

SARFRAZ

# **BUILD A COMPUTER FROM SCRATCH**



**A step by step guide  
for beginners**

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This guide is for those who want to build there gaming computer from scratch. I have spent a month creating this guide and have added useful resources for software downloads and provided links to different articles on my website .This ebook is not for sale and it's copyright belongs to me only. Enjoy!

# Table Of Contents

- **Chapter 1: Why you should learn Building a Computer?**
- **Chapter 2: Getting to know the components of a Computer**
  - CPU(Central Processing Unit)
  - RAM(Random Access Memory) Storage
  - GPU(Graphics Processing Unit)
  - Motherboard
  - SMPS(Switched Mode Power Supply)
- **Chapter 3: Know)ing the compatibility of components**
  - Compatibility of Processors with Motherboards
  - Compatibility of Ram with Motherboards
  - Compatibility of Hard disks with Motherboards
  - Compatibility of Graphics cards with Motherboards
- **Chapter 4: Making your budget and goal**
- **Chapter 5: Choosing the right Components**
  - Choosing the right Processor
  - Choosing the right Motherboard
  - Choosing the right Memory
  - Choosing the right Graphics card
  - Choosing the right Storage
  - Choosing the right Power Supply
  - Choosing the right Case

## **. Chapter 6: Tools needed for building your computer**



- Chapter 7: Getting Started
- Chapter 8: Installing Processor and Heat sink
- Chapter 9: Installing the Memory
- Chapter 10: Installing the Power supply
- Chapter 11: Mounting the Motherboard
- Chapter 12: Installing the Hard drive and Optical Drive
- Chapter 13: Cable management and Wiring
- Chapter 14: Installing the Graphics card
- Chapter 15: Installing additional components
- Chapter 16: Making it work/Troubleshooting
- Chapter 17: O/S and Driver Installation
- Chapter 18: Benchmark your PC
- Chapter 19: There you go! Congratulations

# Chapter 1: Why you should learn building a Computer?

When you go to a market for getting a good computer, you are thugged in many ways you don't even know. The computer dealer makes a lot of money when you buy the components from him.

If you don't know anything about computer and its components, things will get worse and the dealer can charge you more than your budget. Even if you know how many components are required to build a computer but don't know how to choose them you will still suffer.

Same case occurred with me in the past. When I was a total noob, I just said to my father that buy me a good computer on which I can do my basic works and a little bit of gaming as my PC was too old for now. He went and spent around \$350 for my new PC.

I was very happy. But it had a graphics card which was not able to run the games smoothly even at 720p. It was Nvidia Gt 210. I didn't know what this name meant. I just tried to tweak many settings and then finally searched on internet.

Soon, I realized that my father was also thugged by the dealer. He also put an Intel's core i3 processor which was 2<sup>nd</sup> gen but at that time 3<sup>rd</sup> gen processor also costed the same in India. Then I realized that the power supply I had wasn't enough to power a good dedicated graphics card and the case was also a crap.

Then my journey on PC building started. I continuously researched and gained knowledge on every component. I realized what mistakes I have

done in the past but not any more now.

Everybody starts from a noob but I spent hundreds of hours in researching so that I could solve every problem of a computer. I even enrolled in a card level and chip level repairing course where I learn every aspect of troubleshooting and repairing a computer because the knowledge of choosing components isn't enough at all.

Now I can build any type of computer, a business computer, a multitasking computer and a gaming computer too. Each one of these have different requirements. I have learnt a lot and I know that there are millions of people who want to learn the same. But it takes lot of dedication and time to learn everything but still you can make big mistakes and therefore I wrote this guide to eliminate all these problems.

Now you don't have to search on Internet what graphics card you should buy or How to Install a Processor. It's all included in this guide. This is a complete beginners guide to build a Gaming pc from scratch. You don't have to roam here and there on the forums asking questions on assembling or choosing the components. I have explained everything in detail with High quality images.

I explained assembling through my own computer step by step with hd images.

Now I want to ask you a question: ***“Why you should pay 50 dollars or more to a computer mechanic for building your Computer if you still cannot get all the information about the components?”***

***“Why you should pay hundreds of dollars for a pre-built computer if you can save a lot of money and utilize them in your system for better***

*upgrades?”*

It's foolish to spend a lot of money just to get a idiot computer which you don't know about.

Therefore, I have made this ebook that targets these aspects. If you are a total newbie and don't even know anything, you will know everything when you read this whole guide to build your own Gaming computer from scratch.

Now,

**>You will never be thugged by any dealer or a mechanic again!**

**>You will be able to build your computer as well as you will be able to make money building computers for others.**

**>You will have updated knowledge on every component that is present right now in the market.**

**>You don't have to pay dealers and assemblers again.**

**That's why you should Learn how to build  
a Computer by Yourself !**

# Chapter 2: Getting to know the Components of a Computer

Without a proper knowledge of computer components you can never build a gaming computer. You may know a lot of components but there are still many things you need to know before starting your build. I am telling you this honestly as I have experienced this myself. I am a huge hardware enthusiast and knew almost every component right there in the market but I still faced many problems that lead to some of my failure but we learn from failures. And from that experience I am giving you the complete knowledge of each and every component in detail so that you may never have to ask any computer tech to tell you the problem with your build.

From the 3<sup>rd</sup> standard we are learning a lot about the parts of computer but now we will be doing some practicals therefore leave all that knowledge behind and be serious.

To build a Computer there are only 5 main components that you need to have. If any of these parts are missing, your computer won't work. These components are as following:

- 1. The Processor**
- 2. The Motherboard**
- 3. The Memory or Ram**
- 4. The Hard Drive**
- 5. The Power supply**

Even if you don't have a case or a graphics card or a dvd drive your computer will still work but if any of the above misses, your computer is incomplete. **GOT MY POINT!**

However, to build a “**GAMING**” computer, you got to have some components more which are:

- 1. Cabinet**
- 2. Graphics card(A must)**
- 3. CPU fan**
- 4. Additional components like optical drive, custom fans, Ssd's etc.**

Out of these a graphics card is the compulsory component to build a gaming computer. Even if you skip your cabinet and mount your computer on a wooden plank you will be still able to play all of your games without a problem neglecting the fact that your system will consume a lot of dust and moisture.

Now you have the knowledge about the components of a computer let's learn what are these and how they work.

# CPU(Central Processing Unit) Or Processor

The processor is the brain of computer. It controls everything that operates on your system. May it be a simple paint application to a highly intensive game.

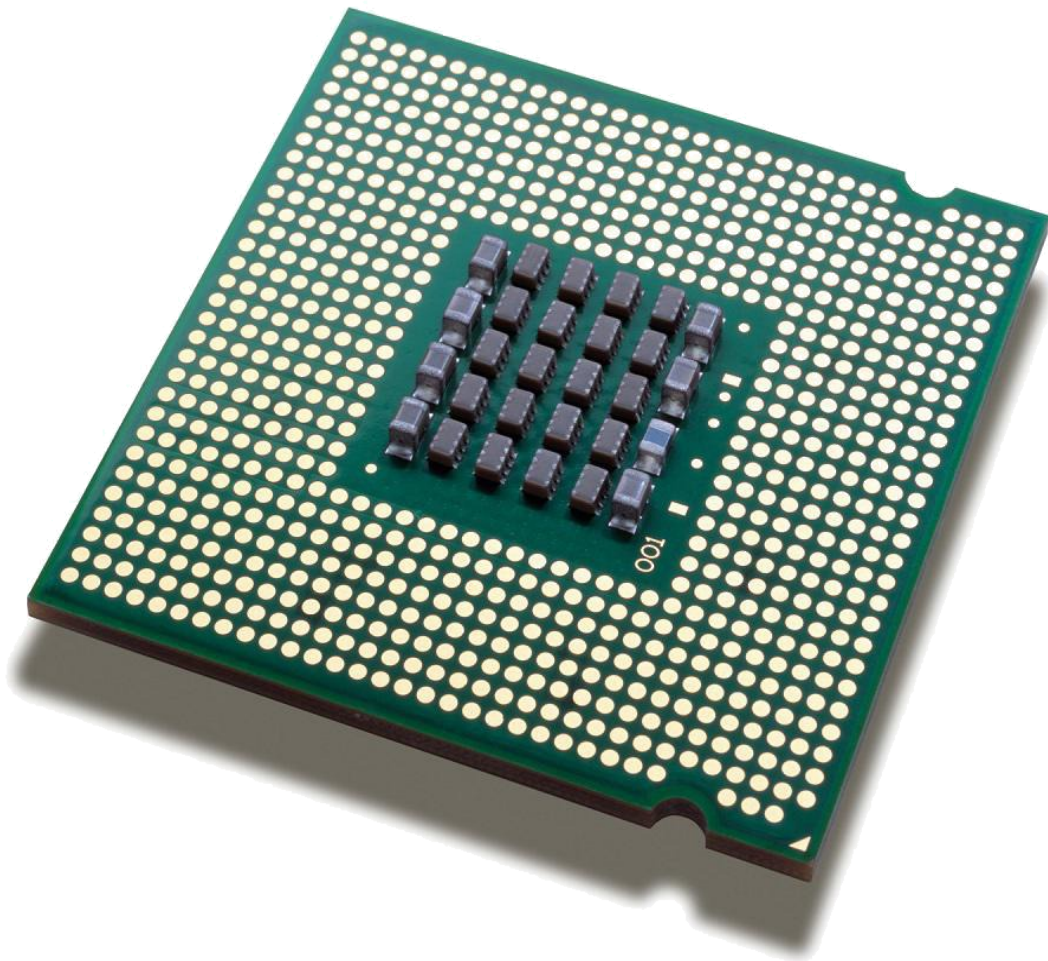
The processor is also called A CPU so, keep in mind if use the word CPU , it literally means the Processor.

A processor controls the logical and arithmetic operations of a computer. If you do a  $2+2$  on a calculator, the processor executes it and produces the result. Similarly, if you listen to a song or some audio, the sound is first processed and converted into appropriate form by your cpu and then sent as output to the speakers.

Even the Graphics you are seeing on your monitor, the text you are reading is all because of your cpu as it processes the input and then sends the signal to the right component like Gpu(graphics processing unit), monitor, speakers, printers etc and you get the right output.

So, each and every component in your pc is controlled by your processor.

Have you ever seen what a processor looks like? If not then the following image will show you the actual processor.



You can see a cpu is made of hundreds of small dots which varies in number as you change the generations of processors. Amd processors come with small pins instead but this is the intel one above.

A Cpu has a specific fixed speed which is measured in frequency that can be from a few hundred MegaHertz to a few GigaHertz. Generally all the latest processors come with at least 2.0Ghz of speed and in more common more than 3.0Ghz.



These processors are of two types:

**1. Locked**

**2. Unlocked**

**Locked** processors are those of which you cannot increase the clock speed or you are limited to a few hundred MegaHertz.(If you own an unlocked motherboard)

**Unlocked** processors are those of which you can increase the clock speed from a few hundred MegaHertz to a few GigaHertz.

These processors can be overclocked generally from the bios settings and by overclocking them you can get a significant amount of increase in performance of your computer. Generally when I build a gaming computer I only use and recommend the unlocked processors because they worth the money as they give some free performance in the same price.

# RAM(Random Access Memory)



Memory or Ram which is also known as Random Access Memory is used to store temporary data of your computer when you do some work and get erased when you switch off your computer. So, the work of ram is generally to increase the speed of your computer by storing the cached data.

With years passing on, more and more ram is becoming the requirement and it will go on increasing. 11 years ago I used 128mb ram and today I use 8gb. Not only this, the 128mb of ram was DDR 1<sup>st</sup> generation and the 8gb I use today is DDR 3<sup>rd</sup> generation which is several times faster. But the latest is DDR4 which consumes much less power and operates even faster.

The speed of Ram is also measured in Frequency like 1000Mhz, 1333Mhz, 2133Mhz and so on. More frequency means faster ram for example 1600Mhz of ram will operate faster than the 1333Mhz but it is not true every time. Above 1600Mhz of frequency the ram becomes almost equal to that of 2133Mhz or even 2800Mhz. Therefore for clearing your concept, remember if you buy a ram you necessarily not need a 2800Mhz of Ram. 1600Mhz would be just fine.

# STORAGE

Storage is referred to as an electronic device which is used for storing your data like applications, movies, games, files and folders etc. Even if you operate just on a Ram you would not be able to store the data on it as it stores the data Temporary. But the permanent storage is “**ROM**” only which means Read only memory. It stores data as long as you need it. If you want to delete it you can delete it any time and if you want to save it for years you can do it too.

Your operating system can never work without a storage or a ROM. Therefore you need to add a storage device to your system.

Examples of ROM or storage devices are:

- 1. HDD- Hard Disk Drive**
- 2. SSD- Solid State Drive**
- 3. FDD- Floppy Disk Drive**
- 4. USB- Universal Serial Bus or Portable Hard drive**

These are used in our computers. The HDD is the most commonly used storage device in a computer and is used for windows installation and storing the data. FDD is not used any more as it is outdated now. SSD is the fastest storage you can get which is almost 10 times faster than the HDD and is used for decreasing loading times and speeding up the applications.

USB is the portable storage which you can take with yourself to anywhere and can exchange your data with any of your friends pc or laptop. But you can not install the OS in a USB. So, never ever think of skipping the HDD and take USB for your complete storage of your OS

and Data. It can only store your Data and not your OS.

Following are the images of what a modern HDD, SSD and USB looks like:



**HDD**



**SSD**



**USB DRIVE**



**V-Nand SSD**

# THE GPU

## (Graphics Processing Unit)



Next comes the GPU which is known as Graphics processing unit.  
Ever Wondered how the images get displayed on your screen?

This is the job of the GPU. Which collects the input from the user and then converts the signals into digital form to display on the screen. Every image is comprised of several pixels and these pixels combine to form a single image or multiple images.

These pixels can not be seen individually by naked eyes because they are very small. Have you every noticed why people call the resolution to be 1366x768p or 1080p or whatever?

These means pixels (Horizontal Pixels x Vertical Pixels) on your screen. The more the pixels the better and clear would be the image.

The more the resolution the better has to be the power of the GPU to display it properly.

Same goes for your games. Your games are lot more than just 2D images. They are 3D advanced video effects that have to be processed in a split second and there is no simple algorithm of displaying these effects.

The games have detailed textures of trees, grasses, rocks, skins and detailed shadows and their respective resolutions. These all have to be resolved by the GPU. A Gpu has it's own processor which does this thing. In the past, many years back a gpu was controlled by the main processor but modern GPU's have evolved themselves much that they don't need any separate processors and these are called **Graphics Cards**.

The speed of a GPU is also measured in frequency just like the CPU and the RAM. But a Gpu has two types of clocks, one is the **Processor Clock or Core Clock** and one is the **Memory Clock**. With increase in the processor clock the speed of the Gpu becomes more faster while there is still a limit in the increase of speed of a gpu when it comes with the Memory clock.

Now, there are several more specifications of GPU then the Core Clock and Memory Clock. These are the Shaders, Stream Processors, Memory Interface, Memory size, Memory bandwidth, Texture bandwidth etc. These all contribute to the power of a GPU.



# **THE MOTHERBOARD**

When it comes to connecting all the components, the task is only achieved by a PCB which serves as a connecting interface which is called a **Motherboard**. The name itself suggests that this component is the mother of the computer as it connects each and every component.

The processor, the graphics card, SMPS, Mouse, Keyboard, ram all are installed on a motherboard. Each component has a different slot on it.

There are different types of motherboards and every motherboard may or may not have some slots depending upon what type of the motherboard it is. A motherboard may not have a Graphics card slot and there can be a motherboard which can have upto 5 Graphics cards slots and that all depends upon the buyers choice.

Now to clear the point, you have to remember that there are four types of motherboards that we use generally in a gaming pc.

1. **Mini ITX(Information Technology eXtended)**
2. **Micro ATX(Advanced Technology eXtended)**
3. **ATX**
4. **EATX**

These are known as **Form Factors**. We do not use the Pico ITX and Nano ITX for gaming computers. Each of these have different sizes and come in different prices. The **Mini ITX** motherboards are smallest in size . It has very few slots and ports for components and peripherals and these are generally cheap. This type of motherboard is for those who have a very tight budget or a very small case.

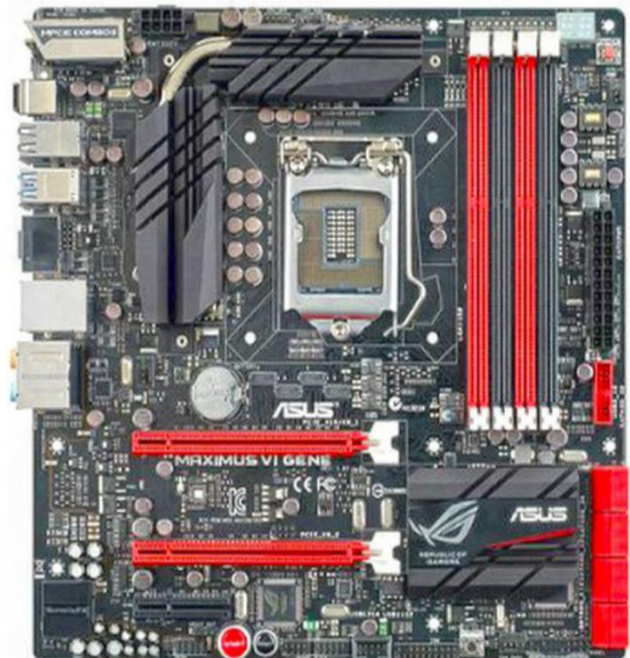
The **Micro ATX** motherboards are a little larger in size and have more slots and ports for different components. These are also budget gaming motherboards.

The **ATX** motherboards are high end motherboards which have almost every port and slot for connecting any type of component or device you need whereas the **EATX** motherboards are extremely high end motherboards which have the highest number of memory and graphics card ports you can imagine with a lot more additional features like better heat sink or even cooling fans.

