**Experiment 1:-**

**Study and measure voltages of SMPS.**

The **SMPS (Switch Main Power Supply)** Converts main AC (230V) electricity to the DC voltages required by chips motors and circuits in the PC. SMPS is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. SMPS gives power supply to our computer so that our computer runs.

The SMPS used in PCs work by switching larger voltages on and off rapidly to give a lower average voltage.

**Voltages:** There are five main DC voltages produced by SMPSs: **+3.3V**, **+5V**, **-5V**, **+12V** and **-12V**. The SMPS also provide the main system ground those current returns along.

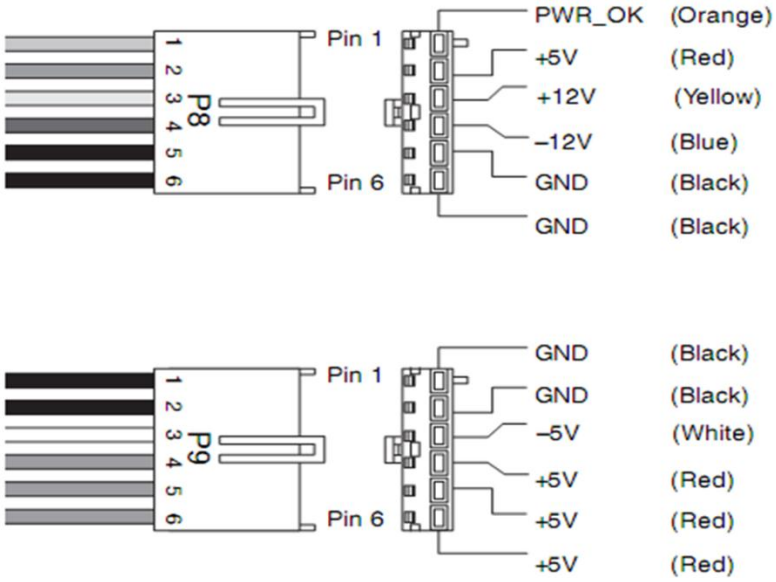
- **3.3V** is used by processor
- **5V** by Motherboard ICs, expansion cards and disk drives.
- **12V** is typically power expansion cards and disk drive motors.

Some SMPSs allow mains power to be passed through to the display screen.

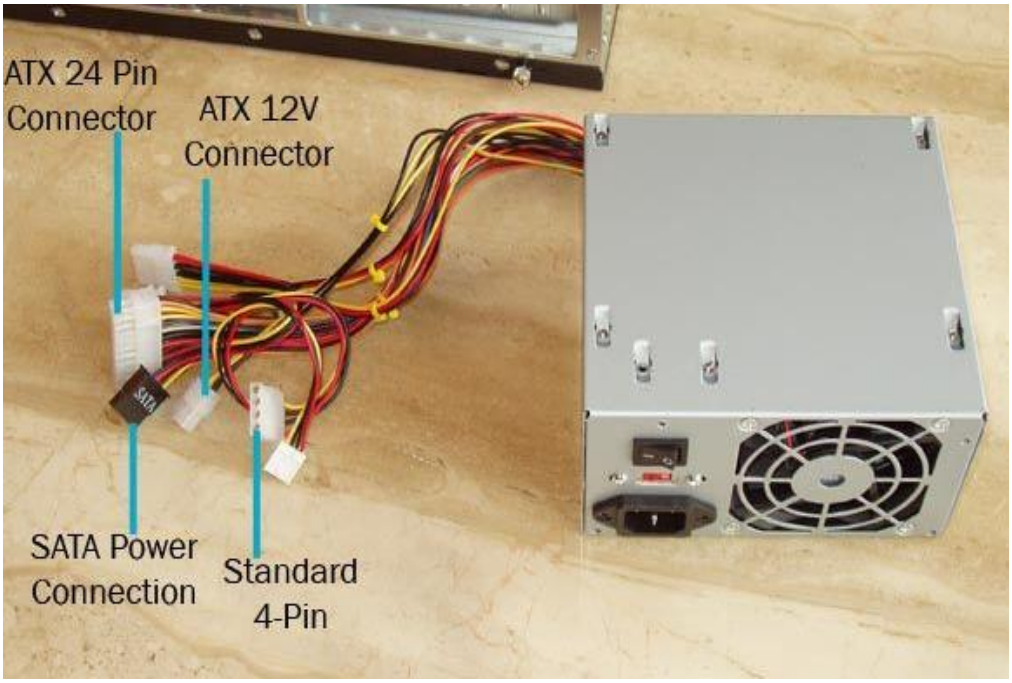
There are two types of SMPS

1. **AT (**Advanced Technology)
2. **ATX (**Advanced Technology Extended)

**1. AT:** The older supply used by AT systems has **two 6 pin** connectors (labeled P8 and P9) that connect to the system board (carries DC power to motherboard) and two 4-pin connectors. AT-style computer cases had a power button that is directly connected to the system computer power supply.

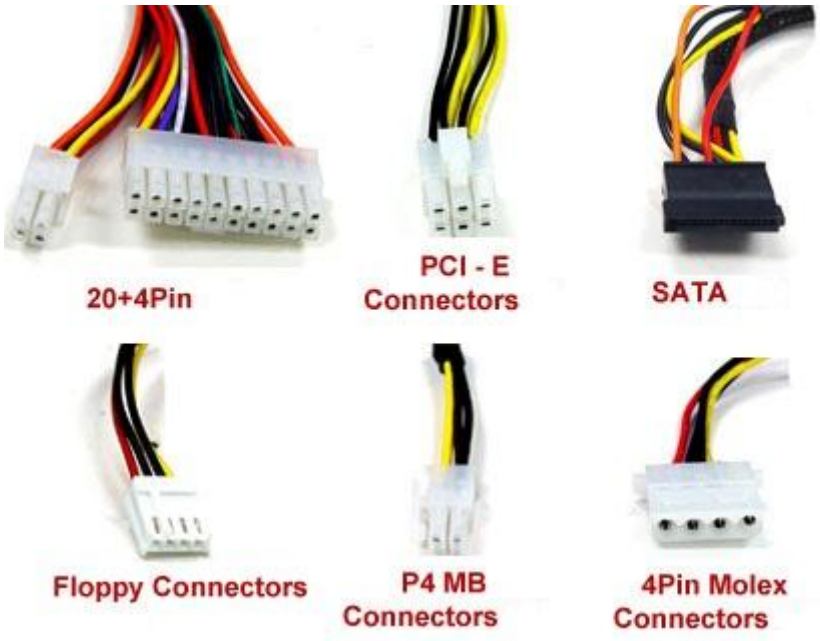


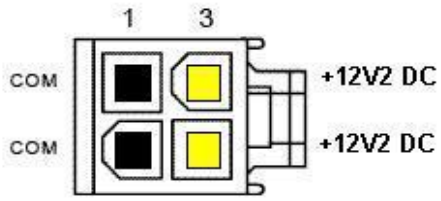

**2. ATX (Advanced Technology Extended):** ATX style SMPSs use **single 20 pin** (or **24 Pins**) adapter, but may also support auxiliary connecters for system boards requiring higher currents. An ATX power supply is typically controlled by an electronic switch.



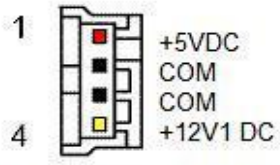

The main difference between AT and ATX power supply is, **AT** works with a **mechanical switch**. The switching is not programmable in AT model. But in the **ATX** it works with **logical switching** circuit, which can be switched by the various sources like power switch, keyboard, mouse, password etc.

**SMPS Connectors and Voltages:**

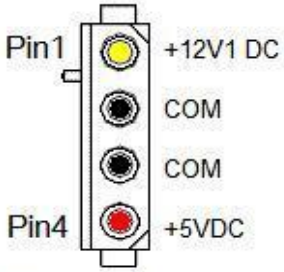




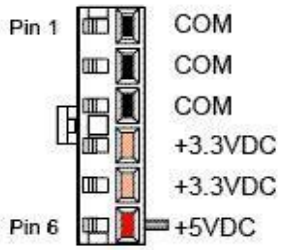

+12V2 DC Connector




Floppy Drive Connector

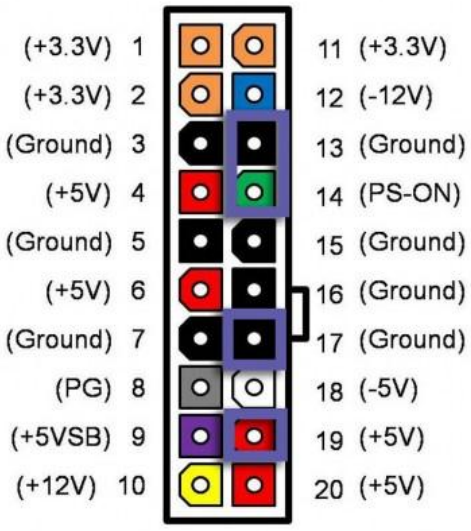



Peripheral Connector

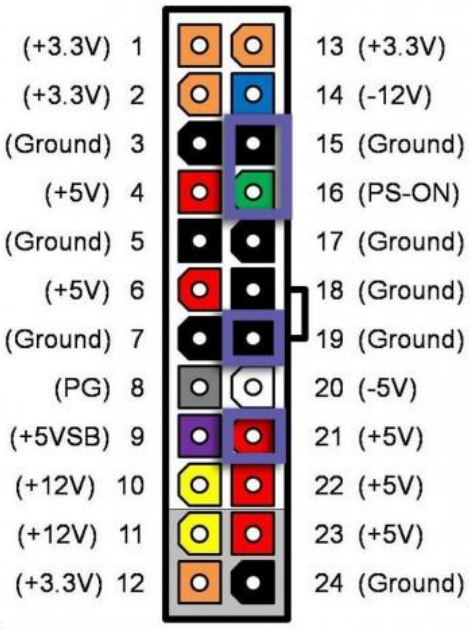


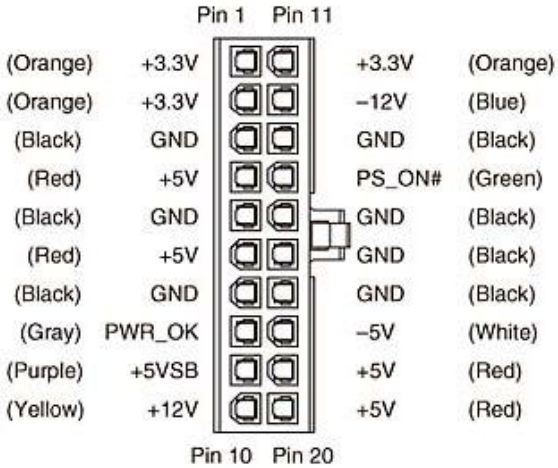

Aux Power Connector
(ATX12V v.1)

20 PIN CONNECTOR

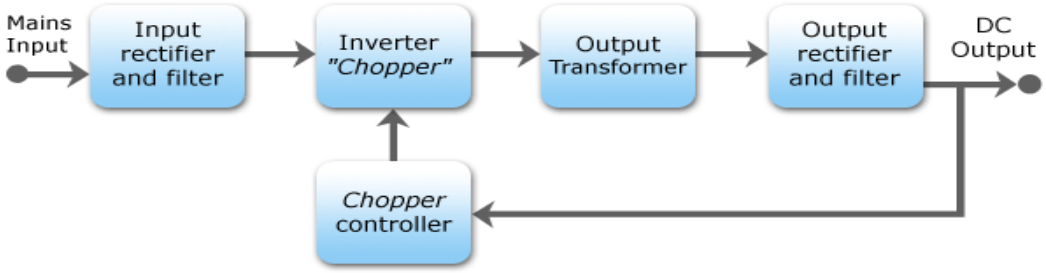



24 PIN CONNECTOR



**Theory of operation:**

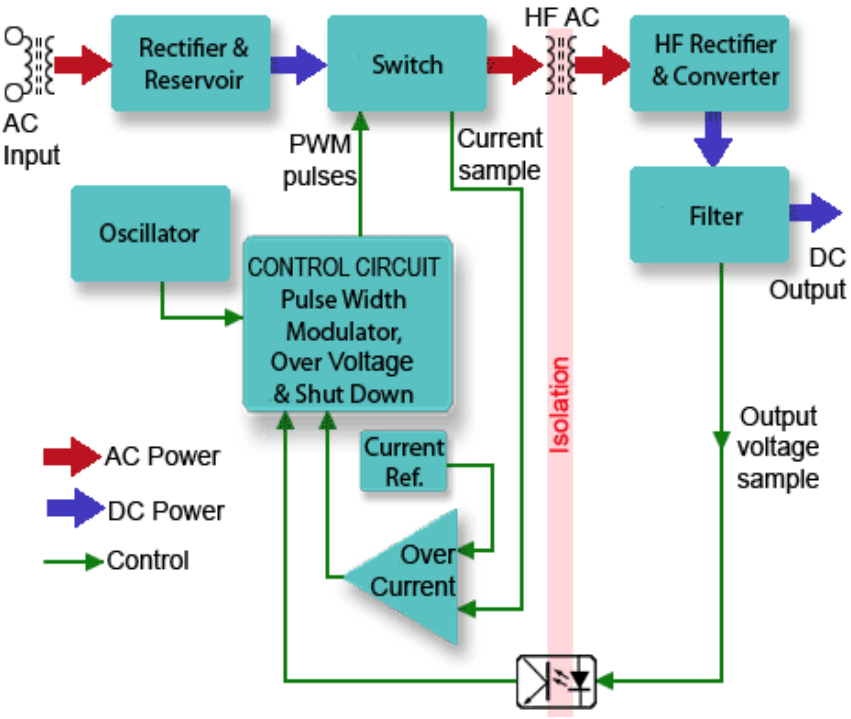



**Input rectifier stage:** If the SMPS has an AC input, then the first stage is to convert the input to DC. This is called **rectification**. An SMPS with a DC input does not require this stage. The rectifier produces an unregulated DC voltage which is then sent to a large filter capacitor.

**Inverter stage:** The inverter stage converts DC, whether directly from the input or from the rectifier stage described above, to AC by running it through a power oscillator, whose output transformer is very small with few windings at a frequency of tens or hundreds of kilohertz.

**Voltage converter and output rectifier:** If the output is required to be isolated from the input, as is usually the case in mains power supplies, the inverted AC is used to drive the primary winding of a high-frequency transformer. This converts the voltage up or down to the required output level on its secondary winding. The output transformer in the block diagram serves this purpose.

If a DC output is required, the AC output from the transformer is rectified. For output voltages above ten volts or so, ordinary silicon diodes are commonly used. The rectified output is then smoothed by a filter consisting of inductors and capacitors. For higher switching frequencies, components with lower capacitance and inductance are needed. A feedback control loop is employed to regulate the output voltage by varying the duty cycle to compensate for variations in input voltage.



**Testing a Power Supply of SMPS with a Multimeter:**

**Tools Required:**

1. A Multimeter
2. A Power Supply Unit (SMPS + Power Cable)
3. A Screw Driver( To remove the PSU from the Computer case)

**Step 1:** Shut down your computer. Once the computer has been shut down, unplug the power supply from the outlet.

**Step 2:** Open your computer case. Disconnect SMPS from all of the components inside the case.

**Step 3:** Find the 20/24 Pin connector in SMPS that normally attaches to your computer's motherboard.

**Step 4:** Find the **green pin** and a **black pin** (pins 15 & 16) and short (Jump) both pins using wire. You will be inserting the ends of the wire into the **green pin** (there should be only one) and a neighboring **black pin**.

**Step 5:** Check the fan. Once the power supply is receiving power, you should be able to hear and/or see a fan moving. This will let you know that the power supply is at least working.

**Step 6:** Test the various voltages with a multimeter. (Set your digital multimeter to measure AC voltage. The **AC** symbol is a "**V**" with a "**~**" near it. Set it to the range of 20 V.)

**Step 7:** Connect the **negative probe** on the multimeter (**black**) to any ground wired pin and connect the **positive probe** (**red**) to the first power line you want to test. The 24-pin main power connector has +3.3 VDC, +5 VDC, -5 VDC (optional), +12 VDC, and -12 VDC lines across multiple pins.

**Step 8:** Check the voltages to make sure they fall within the tolerance threshold. If any of the voltages are outside of the tolerance range, then the power supply is defective.

***NOTE:** There is no risk of electric shock involved in this test.

**Experiment 2:-**

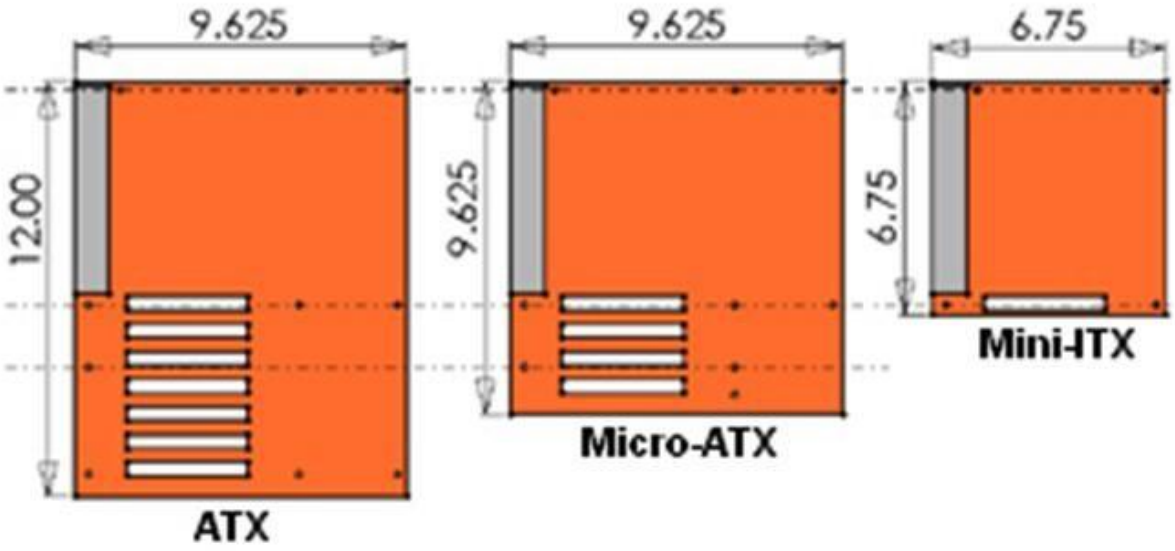
**Drawing the motherboard layout (any latest processor) and studying the chipset through data books or Internet**

A **motherboard** (sometimes alternatively known as the mainboard, main circuit board, system board, baseboard, planar board or logic board, or colloquially, a mobo) is the main printed circuit board (**PCB**) found on the back side or at the bottom of the general purpose computers and other expandable systems.

It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Motherboard is the heart ♥ of any PC. It contains both hardware circuits and firmware routines. Most of activities in the PC are the actions initiated by the firmware routines in ROM BIOS. Certain functions are done exclusively by hardware.

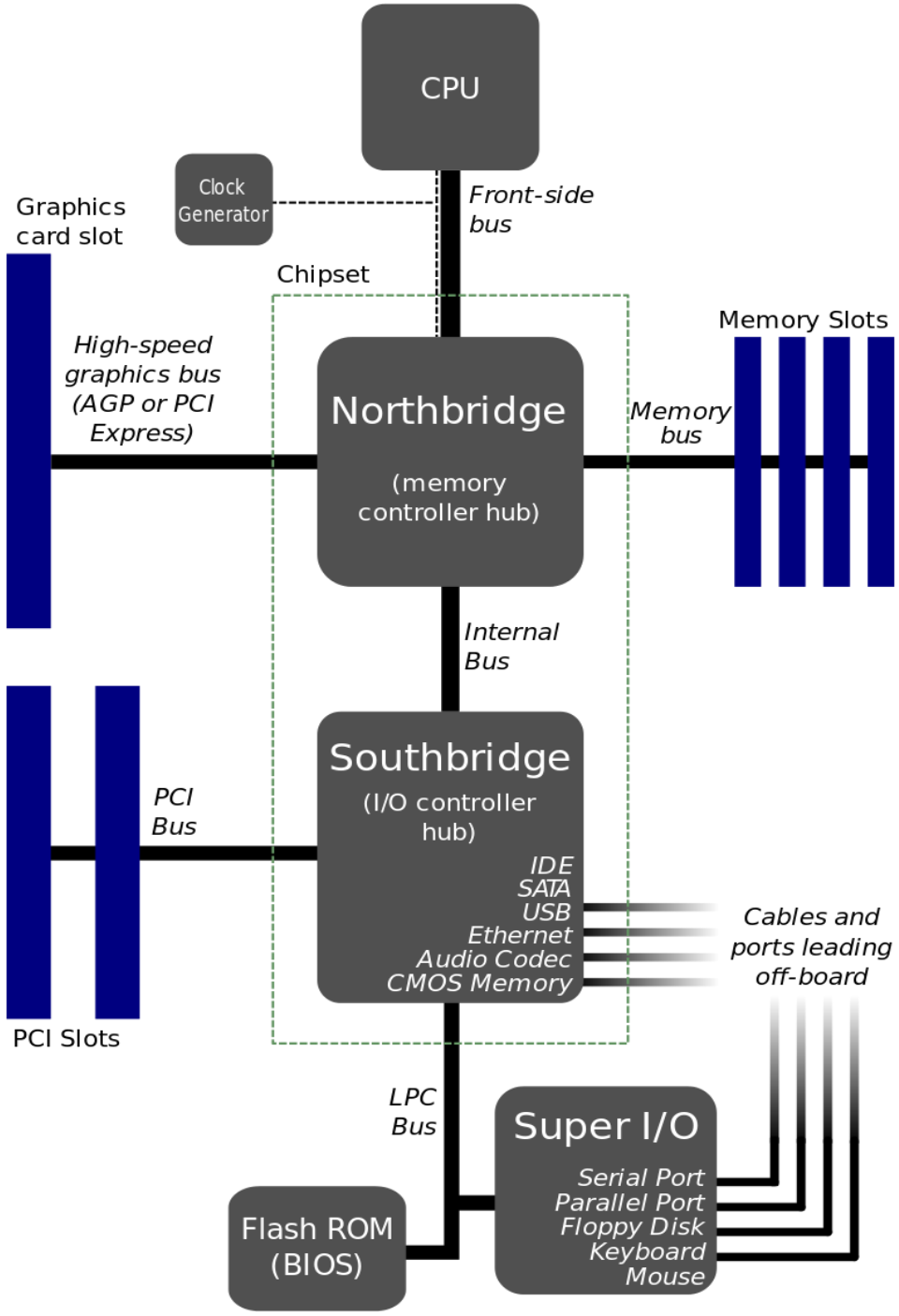
**Most modern motherboards come in three sizes.**

- **ATX** is the de facto standard and offers the most space for plugs and slots.
- **Micro-ATX** is 2.4-inches shorter, which means less room for expansion slots.
- **Mini-ITX** can make for a tiny PC, but you'll usually only have room for one add-in card (like a graphics card), and fewer connectors for storage and RAM.



