N.S.REDDY

NEO Institute of
Hardware Technology

PC Hardware Maintenance & Troubleshooting

In - Depth

THEORY CONTENTS

PRACTICAL CONTENTS

Definitions

1. What is a Computer?

Computer is an electronic device that can process and stores the information or data.

2. What is Information?

Set of facts about human being or about an object are called as information.

3. What is Data?

Collection of information is called as data.

4. What is Data Storing?

Storing the data means keeping or holding the data in digital format.

5. What is processing?

Performing both logical and arithmetic operations according to user given instructions or user written program or installed software.

6. What is Computer Hardware?

The physical components of a computer system are called as computer hardware.

7. What is software?

Set of instructions or programs which will be used to control the operation of a computer system and to perform tasks are called as Software.

8. What is a Program?

A computer program**,** or just a program, is a sequence of instructions, written to perform a specified task with a computer.

9. What is firmware?

Software permanently stored in hardware (Ex: Software stored in BIOS).

10. What is Peripheral?

Input / Output device like Printer, Scanner, Web Camera etc. Those are not the part of the Computer, they are separate devices, for a specific purpose we are attaching them to Computer

11. What is a Computer system?

Computer with software installed and peripherals connected is called as computer system.

Computer Parts and Peripherals

S	Component /

No	Peripheral	Description
1	**Computer Case / Chassis/ Cabinet**	A computer case (also known as the computer chassis, box or housing) is the enclosure that contains the main components of a computer.
2	**Motherboard / Mainboard / Systemboard**	The main printed circuit board in a computer that carries the system buses. It is equipped with sockets to which all processors, memory modules, plug-in cards, daughter boards, or peripheral devices are connected.
3	**CPU / Processor**	Central Processing Unit / Processor .The brain of the computer - the device capable of performing Arithmetic and Logical operations on data. Or for thinking.
4	**Memory / RAM**	Abbreviation for Random Access Memory. Operating System Software, programs and data are usually copied into RAM from a disk drive for the central processing unit (CPU) to have fast and direct access when needed to perform tasks.
5	**Display / Video / Graphics Adapter**	Display Adapter is an expansion card which generates a feed of output images to a display. It converts digital signals into video signals.
6	**Hard Disk Drive**	A hard disk Drive is a computer storage device that stores data on rotating magnetic surfaces permanently.

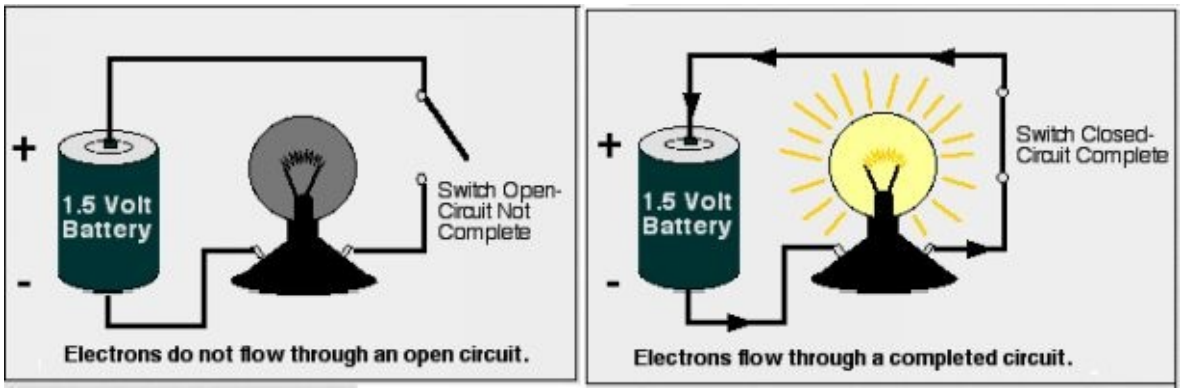
7	**Floppy Disk Drive**	A drive that reads from or writes to separate diskettes which the user inserts. Information is stored on the diskettes themselves.
8	**Optical Disc Drive (ODD)**	An optical disk drive is a storage device that uses light or lasers to store or retrieve information. Common types include CD or DVD drives.
9	**Sound Card / Audio Adapter**	A sound card is an internal computer expansion card that facilitates the input and output of audio signals to and from a computer under control of computer programs.
10	**LAN / Ethernet Adapter**	The Ethernet card provides a standardized way of connecting computers together to create a network.
11	**MODEM (Modulator and Demodulator)**	A device that allows two computers to communicate over telephone lines. It converts digital computer signals into analog and converts the analog signal back into a digital format.
12	**TV / FM Card**	A TV tuner card is hardware that allows analogue or digital broadcast television signals to be received and converted or translated for display by a computer.
13	**Monitor**	The monitor displays the video and graphics information generated by the computer through the video card. Monitors are very similar to televisions with high resolution.

14	**Keyboard**	The keyboard is an input device designed to enter text, characters and other commands into a computer or similar device.
15	**Mouse**	The mouse is a part of a computer which provides the major way of interacting with graphical user interfaces on a computer.
16	**Printer**	A computer printer is a computer peripheral device that produces a hard copy (permanent human-readable text and/or graphics, usually on paper) from data stored in a computer connected to it.
17	**Scanner**	A device that reads a printed page and converts it into a graphics image (Soft Copy) for the computer.
18	**Web Cam**	Used to capture images and videos and transfer them over Web or Internet
19	**Microphone**	A microphone, sometimes called a Mic (pronounced “mike”), is a device that converts sound into an electrical signal.
20	**Speakers**	You need speakers to hear the sound generated by a sound card. You should buy speakers with a built-in amplifier to strengthen the sound signal and improve the performance.

21	**Thumb Drive / Pen Drive / USB Flash Drive**	A USB Flash Drive is used as a small, lightweight, removable data storage device. This hot-swappable, non-volatile.

Power Supplies

Current : Flow of electric Charge or Flow of electricity or flow of electrons (negative charged particles) through a conductor or wire.

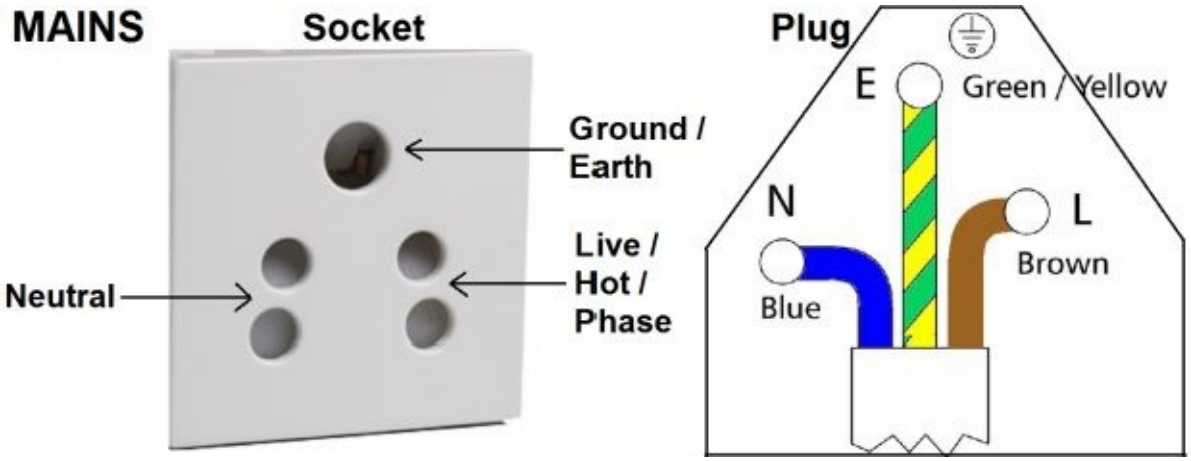


AC : Alternating Current **(~)**: Flow of Electrons direction will be changed alternatively (OR) Polarity will be changed alternatively.

DC : Direct Current **(⎓)**: Always Electrons will be flow in only one direction. (OR)

polarity will not be changed.

AC Sources: 1. Mains, 2. Output from Stabilizer, UPS and Inverter, 3. Generator etc



DC Sources: 1. Cells, 2. Batteries, 3. AC / DC Adapters 4. Dynamos etc.

Voltage : An electromotive force or potential difference between two points on a circuit

Note: INDIAN VOLTAGE: 230V, 50HZ AC US VOLTAGE: 120V, 60HZ AC

Stabilizer / Voltage Regulator

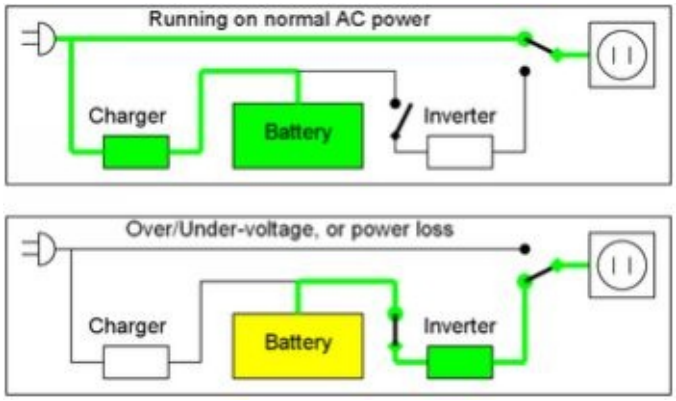
A voltage stabilizer is an electrical appliance used to feed constant voltage current to electrical gadgets like ACs and computers, and protects them from damage due to voltage fluctuations.

Buck Boost Stabilizer

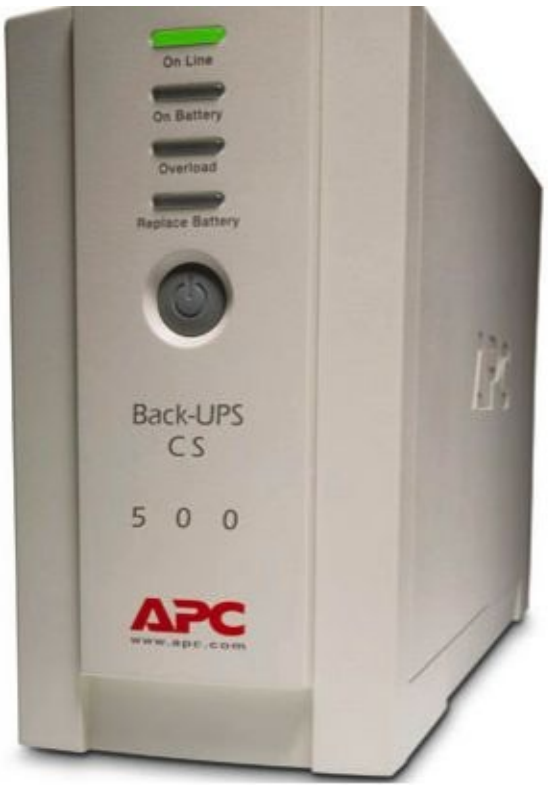
It works on the principle of a transformer, where the input current is connected to primary windings and output is received from secondary windings. When there is a drop in incoming voltage, it activates electromagnetic relays which add to more number of turns in the secondary winding, thus giving higher voltage which compensates for loss in output voltage. When there is rise in the incoming voltage, the reverse happens, and, thus, the voltage at the output side remains almost unchanged. However, output voltage accuracy is usually ±10%.

UPS

A UPS (uninterruptible power supply) is a device that allows your computer to keep running for at least a short time when the primary power source is lost. It also provides protection from power surges. A UPS contains a battery that “kicks in” when the device senses a loss of power from the primary source. If you are using the computer when the UPS notifies you of the power loss, you have time to save any data you are working on and exit gracefully before the secondary power source (the battery) runs out. When all power runs out, any data in your computer’s random access memory (RAM) is erased. When power surges occur, a UPS intercepts the surge so that it doesn’t damage your computer



Internal battery ups



External Battery ups

Inverter:

The mains power comes to the Inverter. This is directly sent to the output but the AC is also converted to DC and this DC is constantly charging the battery. A sensor and relay mechanism checks whether the mains is ON or OFF. When the main switches OFF, the relay actuator triggers to switch from mains to inverter. Rest is same like the UPS. Because of this sensor and relay, there is a gap between triggering.
UPS involves more costly circuits and is therefore more expensive to make and sell.

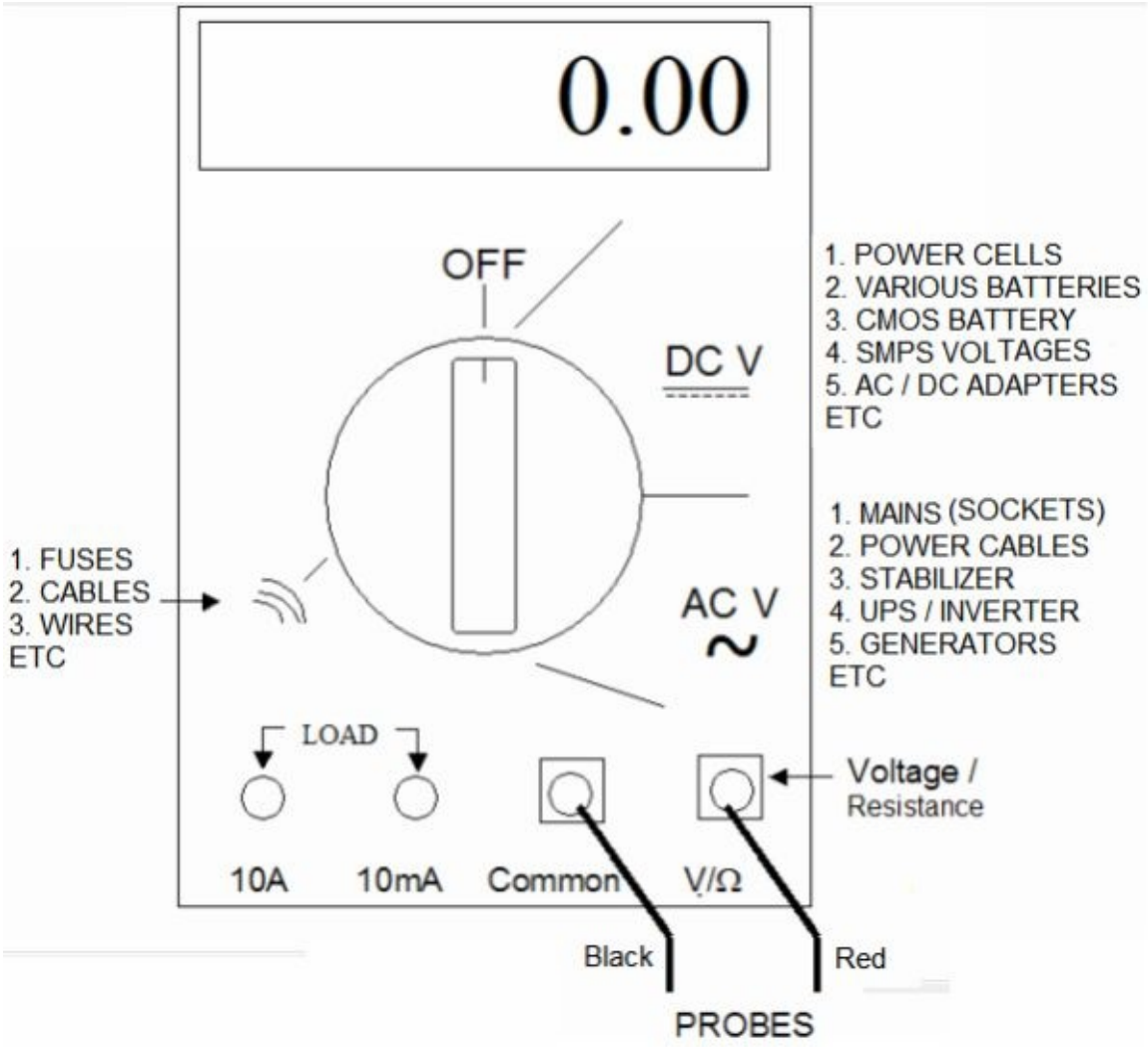
UPS Vs Inverter

While both provide backup power during mains outage, with the UPS the switch is instantaneous whereas with the Inverter there is a gap of a second or two. This gap is OK for household gadgets such as lights, fans, fridge, etc. but not OK for computers.

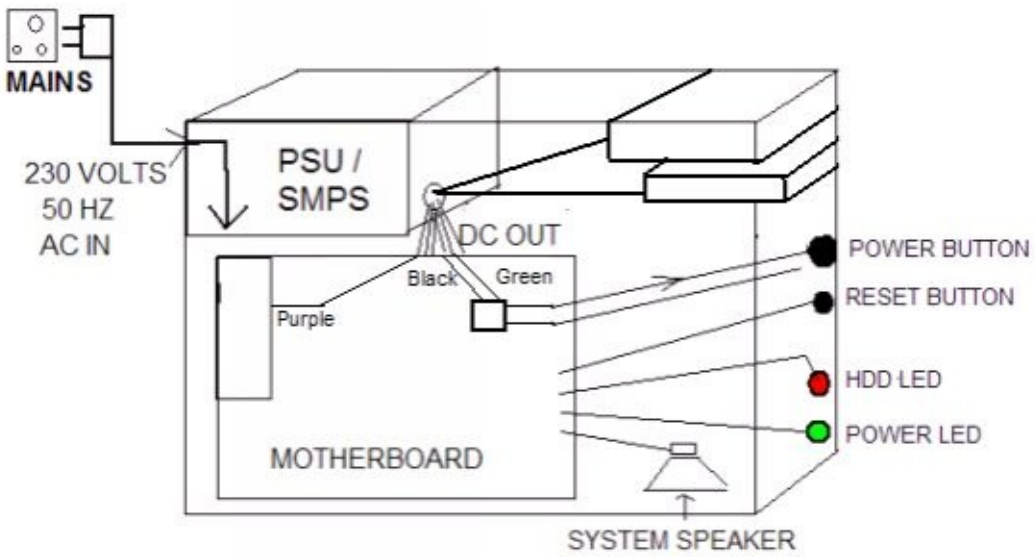
Apart from these there is another difference. The AC supply has a pure sine wave whereas in UPS the output is a near sine wave, not a pure sine wave where as for a inverter its square wave, waveform which uses less battery power for longer backups. This is the reason that we hear a hum when we attach a inductive load (Fan, Tube light etc.) to a

Inverter. But we do not hear anything when it’s on AC supply or low on UPS.

Digital Multimeter



Computer Case / Chassis (Cabinet)



AT (Advanced Technology) Cabinet: In olden days AT cabinet was used. In AT AC power enter into ON / OFF switch in front panel of Cabinet. So there was only one way to Power on the System. And there are no safety features.

ATX (Advanced Technology Extended) Cabinet: Present Cabinets are ATX. In ATX Power controlled through Motherboard. So there are so many ways to Power ON. And also there are safety features

SMPS :Switch Mode Power Supply (SMPS uses Transistors, by Transistors Switching Operation output will be obtained.) Using SMPS technology Power Supply units became smaller and lighter and Constant Output will be obtained.

Parts of Cabinet

1. PSU / SMPS : It coverts AC into DC and supplies to various parts
2. Power Button: For Power On and Power Off.
3. Reset Button : For Fast Off & On when Computer become Struck/ Hang /Freeze
4. Power LED : Power Status Indicator
5. HDD LED : Data transfer / Process Status Indicator
6. System Speaker: For System Diagnostics.

Power Supply Voltages

1. YELLOW +12 VOLTS

2. RED +5 VOLTS

3. ORANGE +3.3 VOLTS

4. BLACK 0 (GROUND / COMMON)

5. WHITE -5 VOLTS (Not used in Present Motherboard)

6. BLUE -12 VOLTS (Not used in Present Motherboard)

7. GREEN +5 VOLTS (POWER ON)

8. PURPLE +5 VOLTS (STANDBY)

9. GREY +5 VOLTS (POWERGOOD)

10. BROWN +3.3 VOLTS (REMOTE SENSING)

Generally, supply voltages must be within ±5% of their nominal values at all times.

Four wires have special functions:

Green : PS_ON or "Power On" is a signal from the motherboard to the power supply. When the line is connected to GND (by the motherboard), the power supply turns on. It is internally pulled up to +5 V inside the power supply.

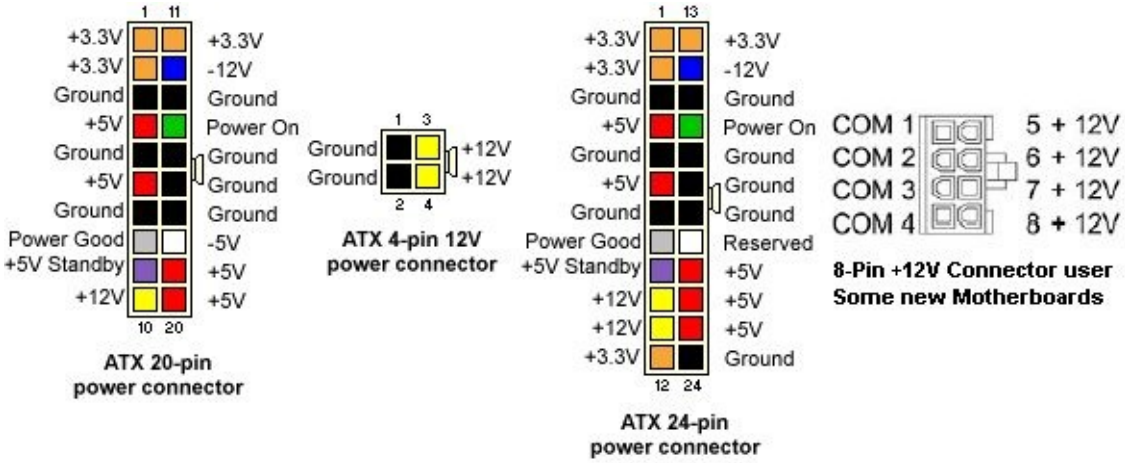
Purple : +5 V_{SB} or "+5 V standby" supplies power even when the rest of the supply lines are off. This can be used to power the circuitry that controls the Power On Signal (Generally it supplies power to Keyboard, Mouse etc in standby mode).

Grey : PWR_OK or "Power Good" is an output from the power supply that indicates that its output has stabilized and is ready for use. Or it monitors SMPS.

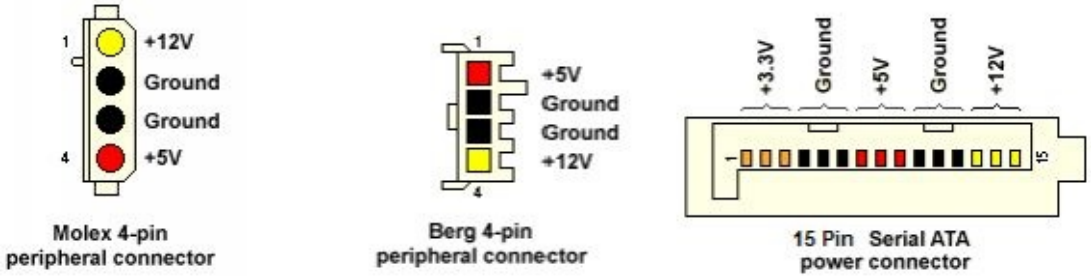
Brown : +3.3 V sense should be connected to the +3.3 V on the motherboard or its power connector. This connection allows for remote sensing of the voltage drop in the power supply wiring due to overload, generally by adding Graphics Card.

Power Supply Unit (PSU) connectors & Pinouts

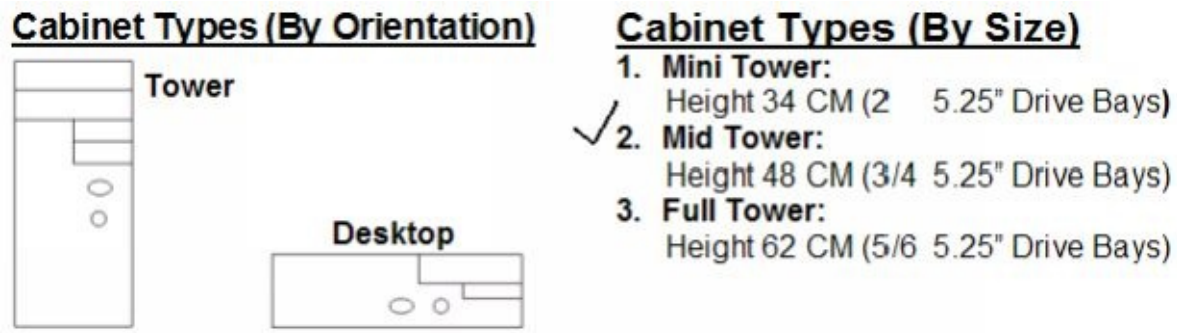
For Motherboard



For Peripherals

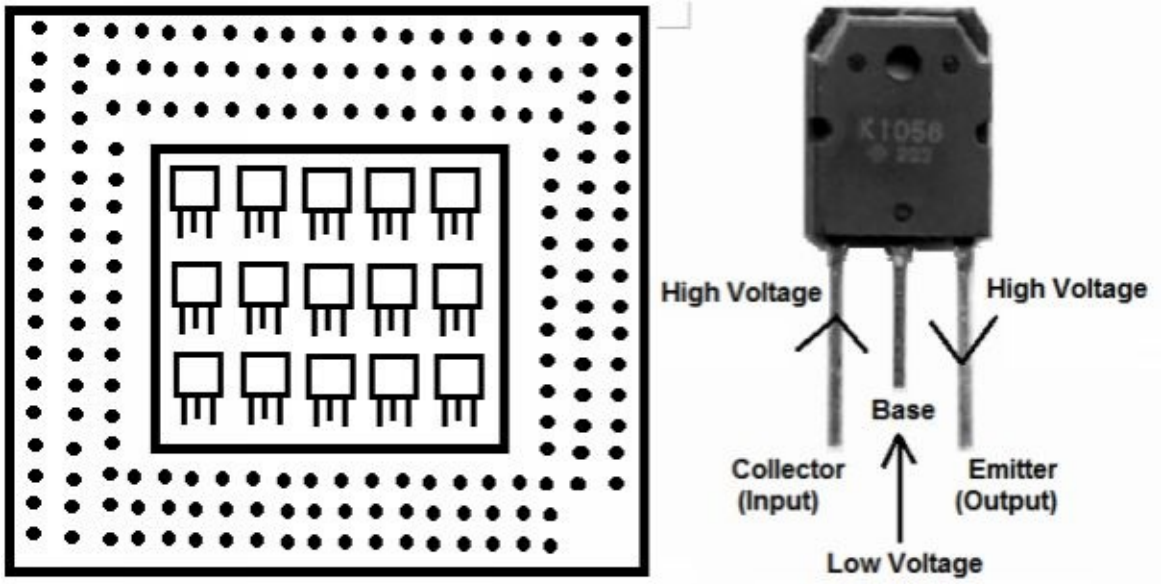


(For 40 Pin HDD / DVD) **(For FDD / Graphics Card Fan)** **For 7Pin HDD / DVD)**

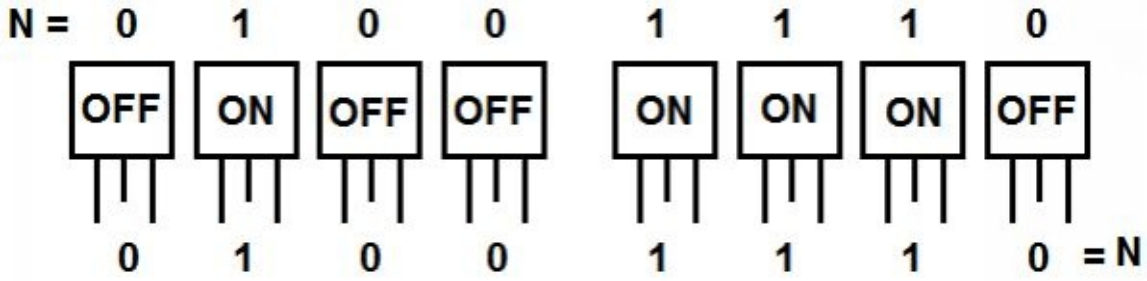


Data Storage in Various Parts

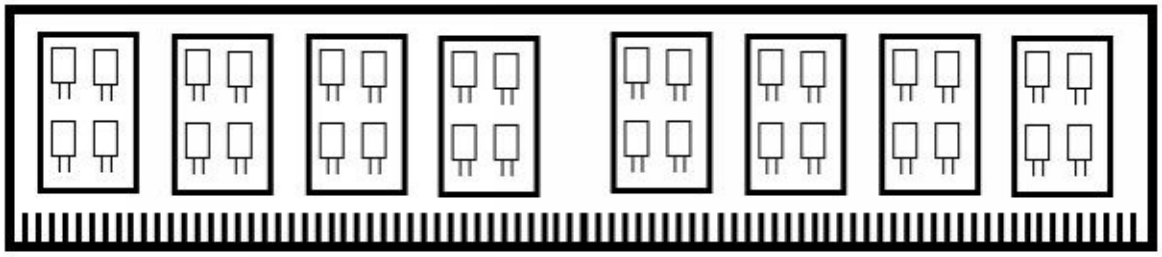
1. Processor / CPU: Made with Silicon Chip, Made up with Transistors



Transistors are commonly used as electronic switches, for both high power applications including switched-mode power supplies and low power applications such as logic gates. When the transistor reaches a base voltage of a certain level the current will no longer increase and the output will be held at a fixed voltage. Because of this property the transistor can have values of input voltage such that the output is either completely off or completely on. The transistor is acting as a switch, and this type of operation is common in digital circuits where only “on” and “off” values are relevant. Transistor is also called as electronic switch.



