 in to binary number?

Answer:

12 divided to 2

12	6 divided to 2
0	6	3 divided to 2
	0	2	1
		1	1

Please start Gathering the numbers starting from the right (all the remainders)

(1100) base 2S

The binary representative of the number 12 is (00001100)

Binary to Decimal

Converting Binary to Decimal

1.2 Convert (1100) base 2 to Decimal?

Answer:

1   1   0   0

2^3 2^2 2^1 2^0

8 + 4 + 0 + 0 = 12√

0 x 1 =	0
1 x 2 =	2
1 x 4 =	4
0 x 8 =	0
1 x 16 =	16
1 x 32 =	32
0 x 64 =	0
1 x 128 =	128
TOTAL =	182

BINARY-TO-DECIMAL CONVERSION

The Decimal representation for the binary bits is 12

Measurement-Related Terminology:-

• **Kilobyte (KB)** – A kilobyte is 1,024 (or approximately 1,000) bytes.

• **Kilobytes per second (KBps)** – KBps is the amount of data transferred over a network connection. KBps is a data transfer rate of approximately 1,000 bytes per second.

• **Kilobit (Kb)** – A kilobit is 1,024 (or approximately 1,000) bits.

• **Kilobits per second (Kbps)** – This is the amount of data transferred over a network connection. Kbps is a data transfer rate of approximately 1,000 bits per second.

• **Megabyte (MB)** – A megabyte is 1,048,576 bytes (or approximately 1,000,000 bytes).

• **Megabytes per second (MBps)** – This is the amount of data transferred over a network connection. MBps is a data transfer rate of approximately 1,000,000 bytes per second.

• **Megabits per second (Mbps)** – This is the amount of data transferred over a network connection. Mbps is a data transfer rate of approximately 1,000,000 bits per second.

• **Hertz (Hz)** – Hertz is a unit of measurement of frequency. It is the rate of change in the state or cycle in a sound wave, alternating current, or other cyclical waveform. Hertz is synonymous with cycles per second and it is used to describe the speed of a computer microprocessor.

• **Megahertz (MHz)** – One million cycles per second. This is a common measurement of the speed of a processing chip.

• **Gigahertz (GHz)** – One billion (1,000,000,000) cycles per second. This is a common measurement of the speed of a processing chip.

SAFETY AND PREVENTIVE MAINTENANCE

Protect Yourself from Electric Shock

- Do not disassemble a power supply
- Replace entire power supply if defective
- Have power supply serviced by special trained.
- Do not disassemble monitor
- Replace entire monitor if defective
- Have monitor serviced by specially trained technician

Equalize the Potential:-

-Touch metal frame of PC before touching circuit board or chip

Avoiding ESD in Environment:-

- Work in a room with humidity between 50% and 80%
- Wear natural fibers, not synthetic

Compiled By Eng. Abel (07247119)

- Wear rubber-soled shoes when possible
- Stand on a ESD-dispersing floor mat if available.

Other PC Hazards:-

- Temperature: PCs prefer cool areas, but keep above freezing
- Trauma: Don't place PCs where they can be kicked or knocked off
- Magnets: Magnets can ruin data stored on a disk. Magnets may be found in speakers and in some older phones, as well as magnetic tools.

Cleaning Supplies for a PC:-

- Spray cleaner designed for external computer parts
- Vacuum designed for electronics
- Denatured alcohol
- Cotton swabs
- Clean dry lint-free cloths
- Can of compressed air

Cleaning a Monitor

- Do not use regular glass cleaner
- Use glass cleaner designed for

-
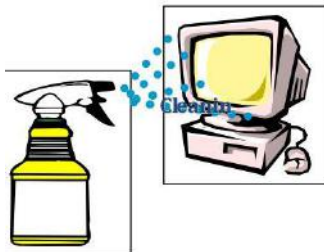
Cleaning Keyboard

- Turn off the PC before cleaning keyboard
- Turn keyboard upside-down and shake gently to remove loose particles
- Get between the cracks with a cotton swab or a bit of folded paper towel
- Clean keys with a cloth dampened with spray cleaner designed for PCs monitors
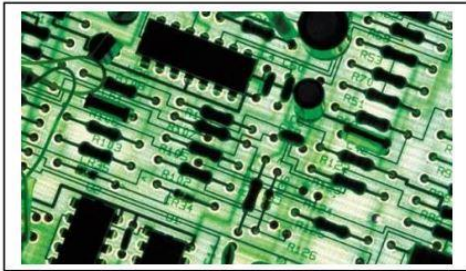- Do not spray while monitor is turned on

-

Cleaning a Mouse

- Remove panel on the bottom
- Remove the ball
- Clean inside with alcohol and cotton swab
- Clean ball with soap and water

Cleaning Circuit Boards

- Use canned air to blow dust away
- Do not use water
- Use alcohol if liquid is necessary

COMPUTER-FRONT-VIEW COMPONENTS

Power-on LED:

This green light-emitting diode (LED) is lit and stays on when you turn on your server and flashes when the server is in Standby mode.

Power-control button:

Press this button to manually turn on the server and put the server in Standby mode

Reset button:

Press this button to reset the server and run the power-on self-test (POST). You might need to use a pen or the end of a straightened paper clip to press the button.

CD-ROM drive activity LED:

When this LED is lit, it indicates that the CD-ROM drive is in use.

CD-eject button:

Press this button to release a CD from the drive.

Hard disk drive activity LED:

Each of the hot-swap drives has a hard disk drive activity LED. When this green LED is flashing, the controller is accessing the drive.

Hard disk drive status LED:

Each hot-swap drive has a hard disk drive status LED. When this amber LED is lit continuously, the drive has failed. If a RAID adapter is installed in the server, when the LED flashes slowly (one flash per second), the drive is being rebuilt. When the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

THE COMPUTER SYSTEM PARTS

A Personal computer can be considered as complete computer system if it includes all the essential components and sub components as shown in the following picture. Computers just like human beings have their own ways of listening , speaking and thinking , healthy humans at least have the five senses and the brain that enable them to properly communicate with their environment. Computes likewise require and minimum of the components shown in picture below, to compote and communicate effectively with the environment.

For a computer to compute anything it needs two key components. According this computer is divided in to two components. These two components are:

- The Hardware Components and
- The soft Ware Components.

Hard Ware:-
The tangible parts of a computer, the things that we touch with our hands physically are called hardware components. These components are the device of a computer that we get in touch with every day and these are the components that many people call as the computer. The Hardware components of a computer enable the system to perform four functions. Therefore the hardware components are divided into four categories. These four Categories enables a system to input data, process and store it. And finally output it form the system.

Input Devices:-

When a user works with his system, the user will for sure need to communicate that is to input the data in to his system. This is done with the help of input devices. Input devices are external peripherals (they Resided outside of the system unit) that enable a user to command his computer, examples of input devices include mouse keyboard, scanners etc.).

Processing Devices:-

When the data is inside the system that is after it had been inputted and before it is outputted the computer's brain works on it. This is called processing. The components that are within the system unit are the best example of processing devices. Example of these devices include processor, motherboard etc.

Storage Devices:-

The devices that are within the system unit can also be store date with in the system. Any kind of new data that comes in to the system unit cab be stored within the system unit for some time and when necessary can be taken out the computer. Example of storage devices and CD/DVD rom etc.

Output Devices:-

The final purpose of having a computer is to get final product. After the data has been inputted, store and processed it is exported out of the system using output device. Output devices are external peripherals (they resided outside of the system unit) that are used to export data out of the system, and example include monitors, printers, speakers and plotters Etc.

Input/output Devices:-

There are some devices that are used for both inputting and put putting data. They can be used to input data in to the system and they can also be used to output data out of the system. Example of such kind of devices include fax. Modem and NIC etc.

Software: -

Software is a set of programs used to control the computer's hard ware software usually resides with in the computer and is retrieved and processed by the computer's hardware. Software always works as an interface between the user and the hardware. Imagine how difficult it would have been to communicate with your hardware if there was no software. It would even be impossible to shut down your computer properly.

The advantage of software is not only to allow a user control his hardware but it also makes life easier by providing thousands of applications that can be simplify your daily activities work load. Therefore we have hundreds of software and these software are categorized in to two. The two categories of software are categorized in to two. The two categories of software are:-

- System Software (example:- Operating system ,Bios Setup utilities)
- Application Software (MS.office, ulead, print master etc.)

Ports

 All peripheral devices that connect to the computer use connectors on the back of the computer known as ports.

Ports are mainly used for two reasons
- Communication and
- Device controlling

-

There are two types of ports:-

Pararrel:- Parallel devices transmit multiple bits at a time over multiple wires. Parallel devices use LPT ports for resources. Common parallel devices include printers and scanners.

- Multiple (usually eight) wires carry data in each direction
- Data travels one complete byte at a time

Serial:- A serial port serially transmits data bits one after the other over a single line USB 2.0. It uses DB-9 (9-pin) connector. A typical computer contains only two serial referred to as COM1 and COM2. Serial cables are easy to work with and are fast, with a speed of 150MB/sec and higher. Examples:
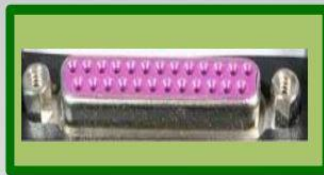
- Legacy COM port ("serial port")
- Universal Serial Bus (USB)
- FireWire (IEEE 1394)
- Serial IDE

Serial Port. D- Shell Connector
❏uses pin connectors,
❏Also known as a COM port) can be a 9-pin Female D-shell connector
❏Data travels at 115 kilobits per second

Parallel Port. (D-Shell Connector)
❏This long and slender port is also no longer commonly used,
❏The most common parallel port has holes for 25 pins,
❏Used for scanners and printers
❏Also called printer port
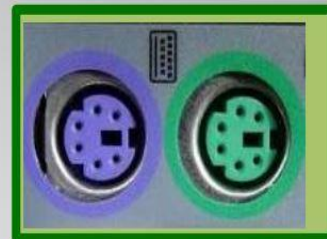
PS/2. DIN Connectors
❏Most desktop computers have two of these round ports for six pin connectors, one for the mouse and one for the keyboard.