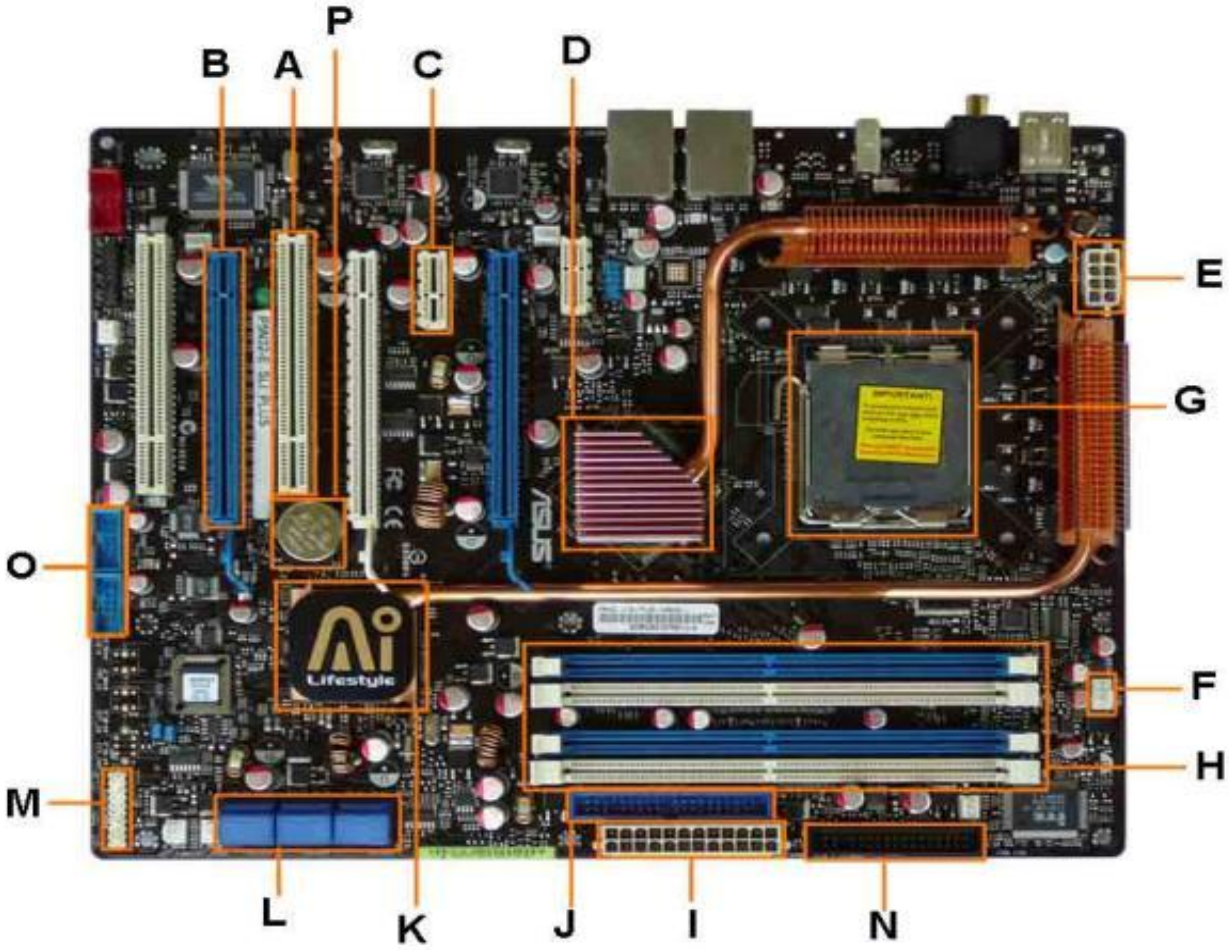

A typical motherboard will have a different number of connections depending on its **standard** and **form factor**. (**form factor** is the specification of a motherboard – the dimensions, power supply type, location of mounting holes, number of ports on the back panel, etc.)

**Block diagram of a motherboard:**




A chipset is usually designed to work with specific family of microprocessors, because it controls communications between the processor and external devices. It is a number of integrated circuits designed to perform one or more related functions. On most motherboards the "chipset" consists of two chips, the Northbridge and the Southbridge.

**Computer Motherboard and its parts:**




A **computer motherboard diagram** is very useful for when you need to **replace motherboard, do motherboard upgrades, troubleshoot motherboard, or build your own computer**.

**A. PCI Slot** - This board has 2 PCI (Peripheral Component Interconnect) slots. These can be used for components such as Ethernet cards, sound cards, and modems.

**B. PCI-E 16x Slot** - There are 2 of them on this motherboard diagram, both are **blue**. These are used for your **graphics card**. With two of them onboard, you can run 2 graphics cards in it. These are the 16x speed versions, which are currently the fastest.

**C. PCI-E 1x Slot** - Single slot - In the PCI-E 1.x generation, each lane (1x) carries 250 MB/s compared to 133 MB/s for the PCI slots. These can be used for expansion cards such as Sound Cards, or Ethernet Cards.

**D. Northbridge** - This is the Northbridge (also called the memory controller) for this motherboard. This allows communication between the **CPU** and the **system memory** and PCI-E slots.

**E. ATX 12V 2X and 4 Pin Power Connection** Power Connection - This is one of two power connections that supply power to the motherboard. This connection will come from your Power Supply (SMPS).

**F. CPU-Fan** Connection - This is where your CPU fan will connect. Using this connection over one from your power supply will allow the motherboard to control the speed of your fan, based on the CPU temperature.

**G. Socket** - This is where your **CPU** will plug in. The orange bracket that is surrounding it is used for high end heat sinks. It helps to support the weight of the heat sink.

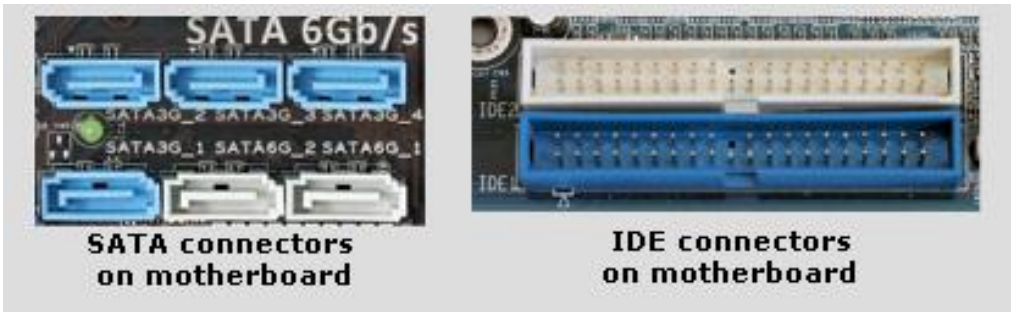
**H. Memory Slots (DIMM)** - This is also called as **Dual Inline Memory Module**. These are the slots for your **RAM**. Most boards will have 4 slots, but some will only have 2. The colour coding you see on the motherboard diagram is used to match up RAM for Dual-Channel. Using them this way will give your memory a speed boost. The memory slots depend on the type of the memory. Such as the SDRAM-DDR 3, SDRAM and SDRAM-DDR 1.

**I. ATX Power Connector** - This is the second of two power connections. This is the main power connection for the motherboard, and comes from the Power Supply (SMPS).

**J. IDE Connection** - The IDE (Integrated Drive Electronics) is the connection for your hard drive or CD / DVD drive. Most drives today come with **SATA** (serial advanced technology attachment) connections, so you may not use this.

**K. Southbridge** - This is the controller for components such as the PCI slots, onboard audio, and USB connections. It is also called the input/output controller or expansion controller.

**L. SATA Connections** - These are 4 of the 6 SATA connections on the motherboard. These will be used for hard drives, and CD / DVD drives.




**M. Front Panel Connections** - this is where you will hook in the connections from your case. These are mostly the different lights on your case, such as power on, hard drive activity etc.

**N. FDD Connection** - The FDD is the Floppy Disk controller. If you have a floppy disk drive in your computer, this is where you will hook it up.

**O. External USB Connections** - This is where you will plug in external USB connections for your case or USB bracket.

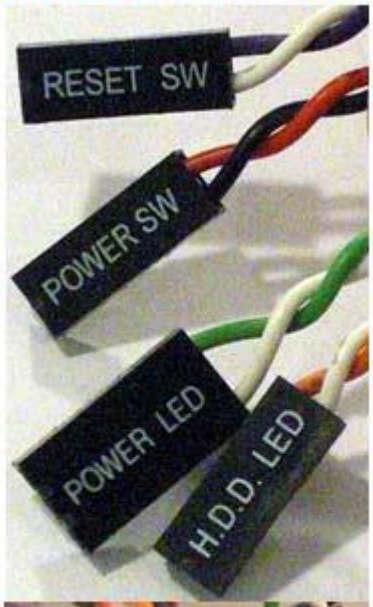
**P. CMOS battery** - This is the motherboard's battery. This is used to allow the CMOS to keep its settings. It can provide 3 volts direct current/voltage to the CMOS IC. To preserve the BIOS settings of the computer. Such as the date/time module, hardware information and settings/parameter, etc.

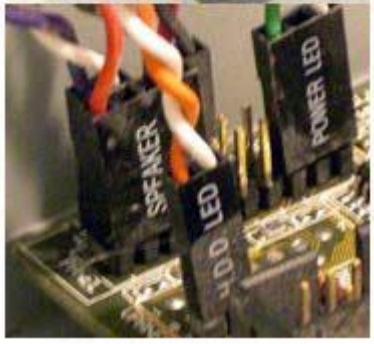
CMOS Battery


**Q. Northbridge and Southbridge:** If you have a look at your motherboard, chances are you'll see a square metal component somewhere in the lower-right part of the board. This metal component is actually a heatsink, and its role is to provide thermal protection for the Northbridge – one of the most important components of a motherboard. The **Northbridge** is responsible for coordinating the data flow between the **memory**, the **video** card and the **processor**. A secondary chip, known as **Southbridge**, has a similar function, coordinating the data flow between the **processor** and peripherals such as **sound cards** or **network cards**.

**R. System panel connector**: front panel connector (fpanel or system panel header) controls a computer power button, reset button, and LED's. The System panel cables, as shown in the picture are two wire cables that are color coded to help identify where they connect to the motherboard system panel connector. The **black** or **white** wire is the **GND** (ground) wire and the colored wire is the powered wire. The cables, colors, and connections vary depending on the computer case and motherboard you have, however, generally include the cables mentioned below.

System Panel Cables & Connector




**Types of system panel cables:**

- **HDD LED (IDE LED)** - The LED activity light for the hard drive. This indicator is the light that flashes as information is being written to and read from the hard drive.
- **PLED (Power LED)** - The LED power light, which indicates when the computer is on, off, or in Standby.
- **PWRSW (Power SW)** - Controls the power button that allows you to turn on and off the computer.
- **RESET SW** - Handles the reset button to restart the computer.
- **SPEAKER** - The internal speaker used to sound the beep noises you hear from your computer when it is booting.

**S. Heat Sink:** A heat sink is a device that incorporates either a fan or some other means to keep a hot component, such as a processor, cooled down. There are two heat sink types: **active** and **passive**.

- **Active Heat Sink:** Active heat sinks utilize the computer's power supply and may include a fan. Sometimes these types of heat sinks are referred to as an **HSF** (Heat Sink Fan). There are also liquid cooling systems, which have become more popular in recent years.
- **Passive heat sinks:** Passive heat sinks are those that have no mechanical components. Consequently, they are 100% reliable. Passive heat sinks are made of an aluminum finned radiator that dissipates heat through convection. For passive heat sinks to work to their full capacity there should be a steady airflow moving across the fins.

**T. Jumpers:** Jumpers allow the computer to close an electrical circuit, allowing the electricity to flow certain sections of the circuit board. Jumpers consist of a set of small pins that can be covered with a small plastic box (jumper block) as shown in the illustration to the right. When pins **1-2** are jumped the computer operating in **Normal mode**, when pins **2-3** are jumped it is set into **config mode**, and when **open** the computer is in **recovery mode**. Jumpers are used to configure the settings for computer peripherals such as the motherboard, hard drives, modems, sound cards, and other components.

Computer Jumper



**U. Super I/O: super input/output** or **SIO** is an integrated circuit on a computer motherboard that handles the slower and less prominent input/output devices such as Floppy disk controller, Game port, Infrared, Intrusion detection, Keyboard and mouse (non-USB), Parallel port, RTC (Real-time clock), Serial port UART, Temperature sensor and fan speed.

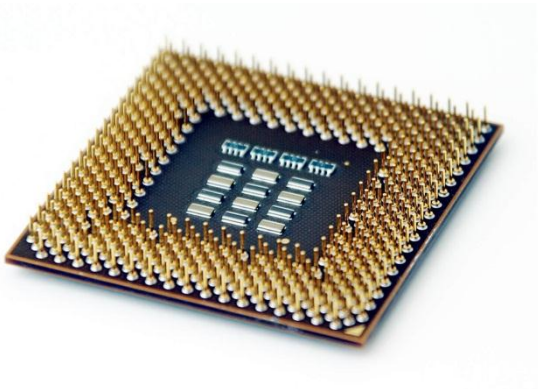
Super I/O

V. **Expansion slot:** An expansion slot (**bus slot** or **expansion port**) is a socket on the motherboard that is used to insert an expansion card (or circuit board), which provides additional features to a computer such as video, sound, advanced graphics, Ethernet or memory**.** Commonly found expansion slots are: **AGP (Accelerated** Graphics Port)**, PCI (**Peripheral Component Interconnect), **PCI Express.**

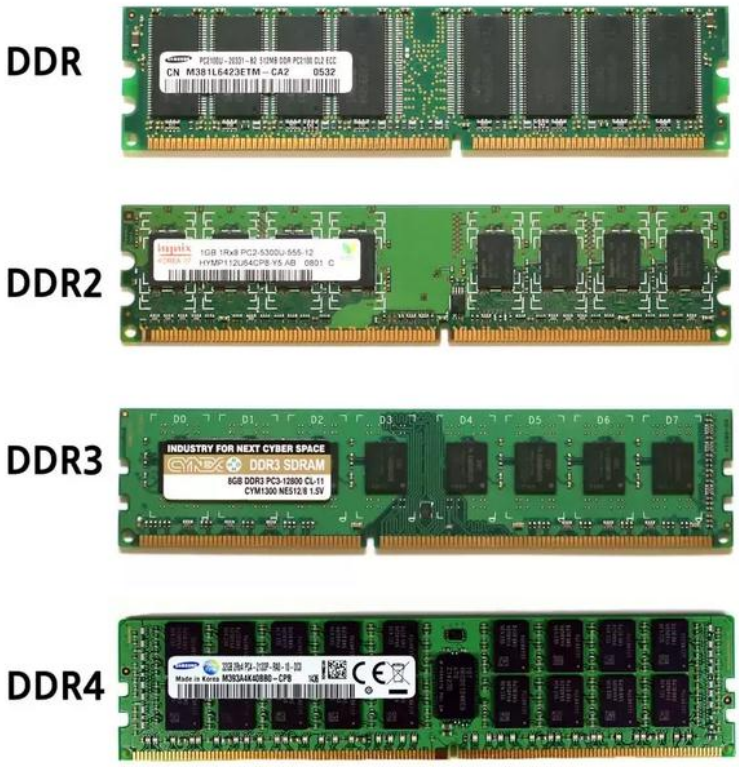
W. **BIOS:** BIOS (basic input/output system) is the firmware program a personal computer's microprocessor uses to get the computer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, video adapter, keyboard, mouse and printer. **BIOS** is a program that is made accessible to the microprocessor on an erasable programmable read-only memory (EPROM) chip.

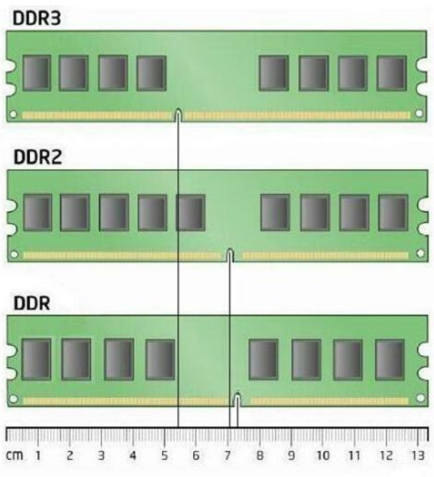

X. **Processor:** A processor is the logic circuitry that responds to and processes the basic instructions that drive a computer. The four primary functions of a processor are fetch, decode, execute and writeback. A processor or micro-processor is the '**brain**' of a computer system. It is the processor that controls the working of all of the hardware and software. The processor is sometimes referred to as the **Central Processing Unit** (CPU). A processor connects directly to the computer's motherboard. Processors can be categorized by the way they are connected to the motherboard. There are two main types of processor connections to motherboards:

- **Sockets**- processor that is connected to a socket is a square package with many pins (more than 250) on the bottom surface of the chip, which connects to a motherboard by a **Zero Insertion Force** (ZIF) socket.
- **Slots** - processors take is a chip soldered on to a card, which then connects to a motherboard by a slot.

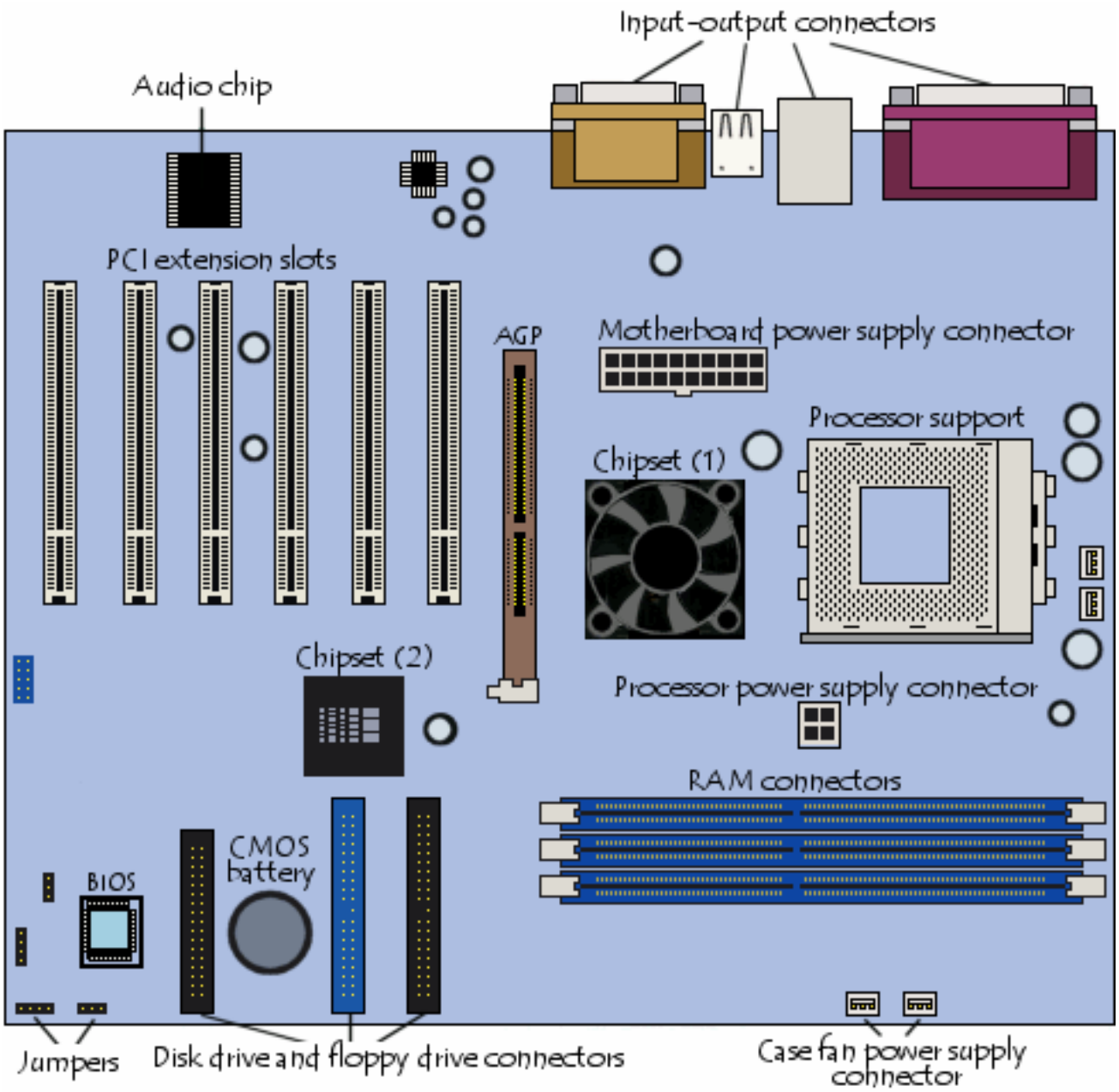


**Y. RAM (Random Access Memory)**: RAM is temporary storage that the processor uses to store programs, and their associated data, while they are running. The idea of a program running from a computer's main memory is known as the '**stored program concept**'. When invoked a program will be loaded from hard disk into RAM and any data entered is stored in RAM as well. RAM is **volatile**, which means that its contents are lost when the machine is turned off. There are a number of ways you can use to determine the kind of RAM slot you have. To begin with, you can check the number of pins. **DDR** has **184** pins and **DDR2** and **3** has **240 pins** while **DDR4** has **288** pins. The other method is to look at the key notch position. DDR notch is almost at the center but slightly to the right. DDR2 notch is almost at the center as compared to DDR3 which is slightly to the left. DDR4 has a notch slightly to the right but very close to the center of the RAM slot.