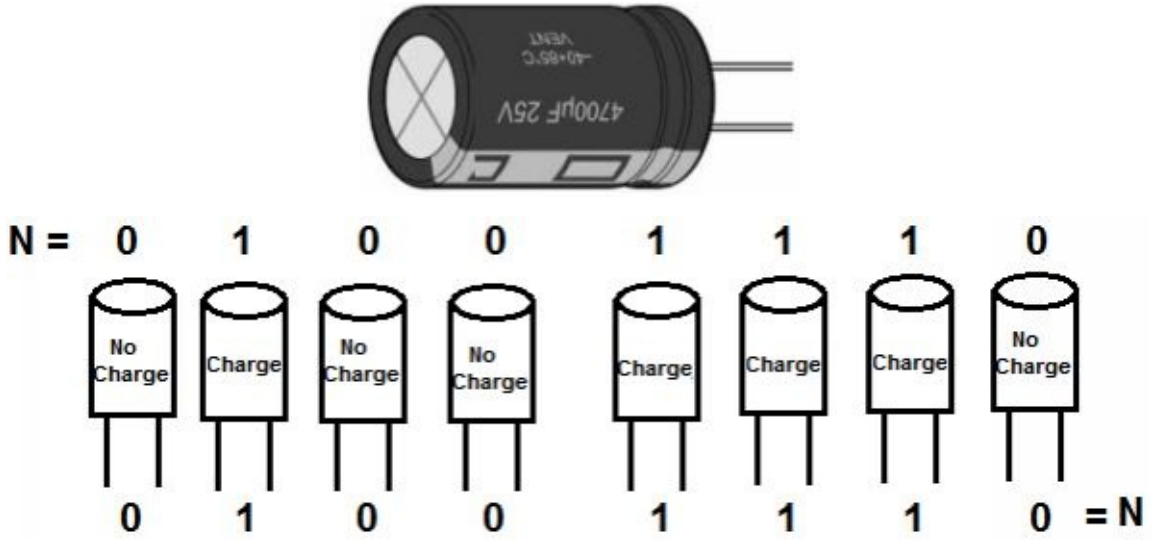
2. **Memory / RAM:** Made with Silicon Chips, Made up with Capacitors



A capacitor or condenser is an electronic device which consists of two plates (electrically conductive material) separated by an insulator called dielectric.

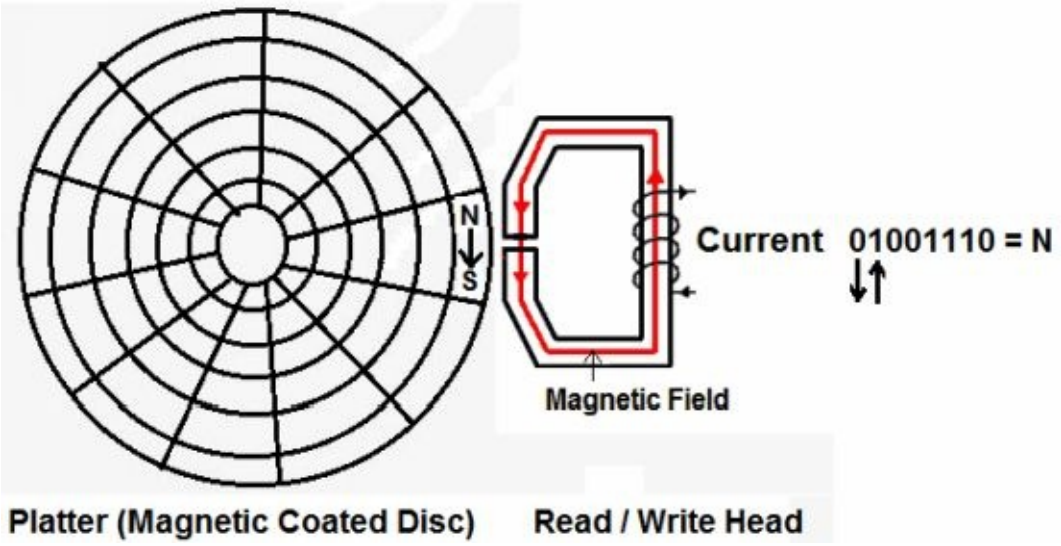
A capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both **store electrical energy**. Inside the battery, chemical reactions produce electrons on one terminal and absorb electrons on the other terminal. A

capacitor is much simpler than a battery, as it can’t produce new electrons — it only stores them.



Semiconductor device fabrication: is the process used to create the integrated circuits that are present in everyday electrical and electronic devices. It is a multiple-step sequence of photolithographic and chemical processing steps during which electronic circuits are gradually created on a wafer made of pure semi conducting material. Silicon is almost always used. The entire manufacturing process, from start to packaged chips ready for shipment, takes six to eight weeks and is performed in highly specialized facilities referred to as **fabs**.

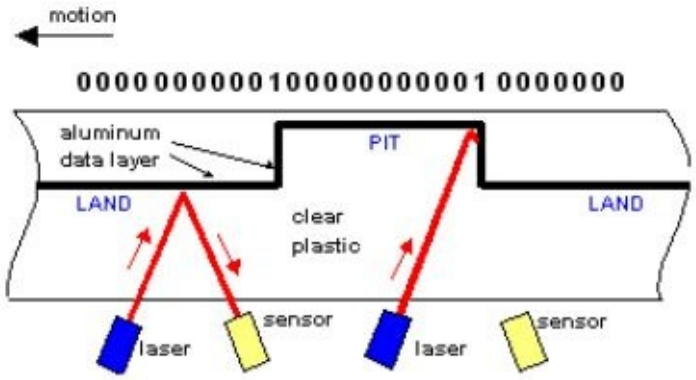
3. Hard Disc : Made with Magnetic coated disc, Made up with magnetic parts / domains.

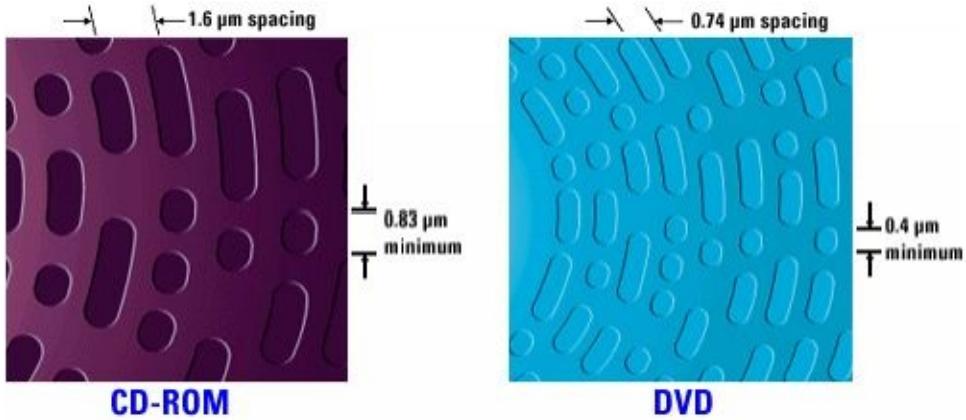


Platter: One or more aluminum, glass, or ceramic disk that is coated in a magnetic media and is located within a hard drive to permanently store all your computer’s data. When the computer is turned on, these platters will begin to rotate at so many rotations per minute (RPM). As the disk platters are rotating, the read/write head accesses information on one of the platters.

4. Optical Disc (CD / DVD / BD)

A direct access storage device that is written and read by light (Laser). The most common optical discs in use are CDs, DVDs and BDs. As removable media, optical discs have advantages over the older removable magnetic disk cartridges. They weigh less, have higher capacities and are not subject to head crashes or corruption from stray magnetic fields.





1. CD (120mm) - 700MB, Mini CD (80mm) - 185MB

2. DVD (120mm) - 4.7 GB (Single Layer) Mini DVD(80mm) - 1.4GB

3. DVD (120mm) - 8.5 GB (Double Layer)

4. BD (120mm) – 25GB (Single Layer) Mini BD (80mm) – 7.8GB

5. BD (120mm) – 50 GB (Double Layer) , 100 - 200GB (Multi Layer)

5. Data Transfer : Cables Copper wires

Parallel Interface

Serial Interface

The Binary Language of Computers

This topic describes how Information, Pictures, Movies and Songs will be stored in different devices and how information will transferred from one device to another device through wires.

Example: To store “NEO”, it will be converted into 0s and 1s as follows.

01001110 01000101 01001111

Now these 0s and 1s are stores in different devices as follows.

DEVICE	DESCRIPTION	POSITION	
		For “0”	For “1”
1. CPU / Processor	Made with Silicon, and made up with Transistors (Bipolar). (Electronic switches)	OFF	ON
2. Memory / RAM	Made with Silicon, and made up with Capacitors. (Stores Electrical Charge)	No Charge	Charge
3. Hard Disc / Floppy Disc	Plastic / Fiber / Glass / Aluminum Disc with Magnetic coating		

			
4. CD / DVD / BD	Optical Disc with Aluminum Reflective Layer	Pit / bump	Land
5. PEN Drive	Made with Silicon, and made up with Transistors (Floating Gate) (Electronic switches)	OFF	ON
6. Data Cable	Copper wires	Low Voltage/ No Current	High Voltage / Current

Bit

These 0s and 1s are called as binary digits or bits (b). A ***bit*** is the smallest unit of information that is recognized by a computer: a single on or off event.

The binary system of numbers uses the base of 2 (0 and 1). As described earlier, a bit can exist in only two states, on or off. When bits are represented visually:

- 0 equals off.
- 1 equals on.

Byte

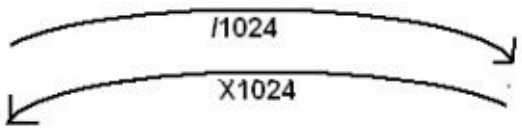
A *byte* is a group of 8 bits. A byte is required to represent one character of information. Pressing one key on a keyboard is equivalent to sending 1 byte of information to the computer's central processing unit (CPU). A byte is the standard unit by which memory is measured in a computer—values are expressed in terms of kilobytes (KB) or megabytes (MB) Etc..

UNITS

Memory Unit	Value	Value in Bytes
1 KB (Kilo Byte)	1024 Bytes	Exact Value :1,024 Approximate Value: 1 thousand = 1,000 (10^3)
1 MB (Mega Byte)	1024 Kilo Bytes	Exact :1,048,576 App: 1 million =1,000,000 (10^6) 10 lakhs=10,00,000
1 GB (Giga Byte)	1024 Mega Bytes	Exact: 1,073,741,824 App: 1 biilion =1,000,000,000 (10^9) 100 crores = 100,00,00,000
1 TB (Tera Byte)	1024 Giga Bytes	Exact: 1,099,511,627,776 App: 1 trillion = 1,000,000,000,000 (10^{12}) 1 lakh crores =1,00,000,00,00,000
1 PB (Peta Byte)	1024 Tera Bytes	Exact: 1,125,899,906,843,624 App: 1 quadrillion = 1,000,000,000,000,000 (10^{15}) 10 crore crores=10,00,00,000,00,00,000

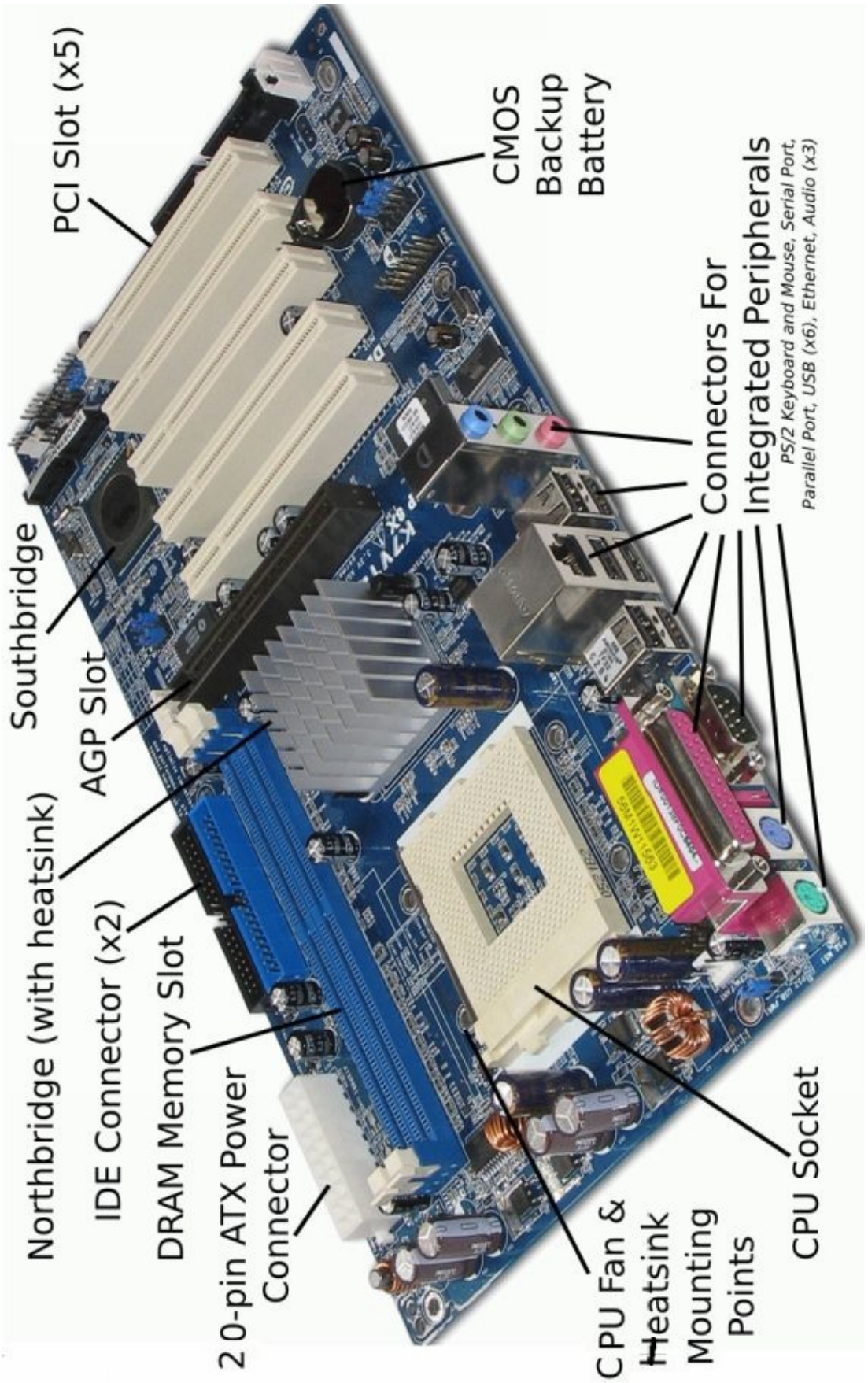
		Exact :1,152,921,504,607,870,976 App: 1 quintillion = 1,000,000,000,000,000,000(**10 18**) 10,000 crore crores 10,000,00,00,000,00,00,000
1 EB (Exa Byte)	1024 Peta Bytes	
1 ZB (Zetta Byte)	1024 Exa Bytes	Exact: 1,180,591,620,718,458,879,424 App: 1 sextillion=1,000,000,000,000,000,000,000 (**10 21)** 1 crore crore crore
1 YB (Yotta Byte)	1024 Zetta Bytes	Exact: 1,208,925,819,615,701,892,530,176 App: 1septillion=1,000,000,000,000,000,000,000,000 (**10 24**) 1000 crore crore crore

Low **High**



Units Conversion

MOTHERBOARD / MAINBOARD



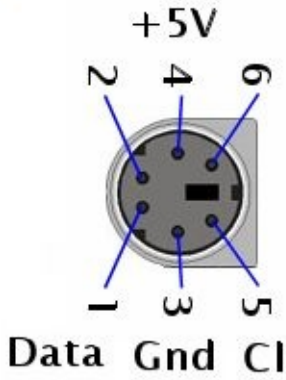
I / O Ports (Input / Output Ports)

6 Pin PS/2 Ports (PS/2 :Personal System Series 2)

Keyboard Mouse

Purple for Keyboard

Green for Mouse



3 & 4 Pins for Power

5 Pin for Clock / pulse

1 Pin for Data Transfer

2 & 6 Pins are Dummy

Bandwidth : 33 Kbps (Kilo bits / Sec) / 4 KBps (Kilo Bytes / Sec)

Cable length : 50MTS+ Type : Mini DIN ((**D**eutsches **I**nstitut fur **N**ormung) German Standard

9 Pin COM / SERIAL Ports

COM : Communication

SERIAL : Data Will be Transferred Serially / bit by bit / One bit at a time in one wire

BANDWIDTH : 115.2 Kbps (Kilo bits / Sec) or 14.4 KBps / 15KBps (Kilo Bytes / Sec)

Cable length : 3MTS (10 Feet) Type : D-Sub Male (D-subminiature)

Supported Devices:

1. Modem
2. Webcam
3. Digital Camera
4. Digital Pen
5. Some Printers Old Only (New Devices come with USB connector)

Etc.

Note : Only Modem will use all 9Pins(2 for Power, 2 for Data (1Transmit+1Receive))

Other Devices will use only 4 pins (2 for Power, 2 for Data)

MODEM: Modulator and De Modulator

Modulation : Conversion of Digital Data Signal into Analog Telephone Signal

Demodulation : Conversion of Analog Telephone Signal into Digital Data Signal.

Webcam

A Webcam is a compact digital camera you can hook up to your computer to broadcast video images in real time (as they happen). Just like a digital camera, it captures light through a small lens at the front using a tiny grid of light-detectors, known as a Image sensor. As we'll see in a moment, the Image sensor converts the picture in front of the camera into digital format—a string of zeros and ones that a computer knows how to handle. Unlike a digital camera, a webcam has no built-in memory chip or flash memory card: it doesn't need to "remember" pictures because it's designed to capture and transmit them immediately to a computer. That's why webcams have USB cables coming out of the back. The USB cable supplies power to the webcam from the computer and takes the digital information captured by the webcam's CCD back to the computer—from where it travels on to the Internet.

25 Pin Parallel Port / Printer Port / LPT

(Device side 36Pin)

PARALLEL : Data will be transferred parallely / 8 bits (1Byte) at a time in 8 wires.

LPT : Local Printer BANDWIDTH : Maximum 150 KBPS

Cable Length: 1.8MTS (6 Feet)

Maximum Devices = Two / Port

Type : D-Sub Female (D-subminiature)

Supported Devices:

1. Printer
2. Scanner Old Only (New Devices comes with USB connector)
3. Plotter
4. Etc.

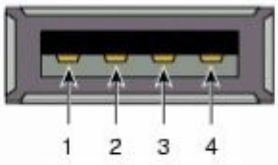
Plotter:

A plotter is a special type of printer which is able to draw high quality images on very large peace of paper. They are used by Engineers, Architects and map makers to draw plans of buildings, diagram of machines or large scale maps.

A plotter differs from a printer in that it draws images using pen a pen that can be lowered, raised and moved across the paper to form continuous lines. The electronically controlled pen is moved around the paper by computer controlled motors.

4 PIN USB PORTS

USB type A Port
(On Motherboard)



USB type B Port
(On Device)

Pin	Description
1	+5V
2	Data -
3	Data +
4	Ground

USB (**Universal Serial Bus**) is a specification to establish communication between devices and a host controller (usually personal computers) USB is intended to replace many varieties of serial and parallel ports. USB can connect computer peripherals such as mice, keyboards, digital cameras, printers, personal media players, flash drives, and external hard drives. For many of those devices, USB has become the standard connection method. USB was designed for personal computers, but it has become commonplace on other devices such as smart phones, PDAs and video game consoles, and as a power cord between a device and an AC adapter plugged into a wall plug for charging

BANDWIDTH : 12 Mbps / 1.5 MBps

Data Transfer : 1bit (serial)

Duplex Mode : Half Duplex (Transmit / Receive)

Devices : 127 DEVICES / Controller by using Hubs

Cable Length : 5 MTS (Up to 30 Meters with hubs and 6 Cables)

Voltage : 5 Volts DC

Power : Up to 2.5 Watts

Supported Devices

1.Keyboard, 2. Mouse, 3. Cordless / Wireless Keyboard & Mouse

4. Modem 5. Web Camera, 6. Digital Cam 7.Digital Pen

8. Printer, 9. Scanner, 10. Plotter 11. Pen / Flash Drive

12. External Drives : CD / DVD / HDD

13. External Adapters : (Display, Audio, LAN, TV, Modem etc.)

14. Converters : (USB to Parallel, USB to PS /2 etc.)

15. Accessories : (Light, Fan , Charger , Cleaner etc.)

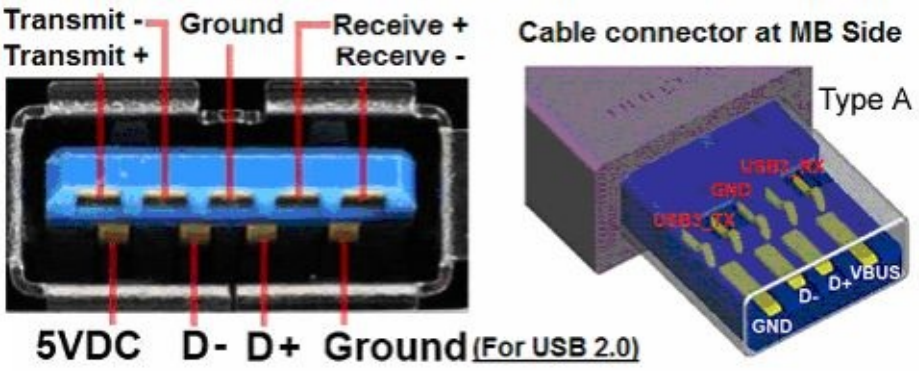
16. Gaming Devices : (Joy Stick, Game Pad, Steering Wheel etc.)

17. Dongles : (Bluetooth, Internet Data Card etc.)

USB Versions			
	USB 1.1	**USB 2.0**	**USB 3.0**
Bandwidth	12Mbps (1.5MBPS)	480Mbps(60MBPS)	4800Mbps (600MBPS) (4.8Gbps)
Cable Length Limit	5MTS (16Feet)	5MTS (16Feet)	3MTS (10Feet)
Bus Power	500mA (2.5 Watts)	500mA (2.5 Watts)	900mA (4.5 Watts)
Duplex Mode	Half Duplex	Half Duplex	Full Duplex
Pins	4 Pin	4 Pin	9 Pin

USB 3.0 (9pin)

USB 3.0 is the third major revision of the Universal Serial Bus (USB) standard for computer connectivity. In the late 1990s. USB 3.0 has transmission speeds of up to 5 Gbit/s, which is 10 times faster than USB 2.0 (480 Mbit/s) with full duplex support. USB 3.0 significantly reduces the time required for data transmission, reduces power consumption, and is backwards compatible with USB 2.0.



USB Ports Device Side (Type -B)

Ver 1.1 / 2.0

Type B-Male

Mini B-Male

Micro B-Male

Ver 3.0

Type B-Male

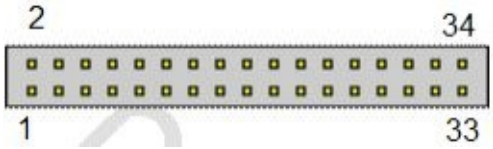
Mini B-Male

Micro B-Male

34 PIN FDC

FDC : Floppy Disk Connector

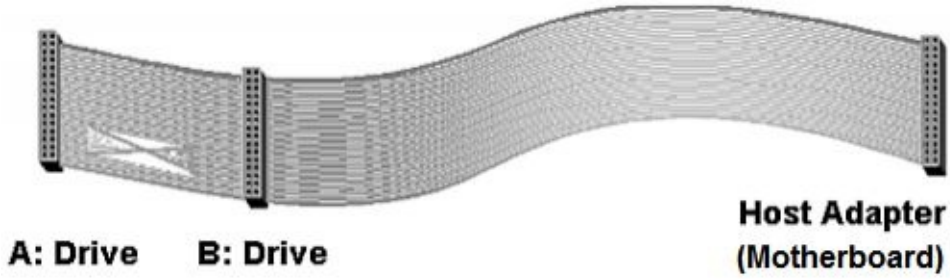
FDD : Floppy Disk Drive



Disc Capacity : 1.44MB (Latest)

Bus Width : 1bit (Serial Interface)

Data Transfer Rate: 500Kbps (62.5KBPS)



40 PIN PATA / IDE PORTS

PATA : Parallel ATA (Parallel Advanced Technology Attachment)

IDE : Integrated / Intelligent Drive Electronics

Bus Width : 16bit (2Bytes)

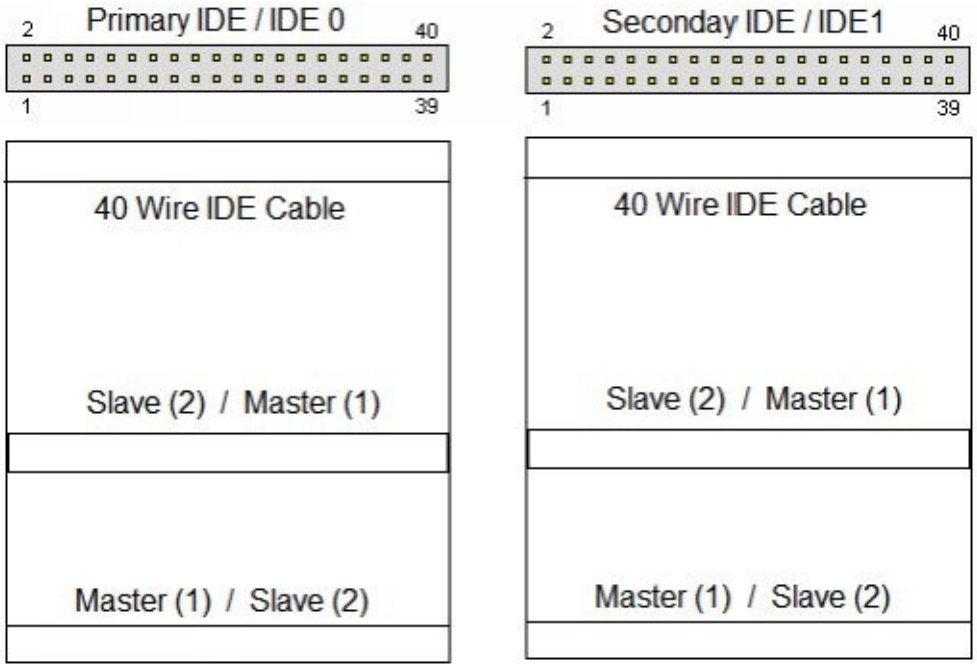
Cable Length : 1.5 Feet

Drives / Cable : Two (Master & Slave)

Power Plug : 4 Pin Molex

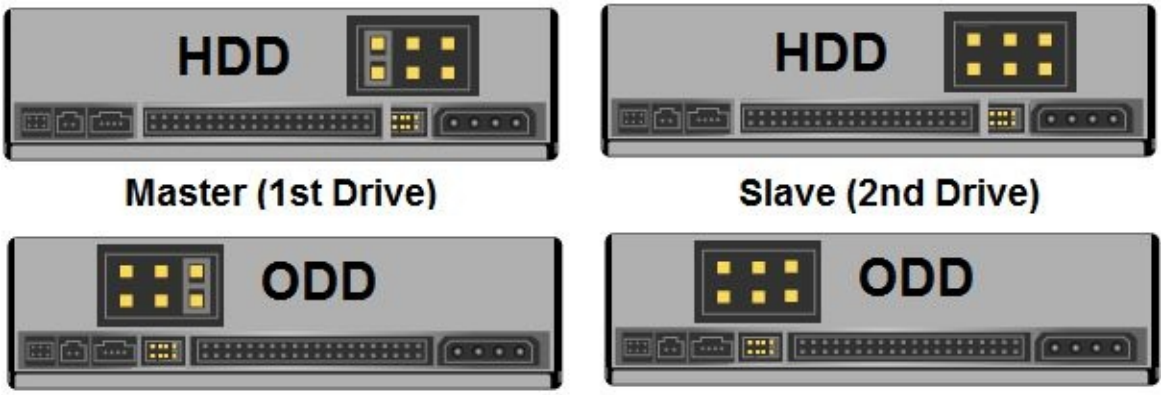
Bandwidth : 66 MBPS (ATA66) / 100 MBPS (ATA100) /133 MBPS (ATA133)

Note: 80 wire cable is preferred)



IDE (40 PIN) Devices:

1. Hard Disk Drive (HDD)
2. Optical Disc Drive (ODD) Ex: CD / DVD / BD drive.
3. ZIP DRIVE
4. TAPE DRIVE Etc.



7PIN SATA Ports

SATA : Serial ATA (Serial Advanced Technology Attachment)

Bus Width : 1bit

Cable Length : 3.3 Feet

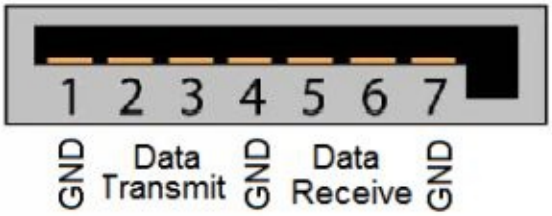
Drives / Cable : One (Master)

Power Plug : 15 Pin Molex (For Some Drives 4 Pin Port also added)

Bandwidth : 1.5 Gbps Theoretical (1.2Gbps Practical) / 150 MBPS (SATA – I)

Gbps Theoretical (2.4Gbps Practical) / 300 MBPS (SATA– II)

Gbps Theoretical (4.8Gbps Practical) / 600 MBPS (SATA– III)



SATA Advantages: Due to Low Electro Magnetic Interference (EMI) or Cross Talk

1. High Data Transfer Rate.
2. Full Duplex operation
3. Cable Length increased

Disadvantages with Hard Disk Drives (HDD)

1. Large in Size (3.5”)
2. Heavy Weight
3. Damage by Vibrations
4. Damage by Magnetic Effect
5. Damage by Impact Force
6. Damage by Electro Static Discharge
7. High Power consumption
8. Large amount of Heat
9. Noise
10. Spin up Time
11. Slow Operation
12. Slow Down in Future
13. Bad area formation
14. Crashing problem
15. Short Life

Etc

Advantages: 1. Cheap
2. High Capacities

Solid State Drive / Disk (SSD)

A **solid state drive** (**SSD**), or **solid state disk**, is a data storage device that uses solid-state memory to store persistent data. SSD emulates conventional hard disk drive, thus easily replacing it in any application. With no moving parts, a solid state drive largely eliminates seek time, latency and other electro-mechanical delays and failures associated with a conventional hard disk drive. Solid state disks use either NAND flash (non-volatile storage). NAND flash is so-called because of the NAND-gate technology it uses and is common in USB flash drives and many types of memory card.