USB cable and port

USB.
❏A 4-wire connector type of port
❏ Different models (USB 1.0, USB 2.0 and USB 3.0),
❏ Connect all kinds of external USB devices e.g. external hard disk, printer, scanner, mouse, keyboard etc.
❏ Most of the computers provide two USB or three USB ports as minimum.
❏Data travels at 12 megabits per seconds
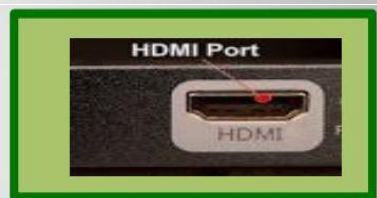❏USB compliant devices can get power from a USB port

TRS. TRS (tip, ring and sleeve) ports Also known as ports for mini-jacks or audio jacks.
They are commonly used to connect audio devices such as headphones and microphones to computers.

GAME PORT.D-Shell Connector.
A 15 port pin used to connect games
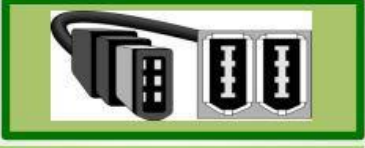
HDMI Port

HDMI (High Definition Multimedia Interface**)**
❏provides an interface between any audio/video source, e.g. DVD player, or A/V receiver and an audio and/or video monitor, such as a digital television (DTV),
❏HDMI supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.

VGA
❑A three row,
❑15-pin female D-shell connector for newer VGA, SVGA, XGA, SXGA, or UXGA monitors
❑Connects monitor to a computer's video card.
❑Similar to serial port connector but serial port connector has pins, it has holes.

Modem Port
❑Connects a PC's modem to the telephone network.

Game Port.
❑Connect a joystick to a PC
❑Now replaced by USB

IEEE 1394 ports –
❑A serial technology developed by Apple Computer sometimes called the FireWire port.
❑ A 6-wire cable/port (4 for data, 2 for power)
❑ speeds of 100, 200, 400, 800, and 1200 Mbps.

Back

Serial Port. Male D- Shell Connector
❑uses pin connectors,
❑it is no longer commonly used,
❑ It was used for printers, mice, modems and a variety of other digital devices.
❑Data travels at 115 kilobits per second

Ethernet Port
❑Connects to a network and high speed Internet.
❑Connect network cable to a computer.
❑This port resides on an Ethernet Card.
❑Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

Power Supply

Generally a power supply of any electronic item is used to convert A.c (Actual Current) in to D.c (Direct current) and step down voltage and then distribute it according to the power requirements of the system unit's components.

Power Supply form factors:-

AT Power Supply:-

The circuit is totally disconnected from the A.C mains when the power supply is turned off .

Compiled By Eng. Abel (07247119)

ATX Power Supply:-

- The power is always on standby mode. if the computer is connected to A.C mains.
- The power supply will turn on manually and it turns off automatically by the operating system.
- Usually window 98 and above operating systems. This power supply can't work with old
- Operating system like, DOS, WIN3.1, WINNT, and WIN95.
- Connector jack to the motherboard is only one and it has polarity protector key.
- When we finish with ATX we have to plug off the socket.
- ATX power supply have +3 and _3 which keeps the power supply in standby mode and turn on the power supply by mother board.
- The power supply produces four (five in the ATX) different levels of well-regulated DC voltage for use by the system components. These are +5V, -5V, +12V, and -12V.
- In ATX power supplies, the +3.3V level is also produced and is used by the second-generation Intel
- Pentium processors. The IC devices on the motherboard and adapter cards use the +5V level.
- Be able to identify the uses for each voltage level and the corresponding color-coded wire. This will allow testing of the wires using a multi meter to determine if there are problems with the power supply.
- The computer power supply produces a voltage only when it has a load. Some component must be running on the machine before a voltage can be found in the power cab le connectors
- ✓ The PSU takes an AC of 110V – 250V from the wall-power-outlet and converts it to DC and then distribute it to the system unit components at the rate of -12V to 12V DC.
- ✓ Computer hardware operates on different voltage levels. For example, a CPU needs 1.5v to 3.5V while an expansion board needs 12V.
- ✓ The voltages of a PSU are +12, -12, +5, -5 and +3.3 on ATX motherboards.
- ✓ Because the +3.3v signal is a relatively recent addition, power supplies do not generate a -3.3v signal DC current.

Batteries: One of the best features of using a laptop computer is that it can run on batteries. Many people are not aware that many laptop computers have three different batteries:

- The main battery (or batteries)
- The suspend/standby battery
- The CMOS/clock battery

The suspend/standby battery

The first two battery types are rechargeable, whereas the CMOS/Clock battery is not. Some systems don't Incorporate a suspend/standby battery, instead using only the main battery for power when in Suspend or Standby mode. Most people are aware of the main battery, and many know that like desktop systems, laptops also have a CMOS/Clock battery. The other battery found in some of the more sophisticated laptop models is the suspend/standby battery, which powers the RAM when the system is in Suspend or Standby mode. This battery is rechargeable, just like the main battery, and will power the

memory for a limited time when the system is in Suspend or Standby mode. Many systems have an additional "Hibernate" mode, which copies the RAM to the hard disk and then shuts the system off. When the notebook is in Hibernate mode, no power is used, so the system can be left that way and restarted later without losing data.
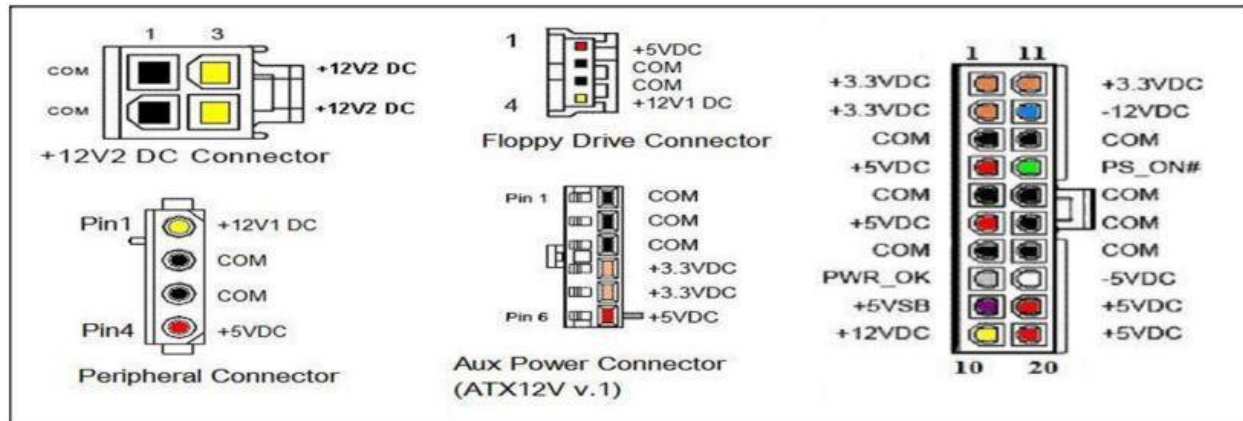
SATA POWER
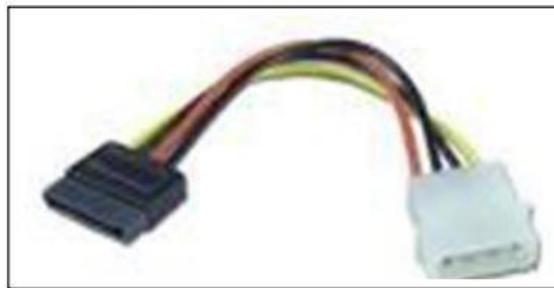
MOTHERBOARD MAIN CONNECTOR
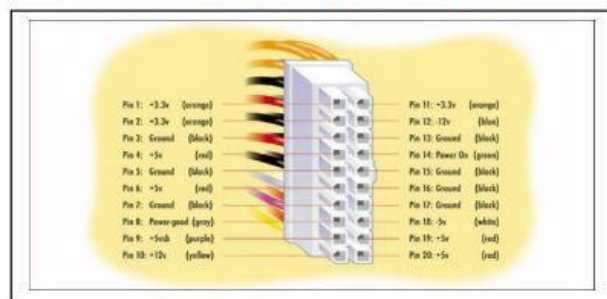
Measuring Voltage
- Must be measured with computer on
- Use back-probing
- Place black probe on grounding wire (black)
- Place red probe on wire to be tested

Measuring Current
- Must be measured with computer on
- Multimeter must be placed in-line
- Difficult to do with most computer components

AC and DC
- **AC: Alternating Current**
  - Ordinary household current
  - Alternates positive and negative poles at 60 Hz
  - Good for sending power over long distances
- **DC: Direct current**
  - Batteries
  - Positive and negative poles stay fixed
  - Lower overhead
  - Portable

Electrical Measurements
- Analog multimeter
  - Uses a needle gauge
  - Continuously variable
- Digital multimeter
  - Uses a digital display
  - Precise values
  - More suitable for computers

Linear Power Supply (LPS)