**Z. General Layout of the Mother board**:



**Experiment 3:-**

**CMOS setup of any latest PC.**

**BIOS (**Basic Input/Output System**)** is a **firmware**, in short. It is stored on a chip on a part of the computer motherboard and is basically, a set of instructions that run to help load the operating system. The computer **BIOS setup** utility (also known as the **CMOS setup**) is the place where you can change a few basic computer hardware settings. The **BIOS** is a **ROM** chip found on motherboards that allows you to access and set up your computer system at the most basic level. The BIOS and CMOS often get confused but there is quite a difference. The BIOS contains all the settings and the CMOS memory is a piece of RAM that remembers all the info.

The BIOS includes instructions on how to load basic computer hardware. It also includes a test referred to as a **POST** (Power-On Self-Test) that helps verify the computer meets requirements to boot up properly. If the computer does not pass the POST, you will receive a combination of beeps indicating what is malfunctioning in the computer.

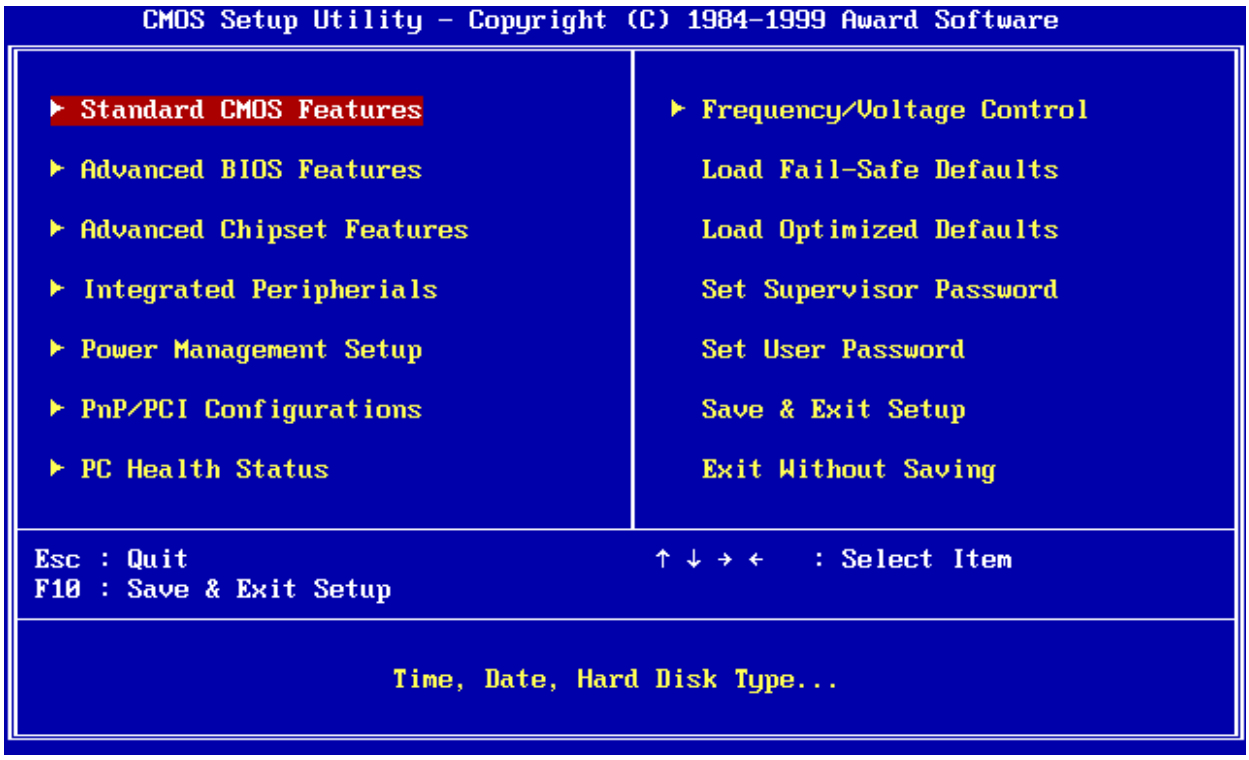
**The four main functions of a PC BIOS**

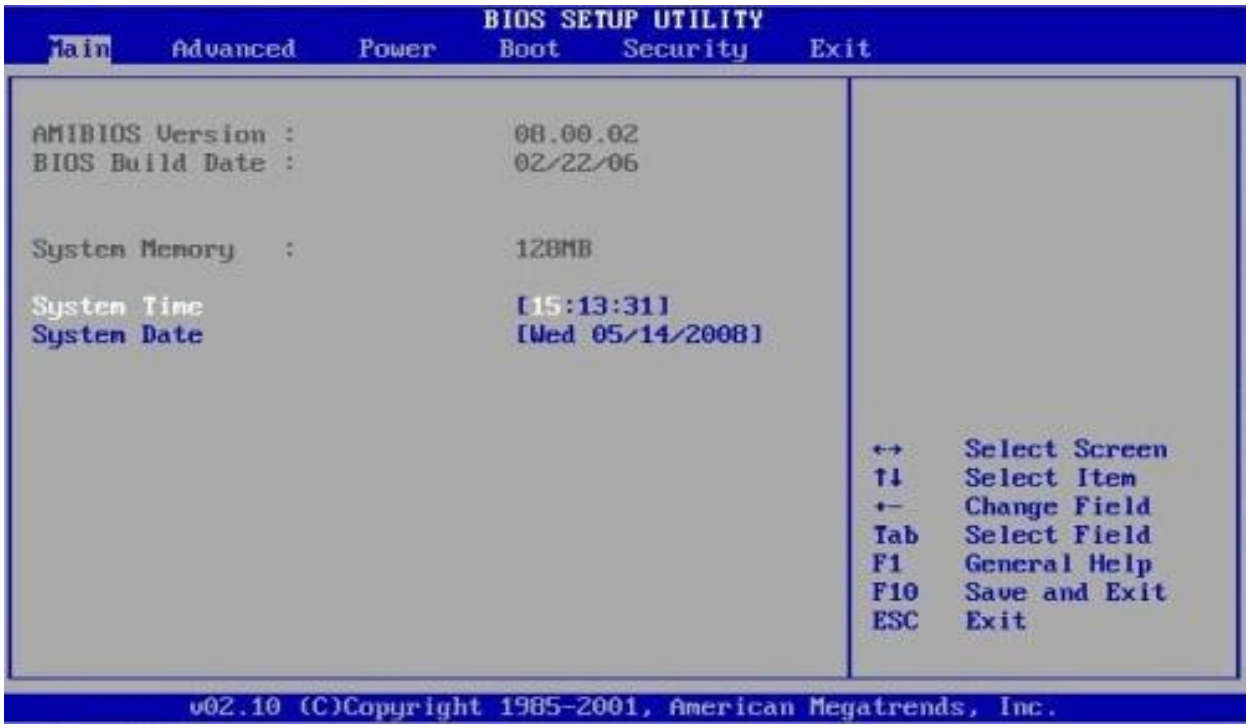
- **POST** - Test computer hardware insuring hardware is properly functioning before starting process of loading Operating System.
- **Bootstrap Loader** - Locate the operating system. If a capable operating system is located, the BIOS will pass control to it.
- **BIOS drivers** - Low-level Software / Drivers which interfaces between the operating system and your hardware. When running DOS or Windows you are using complete BIOS support.
- **BIOS or CMOS (Complementary Metal-Oxide Semiconductor) Setup** - Configuration program that allows you to configure hardware settings including system settings such as computer passwords, time, and date.

**BIOS Setup Utility:**

To enter the CMOS Setup, you must press a certain key or combination of keys during the initial startup sequence. Most systems use "**Esc**," "**Del**," "**F1**," "**F2**," "**F10**," "**Ctrl-Esc**" or "**Ctrl-Alt-Esc**" to enter setup. There is usually a line of text at the bottom of the display that tells you "Press *** to Enter Setup."

Once you have entered setup, you will see a set of text screens with a number of options. You can change many options. You can change the order of booting, which device you want the computer to boot to etc. You can decide whether to disable particular devices (such as onboard sound or network cards). You can change the date or time and you can also reset the CMOS back to factory settings. Some of these are standard, while others vary according to the BIOS manufacturer.




- **Advanced Tab:** In the advance tab you often find information on the IDE configuration, the Floppy Configuration, the Boot Settings configuration. You can further investigate by pressing enter over the IDE configuration and then looking at the items listed. It will have all your hard drives and cd/dvd drives listed here. If you have two hard drives connected then two will show up here. This is a great place to check if your hard drive is being recognized. If the new hard drive or cd/dvd drive is not recognized in here, then your os will not find it. You can zoom in even more by pressing **ENTER** and have a look at a specific hard drive in detail. You can see its exact size, the vendor and the mode and other specifications.

- **Power Tab:** The power tab is self-explanatory. It just gives you power options that you can change. I would recommend leaving these as they are.
- **Boot Tab**: The boot tab of the BIOS setup gives you all the options for when you boot up. You can order the preference in booting (**Boot sequence**). You can choose whether you want to boot from the Floppy Drive, CD drive, or hard drive and in what order. This is probably the most changed setting in the BIOS setup. I would also leave as they are unless you need to specifically boot from another location. In more recent computers you can change it to boot via a network, or through USB.
- **Security Tab:** In this tab you can change all the passwords, or assign passwords to the BIOS. You can specify two levels of BIOS password: a **user password** that required at power-on, and a **supervisor password** that is required to access CMOS. Clearing a BIOS password can usually be achieved by shorting the "**clear CMOS**" jumpers on the motherboard.
- **Exit Tab:** The Exit tab is more completed then you would expect. There are a number of options here. You can exit saving your changes, you can exit discarding changes, you can load optimal defaults and also the failsage defaults.

***NOTE:** One word of advice don't change anything unless you know what you are doing and if you accidently do then just exit without changes.

### How to Reset BIOS:

### Method 1: BIOS Menu

To reset your computer's CMOS or BIOS settings back to the default by following steps:

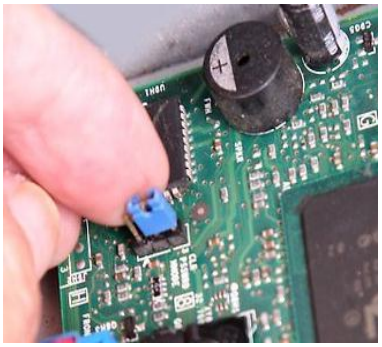
1. Enter CMOS setup.
2. In CMOS setup, look for an option to reset the CMOS values to the default setting or an option to load the fail-safe defaults. With many CMOS setup screens, there will be a function key to do this. For example, the F5, F6, F9, F11, or F12 key may be set up as a shortcut to load the default settings. Other setups may list an option that you can arrow over to using the arrow keys and pressing Enter.
3. When found and selected, you'll likely be asked if you're sure you want to load the defaults. Press **Y** for **yes** or arrow to the yes option.
4. Once the default values are set, make sure to **Save** and **Exit.**
5. If you're working on a computer with a Phoenix BIOS that has **Main - Advanced - Security** listed at the top of the screen, you can get to this setting by using the right arrow to move over to **Advanced**. Under Advanced, arrow down to the **Reset Configuration Data** option and change the value from Disabled or No to Enabled or Yes. Once the above is done, press the **F10** key and **Save and Exit** CMOS setup.

### Method 2: Hard reset the CMOS


If the above steps do not reset the CMOS settings, we suggest removing the CMOS battery, causing the computer to forget all CMOS settings, including the password. Wait 5 minutes after removing the battery, then put the battery back into the motherboard and turn on the computer.

### Method 3: Clear the jumper

1. Power off the system.
2. Open up the system so you can see the motherboard.
3. Locate the **CMOS jumper** by referring to the motherboard manual and how to clear the CMOS. In general, the CMOS jumper is three pins located near the battery.
4. In general, CMOS jumper has positions 1–2 and 2–3. Move the jumper from the **default position 1–2** to **position 2–3** to clear CMOS. Wait 1–5 minutes then move it back to the default position.



5. Power on the system. In some systems, you might need to enter BIOS to reset to the factory defaults.

### Updating Your BIOS:

Occasionally, a computer will need to have its BIOS updated. This is especially true of older machines. As new devices and standards arise, the BIOS needs to change in order to understand the new hardware. In this situation, we need to download BIOS from manufacturer website and update it.

**Experiment 4:-**

**Fault findings: (a) Problems related to CPU (b) Problems related to RAM.**

**Hardware troubleshooting** is the process of reviewing, diagnosing and identifying operational or technical problems within a hardware device or equipment. It aims to resolve physical and/or logical problems and issues within a computing hardware.

Hardware troubleshooting processes primarily aim to resolve computer hardware problems using a systematic approach.

The process starts by first identifying the problem and finding different issues that can cause such a problem and eventually leading to implementing a solution or alternative. Hardware troubleshooting is generally done on hardware equipment installed within a computer, server, laptop or related device.

**Some processes within hardware troubleshooting include:**

- Removing, repairing and replacing faulty RAM, hard disk or video/graphic card.
- Cleaning dusts from RAM and Video carts slot/ports and from cooling fan.
- Tightening cable and jumpers on motherboard and/or components.
- Software related hardware problems such as device driver update or installation.

**Problems related to CPU:**

- **CPU is not booting:** The motherboard will emit a number of "beeps" when the PC powers up.
- **Firmware Problem or Configuration**: The Operating System or device drivers do not correctly support a component.
- **Heat problems**: A component (CPU or a graphics card) is getting too hot and overheating.
- **Power problems**: The PSU is supplying too little or too much power, or cannot maintain a constant supply.
- **Motherboard problems**: A motherboard component (e.g. Northbridge/MCH) that communicates with the processor is damaged or misbehaving.

**CPU Troubleshooting:**

- Keep an eye on processor temperature.
- Keep the system clean.
- Use a good CPU cooler.
- Install supplemental case fans.
- Upgrade the case.
- Position the system properly.

**Troubleshooting with Beeps:**

The BIOS performs a **Power On Self Test** (POST) when the system is turned on. This test is used to ensure that the system is functioning properly and to gather information about what the system contains. When a problem is identified with the system during the POST, the BIOS will normally produce an error message. However, in some cases the problem is detected so early in the test that the BIOS cannot even access the video card to print the message! In this case the BIOS will produce a beeping pattern on the speaker to tell you what the problem is.

The exact meaning of the beep codes depends on the type and version of BIOS that you have. The most popular types of BIOS are Award, AMI, Dell, IBM, Macintosh, and Phoenix.

***NOTE:** A single beep during boot process, usually right before the BIOS startup screen is displayed, is normal and does not indicate a failure as long as the boot continues on.

The beep codes are different according to the BIOS manufacturing company. Below are the beep codes for AMI BIOS:

- **1 Short Beep:** A **single short beep** from an AMI based BIOS means there has been a memory refresh timer error. The solution is often to replace RAM in the computer. If another computer memory works you know that you have defective memory. If not your motherboard or the slots on motherboard are defective.
- **2 Short Beeps: Two short beeps** means there has been a parity error in base memory. This is an issue with the first 64 KB block of memory in your RAM. The solution is often to replace the memory.
- **3 Short Beeps: Three short beeps** means there has been a base memory read/write test error in the first 64 KB block of memory. Replacing the RAM usually solves this AMI beep code.
- **4 Short Beeps: Four short beeps** means that the motherboard timer is not working properly but it could also mean that there's an issue with the RAM module that's in the lowest (usually marked 0) slot. Usually, a hardware failure with an expansion card or an issue with the motherboard itself could be the cause of this beep code.
- **Continuous Beep:** The system producing constant beeping in no specific pattern, or a fast "ringing" sound. This is usually caused by a problem with system memory or possible the video card.
- **Long and short beep:** The BIOS is unable to access the video system in order to write any error messages to the screen.
- **Long beeps:** An error with keyboard can be caused by any of the below possibility. Key board is not connected properly, stuck key, bad keyboard, bad PS/2 or AT port.

**Problems related to RAM:**

RAM (Random Access Memory) is a System's memory where your computer Read and Write the Process Data at the same speed, it can help your CPU to perform better and fast in order to provide the best performance to the Computer User.

If your Desktop/Laptop is working slow or lagging or maybe only if some applications are running slowly, then it's possible that you might not have enough RAM in your computer's system for running that particular or multi-applications. A bad memory module (RAM) can cause unpredictable behavior in an Operating System;

**Problems related to CPU:**

- Instant Computer freeze while working or maybe on your Computer's startup.
- Instant Computer restarts, even without pressing the Reset button.
- Windows Booting problem.
- BSOD (Blue Screen Stop Error) on the screen while working or on system's startup.
- NO display on computer's startup.

**RAM Troubleshooting:**

- RAM Cleaning
- Replacing RAM
- Changing RAM Slot

**Experiment 5:-**

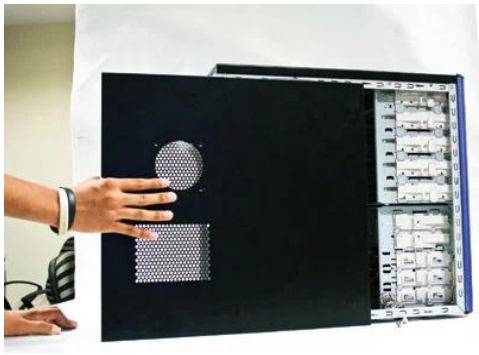
**Disassembly and Assembling of PC and Installation of Operating System**

**a) Windows b) Linux. Perform dual booting also.**

**Disassembly and Assembling of the computer system:**

**Step 1: Switch off the power supply and detach power cable.**

The disassembling of the computer system starts with externally connected device detachment. Make sure the computer system is turned off, if not then successfully shut down the system and then start detaching the external devices from the computer system.



**Step 2: Remove the CPU cabinet cover.**

The standard way of removing tower cases used to be to undo the screws on the back of the case, slide the cover back about an inch and lift it off.

**Step 3: Detach internal cables.**

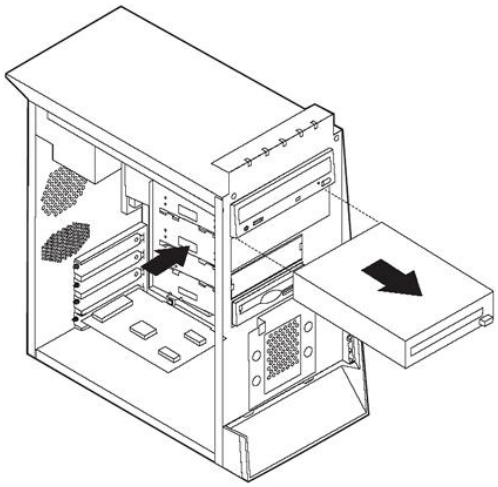
Disconnect all internal cables and fan connectors.