SSD Advantages :

1. Faster than HDD
2. Less Problems
3. Long Life

SSD Disadvantages :

1. Expensive
2. Lower Capacities

HDD & SSD Sizes and Pins in Desktop & Laptop

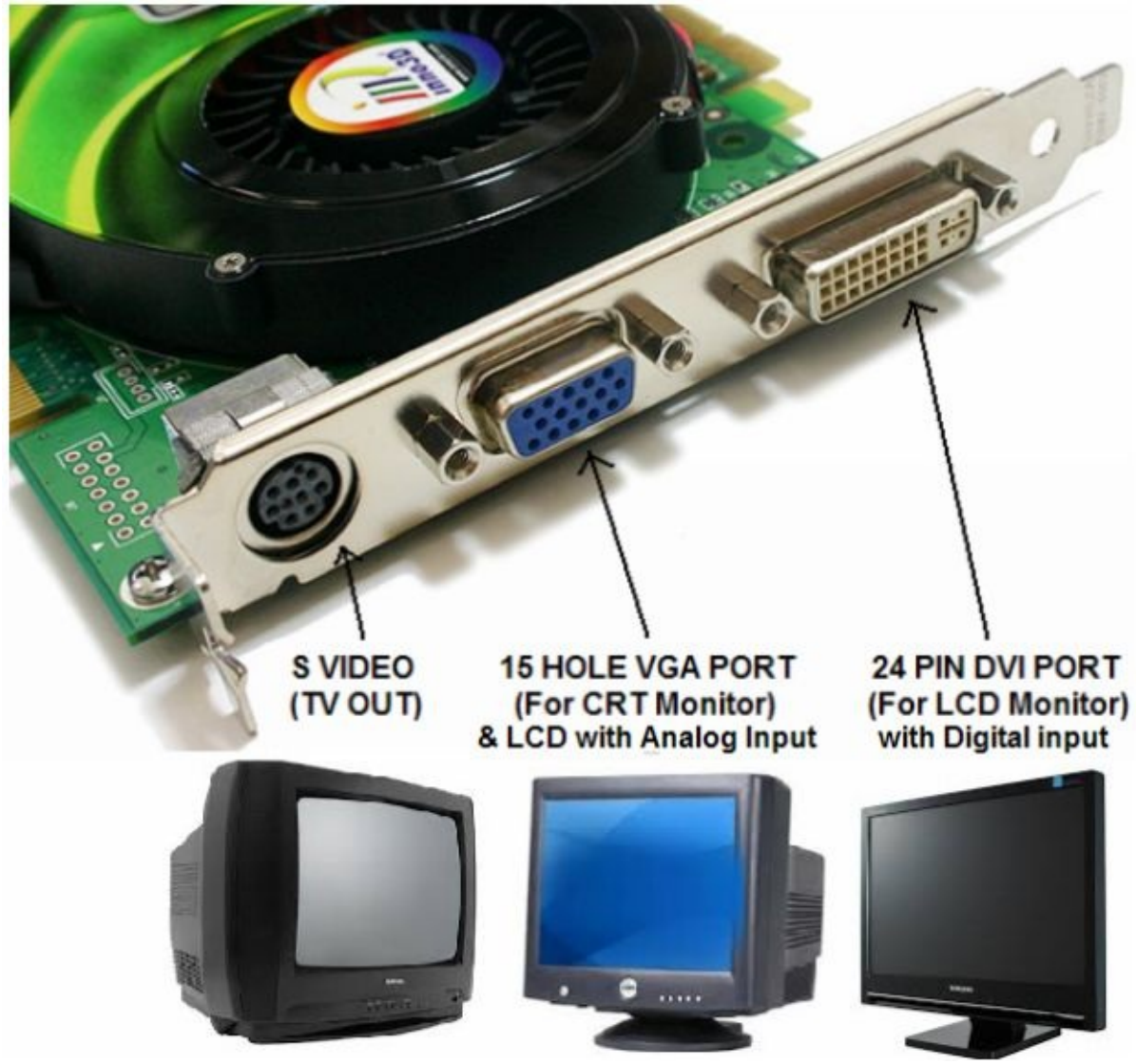
	IDE / PATA HDD	SATA HDD	SATA SSD
Desktop	Size 3.5”, 40 Pin Data + 4 Pin Power	Size 3.5”, 7 Pin Data + 15 Pow	Size 2.5”, 7 + 15
Laptop	Size 2.5”, 44 Pin Data and Power	Size 2.5”, 7 Pin Data + 15 Pow	Size 2.5”, 7 + 15

Converter to use Laptop 44 pin IDE /PATA HDD on Desktop 40 pin IDE /PATA port

Note : No Converter is required to use Laptop 7 pin SATA HDD in Desktop Computer.

Expansion Adapters

1. Display / Video / VGA / Graphics Adapter



VGA : Video Graphics Array, **CRT : Cathode Ray Tube**

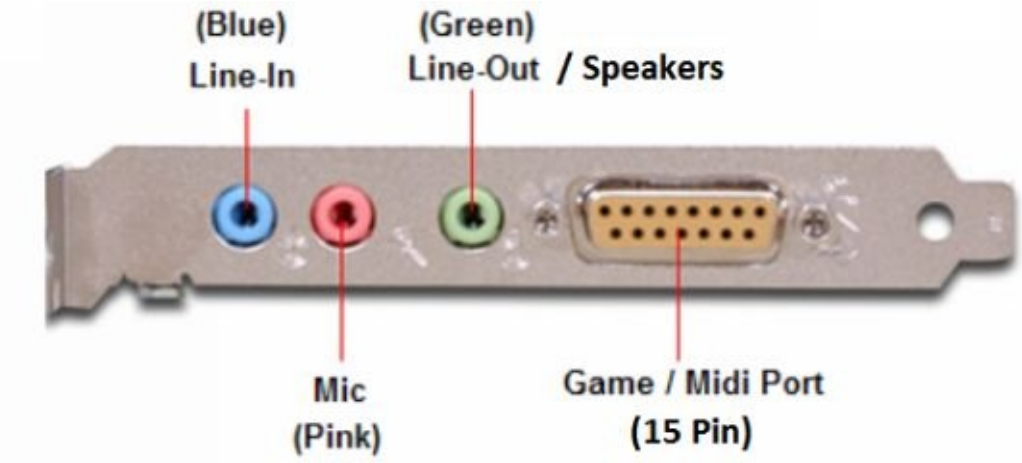
DVI : Digital Visual Interface, **LCD : Liquid Crystal Display**

TFT : Thin film Transistor **S-video : Separate Video**

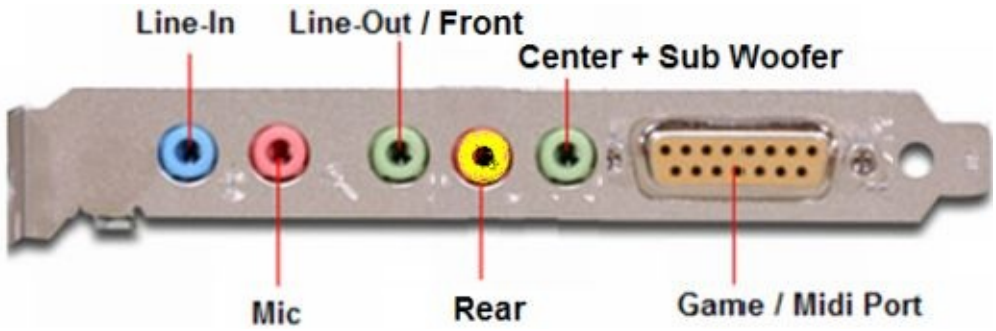
HDMI : High Definition Multimedia Interface (For HD LCD TV)

2. Sound / Audio Adapter

<u>2 Channel / 2 Way audio Adapter</u> (For 2 / 2.1 Speakers)



<u>6 Channel Audio Adapter</u> (For 5.1 / 4.1 / 2.1 / 2 Speakers)

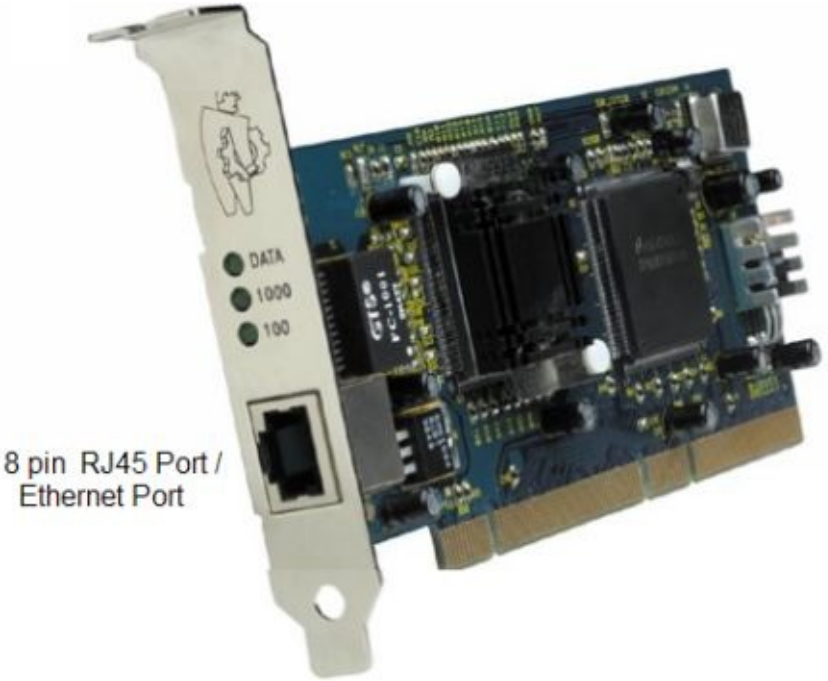


<u>6 Channel Onboard Audio</u>

3. Dial-Up Modem

4. LAN / Ethernet Adapter

Local-Area Network (LAN): A LAN (Local-Area Network) is a computer network that connects PCs, workstations or other LANs and networks to enable data and device access and sharing. It is used to cover a small local area such as a home, office or small group of buildings**.**

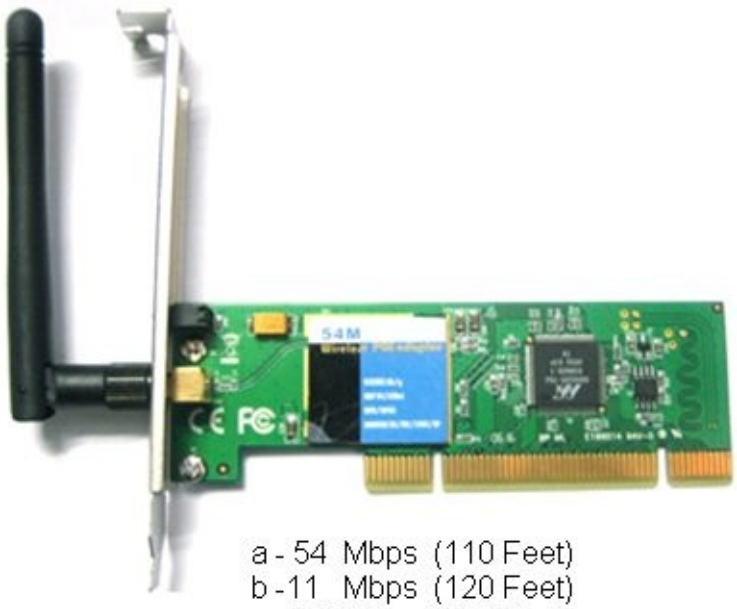


LAN: Local Area Network NIC : Network Interface Card RJ : Registered Jack

Types and Speeds (All 100 Meters Range)

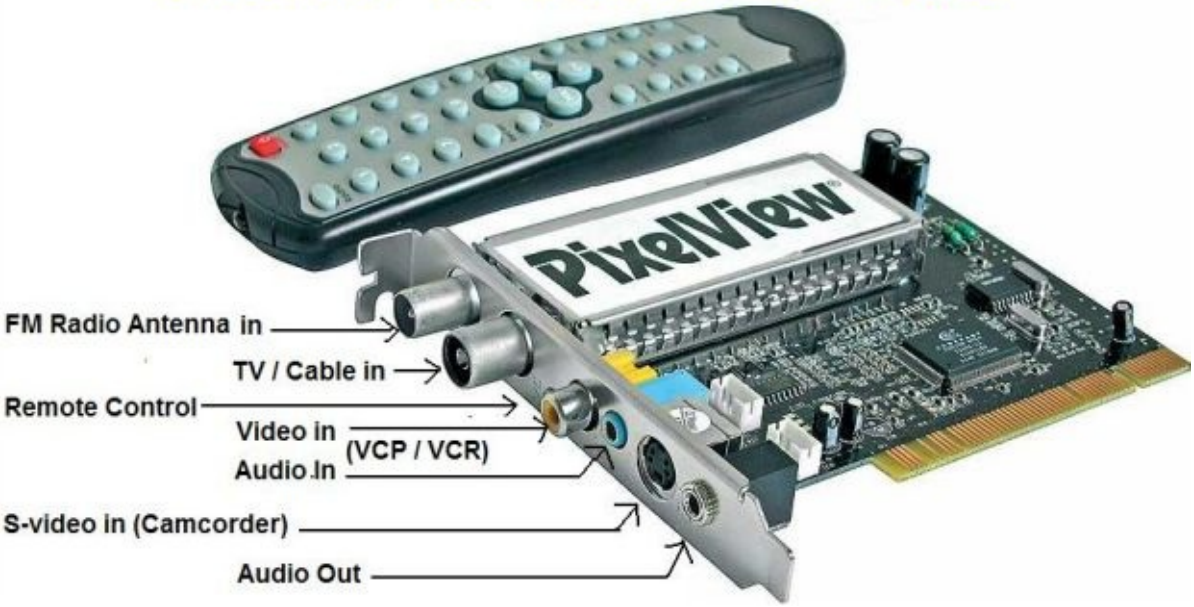
1. Ethernet 10Mbps
2. Fast Ethernet 100Mbps
3. Gigabit Ethernet (Gb Ethernet / GbLAN) 1000Mbps / 1Gbps

5. WLAN / Wi-Fi / IEEE802.11 Adapter

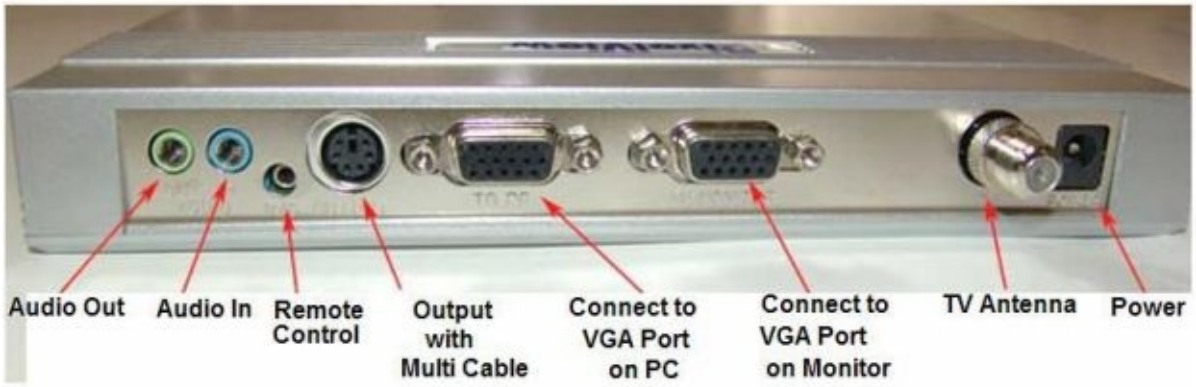


a - 54 Mbps (110 Feet)
b - 11 Mbps (120 Feet)
g - 54 Mbps (120 Feet)
n - 600Mbps (230 Feet)

Internal TV Tuner / TV Card



External TV Tuner Box



Expansion Slots

124 Pin PCI Slot: (Peripheral Component Interconnect)

For : Display, Audio, Modem, Network etc.

32bit / 4Bytes X 33MHZ = 133MBPS

Bus Width X Bus Speed = Bandwidth

(bits / Bytes) (Hz) (PS)

132 Pin AGP Slot: (Accelerated Graphics Port / Advanced Graphics Port)

For : Display only

32bit / 4Bytes X 66MHZ = 266MBPS

Bus Width X Bus Speed = Bandwidth

(bits / Bytes) (Hz) (PS)

AGP Versions

1. AGP	(3.3V)	: 32 bit, 66MHZ X 1	(66MHZ) = 266MBPS (Single Pumping)
2. AGP 2X	(3.3V &1.5V)	: 32 bit, 66MHZ X 2	(133MHZ)= 533MBPS (Double Pump)
3. AGP 4X	(3.3V & 1.5V)	:32 bit, 66MHZ X 4	(266MHZ)=1066MBPS (1GBPS) (Quad)
4. AGP 8X	(1.5V)	:32 bit, 66MHZ X 8	(533MHZ)= 2133MBPS(2.1GBPS)(Oct)

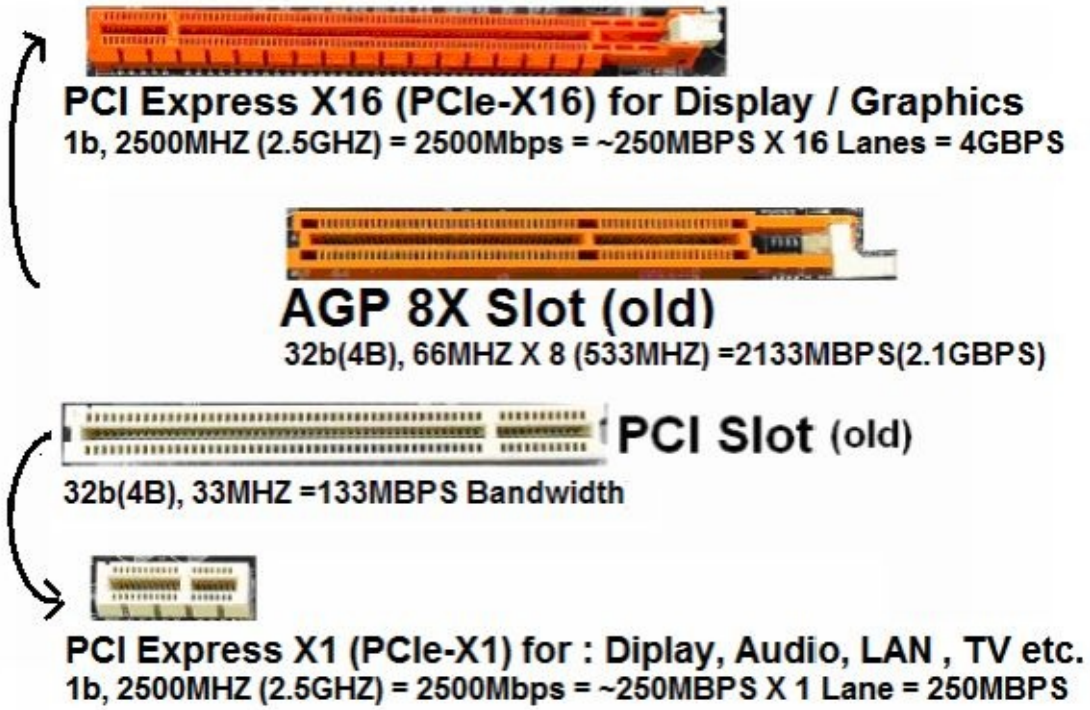
32bit, 33MHZ PCI Display Card

32bit, 66MHZ AGP CARD (1X)

CNR SLOT (Communications Networking Riser)

Communications and Networking Riser, or CNR, is a slot found on certain PC motherboards and used for specialized networking and telephony equipment. CNR slots were once commonly found on Pentium 4-class motherboards.

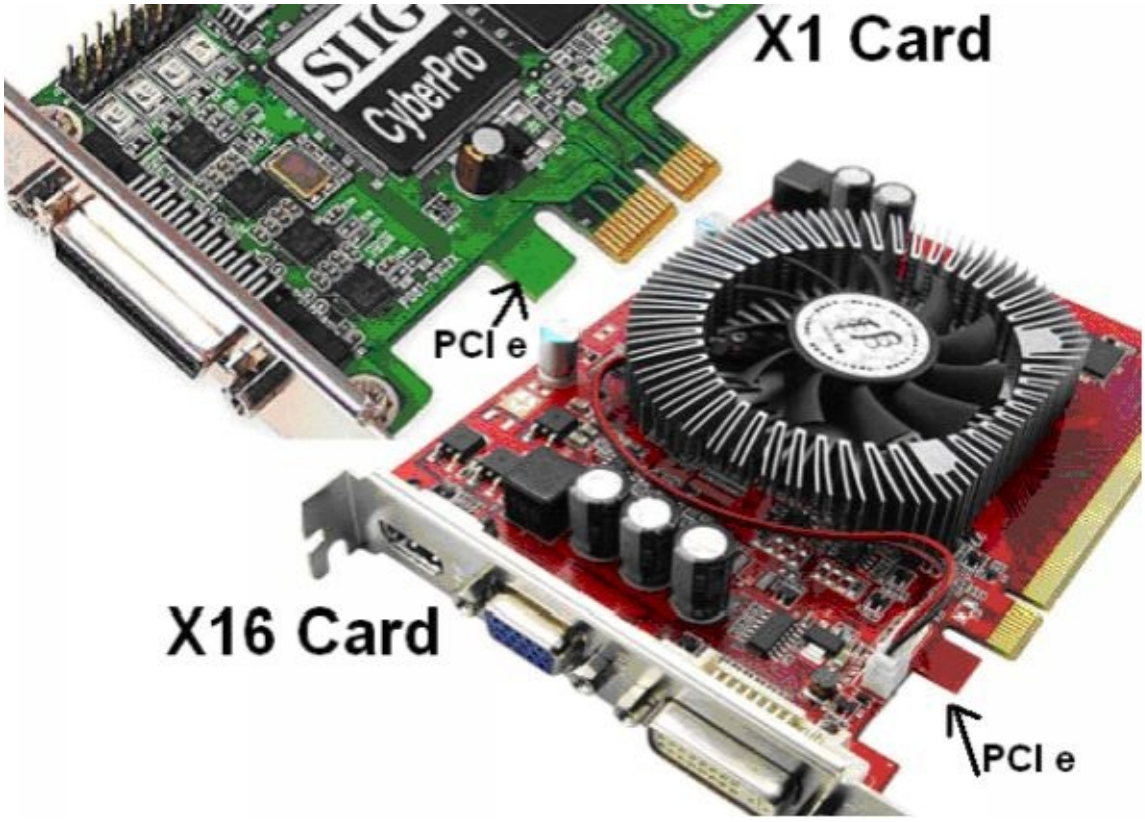
PCI Express Expansion Slots (Serial)



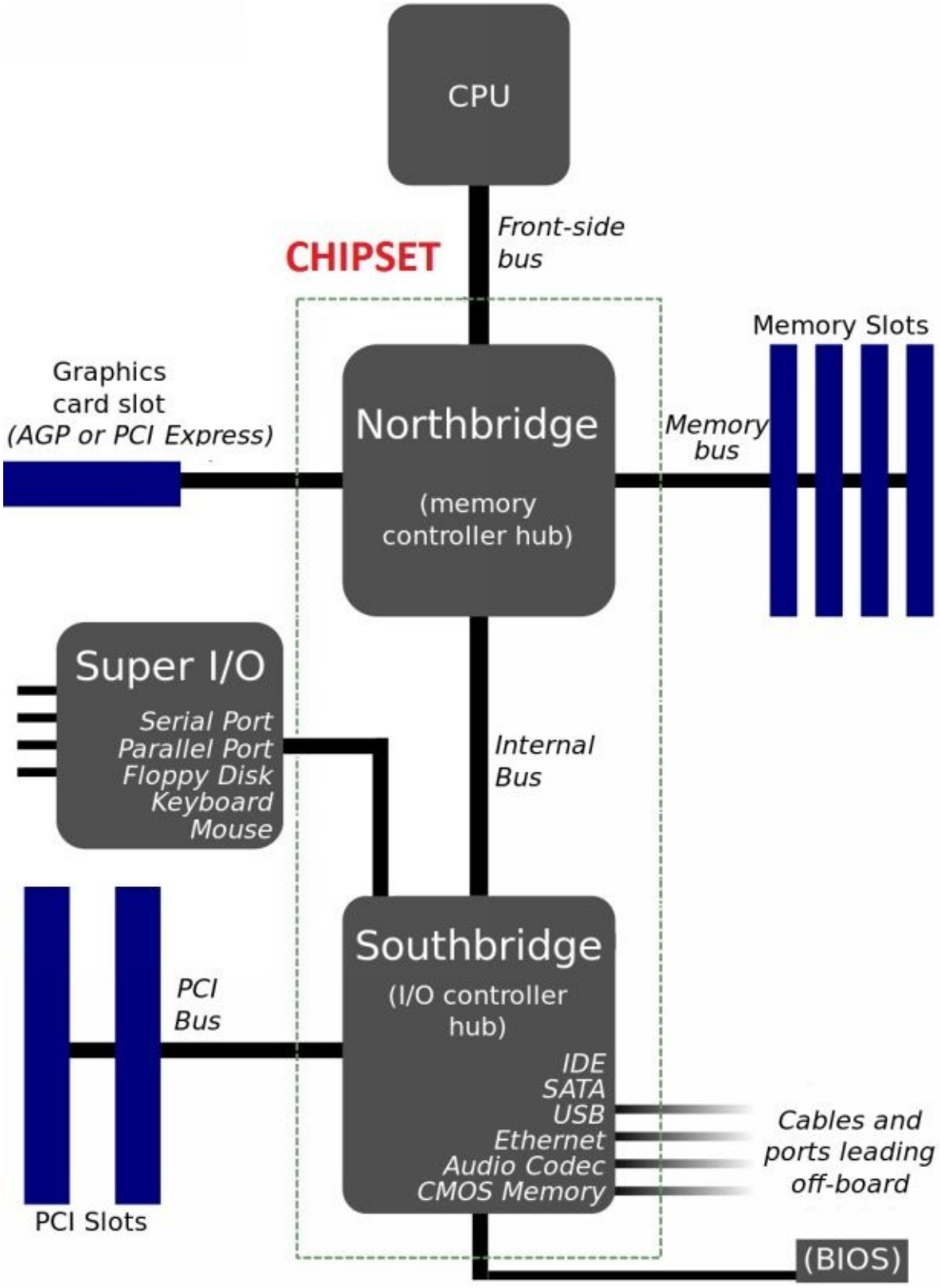
(<u>Advantages</u>: 1. Serial 2. High Data Transfer Rate, 3. Full Duplex Operation)

<u>Versions:</u> V1.0=250MBPS, V2.0=500MBPS, V3.0=1GBPS, V4.0=2GBPS

Per Lane (Each Direction)



Chipset & Controllers



Bus: The bus often refers to a data pathway (sometimes called the power pathway) which transfers data (or power) between computer components inside a computer system or between different computers. For example, there is a front side bus to connect the CPU to the chipset, and there is the PCI bus to connect the chipset to PCI devices.

IC: An integrated circuit (IC), sometimes called microchip, is a semiconductor wafer on

which thousands or millions of tiny resistors, capacitors, Diodes and transistors are fabricated. An IC can function as an amplifier, oscillator, timer, counter, computer memory, or microprocessor. A particular IC is categorized as either linear (analog) or digital, depending on its intended application. IC has two side connections.

Chip: A chips is a group of integrated circuits (microchips) that can be used together to serve a single function and are therefore manufactured and sold as a unit. For example, one chips might combine all the microchips needed to serve as the communications controller between a processor and memory and other devices in a computer. (Simply Chip contains so many Integrated Circuits called Controllers). Chip has four side connections.

Chipset:

The term “chipset” (sometimes called core logic) often refers to the two main chips on the motherboard: the Northbridge and the Southbridge. The Northbridge and Southbridge are sometimes combined. This is called single-chip design.

1. North Bridge / MCH (Memory Controller Hub)

The Northbridge typically handles communications among the CPU, RAM, and PCI Express (or AGP) video cards, and the Southbridge. Some north bridges also contain integrated video controllers, also known as a Graphics and Memory Controller Hub (GMCH) in Intel systems. Because different processors and RAM require different signaling, a Northbridge will typically work with only one or two classes of CPUs and generally only one type of RAM.

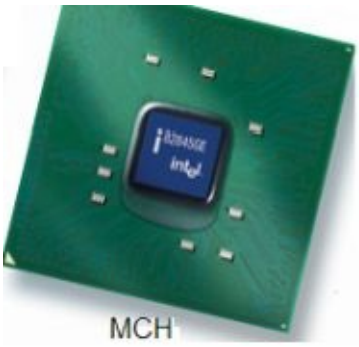
2. South Bridge / ICH (Input / Output Controller Hub)

Southbridge is the chip that controls all of the computers I/O functions, such as USB, audio, serial, the system BIOS, the ISA bus, the interrupt controller and the IDE channels. In other words, all of the functions of a processor except RAM, PCI and AGP.

3. Super I / O (Super Input / Output)

Super I/O is a class of I/O controller integrated circuits that began to be used on personal computer motherboards in the late 1980s, originally as add-in cards, later embedded on the motherboards. A super I/O chip combines interfaces for a variety of low-bandwidth devices. The functions provided usually include:

A floppy disk controller, A parallel port (commonly used for printers), One or more serial ports, A keyboard and mouse interface. Temperature sensor and fan speed monitoring.



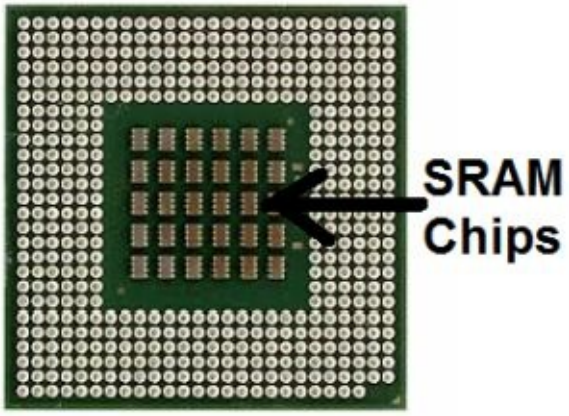
MCH

ICH

SUPER I/O

Random Access Memory (RAM)

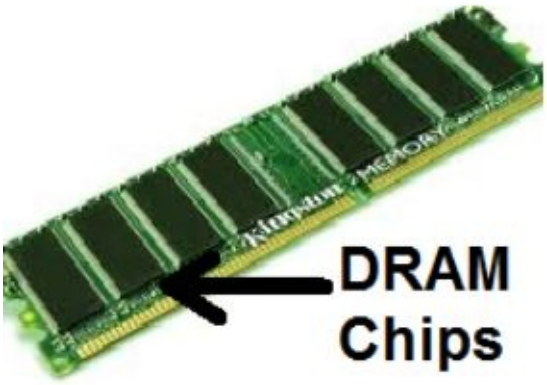
STATIC RAM (SRAM)



Made up with Transistors to store data.