Schematic of basic AC-to-DC power supply, showing (from L-R) transformer, full-wave bridge rectifier, filter capacitor and resistor load
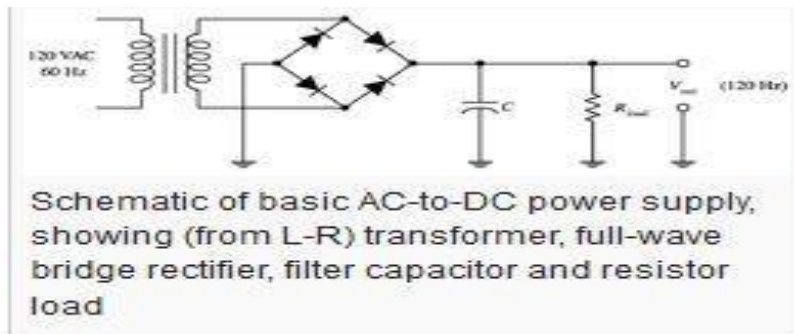
Switch Mode Power Supply (SMPS)
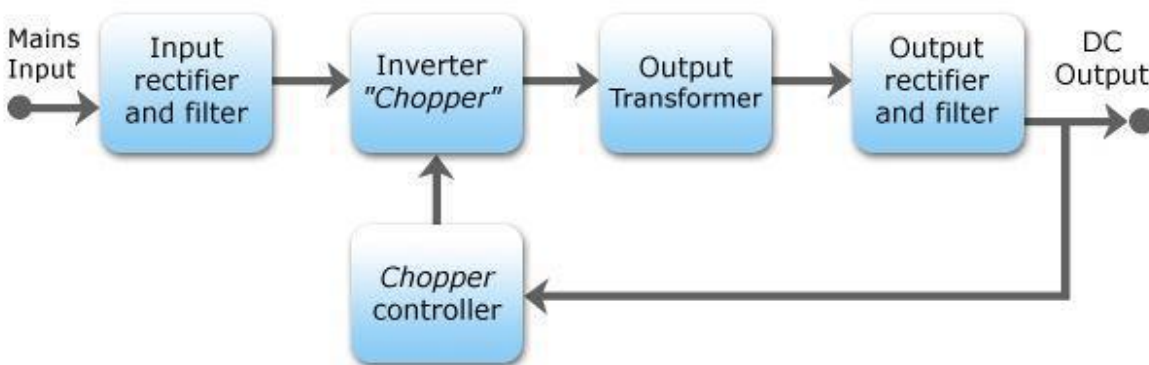
Power Supply System Failure Symptoms

- Fan won't spin
- Inconsistent power provided (fan revs and sags)
- System will not boot (appears dead)

Overloaded Power Supply

- Typically overloads at startup
- Problems occur when drives spin up
- System may spontaneously reboot when multiple drives are accessed

Testing a Power Supply

- Check voltage on the Power Good pin
- ✓ AT: Pin 1 on P8 (orange wire)
- ✓ ATX: Pin 8 (gray wire)
- Use back-probing
- Range should be +3v to +6v

Surge Suppressor

- ✓ No backup power
- ✓ Protects from damage due to spikes
- ✓ Does not protect from damage due to sags

Standby UPS

- Serves as surge suppressor
- Switches to battery backup when needed

Standby power supply:- is known as an offline device: it functions only when normal power is disrupted. And when disruptions occur there is a switching circuit's process. A standby power supply (SPS) is equipped with a backup battery to supply power when the incoming voltage drops below the normal level. The battery is on standby during the normal operation of the unit.

Computer monitor

A computer monitor or a computer display is an electronic visual display for computers. A monitor usually comprises the display device, circuitry, casing, and power supply. The display device in modern monitors is typically a thin film transistor liquid crystal display (TFT-LCD) or a flat panel LED display, while older monitors used a cathode ray tubes (CRT). It can be connected to the computer via VGA, DVI, HDMI, Display Port, Thunderbolt, LVDS (Low-voltage differential signaling) or other proprietary connectors and signals.

Originally, computer monitors were used for data processing while television receivers were used for entertainment. From the 1980s onwards, computers (and their monitors) have been used for both data processing and entertainment, while televisions have implemented some computer functionality. The common aspect ratio of televisions, and computer monitors, has changed from 4:3 to 16:10, to 16:9.

Cathode ray tube

The cathode ray tube (CRT) is a vacuum tube containing one or more electron guns, and a phosphorescent screen used to view images.[1] It has a means to accelerate and deflect the electron beam(s) onto the screen to create the images. The images may represent electrical waveforms (oscilloscope), pictures (television, computer monitor), radar targets or others. CRTs have also been used as memory devices, in which case the visible light emitted from the fluorescent material (if any) is not intended to have significant meaning to a visual observer (though the visible pattern on the tube face may cryptically represent the stored data).

Cutaway rendering of a color CRT:
1. Three electron emitters (for red, green, and blue phosphor dots)
2. Electron beams
3. Focusing coils
4. Deflection coils
5. Anode (collector)
6. Mask for separating beams for red, green, and blue part of displayed image
7. Phosphor layer with red, green, and blue zones
8. Close-up of the phosphor-coated inner side of the screen

Liquid-crystal display

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly.

LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Reflective twisted nematic liquid crystal display.

1. Polarizing filter film with a vertical axis to polarize light as it enters.

Compiled By Eng. Abel (07247119)

2. Glass substrate with ITO electrodes. The shapes of these electrodes will determine the shapes that will appear when the LCD is turned ON. Vertical ridges etched on the surface are smooth.
3. Twisted nematic liquid crystal.
4. Glass substrate with common electrode film (ITO) with horizontal ridges to line up with the horizontal filter.
5. Polarizing filter film with a horizontal axis to block/pass light.
6. Reflective surface to send light back to viewer. (In a backlit LCD, this layer is replaced with a light source.)

Organic Light Emitting Diode (OLED)

Prototype OLED lighting panels
Demonstration of a flexible OLED device
An organic light-emitting diode (OLED) is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound that emits light in response to an electric current. This layer of organic semiconductor is situated between two electrodes; typically, at least one of these electrodes is transparent. OLEDs are used to create digital displays in devices such as television screens, computer monitors, portable systems such as mobile phones, handheld game consoles and PDAs. A major area of research is the development of white OLED devices for use in solid-state lighting applications.

The factors we need to see when we are buying a Monitor are:

- Viewable image size
- Resolution
- Image brightness and contrast
- Power management and safety certification
- Vertical and horizontal frequencies
- Picture controls
- Environmental issues (lighting, size, weight)

Video Adapter Components

- Video BIOS
- Video processor/ video accelerator
- Video memory
- DAC
- Bus connector
- Video driver

Monitor Failure Symptoms

- There is no picture.
- Mixture of colors.
- Led of the monitor not turning on.
- Not enough brightness and contrast even when you change it.

Motherboard

It is a printed circuit board, on which multiple chips, ports (plug INS), and other electronic components are mounted. In the PC, data are exchanged continuously between these components. Therefore it is important to understand each component, its connections and characteristics. All data exchange is done on the system board, which thus is the most important component in the PC.
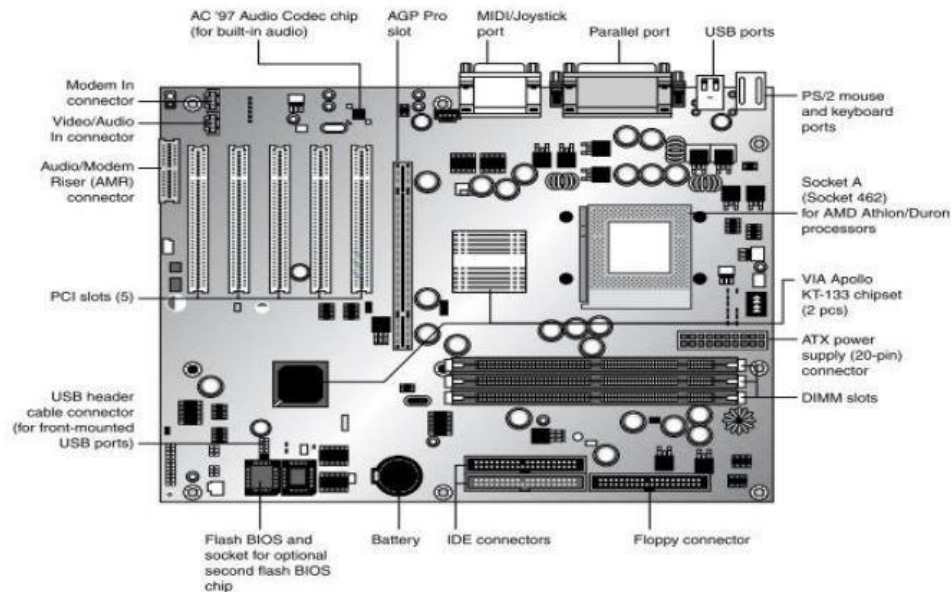
Several common form factors are used for pc motherboards. The **form factor** refers to the physical dimensions and size of the board and dictates what type of case the board will fit into. Some are true standards(meaning that all boards with that form factor are interchangeable) whereas others are not standardized enough to allow for true interchangeability.