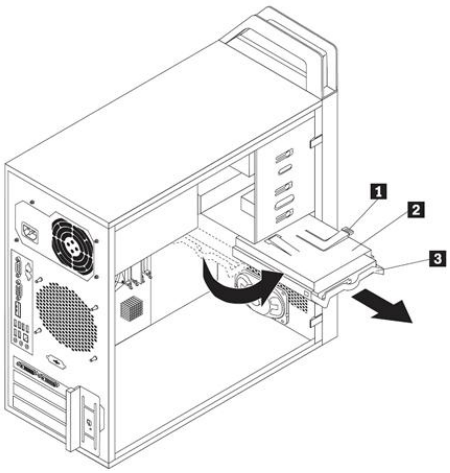
**Step 4: Uninstall adapter cards.**

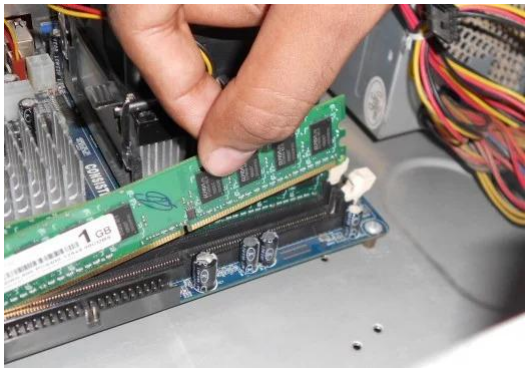
Make sure if the card has any cables or wires that might be attached and decide if it would be easier to remove them before or after you remove the card. Remove the screw if any, which holds the card in place.

**Step 5: Remove drives**

There can be possibly three types of drives present in your computer system, Hard disk drive, CD/DVD/Blue-ray drives, and floppy disk drives. They usually have a power connector and a data cable attached from the device to a controller card or a connector on the motherboard.



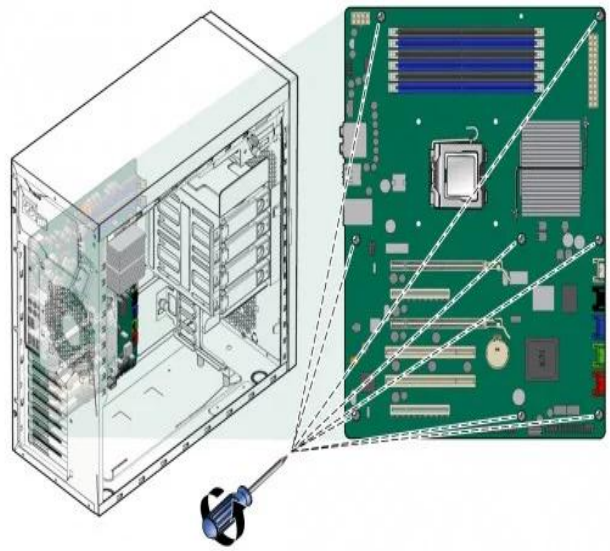




**Step 6: Remove RAM**

Memory modules are mounted on the motherboard as the chips that can be damaged by manual force if applied improperly. Be careful and handle the chip only by the edges. SIMMs and DIMMs are removed in a different way.

**Step 7: Remove the motherboard.**



Before removing all the connectors from the motherboard, make sure you memorize the connectors for assembling the computer if required, as that may require connecting the connectors at its place. Remove the screws from the back of the motherboard and you will be able to detach it from the cabinet. Now remove the CPU fan from the motherboard. The heat sink will be visible now which can be removed by the pulling the tab upward. Finally, the processor is visible now, which can be removed by the plastic tab which can be pulled back one stretching it side way.

**Step 8:** The assembling of the computer system is exactly the opposite of disassembling operation. If you are rebuilding the computer, insert the components in the opposite order you removed them, starting with the motherboard. Plug in all the cables as you insert the component; most items will plug into the motherboard and the power supply unit.

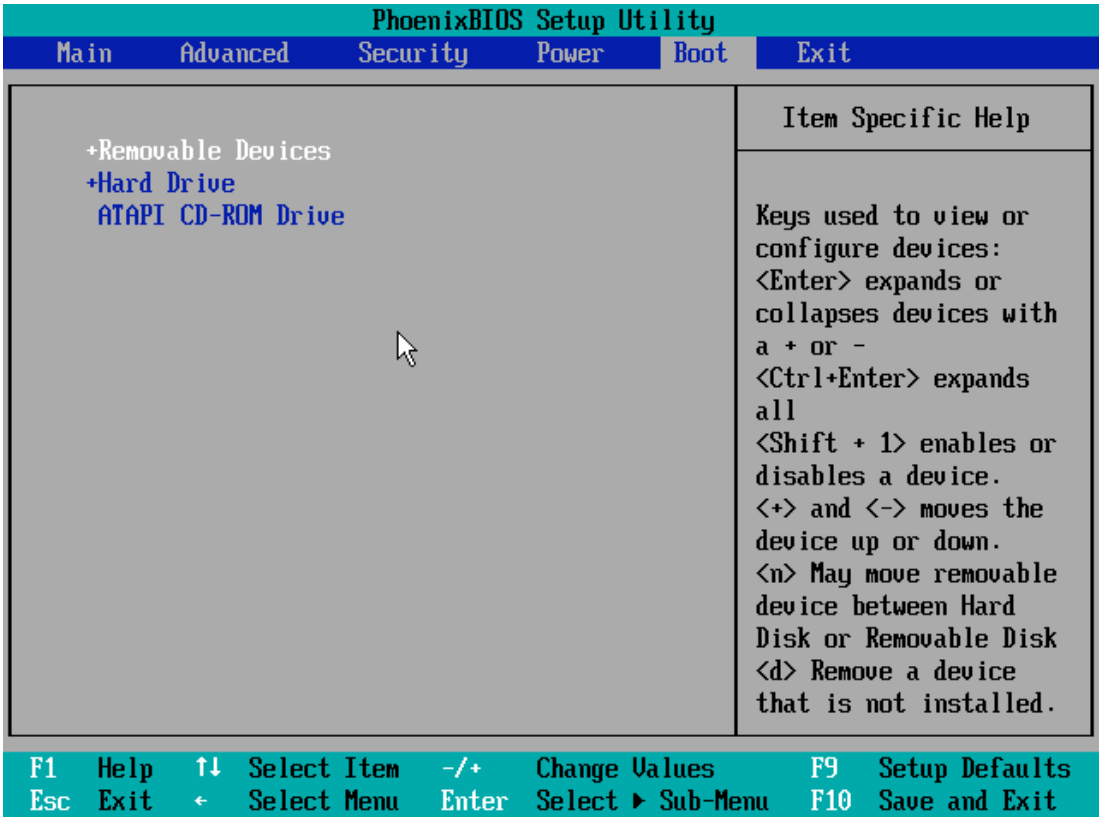
## Installation of Windows 7:

**Minimum hardware requirements for Windows 7:**

- 1 gigahertz (GHz) or faster 32-bit (x86) **or** 64-bit (x64) processor
- 1 gigabyte (GB) RAM (32-bit) **or** 2 GB RAM (64-bit)
- 16 GB available hard disk space (32-bit) **or** 20 GB (64-bit)
- DirectX 9 graphics device with WDDM 1.0 **or** higher driver

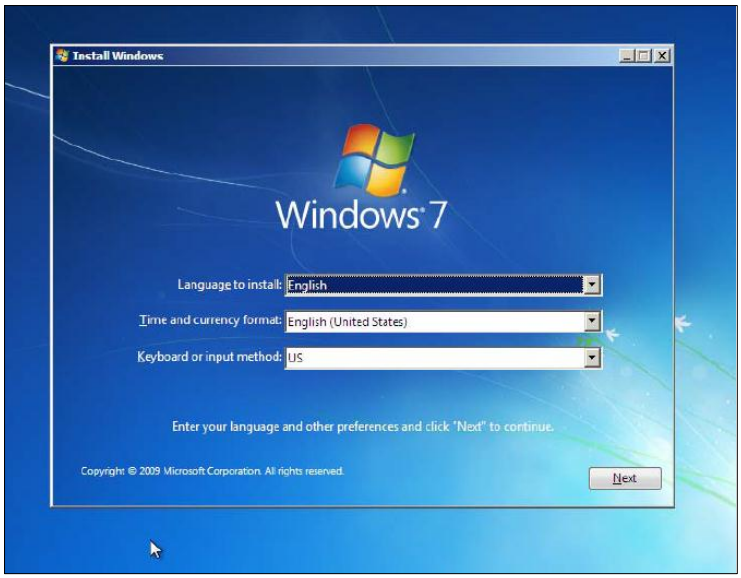
**Step 1:** Insert the Windows 7 operating system disk into your DVD drive, and then restart your computer

**Step 2:** You will see a prompt that says '**Press any key to continue**' after when you see this press any key immediately.



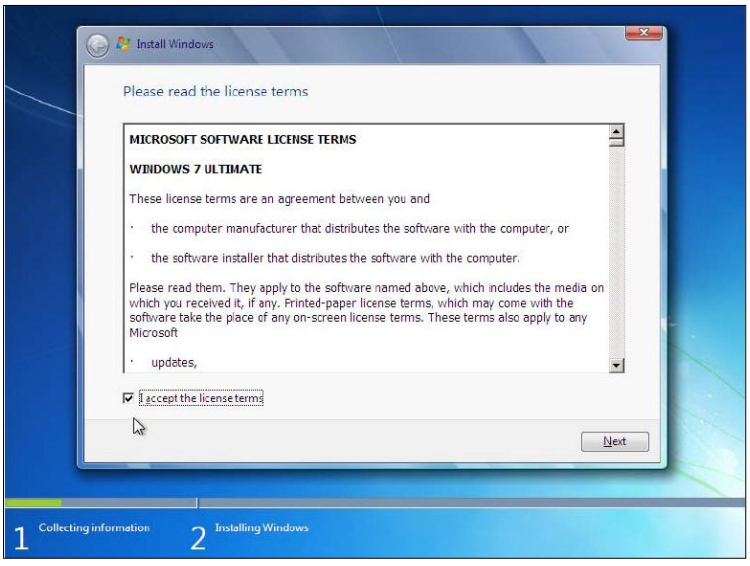

**Step 3:** If the previous screen does not appear, reboot your machine and open up the BIOS. You need to make the system boot to the CD-ROM first. The following screen is one of several different BIOSes you could have on your system. You need to navigate to a screen that allows you to change the Boot Order. This is where you tell it to boot off of the CD-ROM.


**Step 4:** 'Starting Windows' with the Windows7 logo will appear.

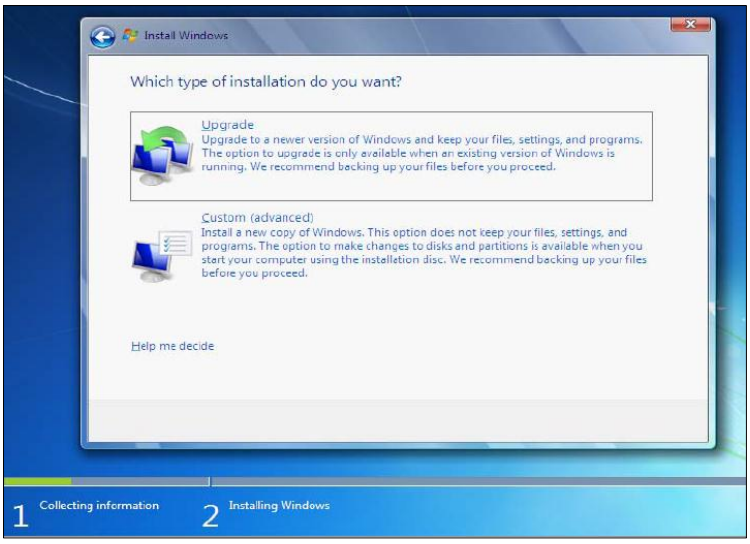



**Step 5:** Language options, by default English will be set along with "time and currency format" and "keyboard or input method"

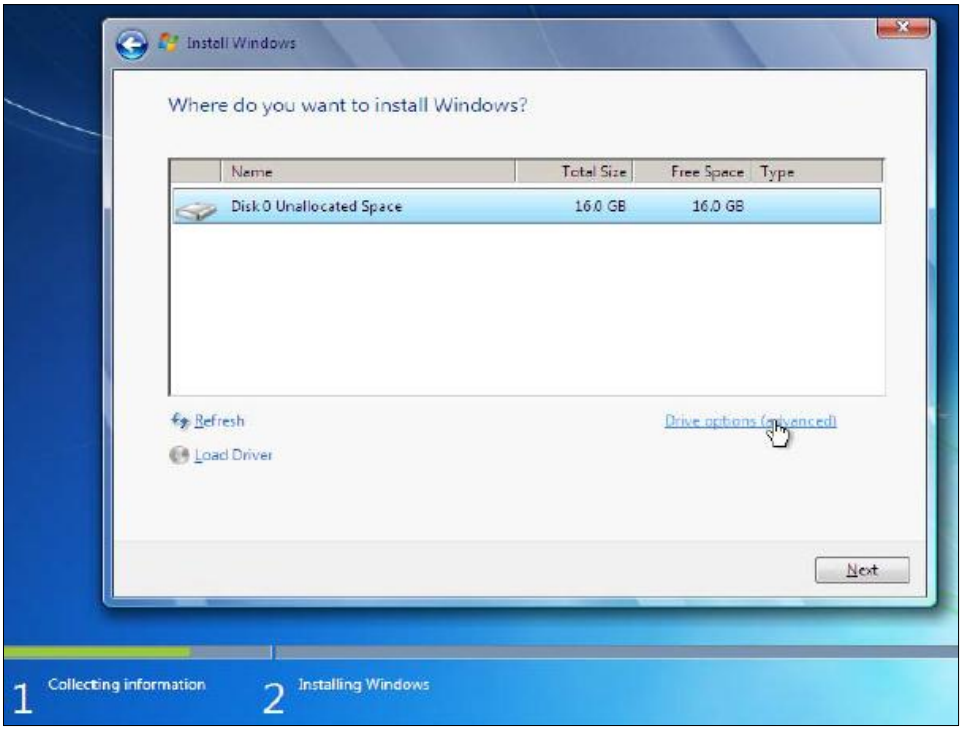

**Step 6:** Click "Install Now".




**Step 7:** End User License Agreement (E.U.L.A.), check the box to accept, and click "**Next**".



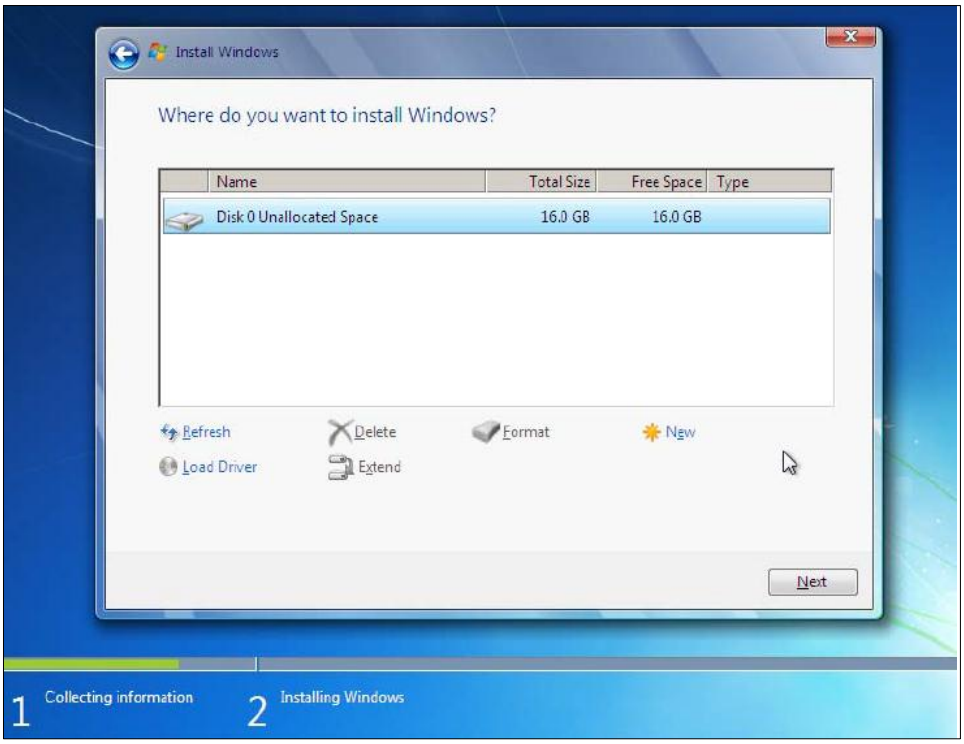

**Step 8:** "Which type of installation?" window will appear. Upgrade will be greyed out; the only option you should be able to choose is Custom (advanced).



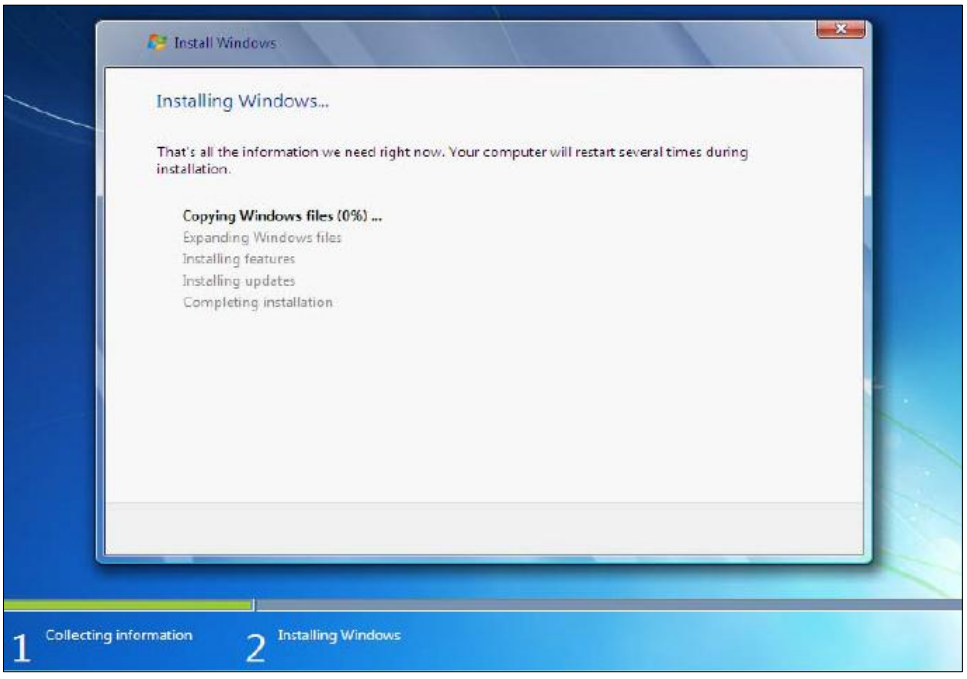

**Step 9:** "Where do you want to install windows?" Make sure the partition is highlighted.

**Step 10:** Delete the partition by clicking on Drive options (advanced) on the bottom right corner of the field. Make sure the partition is highlighted and click on Delete. If drive advanced options is greyed out, then the partition will not have to be deleted.

*****NOTE:** Deleting the partitions will erase all data on the system.



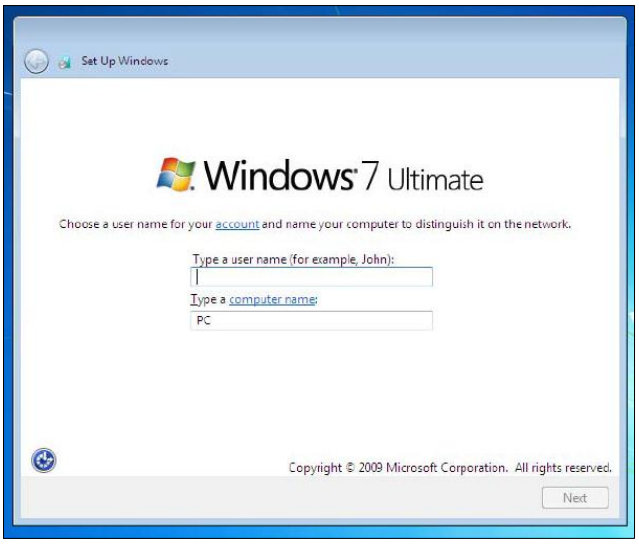

**Step 11:** Disk 0 Unallocated Space should be the only listing at this point. If it is press next, If not please proceed to delete any additional partitions that may be listed.



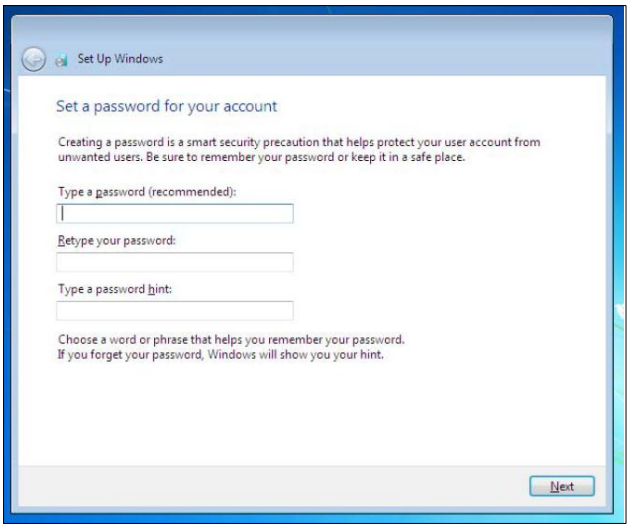

**Step 12**: The next screen will show "Installing Windows". This process should take approximately 10 minutes after which the system will reboot.