Transistors stores information statically. No need to refresh the data. That's why it is called as Static RAM

DYNAMIC RAM (DRAM)



Made up with Transistors & Capacitors, But Capacitors are used to store Data. Capacitors have to be recharged dynamically. We have to refresh data. That's why it is called as Dynamic RAM

Advantages

1. Operates at Very High Speed

(Equals to Processor Speeds)

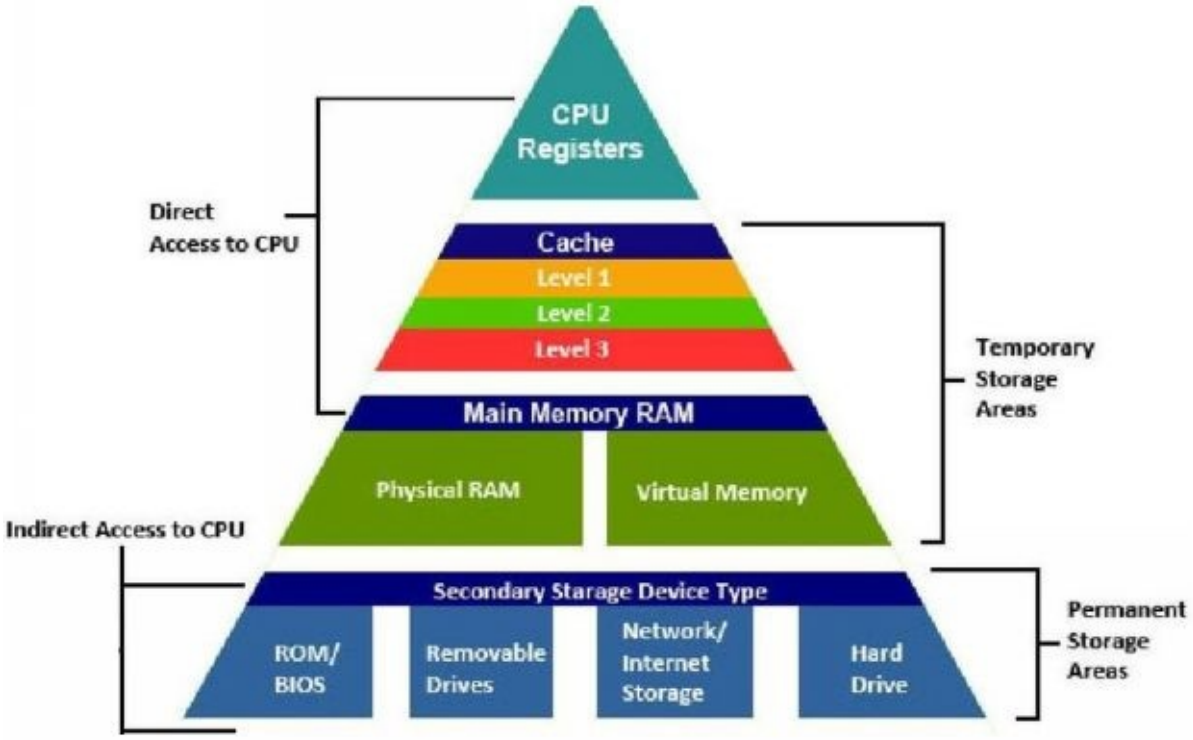
Disadvantages

1. Operates at high / medium Speed

(Compared to Static)

2. No Data Refreshment is Required.	2. Data Refreshment is required
Disadvantages	**Advantages**
1. Large in Size (Requires 6 transistors to store 1 bit)	1. Small in Size (Requires 1 transistor & 1 Capacitor to store 1 bit)
2. Complex Design	2. Simple Design
3. High Power Consumption	3. Low Power Consumption
4. Very high Cost.	4. Low cost
Due to High Cost and Large size smaller capacities will be used. (1 /2 /4 / 8 MB…)	Due to Low cost and Small size higher capacities will be used. (1 / 2/ 4 /8 GB…)
Ex: Registers, L1, L2 & L3 cache memories used in CPU/ Processor	Ex: DDR1, DDR2, DDR3, DDR4 RAMS installed on the motherboard.

Memory Hierarchy



CPU Register: A, special, high-speed storage area within the CPU. All data must be represented in a register before it can be processed. For example, if two numbers are to be multiplied, both numbers must be in registers, and the result is also placed in a register. (The register can contain the address of a memory location where data is stored rather than the actual data itself.)

The number of registers that a CPU has and the size of each (number of bits) help determine the power and speed of a CPU. For example a 32-bit CPU is one in which each register is 32 bits wide. Therefore, each CPU instruction can manipulate 32 bits of data.

A CPU cache is a cache used by the central processing unit (CPU) of a computer to reduce the average time to access memory. The cache is a smaller, faster memory which stores copies of the data from frequently used main memory locations. Most CPUs have different independent caches, including instruction and data caches, where the data cache is usually organized as a hierarchy of more cache levels (L1, L2, L3)

Main Memory (Primary memory), often referred to simply as memory, is the only one directly accessible to the CPU. The CPU continuously reads instructions stored there and executes them as required. Any data actively operated on is also stored there in uniform manner.

Secondary Memory: This type of memory is also known as external memory or non-volatile. It is slower than main memory. These are used for storing Data/Information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. Contents of secondary memories are first transferred to main

DYNAMIC MEMORY / RAM (DRAM) / DIMM

SNO	NAME	VOLT	WIDTH	SPEED	SHAPE
1.	SD 168 pins	5, 3.3 V	64 bit	66/100/133MGHZ 5V/3.3V/3.3V	
2.	RD 184 pins	2.5V	16bit	600-1200MHZ	
3.	DDR (1) 184 pins	2.5V	64bit	200/266/333/400 MTS 100/133/266/200 MHZ	Bandwidth: 1600/ 2100/ 2700/ 3200 MBPS 
4.	DDR 2 240 pins	1.8V	64bit	400/533/667/800/1066 200/266/333/400/533MHZ	Bandwidth: 3200/ 4250/ 5300/ 6400/ 8500 MBPS 
5.	DDR 3 240 pins	1.5V	64bit	800/1066/1333/1600/1866/2133 400/533 /667 /800 /933/1066MHZ	Bandwidth: 6400/ 8500/ 10600/ 12800/ 14900/ 17000MBPS 
6.	DDR 4 284/288 pins	1.2V	64bit	2133/2666/3200/3733/4266 1066/1333/1600/1866/2133MHZ	Bandwidth: 17000/ 21400/ 25600/ 29800/ 34000MBPS 

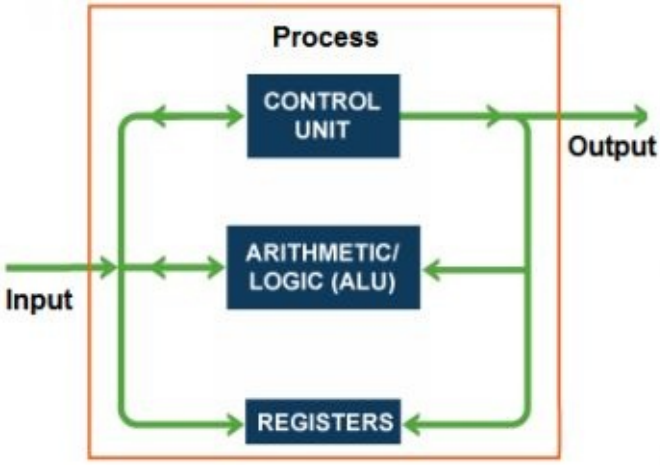
SIMM: Single Inline Memory Module. DIMM: Dual Inline Memory Module. SD: Synchronous Dynamic (Memory Speed has equalised with System Bus / Front Side Bus) RD: Rambus Dynamic. DDR : Double Data Rate (Data will be transferred twice per clock cycle). ECC RAM (Parity RAM) : RAM with ECC or "Error Correction Code" can detect and correct errors. Making ECC RAM more expensive and a little slower than non-parity. Buffered (Registered) RAM : Registered (also called buffered) memory modules have a register (Static RAM) between the DRAM modules **Dual Channel: Two Data Buses for Data Transfer (Use two Modules)**

memory and then CPU can access it. For example, disk, CD-ROM, DVD, etc.

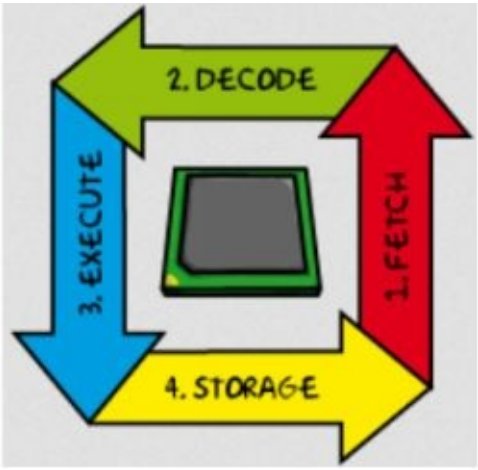
CPU

CPU is a brain of a computer. It called Central Process Unit. CPU fetches and executes instructions. CPU consists of an Arithmetic and Logic Unit (ALU), a control unit, registers and buses.

Part of CPU (Processing)



Instruction Cycle



ALU: is a digital circuit that calculates an arithmetic operation (like an addition, subtraction, etc.) and logic operations (like an Exclusive Or) between two numbers. the ALU is a fundamental building block of the central processing unit of a computer.

Control Unit: controls CPU operations, including ALU operations, the movement of data within the CPU, and the exchange of data and control signals across external interfaces (e.g., the system bus)

Registers: these components are special memory locations that can be accessed very fast. Three registers are shown: the Instruction Register (IR), the Program Counter (PC), and the Accumulator.

Buses: these components are the information highway for the CPU. Buses are bundles of tiny wires that carry data between components. The three most important buses are the address, the data, and the control buses.

Input, Process, Output (IPO)

Input involves entering the data and instructions that the computer needs to carry out a particular task.

process is what the computer is to do with the data or instructions that have been input

Output is the set of results which is obtained when the instructions have been run.

Instruction Cycle : Executing a single instruction consists of a particular cycle of events; fetching, decoding, executing and storing .

For example, to do the **add** instruction above the CPU must

Fetch **:** get the instruction from memory into the processor.

Decode **:** internally decode what it has to do (in this case add).

Execute **:** take the values from the registers, actually add them together

Store **:** store the result back into another register.

Intel Processor / CPU Generations

First Generation Processors (1971)

4004, 4040
(4bit CPU)

8008, 8080, 8085
(8bit CPU)

8086, 8088, 80186, 80188
(16bit CPU)

Second Generation Processors (1982)

80286
(16bit CPU)

Third Generation Processors (1985)

80386DX, 80386SX, 80386SL, 80386EX (32bit CPU)

Fourth Generation Processors (1989)

80486DX, 80486SX, 80486DX2, 80486SL, 80486DX4 (32bit CPU)

Fifth Generation Processors (1993)

Pentium, Pentium MMX
(32bit CPU)

Sixth Generation Processors (1995)

Pentium Pro, Pentium II, Pentium III, Celeron (Slot)
(32bit CPU)

Pentium III, Celeron
(Socket) (32bit CPU)

Seventh Generation Processors (2000)

Pentium 4, Celeron, Pentium 4 HT
(32bit CPU)

Pentium D, Celeron D, Pentium4 EE (32bit CPU)

Eighth Generation Processors (2006)

Core Solo, Core Duo

(32bit CPU)

Core 2 Solo, Core 2 Duo, Core 2 Quad, Core2 Extreme (64bit CPU)

Pentium Dual Core, Celeron Dual Core, Atom (Low Cost)
(64bit CPU)

Core i3, Core i5, Core i7
(64bit CPU)

Intel 7th Generation Processors (Released in 2000)

Pins: 478

Pins: 478

Low L2 Cache &
Some Features Disabled

Pins: 775

One Physical Processor
act like Two Logical Processors

Pins: 775

Two Physical Processors

Pins: 775

Two Physical Processors with
Low L2 Cache

Pins: 775

Two Physical Processors with HT
act like Four Logical Processors

Intel 8th Generation Processors (Released in 2006)

Pins: 775
Architeture: 65nm

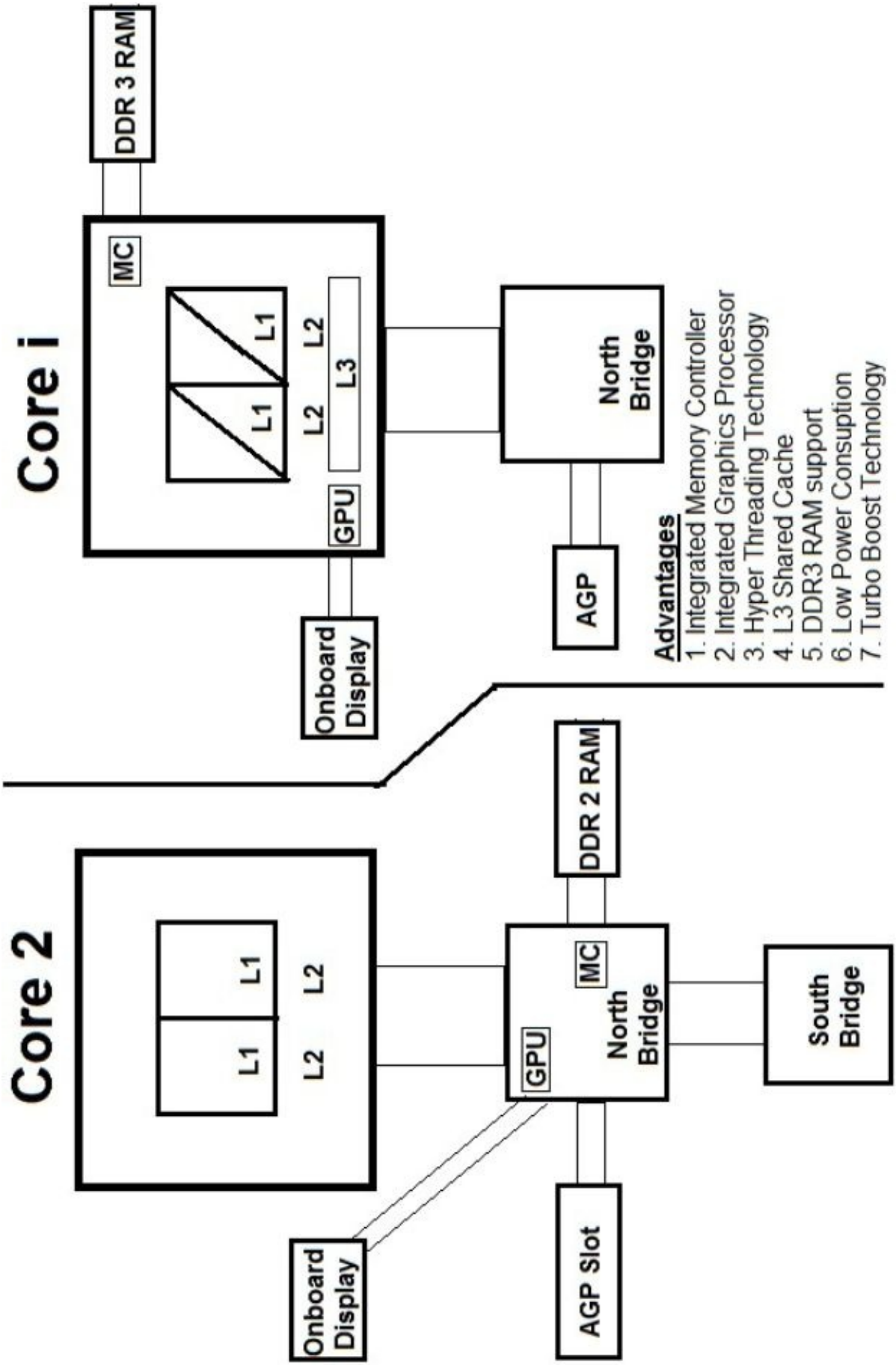
Pins: 775
Architecture: 65nm & 45nm

Pins: 775
Architecture: 65nm & 45nm

Pins:1156
Architecture: 32nm & 22nm

Pins:1156
Architecture: 32nm & 22nm

Pins:1156
Architecture: 32nm & 22nm



Generations in Core i3, i5, i7

	1st Gen	2nd Gen	3rd Gen	4th Gen	5th Gen

Code Name	Clarkdale	Sandy Bridge	Ivy Bridge	Haswell	Broadwell
Architecture (Transistor size)	32nm (Bi-Polar)	32nm (Bi-Polar)	22nm (Bi-Polar)	22nm (3D/ Trigate)	14nm (3D/ Trigate)
Power consumption	75 Watts	65 Watts	35 Watts	17 Watts	15 Watts
Number of Pins	1156	1155	1155	1150	1150
Graphics Processor	Graphics Processor	HD Graphics 2000 MHZ	HD Graphics 2500 MHZ	HD Graphics 4600 MHZ	HD Graphics 5500-6100

Intel Core i3 Processor

This particular Intel processor is the enter level processor of this new series of Intel processors. While it may not be the fastest one of the bunch, it can get the job done, at least for most applications.

Mind you, if you need high speed, I suggest one of the other processors that I will unveil in front of your eyes later on in this post. Here's some of the Core i3 features.

* Uses less heat and energy than earlier processors, which is always a good thing in this day and age.

Intel Core i5 Processor

This is the mid-size processor of this bunch, recommended for those who demand a little speed, but not quite enough where the user will be running resource-intensive applications.

* This is also a heat and energy efficient processor, but it does seem to be better at this particular job than the Core i3 processor.
* The number of threads used in this is no different than the Core i3 with 2-4 threads, and it also uses hyper threading technology for a boost in performance.
* The Core i5 is where the turbo mode is made available, this provides users with the opportunity to turn off a core if it's not being utilized.

Intel Core i7 Processor

This is for the users that demand power, yes it does provide more power and if Tim

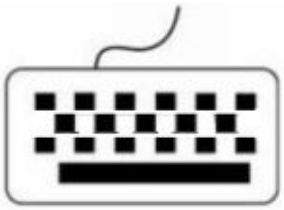
Allen gets one of these, this would be the best that he gets his hands on. Great for gamers and other resource intensive users.

* You will have four cores to take advantage of with this particular series.
* And just like the other ones in this Intel series of processors, it is more energy efficient and produces less heat.

Core i3, i5 and i7 comparison

	Core i3	Core i5	Corei7
No of Cores	2	4	4
Hyper Threading	Yes	No	Yes
No of Threads / Applications	4	4	8
L3 / Smart Cache	4MB	6MB	8MB
Turbo Boost	No	Yes	Yes
Power	54 Watts	84 Watts	84 Watts

Ports / Interfaces Symbols

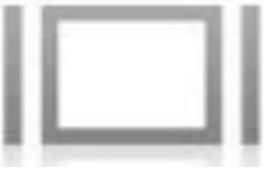


KEYBOARD

MOUSE

COM / SERIAL

PRINTER

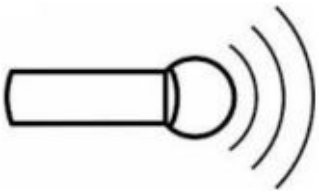


MONITOR

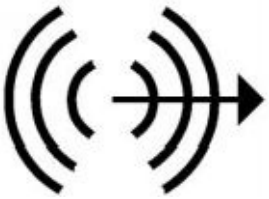
DISPLAY

FIREWIRE

USB



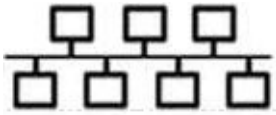
MIC



LINE-OUT

LINE - IN

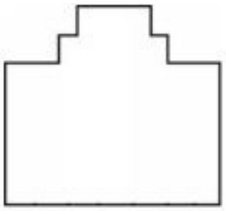
JOYSTICK



LAN

BLUETOOTH

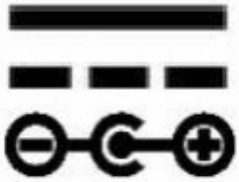
WIFI



TELEPHONE

POWER BUTTON

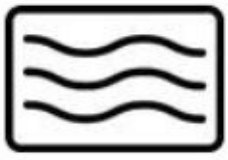
AC IN



DC IN

TV OUT

INFRARED



MICROWAVE

E- SATA

LOCK

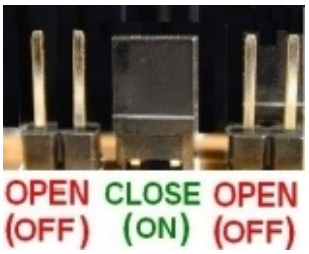
Computer Parts and Peripherals

S No	Component /

	Peripheral	Description	Picture
1	**All-In-One Printer**	All-in-one printer, also known as a multifunction printer (MFP), is a great buy. All-in-one printers can print, scan, copy, and sometimes fax.	
2	**Barcode Reader**	A barcode reader (or barcode scanner) is a computer peripheral for reading barcodes printed on various surfaces. Like a flatbed scanner, it generally consists of a light source, a lens and a photo conductor translating optical impulses into electrical ones.	
3	**Blue tooth Adapter**	A short distance, low speed radio frequency technology primarily used to allow a Personal Digital Assistant (PDA) or mobile phone to interact with a laptop or desktop computer.	
4	**Camcorder**	A camcorder (camera recorder) is a portable electronic recording device capable of recording live-motion video and audio for later playback. Generally uses Hard Disk for Storage.	
		A Card reader is an extra piece of hardware which will plug directly into your computer, generally via a USB port and allow you to read the contents	

5	**Card Reader**	of a media card without the need to plug your camera into the PC.	
6	**CMOS Battery**	CMOS (pronounced "see-moss"), which stands for complementary metal-oxide-semiconductor uses 3Volts Lithium battery power to store data in CMOS RAM.	
7	**Data Cartridge / Tape**	Magnetic tape has been used for data storage for over 50 years. In this time, many advances in tape formulation, packaging, and data density have been made. Modern magnetic tape is most commonly packaged in cartridges and cassettes.	
8	**Digital Camera**	A camera which stores images as digital information rather than on photographic film. This allows images to be easily displayed and edited on computer.	
9	**Digital Pen**	An instrument that captures what the user writes on paper and sends it to the computer. Using special paper with a tiny grid that enables the pen to sense what is actually written or drawn, the device turns the writing into an image file and transmits it to the computer via wireless or when mounted in a cradle.	

10	**Game Pad**	A pointing device like a mouse used to move an object on a computer screen. A game pad is a flat hand held pad with several control buttons connected tot he computer by a special port.	
11	**HD TV**	High-definition television (or HDTV) is a digital television broadcasting system with higher resolution. The number of lines that create the image and the letter are 720 or 1080 lines into perspective, televisions of the past had only 576/ 480 lines. And audio with Digital Dolby.	
12	**Heat Sink Compound / Thermal Compound**	A thick gooey substance, with very good heat conductive qualities. This is placed between the CPU core and the surface of the heatsink, to assist in the quick transferal of heat from the core.	
13	**Ink Cartridge**	A cartridge that contains ink and Nozzles. It will be used in Ink Jet / Desk Jet Printers. And can be replaced	
14	**USB Data Card**	An USB device will be used to get Internet through Wireless from Cell Phone Towers.	
		In electronics and particularly computing, a jumper is a short length of conductor used to	

15	**Jumpers**	close a break in or bypass part of an electrical circuit. Jumpers are typically used to set up or adjust printed circuit boards	
16	**Memory Card/ Flash Memory Card**	A memory card is a small storage medium used to store data such as text, pictures, audio, and video, for use on small, portable or remote computing devices.	
17	**PCMCIA Card**	Personal Computer Memory Card International Association. A standard for miniaturized laptop expansion cards for modems, storage, and other devices. Often called PC cards.	
18	**Projector**	A projector is a device that integrates a light source, optics system, electronics and display(s) for the purpose of projecting an image from a computer or video device onto a wall or screen for large image viewing.	
19	**Ribbon / Ribbon Cartridge**	Used by Impact printers like Dot Matrix and Line Printers to produce an imprint on paper.	
20	**RJ11 Connector**	Registered Jack number 11. Small line plug and socket used on telephone handsets	

		and modem connections with 4 pins	
21	**RJ45 Connector**	Registered Jack-45, an eight-wire connector used to connect computers onto a local-area networks (LAN), especially Ethernets.	
22	**SATA Card**	An expansion card that provides additional SATA ports for SATA Hard Disk Drives.	
23	**SO DIMM**	Short for Small Outline DIMM, a small version of a DIMM used commonly in notebook computers	
24	**Steering Wheel**	A gaming device with a steering wheel and foot pedals.	
25	**Tape Drive**	An add-on component to a computer system that allows a great volume of information to be stored on inexpensive magnetic tape cartridges. Used for daily back-ups and long term archival storage of past projects	
		A cartridge in laser printers which contains the toner (Dry	

		ink / Powder).	
26	**Toner Cartridge**		
27	**Wrist Strap / ESD Wrist Strap/ Ground Bracelet**	An excellent way to prevent ESD damage to your computer is to use an anti-static wrist strap. It's a conductive strap that fits on your wrist as you're working. It has a wire attached to it with an alligator clip on the end to connect to your case or to an anti-static mat. Some can be plugged right into the wall socket	

Assembly of Computer System

The minimum tools required to assemble a PC is a set of screwdrivers. Here is also suggested list of other items you should use to help resolve potential problems.

1. Magnetic Screwdriver
2. Cutting Plier or Nose Plier
3. Wrist Strap
4. Startup Disk and CDROM Drivers
5. List of Components to be assembled
6. Thin razor blade
7. POST Diagnostic tool
8. PC repair Book
9. Notepad and Pencil
10. Telephone close to the PC assemble area
11. Telephone numbers for manufacturers and known "Experts"
12. Access to the world wide web, with accompanying list of websites

CAUTIONS

Before continuing, make sure that you always unplug the power supply from the power source (surge protector / wall unit). There are three main reasons:

1. Your are trying to create a common ground between you and the parts.

   Electrons migrate based on charge differentials. The static charge or ESD (Electrostatic discharge) destroys components. No, you will not see the damage with your eyes. No, you will not here any sparks fly. Instead, memory chips are slowly degraded, holes are created in the chip, and random errors will be present. Then one day, the part will stop functioning.

2. Motherboards use +5V from the power supply to turn on the PC. For ATX systems this voltage is always present when the power supply is plugged into the wall and motherboard. They use a momentary switch the uses this voltage to turn on the PC. Sliding parts in and out of the main board while the power is available might cause damage. (Note: some power supplies should not receive power if they are not plugged into the motherboard. Doing this can cause problems.

Gather all your components

Make sure that you have clean area to work, and plenty of time without interruptions. Start with the power supply , main board, CPU, CPU fan, and case speaker. Do not mount the motherboard in your enclosure. Set the main board on a cardboard box on top of the enclosure so that the power supply connection will reach.

Check your components.

1. Before you touch any of the parts, ground yourself by touching the metal case and / or ware wrist strap.

2. Open your components in static free area (away from plastic wrap, packing material, carpet, wool, polyester, your shirt sleeves) and visually inspect them.

3. Keep all your packing material, manuals and any instructions that may accompany the parts.

4. Make sure that all of the parts arrived.

5. Check all parts to verify they are the correct model numbers.

6. Look for physical damage; dents, scuffs, broken or bent pins. Do not power to any parts that are damaged.

7. Verify that you have the mainboard manual. Read the manual

8. Check all jumper setting by comparing them with manual's instructions.

9. Do not let any one else touch you or your components while you are working on the system. Keep everyone at least 3 feet away (arms distance!) from the system.

Benchtop Assembly

You will start your assembly outside of the computer case. The motherboard, Processor, Power supply, and speaker will be assembled together first.

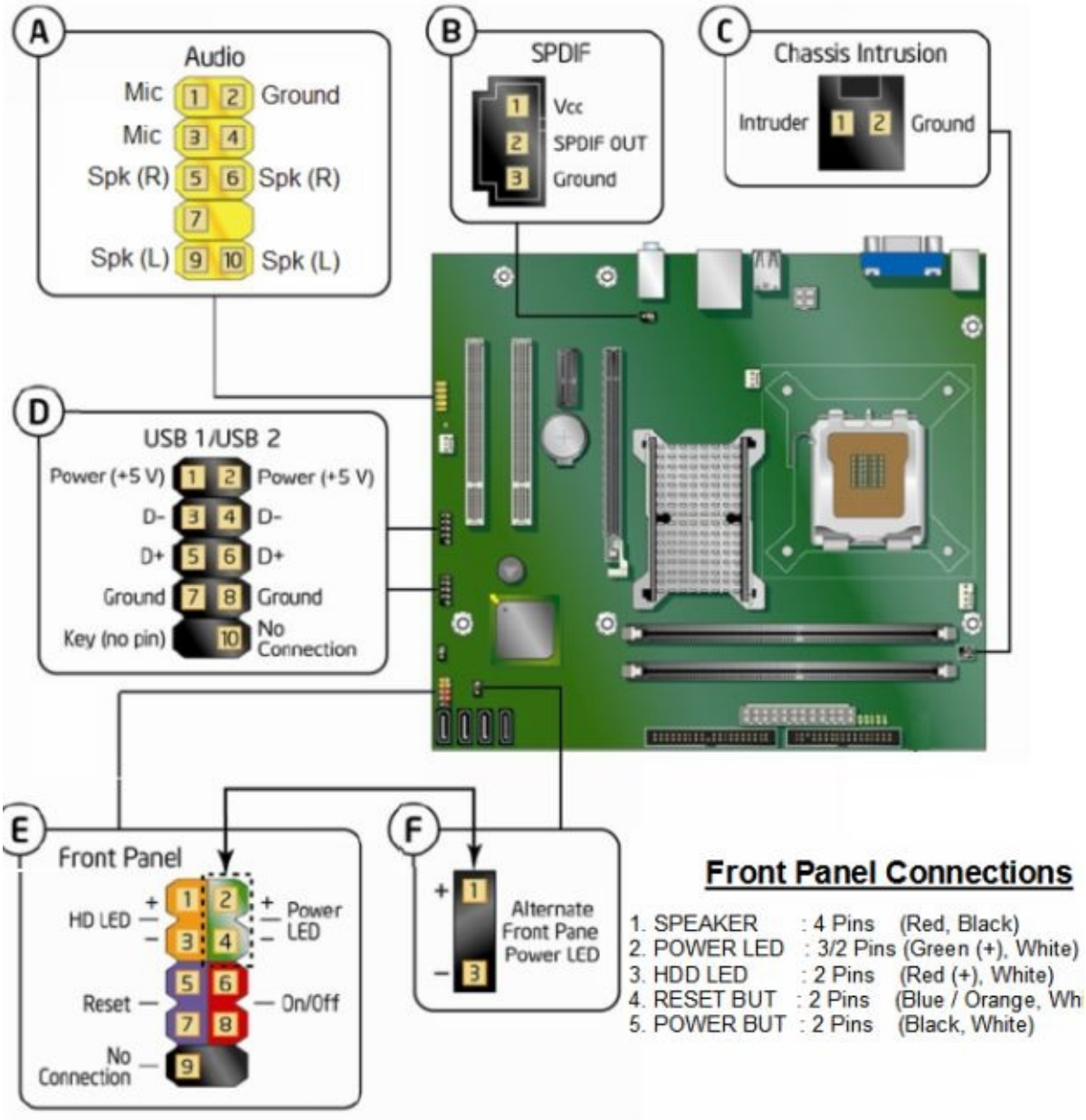
Check the motherboard

Now that you have your new computer components, you want to verify that the mainboard works.