The most common pc motherboard form factor includes the following

Obsolete Form Factors	Modern Form Factors	All Others
■ Baby-AT	■ ATX	■ Proprietary Designs (certain Compaq, Packard Bell, Hewlett-Packard, notebook/ portable systems, and so on)
■ Full-size AT	■ Micro-ATX	
■ LPX (semiproprietary)	■ Flex-ATX	
	■ NLX	
	■ WTX (no longer in production)	

Motherboard components:-Most modern motherboard has at least the following components on them,

- Processor sockets/slot
- Chipsets(north/south bridge or memory and i/o controller hubs)
- Super i/o chip
- Rom Bios (flash rom/firm ware hub)
- SIMM-DIMM-RIMM memory slots
- ISA-AGP-PCI EXPANTION SLOTS
- CPU VOLTAGE REGULATER AND BATTERY

CHIPSETS

- Chip sets are like nervous system in human beings and MOBO as a skeleton while processors as a brain.
- It is the data path way that all I/O and other devices have to pass their messages through.
- IC's that allow PC components to communicate with each other.
- The chip set is very important to the modern PC and its performance. Many technologies meet on the motherboard and are "glued" together via these controllers, which we call the "chip set".
- Chip sets are integrated in MOBO.
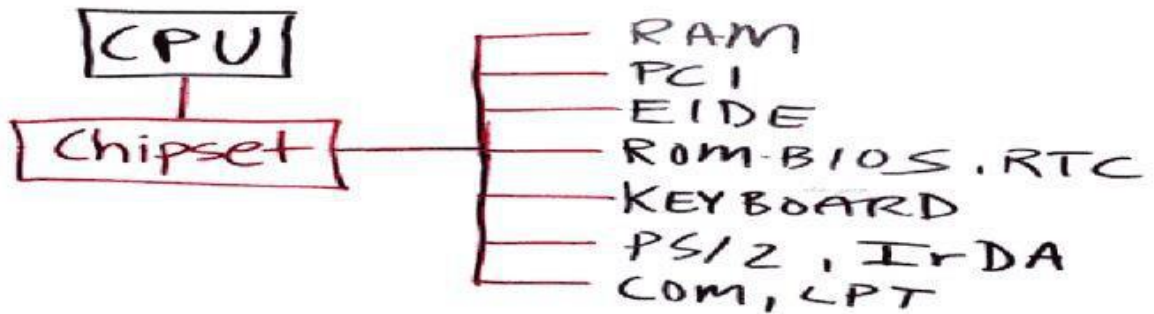
CHIPSET MANUFACTURERS:-

- Intel chipsets: currently owns the vast majority of the chipset markets.

1. Northbridge so named b/c it is connected b/n the high speed processor bus(400/266/mhz) and slower AGP (533/266/66MHZ).

2. Southbridge is so named it is the bridge between PCI bus(66/33MHZ)& even slower ISA bus(8MHZ).

Example:- Intel North/south bridge chipsets with part number 815 & 810 and their features.

- 66/100/133MHz system bus
- 266MB/sec hub interface
- ATA-100 (815E/EP) or ATA-66 (815)
- PC100 or PC133 CL-2 SDRAM
- Up to 512MB RAM
- Integrated Audio-Codec 97 (AC97) controller
- Low-power sleep modes
- RNG for stronger security products
- One (815) or two (815E/EP) integrated USB controllers with either two or four ports, respectively
- LPC bus for Super I/O and Firmware Hub (ROM BIOS) connection
- Elimination of ISA Bus

- AMD chipsets:
- VIA chipsets:
- Apollo chipsets:
- Acer lab chipsets:

Compiled By Eng. Abel (07247119)

- SIS(silicon integrated system):one of the three non inter manufacturer eg.SIS540 a single chipset that combines north/south bridge as well as video and networking all in one chip.
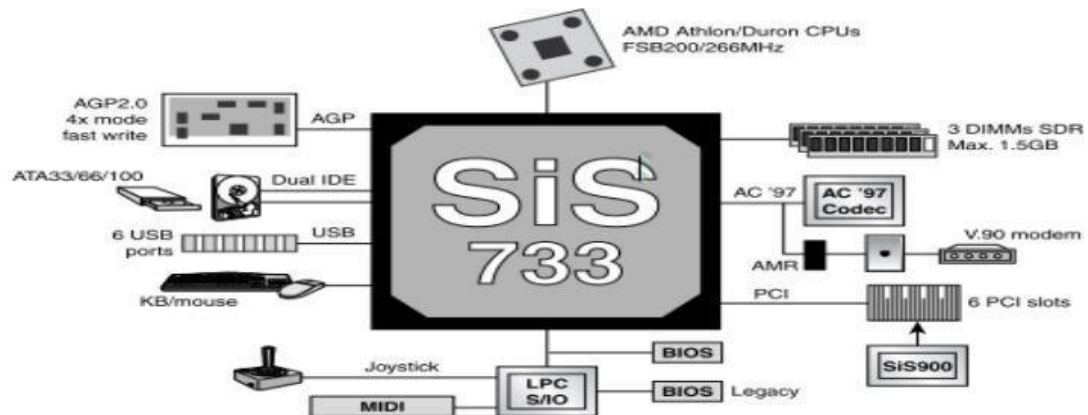
Types of I/O buses (Expansion Slots)

The main difference among the buses consist primarily of the amount of data they can transfer at one time and the speeds at which they can do it.

1. The ISA bus (8 bit bus with 4.4 inches size). (General purpose slot, slow with 12 bit and 8MHZ speed)

2. The PCI (peripheral component interconnector) bus:- for NiC cards, Sound Cards, Port Cards... etc.

3. AGP (advanced graphical port) bus:-created by Intel designed for high performance graphics and video support. AGP is having double data transmission rate comparing to PCI (256MB/sec).

4. PCI Extended. this is the newest technology available in today's market designed for almost all types of peripherals.eg. Video card, TV card, NIC......etc.

Bandwidth is the amount of date transmitted per second (MB/sec)

Eg. PCI =32bus width, 33bus speed, data cycles 1. Then

Bandwidth =Bus width/bytes (8bits)*bus speed=32/8bits*33=132MB/sec

Compiled By Eng. Abel (07247119)
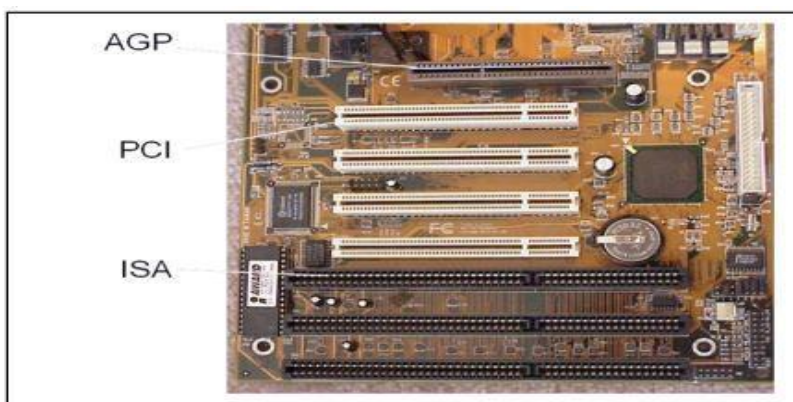
BIOS Setup Basics:- Bios stands for Basic input and output System(Basic inputs-(keyboard, mouse, USB, VGA port…etc.).BIOS is really the link between hardware and software in a system. Most people know the term bios by another name DEVICE DRIVERs or Drivers. But bios is the term that describes all the drivers in a system working together to act as interface between the hard ware and operating system.

Where is the BIOS Stored?

The bios in pc comes from three possible sources:

1. Motherboard ROM

2. Adapter card ROM (such as found in video card)

3. Loaded in to RAM from disk (device drivers)

Since BIOS is stored in ROM(read only memory) So we mean that we don't change the program of the

BIOS, but be careful that we off course change certain setting for the BIOS that is designed for.

Example:-

- You can change the boot order, Time and Date, but you can't save it on BIOS. Because we know that BIOS program is hard coded. So with in BIOS there is CMOS called (Complimentary Metal Oxide Semiconductor) which is a portion of memory that saves certain information even when the power is absent, because there is a small battery attached to the CMOS.
- AMIBIOS (AMI stands for American Megatrend Incorporated) Chip on board.
- Bios can be replaced. This chip can be removed if it is not working by a special tool called IC puller. So whenever you made changes on the BIOS it will automatically be saved on CMOS found beside BIOS.
- CMOS is placed or mounted/integrated with in the BIOS chips on some computers where as other CMOS are found beside the BIOS chips. The problem is it has no clear position and common color to identify.

CMOS Battery:-

- It is a rechargeable lithium battery mostly 3.3V that always fetches to CMOS and keeps save the BIOS configuration changes and other date and time settings.
- CMOS battery is long life battery. It keeps the CMOS long time unless the battery is short life for same reasons.
- CMOS configuration mismatch is another problem that always occur that tells the cmos setting have been corrupted, it might be because of power surgeon or electric charges disturbs the settings. So at this time the only thing you should do is just unplug the CMOS battery and insert it again after certain seconds.

  HOW DO YOU KNOW THAT THE CMOS BATTERY IS WORKING PROPERLY OR DIED?
- Computer date and time may always get wrong or gets late rather than the current date. Example: the right date of the current date cab be 8/12/2012 but the result caused due to a CMOS battery Died cab be 9/12/1981 or other.

Compiled By Eng. Abel (07247119)

- The motherboard will normally outlast the CMOS battery. so the motherboard usually becomes absolute before the battery died.

Troubleshooting References:-

Since same batteries may not work, because of environmental and other reasons that makes it corrosion.

- so the only solution that you should do is remove the battery and clean or rube the battery,
- other wise you check the battery by voltmeter
- Or check whether it is installed properly, or check for the chips found pushing the battery to keep if fine, and finally check if there is a good contacts.

Conclusion:-

- So BIOS provides drivers for elementary hard wares.
- Responsible for managing the POST (power on self test).
- BIOS is also responsible for Boot process
- BIOS will look automatically for master boot record on a disk(MBR) that holds the OS
- And technically it will also look the NTLoader in side the OS (NTLDR) which holds instructions how the operating system will boot.
- BIOS are also responsible for identifying ERRORS. Means Example: - unplug your keyboard or your mouse and turn on your computer then the BIOS will automatically tell that keyboard errors or keyboard is not detected and adds press any key to continue.
- Primary reason why very old pc's can not see large new drives is because they requires a Bios update for motherboard or add-on BIOS utility from drive maker.