*****NOTE:** Do not press any keys during this boot up process so as to not disturb the rest of the installation.

**Step 13:** The next screen will show "Installing Windows" again to complete the installation process.

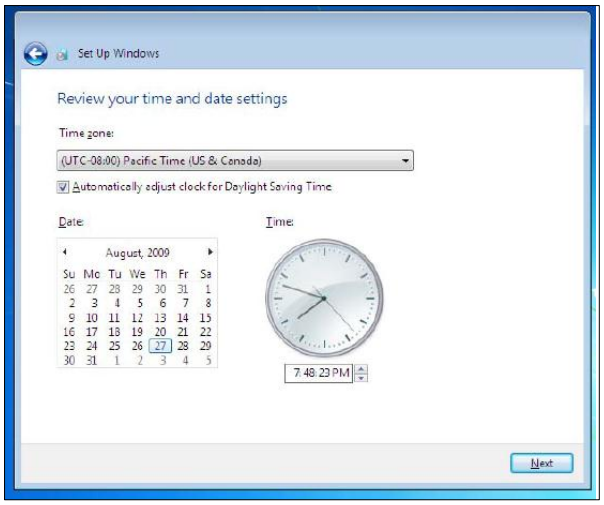



**Step 14:** "Setup is starting Windows" will appear on the screen, and then you will be asked to create a user name and a computer name.

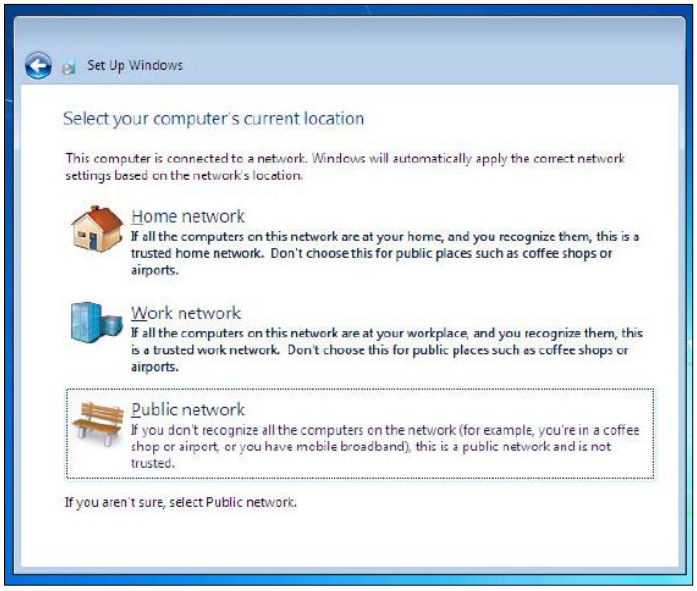



**Step 15:** The next step will prompt you to create a password for your account (optional).

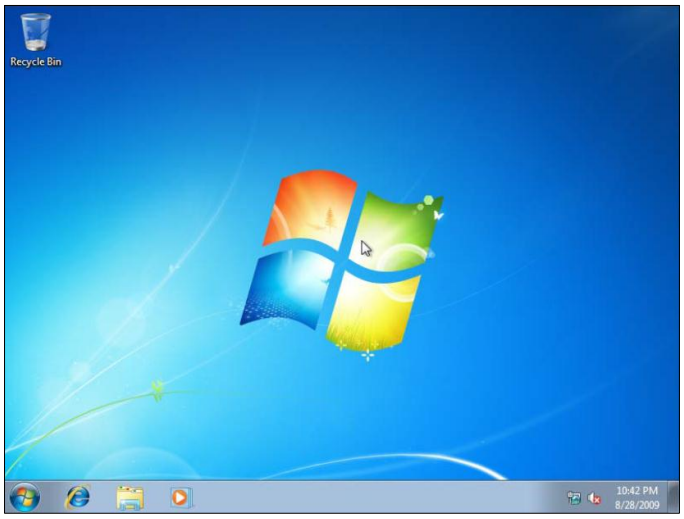

**Step 16:** The next screen will come up and ask you to choose one of three options: "Use recommended settings", "Install important updates only" and "Ask me later".




**Step 17:** This screen will allow you to choose your local time zone and also adjust the date and time.




**Step 18:** Click on the appropriate location of your computer to enable Windows 7 to apply the correct network settings.

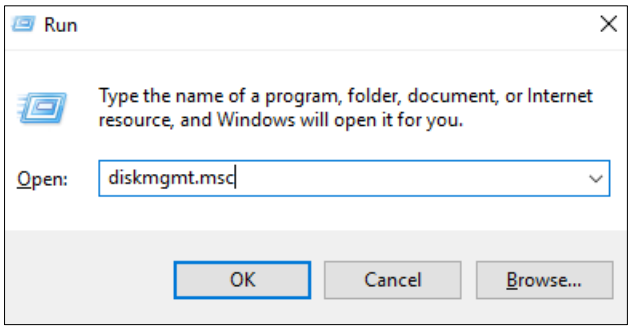



The installation is done! You have successfully installed Windows 7 on your computer.

After this the user will need install Device drivers and Application software.

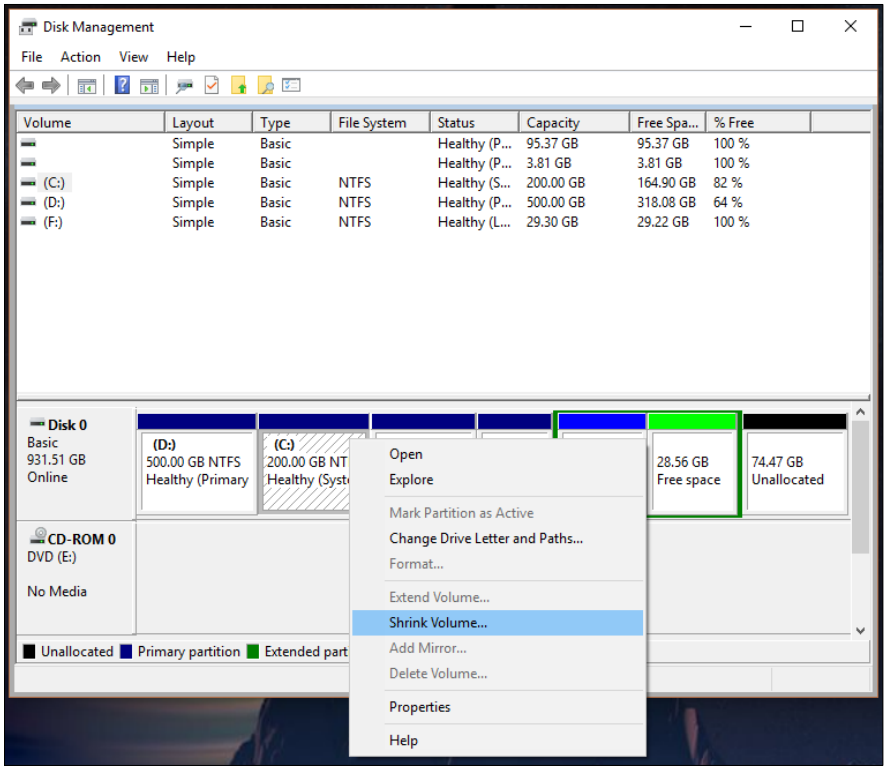
**Installation of Red Hat Linux in dual booting:**

**Step 1:** Turn on your Windows 7 PC and create a "free space (in extended partition)"/ "unallocated space" in your HDD needed for Linux installation.



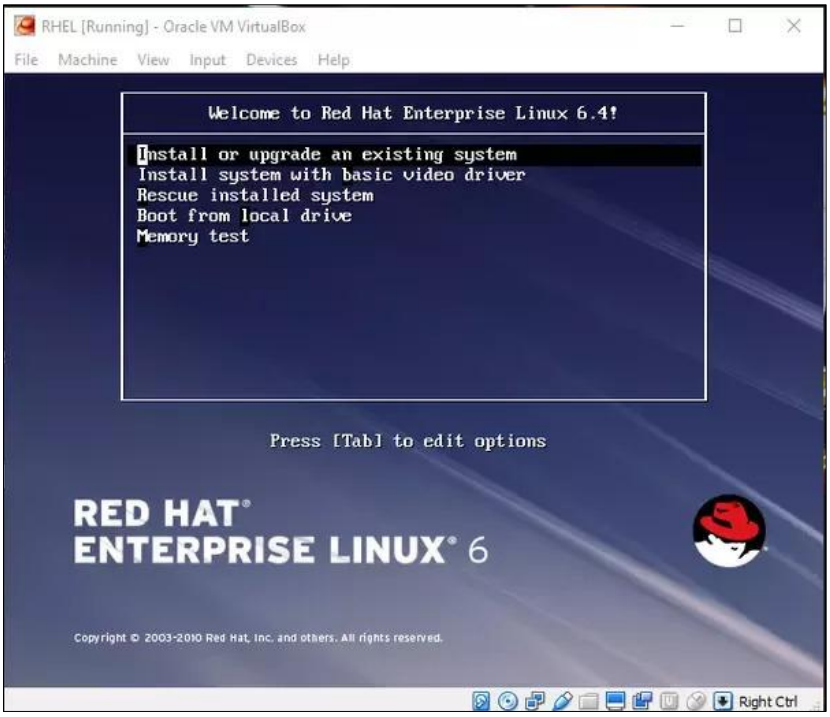

**Step 2:** Hit **Windows+R** from keyboard to open run dialog box. There you type in "**diskmgmt.msc**" and hit Enter. It will open Disk Management window.

**Step 3:** Here if you already have **unallocated space/ free space** of at least 20GB turn off your PC and move to next step. If you don't have unallocated space then you right click on any of the drive and then click Shrink Volume. After shrinking a volume you will get unallocated space.




**Step 3:** Download Red Hat Linux (RHEL) and burn it to a DVD or Create bootable USB drives. Now place your RHEL DVD/USB installation media and boot your PC. (Enter BIOS and boot from DVD/USB Drive in boot order)

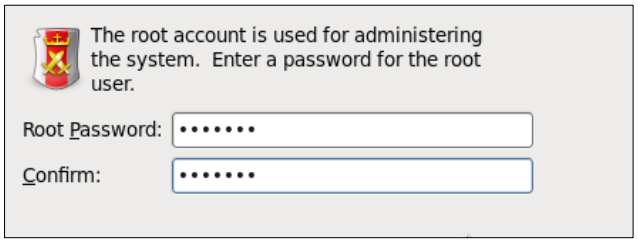
**Step 4:** When the installation starts you click "**Install or upgrade an existing system**".



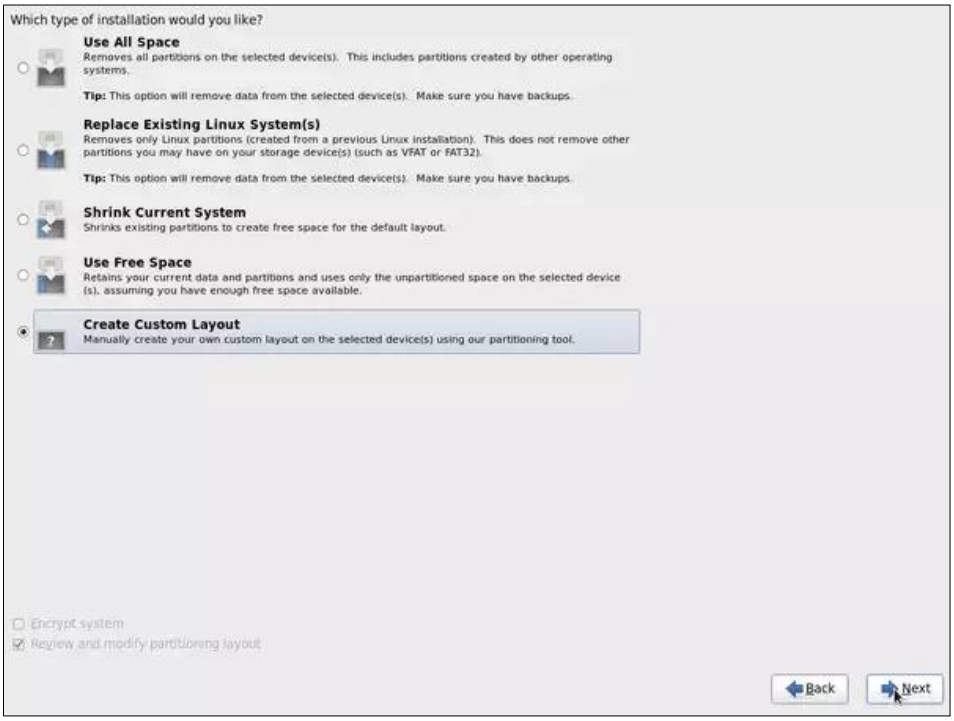

**Step 5:** Now you will get to disk checking there you hit tab followed by Enter from the keyboard to **Skip** disc checking.

**Step 6:** Now you click **Next** then next until you see storage device selection screen there you select "**Basic Storage Device**" and click **Next.**

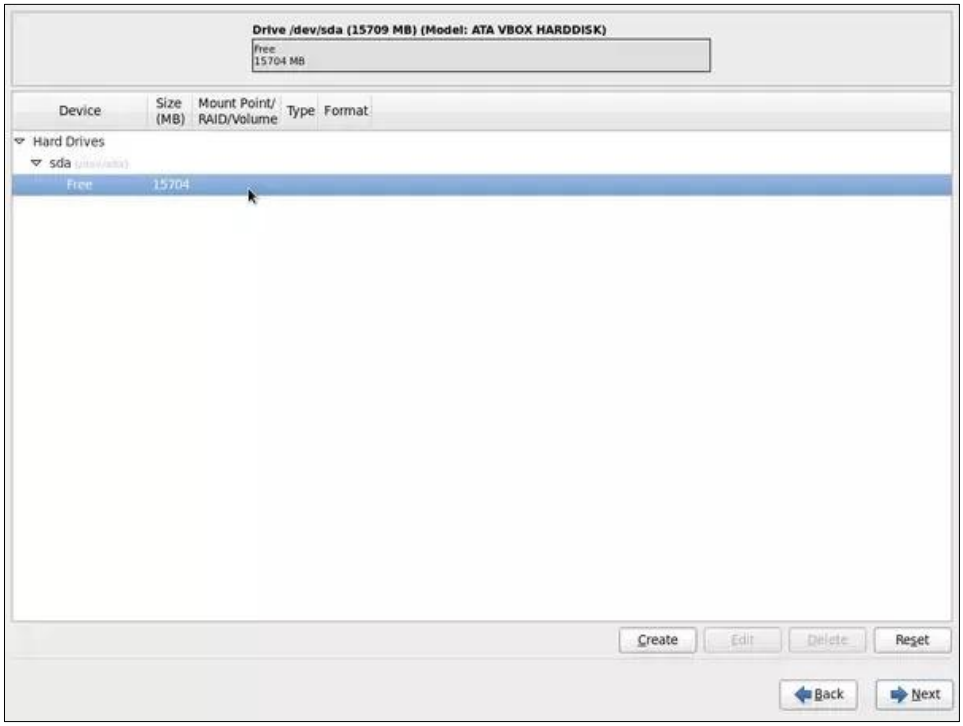

**Step 7:** Now set **root Password** and click next.



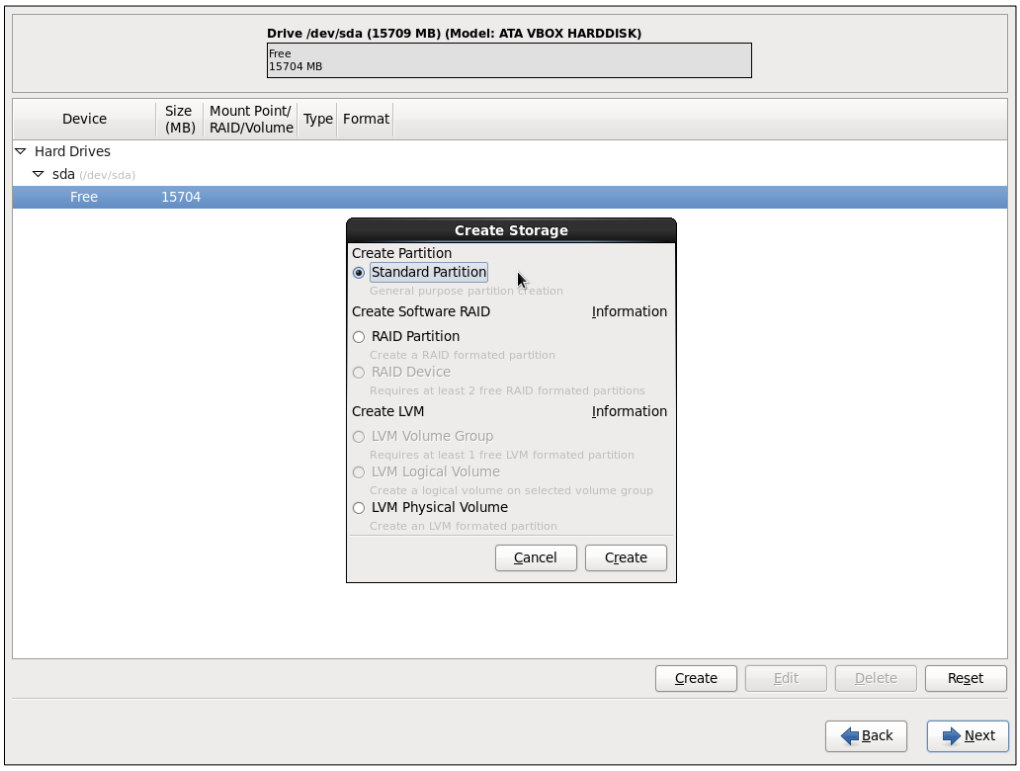
**Step 8:** Now this is the most important step of choosing installation type. You select "**Create custom layout**" in this step and click **Next**.



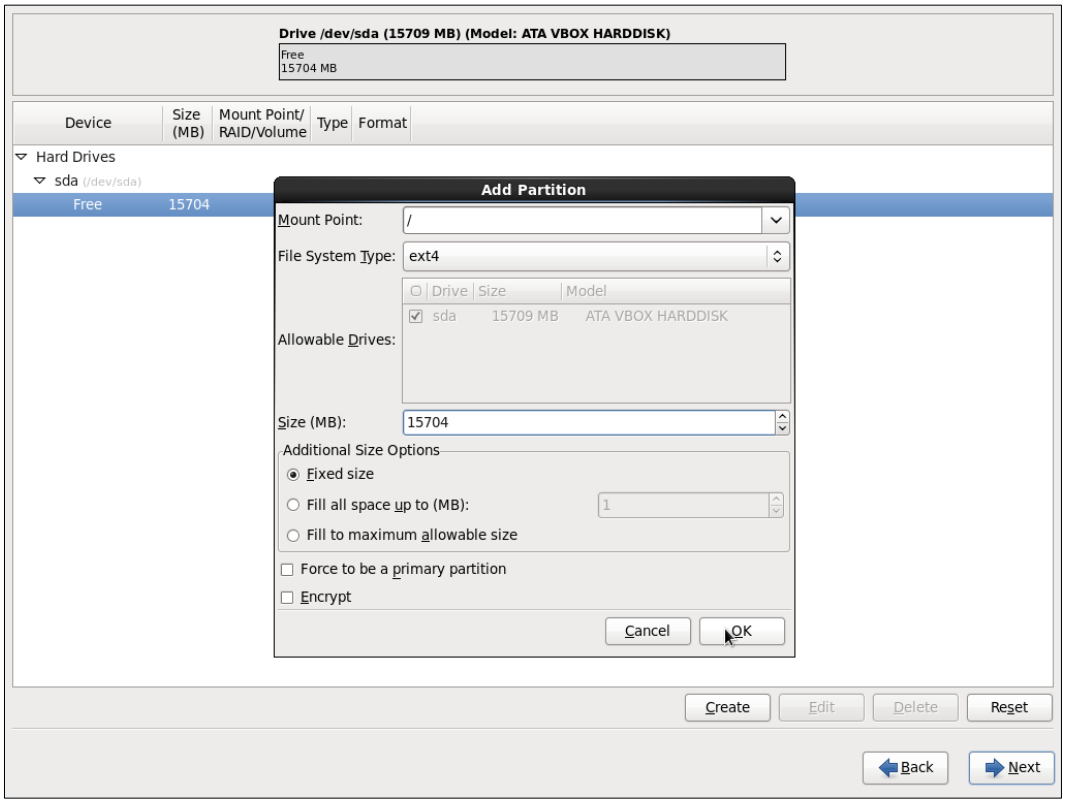

**Step 9:** Here you will see your **unallocated space/ free space** that you have created in previous steps showing as free and its size select it and click **create** (don't bother about the other partitions your goal is to select the free/ unpartitioned space and click create).



**Step 10:** When you click create you will be asked to select partition type there you select "**Standard Type**" and then click **create**.