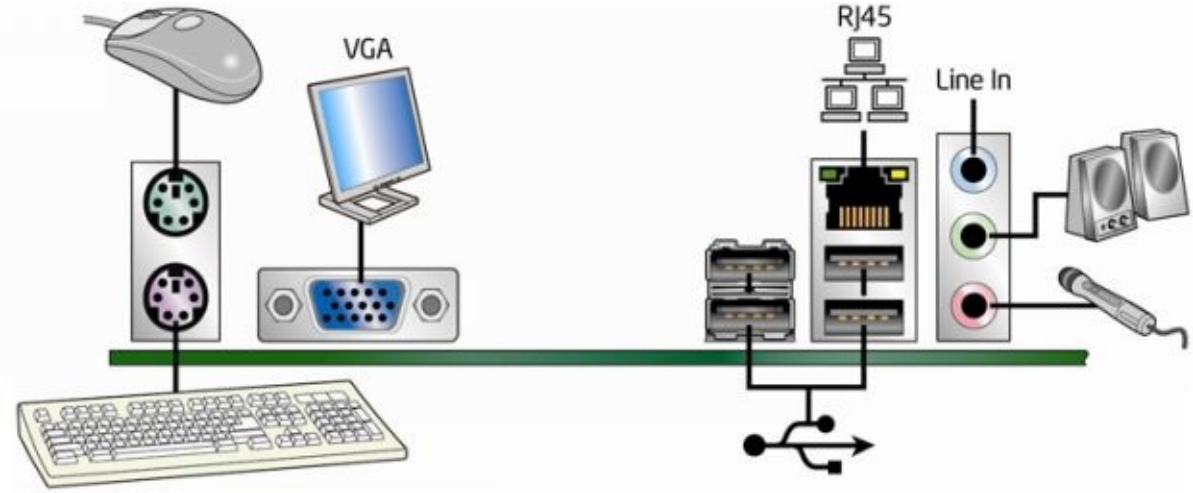
1. Read the manual thoroughly. Your component manuals contain detailed information about your products and often step-by-step installation instruction. Most good technicians double-check the manual.

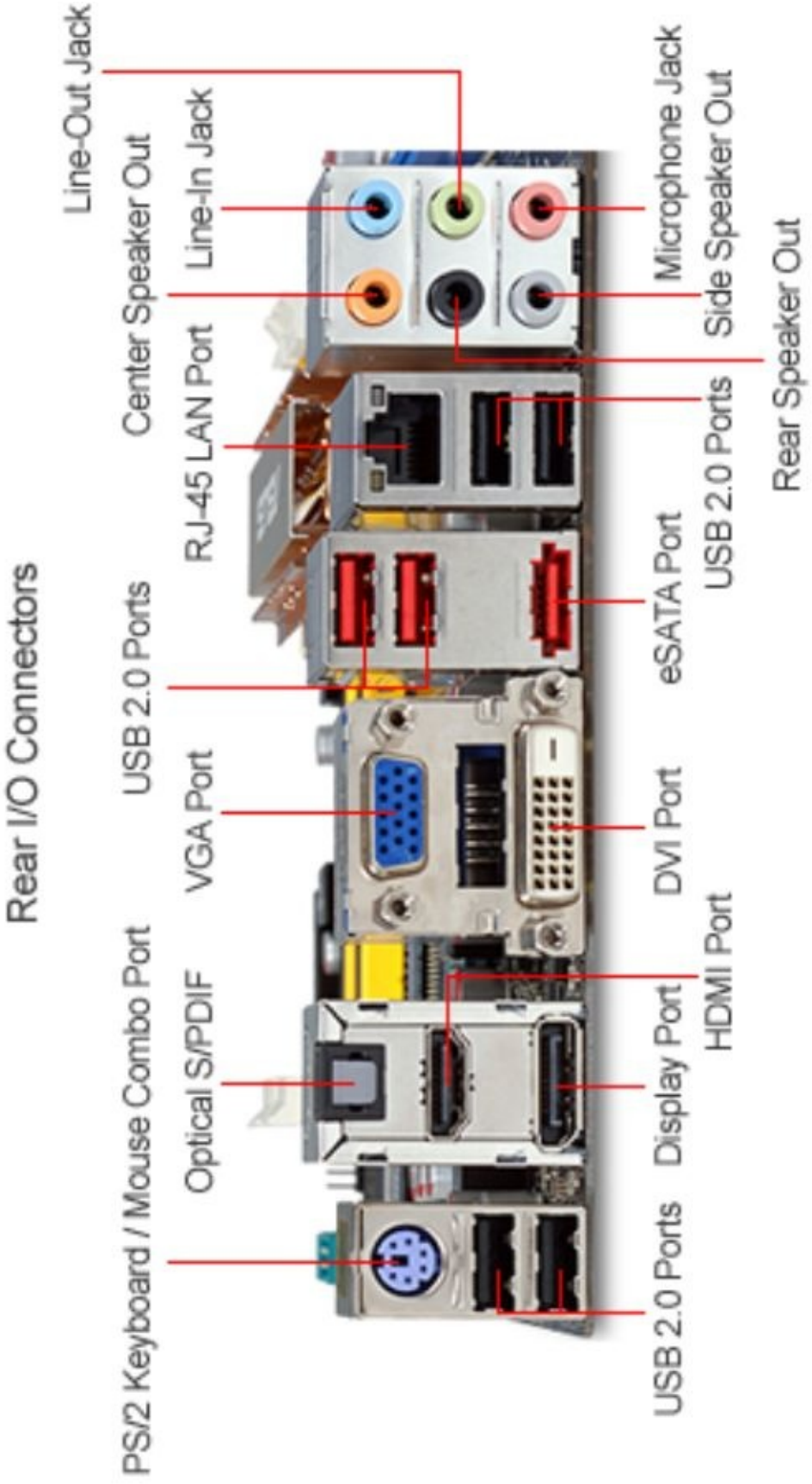
2. Check all jumper setting on your motherboard to make sure they are accurate. Use your motherboard manual as a reference. The main jumpers to check are the external bus speed setting, clock multipliers and voltage jumpers.

3. You can Install Processor, cooling fan and memory on the motherboard before installing it in the cabinet.



Rear Panel Connections


VGA
RJ45
Line In



LAPTOP AND NOTEBOOK COMPUTERS

Some Original Equipment Manufacturers (OEM's) call their mobile computers "laptops" and some call them "notebooks".

Laptop computers are somewhat larger than notebooks and will accommodate a built-in

disk drive unit and; optionally, a floppy drive unit. That is, a CD ROM drive is either built into the unit or the unit has a built-in bay that will accommodate a removable CD drive.

Notebook computers will allow you to attach, via cable, a CD ROM drive, Since the drive is not built into the unit, notebooks are smaller and lighter than laptops. Hence, a notebook is an ultra small laptop. Another way to look at it is a notebook is about the size (or a little larger than) of a real [binder] notebook. If you use note books are more harder than laptops as my laptop's system dead twice but note book not.

The Laptop Computer

The standard laptop computer would have some , if not all, of the following features:

1. 14" - 17" (widescreen) TFT screen.
2. Medium to Maximum graphics subsystem.
3. Internal DVD-ROM or DVD-RW drive
4. Large full featured keyboard.
5. 3 hour+ battery life.
6. Upgradeable.
7. Integrated modem, network, Bluetooth & Wi-Fi.
8. High quality integrate audio and speaker system.

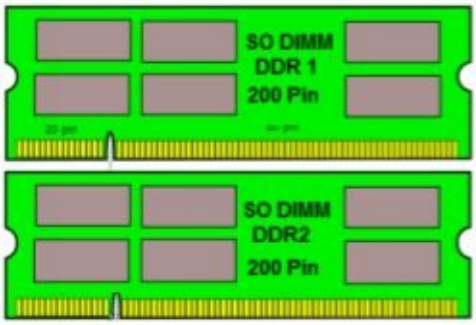
The Notebook Computer

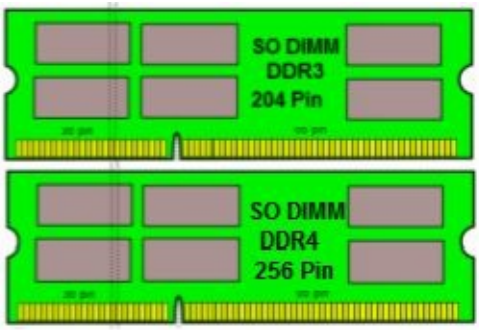
A standard notebook has the following features:

1. Ultralight. Less weight is better.
2. 4 - 5 hour battery life.
3. No internal floppy drive.
4. Minimal graphics subsystem.
5. No internal DVD or CD system.
6. 12" - 14" TFT screen.
7. Low profile (thin).
8. Integrated modem and network connection.
9. Smallest possible keyboard.

SO DIMM (Small Outline Memory Module)

Memory used in Laptop / Notebook





BIOS

In IBM PC Compatible computers, the **basic input/output system (BIOS)** , also known as the **System BIOS**.

The BIOS is boot firmware, designed to be the first code run by a PC when powered on. The initial function of the BIOS is to identify, test, and initialize system devices such as the video display card, hard disk, floppy disk and other hardware. The BIOS sets the machine hardware into a known state, so that software stored on compatible media can be loaded, executed, and given control of the PC. This process is known as booting, or booting up, which is short for bootstrapping.

Functions of BIOS:

BIOS Contains Read Only Software (Firmware) and will be used to

1. Start the Computer.
2. Performs POST (Power On Self Test)
3. IPL (Initial Program Load- The Process of Getting the Operating System started)
4. Stores Drivers Software for Basic Input / Output devices like Keyboard, Hard Disk, Floppy Disk , Serial , Parallel ports etc..
5. Used to Change System Setting / Configuration.

Booting: Loading of Operating System into Main Memory is called as Booting.

CMOS

Motherboards also include a separate block of memory made from very low power consumption CMOS (complementary metal oxide silicon) RAM chips, which is kept "alive" by a battery even when the PC's power is off. This is used to store basic information about the PC's configuration: number and type of hard and floppy drives, how much memory, what kind and so on. All this used to be entered manually, but modern auto-configuring BIOSes do much of this work, in which case the more important settings are advanced settings such as DRAM timings. The other important data kept in CMOS memory is the time and date, which is updated by a Real Time Clock (RTC).

The CMOS memory is usually located with the real-time clock in the motherboard chipset or in a separate real-time clock chip. The PC reads the time from the RTC when it boots up, after which the CPU keeps time - which is why system clocks are sometimes out of sync.

BIOS Setup

The BIOS (basic Input Output System) setup Utility displays the system's configuration status and provides you with options to set system parameters. The parameters are stored in battery-backed-up CMOS RAM that saves this information when the power is turned off. When the system is turned on, the system is configured with the values you stored in CMOS.

Note : For Some Computers Hit F1, F2, F8, F10, ESC, CTRL+ESC, CTRL+S .

AWARD BIOS (Used in MSI, Mercury, Gigabyte, Biostar, EVGA MB…)

Award BIOS CMOS Setup Utility	
Standard CMOS Features	Frequency / Voltage Control
Advanced BIOS Features	Load Fail – Safe Defaults
Advanced Chipset Features	Load Optimized Defaults

Integrated Peripherals	Set supervisor Password
Power Management Setup	Set User Password
PnP / PCI Configurations	Save & Exit Setup
PC Health Status	Exit Without Saving
Esc : Quit	: Select Item
F10 : Save & Exit Setup	
Time, Date, Hard Disk Type…	

AMI BIOS (Used in INTEL & ASUS Motherboards…)

BIOS Setup Utility

Main Advanced Security Power Boot

Bios Version **BX97510J.86A.1209.2009.0601.1340**

Processor Type **Intel (R) Core (TM) 2 CPU**
Processor Speed **2.92 GHz**
System Bus Speed **1066 MHz**
System Memory Speed **667 MHz**

L2 Cache RAM **4096 KB**

Total Memory	**2048 MB**
Memory Mode	**Dual Channel**
Memory Channel A Slot 0	**1024 MB**
Memory Channel A Slot 1	**Not Installed**
Memory Channel A Slot 0	**1024 MB**
Memory Channel A Slot 1	**Not Installed**
Language	**<English>**
System Date	**[06/15/2009]**
System Time	**[08:45:12]**

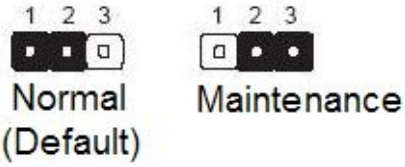
CMOS clear

Method 1: Clearing the CMOS can be done a few ways. The most common way is to use the jumper on the motherboard. This jumper has two settings. Normal and Clear. Moving the jumper to the Clear setting will erase the settings stored in CMOS. It does not remove the BIOS itself, only the user defined settings within the CMOS. When you clear the CMOS you will most likely see the error message “CMOS Checksum Error” on the next reboot. You can enter the BIOS setup at this point or before and reconfigure the settings.

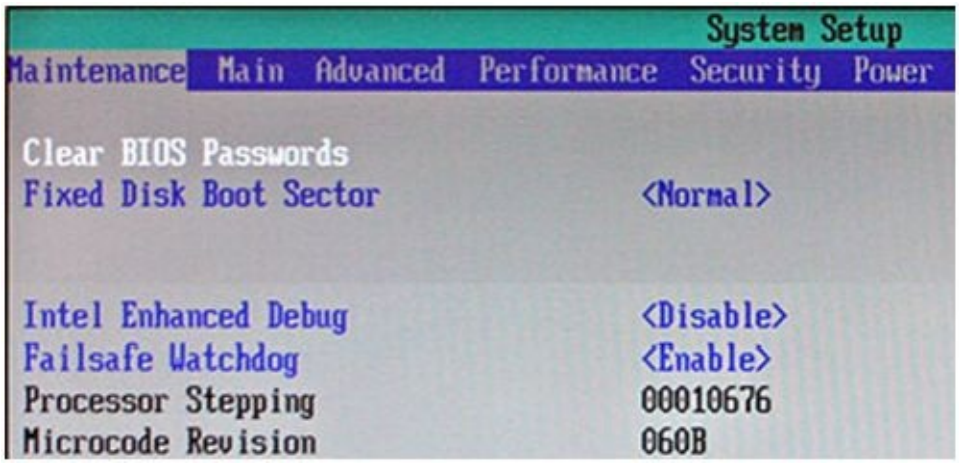
Method 2: Another method is to remove the CMOS battery from the system. Removing the battery is usually the second method as it may take anywhere from 15 minutes to 8 hours in order for the CMOS to loss the settings, For immediate clearing Short the Battery terminals on Motherboard. Once the CMOS is clear, you should know by the “BIOS checksum error, press F1 to continue “, or “CMOS Checksum Error - Defaults Loaded” message at bootup.

Clear CMOS in Intel Motherboard

Switch off the Computer and put the CMOS jumper in 2-3 position as follows



Now switch on the Computer, it will automatically enters into BIOS and you will get the following screen as follows. In the Maintenance option select “Clear BIOS Passwords” and “Save & Exit”.



Now replace the CMOS jumper to 1-2 position and restart the Computer.

BIOS Recover

The BIOS recovers Data in the event of a failed BIOS Update.

UEFI BIOS (Latest for All MB)

(UEFI : Unified Extensible Firmware Interface)

Advantages : 1. Graphical User Interface 2. Ability to boot from large disks (over 2 TB) 3.. CPU-independent architecture 4. CPU-independent drivers

5. Flexible pre-OS environment, including network capability. 6. Modular Design.

Operating system (OS)

An **operating system** (**OS**) is a set of computer programs that manage the hardware and

software resources of a computer. An operating system processes raw system and user input and responds by allocating and managing tasks and internal system resources as a service to users and programs of the system. At the foundation of all system software, an operating system performs basic tasks such as controlling and allocating memory, prioritizing system requests, controlling input and output devices, facilitating networking and managing file systems. Most operating systems come with an application that provides an interface to the OS managed resources. These applications have had command line interpreters as a basic user interface but, since the mid-1980s, have been implemented as a graphical user interface (GUI) for ease of operation. Operating Systems themselves have no user interfaces; the user of an OS is an application, not a person. The operating system forms a platform for other system software and for application software. Windows, Linux, and Mac OS are some of the most popular OSes.

Services:

1. Process management
2. Memory Management
3. Disk and File systems
4. Networking
5. Internal Secuirty
6. External Security
7. Graphical User Interface
8. Device Drivers.

Kernel :

In computer science, the **kernel** is the central component of most computer operating systems (OS). Its responsibilities include managing the system's resources(the communication between hardware and software components). As a basic component of an operating system, a kernel provides the lowest-level abstraction layer for the resources (especially memory, processors and I/O devices) that application software must control to perform its function. It typically makes these facilities available to application processes through inter-process communication mechanisms and system calls.

Assembler :

An **assembly language** is a low-level language for programming computers. It implements a symbolic representation of the numeric machine codes and other constants needed to program a particular CPU architecture. This representation is usually defined by the hardware manufacturer, and is based on abbreviations (called mnemonics) that help

the programmer remember individual instructions, registers, etc. An assembly language is thus specific to a certain physical or virtual computer architecture (as opposed to most high-level languages, most of which are portable).

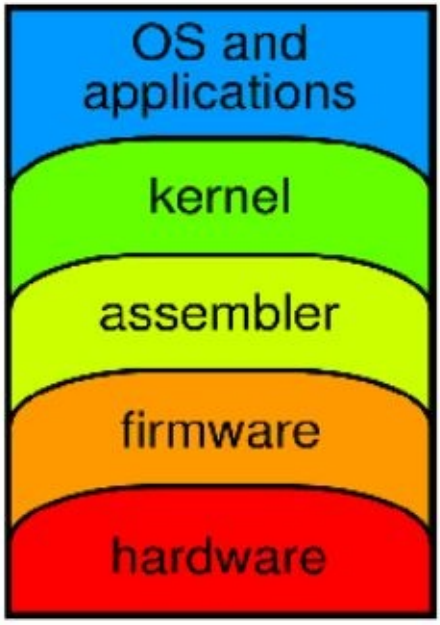
Assembly languages were first developed in the 1950s, when they were referred to as second generation programming languages. They eliminated much of the error-prone and time-consuming first-generation programming needed with the earliest computers, freeing the programmer from tedium such as remembering numeric codes and calculating addresses. They were once widely used for all sorts of programming. However, by the 1980s (1990s on small computers), their use had largely been supplanted by high-level languages, in the search for improved programming productivity. Today, assembly language is used primarily for direct hardware manipulation, or to address critical performance issues. Typical uses are device drivers, low-level embedded systems, and real-time systems.

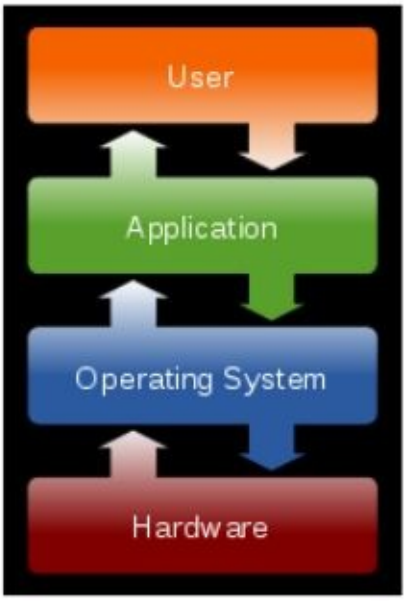
A utility program called an **assembler**, is used to translate assembly language statements into the target computer's machine code. The assembler performs a more or less isomorphic translation (a one-to-one mapping) from mnemonic statements into machine instructions and data. (This is in contrast with high-level languages, in which a single statement generally results in many machine instructions. A compiler, analogous to an assembler, is used to translate high-level language statements into machine code; or an interpreter executes statements directly.)

Firmware :

In computing, **firmware** is a computer program that is embedded in a hardware device, for example a microcontroller. It can also be provided on flash ROMs or as a binary image file that can be uploaded onto existing hardware by a user.

As its name suggests, firmware is somewhere between hardware and software. Like software, it is a computer program which is executed by a computer. But it is also an intimate and vital part of a piece of hardware, and has little meaning outside of that particular hardware.





List of Operating Systems

Microsoft:

1. **MS-DOS Family**
    1. MS-DOS 1.0 1981
    2. Windows 1.0 1985
    3. MS-DOS 6.22 1994
    4. Windows 3.11 1994

2. **Windows 9X Family**
    1. Windows 95 1995
    2. Windows 95B (OSR2) 1997
    3. Windows 98 1998
    4. Windows 98 SE 1999
    5. Windows ME 2000

3. **Windows NT Family**
    1. Windows NT 4.0 1996
    2. Windows 2000 2000
    3. Windows XP 32bit (x86) 2001
    4. Windows XP MC 2003

5. Windows Server 2003 2003
6. Windows XP 64bit 2005
7. Windows Vista 2007
8. Windows Server 2008 2008
9. Windows 7 2009
10. Windows 8 (32bit & 64bit) 2012
11. Windows Server 2012 2012
12. Windows 10 (32bit & 64bit) 2015

Non- Microsoft:

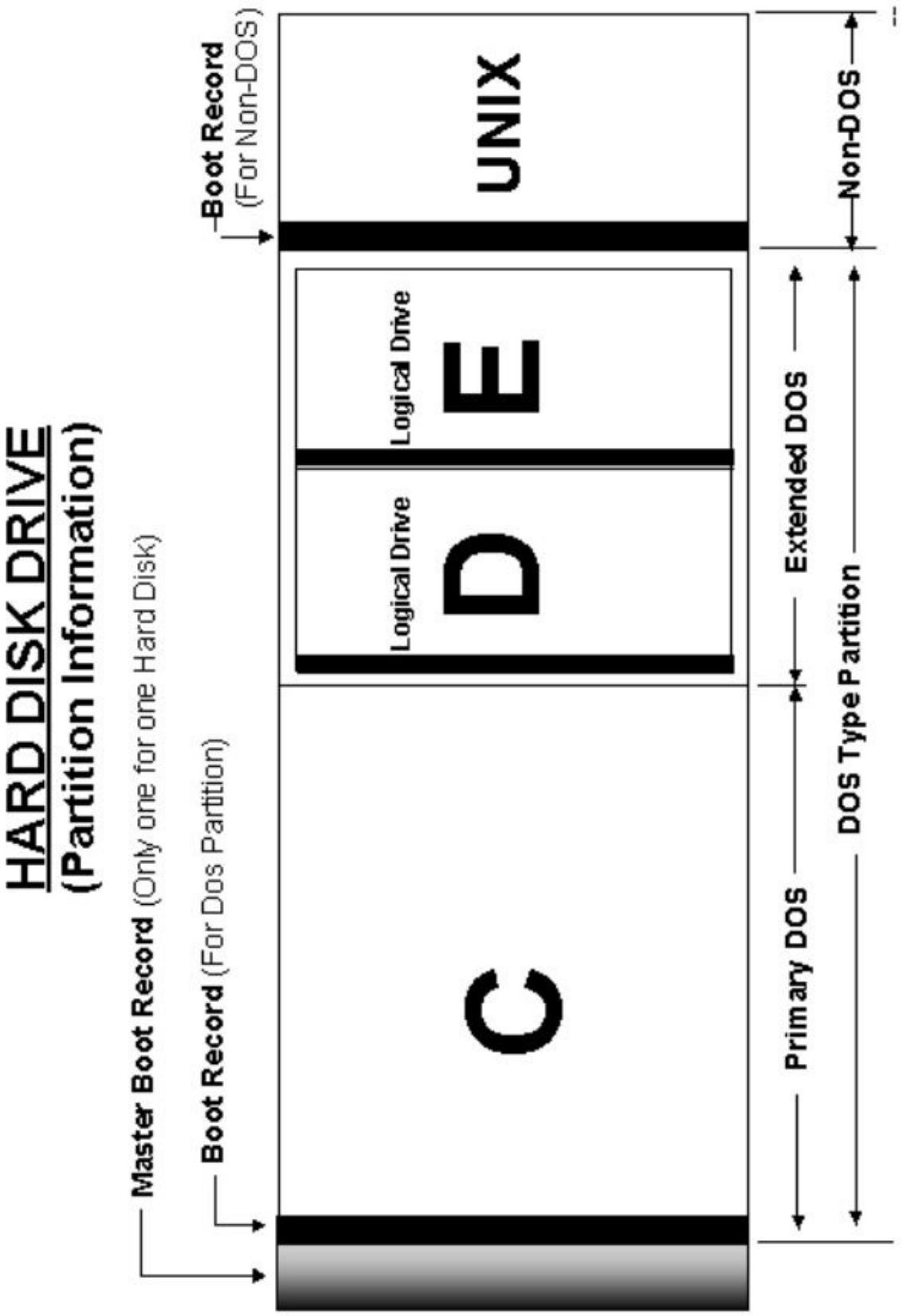
1. MAC / Macintosh (Apple) 1997
2. OS/2 Warp (IBM) 1999
3. PC-DOS (IBM) 1991
4. Unix (Bell) 1971
5. Linux (Linus Torvalds) 1991
6. Netware (Novell) 1983
7. Solaris (Sun Microsystems) 1992

DOS : Disk Operating System, SE : Second Edition

ME: Millennium Edition NT: New Technology XP: Experience

MC: Media Center OSR: OEM Service Release

OEM: Original Equipment Manufacturer.



MBR (Master Boot Record) Contains Partition table and Boot Partition Information

PBR (Partition Boot Record) Contains Operating System First File Information

FAT: File Allocation Table, just like index in Notebook.

NTFS: New Technology File System, also like FAT, but with so many security features.

Windows 7

Windows 7 is the latest public release version of Microsoft Windows, a series of operating systems produced by Microsoft for use on personal computers, including home and business desktops, laptops, netbooks, tablet PCs, and media center PCs. Windows 7 was released to manufacturing on July 22, 2009, and reached general retail availability on October 22, 2009, less than three years after the release of its predecessor, Windows Vista. Windows 7's server counterpart, Windows Server 2008 R2, was released at the same time.

Minimum hardware requirements for Windows 7		
Architecture	32-bit	64-bit
Processor	1 GHz 32-bit processor	1 GHz 64-bit processor
Memory (RAM)	1 GB of RAM	2 GB of RAM
Graphics Card	DirectX 9 graphics processor with WDDM driver model 1.0 (For Aero)	
HDD free space	16 GB of available disk space	20 GB of available disk space
Optical drive	DVD drive	

Standard editions

1. **Windows 7 Starter**
2. **Windows 7 Home Basic**
3. **Windows 7 Home Premium**
4. **Windows 7 Professional**
5. **Windows 7 Enterprise**
6. **Windows 7 Ultimate**

Windows 8

Windows 8 is a upcoming operating system part of the Microsoft Windows series produced by Microsoft, for use on personal computers, including home and business desktops, laptops, tablets, and home theater PCs. The release to manufacturing (RTM) is expected in the first week of August 2012, and Windows 8 will be available to users starting October 26, 2012.

Minimum hardware requirements for Windows 8		
Architecture	32-bit	64-bit
Processor	1 GHz 32-bit processor	1 GHz 64-bit processor
Memory (RAM)	1 GB of RAM	2 GB of RAM
Graphics Card	DirectX 9 graphics processor with WDDM driver model 1.0 (For Aero)	
HDD free space	16 GB of available disk space	20 GB of available disk space
Optical drive	DVD drive	

Standard editions

1. **Windows 8**
2. **Windows 8 Professional**
3. **Windows 8 Enterprise**

Windows 10

Windows 10 has launched globally in 190 countries today on 29 July 2015.

Minimum hardware requirements for Windows 10		
Architecture	32-bit	64-bit
Processor	1 GHz 32-bit processor	1 GHz 64-bit processor
Memory (RAM)	1 GB of RAM	2 GB of RAM
Graphics Card	DirectX 9 graphics processor with WDDM driver model 1.0 (For Aero)	
HDD free space	16 GB of available disk space	20 GB of available disk space
Optical drive	DVD drive	

Windows 10 has eight **editions** (excluding the four “N” editions), with varying feature sets and intended hardware.

All mentioned editions have the ability to use language packs, enabling multiple user interface languages. This functionality was previously only available in Windows 7 Ultimate or Enterprise.

Windows 10 Home

Windows 10 Home is designed for use in PCs, tablets, and 2-in-1s. It includes all consumer-directed features and is the equivalent to basic Windows 8, 8.1, Windows 7 Home Basic and Home Premium.

Windows 10 Pro

Windows 10 Pro is comparable with Windows 8 Pro, Windows 7 Professional and Ultimate and Windows Vista Business and Ultimate. It builds on the Home edition and adds features essential for businesses, and functionality-wise equal to Windows 8.1 Pro.

Windows 10 Enterprise

Windows 10 Enterprise provides all the features of Windows 10 Pro, with additional features to assist with IT-based organizations, and is functionality-wise equal to Windows 8.1 Enterprise.

Windows 10 Enterprise 2015 LTSB

Windows 10 Enterprise 2015 LTSB (Long Term Servicing Branch) is the same edition as Windows 10 Enterprise but will not receive any feature updates and gives companies more control over the update process.

Windows 10 Education

Windows 10 Education provides all Windows 10 Enterprise features, designed for use in schools, colleges and universities. It will be available with Microsoft's Academic Volume Licensing, in a manner similar to Windows 8.1 Enterprise.

Windows 10 Mobile

Windows 10 Mobile Enterprise

Windows 10 IoT Core

Windows 7 / 8 /10 Installation using a Disc

1. Enter your computer's BIOS. Turn off the computer that you want to install Windows on then turn it back on. When the BIOS screen appears or you are prompted to do so, press ⌦ Del, ⎋ Esc, F2, F10, or F9 (depending on your computer's motherboard) to enter the system BIOS. The key to enter the BIOS is usually shown on the screen.

2. Find your BIOS's boot options menu. The boot options menu of your BIOS may vary in location or name from the illustration, but you may eventually find it if you search around.

3. Select the CD-ROM drive as the first boot device of your computer.

Although this method may vary among computers, the boot options menu is typically a menu of movable device names where you should set your CD-ROM drive as the first boot device. It can also be a list of devices that you can set the order of their boot on. Consult a manual or the internet for help if you're stuck.