Following images show different form factors of motherboards:

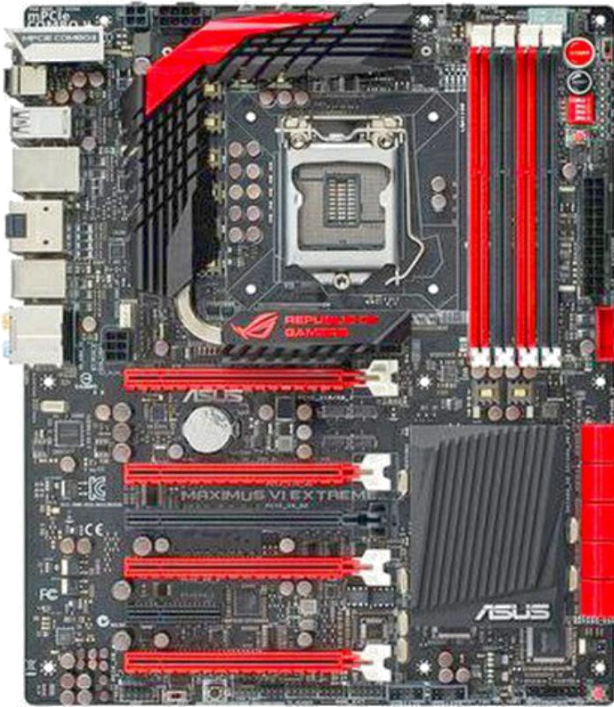


**Mini-ITX**

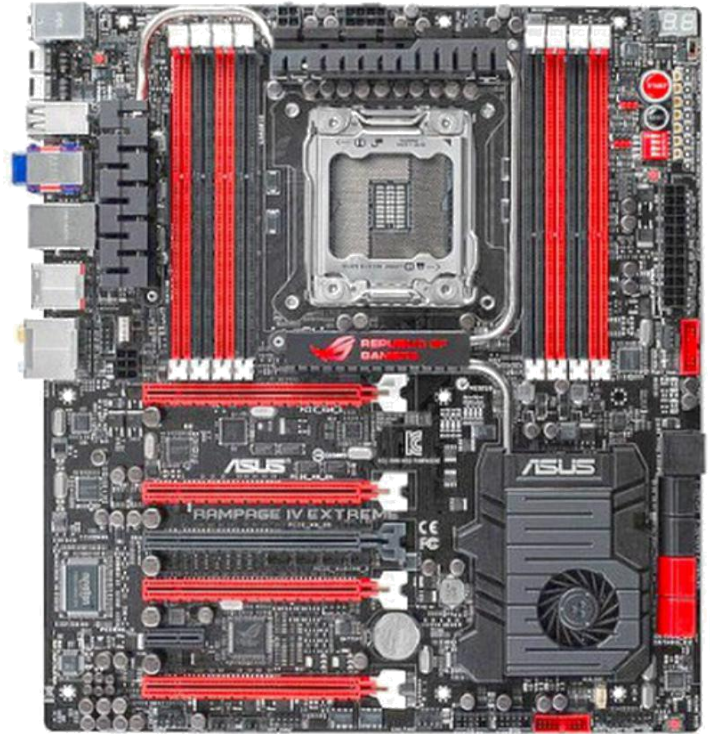


**Micro-ATX**





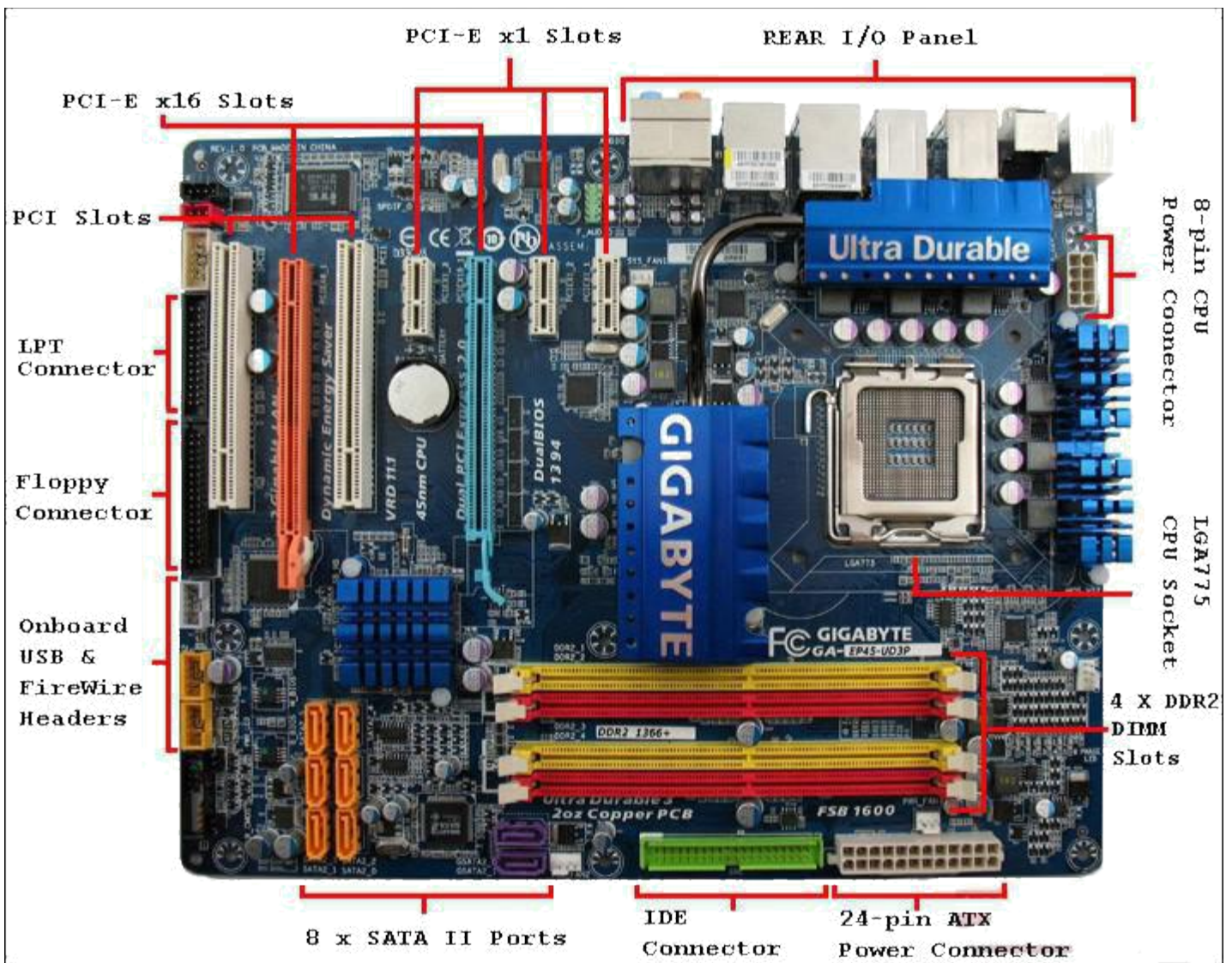
## ATX



## EATX

Now I would be explaining what each port and slot of a motherboard do by taking a simple example of an ATX motherboard showing you exactly what all ports and slots actually are and which port or slot is used for which component.

Although I am not going to explain in full detail how each port/slot work as it is not required but will keep it simple to make you aware of different types of slots and ports. Out of these there are a few slots that you should know properly so that you may not mess up with wiring or stuff which I would be covering in the wiring section coming in the assembling chapter.



By the above diagram you can easily read and understand which port or slot is used for which component but there are certain ports you need to know about which you aren't able to understand clearly.

1. On the right hand side of the motherboard you can see a square port with a latch which mentions LGA 775 CPU socket which is where the Processor fits in.
2. Below it there are 4 DIMM slots where the RAM chips are installed. In the middle and at the left you can see several different sized slots which are mentioned as PCI-E x1, PCI-E x16 and PCI

slots which serve for different components. The PCI-E x1 and PCI slots are used for connecting LAN cards, sound cards and modems whereas the PCI-E x16 slot is used for graphics card. It is the longest among all the PCI-E slots. Although some motherboards today many not need LAN cards or sound cards but they are still provided as an additional preference.

3. At the extreme left there are LPT connectors, Floppy connectors(don't come now) and USB ports. On latest motherboards there come USB 2.0 and 3.0 ports separately. Below these ports, at the extreme left bottom corner there are the Reset, Led and power ports which are connected to the front of the case through wires.

4. On just a little right, there are SATA and IDE ports which are used for connecting storage devices like hard drives. In latest motherboards, IDE ports are absent.

5. Then comes your power connectors which is a 24 pin eatx power port and near the I/O ports you can find the CPU 8 pin port. In some motherboards a CPU port may be a 4 pin port or an 8 pin port and may or may not present at the exact same location as shown in the figure.



# SMPS(Power Supply)



SMPS or Power supply is the source of power through which every component gets electrical energy. Your motherboard, cpu, graphics card, ram, dvd drive and hard drive, all need electrical energy to operate.

Each of the component have it's own power connecting port in it to get the power supply. Most number of power connecting ports are present in the motherboard. Ram consumes the least power out of all the components whereas a dedicated graphics card consumes maximum amount of power which starts from 20 watts to more than 300 watts.

For each connecting port, the smps provides different types of cables with different number of pins. There are three types of power supplies which are generally used in home systems:

### **1. AT- Advanced Technology**

### **2. ATX- Advanced Technology Extended**

### **3. EATX- Extended ATX**

These are the power supplies which you will generally find in almost every pc. The more commonly used today is the EATX because of its reliability and power. Systems with low end components used ATX power supplies and Older generation computers which used Pentium 4 and Core 2 duo configuration used AT power supplies.

AT Power supplies have limited power connectors and have power connectors for Floppy drive and IDE storage whereas the ATX and EATX Power supplies don't have these connectors, instead they have the latest connectors for SATA and USB 3.0 which are absent in AT powersupplies.

The main difference between an ATX and EATX power supply is that EATX has even more power connectors which can be used for multiple components. For example, ATX power supplies like Zebronics 450 watts doesn't have a 6pin or 8pin power connector for graphics card but Corsair VS 450 watts power supply has it and it has even more connectors for powering multiple HDD's, SSD's and ODD's.

## Chapter 3: Knowing the compatibility of Components

Now you have known the basics of the computer components, it's time to know the compatibility of each component. Without knowing the compatibility, you will be never able to build a gaming computer.

**Note it down.**

What if you buy a Cpu and a motherboard randomly and try to put the cpu into the socket? It won't work!

Buy Why?

Because there is a very less chance that you have ordered compatible motherboard and cpu. You might have bought an AMD Cpu and tried to put it in an Intel Motherboard.

**OR**

You might have bought an Intel Processor and an Intel motherboard but the Socket on the motherboard might have different number of pins. Therefore, you got to know the compatibility first before going to buy the parts.

Let's Start with the Processors and their Compatible motherboards.

## Compatibility of Processors with Motherboards

For building a good gaming computer, you must use the latest generation processor and motherboard. For building an Intel gaming computer, it is recommended that you use a Pentium, Core i3/i5/i7 processor. But again you should choose the latest generation processors. Older systems also used Pentium processors, but these were Pentium1,2,3 and 4. Pentium1,2,3 are no longer available in the market but Pentium 4 is still used as it is also present in dual core version.

**Remember that you must use at least a dual core processor.**

Following is the Intel Components table which shows the processors and their compatible motherboards Sockets.

Processor	Model	Generation	Compatible Socket
Celeron	<a href="#">G1xxx</a>	1 <sup>st</sup>	LGA 1156
	G4xx	2 <sup>nd</sup>	LGA 1155
	G5xx/T	2 <sup>nd</sup>	LGA 1155
	G16xx/T	3 <sup>rd</sup>	LGA 1155
	G18xx/T/TE	4 <sup>th</sup>	LGA 1150
Pentium	<a href="#">G6xxx</a>	1 <sup>st</sup>	LGA 1156
	G6xx/T	2 <sup>nd</sup>	LGA 1155
	G8xx/T	2 <sup>nd</sup>	LGA 1155
	G20xx/T	3 <sup>rd</sup>	LGA 1155
	G21xx/T	3 <sup>rd</sup>	LGA 1155
	G32xx/T	4 <sup>th</sup>	LGA 1150

	G3320TE	4 <sup>th</sup>	LGA 1150
	G34xx/T		LGA 1150
Core i3	<a href="#">i3-5/9xx</a>		LGA 1156
	i3-21xx/T	2 <sup>nd</sup>	LGA 1155
	i3-32xx/T		LGA 1155
	i3-41xx/T		LGA 1150
	i3-43xx/T/TE		LGA 1150
	i3-5xxxU		LAPTOP
	i3-6xxx/U/H/T/TE		LGA 1151
Core i5	<a href="#">i5-6xx</a>		LGA 1156
	<a href="#">i5-7xx</a>	1 <sup>st</sup>	LGA 1156
	i5-23xx/T/P		LGA 1155
	i5-24xx/S/P		LGA 1155
	i5-25xx/T/S/K		LGA 1155
	i5-33xx/S/P		LGA 1155
	i5-34xx/S/T		LGA 1155
	i5-35xx/T/S/K		LGA 1155
	i5-44xx/S/T		LGA 1150
	i5-45xx/T/TE/R/S		LGA 1150
	i5-46xx/T/R/S/K		LGA 1150
	i5-5xxx/R/C/U/H		LAPTOP
	i5-		LGA 1151
	6xxx/U/EQ/HQ/T/T		
	E/K		



Core i7	<a href="#">i7-8xx</a>	1 <sup>st</sup>	LGA 1156
	i7-26xx/S/K	2 <sup>nd</sup>  2 <sup>nd</sup>  3 <sup>rd</sup>  4 <sup>th</sup>  5 <sup>th</sup>	LGA 1155
	i7-2700K		LGA 1155
	i7-37xx/S/K/T		LGA 1155
	i7-47xx/S/K/T/R/TE		LGA 1150
	i7-		LAPTOP
	5xxx/HQ/EQ/R/C/U		
	i7-	6 <sup>th</sup>	LGA 1151
	6xxx/U/HQ/HK/EQ		
	/K/T/TE		
Core i7	i7-3820	3 <sup>rd</sup>	LGA 2011
Extreme			
	i7-3930K	3 <sup>rd</sup>  3 <sup>rd</sup>  3 <sup>rd</sup>  4 <sup>th</sup>  4 <sup>th</sup>  5 <sup>th</sup>  5 <sup>th</sup>  5 <sup>th</sup>  6 <sup>th</sup>	LGA 2011
	i7-3960X		LGA 2011
	i7-3970X		LGA 2011
	i7-4930K		LGA 2011
	i7-4960X		LGA 2011
	i7-5820K		LGA 2011-V3
	i7-5930K		LGA 2011-V3
	i7-5960X		LGA 2011-V3
	i7-6XXXXK/X		LGA 2011-V3

This was the list of the best intel processors you can get today for building your system and their respective Motherboard sockets. It is very important to know before buying a motherboard that you know which processor do you have and based upon that, you buy your motherboard.

Now Motherboards also come in with different chipsets. Some are for basic purposes, some are for business purposes, some are economic and some are for overclocking. But each and every motherboard with different chipset will support every processor if the processor is made for that particular socket. Even if the motherboards have different chipsets and their prices have a large difference, still they can support the same processor. Suppose if you buy a processor called Pentium G3258 which is 4<sup>th</sup> generation Intel processor and put it in a cheap motherboard like MSI H81-M E33, you can put the same processor in an expensive motherboard like Gigabyte GA-Z97X Gaming 5 as both the motherboards have same LGA 1150 Socket. Now, I think you have got it!

Next comes the AMD processors and their respective compatible motherboards. There are two types of AMD Processors that are most commonly used. One is the **FM2 Processor** and the other one is the **AM3 Processor**. FM2 Processors are older generation processor whereas the AM3 one's are the latest. But both are used for building Computers.

FM2 Processors are only compatible with the FM2 and FM2+ socket motherboards and the AM3 processors are compatible with AM3 and AM3+ socket motherboards. You can never install an AM3 processor in a FM2 or FM2+ motherboard and the same applies for the FM2 processors and the AM3 motherboards.

## **Compatibility of RAM with Motherboards**

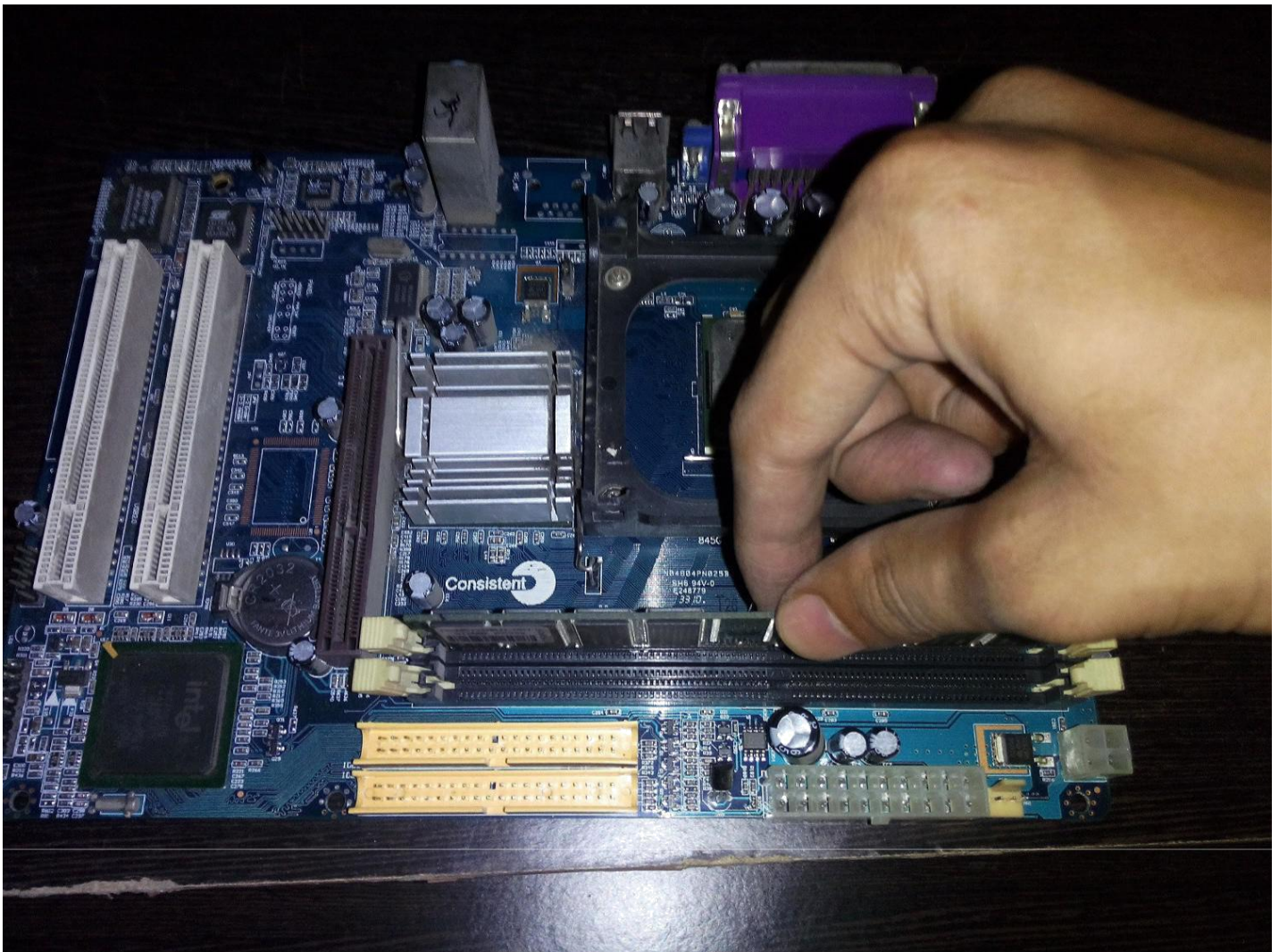
Next comes Random access memory. Now you have chosen a good motherboard and processor for you build. But do you know what memory you have to choose, DDR1, DDR2, DDR3 or DDR4?

If you don't, then I am going to explain.

Previous generation motherboards only supported DDR1 and DDR2 Ram's but this generation motherboards support DDR3 and DDR4 Ram's as they are the most widely used memories and are faster than the DDR1 and DDR2.

I am giving you a brief explanation so that you can know what type of Ram your motherboard can support. The processors I have mentioned above, both the Intel and AMD one's, all use those motherboards which support DDR3 and DDR4 Ram's. But the AMD processors and motherboards don't support the DDR4 memory still.

If you own an older motherboard like the following one which uses Pentium 4 processor then most likely the Ram it will support will be either a DDR1 or DDR2.



But if you own a motherboard with chipset G41,G42 or G45 which also use Pentium 4 Processors then the memory it will support will be DDR3. Otherwise every processor that is available right now in the market which I have mentioned previously in the table fit on a DDR3 or DDR4 memory supporting Motherboard.