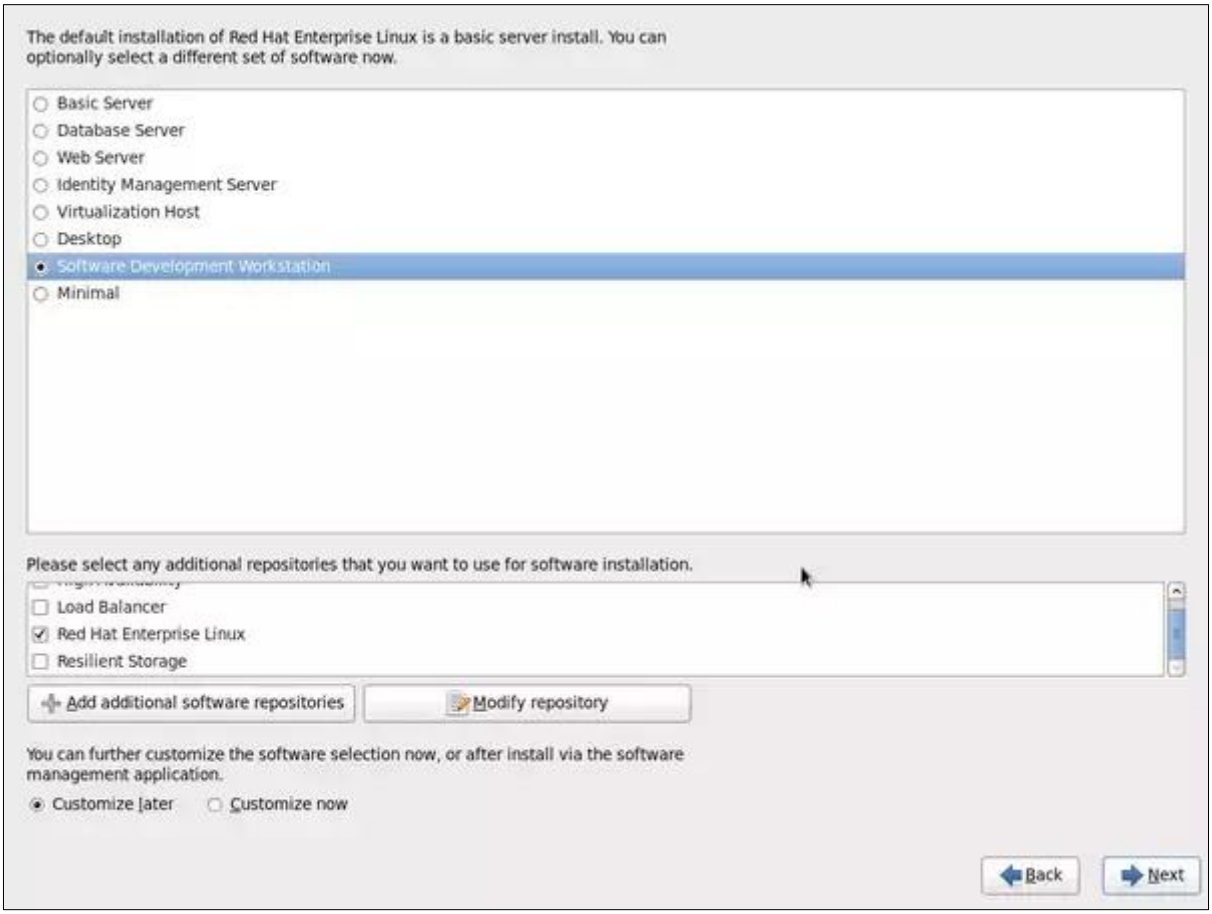



**Step 11:** clicking on create will open creating "**partition type**" there you set mount point as / (forward slash), File system type as **Ext4** and size to **15000** MB then click **OK.**



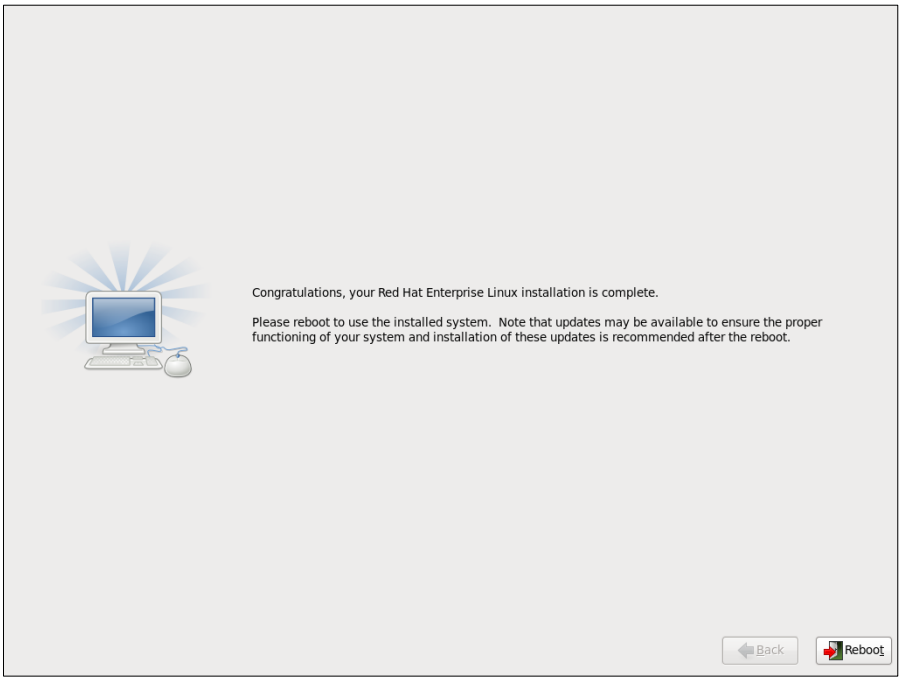
**Step 12:** After clicking **OK** click **Next** and then you may be asked to create a swap partition simply ignore it and click **continue** then click "**write changes to disk**" again click **Next** until you see boot loader options here you will also see your "Windows 7" installation you can also set is as default. If you don't see your Windows 7 boot list then something is wrong that is you must have installed Windows 7 in legacy mode and installing RHEL in legacy mode too. Now you again click **Next**.


**Step13:** Now select installation type that is you only want the server or desktop or anything else and click **Next**.



**Step 14:** Your installation will start and the setup will install packages here you just wait for it to finish.


**Step 15:** After packages are finished installing you will see a congratulation greeting or something like that here you click reboot and remove your installation media. Hurry you have finish installing a dual boot system.




## Red Hat Enterprise Linux Hardware Requirements:

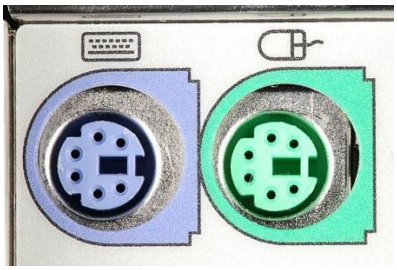
| Criteria | Requirements |
|---|---|
| Operating System | Red Hat Enterprise Linux 4 or 5 with the latest patches and upgrades |
| CPU Type | Pentium 4 or higher; 2 GHz or higher |
| Memory/RAM | 1 GB minimum, up to the system limit |
| Hard Disk | 4 GB minimum |
| Other | To run the Directory Server using port numbers less than 1024, such as the default port 389, you must setup and start the Directory Server as `root`, but it is not necessary to run the Directory Server as `root`. |

**Experiment 6:-**

**Learn parallel port, serial port and USB port testing and Installation of Scanner, Printers and ADSL/DSL Modems.**

**Different kinds Computer Ports:**

- **Power In Socket:** This socket is used to input **220V AC** to the PC from mains supply when the computer switch on the front side is pressed.



- **PS-2 Port:** You can see two different colored **6 pins** round shaped connectors. These connectors are used to connect input devices, keyboard and mouse. Color Coding defines the connector type. The **purple** connector is dedicated to connect **Keyboard** and **Green** color is used for **Mouse**.
- **USB Port:** The full form is Universal Serial Bus and is used to connect various input and output devices like Mouse, Keyboard, Printers, Webcams etc. USB 3.0 is the latest version which offers high data transfer speed.

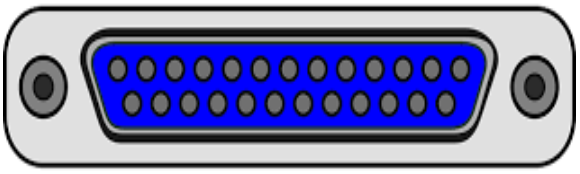
- **DVI Port: D**igital **V**ideo **I**nterface is a high-speed serial link for connecting output display Devices. Most DVI connectors have **24 pins** and a single larger, offset ground bar.

- **HDMI Port: High Definition Multimedia Interface** helps to get high definition video and multi-channel sound. You can connect HDMI enabled blue ray devices, LED's etc.

- **Female VGA Port:** This is used to connect display devices like Monitor / LCD / LED Display. It has **15 pins**.
- **Parallel Port (LPT Parallel Port):** It can be used to connect a parallel port printer. Previously **dot matrix**, inkjet, bubble jet printers etc. were connected to parallel port.it has **25 pins**.

VGA cable

VGA connector

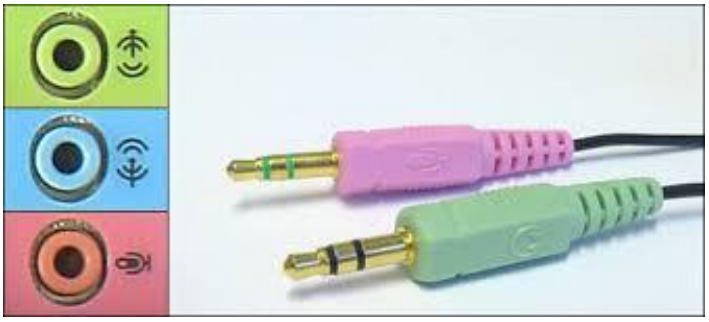


LPT Port

- **Serial Port (COM port or an RS-232 port):** It is used to connect modem but it can also be used for connecting mouse, network modems and printer. It has **9 pins.** A serial port is an interface that allows a PC to transmit or receive data one bit at a time.

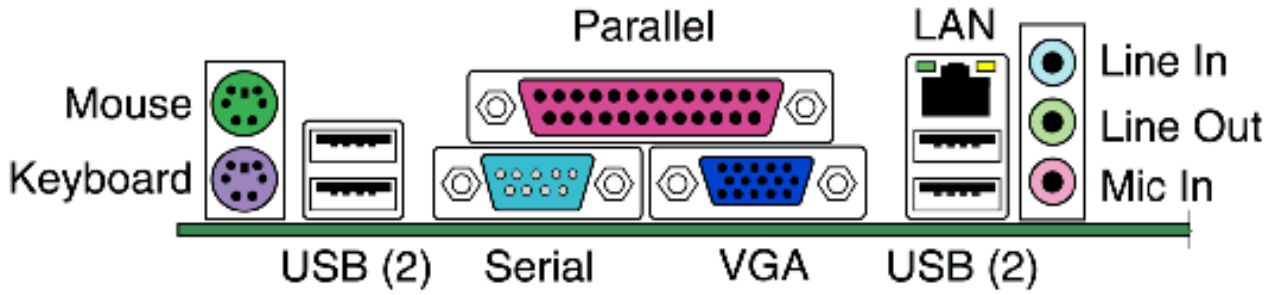
- **LAN Port** (**L**ocal **A**rea **N**etwork port)**:** The LAN or network port is used to connect to other devices and computers in a network. It's an **RJ-45** Ethernet socket on a computer or network device such as a switch or router.

- **Audio Ports:** Generally there are **3** audio ports on the back side of a PC. These parts are either aligned vertically or in horizontal position. Green color port is dedicated for headphones or speakers, a blue colored port is marked as Line-in and Mic can be inserted in a pink port.



- **Game Port:** It is used to connect joystick, which is usually used in video games.
- **Expansion Slots:** These expansion slots are used to connect add-on cards to increase the capabilities of the motherboard.

**Block Diagram of Ports:**




**Installation of Scanner/Printers:**


**Step 1: Download and install the software**

Before plugging in your scanner/printer, download and install the **driver software** on your computer from the website.

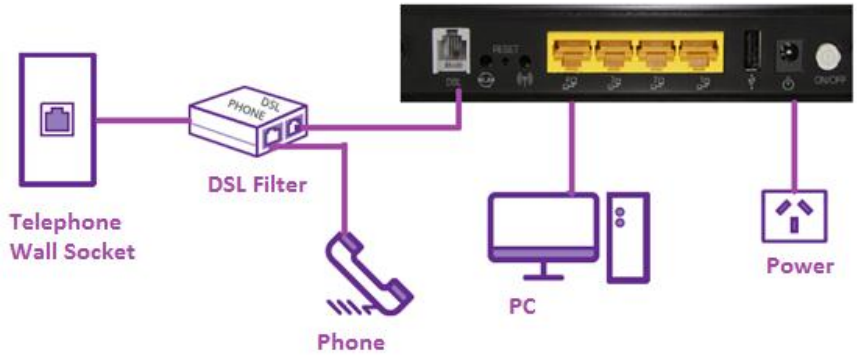
**Step 2: Plug in and open the scanner/printer**

Plug the supplied USB cable and power adapter into the scanner/ printer and connect the USB cable to your computer. Open the scanner/printer and it will power on.

**Step 3: Setting the default scanner/printer**

Visit this **Control Panel\Hardware and Sound\Devices and Printers** and choose your default scanner/printer.

**Installation of ADSL/DSL (D**igital **S**ubscriber **L**ine**) Modems:**



**Step 1:** Open up a web browser and type in the IP address of the DSL-300T (default is 192.168.1.1). Press **Enter**.

**Step 2:** Enter the **Login name** and **password** (default is admin/admin). Click on **Login**.

**Step 3:** Click on the **Setup** tab at the top. Click on **Connection** on the left.

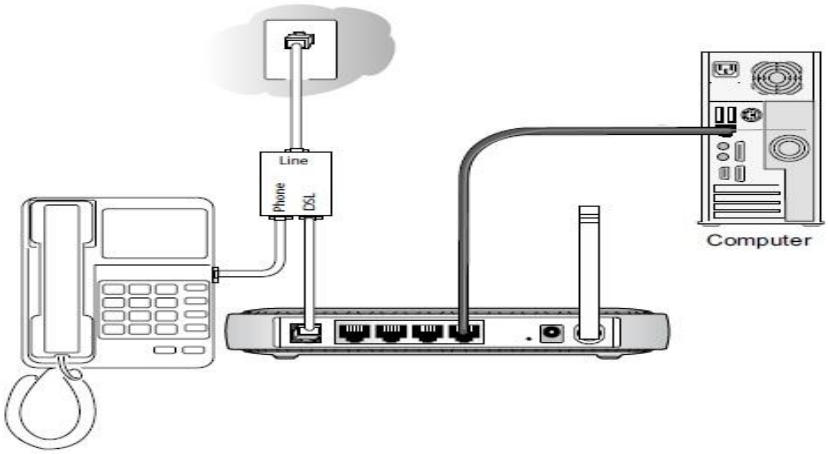
**Step 4:** Configure the following for your connection:

- **Type** - Set the connection Type to PPPoA
- **Name** - Type in the name for the connection
- **Encapsulation** - set the encapsulation as recommended by your ISP
- **Username** - Type in the ISP login username
- **Password** - Type in the login password
- **Keep alive** - leave default
- **MAX Fail** - leave default
- **MTU** - leave default
- **MRU** - leave default
- **Set Route** - enable set route(default)
- **VPI** (Virtual Path Identifier)- set to ISP recommended settings **(i.e. 0)**
- **VCI** (Virtual Channel Identifier)- set to ISP recommended settings **(i.e.35)**
- **QoS** - leave default
- **PCR** - leave default
- **SCR** - leave default

Click on **Apply** when done.

**Step 5:** Click on the **Status** tab at the top and then click on **Connection Status** on the left side. The Connection information can be seen in the **WANsection** of the page. Once connected, your machine will now get the IP address from the ISP.

**Step 6:** Click on **Tools** at the top. Click on **System Commands** on the left. Click on **Save All** to permanently save the changes.



**Experiment 7:-**

**Crimping of RJ45: Straight and Cross. a) Punching Cat 6 cable to I/O Box. Use punching tool. b) Check connectivity using LAN tester.**

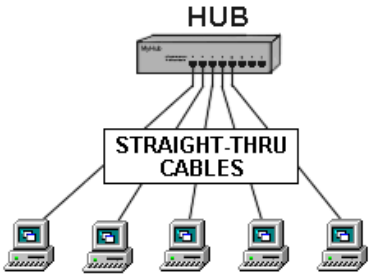
**Ethernet cable types:** There are 3 types of Cables.

1. **Straight Through Cables**

If we want to connect two **different types of device** then we can use straight-through cables.

**For example**:

- Connecting a router to a hub
- Connecting a computer to a switch/router
- Connecting a modem to a router




2. **Crossover Cables**

If we want to connect two **same types of device** then we can use crossover cables.

**For example**:

- Connecting a computer to a computer
- Connecting a router to a router
- Connecting a switch to a switch
- Connecting a hub to a hub


3. **Rollover Cables**

This cable is used to connect computer to router's console port. This permits an engineer or programmer to connect to the network device and manipulate the programming as required. It is also called as console cable or **yost cable**.

**Ethernet Cable Type**

In computer networks, Cat (**Cat**egory)-5, Cat-5E, and Cat-6 cables are mostly used. UTP cables are connected by **RJ (R**egistered **J**ack**) 45** connectors.

**Cable Type and Speed**

- **CAT 3** -16Mbps
- **CAT 5** -100Mbps 1000Mbps (4 pairs)
- **CAT 5E** -1000Mbps
- **CAT 6** -Up to 400MHz for super-fast broadband applications
- **CAT 7** - cabling is also known as **Class F**.

**Tools Required for Crimping:**

- Rj45 Plug/Jack
- Ethernet cable
- LAN wire cutter
- RJ45 Crimping tool
- RJ45 Network LAN cable tester

RJ45 Plug/Jack

Ethernet Cable

Lan wire cutter

RJ-45 Crimping tool

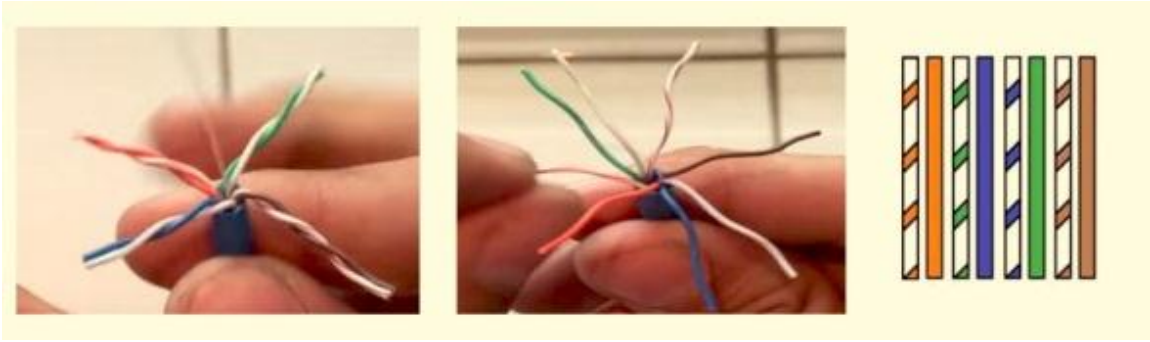
RJ45 Network Lan Cable Tester

**Crimping Procedure:**

**Step 1:** Take your LAN Cable and strip the outer cover be carefully in doing this or else the internal wire will be damage.

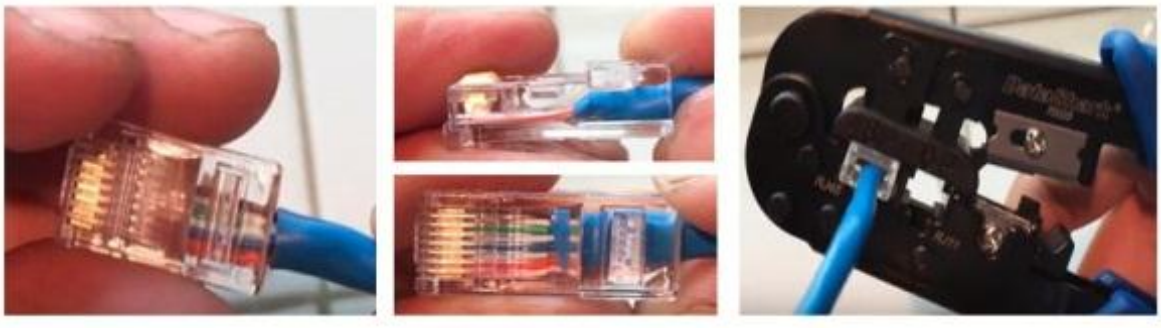
**Step 2:** There will be **4 pair** of twisted wire.

**Step 3:** Unwind the twist cable and make it straight and cut the edge of wire.



**Step 4:** Trim all the wires to the same length.

**Step 5:** Insert the wires into the **RJ45** plug – make sure each wire is fully inserted to the front of the RJ45 plug and in the correct order. (Follow the correct colour coding scheme). The sheath of the cable should extend into the RJ45 end by about 1/2" and will be held in place by the crimp.