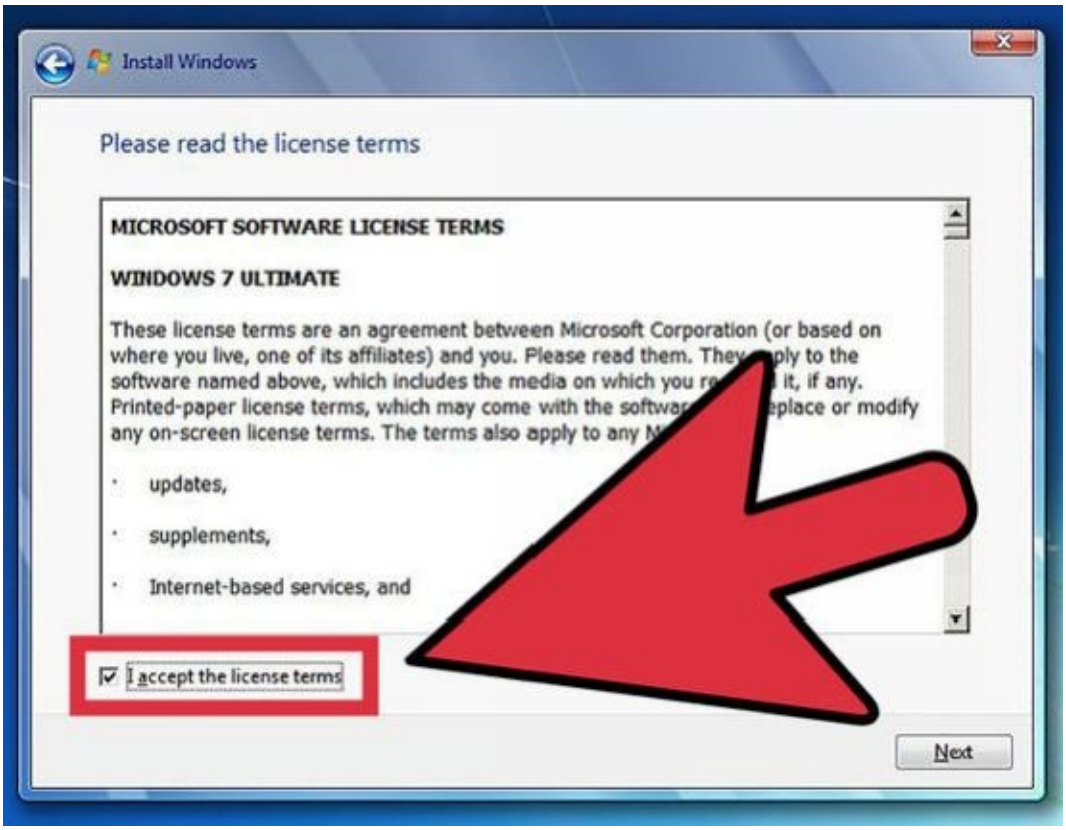
4. Save the changes of the settings. Press the button indicated on the screen or select the save option from the BIOS menu to save your configuration and restart.

5. Insert the Windows 7 disc into your disc drive.

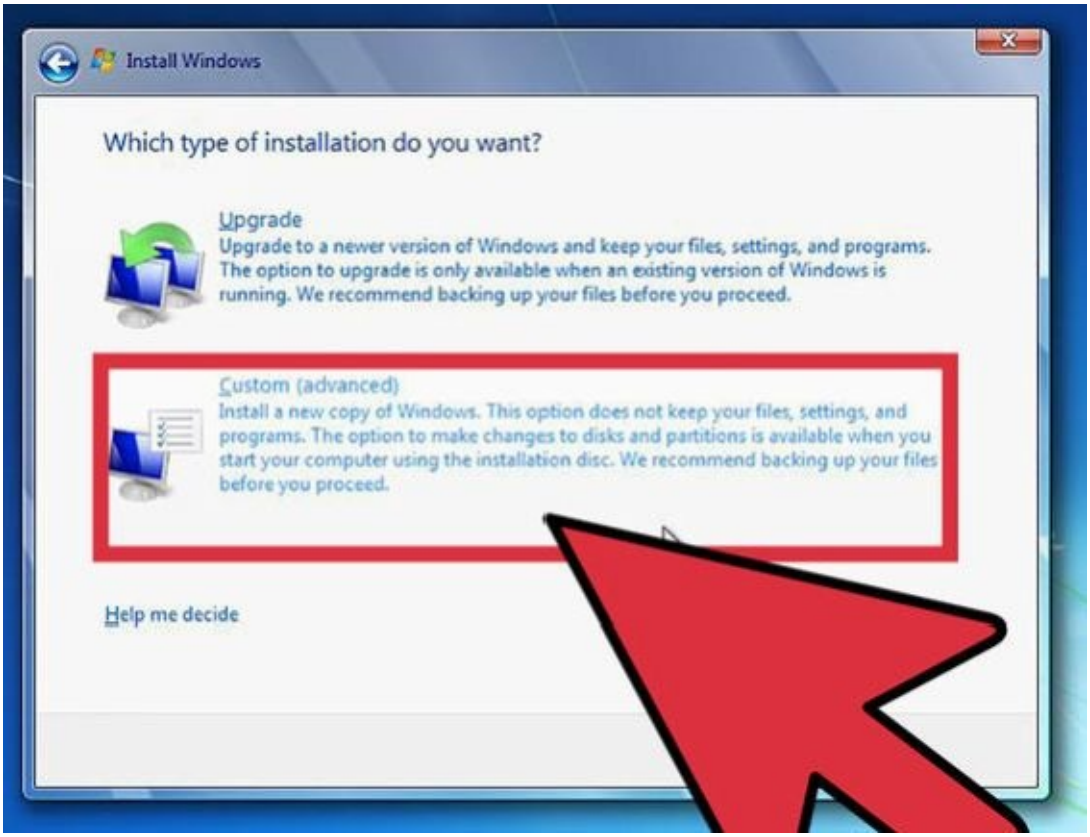
6. Start your computer from the disc. After you have placed the disc into the disc drive, start your computer. When the computer starts, press a key if you are asked if you would like to boot from the disc by pressing any key. After you choose to start from the disc, Windows Setup will begin loading.

7. Choose your Windows Setup options. Once Windows Setup loads, you'll be presented with a window. Select your preferred language, keyboard type, and time/currency format, then click *Next*.

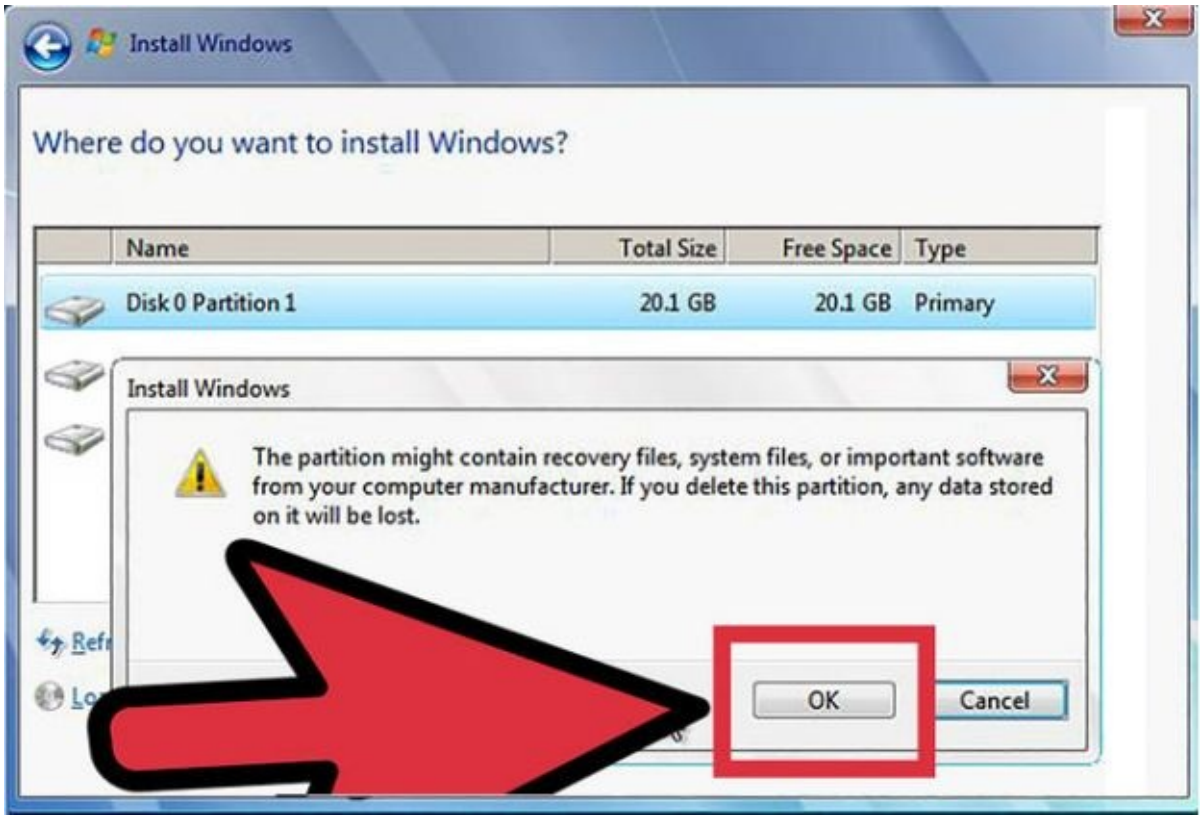
8. Click the Install Now button.



9. Accept the License Terms. Read over the Microsoft Software License Terms, check *I accept the license terms*, and click *Next*.



10. Select the *Custom* installation.



11. Decide on which hard drive and partition you want to install Windows on. A hard drive is a physical part of your computer that stores data, and partitions "divide" hard drives into separate parts.

- If the hard drive has data on it, delete the data off of it, or **format** it.
    - Select the hard drive from the list of hard drives.
    - Click *Drive options (advanced)*.
    - Click *Format* from Drive options.

- If your computer doesn't have any partitions yet, create one to install Windows on it.
    - Select the hard drive from the list of hard drives.
    - Click *Drive options (advanced)*.
    - Select *New* from Drive options.
    - Select the size, and click *OK*.

12. Install Windows on your preferred hard drive and partition. Once you've decided on where to install Windows, select it and click *Next*. Windows will begin installing.

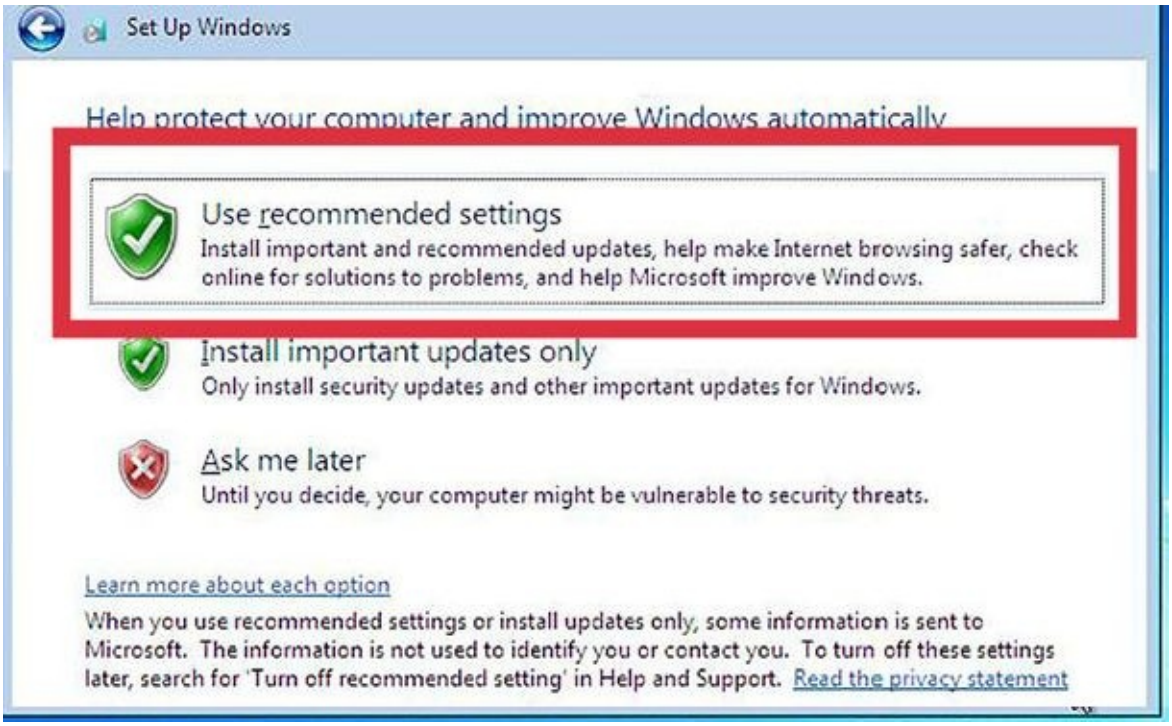
13. Wait while Windows installs files. The percentage next to Expanding Windows files will steadily increase. This part of the process can take up to 30 minutes.

- Windows will automatically restart your computer when finished.
- Setup will launch again, and a message will tell you that Setup is updating registry settings.
- Setup will then configure your computer's services. This happens every time you start Windows, but will happen in the background next time.
- A window will open letting you know that Windows is completing the installation. Your computer will restart again when this is complete.
- Setup will now load drivers and check video settings. This part does not require any input from you.

14. Enter your user name and computer name. Your username will be used to log in to the computer and personalize your account. Your computer name is the name that your computer will display on the network.

- You can add more users later through the Windows 7 control panel.
- Windows will ask you for a password. This is optional but highly recommended, especially if the computer will be accessible by users other than yourself. If you'd rather not have a password, leave the fields blank and click Next.

15. Enter your product key. This is the 25-character key that came with your copy of Windows. Check the "Automatically activate Windows when I'm online" to have Windows automatically verify your key the next time it is connected to the internet.



16. Select your Windows Update option. To make sure that your copy of Windows runs securely and stably, it is highly recommended that you choose one of the first two options. The first option will install all updates automatically, the second option will prompt you when important updates are available.

17. Select your date and time. These should be correct already as they are linked to your BIOS, but you can change them now if they are not. Check the box if your area observes Daylight Savings.

18. Select network preferences. If your computer is connected to a network, you will be given an option to identify that network. Most users will select Home or Work network. If your computer is being used in a public place, select Public network. Mobile broadband users should always select Public network.

- Windows will now attempt to connect your computer to the network. This process is completely automated.

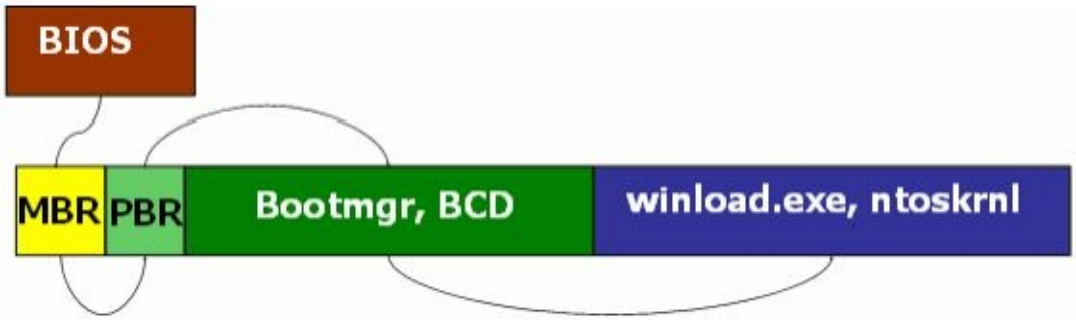
19. Explore your desktop. After one final loading screen, your new Windows 7 desktop will appear. Installation is now complete.

Startup in Windows Vista 7 / 8

The boot process in Microsoft's Windows Vista operating system (Windows Vista) differs from Windows XP in the way that the operating system is located and initialized.

Starting in Windows Vista is different from XP because the code written by Windows Vista no longer looks for **NTLDR**. The new boot loader in Windows Vista is **Bootmgr**.

Bootmgr loads the Boot Configuration Database (BCD), which, in turn, loads an OS loader boot application (**Winload.exe**, in the case of Windows Vista). Finally, the OS loader application is responsible for initializing the kernel.



(MBR = Master Boot Record; PBR = Partition Boot Record)

Two key actions performed by **NTLDR** in previous Windows versions have been divided between two components:

- **\Bootmgr:** Reads the boot configuration, including device and path locations.
- **\Windows\System32\Winload.exe:** Initializes the kernel.

The boot configuration stored by **Boot.ini** in previous Windows versions is now stored in an extensible database:

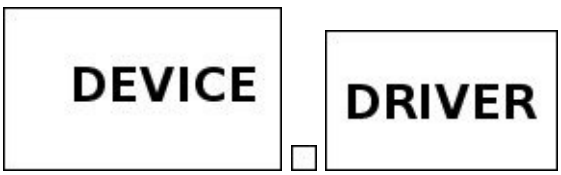
\Boot\BCD: The Boot Configuration Database (BCD)

What Is the BCD Store?

The Boot Configuration Data (BCD) store contains boot configuration parameters and controls how the operating system is started in Windows Vista. These parameters were previously in the Boot.ini file (in BIOS-based operating systems) or in the nonvolatile RAM (NVRAM) entries (in Extensible Firmware Interface–based operating systems).

The BCD is a database used by **Bootmgr**. It contains the functions of boot.ini and is located at {ActivePartition}\boot folder.

Device Drivers Installation



In computing, a **device driver** or **software driver** is a computer program allowing higher-level computer programs / Operating System to interact with a hardware device.

A driver typically communicates with the device through the computer bus or communications subsystem to which the hardware connects. When a calling program invokes a routine in the driver, the driver issues commands to the device. Once the device sends data back to the driver, the driver may invoke routines in the original calling program. Drivers are hardware-dependent and operating-system-specific. They usually provide the interrupt handling required for any necessary asynchronous time-dependent hardware interface.

To know Drivers Status open "Device Manager",

We have to load drivers for Other Devices

Drivers Installation

Method 1 **By running "SETUP.EXE" from Driver CD / DVD**

Insert the Drivers CD / DVD, If it is Autorun Disc a Menu will be appeared on the screen. In this menu click on Device name you want to install. If it not Autorun Disc then enter in to the Drivers directory and search for SETUP.EXE or .EXE file and run it

Removal of Drivers:

Uninstall from Start, Settings, control Panel, "Add/Remove Programs".

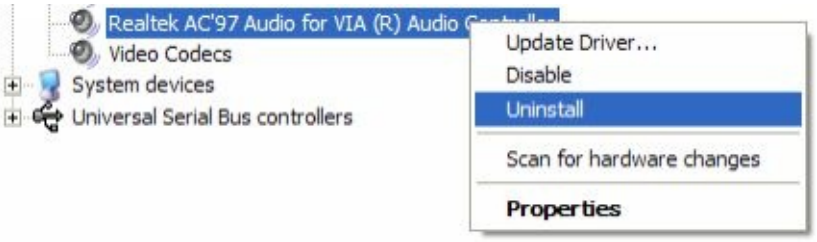
Method 2 By Update Driver through Device Manager

Insert Drivers Disc or Connect to the Internet

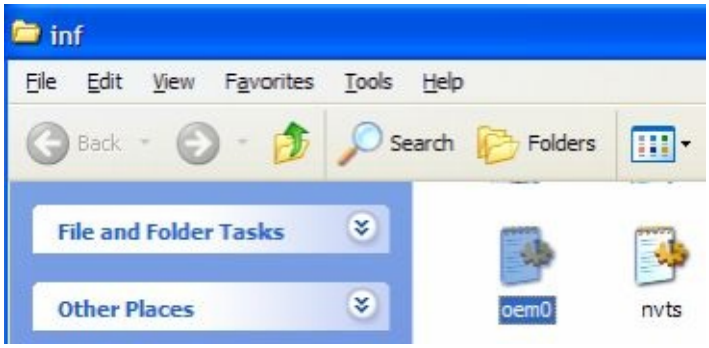
In Device Manager Right click on "Other devices", Device name you want to load driver and select "Update Driver…" option.

Removal of Drivers:

1. Remove Driver from Device Manager

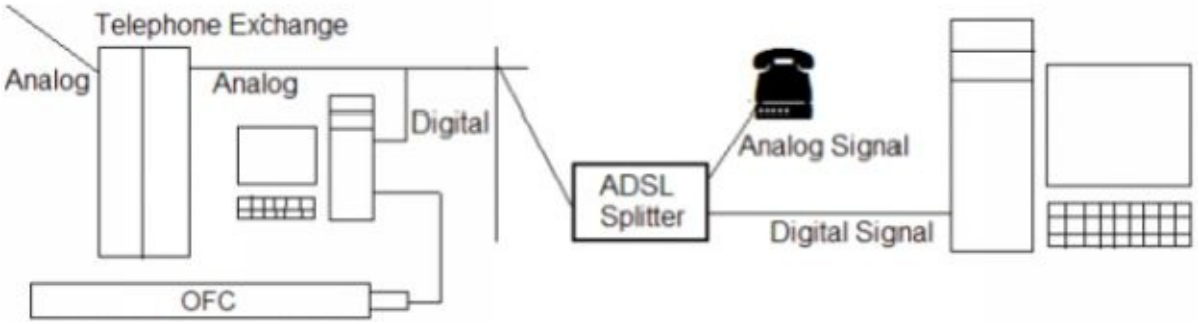


2. Remove ".Inf" file from C:\WINDOWS\INF and confirm it by opening. (User installed drivers are with oem0.inf, oem1.inf etc.)



Internet Configurations

1. By using ADSL Modem & Phone Line (Broadband)



ADSL : Asymmetric Digital Subscriber Line (External Modem only)

Bandwidth : Min 256Kbps (Broadband), Max : 8Mbps

Note: We can use USB / LAN (Ethernet) interface between Modem and Computer.

a. If you use USB interface, you have to load ADSL Modem Driver.

b. If you use LAN interface, you have to load Ethernet Card Driver.
(But is better to use LAN / Ethernet Interface than USB interface.)

1. Install **LAN / Ethernet Card Driver** (Ignore if already installed)

(Install **ADSL Modem Driver** if you are using USB Interface)

2. Right click on **"My Network Places"** and select **"Properties"**.
In left side windows, Network Tasks, click on "**create a new connection"**.

3. Select "**connect to the Internet"** in Network connection type and next.

4. Select "**Set up my connection manually**" in getting Ready and next

5. Select **"Connect using a broadband connection that requires a user name and password"** in Internet connection and next.

6. In **ISP Name** inter Internet Service Provider Name(**BSNL Broadband**) and **next**, **Next** In Internet Account Information

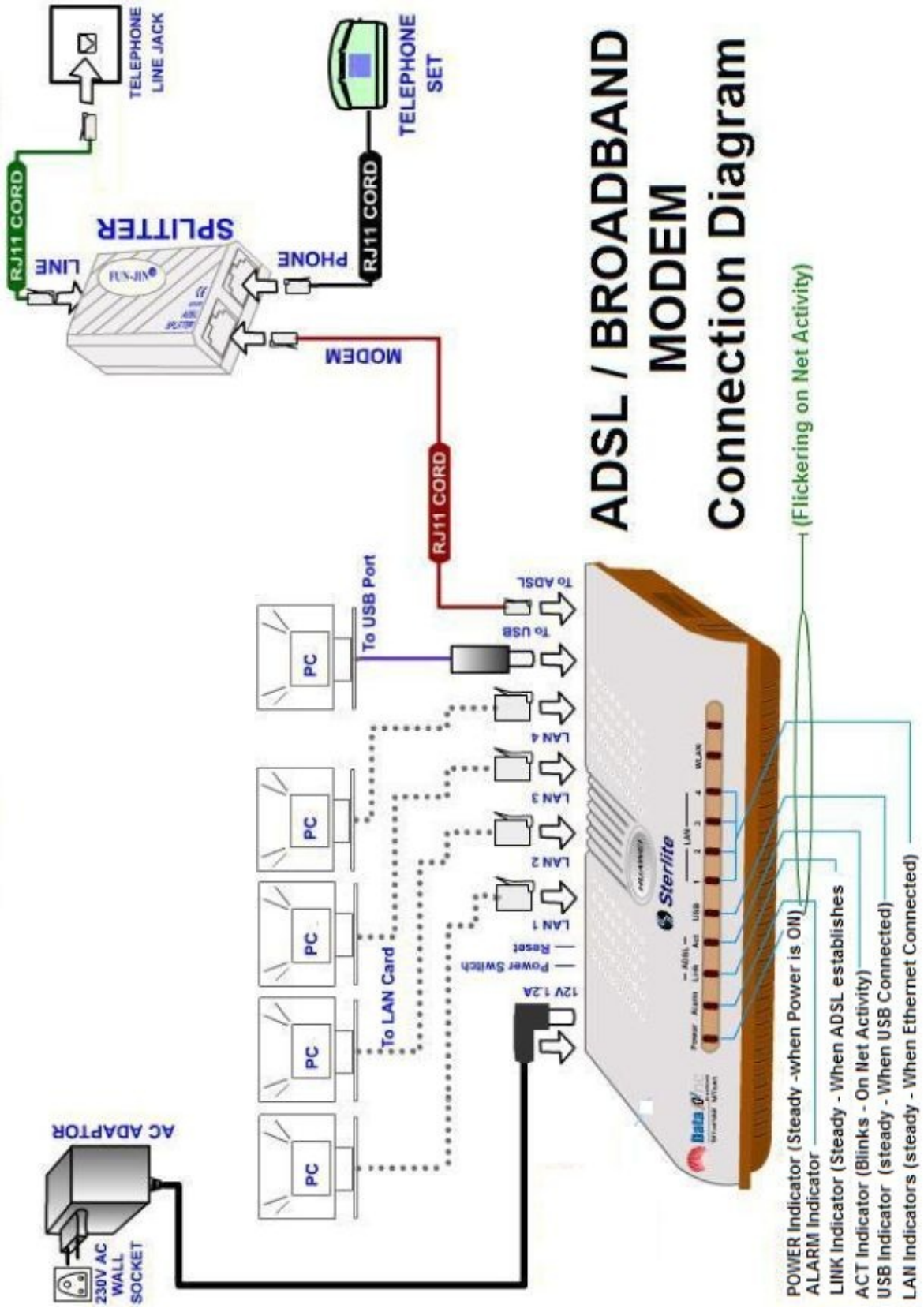
7. Select "**Add a short cut to this connection to my desktop and finish"**. In

completing the new connection wizard and **finish**.

8. To Connect Internet, first dial through BSNL Broadband shortcut on desktop. While dialing enter **user name** and **Password** (Already provided by the ISP)

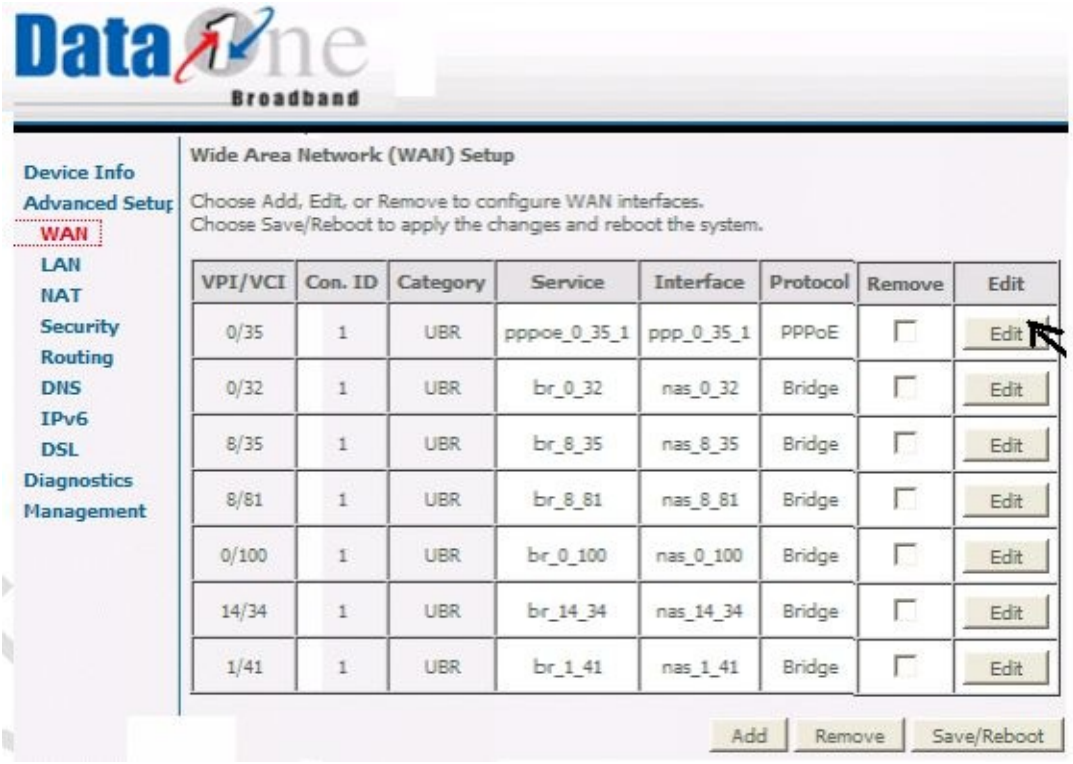
9. After connection has established, open the Inter Explorer & Browse.

10. To check you Account usage and Password change open **www.dataone.in**



Deselecting ADSL MODEM as Internet Server (BSNL Modem)

1. Open Internet Explorer and type the address as **192.168.1.1** and enter.



2. Select “WAN” in “Advanced Setup” and Edit the VPI/VCI values with 0/35

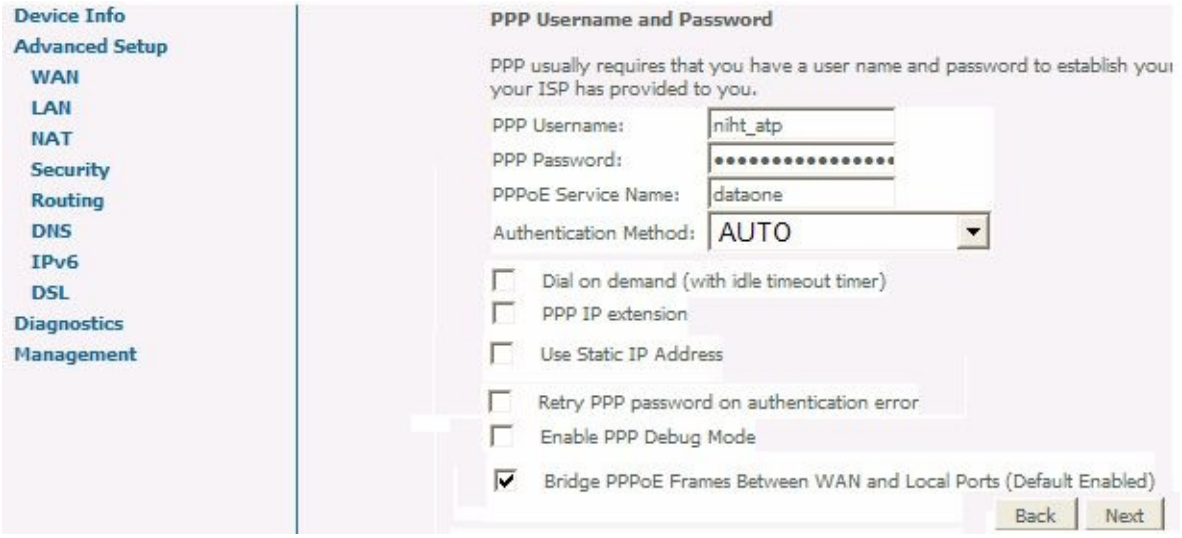
3. In “Connection” Type select **“Bridging”** and select next.