The Only Motherboards that support DDR4 Ram's have CPU sockets of LGA 2011-V3 and LGA 1151. Other than these, every motherboard supports only DDR3. However Amd zen is on the way.

# Compatibility of Hard Disks with Motherboards

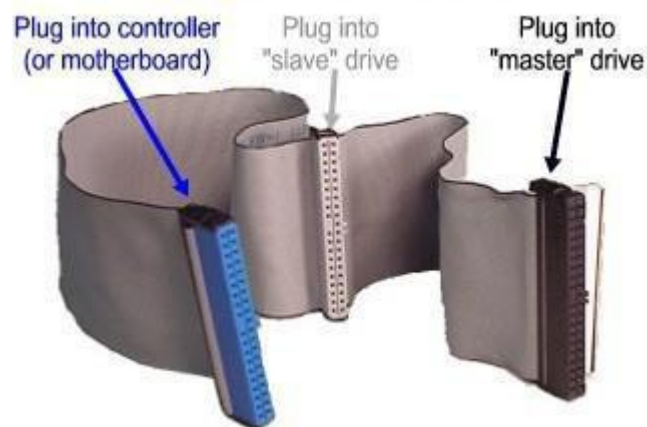
There are mainly two types of hard drives that are used to build a computer:-

## **1. IDE- Integrated Disk Electronics**

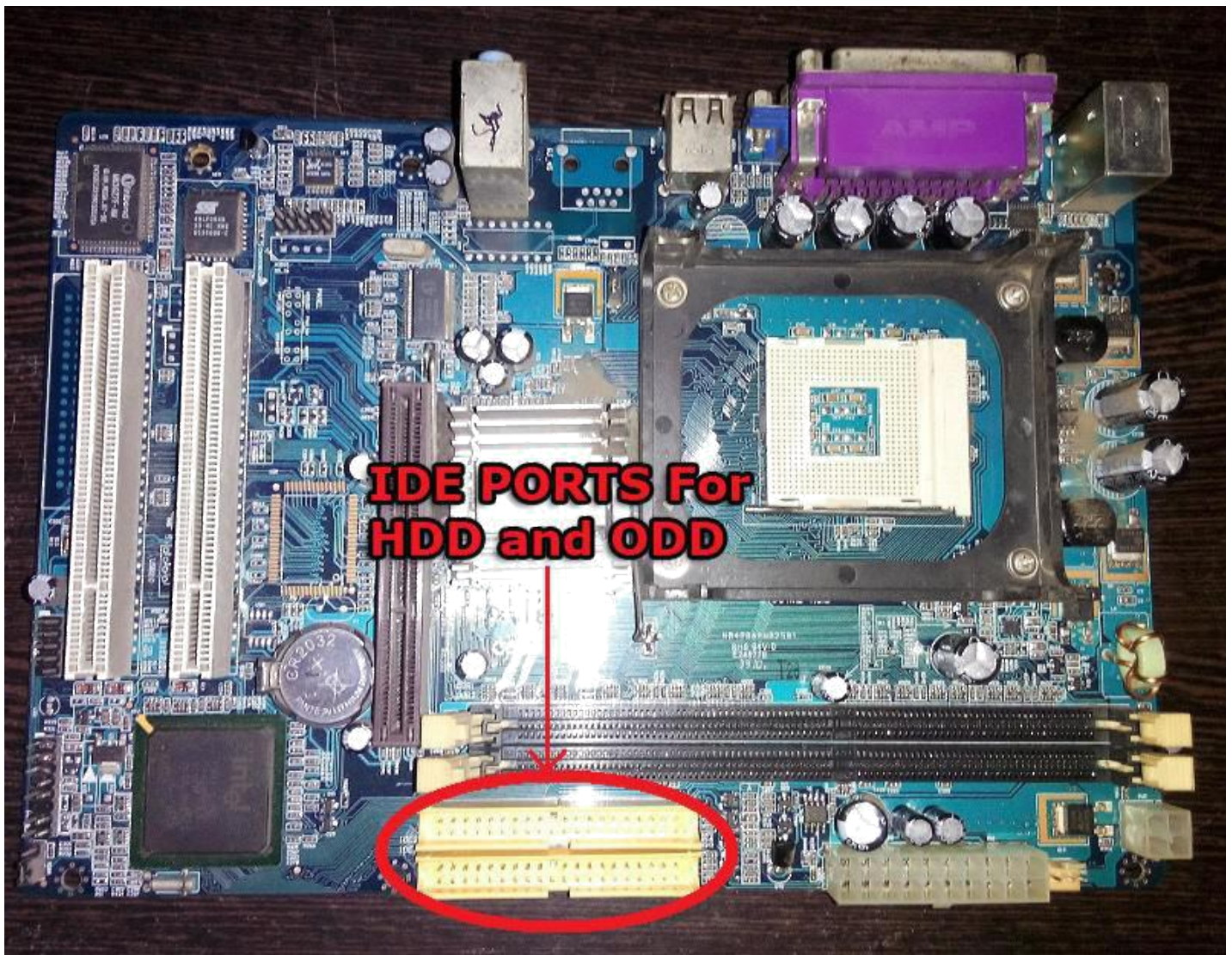
## **2. SATA- Serial Advance Technology Attachment**

Older generation motherboards used to have the IDE Ports for connecting IDE hard disk drives but latest motherboards only have SATA ports. Motherboard with chipset 845G which uses Pentium 4 processor only has IDE ports whereas the latest versions of Pentium 4 motherboards which supported Dual core, Core2Duo, Core2Quad and Core2Extreme used to have both IDE and SATA interface for Both types of hard drives.

An older generation motherboard would have generally two or more IDE ports for connecting one HDD and one ODD. Both used the same connecting port. They even shared the same flat PATA connecting strap which made the system look ugly and hard to manage.



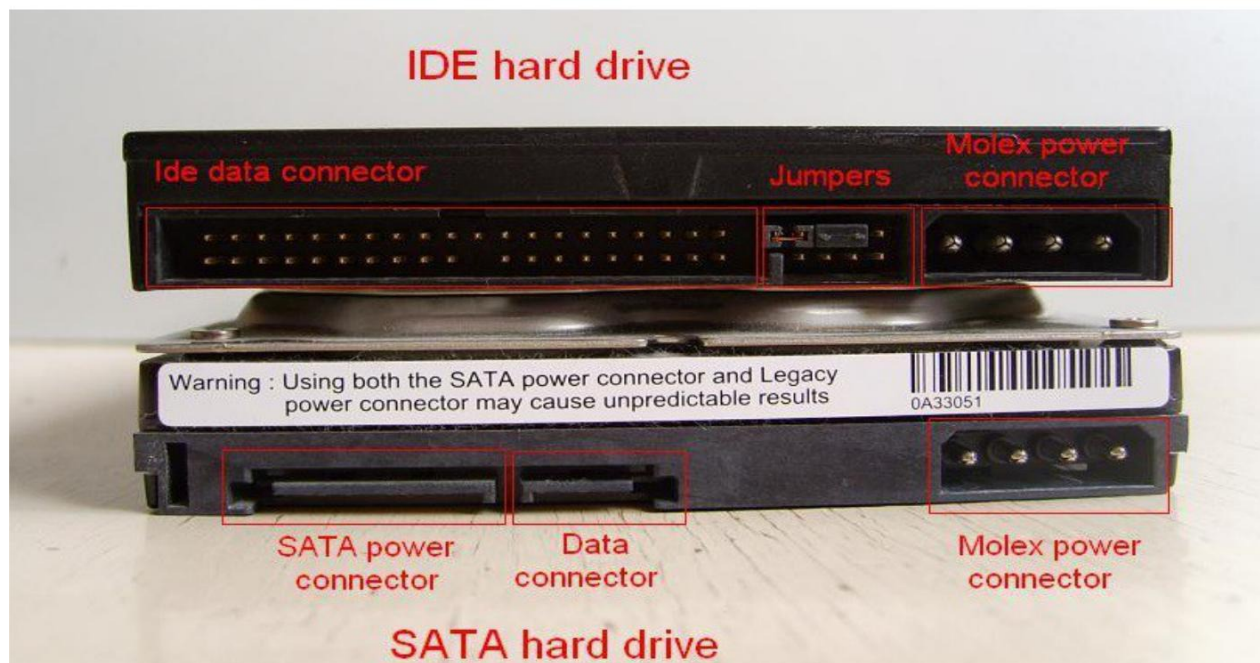
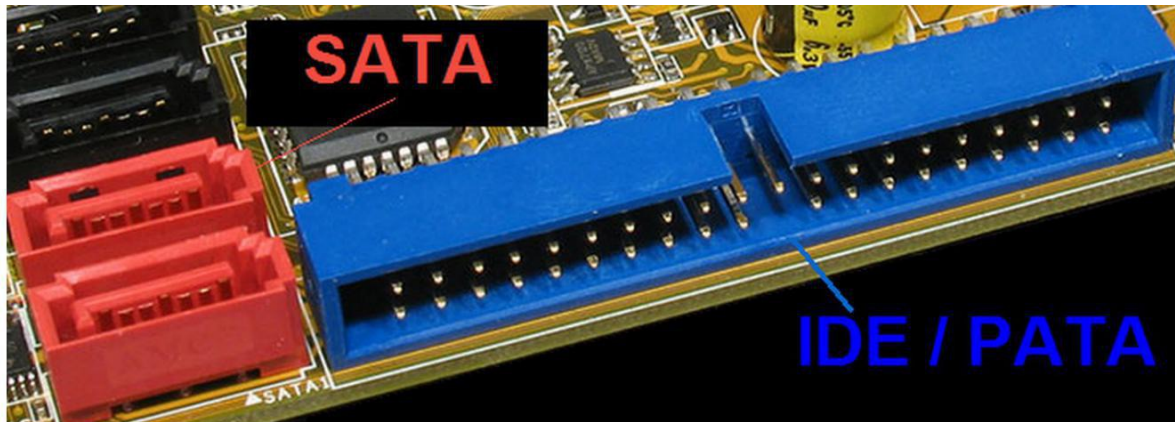




But not only this, the main problem was to configure the cables. If you just put the same cable into both the HDD and ODD, no disk will work because the system would not recognize which one is the primary drive and which one is secondary. Therefore a jumper is used to create one of them as **Master** and one of them as **Slave**.

Therefore companies stopped manufacturing these IDE Hard disk drives and these motherboards, instead now SATA is used commonly.

Following are the images of IDE/SATA Ports, IDE and SATA HDD:-



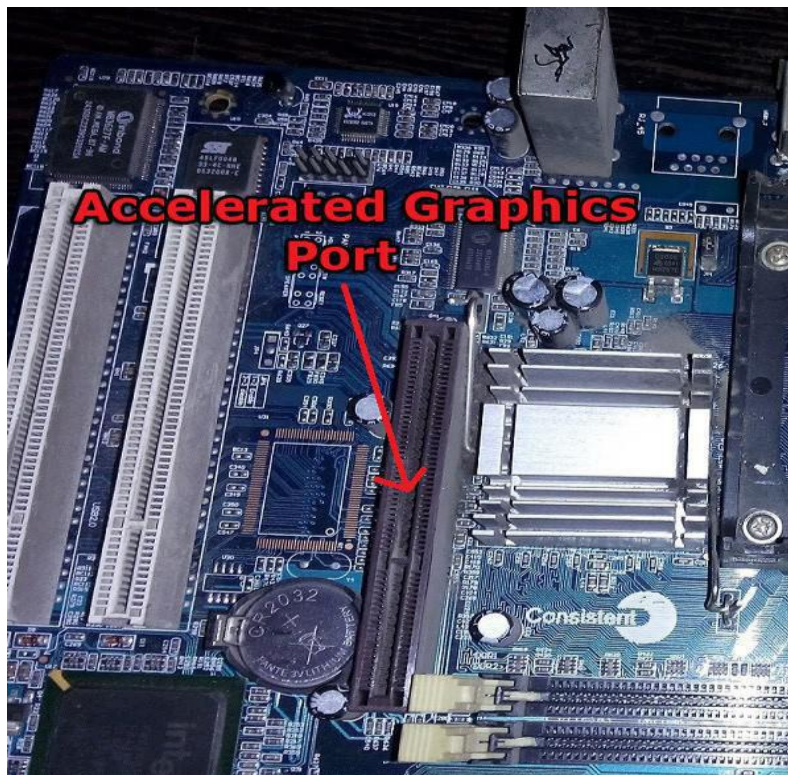
From the images above now you can easily know what type of hard drive your motherboard will support.



# Compatibility of Graphics Cards with Motherboards

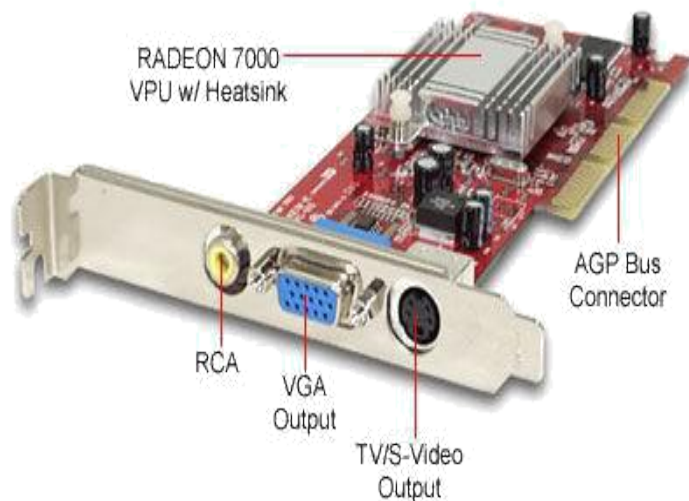
Older Generation Motherboards used Graphics Processing unit in-built that came with the processors itself. Still till date, almost every processor comes with Inbuilt GPU specially Core i3, i5 and i7's. But if you want to install a dedicated graphics card to your motherboard, you should know what type of Slot your motherboard has and what graphics card will it support.

Older generation motherboards like the below one has an **AGP** slot which stands for **Accelerated Graphics Port**. It is a very old version slot for installing graphics cards.



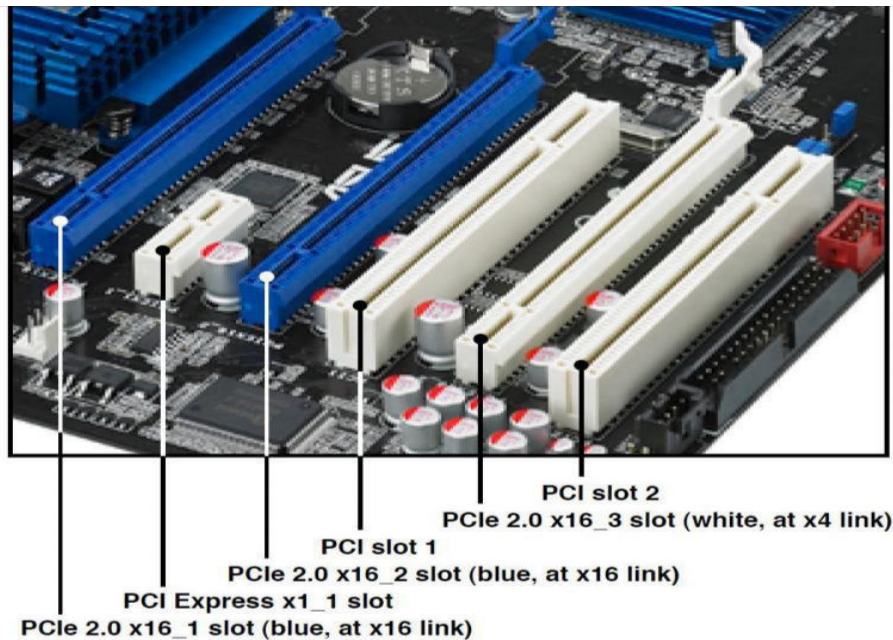
And the graphics cards used to look like this:-

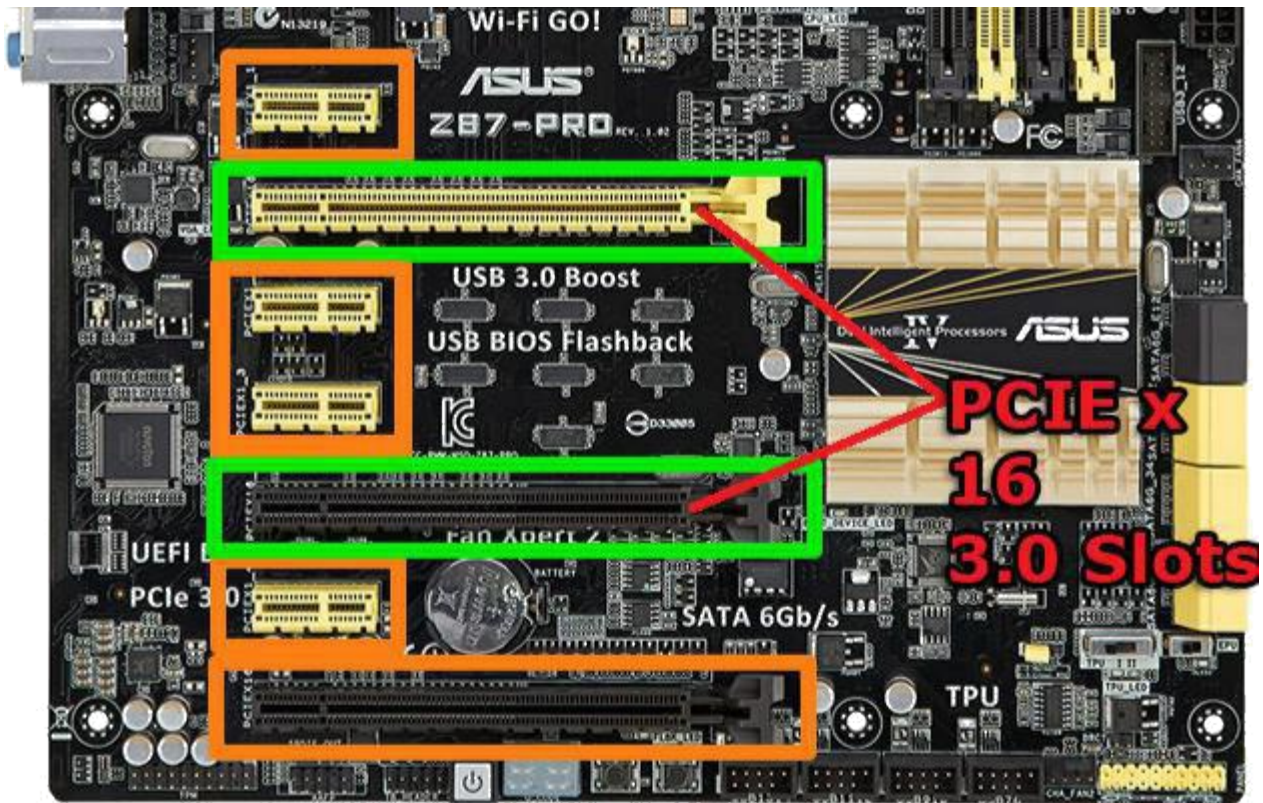




These were very low end graphics cards and only had VGA or DVI ports. The latest Slots for Graphics cards are **PCI-Express x 16 2.0 and 3.0**. These support low end graphics cards to extremely high end graphics cards like Gtx 980 ti and Gtx Titan X.