The boot process

- The last step in the PC start-up is reading the operating system. The start-up program is instructed to find the Master boot sector.
- The boot sector is the very first sector on either hard disk (C) or floppy drive A. By default, the PC will look for a boot sector in floppy drive A.
- That is why the PC "drops dead" if there is a different diskette in A drive.
- If there is no diskette in A drive, the start-up program will search for the boot sector on hard drive C. When the boot sector is found, a small program segment (boot-strap) is read from there. The boot-strap then takes over control of the PC. The start-up program has done its job. Now DOS, Windows, or another operating system takes control.
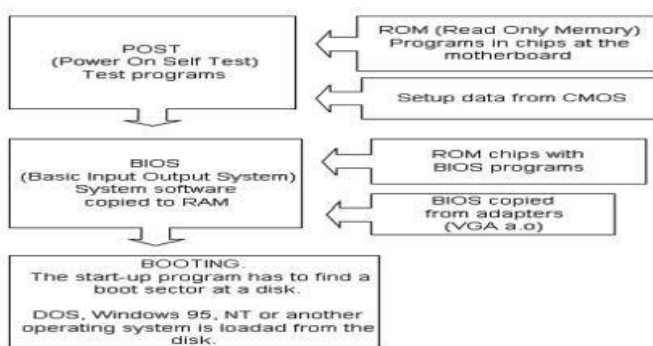
ROM

It is a type of memory that can permanently or semi permanently hold date.it is called read only because it is impossible to write. Post is the first instruction to be executed when the computer is turned on to test your computer processor, memory, chipset, video adapter, disk controller, keyboard and other crucial components.

Types of ROM chip:-

1. Rom (read only memory)

2. Prom (programmable ROM): a type of ROM which are always blank and are programmed later with whatever data u want.

3. Eprom (erasable prom):-an eprom chip can be easily recognized by the clear quartz crystal window set in the chip package directly over the die.

4. An EPROM showing the quartz window for ultraviolet eraser.

5. EEPROM (Electrical Eprom also called flash ROM) /FLASH ROM:- A newer type of ROM is eeprom. these chips are also called flash ROMs and are characterized by their capability to be erased and reprogrammed directly in the circuit board they are installed in, with no special equipment requidred.by using an EEPROM, or flash ROM, you can erase and reprogram the motherboard ROM in a pc without removing the chip from the system or even opening up the system chassis! EEPROM or flash rom can be identified by a 28xxxx or 29xxxx part number as well as by the absence of windows on the chip. here u don't need uv eraser or device programmer to program or erase chips. you can easily upgrade the motherboard tom without having to swap chips. you just download the updated rom from mobo manufacturers web site and then run a special program it provides to update the ROM.(http/www.fastchip.com) or super chip (http/www.superchips.com).

ROM BIOS CHIP MANUFACTURERS:-

1. **AMI** (AMERICAN MEGATREND INC.). This is currently the most popular BIOS in Systems. Newer version of the AMI BIOS are called Hi-Flix because of the high flexibility found in the BIOS config program. During power up, the BIOS ID string is displayed on the lower left of the screen. The string tells you valuable information about which BIOS version you have and about certain setting that are determined.

2. PHOENIX TECHNOLOGY

3. AWARD SOFTWARE (now owned by phoenix). The award BIOS has all the features you expect including a built in setup program activated by pressing CTR+ALT+ESC or a particular key on start up (usually prompted on screen).

The major vendors have standardized on the following keystrokes to enter the BIOS Setup:

- For AMI BIOS, press Del during POST.
- For Phoenix BIOS, press F2 during POST.
- For Award BIOS, press Del or Ctrl+Alt+Esc during POST.

Compiled By Eng. Abel (07247119)

- For Microid Research BIOS, press Esc during POST.

These three passwords are as follows:

- **Power-on password (POP)—** Protects the system from being powered on by an unauthorized user. The POP must be entered before an operating system will boot. The POP resides in the CMOS RAM on the motherboard. If it's lost, the POP can be cleared through a relatively simple procedure. If it's lost, the POP can be erased in most systems by setting a password -clear jumper (located normally on the motherboard) or by removing the CMOS battery.

- **Hard disk password (HDP)—** Protects the information on your drive from access by an unauthorized user. If you set an HDP, others cannot access the data on your hard disk without knowing the password, even if the drive is installed in another system. The HDP resides on the hard disk, in an area inaccessible by the user and the system, and it cannot be accessed or reset if lost.

- **Supervisor password (SVP)—** Protects the information stored in the BIOS Setup. The SVP must be entered in order to get access to the BIOS Setup and make changes to configuration settings. The SVP is stored on the motherboard in a specialized type of memory and cannot be accessed or reset if lost.

Troubleshooting Motherboards:-

- ✓ Dead Motherboard:
- Correct CPU installed?
- Correct type of RAM?
- Power supply working?
- Video card installed?
- Power turned on?

- ✓ Beeping
- RAM, CPU, video card:
- Installed correctly?
- Appropriate for this motherboard?
- Malfunctioning?
- Look up beep code in BIOS reference

- ✓ Dead Battery
- Real-time clock is losing time
- PC forgets its configuration settings when powered off

- ✓ Dead built-in components
- ✓ Malfunctioning expansion slots
- ✓ Broken connection (poor soldering)
- ✓ Short circuiting

Compiled By Eng. Abel (07247119)

Central Processing Unit (CPU)

The microprocessor—or commonly, the CPU or just processor—is the brain of a computer. It performs many calculations behind the scenes, ultimately allowing you to complete tasks as trivial as composing an e-mail to tasks as intensive as data analysis and modeling. Processors are encountered in many forms of consumer electronics. Most familiar to many are notebook and desktop computers as well as mobile devices such as smartphones and tablets. Though the processor is just one of the many physical components that comprise these products, it is arguably the most central to determining their overall "usefulness" into the future as software requirements become increasingly demanding.

COMPANIES:- The processors are divided by the companies making the processors (Intel and AMD) then within those companies, a general ranking and purpose is offered for the kinds of processors each is offering. That is, some will be far better suited for doing advanced tasks such as data/statistical analysis, modelling, and multimedia creation where at the other extreme (toward the bottom of the Intel and AMD charts below), these products will not be able to handle much more than web browsing and e-mail. In between those extremes are processors that can usually handle a little bit from the top and bottom ends of the spectrum. The kind of performance implied by these processors is typically enough and recommended for most users; e.g. the Core i3 or i5 processors on the Intel side or the Phenom II or A - series from AMD's offerings.

1.1-INTEL:- Intel's processors generally offer the best performance for all-around usage.

Processor Comparison Table:-

INTEL	Number of Cores	Notable Features
1.1 Pentium III & Pentium 4	1	Pentium 4: mostly 32-bit later versions 64-bit, w/Hyper- Threading
1.2 Core Solo/Core Duo/Centrino & Celeron (Pre-2010)-	1,2	32-bit
1.3 Core 2 Duo & Core 2 Quad	2,4	64-bit
1.4 Atom	1,2	(1)Hyper-Threading (2)64-bit
1.5 Celeron(Post2010)	2 (("Sandy Bridge"))	64-bit
1.6 Pentium (Post-2009)	2	Hyper-Threading (however, most currently do not support this feature)
Intel Core i3	1,2,	Intel HD graphics3000,64bit,Tri-gate 3d transistors
Intel Core i5	2,4	Hyper Threading,Turbo Bust,Intel HD graphics3000,64bit,Tri-gate 3d
Intel Core I7	2,4,6	(1)Hyper-Threading-(2)TurboBoost-(3)QuickPathInterConnect (4)Tri-Gate(3D)Transistors-(5)IntelHDGraphics-(6) 64-bit

This has been especially the case the last several years with the introduction and evolution of Intel's Core series product line. Currently, Intel's flagship consumer product line consists of mobile and desktop-grade Core i3, Core i5 and Core i7 processors.

1.2-AMD (Advanced Micro Device):-

AMD	Number of Cores	Notable Features
Athlon (Classic)	1,2	32-bit or 64-bit
Phenom	2,3,4	(1) HyperTransport (2) AMD PowerNow! (Cool'n'Quiet) (3) AMD CoolCore!
Sempron	1,2	(1) HyperTransport (2) 64-bit
Turion II	1,2	(1) HyperTransport (2) 64-bit
Athlon II	2, 3, 4	(1) AMD Virtualization (2) AMD PowerNow! (Cool'n'Quiet) (3) AMD CoolCore!
Phenom II	2, 3, 4, 6	(1) HyperTransport™ (2) Integrated DRAM Controller with AMD Memory Optimizer (3) AMD Turbo CORE (4) AMD PowerNow! (Cool'n'Quiet) (5) AMD CoolCore!
A-Series (Fusion	A4: 2 ,A6, A8: 4	DirectX II Capable Graphics
FX	4,6,8	(1) HyperTransport (2) Integrated DRAM Controller with AMD Memory Optimizer (2) AMD Turbo CORE (3) AMD Virtualization (4) AMD PowerNow! (Cool'n'Quiet)

- Single-core CPU: One core inside a single CPU chip that handles all the processing capability. A motherboard manufacturer may provide sockets for more than a single processor, providing the ability to build a powerful multiprocessor computer.
- Dual-core CPU: Two cores inside a single CPU chip, in which both cores can process information at the same time.

1.2-ARM:-

ARM is well-known for the design of mobile, power-efficient processor designs. ARM processors are sometimes called as SOC(System on Chip) means merge many of the essential components of a computer (such as the CPU, RAM, ROM etc.) on a single chip which allows devices that utilize them to be lightweight and compact. some of the companies that use this processors are Apple's iPhone and iPad or Samsung's series of Galaxy phones, Nvidia ASUS Eee Pad Transformer, Samsung Galaxy Tab 10.1, Motorola Xoom, Dell Streak 7 & Pro, Sony Tablet S and others.