Selecting ADSL MODEM as Internet Server

1. Select “WAN” in “Advanced Setup” and Edit the VPI/VCI values with 0/35

2. In “Connection Type” select PPP over Ethernet **(PPPoE)** and select next.

3. In the following screen enter the broadband username & password and select next.



when Internet Connects the Internet light will glow.

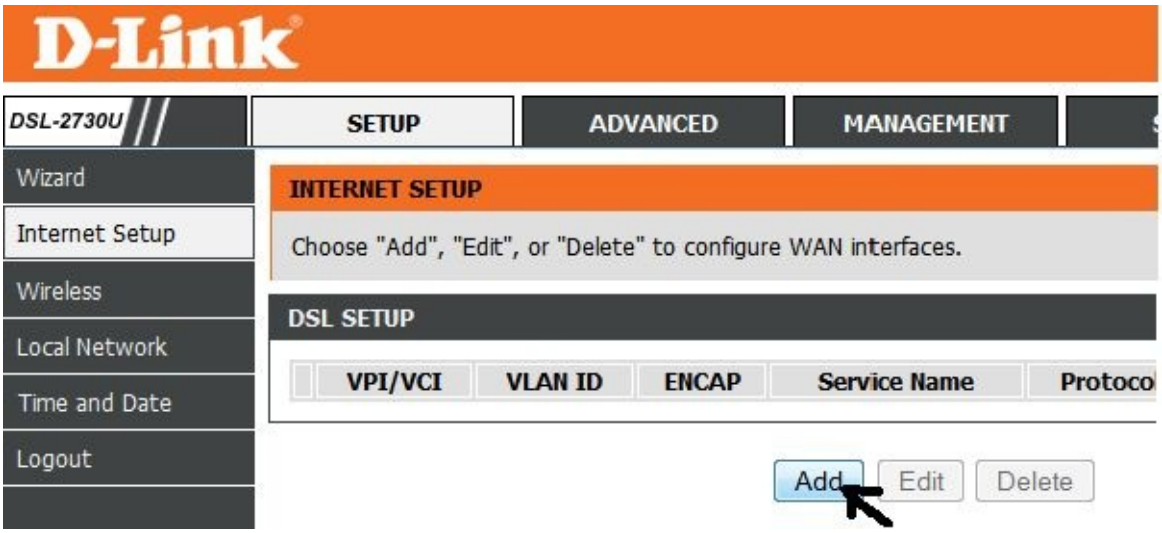
PPPoE: Point to Point Protocol over Ethernet **PVC:** Permanent Virtual Circuit

VPI: Virtual Path Identifier **VCI:** Virtual

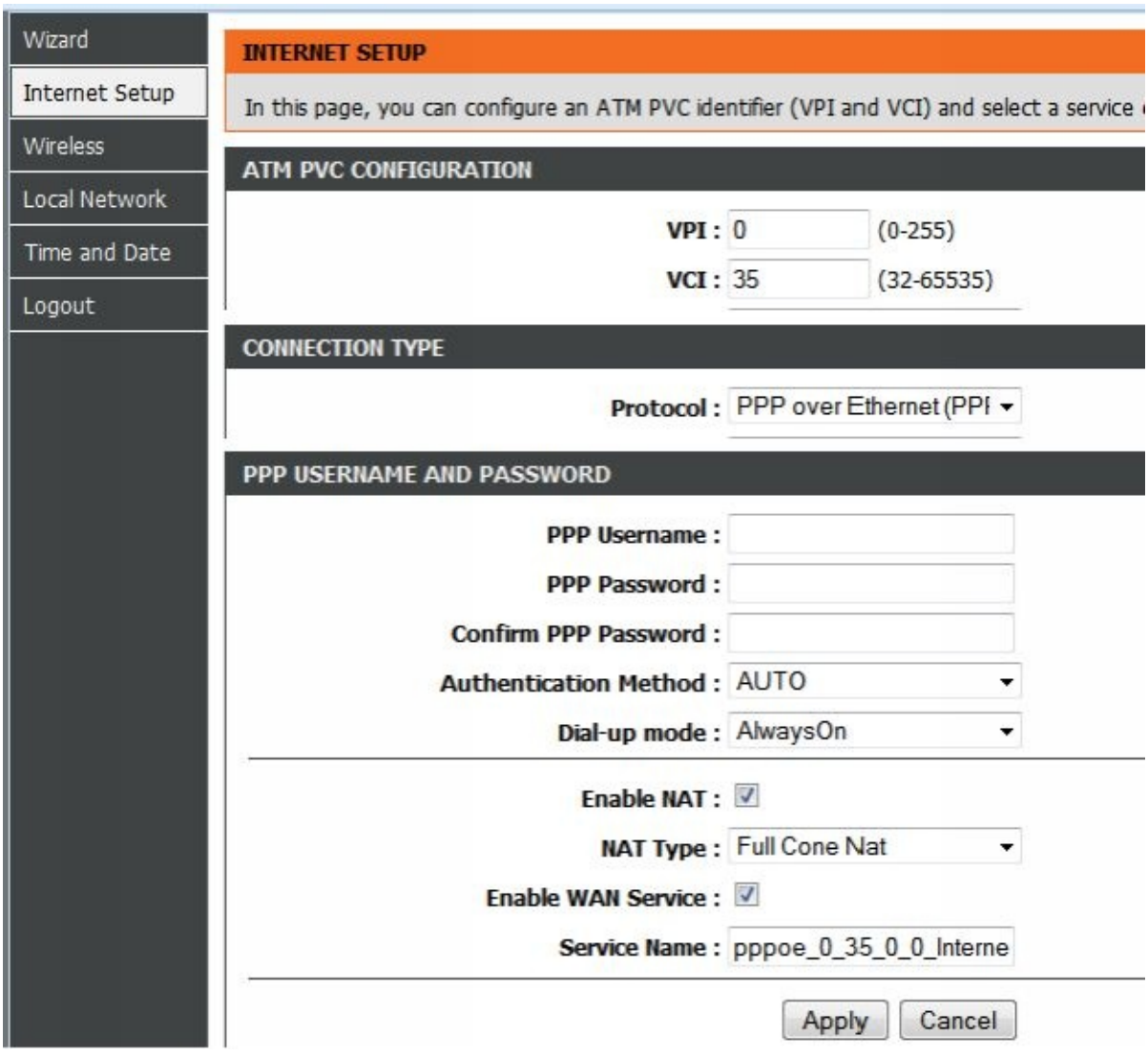
Circuit Identifier

Note: To change Broadband Password and Usage check open the website (http://selfcare.sdc.bsnl.co.in) and register.

Selecting ADSL MODEM as Internet Server (D-Link)

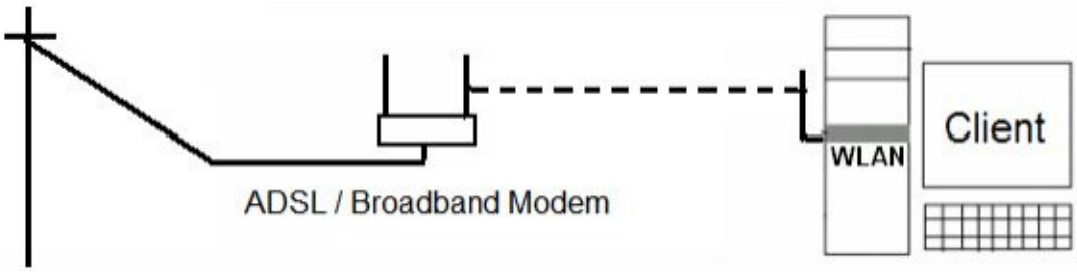


Enter the VPI & VCI values as 0 & 35, Protocol as PPP Over Ethernet (PPPOE) and PPP Username, PPP Password & Confirm PPP Password.

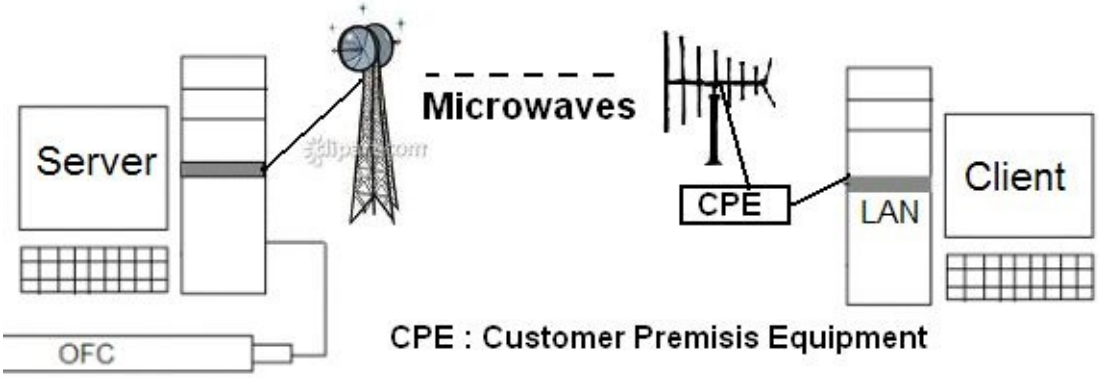


Note : To Deselect select “Edit” and in “Connection Type”, “Protocol” select “Bridging” and select Apply.

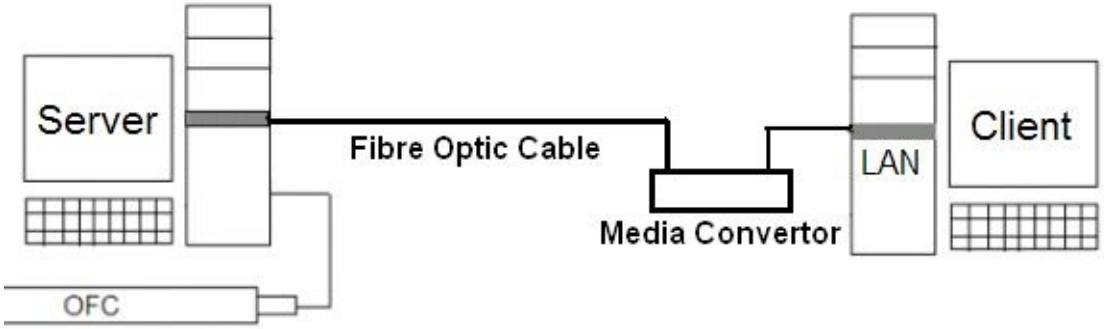
2. By using Radio Frequency (RF) waves / Wi-Fi / Hotspots



3. By using Microwaves / Wi-Max / Wireless Broadband



4 . By using Fibre Optic Cable / Fibre To Home



Installation is common for above 2,3 & 4 Methods

1. Install **LAN / Ethernet Card / WALN Driver** (ignore if already installed)

2. Right click on **“My Network Places”** and select **“Properties”.**

3. Right click on **“Local Area Network / WLAN Connection”** and **“Properties”.**

4. Select **Internet Protocol (TCP/IP)** , **Properties** and enter the addresses as provided by the ISP. (1. IP Address, 2.Default Gateway, 3.Preferred DNS Server)

(No need to enter Address for BSNL Broadband Wifi Modem)

5. By using USB Modem / Data Card

For this method no additional configuration is required.

When we insert the USB device, Automatically installation will start from USB device and a shortcut will appear on the Desktop.

By running the Shortcut on the Desktop internet will connect.

Computer Virus

Computer virus is a small software program or piece of code that is designed to spread from one computer to another and to interfere with computer operation.

How do viruses work?

Basic viruses typically require unwary computer users to inadvertently share or send them.

Some viruses that are more sophisticated, such as worms, can replicate and send themselves automatically to other computers by controlling other software programs, such as an e-mail sharing application.

Certain viruses, called Trojans, can falsely appear as a beneficial program to coax users into downloading them. Some Trojans can even provide expected results while quietly damaging your system or other networked computers at the same time.

To help avoid viruses, it's essential that you keep your computer current with the latest updates and antivirus tools, stay informed about recent threats, and that you follow a few basic rules when you surf the Internet, download files, and open attachments.

Once a virus is on your computer, its type or the method it used to get there is not as important as removing it and preventing further infection.

Who Writes Viruses… and *Why?*

The people who write viruses generally have their own reasons for what they do, and they aren't too open about identifying themselves, for obvious reasons. It is believed that most virus authors are young men in their teens or early twenties, who have a great deal of technical knowledge and have decided for various reasons to use it for destructive purposes. Some of the reasons that people write viruses:

1. Sociopathy: Many virus writers are just troublemakers—or maybe just troubled individuals—who want to create havoc and then thrive on the attention it generates. They are the electronic equivalents of graffiti artists, prank phone callers, etc., looking for fame and glory in a rather twisted way.

2. Revenge: Sometimes viruses or trojan horses are written by disgruntled employees or others who want to get back at someone or make a statement.

3. The Challenge: Some virus writers do it just to see if they can away with it. As virus detection software gets smarter, virus writers have to employ new tricks to have their "products" evade notice.

4. Education: Writing viruses, especially ones smart enough to avoid detection, requires a great deal of technical know-how. Some people take up virus writing to teach themselves how to program at a low-level within the PC. It's ironic, but experienced virus writers are among the most technically skilled PC programmers in the world! What a waste, isn't it?

Antivirus

Antivirus or anti-virus software is used to prevent, detect, and remove computer viruses, worms, and trojan horses. It may also prevent and remove adware, spyware, and other forms of malware.

Identification methods

There are several methods which antivirus software can use to identify malware

1. Signature based detection is the most common method. To identify viruses and other malware, antivirus software compares the contents of a file to a dictionary of virus signatures. Because viruses can embed themselves in existing files, the entire file is searched, not just as a whole, but also in pieces.

2. Heuristic-based detection, like malicious activity detection, can be used to identify unknown viruses.

3. File emulation is another heuristic approach. File emulation involves executing a program in a virtual environment and logging what actions the program performs. Depending on the actions logged, the antivirus software can determine if the program is malicious or not and then carry out the appropriate disinfection actions.

Top Antivirus

1. Bitdefender :

BitDefender is an antivirus software suite developed by Romania-based software company SOFTWIN. It was launched in November 2001, and it includes several protection and performance enhancements as Search Advisor and Performance Optimizer.

2. Kaspersky:

Kaspersky Lab is a Russian computer security company, co-founded by Natalia Kaspersky and Eugene Kaspersky in 1997, offering anti-virus, anti-spyware, anti-spam, and anti-intrusion products

3. Norton Antivirus

Norton AntiVirus, developed and distributed by Symantec Corporation, provides malware prevention and removal during a subscription period. It uses signatures and heuristics to identify viruses. Other features include e-mail spam filtering and phishing protection.

4. ESET NOD32 :

ESET NOD32 Antivirus, commonly known as NOD32, is an antivirus software package made by the Slovak company ESET. It sports the fastest, most effective technology available to protect you from viruses and spyware without slowing you down while you work or play

5. AVG Antivirus: (Free)

AVG is an umbrella term for a range of anti-virus and Internet security software developed by AVG Technologies, a privately held Czech company formerly known as Grisoft.

System Maintenance Tips

1) Clean the components regularly to avoid overheat and damage due to rust.
2) Run “Check Disk” regularly to rectify disk and file system problems.
3) Run “Defragmenter” frequently to speed up your computer.
4) Run “Disc Cleanup” regularly to delete temporary files.

(**Run** Check Disk, Defragmenter, Disc Cleanup through **C:** Drive properties, Tools)

5) Run “Registry Cleaner” regularly to fix registry problems (Download from Internet).
6) Maintain free space in C Drive for Virtual Memory.
7) Uninstall “unnecessary programs” through Add / Remove programs.
8) Install latest Antivirus Software and update regularly to protect from latest viruses.
9) Store Data files like Docs, Pics etc.. in separate drives.(Other than OS drive).

10) Backup your Data regularly into Tape or CD / DVD / Ext HDD.

11) There will be no loose connections, to avoid components damage and restarts.

12) Always shut your system down properly (use the Start —> Shutdown method) .

13) Don’t place Electro magnetic components (UPS, Stabilizers…) close to the system

14) Earthing should be provided to avoid electrical shock and components damage.

15) Always Mains will be equipped with fuses and Circuit Breakers.

16) UPS or Stabilizer must be installed to protect from high & low voltages.

17) Whenever you move your system, even if it’s just across the desktop, make sure the machine is shut down and unplugged.

18) If it is External battery UPS, check distilled water level and clean terminals regularly and apply grease or petroleum jelly to avoid corrosion.

19) Place your computer in cool, secured and ventilated place.

20) Monitor SMPS voltages and Temperatures through BIOS, PC Health or Hardware Monitor option frequently.

21) Don’t leave your monitor running. The best way to extend your display’s life is to shut it off when it’s not in use.

22) Use dust covers when the System is not in use to avoid entering of unnecessary dust. (Remove all covers when the system is in use)

23) Store CDs & DVDs in cool and secured place. Use Boxes.

24) To unplug Pen drive, Eject them in “Safely Remove Hardware)

25) Sufficient packing (Use Antistatic covers, thermocol, Boxes etc) must be provided while carrying components.

26) Disconnect Power & Telephone connections during strong winds.

27) Use Preferred CPU Heat Sink and Fan only while replacing.

28) Apply Heat Sink Compound between CPU and Heat Sink when necessary.

29) Hold the components by the edges and try not to touch the IC chips, leads.

30) Always switch of the Mains and unplug cables while Replacing Components.

31) Don’t use poor quality CDs / DVDs, It may damage your Drive lens.

32) Put Silica Gel Packets inside the Cabinet to reduce the moisture.

33) Do not smoke around a PC. Cigarette smoke can damage exposed metal contacts.

34) Create and use Duplicate CDs for Original software and Driver software.

35) Always install latest Drivers / Software and update regularly.

36) Do not let lot of programs to be loaded automatically when you start Your Computer (Use MSCONFIG command to stop them)

37) When necessary, Always add Same Capacity, Same speed memories only. Same Company memories are preferred.

38) Cooling Fans must be checked and cleaned regularly.

39) Clean Up Your Desktop (Don’t store files in desktop) to Speed Up Your Computer.

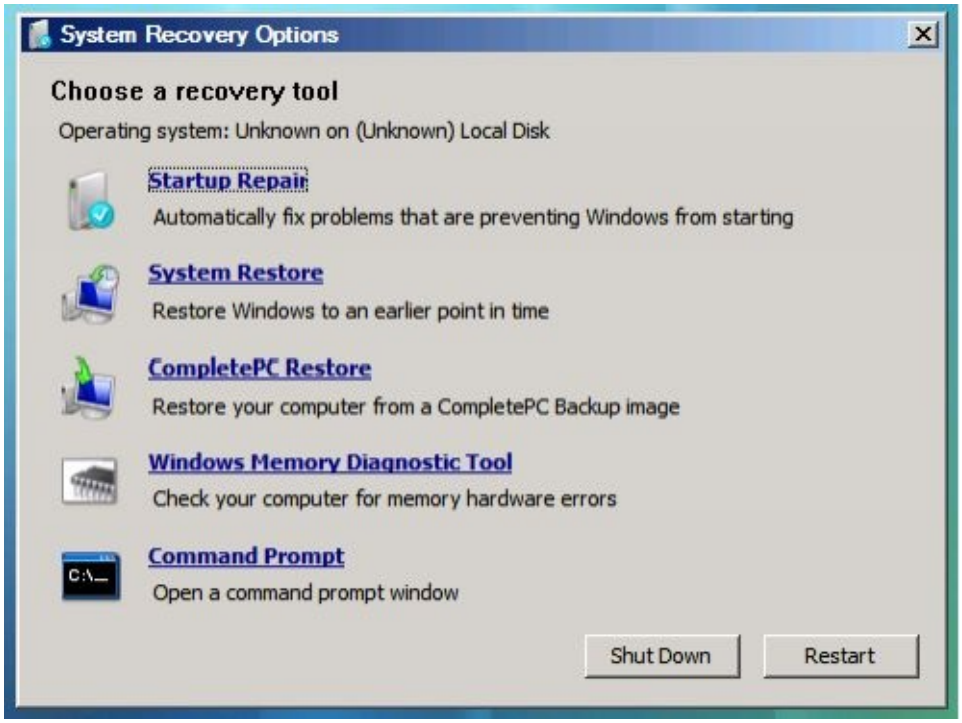
40) Use Passwords to protect your Computer and to prevent from unauthorized access.

Windows Vista / 7 / 8 /10 Troubleshooting

1. Windows Vista / 7 will not Start -Rebuild MBR & PBR

(Master Boot Record (MBR) or Partition Boot Record (PBR) has damaged)

Boot through Windows Vista / 7 DVD and select **"Repair your Computer"** then the following menu will appear on the screen. Now Select "**Command prompt"**



In command Prompt run the following Commands.

Bootrec.exe /FIXMBR

Bootrec.exe /FIXBOOT

2. Windows Vista / 7 Struck or Restart -Reinstall Vista / 7

(Windows Vista / 7 files may corrupted)

Boot through Windows Vista / 7 DVD and select **"Repair your Computer"** then the above menu will appear on the screen. Now Select "**Startup Repair "**

3. If reinstallation not possible -Restore registry

Boot through Windows Vista / 7 DVD and select **“Repair your Computer”** then the above menu will appear on the screen. Now Select “**System Restore”**

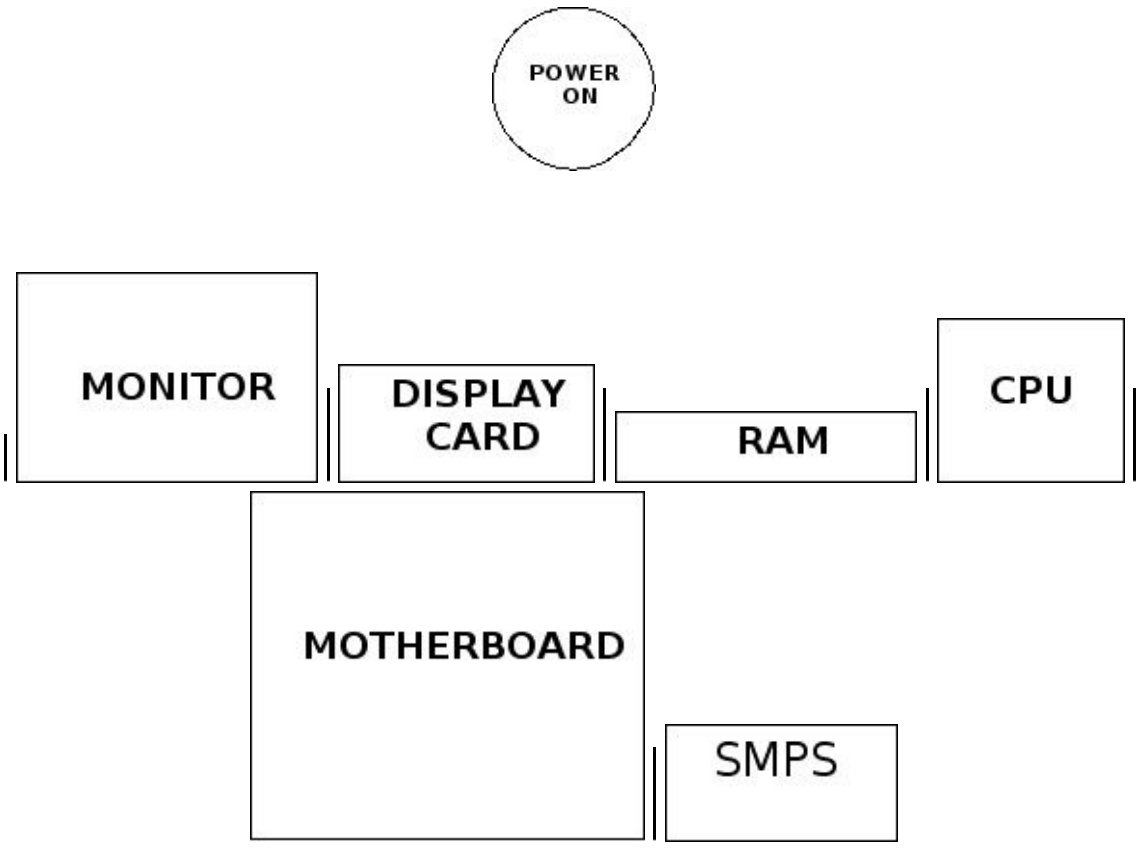
4. If Registry Restore is not possible -Restore from Backup

Boot through Windows Vista / 7 DVD and select **“Repair your Computer”** then the above menu will appear on the screen. Now Select “**Complete PC Restore / System Image Recovery” (It overwrite files on current drive, Be Careful)**

5. If Backup Image file not available -Fresh install Vista /7

Boot through Windows Vista / 7 DVD and select **“Install Now”**

Troubleshooting Flow Chart



HEAR BEEPS

FAIL

OK

LONG BEEPS

NUM LOCK

OK

OPERATES

FAIL

OK

SHORT BEEPS

SINGLE BEEP

OK

Hardware Troubleshooting

S No	Problem

		Reason & Solution
		A). Not getting Power to Both CPU and MONITOR, then check Mains, UPS / Stabilizer, Spike busters Cables, Switches, Fuses, Sockets Etc..
		B). Not getting Power to Monitor, Press Power Card at rear panel, Press plug on Spike buster, Insert into another socket. If not solved test with CPU Power Card If works Monitor Power Card has damaged, If not works there is problem in Monitor, then give it to repair.
		C). Not getting Power to CPU, then press Power Card at SMPS, Switch on SMPS, press plug on Spike buster, insert into another socket . If not solved test with Monitor Power Card, If CPU works then CPU Power cable has damaged.
1	Not Getting Power	If not solved open the cabinet and 1. Check Button connections at Button and Motherboard side in Cabinet by touching the power on pins by using tester. 2. Clear CMOS if not solved, then 3. Check SMPS by touching Black Wire and Green wires of Motherboard plug. If not working check SMPS Fuse. If Fuse is OK, then check for damaged Capacitors. If Capacitors are damaged give it repair. Otherwise replace it 4. If SMPS works, check Capacitors on Motherboard. If Capacitors are damaged give it for repair. Otherwise replace Motherboard.

		Hear Beeps
2	No Display / No Signal Message after switch on CPU and Monitor Power Supply is OK With Beeps from System Speaker	**A). If you hear a single beep**, then the problem everything is ok in System Unit. Then the problem may with Monitor Data Cable or Problem within the Monitor. Tight Monitor Data Cable at both sides. If not solved test with another data cable. Otherwise there will be problem within Monitor. **B). If you hear continuous long beeps**, then the problem is with RAM / Motherboard. Clean and Reinstall the RAM If not solved, test your RAM on another System and test with another RAM on your System If RAM has damaged replace with another one. If RAM is working there may problem within Motherboard. **C). If you hear one long and 2/3 Short beeps**, then the problem is with Display Card / Motherboard. Clean and Reinstall the Display Card, If not solved test your Display Card on another System and test with another Card on your System. If Display Card has damaged Replace with another. - If Display Card is working then there may be problem within Motherboard. - If it is onboard display then Clear the CMOS. - If not solved then the onboard GPU fail, install add-on graphics card. **D). If you hear high frequency beeps**, then the problem is with CPU overheat, check cooling fans. **E). If you hear low and high beeps**, then the

		problem may be with CPU / Motherboard check CPU and Motherboard with another system.
3	No Display / No signal message after switch on SMPS and Monitor Power Supply is OK No Beeps from System Speaker Num-Lock is working	This means Power Supply Unit, Motherboard, CPU and Memory is OK. 1) Then the problem with Monitor Data Cable. Tight both System Unit and Monitor side. 2).If not solved check with another cable. 3).If not solved, then the problem is with Display Card or Monitor. Then check Display Card and Monitor by attaching them to another System or check with another display Card or Monitor with you System. 4). If Display Card has damaged replace with new one 5). If Monitor is not working give it for repair
4	No Display / No Signal message after switch on SMPS and Monitor Power Supply is OK No Beeps from System Speaker Num-Lock	1). Clear CMOS, If not solved. 2). Check for damaged Capacitors on motherboard. 3). Problem may be with HDD, CD/DVD, and Expansion Cards, disconnect them and check. 4). May be RAM problem Clean and Reinstall RAM. If not solved check the RAM on another System. 5). If not solved the problem may with PSU, Motherboard or Processor. First check PSU. 6) If not solved check CPU on another Motherboard and check another CPU on this

	Doesn’t Operates	Motherboard. 7. If CPU is gone replace with new. 8. If CPU is ok, then replace Motherboard
5	No Signal / Out of Sync / Frequency out of Range message after Starting Windows	Resolution Problem In Windows XP Press F8 while booting and select VGA mode while booting. And change resolution in display properties. In Windows 7 /8 Press F8 while booting and select Low Resolution Mode(640,480) And change resolution in display properties.
6	CMOS Check Sum error / Battery failure message Date and Time are not storing.	1). Check 3 Volts Battery and Replace the battery If necessary. 2). If 3Volts Battery is ok. May with loose contact tight them. 3).Check CMOS Jumpers.
7	Disk Boot failure	1). Check in the BIOS for Hard Disc Name. 2). If not detected open the Cabinet cover and check Power and Data cables of Hard Disk for loose connections. If not solved test with another cable and another port. 3). If not solved test them on another System or test another Drives on your System. 4). Check the Boot sequence in BIOS. 5) Boot Record may damaged, Rebuilt them (See Windows XP / Windows 7/8 troubleshooting given in previous pages.