A PCI-Express 2.0 and 3.0 Look like the following:-





PCIE x 16 2.0 will also support a Graphics card 3.0. The only difference is the memory bandwidth but It will have almost no impact on performance if you run a Graphics card 3.0 either on a PCIE 2.0 or PCIE 3.0 slot.

## Chapter 4: Making Your Budget and Goal

You just don't go out to buy random components with different rates that don't match your budget. You have to first define your budget and your goal. Ask yourself:- *“How Much Money do I have?”*

*“How do I invest money for each and every component?” “Why*

*Do I want a \$500 gaming pc or a \$1000 gaming pc?”* etc.

Now you have a particular budget. Suppose \$500, what will you do?

Would you buy a \$200 processor and a \$50 graphics card to play games at 1080p ultra?

**OR**

Will you buy a \$50 dollar processor and a \$200 dollar graphics card for some small editing work or internet surfing?

Your PC will suck! Therefore follow a particular pattern that I will show you on how to spend money on each component depending upon your goal.

What is your goal? Is it to build a simple multitasking computer OR an awesome gaming computer?

If your goal is to build a multi-tasking computer, then you should opt for a very good processor. It should be at least a quad core. But if you want to build a gaming computer, you should opt for at least a dual core

processor and a more powerful Graphics card.

You can completely skip a graphics card if you only do some casual gaming like Minecraft or Counter strike but to play AAA titles, a powerful graphics card is needed.

**For Building a multi-tasking Computer you should spend money like the following patterns:-**

**For Budget \$300 to \$500**

Processor(quad core-octa core)	\$50-\$250
Motherboard	\$50-\$100
Ram(4gb-8gb)	\$25-\$50
Graphics card	Not Required
Hard drive(250gb-1tb)	\$20-\$50
Power supply(350w-450w)	\$20-\$40
Cabinet	\$20-\$40

**For Budget \$600 to \$1000**

Processor(quad core-octa core)	\$100-\$400
Motherboard	\$80-\$200
Ram(8gb)	\$50.00
Graphics card	Optional
Hard drive(1tb)	\$50.00
Solid state drive(120gb-500gb)	\$50-\$200

Power supply(400w-550w)	\$35-\$60
Cabinet	\$30-\$50

There is no need to spend more than a thousand dollars on a normal multi-tasking computer. You will get more than what you want. But for a gaming computer take the following list as your plan to buy the components:-

### **For Budget \$300 to \$500**

Processor(dual core-hexcore)	\$50-\$120
Motherboard	\$50-\$100
Ram(4gb-8gb)	\$25-\$50
Graphics card(1-2gb Gddr5)	\$70-\$170
Hard drive(250gb-1tb)	\$20-\$50
Power supply(350w-450w)	\$20-\$40
Cabinet	\$30-\$50
DVD drive(Optional)	\$20.00

### **For Budget \$600 to \$1000**

Processor(quad core-octa core)	\$100-\$270
Motherboard	\$80-\$150
Ram(8gb)	\$50.00
Graphics card(2gb-8gb gddr5)	\$180-\$350
Hard drive(1tb-2tb)	\$50-\$70
Solid state drive(120gb)	\$50.00
Power supply(450w-600w)	\$45-\$60



Cabinet	\$45-\$100
DVD drive	\$20.00

### For Budget \$1000 to \$2000

Processor(quad core-octa core)	\$270-\$500
Motherboard	\$150-\$300
Ram(8gb-16gb)	\$50-\$100
Graphics card(4gb-8gb gddr5)	\$350-\$650
Hard drive(1tb-3tb)	\$50-\$100
Solid state drive(120gb-500gb)	\$50-\$200
Power supply(600w-850w)	\$60-\$120
Cabinet	\$50-\$150
DVD drive	\$20.00
Custom Fans(additional)	\$10-\$40
Custom cpu cooler(recommended)	\$30-\$100

### TIPS:-

*For a Gaming computer which uses a dedicated graphics card, never ignore your power supply. Buy only a reliable power supply from a trusted company like Corsair, Cooler Master, Seasonic, Evga , Rosewill, thermaltake or silverstone. There are others which produce good power supplies but I recommend these brands.*

*For building a high end gaming computer try to get a custom CPU fan if you are planning to overclock your cpu as the stock cpu fan sink will not help at all. It would be great if you buy a hydro cooler.*



# Chapter 5: Choosing the Right Components

## Choosing the Right Processor

Of all the components, you should make your budget to buy a good processor. You shouldn't make the graphics card your first priority in your system. Even if you have the most powerful graphics card, it's of no use if you don't have enough powerful processor that can unlock your graphics card's full potential. Therefore, a Powerful processor is always needed whether you build a Multitasking computer or a gaming computer.

Now, For a multi-tasking computer you should opt for a multi core processor which should be at least a quad core. Intel processors are more expensive when you compare their core to core price. Therefore if you are on a tight budget, then consider going with the AMD processors, they are also well worth the price.

For under \$100 you can get either a dual core Intel processor or a Dual or quad core Amd processor. My recommendation is to go with a quad core Amd processor if you are building a multi-tasking computer. The best processors for under 100 dollars in Amd are:-

1. Amd Athlon X4860k quad core
2. Amd Fx 6300 hex core

The First one which is X4860k is a quad core FM2 processor which is an older generation one and the second one is the Fx series 6300 six core processor which is AM3 processor and is one of the latest and powerful amd processors. X4860k costs around \$70 and the Fx 6300 costs around

\$100. Depending upon your budget, you can get any of them but recommended is fx 6300 as it has 2 more cores and you will have more options for upgradability. Fx 6300 can also be used in a gaming computer because many of the games like Far cry 4 need at least 4 cores to run and fx 6300 will do this job better than any other at the same price.

For a Gaming computer, you should opt for at least a dual core processor which should have a high single-core performance. As compared to the Amd processors, Intel processors deliver 1.5x times more single-core performance. Therefore try to get an Intel processor if you can. But in some cases it is also better to go with Amd ones as they have more cores.

For under 100 dollars you can get following processors which deliver the best gaming performance:-

- 1. Intel Core Pentium G4560 Dual Core**
- 2. Amd Fx 6300 Hex Core**

Again, you have two choices, depending upon the budget you can get anyone of them. Pentium G3258 is around \$70 and fx 6300 is around \$100. If you can manage the fx 6300, it will be much better because you will have 4 more cores. But On a budget like \$300 or \$400 for a gaming pc, Intel pentium g3258 is the king of all the processors. It is based on the same Haswell architecture which is used in high end core i5's and i7's.

Nevertheless, there are several experiments done on these processors. Most of the times Intel processors take a lead in gaming. But again, if you want more cores and want to make your gaming computer future proof, you can only do it with the Amd processors unless you buy a core i7 which can be very expensive.

For a price between \$150 and \$200, you can either get an i5 quad core processor or an 8 core Amd processor. Core i5 generally have more power and better single-core performance, but an 8 core amd processor is faster in multitasking.

For updated list of best processors head to my page:-

<http://www.xtremegaminerd.com/components/best-processors/>

Here you will find the best processors for gaming for every budget. I update these lists time to time.

***“Now you are ready to buy your Processor”***

## Choosing the Right Motherboard

You have to select your Processor first. After that comes your motherboard. You just don't go and choose your motherboard first and choose a processor according to it.

Now if you have chosen an Intel processor you have to buy an Intel Motherboard and same goes for Amd. For a budget build ranging from \$300 to \$500, you should never go with a motherboard that costs more than \$100.

You must define your goals first, what features do you want in your gaming pc.

*Do you want to have a lot of fans, SSD's, Multiple graphics cards in your system?*

**OR**

*You just want to add one graphics card, one or two Hard drives, one fan?*

According to your aim, your motherboard can be selected easily.

Suppose you want to build a 300 dollar pc, you can not go and buy a full ATX motherboard with a lot of SSD ports, USB 3.0, SATA 3.0 ports and 4 PCI E x 16 slots otherwise you will only have 100-150 dollars left in your hand.

Similarly if you build a \$2000 gaming pc you shouldn't be buying a Mini Itx motherboard containing only One PCI E x 16 slot, two DIMM slots and 2 SATA 3 ports.

For building a tight budget gaming computer, get a Mini-ITX or a Micro-ATX motherboard. That's it, you can install one to two graphics cards in it according to the features given, add some hard drives and SSD's to it and can also add some additional fans to your system.

For building a mid end or high end gaming computer, you should opt for an ATX motherboard that must have support for at least doing either two way CrossfireX or two way SLI of Amd and Nvidia graphics cards respectively.

For updated lists of best motherboards head to my page:-

<http://www.xtremegaminerd.com/components/best-motherboards-3/>

***“Now you are ready to buy your Motherboard”***

## Choosing the Right Memory

Your whole system's speed depends upon your Ram. If you don't have enough ram your Cpu, graphics card and other components will bottleneck.

Suppose you want to play Battlefield 4 which requires at least 4gb Ram, you play it on just 1 Gig. Will it run? Of course not. Even the recommended requirement of the Game is 8gb. But 4gb is also fine but still it will make your games stutter.

Now, you have two choices:-

Either you have to buy a ddr3 memory or a ddr4 memory depending upon your system. DDR 1 and DDR 2 are no longer good for computers. If you are building an entirely new gaming system that will cost you \$500 or above, then there is no reason to choose DDR3 system over DDR4 one. Except if you go with Amd Fm2 or Am3 systems.

Now the question is ***“How much ram do you really need?”***

**The answer is:-**

If your budget of whole pc is around \$250-\$300, then you should only use a 4gb of ddr3 Ram so as you can save your money for the other components. But above \$350, there should be no compromising with the memory. You must buy a 1x8gig or 2x4gig of Ram sticks. 8Gb of Ram is enough for today's games. Your system will be enough fast to run every hard and graphical intensive application or game.



If your budget is above \$1000, then you may consider going up to 16gigs but that is not necessary, 8gb of ram will be perfect for any high end build.

Now comes the next point:- *“How much speed your Memory should have?”*

There are a lot of differently clocked memories, commonly from 1000Mhz upto more than 3200Mhz. But for gaming the ideal number is 1600Mhz for ddr3 memories. If you go below it your system will get a very small decrease in performance that will be not noticeable and if you go above 1600Mhz, then your system will have no effect whatsoever.

But if you go with ddr4 memories, then 2133Mhz is the starting point and as you go up, the cost will increase but in some cases highly clocked ram's are better for gaming if you are just playing on intel hd graphics or using applications like Winrar. But that's an optional choice. 2133Mhz or 2400Mhz ram will be fine for any build.

The next point:- *“Which brand of Ram should you choose?”*

There are a lot of brands right now, most of them are exclusively available for ddr4 memories. For ddr3 memories you will find Corsair Vengeance, G.skill ripjaws, Crucial ballistix, Kingston hyperX etc.

For ddr4 memories you will find these brands as well as some unheard brands like Patriot, Hynix, Mushkin etc. But I recommend only the Above ones for both ddr3 and ddr4 memories.

To get the best memories, check out my articles:-

<http://www.xtremegamainerd.com/best-gaming-ram-ddr3/>

<http://www.xtremegamainerd.com/best-ddr4-ram-for-gaming-guide-to-best-performance/>

These are the best memories you will find currently on the market which offer some really good performance. They also come with good Heat spreaders for heat dissipation and Life Time Warranties.

***“Now you are ready to buy your Memory”***

## Choosing the Right Graphics card

Now this component is the most effective one in a gaming computer. If you are building just a multi-tasking computer than it is an additional component. But it is the heart for a gaming pc. You can never play high graphical intensive games without a good dedicated graphics card. Your whole pc's performance is dependent on this component most of the time. There are games like Tomb Raider 2013 which is totally gpu dependent. Whether you choose your cpu as Pentium g3258 or a core i5-4690k or a core i7-4790k, the fps will be the same in this game if you have the same graphics card.

For buying the right graphics card, there are 4 crucial steps that must be taken which are:-

- 1. Knowing your budget**
- 2. Knowing the Specs of a graphics card**
- 3. Comparing the similar graphics cards with similar prices**
- 4. And finally Real Benchmarks**

*Let me Explain these stuff*

### ***Knowing Your Budget***

Suppose you have a budget of 400 dollars for your pc. How much should you spend for a Graphics card? \$50,\$100,\$150 or \$200?

It is a tough choice sometimes. For a budget of 400 dollars for a gaming pc, you can spend \$50, \$100 or \$150 but then, will you have enough

budget for other components?

This is an important point! Now you don't have to look for the perfect number, I have already made many tables for different budget computers previously. You can refer to them any time.

*\*Note:- A good graphics card generally costs more than 100 dollars upto more than 500 dollars. Now it's upto you what type of performance do you want? You can easily play any game at 1080p from medium to high settings on a >100 dollar graphics card”.*

But now you may have a question: “Will my cpu bottleneck my graphics card? ”

I will tell you it's answer in a single line:-

***“Buy a graphics card double the price of your Processor”***

Yes, you heard it right! If you buy a graphics card which costs double than your processor, then your processor will handle it easily.

Suppose, you buy a processor like AMD Fx 8350 which costs around \$150 and a graphics card double it's price like Gtx 970 4gb which costs around \$300. Your Processor will never bottleneck it. This rule applies almost every time.

***Knowing the Specs of a Graphics card***

Now you have defined your budget for graphics card, it's time to check each and every graphics card that is available in that price range. After collecting the whole list of graphics cards, check their specs carefully. You will get these specs to check:-

## **Memory Size, Memory Type, Memory Clock, Memory Interface, Core Clock, Stream processors/Cuda Cores, Power Consumption etc.**

Except power consumption, check that each of these specs should be high as possible. For Memory Size, a decent graphics card should have at least 2gb of memory and for better performance at 1080p and higher resolutions memory should be at least 4gb or more.

The memory should be Gddr5. Gddr3 memory is a lot slower than Gddr5 memory. Therefore if you have two choices: **A graphics card with 1gb of gddr5 memory and one with 2gb gddr3 memory or 4gb gddr3 memory, go for the 1gb gddr5.** It will perform a lot faster.

Similarly check the memory interface. A good memory interface is 128 bit and above. Also check the memory clock and most importantly the Core clock which should be near to at least 1Ghz.

***Compare the similar graphics cards with similar prices***

### **AMD R7 260X VS Nvidia Gtx 750 ti**

2048 MB	✓	vs	✓	2048 MB
1625	✓	vs		1350 MHz
MHz				
128 Bit	✓	vs	✓	128 Bit
GDDR5	✓	vs	✓	GDDR5
104GB/s	✓	vs		86.4GB/sec
no		vs	✓	2048 KB
no		vs		no

36%vs



30%

You will find two or more graphics cards costing almost the same but their specs will differ. One of them may have a gddr3 memory and the other one may have gddr5. One of them may have better core clock and the other one may have more cuda cores.

So check these specs carefully. The graphics card with higher and better specs should be your choice. And also check their power consumption. A graphics card may perform a little better than the other but its power consumption may be double than the other one. So, if you want a more economic graphics card that performs better and also consumes lesser power, you can go for that one also.

## ***Real Benchmarks***

When you finally compare the specs of similar priced graphics cards, the final job is yet to be done. Search on Youtube the benchmarks of each graphics card and you will find interesting results.

List of best graphics cards for every budget page:-

<http://www.xtremegaminerd.com/components/best-graphics-cards-for-money/>

***“Now you are ready to buy your graphics card”***



## Choosing the Right Storage

Now for storing your applications, you need a storage.

Storage Devices are of 4 types:-

- 1. FDD- Floppy Disk Drive**
- 2. HDD- Hard Disk Drive**
- 3. SSD- Solid State Drive**
- 4. USB- Universal Serial Bus**

Out of these 4 devices for storage, you can only use two as your permanent storage devices. One is HDD and one is SSD. FDD are no longer supported by any latest motherboard. Therefore you have to either choose the Hard disk drive or a Solid State drive.

As I have mentioned earlier hard drive is of two type:-

- 1. IDE- Integrated Disk Electronics**
- 2. SATA- Serial Advanced Technology Attachment**

The IDE hard drives are the older generation hard drives which I have shown previously therefore now is the time for using SATA hard drives only. A SATA hard drive can have memory from 80gb upto 8Tb. The minimum requirement for day to day use is 500Gb or 1Tb but depending upon your total budget you can also get a 250gb hard drive if you have only \$250 in total for your whole pc.

Now, What about SSD? Shouldn't you use it as well?

Yes, but a SSD costs much more than a SATA. If you get a 1tb of SATA hard

drive in 50 dollars you can get the SSD in same price but only 120Gb in size. Therefore it is not a necessity. It is for either mid end gaming pc's or high end gaming pc's.

But if you do not play games and have smaller programs that require less space, then it's your wish otherwise it will make no difference whether you use a 120gb SSD or 1Tb HDD. The only difference is the speed. SSD is around 10 times faster than the HDD. But it will only enhance your Applications loading times and windows booting times. Your games will have no effect whatsoever. Therefore consider going with the HDD instead of SSD.

Or if you can afford both, then it's good to buy 1Tb of HDD with a 120Gb/250Gb SSD. I have already mentioned how you should spend your money on storage devices on different budgets in 4<sup>th</sup> chapter.

### ***Best Hard drives:-***

The best hard drives are from Western digital and Seagate.

You can buy from any of these two. They produce the same type of hard drives with good reliability and provide 2 years of warranty. The best hard drive is the one which has 64mb of Cache and 7200rpm(Rounds per Minute) of speed.

But one more thing you need to take a look at. Western Digital produces 5 types of hard drives:-

- 1. WD Blue***
- 2. WD Green***

**3. *WD Black***

**4. *WD Purple***

**5. *WD Red***

All of these have different purposes. Except the Purple and the Red one you can use any of the first three hard drives. Western digital Blue is the most commonly used in the pc's because it delivers balanced performance whereas the Green one is economic and a little bit slow but consumes less power. The Black one is the fastest but uses more power and produces more sound and costs much more. Therefore the best budget one is blue, otherwise black is also a good choice.

For SSD the best brands are Samsung, Kingston, Sandisk and Crucial. I have provided some of the best storage devices in a post you can check out from link below.

<http://www.xtremegaminerd.com/best-storage-devices/>

***“Now you are ready to buy your storage device”***

# Choosing the Right Power Supply

For powering every component you need a power supply. But Which power supply? You cannot put anything in your system and risk your all components. The truth is that this is the most ignored component of a computer but it is the only component which decides your system's reliability.

If you put anything cheap in your computer, your components like Graphics card, hard drives or CPU may get damaged due to over current or over voltage. Suppose you have build a massive \$2000 gaming computer and now you put a \$40 power supply from Zebronics or from any other cheap brand, you will regret. Because there is a very high risk of damage of your graphics card or any other component. Now you have invested more than 300 dollars for your cpu, more than 500 dollars for your graphics card, how can you just ignore the power supply which decides your computer fate?

For knowing what a good power supply is you must know a few simple points. I will not lengthen power supply guide but will give you a brief explanation on how you can get a good power supply by following these “SIX” simple steps:-

- 1. Calculate the Tdp of each and every component that you will be using and according to that buy a power supply that has at least 100-150 watts more.**
- 2. Choose power supplies from Trusted brands like Corsair, Cooler Master, EVGA, Seasonic, Rosewill or Thermaltake.**

3. Choose the power supply with Continuous Power supply Feature and Never ever buy a power supply that only has Peak Power supply feature.
4. (Recommended) Try to get a power supply which uses 100% Japanese capacitors.
5. The power supply must have at least 80+ efficiency.
6. Check how many Power connectors you need for your components and according to that buy your power supply as some power supplies don't have as many power connectors that you will need.