Q: What is the difference between a 32-bit and 64-bit processor?

From a practical standpoint, the true difference at hand is the ability to run a 32-bit operating system (OS) versus a 64-bit OS and their subsequent applications. Technically, 64-bit allows the processor to address larger chunks of data from physical memory (RAM) than their 32-bit counterparts. Hence, while the maximum amount of RAM for a 32-bit system is 4GB, for a 64-bit system there is no practical limit except where artificially imposed by a specific version of an OS or system manufacturer—for example, Windows 7 Home Edition allows for up to 16GB of RAM where Professional and Ultimate allows up to 192GB. The benefit of 64-bit arises in dealing with the increasing sophistication of applications as well as working with and processing large files with greater efficiency. Most modern CPUs such as any of Intel's iX series are 64-bit and virtually any new configuration of a machine with these processors include a 64-bit OS. It is important to note that while 64-bit CPUs can typically run 32-bit applications, the reverse is not true.

Q: How do I know my computer is 32 or 64 bit capable processor?

To run a 64-bit version of Windows, your computer must have a 64-bit-capable processor. To find out if your processor is 64-bit-capable, do the following 1. Open Performance Information and Tools by clicking the Start button clicking Control Panel, clicking System and Maintenance, and then clicking Performance Information and Tools. 2.Click View and print details 3. In the System section, you can see what type of operating system you're currently running under System type. Under 64-bit capable, you can see whether you can run a 64-bit version of Windows. (If your computer is already running a 64-bit version of Windows, you won't see the 64-bit capable listing.)

Processor Speed:-

• Speed is controlled by an external clock on the motherboard, not the microprocessor.

• Speed is determined by the frequency of the clock signal I.e. the number of ticks per second, and is measured in Megahertz (MHz) or Gigahertz (GHz)

• Currently there are speeds of 3.8 GHz (3800 MHz)

• Multiplier factor by which the bus speed is multiplied to get the CPU clock speed.

Core Voltage:-

- Voltage that the CPU requires to operate
- Ranges from approximately +1.5 to + 5v
- Newer CPUs =Lower Voltages
- Motherboard must provide correct Voltage

Cache Memory:-

This type of memory is found inside a processor to improve performance by buffering transfers between the processor and relatively slow main memory. There may be 2 or 3 cache layers inside a processor. the size of a catch memory differs from processor to processor. the maximum size for a catch memory reaches upto 2GB.
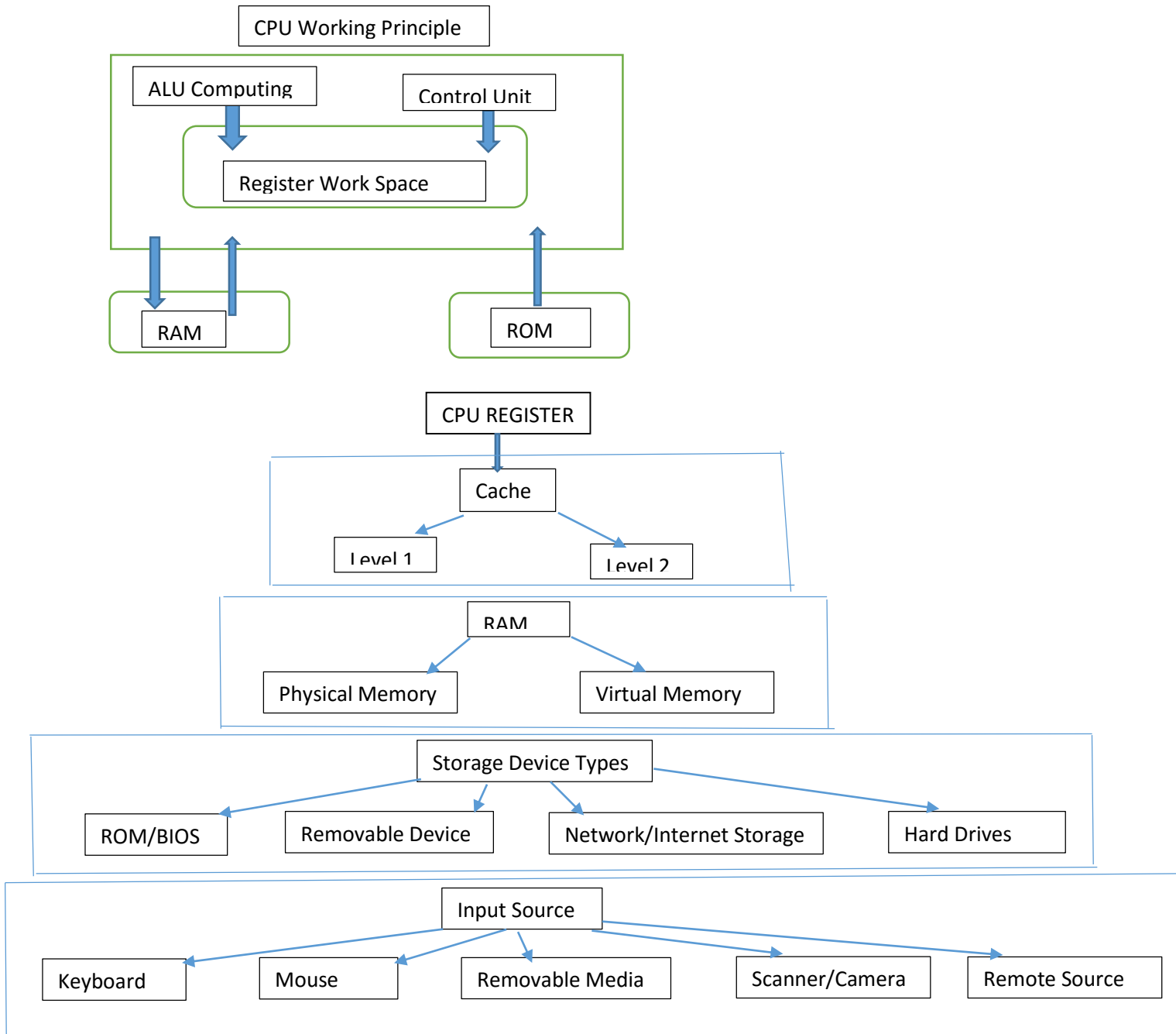
Compiled By Eng. Abel (07247119)

Computer Maintenance

L1 cache

- Front-side cache
- Holds data waiting to enter the CPU
- Built into the CPU on modern systems

L2 cache

- Back-side cache
- Holds data exiting the CPU
- Built into the CPU packaging, but on a separate chip

```
CPU Working Principle
  ┌─────────────────────────────────────────┐
  │  ALU Computing          Control Unit     │
  │         │                    │           │
  │         ▼                    ▼           │
  │     ┌──────────────────────────────┐     │
  │     │    Register Work Space        │     │
  │     └──────────────────────────────┘     │
  │     │    ▲                  ▲             │
  └─────┼────┼──────────────────┼────────────┘
        ▼    │                  │
      ┌──────────┐          ┌──────────┐
      │  RAM     │          │  ROM     │
      └──────────┘          └──────────┘
```

CPU REGISTER
→ Cache
  → Level 1
  → Level 2

RAM
→ Physical Memory
→ Virtual Memory

Storage Device Types
→ ROM/BIOS
→ Removable Device
→ Network/Internet Storage
→ Hard Drives

Input Source
→ Keyboard
→ Mouse
→ Removable Media
→ Scanner/Camera
→ Remote Source

Compiled By Eng. Abel (07247119)

Troubleshooting the CPU:-

- Whether a complete failure or an intermittent problem, CPUs rarely fail.
- However, if it does fail, it is most commonly as a result of some sort of electrical anomaly such as a power surge, brown out or spilling a liquid on it and causing a short.
- A processor in a system with a high-quality motherboard and power supply that is protected by a UPS or a good surge protector is likely to outlast the useful life of the system.
- If your system slows down for no apparent reason or hangs completely, particularly in a warm environment or when the processor is working hard, it's quite possible that overheating is responsible.
- Here are the most important steps you can take to avoid overheating:
- ✓ Keep an eye on processor temperature
- ✓ Keep the system clean
- ✓ Use a good CPU cooler
- ✓ Install supplemental case fans
- ✓ Upgrade the case.
- ✓ Position the system properly
- A faulty CPU, Memory or Motherboard may be impossible to distinguish. They each can cause some of the same symptoms.
- In most cases, the only way to know for sure if a CPU is causing a problem is to replace it with one known to be working.

Processor Upgrade Considerations:-

- Processor Socket Type
- Motherboard model and revision level
- Before you begin an upgrade, verify the compatibility of your motherboard with the upgrade processor you are considering.
- BIOS:- Install the BIOS update before you remove the old processor. Otherwise, you may not be able to install the BIOS update because the new processor won't boot with the older BIOS.
- CPU Cooler
- Memory
- Power Supply:- Faster processors usually consume more power, so it's quite possible that installing a faster processor will also require installing a higher-capacity power supply.

Processor Failure Symptoms:-

- Nothing happens when u turn on your pc. You do hear the fun running may be.
- The Pc freezes randomly
- The Pc randomly shuts up.
- Stacks randomly while it is working.
- Beep codes (it differs from BIOS manufacturers).

When Buying CPU you should consider the:- Clock speed, Core and Cache Memory.

NB. The fastest laptop is never as fast as the fastest desktop. The problem is one of power.

Compiled By Eng. Abel (07247119)

Computer Memory

Memory is technically any form of electronic storage, it is used most often to identify fast, temporary forms of storage as well as permanent storage. In other words we are saying computer memory is the workspace for the computer process.