		6). If not solved, the OS may gone. Reinstall.
8	System Slow While loading / running Operating System.	1). Run Scandisk / Check Disk 2).Run Disk Defragmenter 3) Run Disk Cleanup 4) Check free space available in C drive 5). Stop auto running of all unnecessary programs through “MSCONFIG”. 6). Uninstall unnecessary programs 7). Set BIOS defaults. 8). Check Memory Capacity. 9). Install and run Antivirus program 10) Run “SFC / SCANNOW” command to scan OS files and replace with new files. (click Start**,** click All Programs**,** click Accessories**,** right-click Command Prompt**,** and then click Run as administrator) 11) If not solved Reinstall Operating System 12). If not solved may be Hard disc slow. 1). Problem may be with recently installed Drivers or Software remove them, if not entering into Normal mode then Enter into safe mode by pressing F8 while booting and remove recently installed drivers or software. 2). May be Registry or System files problem restore System to Earlier time. If not entering

		into normal mode, enter into safe mode and Restore the System to Earlier Time. 3). Stop auto running of unnecessary software through “MSCONFIG” command. 4). Enter into Safe Mode and run Thorough Scandisk for Hard Disk Errors. 5).Set BIOS defaults 6). Check for Virus
9	System struck / Shutdown while loading / running Operating System	7).Over heat problem check Fans 8). May be with damaged Capacitors. 9). May faulty RAM check another one. 10) Check Hard Disc Cables. 11). Check SMPS voltages. 12) Run “SFC / SCANNOW” command to scan OS files and replace with new files. (click Start**,** click All Programs**,** click Accessories**,** right-click Command Prompt**,** and then click Run as administrator, At the command prompt, type the above command) 13). Reinstall Operating System 14). If not solved Check CPU 15). If not solved may be it Motherboard internal problem

10	Keyboard not working	1). Check Keyboard connector for loose connection and disconnection 2.) If it is USB keyboard check on another port. 3). If not solved check BIOS USB setting 4).If it is PS/2 keyboard test your keyboard on another System or Test with another keyboard on your System. 5). If your keyboard in not working then Check cable. If your keyboard is working your PS/2 Port / controller has damaged, then use USB Keyboard.
11	Keyboard some times working but some times not working	1). Connect Keyboard Connector tightly. 2)If it is USB keyboard check on another port 3).If it is PS/2 test your keyboard on another System or test with another keyboard on your System. 4). If your keyboard is not working properly on another Computer Check cable. 5). If your keyboard is working properly your PS/2 Port or controller has damaged. Use USB Keyboard.
		1). Check Mouse Connector for loose connection and Disconnection. 2). If it is USB mouse Check on another port.

12	Mouse not working	3. If not solved check BIOS USB setting 4).If it is PS/2 test your mouse on another System or test with another mouse on your System. 5). If your mouse is not working Check cable. If your mouse is working your PS/2 Port has damaged. Use USB mouse.
13	Grinding noise from Hard Disk	1. If the hard drive makes a grinding noise it is due to a heard crash. This is usually not repairable and should be replaced. 2. If the data is extremely valuable, there are companies that can recover the data but at a high price
14	Disk boot failure (some times only)	1). HDD Data cable loose or damaged. Tight them if not solved test with another ribbon cable. 2). HDD power plug loose tight it. If not solved Use another power plug. 3). If not solve it is Hard Disk problem. Copy all important data CD and replace with new.
15	Can’t boot from Bootable CD / DVD	1. CD / DVD drive not detected. 2). CD / DVD may not be bootable. or Disc may be damaged 3) CD / DVD drive is not reading Properly. 4). Check Boot sequence in BIOS.

16	Reddish or Bluish or Greenish Display.	1). Most of the time this is a bad Data Cable. 2). It also could be a loose connection either on the Computer or inside the Monitor. If connections are tight trying changing cords. 3). Presets damaged in the Monitor, give it to repair.
17	Wavy screen	1). Could be caused by any electrical device such as a fan, UPS, Stabilizer, Adapters or telephone too close to the Monitor. 2).Move all electrical devices away from the Monitor and see If that helps. 3). If not solved, there may be problem within the monitor.
18	Applications / Programs are not opening	1). Software Package files may have corrupted reinstall. 2).May be Virus problem. 3). Low Memory / RAM. 4). Virtual memory problem Check free space in C drive.
	Struck while	1).Set BIOS defaults 2). CD / DVD has damaged 3).CD / DVD drive is not reading properly.

19	Windows XP Installation / Installation fail with Blue screen error	4). OS not supported. Try Latest Version 5). May be bad area in HDD, select full format while installation. 6). RAM has damaged partially. 7). If not solved Check CPU
20	Ups is not working after Power fails.	1). Switch on the UPS. 2). Fully Charge it (8 hours) and try. 3). If it is internal battery UPS, the Battery may gone. (Maximum battery life is approximately 2 years) 4). If it is external Battery UPS, Clean the terminals and apply grease and Fill the Battery with Distilled water. 5). If the battery is too old replace it. 6). If not solved may be internal problem.

Beep Codes

Award BIOS (MSI, Mercury, Gigabyte, Biostar, EVGA …Motherboard)

Beeps	Error Message	Description
1long, 2 short	Video adapter error	Either video adapter is bad or is not seated properly. Also, check to ensure the monitor cable is connected properly.

Repeating (endless loop)	Memory error	Check for improperly seated or missing memory.
1long, 3short	No video card or bad video RAM	Reseat or replace the video card.
High frequency beeps while running	Overheated CPU	Check the CPU fan for proper operation. Check the case for proper air flow.
Repeating High/Low	CPU	Either the CPU is not seated properly or the CPU is damaged. May also be due to excess heat. Check the CPU fan or BIOS settings for proper fan speed.
Single Beep	Everything fine	Everything fine in System Unit. So check the Monitor Data cable on both Motherboard and Monitor Side.

AMI BIOS (Intel & ASUS… Motherboards)

Beep Code	**Description**
1 Short Beep	DRAM Refresh Failure (RAM)
2 Short Beeps	Parity Circuit Failure (RAM)
3 Short Beeps	Base 64K RAM Failure (RAM)
4 Short Beeps	System Timer Failure (Motherboard)
5 Short Beeps	Process Failure (CPU)
6 Short Beeps	Keyboard / Keyboard Controller
7 Short Beeps	Processor / Motherboard
8 Short Beeps	Display Memory Read / Write Failure
9 Short Beeps	ROM BIOS Checksum Failure
10 Short Beeps	CMOS Read / Write Failure

11 Short Beeps	CPU Cache Memory
1 long, 3 short	Conventional / Extended Memory Failure
1 long, 8 short	Display / Retrace Failure

Advanced System Care

(Toolbox contains the following Tools)

1. Registry Cleaner - To rectify registry problems.
2. Privacy Sweeper - To remove internet History & Traces.
3. Uninstaller - To Uninstall Programs / Applications
4. Disk Cleaner - To delete unnecessary and junk files.
5. File Shredder - To delete files permanently.
6. Startup Manager - To manage startup programs.
7. Smart Defrag - To Defrag the Hard Disc to improve Speed
8. Undelete - To recover deleted files.
9. Disk Doctor - To rectify Disk and File system problems
10. Win Fix - To fix Windows OS problems
11. Driver Manager - To update and Backup Drivers.
12. Malware Fighter - To detect and remove Malware and Spyware.
13. Clonned Files Scanner - To find and delete duplicate files.
14. System Information - To display detailed information of System.
15. System Control - To change Operating System setting.

Etc…

PRINTERS

Printer is an indirect output device (Peripheral) used to take printouts

(Hard copies)

Dot Matrix Printer

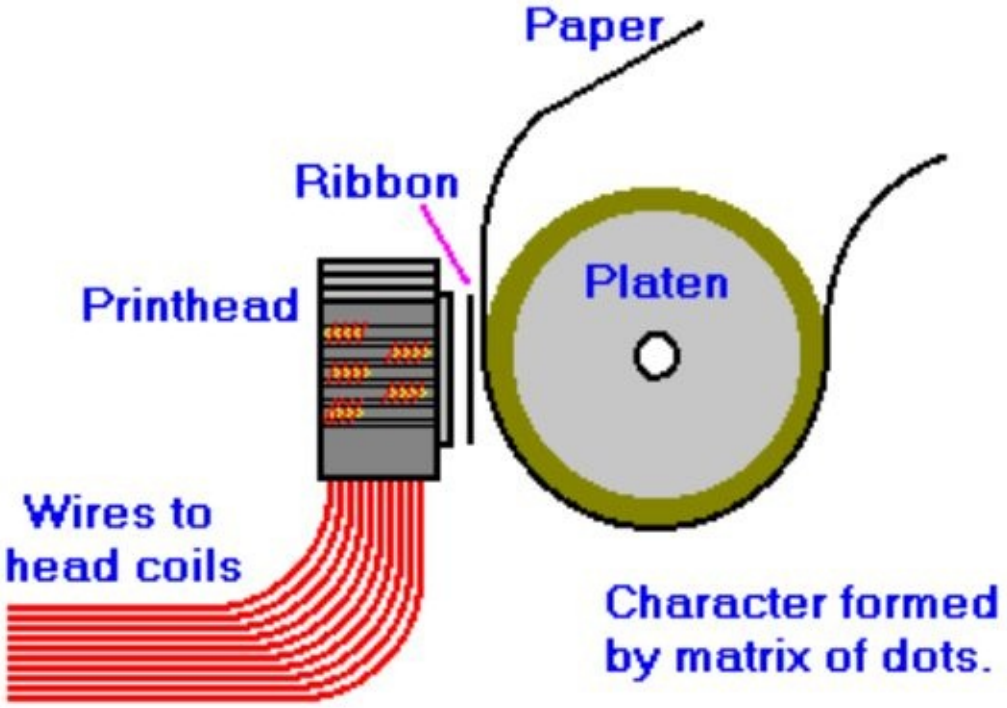
A **Dot Matrix** printer is an impact printer that forms characters as a series of dots. The print head contains a grid of pins which form a character. This heads stamps on to the paper through an inked ribbon to produce a character (for example, “H”) that is made up of dots.

The print heads can have from 9 to 24 pins in them. The more pins the print head has, the better the quality of the printed output. Printers with 24 pins produce letter quality output.

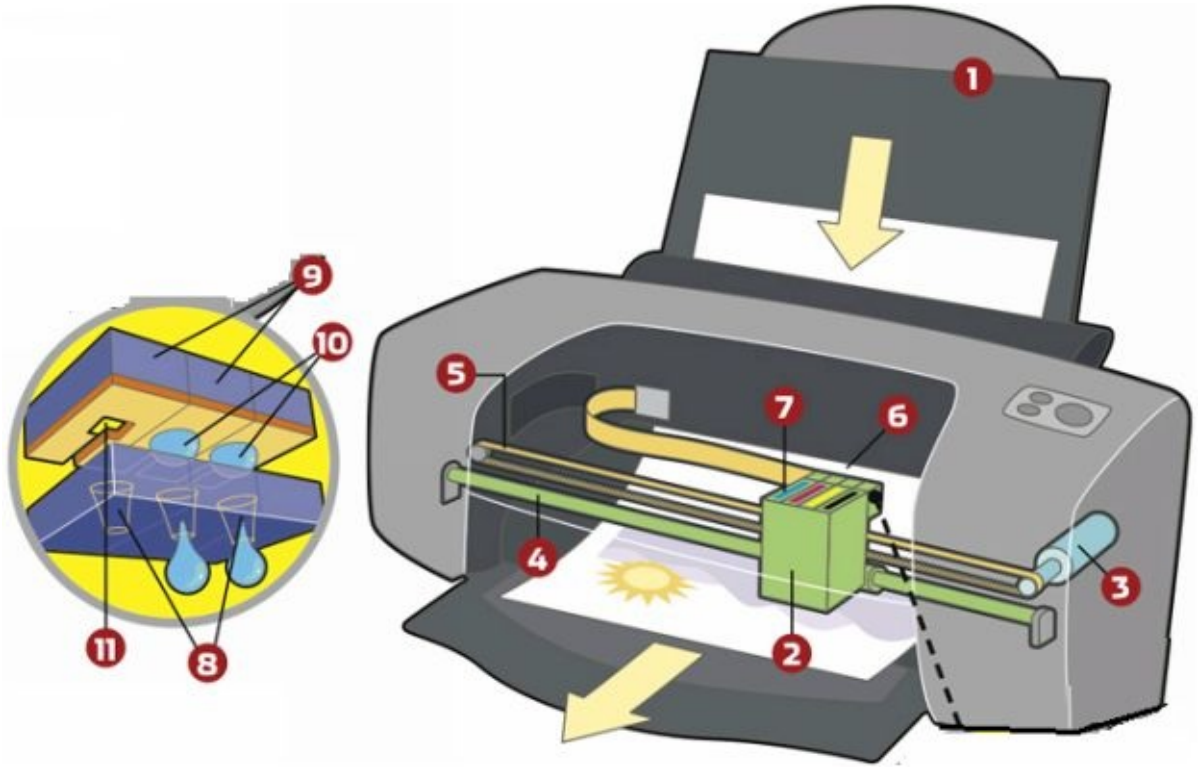
The quality of the printed output is measured in dpi (dots per inch). The higher the dpi, the better the quality of the printed output.

Dot Matrix printers come with a standard parallel interface. They can also use a serial interface. Parallel interfaces are faster, but serial interfaces can be used over greater distances.

Impact printers are the only printers that will make an impression on carbon paper. Any printing that is done on paper with a carbon behind it or on self carbonated paper needs to be done on an impact printer for the printing come through on the second layer of paper.



InkJet or Desk Jet Printer



A typical inkjet receives control info from your printer driver/PC, or may process the printout in its onboard electronics. Either way, rollers advance a page from your ***paper tray*** **(1)** under a sliding ***printhead/cartridge assembly*** **(2)**. Then, the ***printhead stepper motor*** **(3)** kicks in, drawing the assembly on a ***sliding rod*** **(4)** to its starting position, usually via a ***belt*** **(5).**

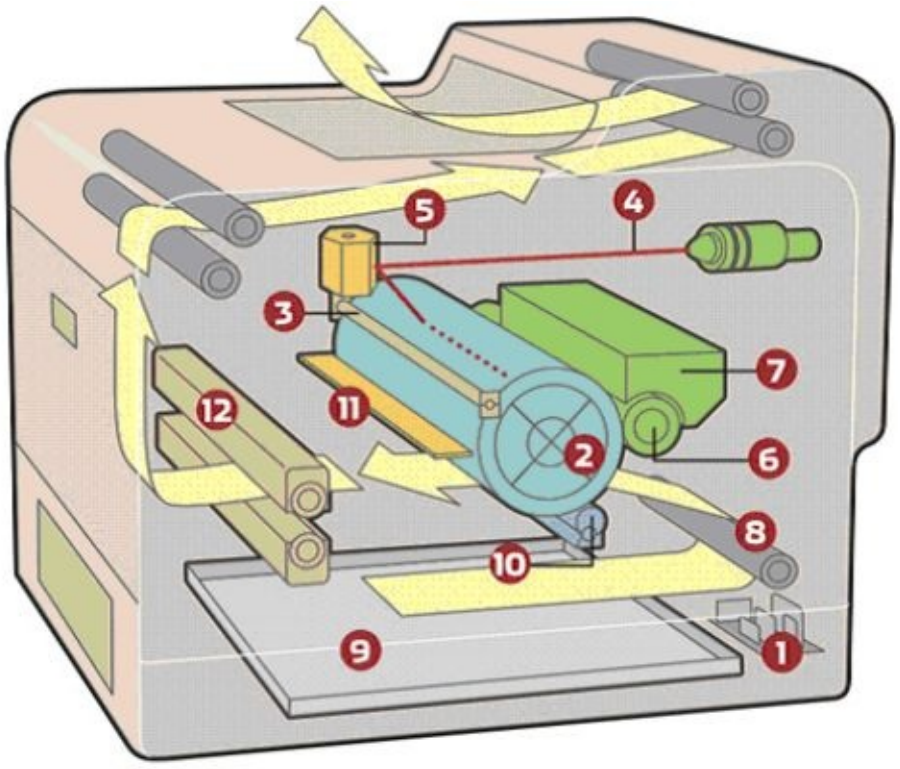
The ***printhead*** **(6)** proper is an incredible piece of miniaturization, in some cases

fabricated via an etching process similar to semiconductor manufacture. On some printers, the head and ***ink cartridge*** **(7)** are one unit. The head's microscopic ***nozzles*** **(8)**—anywhere from dozens to literally thousands—are outlets for incredibly tiny ***ink chambers*** **(9),** which are fed by the cartridge's reservoirs. Microscopic ***droplets*** **(10),** measured in millionths of a millionth of a liter (no, that's not a typo), fire through the nozzles.

But how? Pumps simply don't come that small. Instead, most inkjets (Epsons excepted) use "thermal" technology in which a tiny ***resistor*** **(11)** in an ink chamber is pulsed, as needed, with intense current, superheating the ink and vaporizing part of the droplet. The result: Terrific pressure blasts it out the nozzle and onto your page.

Laser Printer

The most important piece of equipment might be the optical photoconductive (OPC) drum. This drum holds an electromagnetic charge that can be changed by exposure to light. As the process starts, the OPC passes a highly charged wire that gives an electric charge to the OPC. A laser beam is turned on and off rapidly as a spinning mirror focuses the light on a specific part of the OPC.



In most cases, your PC talks with ***controller circuitry*** **(1)** in your laser printer to queue up and translate printing data; a raster image processor (RIP) converts images and text into a virtual matrix of tiny dots.

The main actor, however, is the ***photoconducting drum*** **(2)**, a specially coated cylinder

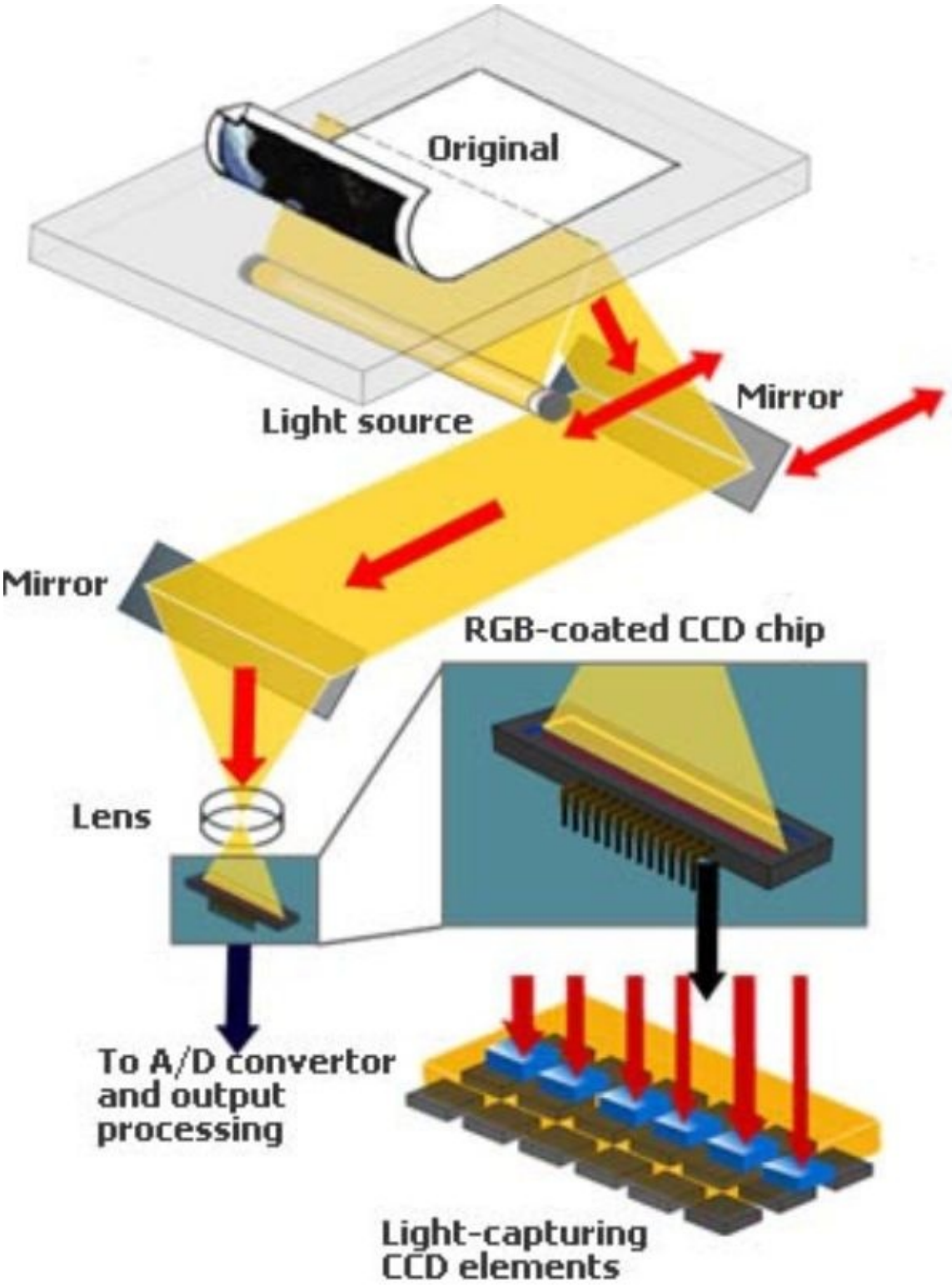
that receives a positive or negative charge from a ***charging roller* (3)** (or, in some printers, a ***corona wire***). A ***laser beam* (4)**, switching rapidly on and off and deflected off a ***rotating mirror* (5)**, scans the charged drum horizontally in precise lines. When the beam flashes on, it reverses the charge of tiny spots on the drum, corresponding to dots that are to be printed black. After the laser scans a line, a stepper motor advances the drum, and the laser repeats the process—all, of course, blindingly fast.

Next, the drum's laser-kissed portion encounters the ***developer roller* (6)**, which is coated in charged toner particles from the ***toner hopper* (7)**, part of the toner cartridge. Charged toner clings to the discharged areas of the drum, reproducing, in reverse, your images and text.

Meanwhile, a ***belt*** or ***roller assembly* (8)** draws paper inside from the ***paper tray* (9)**, past a ***transfer roller*** or ***charging wire* (10)** that applies a charge opposite the toner's to the paper. As the paper sheet meets the drum, the drum-borne toner transfers to paper. A ***cleaning blade* (11)** then cleans the drum, and the process continues in a smooth, circular flow. (Color lasers work similarly, but the paper may require four passes by the drum for four toner colors. Alternately, the printer may transfer each color layer to an intermediate belt before applying it to the paper, or employ four drum/toner assemblies.)

Last, your page, with its imprint of tenuously anchored toner, reaches the ***fuser* (12)**—a heat roller and a pressure roller. It melts the toner, which contains resins and sometimes wax, onto the page. *Voila*, pages in your out tray.

Scanner Setup

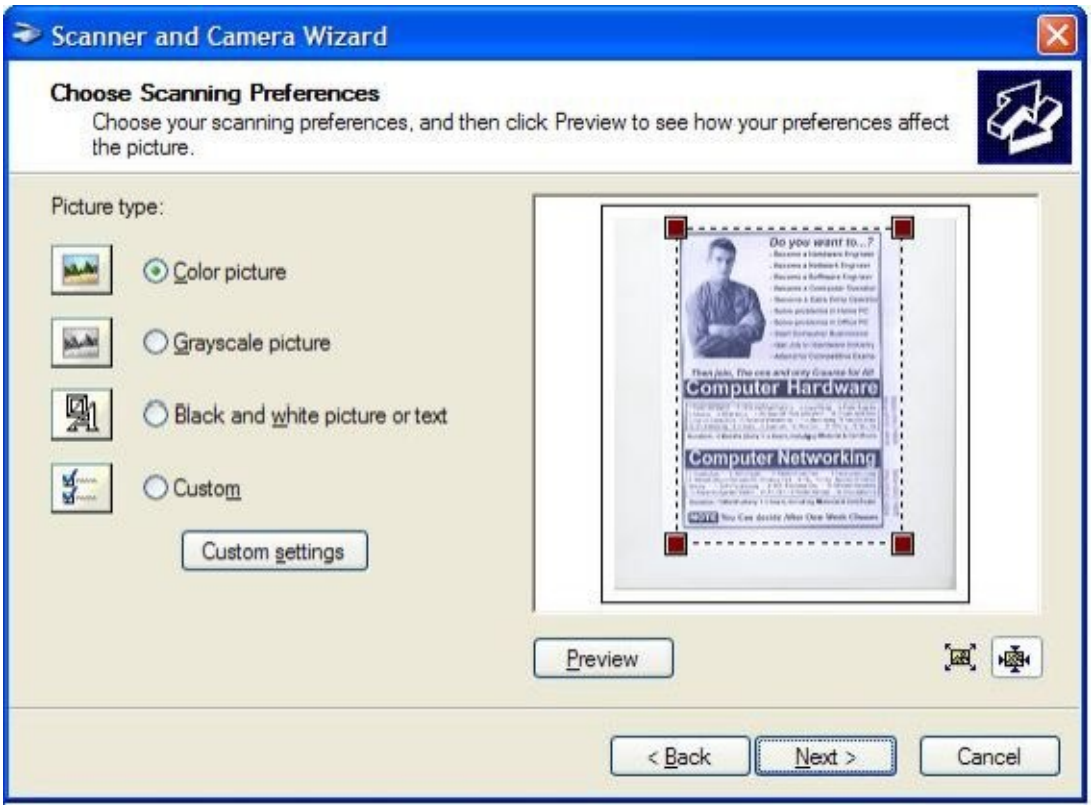


A charge-coupled device (CCD) is an image sensor, consisting of an integrated circuit containing an array of linked, or coupled, light-sensitive capacitors. This device is also known as a Color-Capture Device.

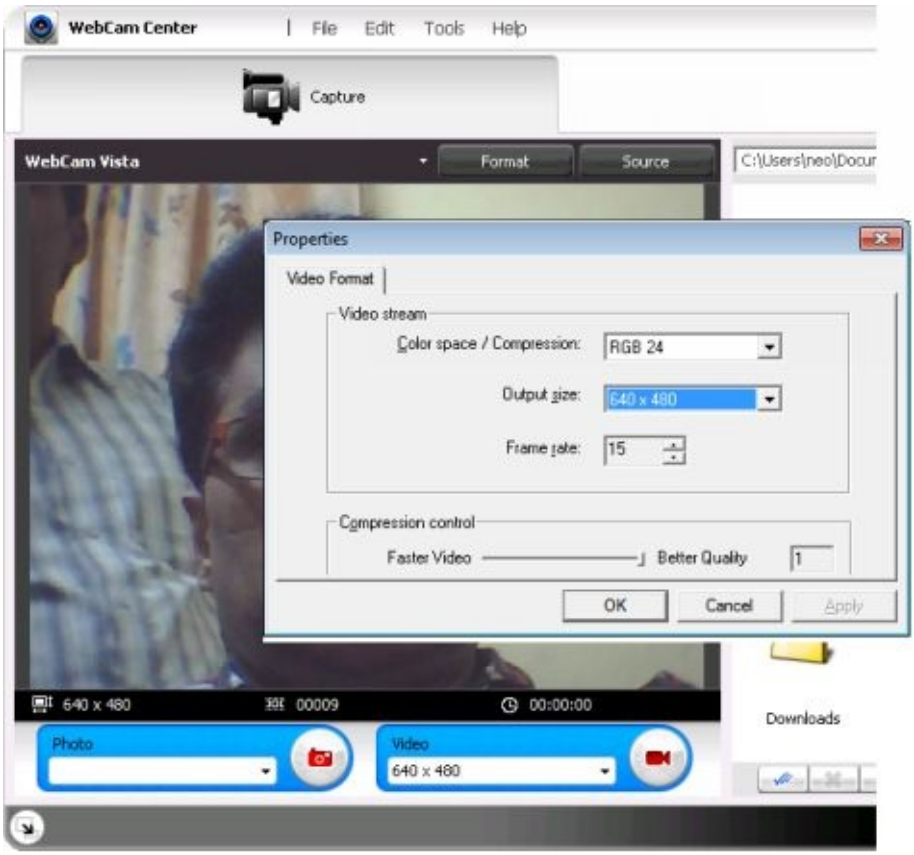
A / D Converter – Analog to Digital Converter

Method 1. Scanning through Manufacturer Software

Method 2. Scanning through Microsoft Windows (My Computer)



Webcam Setup


WebCam Center
File Edit Tools Help
Capture
WebCam Vista
Format
Source
C:\Users\neo\Docur
Properties
Video Format
Video stream
Color space / Compression:
RGB 24
Output size:
640 x 480
Frame rate:
15
Compression control
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1
OK
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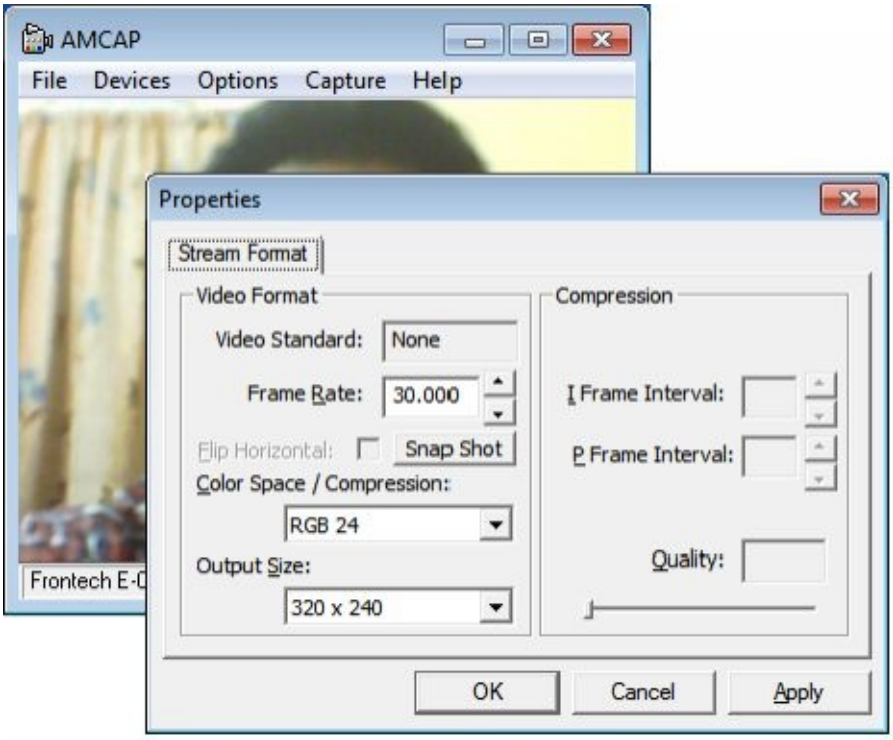
Photo
Video
640 x 480

(OR)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File Devices Options Capture Help
Properties
Stream Format
Video Format
Video Standard:
None
Frame Rate:
30.000
Flip Horizontal:
Snap Shot
Color Space / Compression:
RGB 24
Output Size:
320 x 240
Compression
I Frame Interval:
P Frame Interval:
Quality:
OK
Cancel
Apply