These are the six simple steps which will get you the best power supply for your system.

<http://www.xtremegaminerd.com/best-pc-power-supplies/>

***“Now you are ready to buy your Power Supply”***

## **Choosing the Right Computer Case**

After you have verified what you will be buying now is the time to check the best computer cabinet for your build. Now remember that computer cases are of three types based upon the form factors of the Motherboard. Whenever you buy a cabinet you buy it according to your components especially your motherboard.

If you buy a case that does not support the form factor of your motherboard then your money has gone waste. And if your case supports your motherboard then eventually your case will also support your components if you have bought according to the instructions above. A computer case has three form factors:-

- 1. Mini-ITX**
- 2. Micro-ATX**
- 3. ATX**

**Or**

They come as:-

- 1. Micro-ATX and mini Tower**
- 2. Mid Tower**
- 3. Full Tower**

If you have bought a motherboard that is MINI-ITX then you can buy either a Micro-ATX mini Tower or a Mid Tower. If you have bought an micro ATX motherboard or a ATX motherboard then a Mid Tower case can support both types of Motherboards.



But Generally a Mid Tower case also supports a Mini ITX motherboard. You must check the specifications of a particular case before buying.

Now a motherboard that is either ATX or EATX, Full Tower is the way to go for it. You can also buy a Mid Tower for ATX but if you have a good budget, then you should opt for a Full tower.

*TIP:-*

*“If you have a Mini -ITX motherboard then recommended is the Mid tower because most of the Mini ITX towers don't have enough space to install every component easily. You might get annoyed when installing your graphics card or Power supply. The second disadvantage of a Mini ITX tower is that you can not upgrade your system except your Processor or Graphics card which should also be short. But in a Mid tower you are free to install multiple components and wiring is also easy.”*

The next thing you should consider is the ventilation feature of the case. If your case is compact then it should have at least 2-3 fan mounts at the side panels, bottom/rear or at the top. If the case doesn't have fan mounts and ventilation areas all over the case, then your system will heat up much faster.

The case should also have enough hard drive mounts and SSD mounts for further upgrades as you don't change your components frequently.

And lastly see whether your Case has a good cable management system. I have seen many cases but not every case comes with a good cable management system. If you just put your cables on to your processor and graphics card then your system will not only look ugly but can create many problems such as any of the psu's wires can go into the Cpu fan or

Graphics card's fan.

A neat and tidy system also generates less heat and that is all achieved by a case that has several holes in its mounting plate on which the motherboard is mounted.

<http://www.xtremegamined.com/components/best-gaming-cases-2/>

*“Now you are ready to buy your Computer Case”*

## Chapter 6: Tools Need to Build Your Computer



Don't get scared by the above tools. Yes, of course these are the recommended tools to build your computer safely and easily But many of these are completely useless.

Like Cutter and anti-static wrist band. Yes these are preferable but what use will you have of a cutter. You don't have to cut your motherboard or wires. Anti-static wrist band is only used if your system is turned on and electricity is flowing through the components. But you will not assemble your computer while powering your system at the same time.

Screw Drivers and Screws are the only things you need to have in order to build your pc. Screws will come with the components and you don't have to buy them separately.

Your case comes with screws that are used to mount your motherboard,

graphics card, Hard drive, Optical drive etc. But your Smips comes with different screws separately. The screws of Smips are generally bigger.

The screwdrivers used for assembling system is generally smaller in size. So, there will be no problem at all in getting one. You can assemble whole of the computer with only one screwdriver.

I used the following set of screwdrivers:-



The above two screwdriver bits will do the job easily. But you may use magnetic screwdrivers because sometimes when the screws fall inside

the case, it becomes difficult to pick them up with hands. Magnetic screwdriver will lessen your effort in screwing these small screws.

## Chapter 7: Getting started

Now, it's time. You have all the tools and all the components to build your gaming computer. All you need is confidence and after reading the whole guide of assembling computer, you will easily build your computer without any assistance.

Take a clean table that should be enough wide to put all of your components and wisely put all of your components on it. Now you are ready to go.

But before starting assembling your pc, you need to know where to start from. You cannot just start from installing a graphics card or wiring stuff. Take simple and easy steps. Take the most easy one first and then the next one until you build your whole computer.

We will be building the computer step by step in the following manner:-

**Step 1: Installing the CPU and Heat sink**

**Step 2: Installing the Ram**

**Step 3: Mounting the Power supply**

**Step 4: Mounting the Motherboard**

**Step 5: Installing the Hard drive and Optical drive**

**Step 6: Cable management and Wiring**

**Step 7: Installing the Graphics card**

**Step 8: Finalizing**

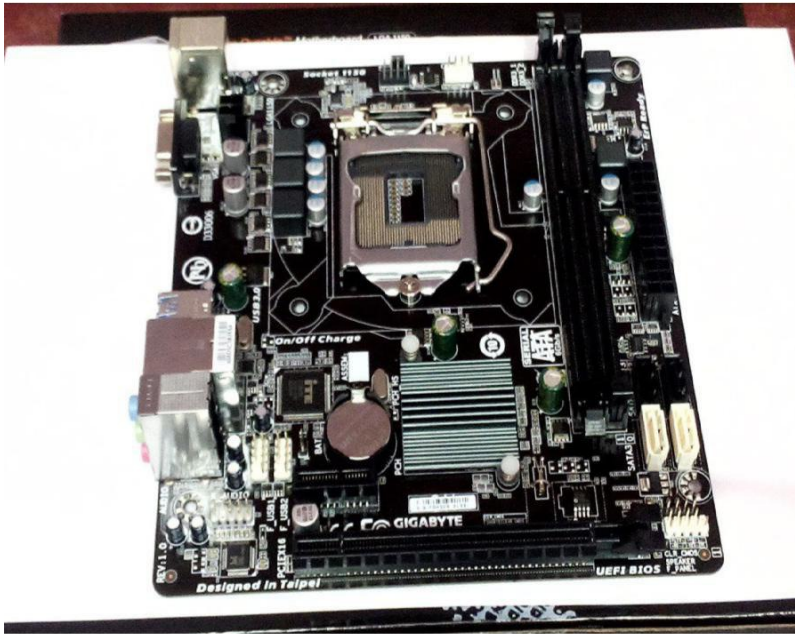
These 8 steps will be executed in sequence and these are the simplest and easiest way of assembling a computer which will not let us into any type of trouble.



# Chapter 8: Installing the Cpu and Heat Sink

Installing the Cpu and Heat sink is the first step you have to do in order to start building your computer.

Just take a look at my motherboard and the Cpu I am going to install.

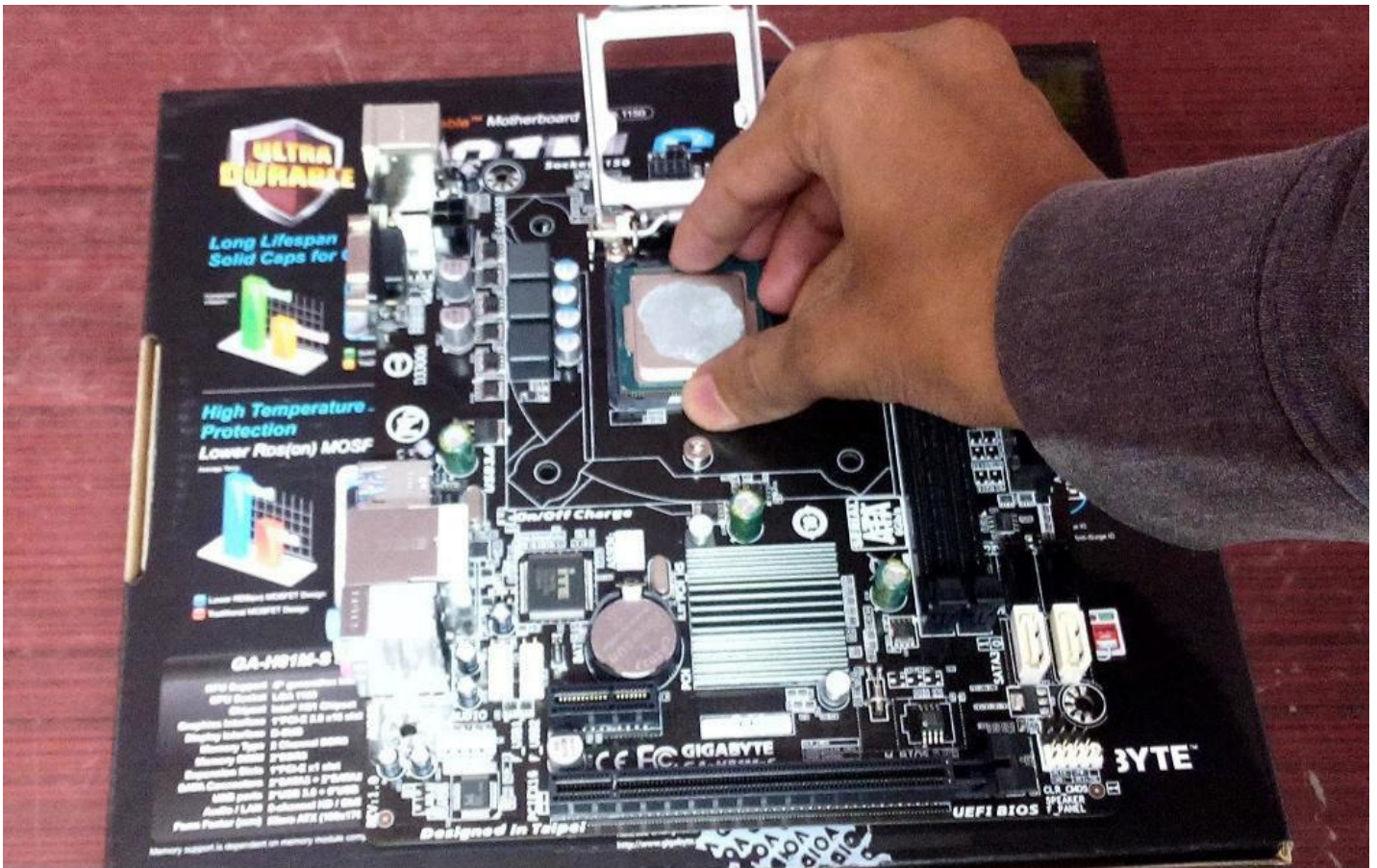


**STEP 1:-** Put the motherboard on the box in which it came so that it's PCB may be protected from scratches.

**STEP 2:** Take the Processor in your hand and apply a thin layer of thermal paste all over it.

*Note:- “Thermal or compound paste comes pre-applied on the heatsink and it's necessary as it covers the gap between the processor and the heat sink to cool it better. You may have to apply thermal paste after a few months as sometimes the thermal paste gets dried up and your computer starts to hang.”*

**STEP 3:** Open the latch of the processor socket on the motherboard and put the processor according to it's alignment.



Just put it gently and don't apply any type of pressure on it. It will fit itself in the socket as you drop it.



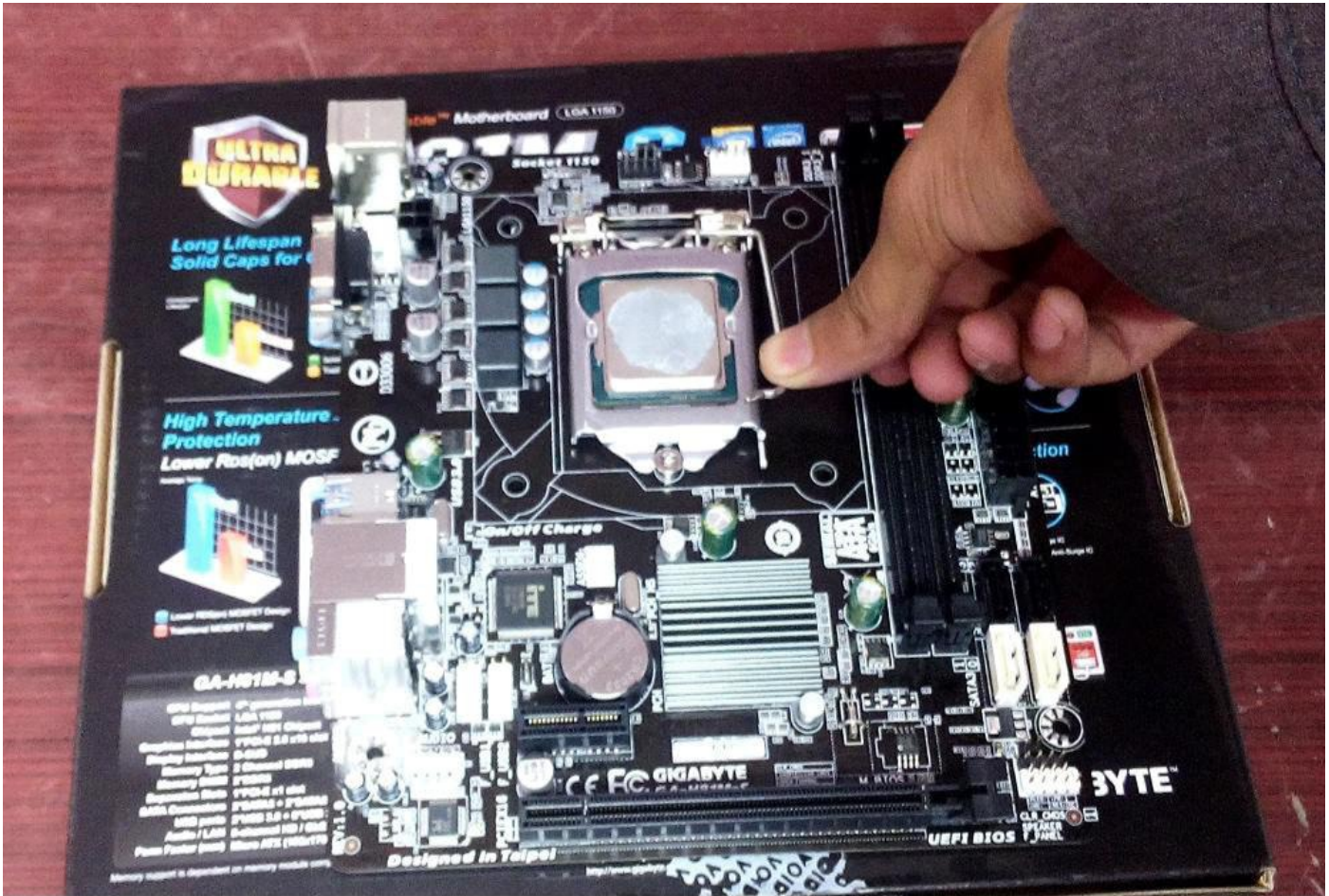
Now to know how the processor is aligned, you have to know that there are two ways to get it in the right way:-

- 1. See the small triangular cut on motherboard socket at on of the edge and you will find a small golden triangle on the processor also which tells you to align that arrow to the triangular cut on the socket edge.*



- 2. Second way is to align the processor according to the two cuts at it's top left and right as you can see in the image above.*

**STEP 4:** Close the latch by pressing down the pin and it will automatically tighten the latch and will not allow the processor to get loose.



**STEP 5:** Now is the time to install the heat sink. Just take the heatsink and put it according to the screwholes in the motherboard. The heatsink comes with the plastic screws and are tighten by pressing and rotating these screws.

Just press them first and then rotate them in clockwise direction. Then again press them to ensure that they are tight enough.

Try to pull the heatsink and see whether it is tight or not. If it doesn't move then you have successfully installed the heatsink.

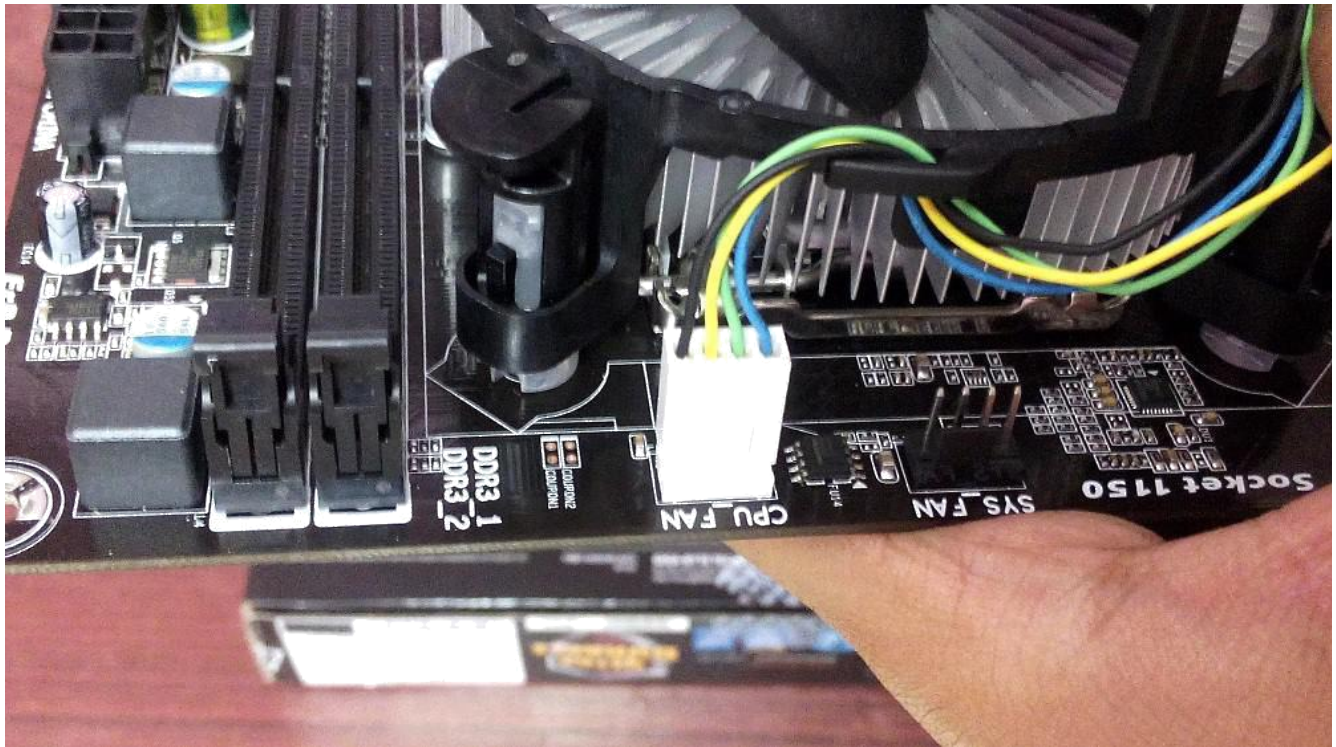




**STEP 6:** Now connect the 4 pin power connector into the 4 pin power port present on the motherboard. You will find it nearby your cpu heatsink. In my motherboard it is above the heat sink and may or may not be at the same place in your motherboard.

The 4 pin power port will be recognized easily by the name written above or below it which will be “**CPU FAN**”.

Just connect it according to the port and connector plastic. You will easily be able to put it in the port.



*“Congratulations, you have successfully Installed your Processor and Heat Sink”*



## Chapter 9: Installing the RAM

This part is the easiest of all. Installation of Ram can be done in a couple of seconds.

**STEP 1:** take your Ram and see the cut in between the pins.

The Memory I have taken has 240pins as it is a DDR3 Ram.



Now you will find one of the sides having more pins than the other. Similarly locate the cut in your DIMM slot of your motherboard. According to this cut align your Ram to the DIMM slot and you are ready to install it.