RAM (Random Access Memory)

If your computer's CPU had to constantly access the hard drive to retrieve every piece of data it needs, it would operate very slowly. When the information is kept in memory (RAM), the CPU can access it much more quickly. Most forms of memory are intended to store data temporarily.

What is a Stick of RAM?

Stick: A SIMM or DIMM that holds a group of chips.
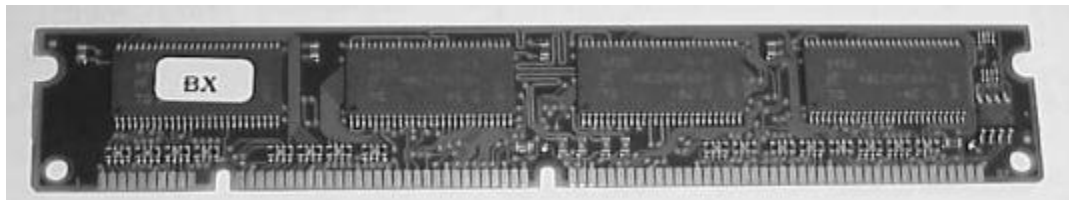
Memory Modules:-

- Single Inline Memory Modules (SIMMs)
  - ✓ 30-pin (8-bit)
  - ✓ 72-pin (32-bit)
  - ✓ Both are now obsolete

- Dual Inline Memory Modules (DIMMs)
  - ✓ ▯ 168-pin (64-bit)
  - ✓ ▯ SDRAM synchronized with system bus
  - ✓ ▯ DDR SDRAM is double the system bus speed

- Rambus Inline Memory Modules (RIMMs)
  - ✓ 184-pin (64-bit)
  - ✓ Faster than DIMMs
  - ✓ Up to 8X or more of the system bus speed
  - ✓ More expensive, less popular
  - ✓ Waning in popularity

Different kinds of RAM:-
SDRAM

SDRAM is short for synchronous DRAM, a type of DRAM that runs in synchronization with the memory bus. SDRAM delivers information in very high-speed bursts using a high-speed,

clocked interface. SDRAM removes most of the latency involved in asynchronous DRAM because the signals are already in synchronization with the motherboard clock.

DDR SDRAM

Double data rate (DDR) SDRAM memory is an evolutionary design of standard SDRAM in which data is transferred twice as quickly. Instead of doubling the actual clock rate, DDR memory achieves the doubling in performance by transferring data twice per transfer cycle: once at the leading (falling) edge and once at the trailing (rising) edge of the cycle. For laptop and portable systems, DDR SDRAM uses either 200-pin SO-DIMMs or 172-pin Micro-DIMMs.

DDR2 SDRAM

is simply a faster version of conventional DDR-SDRAM memory. It achieves higher throughput by using differential pairs of signal wires to allow faster signaling without noise and interference problems. The original DDR specification tops out at 400MHz to 533MHz, whereas DDR2 starts at 400MHz and will go up to 800MHz and beyond.

DDR3 SDRAM

The fastest technology. Mounted in laptops as well as in Desktop computers with 800-1550MHz speed.

VIRTUAL MEMORY

Most modern operating systems employ a method of extending RAM capacity, known as "virtual memory". A portion of the computer's hard drive is set aside for a paging file or a scratch partition, and the combination of physical RAM and the paging file form the system's total memory. (For example, if a computer has 2 GB of RAM and a 1 GB page file, the operating system has 3 GB total memory available to it.) When the system runs low on physical memory, it can "swap" portions of RAM to the paging file to make room for new data, as well as to read previously swapped information back into RAM. Excessive use of this mechanism results in thrashing and generally hampers overall system performance, mainly because hard drives are far slower than RAM.

If you want to see the paging file and the virtual memory of your pc you can follow the steps

- Right click on my computer and click properties
- On the left side of the properties click system protection
- From the tabs above click advanced and under performance click settings
- Again in the coming page click advanced from the tabs and click change
- Then in this page you can uncheck the automatic but be careful when you change the settings here.

TROUBLESHOTING MEMORY

- ✓ Beeping sound
- ✓ Look up Beep code in BIOs reference
- ✓ RAM, CPU, Video card
  - Installed correctly
 - Appropriate for this motherboard
  - Malfunctioning

Hard Disk Drive

It is a magnetic disk, which stores and provides quick access to data on a computer. A hard disk drive facilitates reading and writing of the disk. HDD is the one that is always used to boot up the system, almost all application S/W are loaded and installed in the HDD.

- There are different parts inside a hard disk and these are
  - ✓ The base:- this is the main part that holds every component of the hard disk.
  - ✓ Platters (Cylinders):-this is part of the HDD where your information are stored.
    - Platters are the actual disks inside the drive that store the data.
    - platters are supper smooth metal discs, otherwise the information will not be readable.
    - Platters has also a fine magnetic catching as the data stored there are to be magnetized.
    - The new technology use Glass or Ceramics to use as a platters, this is due to high resistance to heat.
    - The more platters they have the largest capacity they have.
    - so platters are magnetized on both sides, then a drive with two platters has 4 sides to store data.
    - When the hard drives are turned on the platters starts to rotate around. The data on the platters are read through the read/write heads.
      What are inside platters:- the physical disc is again divided in to two smaller compartments that can enable it to store data more effectively.
      - o The disk is first divided in to tracks. Data is stored on both sides of each platters in concentric circles known as tracks.
      - o Each tracks can be divided up in to set of amounts called sectors.
  - ✓ Read/write Head:-the actual read/write head is the mechanism that reads data from or write data to a platter on an HDD.
    - HDDs have many read/write heads, usually two for each platter.
    - The distance between the read/write and the platters is a very small even it can't stop it while it is rotating.
  - ✓ Actuator:- the actuator enables the movement of the read write hear around platters.
    - This movement is enabled by voice coil, which controls the movement of read/write heads inward and outward from the center to the edge of platters, based on the current passes.
    - The actuator arms:- connects the read write heads to the actuator.
    - The actuator moves the actuator arms, which in turn moves the read write heads around platters.
  - ✓ Spindle:- the spindle holds the platters, it rotates rapidly causing the platters to spin in unison at speeds ranging from 5400 revolutions per minute (RPM) to over 10000(RPM).

  Size of a hard disk:- Size of a hard disk is nothing but, the capacity to hold data.it is always measured in Gigabytes.

Example:-Hard disk with 20GB,40GB,120GB,400GB,600GB,Even now days hard disks are measured in Terabytes 2TB, 3TB

We can divide hard disk in to many drives by the process known as Partition.
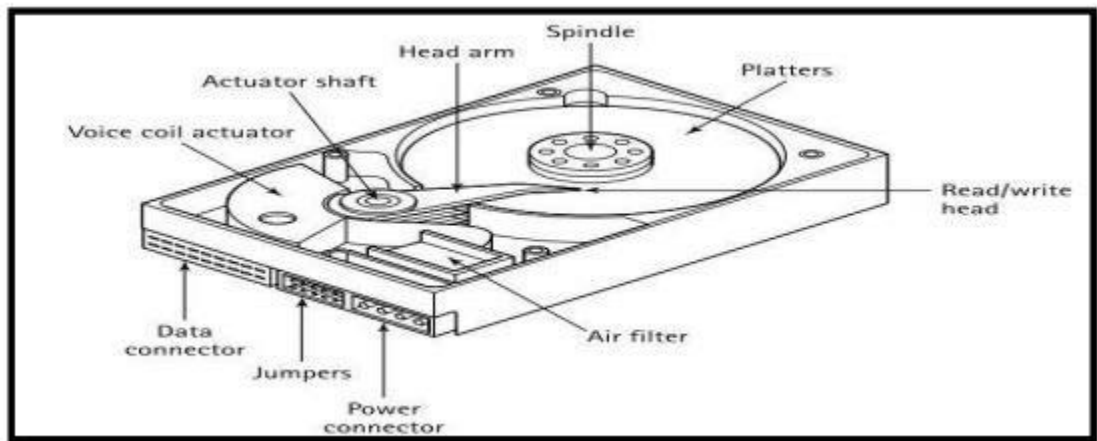

Hard Drives with two interfaces:-

✓ SATA :- New tech, fast, easy to install and don't need jumper.
✓ PATA/IDE:- Old tech, slow, holds much space inside a case, difficult to install and needs jumper settings.

Partition and Drive Letter:-

1. Active Partition:-this is the partition that needs to contain the OS boot files because the BIOS looks to this partition for them. you can, however, designate and partition as the active partition, if it is the wrong one, the computer won't be able to boot from the hard drive. This is Bootable, the only active and must be primary.

2. Basic disk: a physical disk that is accessible by any version of windows.

3. Dynamic disk: a disk used in 2000 or xp that can use special features such as logical disk volumes that span more than one physical disk.

4. Extended partition: a partition that can exist only on a drive containing the master boot record.an extended partition does not get a drive letter.to use an extended partition, you must create one or more logical drives on it. Extended partition can have multiple drive letter.

5. Logical drive: a partition created on an extended partition.logical drive can be assigned a drive letter.

6. Master boot record (MBR): the area on a hard disk that contains boot files, this is the first sector on the disk.

7. Physical disk: a hard drive that you can touch it.

8. Primary Partition: a partition that functions as a physically separate disk. you can create up to four primary partitions on a physical disk that contains the MBR, or three if you create an extended partition also. Primary partition can have only one drive letter.