**Step 6:** Crimp the RJ45 end with the crimper tool; verify the wires ended up the right order.

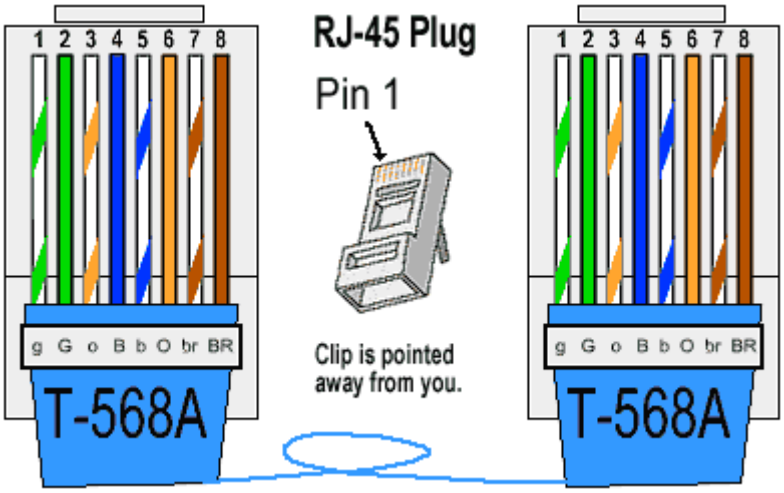
**Step 7:** Repeat the above step for the second RJ45 end.

**Step 8:** If cable taster is available, use it to verify the proper connectivity of the cable. If you see a mistake or problem, cut the end off and start again with new connector.

**Crimping a Straight through cable:**

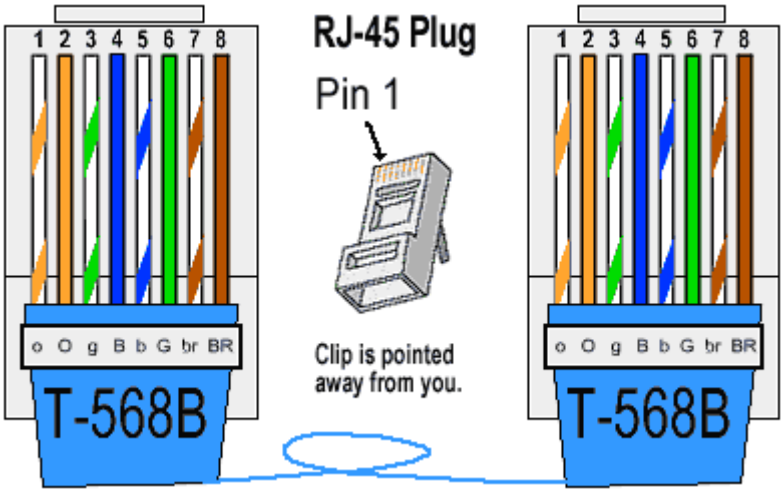
**Straight through** Ethernet cables are the standard cable used for almost all purposes, and are often called "**patch cables**". It is highly recommend you duplicate the colour order as shown below.

The **T568-A** standard which was ratified in 1995, was replaced by the **T568-B** standard in 2002 and has been updated since. Both standards define the **T-568A** and **T-568B** pin-outs for using Unshielded Twisted Pair cable and RJ-45 connectors for Ethernet connectivity. The standards and pin-out specification appear to be related and interchangeable, but are not the same and should not be used interchangeably.




**T-568A Straight-Through Ethernet Cable**

***Note:** The green pair is not side-by-side as are all the other pairs. This configuration allows for longer wire runs.

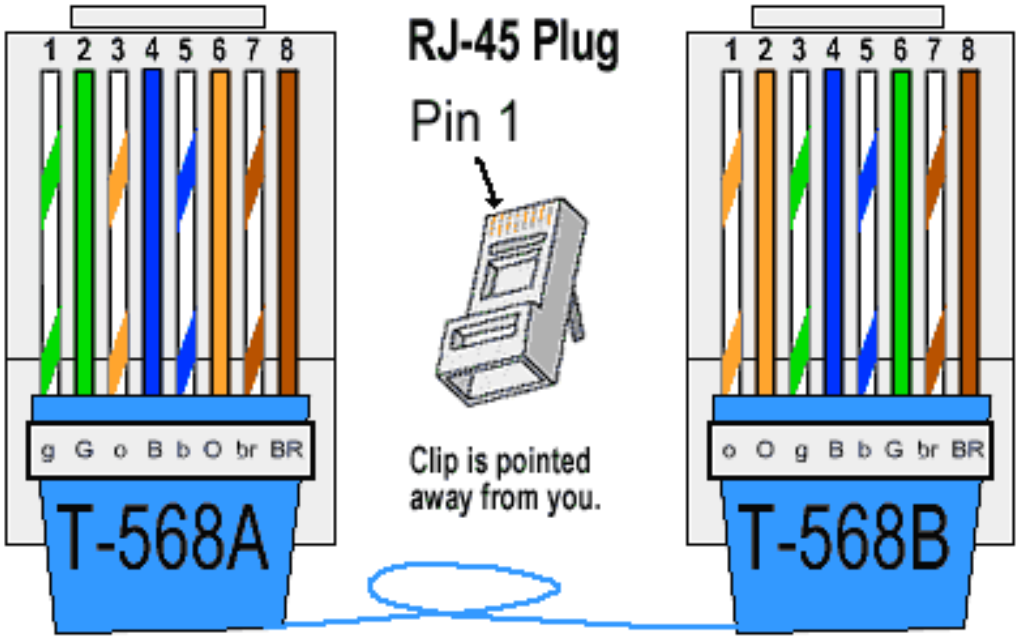



**T-568B Straight-Through Ethernet Cable**

***Both end of cable must have same sequence of coloured wire (Same PINS).**

**Crimping a Crossover cable:**

The purpose of a Crossover Ethernet cable is to directly connect one computer to another computer (or device) without going through a router, switch or hub.



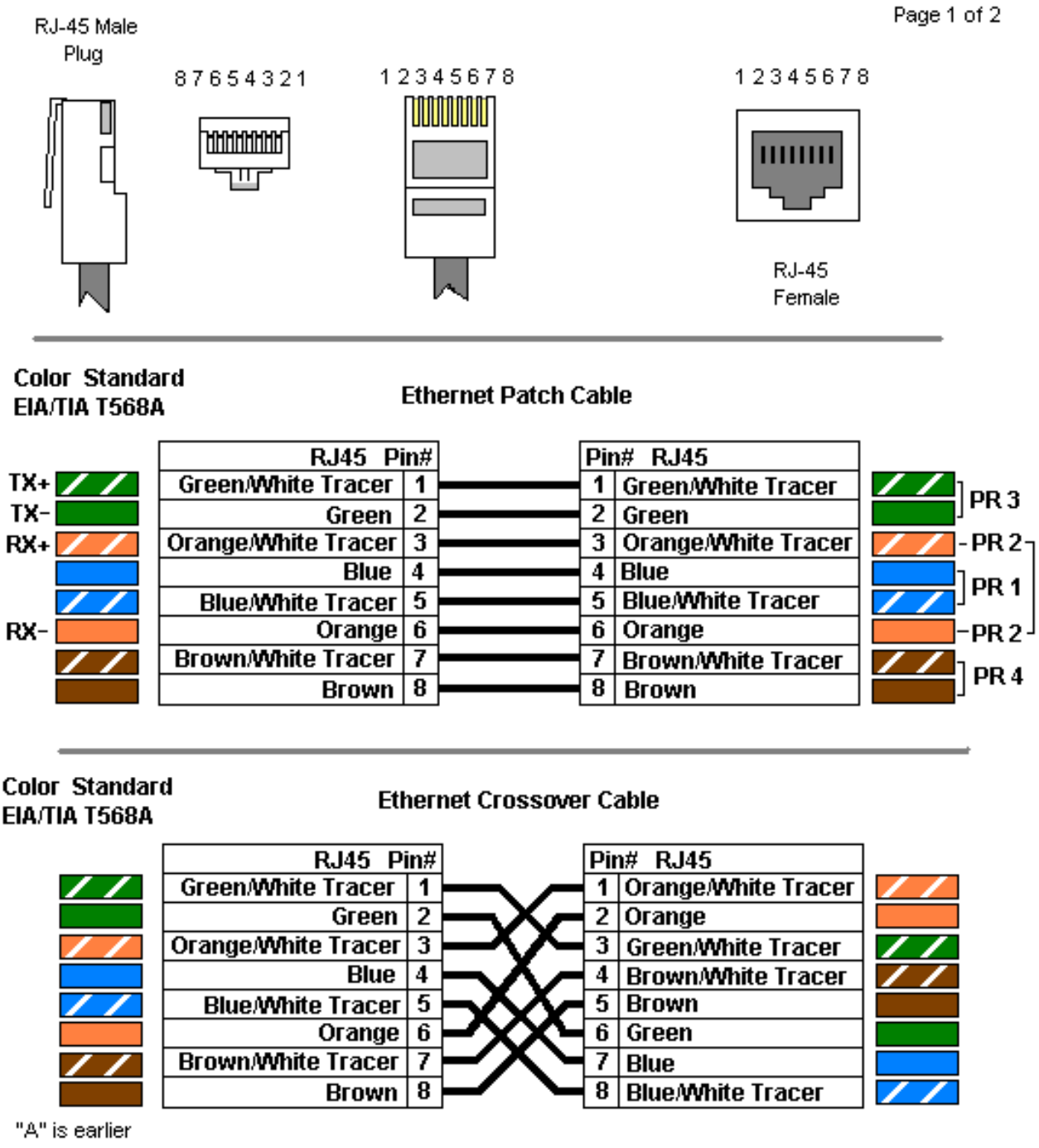

(g,G,o,B,b,O,br,BR) (o,O,g,B,b,G,br,BR)

**Both End of wire (Different Pins) arrangement in cable is different.**

***Note:** The remembering the colour coding is to simply switch the **Green** set of wires in place with the **Orange** set of wires. Specifically, switch the **solid Green** (G) with the **solid Orange** (O), and switch the **green white** (g) with the **orange white** (o).

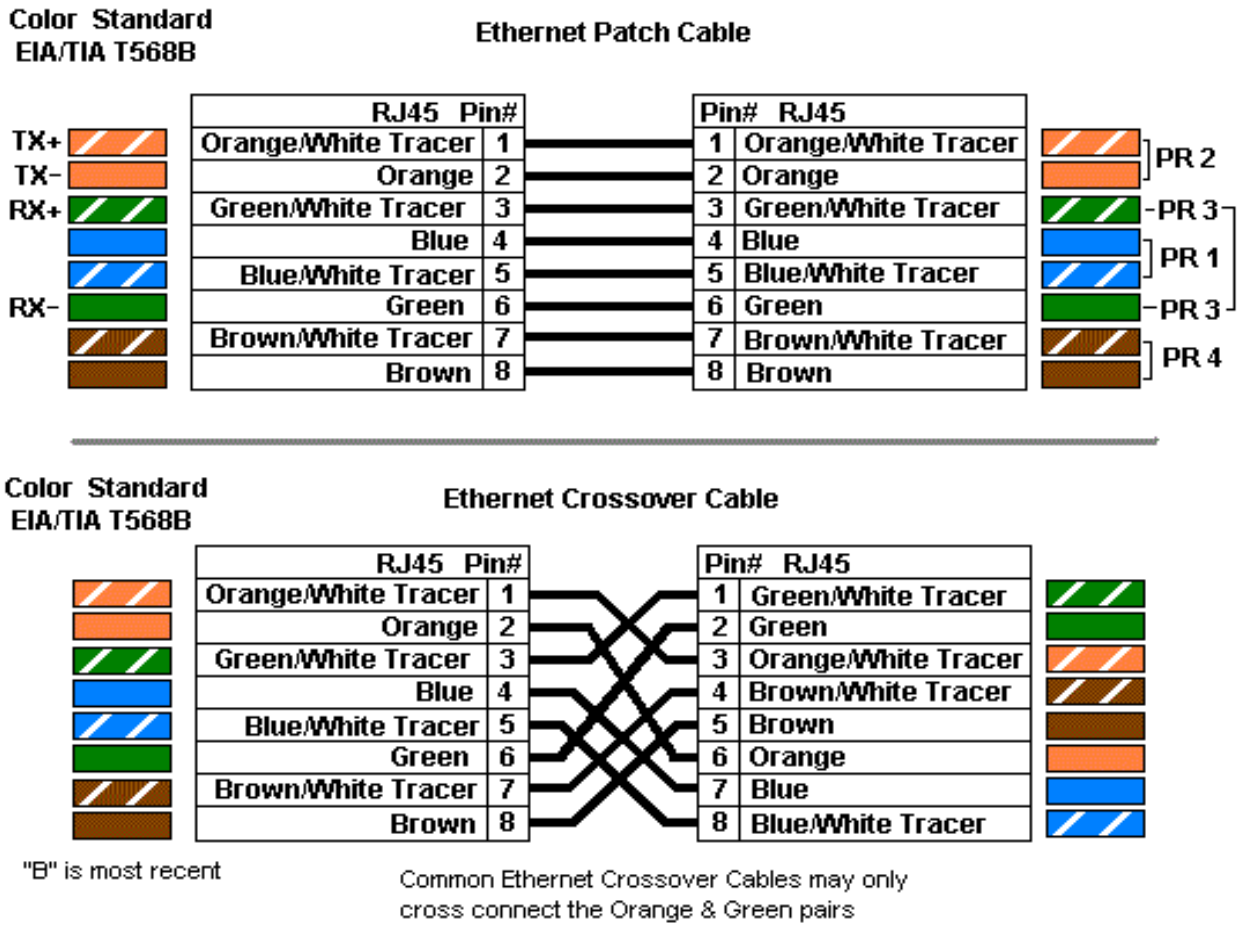
- If a cable has **T568A** colour wiring on **both ends** then it's a **straight through** cable.
- If a cable has **T568B** colour wiring on **both ends** then it's also a **straight through** cable.
- If a cable has **T568A** colour wiring on one end and **T568B** colour coded wiring on the other end, then it's a **crossover** cable

**Straight Through and Crossover Connection for Pin Model T568A:**




***Note that **TX** (transmitter) pins are connected to its Corresponding **RX** (Receiver) pins, plus to plus and minus to minus. And the **odd pin** numbers are always the **white with stripe** colour (**1, 3, 5, and 7**). The wires connect to RJ-45 8-pin.

**Straight Through and Crossover Connection for Pin Model T568B:**




## Crimping Tips:

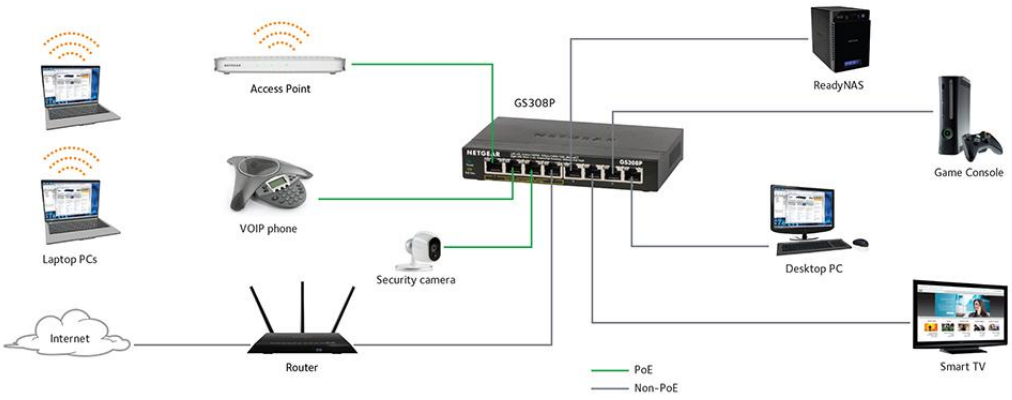
- A **straight-through** cable has **identical** ends.
- A **crossover** cable has **different** ends.
- A straight-thru is used as a **patch** cord in Ethernet connections.
- A crossover is used to connect two Ethernet devices without a hub or for connecting two hubs.
- A crossover has one end with the Orange set of wires switched with the Green set.
- Odd numbered pins are always striped; even numbered pins are always solid coloured.
- Looking at the RJ-45 with the clip **facing away** from you, Brown is always on the right, and pin 1 is on the left.
- No more than 1/2″ of the Ethernet cable should be untwisted otherwise it will be susceptible to **crosstalk**.
- Do not deform, do not bend, do not stretch, do not staple, do not run parallel with power cables, and do not run Ethernet cables near noise inducing components.

**Experiment 8:-**

**Install a Switch and Wireless router.**

In a network, a **switch** is a device that channels incoming data from any of multiple input ports to the specific output port that will take it toward its intended destination. In a LAN using Ethernet, a network switch determines where to send each incoming message frame by looking at the physical device address (also known as the **M**edia **A**ccess **C**ontrol address or MAC address). Network switches are sometimes referred to as switching hubs, bridging hubs *or* MAC bridges.

Network switches for home and small office use are typically stand-alone units, while switches for larger networks are usually rack-mounted. Either way, they typically use either Cat5 or Cat6 Ethernet cables. Switches allow multiple computers to connect to a single Internet connection, but rather than simply passing the signal through, like a network hub, a switch can manage that network traffic.




**Installation of Network Switch:**

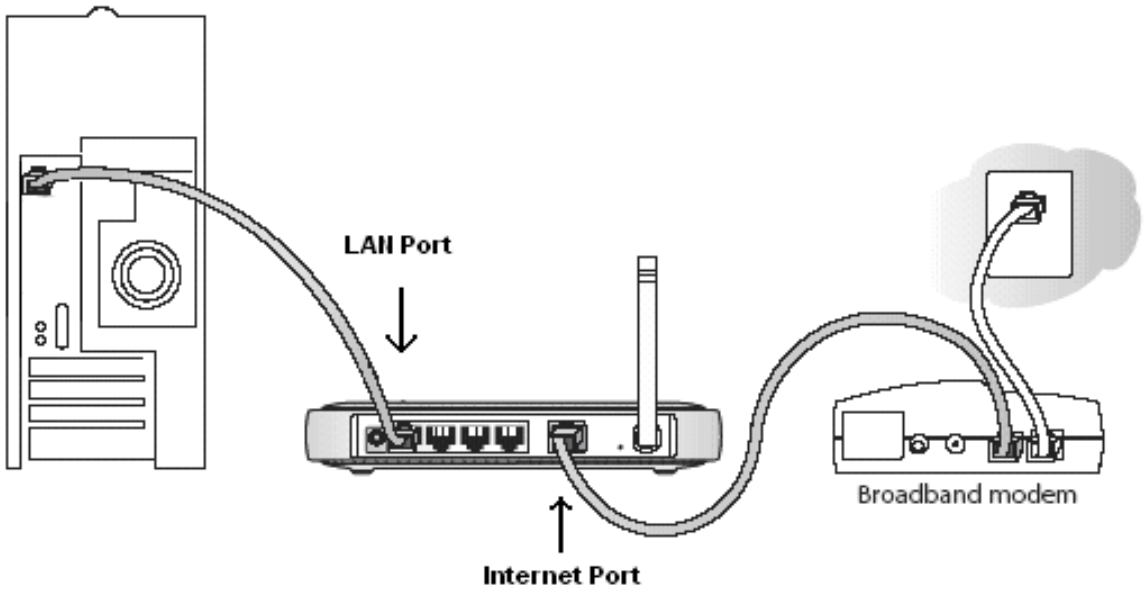
**Step 1:** Provide power to the switch, if required. For a stand-alone switch, this simply means plugging in the power supply. For rack-mounted switches, this means using a slot that has power supplied to it.

**Step 2:** Connect the incoming network cable to the switch. Although any slot can be used on most network switches, it is a good idea to use the first slot so anyone can quickly identify the incoming cable. For home and small office applications, the incoming cable will be the one coming from your modem.

**Step 3**: Connect a Cat5 or Cat6 cable to another slot in the network switch. Connect the other end to a computer you want connected to the network.

A **router** is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet. Data sent through the internet, such as a web page or email, is in the form of data packets. A packet is typically forwarded from one router to another router through the networks that constitute an internetwork until it reaches its destination node. A router is a common type of gateway -- positioned where two or more networks meet, including at each point of presence on the internet.

A **wireless router** is a device that performs the functions of a router and also includes the functions of a wireless access point. It is used to provide access to the Internet or a private computer network. Depending on the manufacturer and model, it can function in a wired local area network, in a wireless-only LAN, or in a mixed wired and wireless network.




**Installation of Wireless Router:**

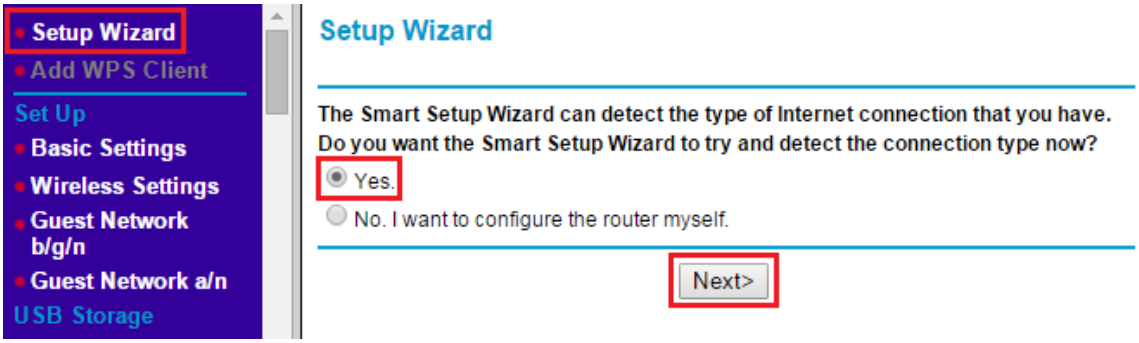
**Step 1:** Connect your modem to the internet port of the router and your computer to any of the four LAN ports.