**STEP 2:** Open the latches of your DIMM slots which are situated at the ends and then put your Ram stick in it. Apply a little bit of pressure on your Ram and you will hear a clicking sound when your latches get automatically closed.



*Note:- “If you have a motherboard that has 4 DIMM slots and two Ram sticks, then install these sticks by leaving a DIMM slot in between. Your system will utilize your Ram sticks much better and the performance will be faster.”*

*“Congratulations, you have successfully installed your Ram”*



## Chapter 10: Mounting the Power Supply

This is a very simple step. Why I am mounting the power supply first because it will enable me to install other components easily. But suppose if I install motherboard first then it may create some issues installing the power supply but it all depends on your case.

Now Let's have a look at my case!



It's a mid tower that supports Mini ITX, Micro ATX and ATX motherboards.

Now remove the side panel of the case and lay down your case to mount your power supply more easily

**STEP 1:** For mounting the Power supply, just align it to the screws holes at the rear top of the case and slide the power supply from inside.

Now Tighten the screws diagonally.

Remember one thing that the screws used for the Power supply are bigger than those which we will be using for motherboard and optical drive.



These are the screws that are generally used for installing the power supply.



*“Congratulations, You have successfully mounted your Power Supply”*



# Chapter 11: Mounting the Motherboard

After you have mounted the power supply, it's time to mount the motherboard. For mounting the motherboard you have to be careful so as you don't damage the PCB.

**STEP 1:** Put the Stencil of the motherboard which came with it according to the ports. You have to put a little bit of pressure on it otherwise if you leave it loose, you will face difficulty in mounting the motherboard.

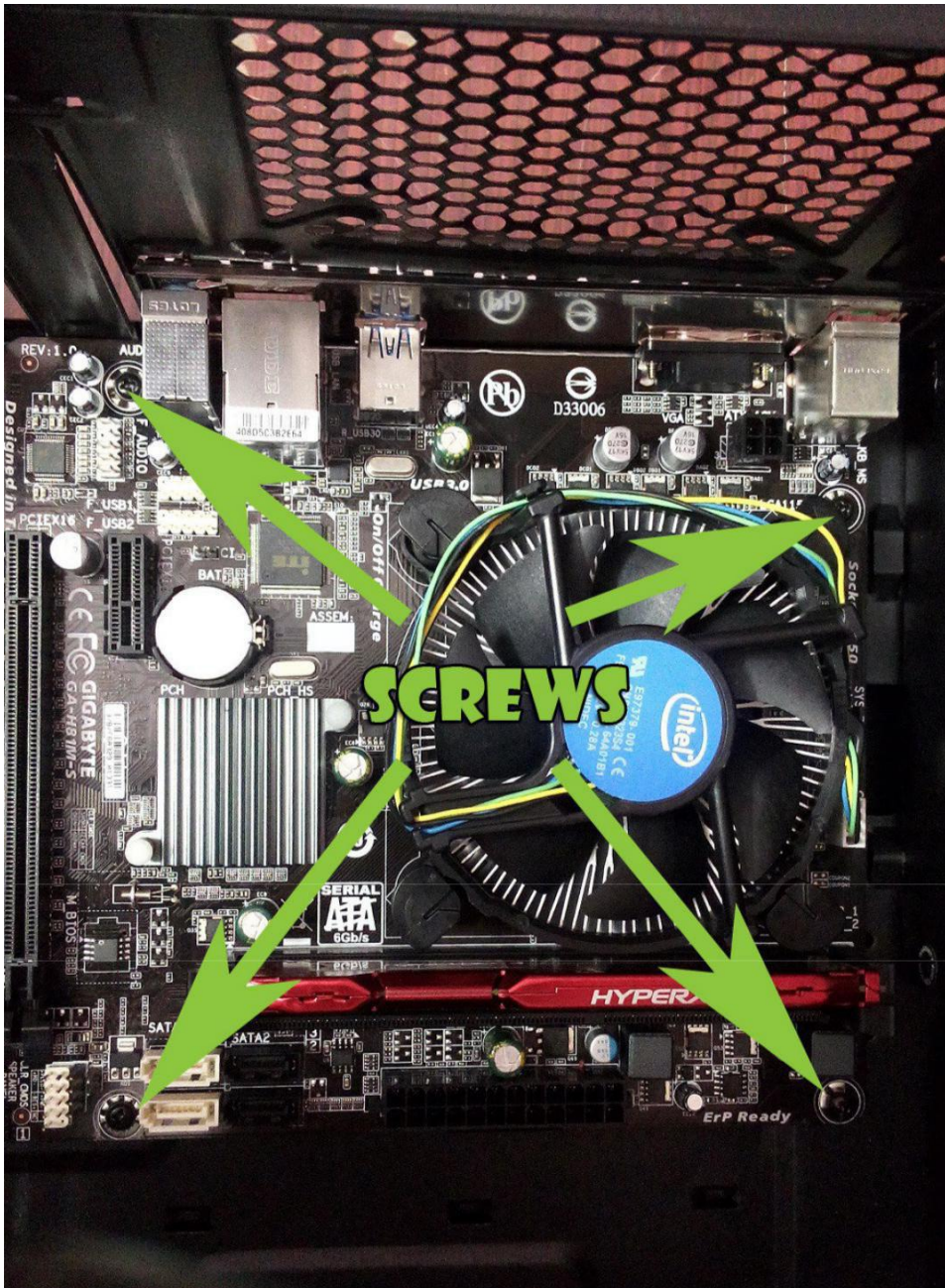


**STEP 2:** Take the motherboard in your hands and align it according to the holes in your stencil as shown in the above image.

Put the screws in the screw holes. Tighten them again diagonally and don't tighten the screws too much or your motherboard's PCB may get



damaged. Just tighten them enough so that your motherboard doesn't move. But don't screw so tight that you won't be able to take them off.



**Screws For  
Motherboard**

*“Congratulations, You have successfully mounted your Motherboard”*

# Chapter 12: Installing the Hard drive and Optical Drive

Hard drive and Optical drive are very easy to install. They both are installed the same way. Their wiring is also the same.

## Installing the Hard drive

**STEP 1:** Find the hard drive mounting in your case. There may be two or more mountings depending upon the size of your case. I have two mounting slots for hard drives.

**STEP 2:** Slide the hard drive into the case gently and it's screw holes will automatically align themselves according to the holes in the mounting slots.





**STEP 3:** Take the same screws which I used for power supply and screw into the screw holes present at the sides. In my case, I can put the screws at only one of the sides. If your case allows you to put the screws at both the sides, then it's better. Make them enough tight so that your hard drive doesn't move.

## Installing the Optical Drive

**STEP 1:** Optical hard drive is also installed in the same manner as the hard drive.

First remove the one of the plastic cover from the front of the case. Then Slide the Optical drive in it from outside. Now take the same screws that we took for motherboard and tighten them from both the sides.



*“Congratulations, you have successfully installed your HDD and ODD”*

# Chapter 13: Cable management and Wiring

This Part can be a little trickier. It's not difficult to do wiring but actually you can do more than just wiring. And that is Cable Management.

To make your build more neat and tidy, you need to hide the cables as much as you can. And sure good cases allow you to do so. But if you have a cheap case, then chances are very less, therefore always buy a case with good cable management.

## But How can You know that the case has this feature or not?

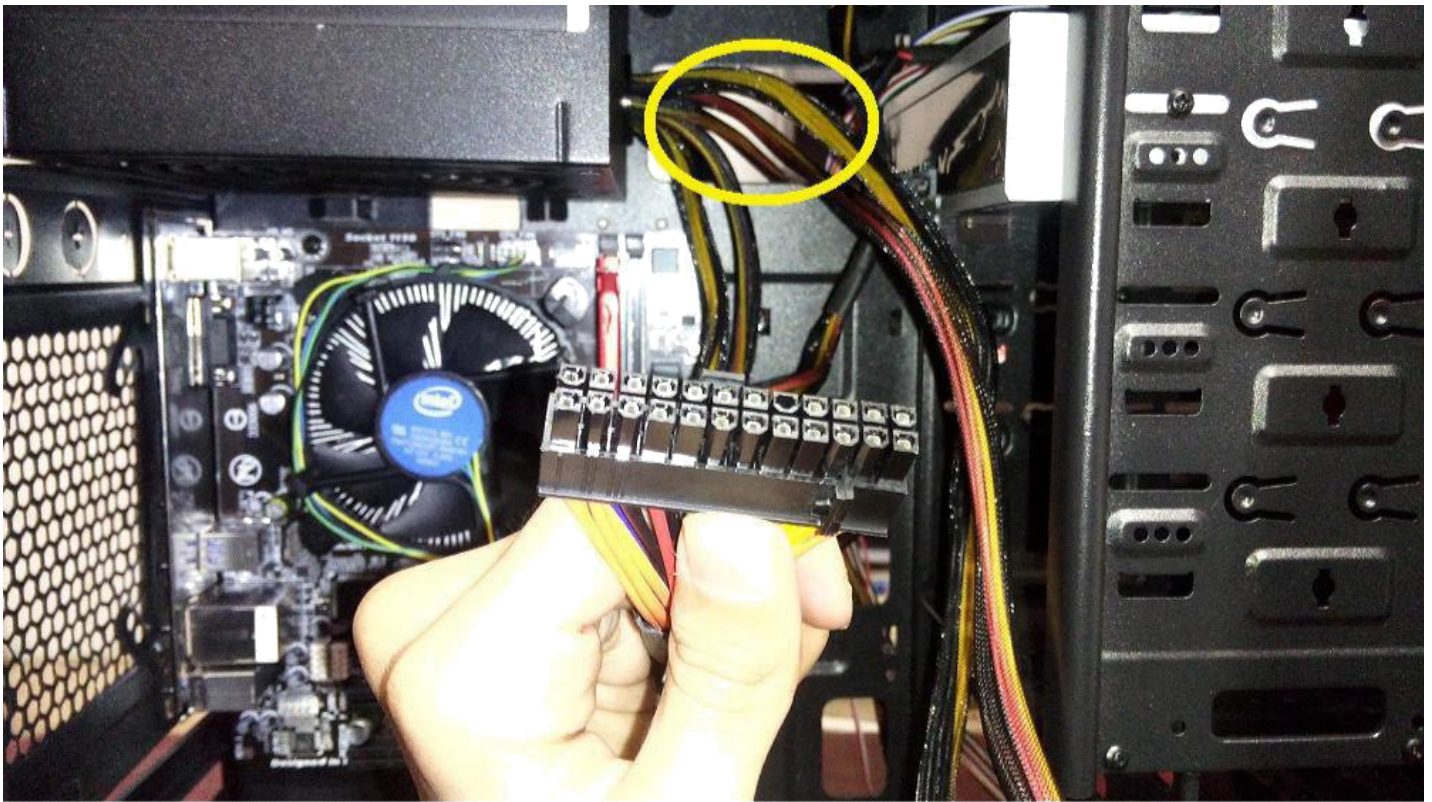
Well it's easy. Just look for grommets in the motherboard mounting plate. If it has several grommets from top to bottom from where you can make the way of wires/cables, then your case has a good cable management feature. (Note that every case has different design and their grommets will be present on different locations) Let's start it right away!

**STEP 1:** The first step will be to connect the 24 pin motherboard power connector to it's port. This power connector will supply the power to your whole motherboard.

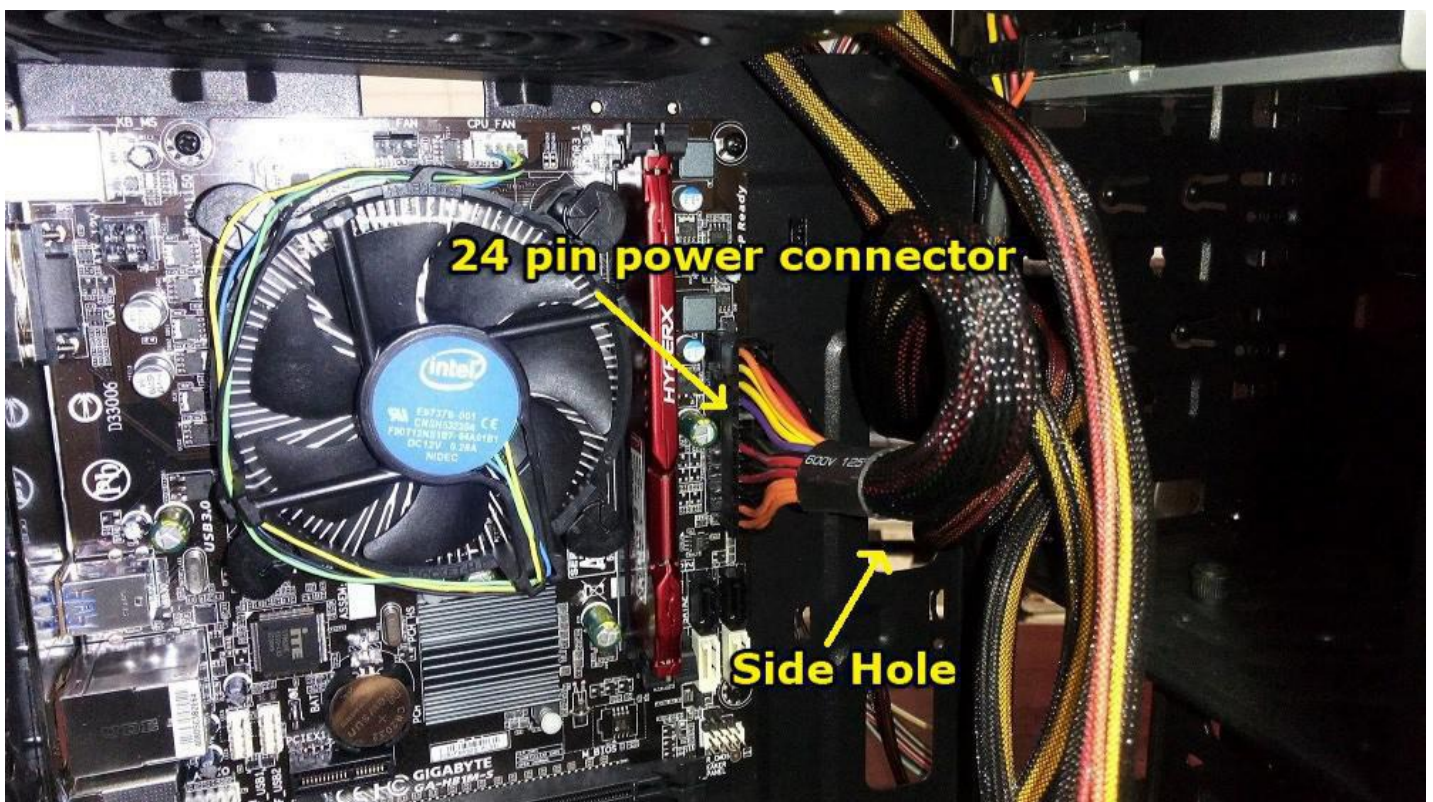
Make the way of this cable through the grommet to the side grommet of the mounting plate. That will reduce the length of the cable and will hide it enough so that it cannot get in your way when you connect the other power connectors.

Take one cable at a time, then make their way through that hole every time when you connect it to the motherboard or other components.



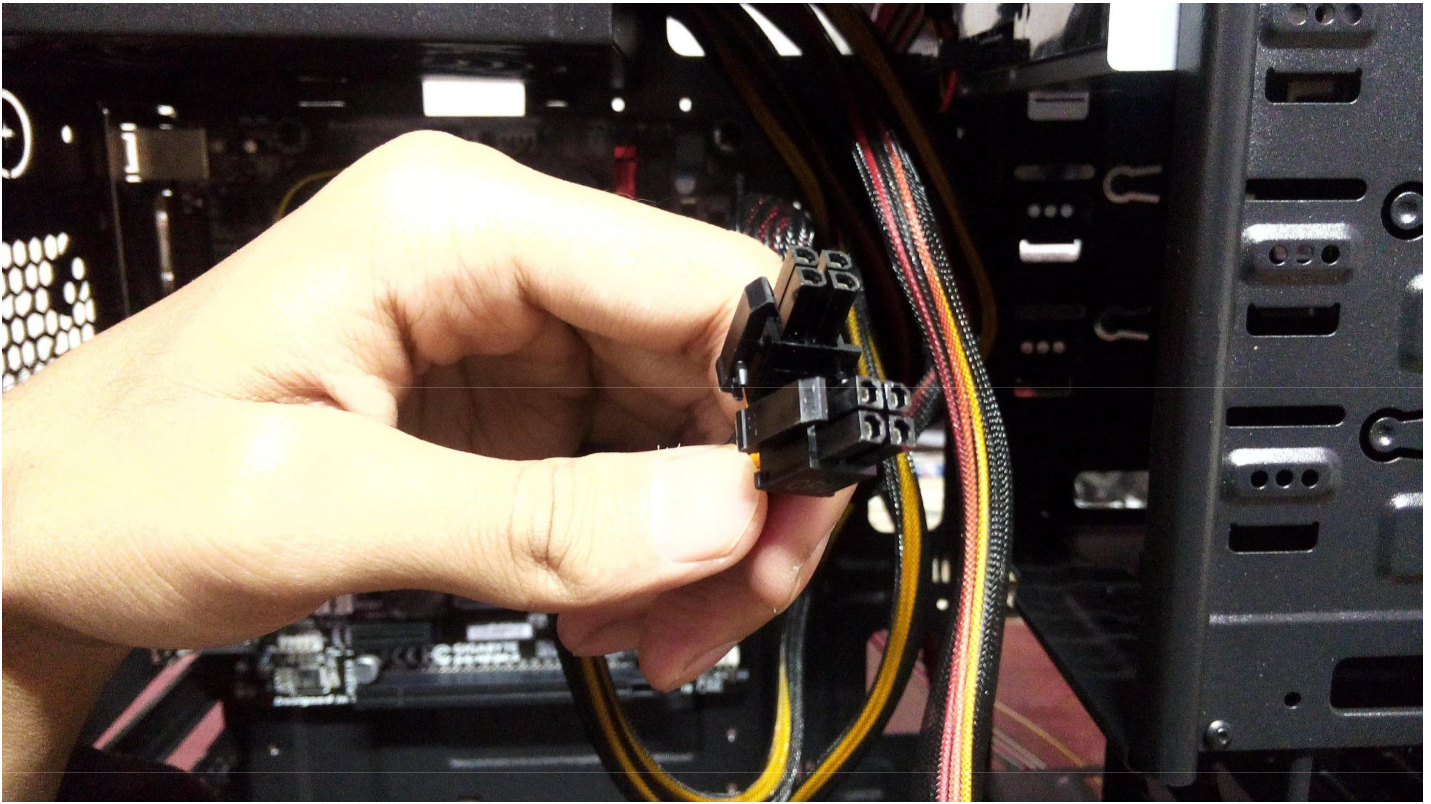


**STEP 2:** Connect it to the 24 pin power port present on the motherboard.





**STEP 3:** Now take the 4+4 pin power connector and make it's way again through the top grommet and take it out from the side one.