9. Master boot Record contains information about the physical drive's partitions, written to the first sector of the first cylinder of the firs head and persists no matter what high-level formatting is done to the drive.
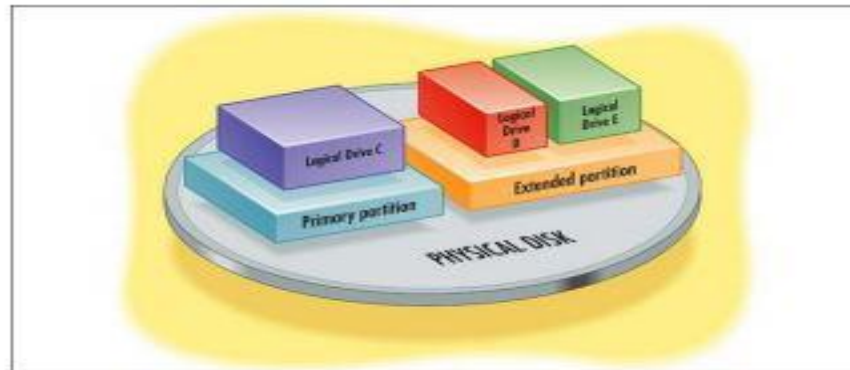
Troubleshooting Hard Drive's (Operating System is Missing):-

One of the most obvious signs of a hard drive problem is an error message early in the boot process saying that the system can't find an OS (Non System Disk or Disk Error,'' or ''ntldr is missing'')

1. Listen for hard drive activity and look at the indicator light on the case. The light should flicker and you should hear some sounds. Buzzing or clicking, however is a possible sign of drive failure.

2. Check the bios to make sure that is recognizes the hard drive. Set the Bios to auto detect the hard drive and to enable S.M.A.R.T drives.

3. Check the power and data cables. Make sure they are plugged in correctly and securely. If the data cable looks damaged, try a replacement cable, try disconnecting the power cable and using another one from the power supply.

4. Check the hard jumpers. Make sure there aren't two slaves, two masters, or a mixture of slave or master and cable select.

5. Remove the hard drive and check it on another computer. Look for the windows folder to make sure it is intact, and scan the drive for viruses.

6. Try a different EIDE device in the same channel to make sure the problems isn't in the motherboard or EIDE controller.

7. If there is another EIDE device on the same channel, disconnect it and boot the computer.one malfunctioning drive can cause the other device to stop working. The system doesn't recognize the full capacity of the Hard Drive. There are a few different reasons why a computer might not make full use of a hard drive. Many BIOS are limited as to the maximum size of a supported partition.in the past the only way to get around these limitations was to partition the drive so that each partition fit in to the size limitation. However today unless the computer is very old, there are more satisfactory way to get around this problem. Enable large drive support in the BIOS, if available. This includes a setting called LBA support.

Other Hard Drive Problems:-Disk too full: whenever a system runs poorly or if you get windows protection errors, check to make sure that at least 10% of the drive is unused. the paging file and other temporary files need this space. if less than 10% of

the disk capacity remains you will have to delete or transfer some data to another location.

Hard Drive Trouble Indicators:-

1. Blue screen of death (BSOD)
2. Beep Code Messages
3. Kick kick sounds
4. No hard drive installed, also hard wares are available.
5. Unclear info. Of drive letter, size, and file system unless u see a word healthy also u could see words like ''Failed'' or ''unreadable'' Hard Drive Crash.

Removable Storage Device

There are different types of removable storage devices, these are only used for data holding devices but not for OS or programs.

USB and Fire wires:- these are external devices used for holding or backing ups and transferring large amount of data. They are called as hot swapping or Plug and Play devices. When we came to speed USB3 is faster than USB2 and USB1.

CD-DVD Drives

Compact disk (CD)(650-700MB size) and Digital versatile Disk(DVD)drives are called optical drives because microscopic pits embedded in to the discs are read by measuring laser light.

1. DVD-R can write to a blank disk once. The discs are compatible with mist dvd players

2. DVD-RW can be written an rewritten to. These discs are compatible with recent dvd players

3. DVD+RW can be written an rewritten to. These can read and write to a DVD-Esthete discs are compatible with recent dvd players

4. DVD-Ram can be written an rewritten .these discs are not compatible with most dvd players

5. DVD-ROM available for commercial programs not to write but to read only. (With 2.6-4.7GB size).

Performing Disk Management Tasks:-

1. Go to control panel
2. Administration tools
3. Computer management
4. Disk management
5. Then shrink for creating new partition from c:/ or other partitions and use extend for merging partitions.
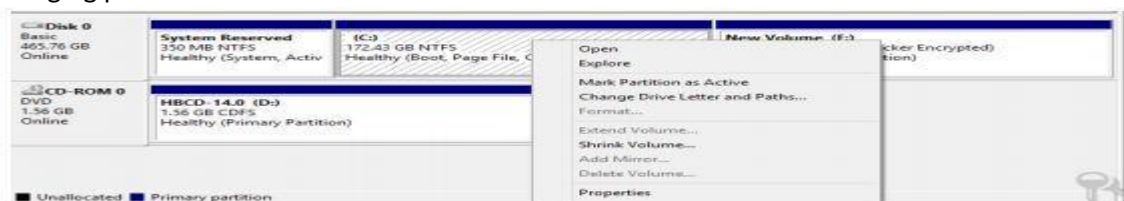
If your computer beeps and fails to boot

On startup, computers perform a Power-on Self Test, commonly referred to as a POST. If problems are found while booting, you can usually diagnose them using the error codes displayed on the screen. However, if nothing displays on the screen, the computer might use sounds (that is, beep codes) to tell you what is wrong. Many of these errors indicate hardware problems that a service technician should fix. However, some errors are easily fixed. For example, keyboard controller errors often mean that your keyboard isn't plugged in.

Following are beep codes for some common brands of BIOS for PCs. For information about Mac beep codes or startup tones, see Apple Support's About Mac computer startup tones.

Note:

Many BIOSs will have different beep codes even if they appear to be from the same manufacturer. This is because motherboard manufacturers reprogram codes to reflect their own customizations. You can often go to the website for the motherboard's manufacturer to find the updated codes, but you may find cases where the manufacturer simply does not document the changes. For more about beeps and error codes, see ComputerHope.com's Computer POST and beep codes.

AMI BIOS computer beep codes 1 Beep Memory refresh timer error. The solution is often replacing the RAM. 2 Beeps Parity error in base memory. This is a problem with the first 64KB memory block in your RAM. The solution is usually to replace the memory. 3 Beeps Base memory read/write test error. Replacing the RAM usually solves this. 4 Beeps Motherboard Timer error. Hardware failure within an expansion card or the motherboard itself could be the cause. 5 Beeps Processor error. A damaged expansion card, the CPU or the motherboard could be at fault. 6 Beeps 8042 Gate A20 test error. Usually an expansion card has failed or the motherboard itself. 7 Beeps General exception error. Usually caused by a faulty expansion card, a motherboard hardware issue, or a damaged CPU. The fix is usually to replace the faulty component. 8 Beeps Error with the display memory. Usually a failed video card causes this error. Replacing the video card fixes this. 9 Beeps AMIBIOS ROM checksum error. This error points to a problem with the BIOS chip on the motherboard itself. This kind of problem is usually fixed by replacing the motherboard. 10 Beeps CMOS shutdown register read/write error. This is usually caused by a hardware issue with the AMI BIOS chip. Replacing the motherboard is usually the way to fix this. 11 Beeps Cache memory test has failed. Your problem is in the Cache Memory chips on the motherboard. Reseat or replace these chips if possible.

Award BIOS computer beep codes 1 Short Beep A single, short beep from an Award BIOS is an indication that your computer has successfully passed the POST test. This is a good sign that all is well. No need to worry about it. 1 Long Beep, 2 Short Beeps This indicates that there has been an error with the video card. Replacing the video card will fix this type of error. 1 Long Beep, 3 Short Beeps One long beep followed by three short beeps means that either the video card isn't installed or the memory on the video card is bad. Reseating or replacing the video card will typically fix this. 1 High Pitched Beep, 1 Low Pitched Beep (Repeatedly) A repeating high pitched / low pitched beep pattern is an indication of some kind of CPU problem. The CPU could be overheating or malfunctioning in some other way. You may have to reseat the CPU because of chip creep. Chip creep is a condition where the CPU is getting warm and cooling and working its way out of its seating. 1 High Pitched Beep (Repeatedly) A single, repeating, high pitched beeping sound means that the CPU is overheating. You'll need to check if the fans are working and that you computer has the proper airflow. In some extreme cases it may be in need of serious cleaning. Note: Turn the computer off immediately to prevent sustaining permanent damage to this component. All Other Computer Beep Codes Any other beep code pattern indicates some kind of memory problem. Replacing the computers RAM will usually fix these problems.

Phoenix BIOS computer beep codes 1 Beep A single, short beep from a Phoenix BIOS is an indication that your computer has successfully passed the POST test. This is a good sign that all is well. No need to worry about it. 1 Long Beep, 2 Short Beeps Checksum error. Indicates that there is a problem with the motherboard. Replacing the motherboard should fix this problem. 1-2-2-3 Beep Code Pattern BIOS ROM checksum error. There is a problem with the BIOS chip on the motherboard. Usually corrected by replacing the motherboard. 1-3-1-1 Beep Code Pattern Indicates a problem testing the DRAM refresh. The culprit could be system memory, an expansion card, or the motherboard. 1-3-1-3 Beep Code Pattern 8742 keyboard controller test has failed. This could mean a problem with the keyboard or a motherboard issue. 1-3-4-1 Beep Code Pattern There is some kind of fault with the RAM. Replacing the RAM usually fixes this problem. 1-3-4-3 Beep Code Pattern Another memory issue. Replacing the RAM is recommended. 1-4-1-1 Beep Code Pattern System memory fault. Replacing the RAM usually fixes this problem. 2-1-2-3 Beep Code Pattern BIOS ROM error, indicates an issue with the BIOS chip on the motherboard. Usually corrected by replacing the motherboard. 2-2-3-1 Beep Code Pattern Problem testing hardware related to IRQs. This could be a hardware or configuration problem with an expansion card or some kind of motherboard failure.