**Step 2:** Switch the computer, router, and broadband/cable modem, off and on again. Wait for them all to finish booting up.

**Step 3:** Open a web browser and type the router's IP address which would be either http://192.168.0.1 or http://192.168.1.1 in the address bar and press Enter.

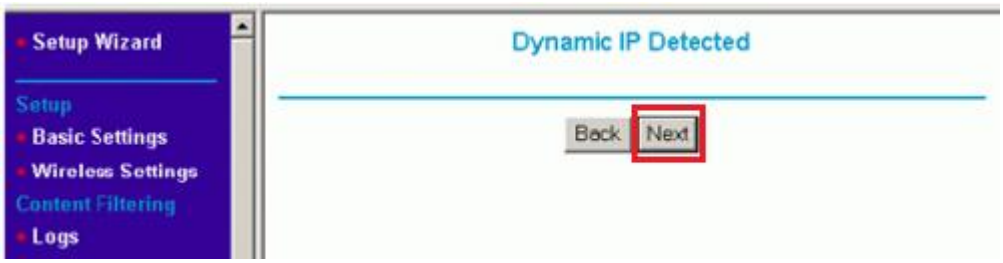
- You are prompted to log into the router.
- The default username and the default password.

**Step4:** Click **Setup Wizard**. The Setup Wizard screen displays and Select **Yes** and click **Next**.



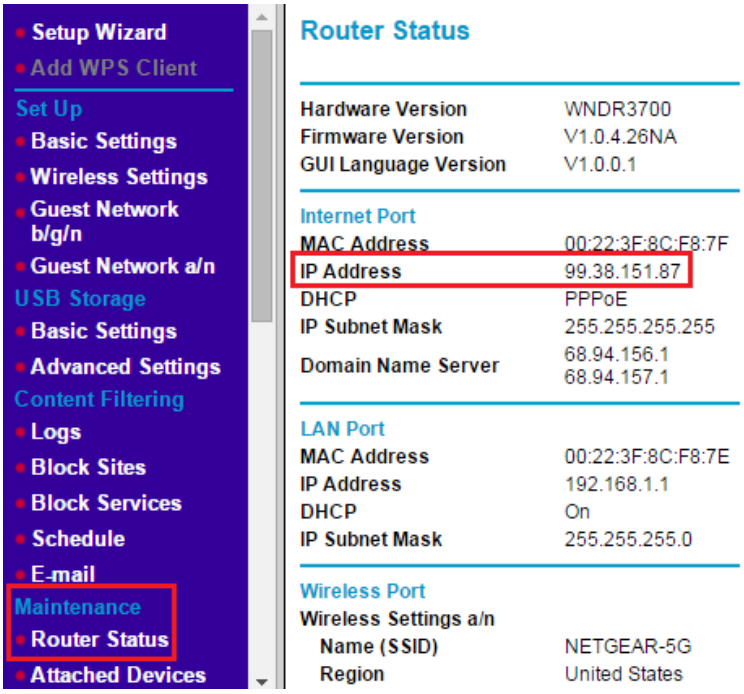

The Setup Wizard detects the type of internet connection. For cable internet connections, the Setup Wizard detects Dynamic IP.

**Step 6:** Click **Next**. The router saves the settings.




***Note:** Do not change the default settings unless your internet service provider gave you specific DNS information that must be configured.

**Step 7:** To check if you are connected to the internet, select Router Status under Maintenance.




Look at the IP Address field to see if you have a valid IP address.

**Experiment 9:-**

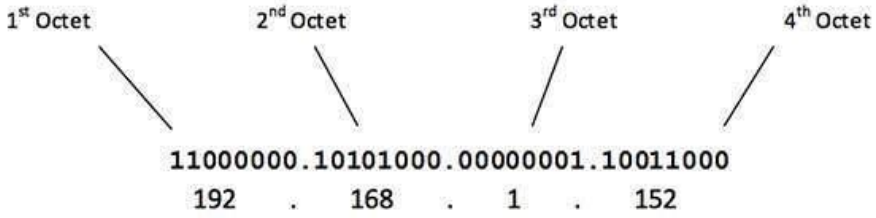
**Study different IP class (A, B, C) addressing. (Manual and Dynamic). Check connectivity for peer-to-peer and client-server.**

An **Internet Protocol address** (IP address) is a **logical** address that is used to **uniquely** identify each device connected to a network that uses the Internet Protocol for communication. It specifies the way information is packetized, addressed, transferred, routed, and received by networked devices.

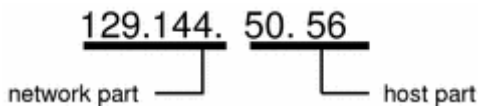
IP is **connectionless** and **unreliable** protocol, which means that there is no continuing connection between the end points that are communicating. Each packet that travels through the Internet is treated as an independent unit of data without any relation to any other unit of data.

The most widely used version of IP today is **Internet Protocol Version 4** (IPv4) and **IP Version 6** (IPv6). An **IPv4** address has a size of **32 bits** (four bytes), which limits the address space to 4294967296 ($2^{32}$) addresses, which is called its **address space**. In **IPv6**, the address has size of **128 bits**, thus providing up to $2^{128}$ (approximately $3.403\times10^{38}$) addresses.

IPv4 addresses are usually represented in **dot-decimal notation**, consisting of four decimal numbers, each ranging from 0 to 255, separated by dots, e.g., 172.16.254.1. Each part represents a group of 8 bits (an octet) of the address.




The bytes of the IP address are further classified into two parts: the **network** part and the **host part**.




**Network Part:**

This part specifies the unique number assigned to your network. It also identifies the class of network assigned.

**Host Part:**

This is the part of the IP address that you assign to each host. It uniquely identifies this machine on your network. Note that for each host on your network, the network part of the address will be the same, but the host part must be different.

**Subnet mask:**

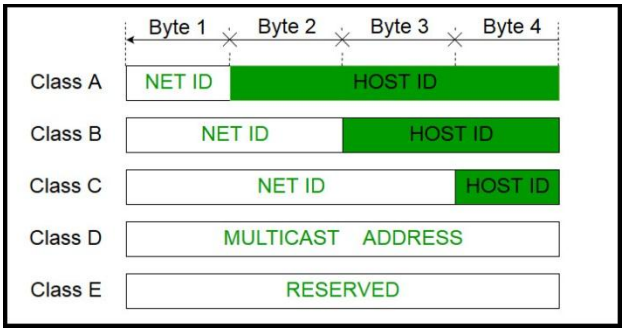
Local networks with large numbers of hosts are sometimes divided into subnets. If you choose to divide your network into subnets, you need to assign a **subnet number** for the subnet.

**Classes of IP addresses**

TCP/IP defines **five classes** of IP addresses: class **A**, **B**, **C**, **D**, and **E**. Each class has a range of valid IP addresses. The value of the first octet determines the class. IP addresses from the first three classes (A, B and C) can be used for host addresses. The other two classes are used for other purposes – class D for multicast and class E for experimental purposes.

The system of IP address classes was developed for the purpose of Internet IP addresses assignment. The classes created were based on the network size. For example, for the small number of networks with a very large number of hosts, the Class A was created. The Class C was created for numerous networks with small number of hosts.

| Class | Subnet Mask decimal | No. of Hosts per Network | No. of Networks | Start -End Address |
|---|---|---|---|---|
| A | 255.0.0.0 | 16 Million | 127 | 1.0.0.0 - 126.255.255.255 |
| B | 255.255.0.0 | 65000 | 16000 | 128.0.0.0 - 191.255.255.255 |
| C | 255.255.255.0 | 254 | 2 Million | 192.0.0.0 - 223.255.255.255 |
| D | Reserved for multicast groups | | | 224.0.0.0 - 239.255.255.255 |
| E | Reserved for future use, or Research and Development Purposes | | | 240.0.0.0 - 254.255.255.254 |




| Class | First octet value | Subnet mask |
|---|---|---|
| A | 0-127 | 8 |
| B | 128-191 | 16 |
| C | 192-223 | 24 |
| D | 224-239 | - |
| E | 240-255 | - |

For the IP addresses from **Class A**, the first **8 bits** (the first decimal number) represent the network part, while the remaining 24 bits represent the host part. For **Class B**, the first **16 bits** (the first two numbers) represent the network part, while the remaining 16 bits represent the host part. For **Class C**, the first **24 bits** represent the network part, while the remaining 8 bits represent the host part.

1. **CLASS A Network:**

A **class A** network number uses the first **8 bits** of the IPv4 address as its "network part." The remaining 24 bits makeup the host part of the IPv4 address. The values assigned to the first byte of **class A** network numbers fall within the range **0-127**. There are 128 possible Class A networks.

**Example for a Class A IP address:** 2.134.213.2

2. **CLASS B Network:**

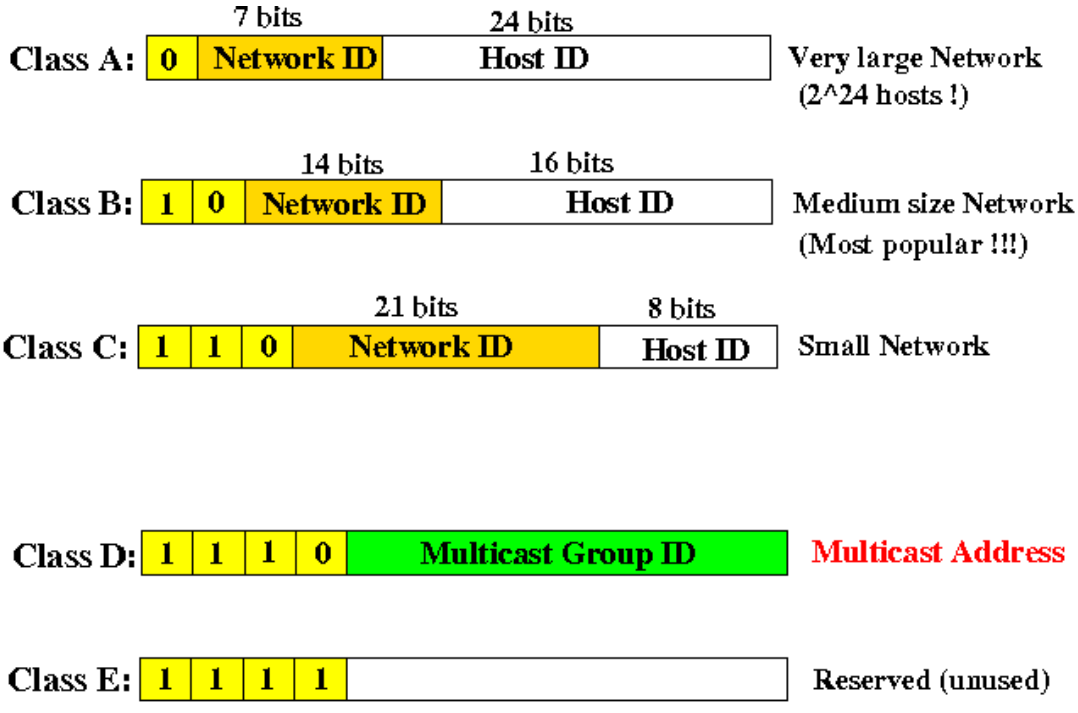
A **class B** network number uses **16 bits** for the network number and 16 bits for host numbers. The first byte of a **class B** network number is in the range **128-191**. All Class B networks have their first bit set to 1 and the second bit set to 0. In dotted decimal notation, that makes 128.0.0.0 to 191.255.0.0 as Class B networks. There are 16,384 possible Class B networks.

**Example for a Class B IP address:** 135.58.24.17

3. **CLASS C Network:**

A **Class C** network numbers use **24 bits** for the network number and 8 bits for host numbers. The first byte of a **class C** network number covers the range **192-223**. In a Class C network, the first two bits are set to 1, and the third bit is set to 0. Class C network addresses range from 192.0.0.0 to 223.255.255.0. There are over 2 million possible Class C networks.

**Example for a Class C IP address:** 192.168.178.1



4. **CLASS D Network:**

**Class D** addresses are used for multicasting applications. Unlike the previous classes, the Class D is not used for "normal" networking operations. Class D addresses have their first three bits set to “1” and their fourth bit set to “0”. **Class D** addresses are 32-bit network addresses, meaning that all the values within the range of 224.0.0.0 – 239.255.255.255 are used to uniquely identify multicast groups. There are no host addresses within the Class D address space, since all the hosts within a group share the group’s IP address for receiver purposes.

**Example for a Class D IP address:** 227.21.6.173

5. **CLASS E Network: Class E** networks are defined by having the first four network address bits as 1. That encompasses addresses from 240.0.0.0 to 255.255.255.255. While this class is reserved, its usage was never defined. As a result, most network implementations discard these addresses as illegal or undefined.

**Example for a Class E IP address:** 243.164.89.28

**Static vs. dynamic IP addresses:**

IP addresses are assigned in two different ways. They may be dynamically assigned (they can change automatically) or statically assigned (they're intended not to change, and must be changed manually). Most home networks use dynamic allocation. Your router uses DHCP to temporarily assign, or "lease," an IP address to your device.

**Experiment 10:-**

**Windows Server & also install the following services a) Active directory b) DNS c) DHCP.**

Minimum requirements for **Windows Server 2012**:

- Processor: Minimum: 1.4 GHz 64-bit processor
- Ram: Minimum: 512 MB
- Disk Space: Minimum: 32 GB

**Step 1:** Insert the Windows Server 2012 DVD, and once you get the following message press Enter to boot from the setup.

```
Press any key to boot from CD or DVD.....
```

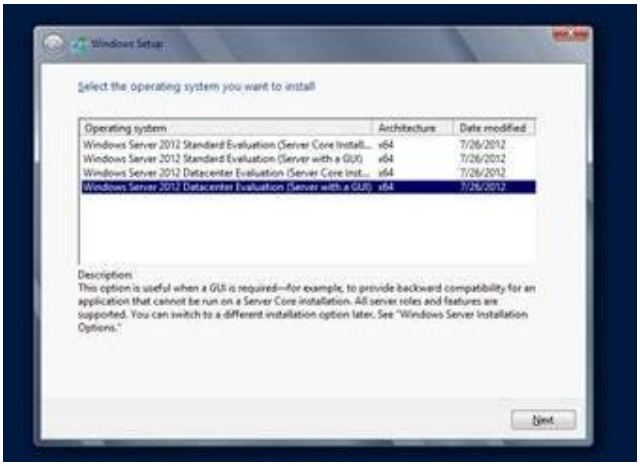
**Step 2:** Wait for a while till the setup loads all necessary files (Depending on your machine, it will take couple of minutes).

**Step 3:** Once the setup files are loaded, the setup will start with the following screen. You can change these to meet your needs (the default values should be fine for now).


**Step 4:** Once you click **Next**, you can start the installation, click "**Install now**".

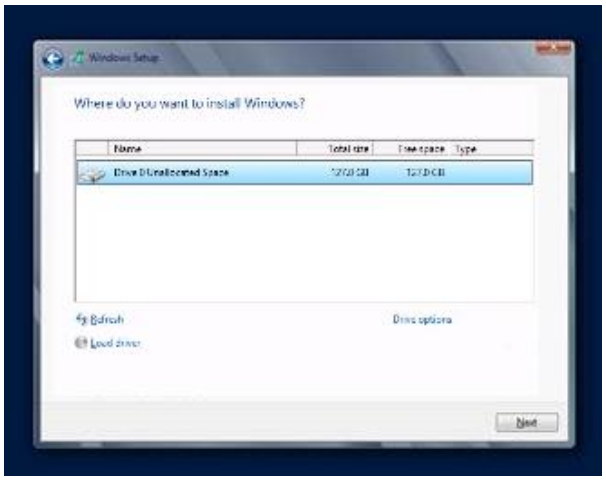
**Step 5:** You will see the **"Setup is starting"** screen, wait until it finishes loading

**Step 6:** In the following setup screen, you will see four options. Select **Windows Server 2012 Data Centre Evaluation** (Server With GUI).



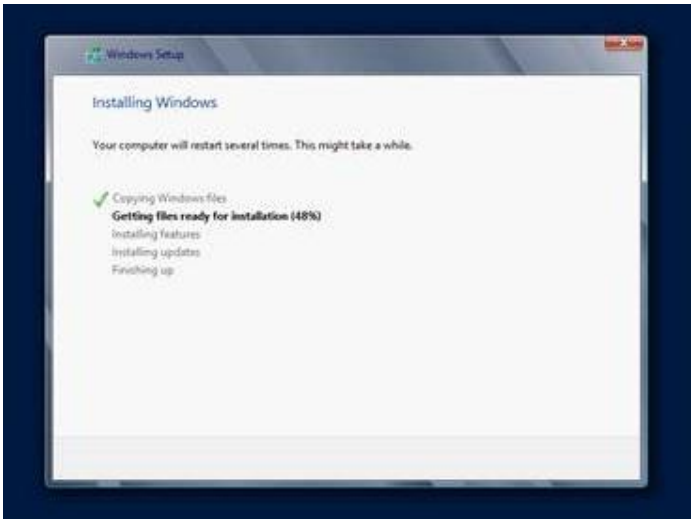

**Step 7:** After you click **Next** from previous screen, Read the License terms, tick the "**I accept the license terms**" and click **Next.**

**Step 8:** Now it will ask you for the drive (or partition) you want to install Windows on.



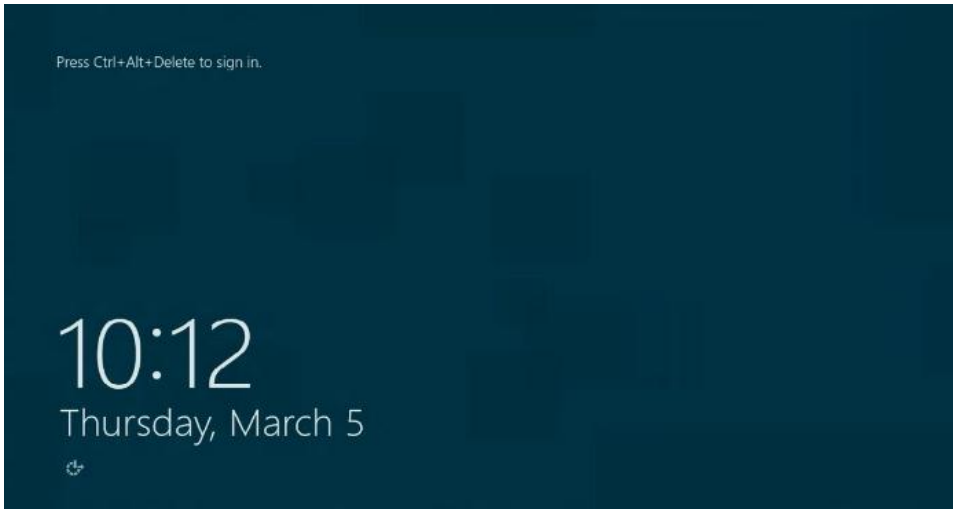

*****NOTE:** This will remove the content of the partition. Either you create a partition to install windows on, or you can test this on a testing machine.

**Step 9:** Now once we picked our partition, clicking on next from previous screen will start the setup. This process might take a while.

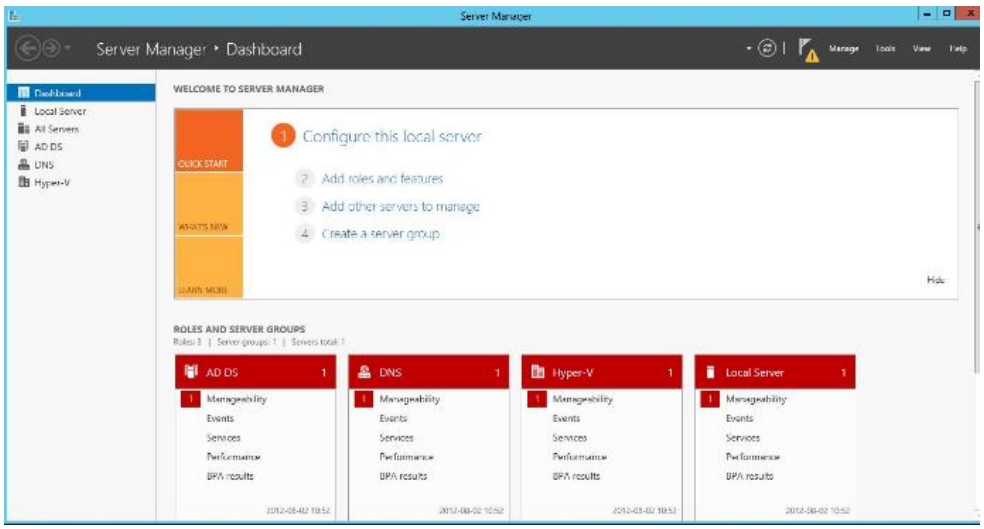


**Step 10:** Once the setup is done, it will restart and start your Windows Server 2012 for the first time. It will ask you then to set up a password for the Administrator user.


**Step 11:**The setup will finalize your settings, Once the setup is done, you can log in for the first time to your Windows Server, as the screen says, press **Ctrl+Alt+Delete** to log in, and use the password you set in the setup process.




**Step12:** Once you Log in, Windows Server 2012 will show the Server Manager.




Congratulations! we have now Windows server 2012 Installed with Datacenter.