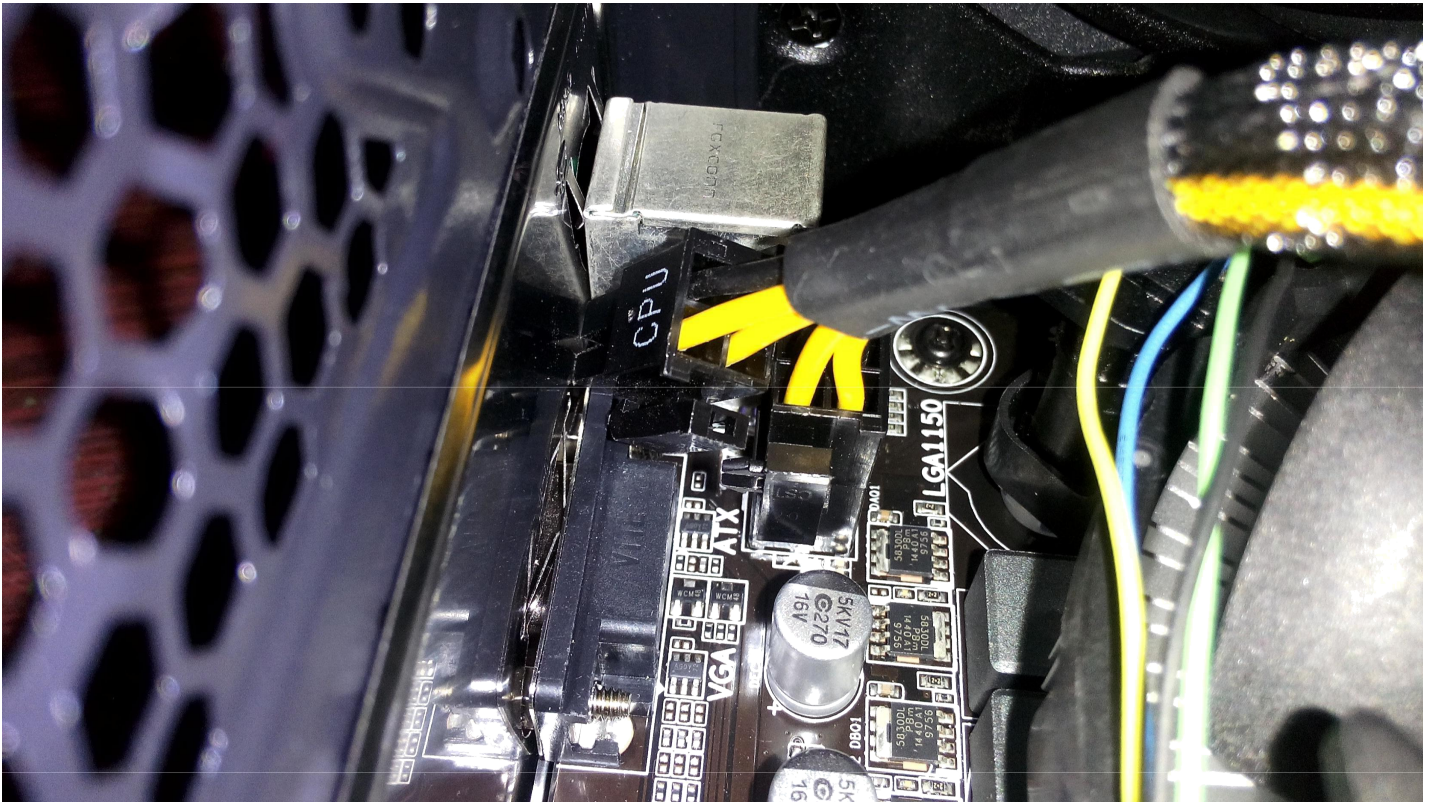


**STEP 4:** Connect one of the 4 pin connector to the 4 pin CPU power port. The name “CPU” will be written on the power connector so, it will be easy to recognize the cpu power cable from all the cables coming from the power supply.

Your motherboard may or may not have 4 pin power port as some motherboards have 8 pin power port for features like overclocking. In that case, you have to use 4+4 pin power connector.

The port will be situated nearby the cpu socket(Most of the times on top)





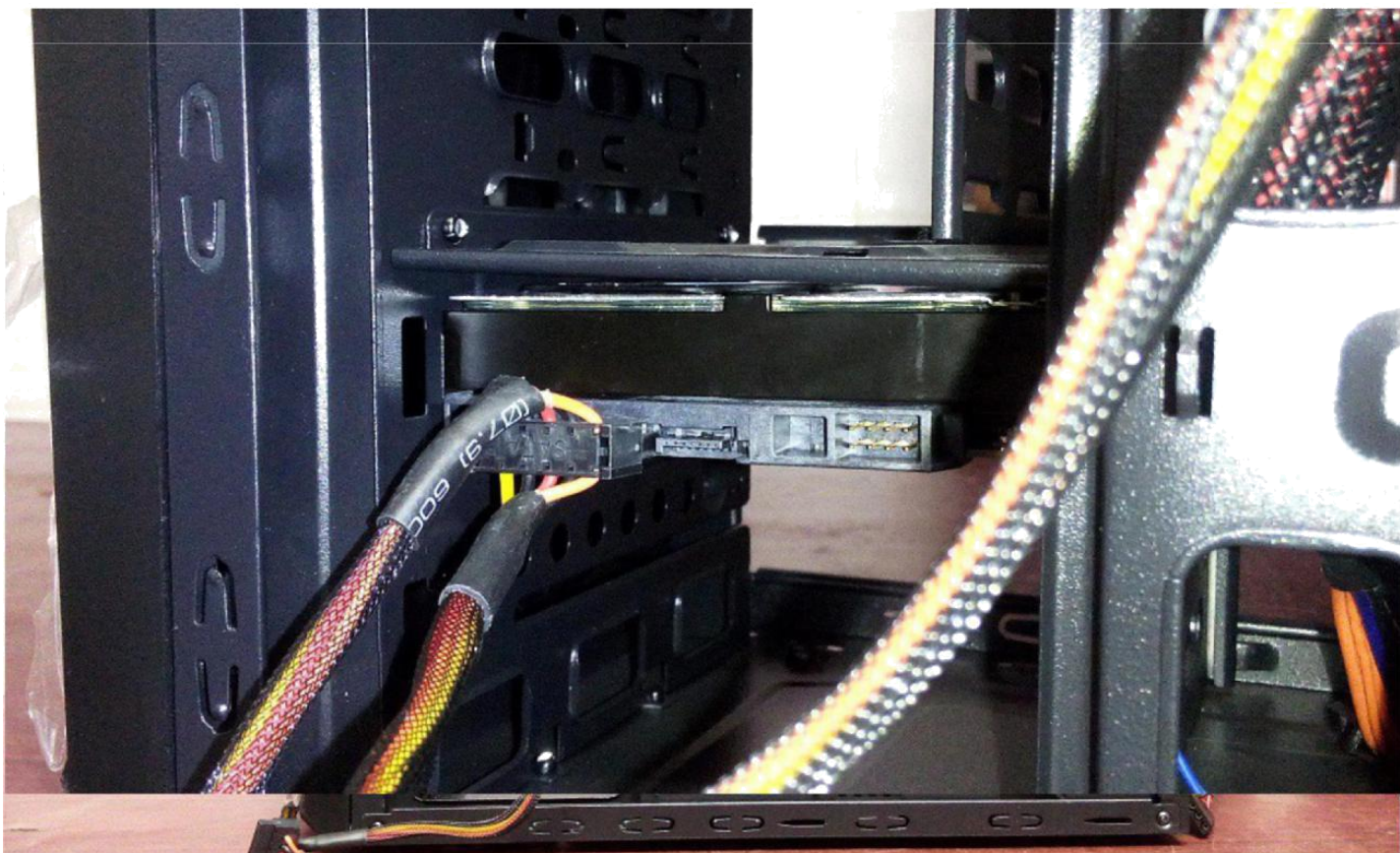
**STEP 5:** Now take the 15 pin Sata power connector from your PSU. Your PSU may have several 15 pin power connectors but you have to take that power connector which is long enough for reaching your Hard drive and Optical drive.

Connect two of them each to hard drive and optical drive respectively.

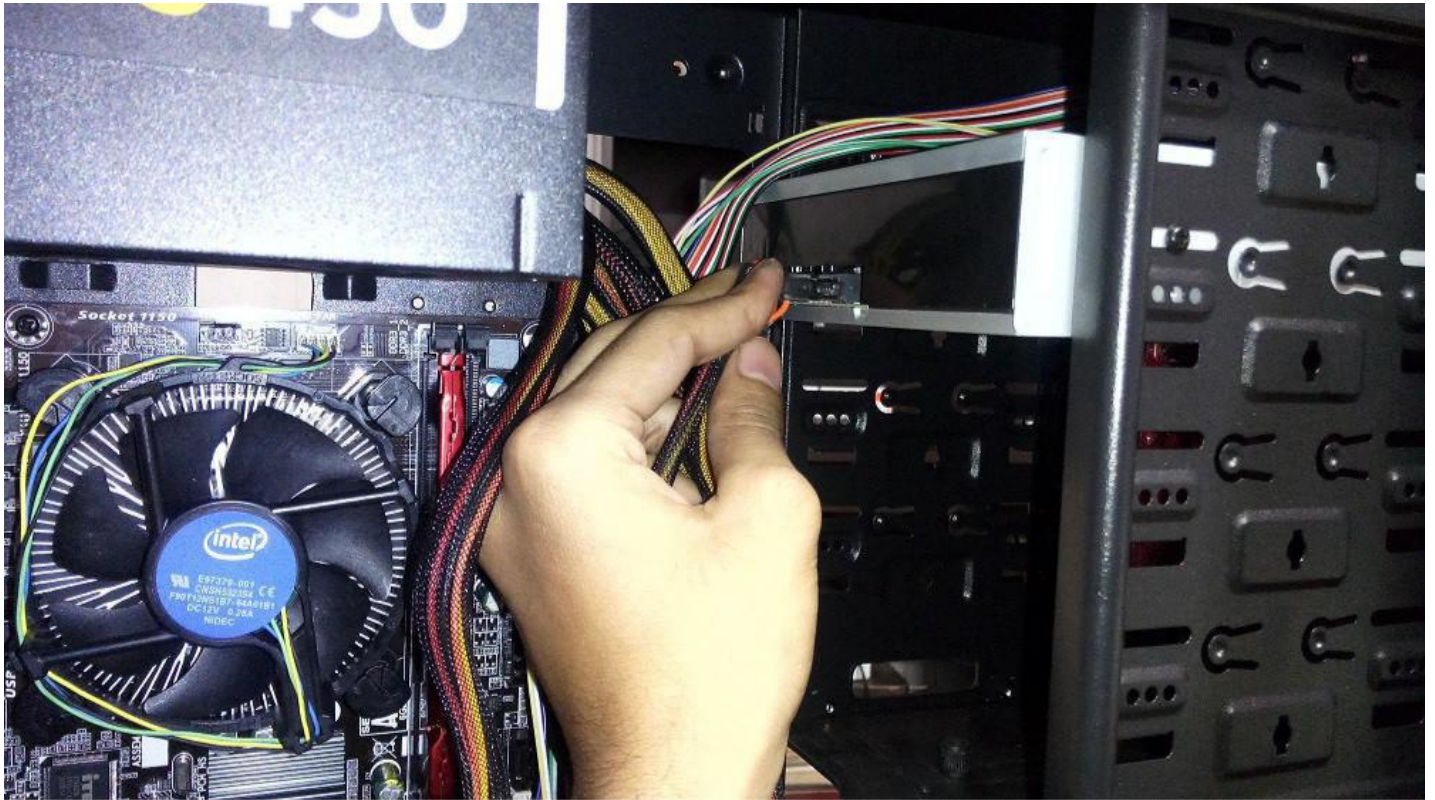
You will find their port at the left side and the right side port will be a little shorter. In my power supply I have 3 cables that have 15 pin power connector. Out of which 2 can reach the optical drive but only one can reach hard drive and that wire has 2 x 15 pin power connectors.

Below is the image of how a 15 pin power connector looks like:-

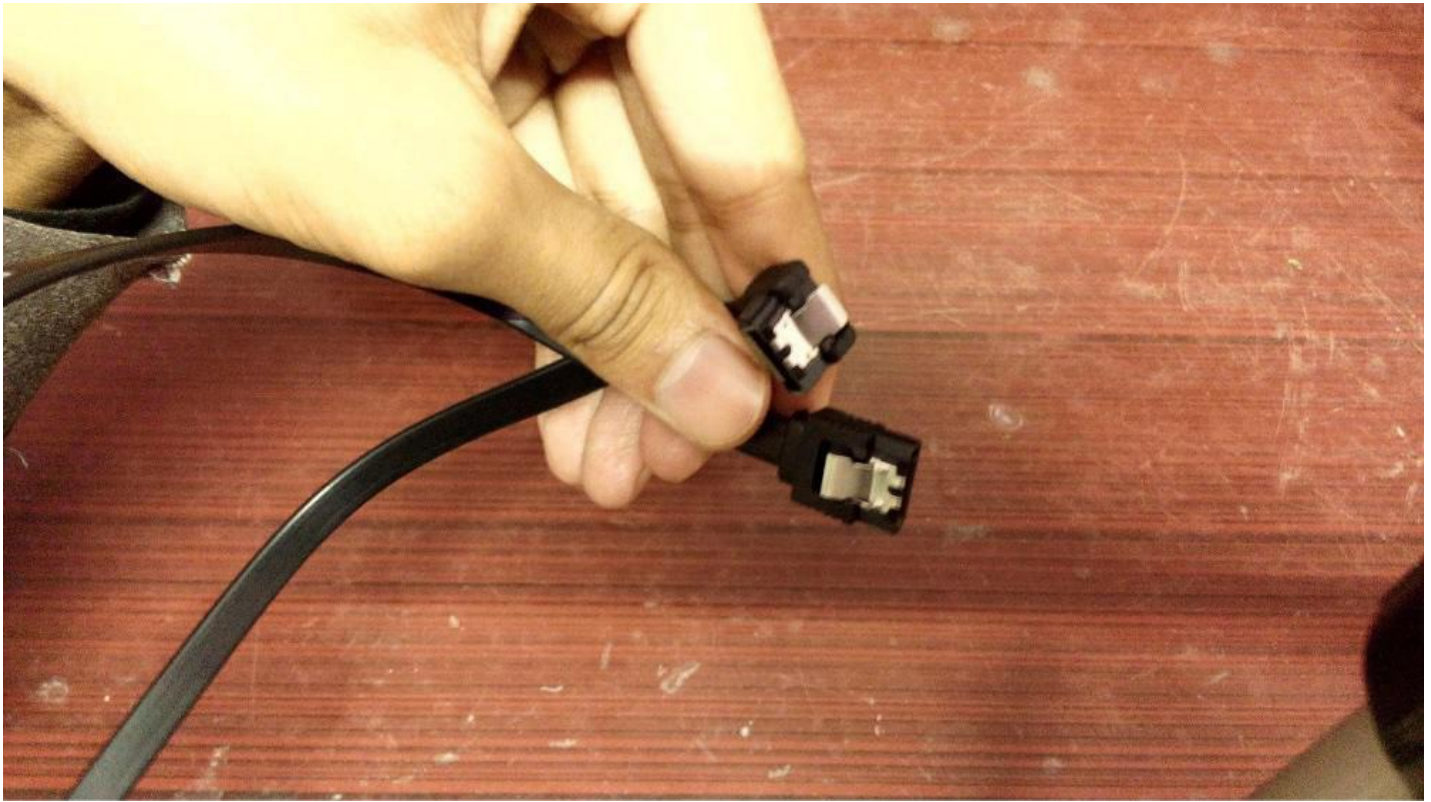




For connecting the power connector to the Optical drive you don't need to make the cable's way through the back hole. Just connect it directly.





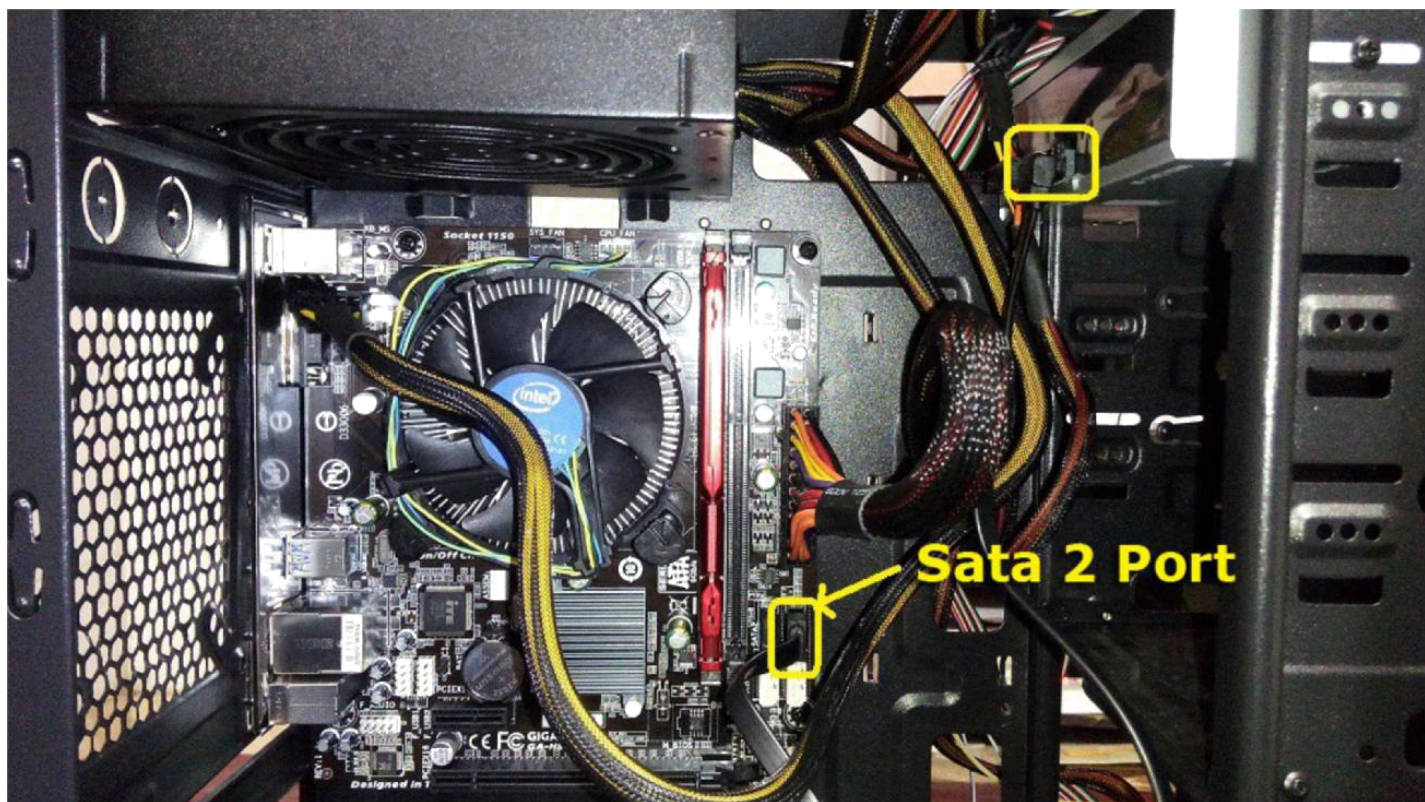


**STEP 6:** After connecting the power connectors to HDD and ODD, connect these drives to motherboard via following cable which you will be getting with your motherboard. One of these cables may have a “L” shaped connector at the end. Use this end for Optical drive or Hard drive according to your needs and easiness.

**STEP 7:** Connect one end to the motherboard's SATA 3/2 ports and the other end to the hard drive and Optical drive's SATA port.

Again make the way for hard drive through the back hole for proper cable management and connect the second cable to the ODD directly.

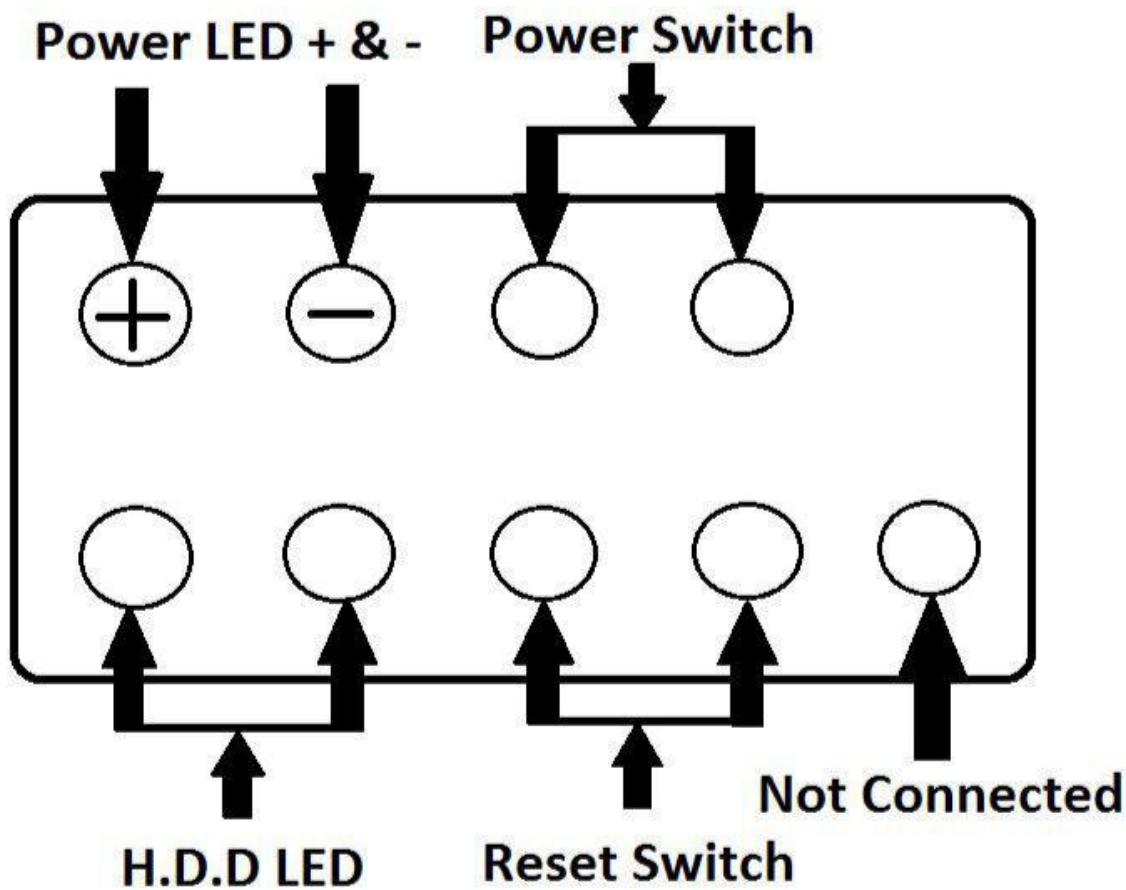




## Connecting the Front Panel power connectors

Connecting the front panel power connectors is the most confusing parts for newbies. But I am going to explain you how to do this and you won't forget it ever if you just followed my steps.

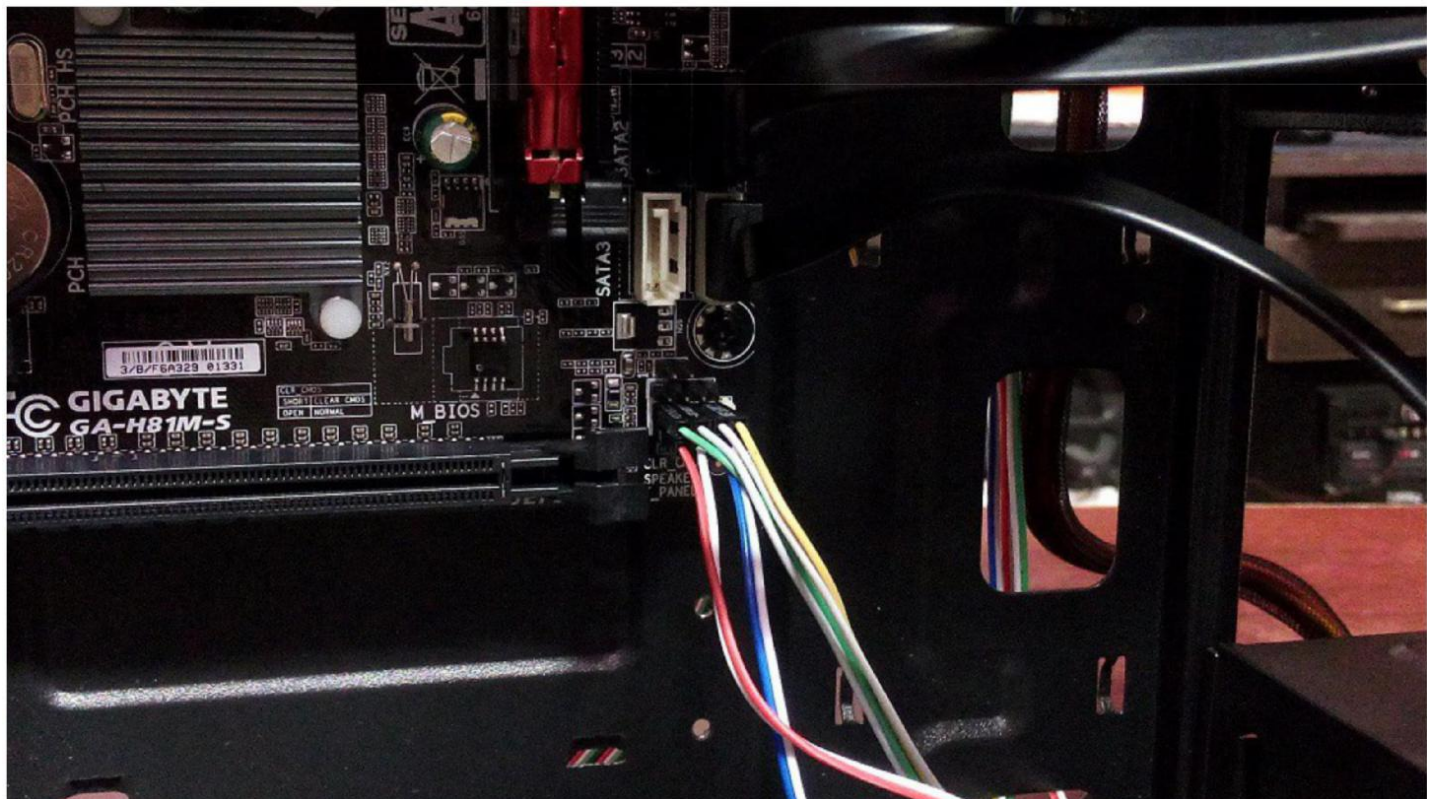
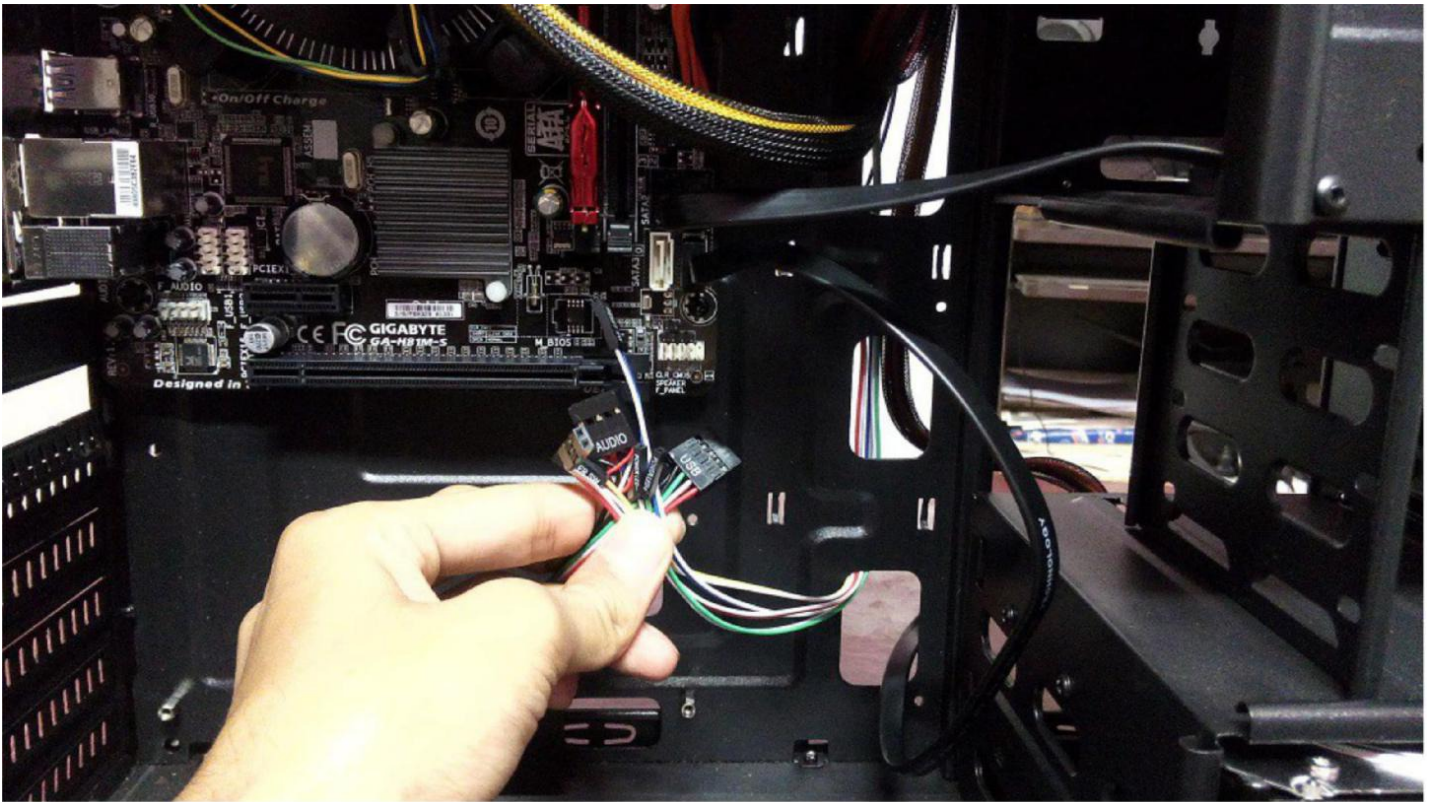
**STEP 8:** Here is the diagram of how the front panel power port looks like and in which pin goes which connector:-



These names will also be written on wires and motherboard. Put each one of them in the correct ports as mentioned above.



## Front panel Connectors:-

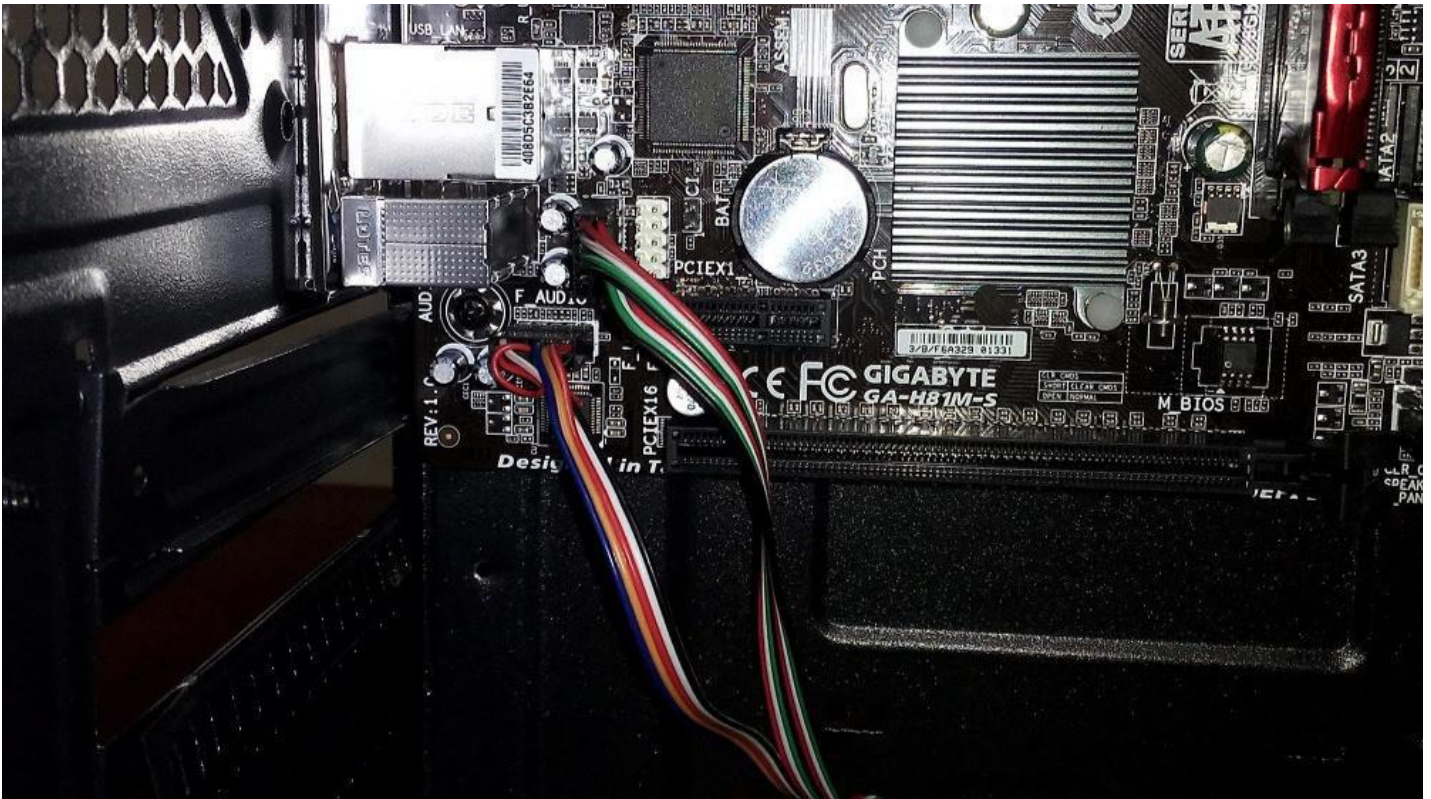




**STEP 9:** Similarly connect the front panel USB and Audio connectors to their respective ports:-

These ports are mostly located near the bottom left of the motherboard.

According to their pin alignments you can easily put their respective connectors. The names of these ports will be written below them.



*NOTE:- “Now this build is complete. But for installing Graphics card you may need to install the graphics card first because if you connect these power connectors first, you may face trouble in installing the graphics card. Also if your motherboard has a USB 3.0*

*front panel port then you can connect it to the case front panel if the case is provided with USB 3.0 power cable.”*

## Chapter 14: Installing the Graphics card

If you have a dedicated graphics card then it's an advantage for you. You can do much more with your pc. You can play high graphical intensive games and do video editing easily. So, now we are going to install our graphics card.

The graphics card which I have used is Zotac Nvidia gtx 650 ti 1gb Gddr5 which is an old card but just to show you how to do it.



Now we are going to install it in the PCI E x 16 slot which is present at the bottom of the motherboard.

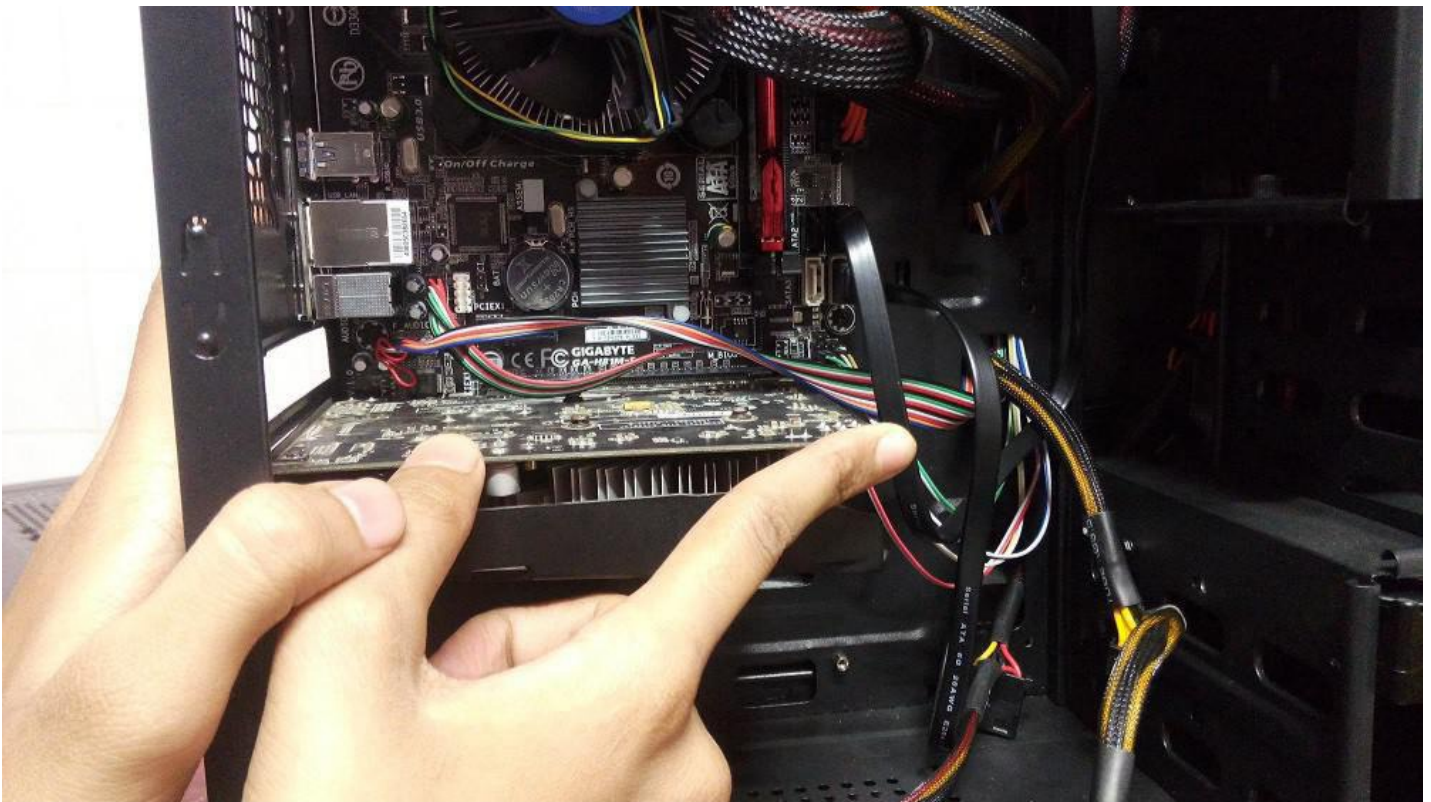
**STEP 10:** Remove the cover which is present at the rear bottom of the case where you will put your screws for your graphics card. You cannot



install your graphics card without removing it. But some good cases don't have that to make easy gpu installation.

After installing your graphics card you have to put that cover again.

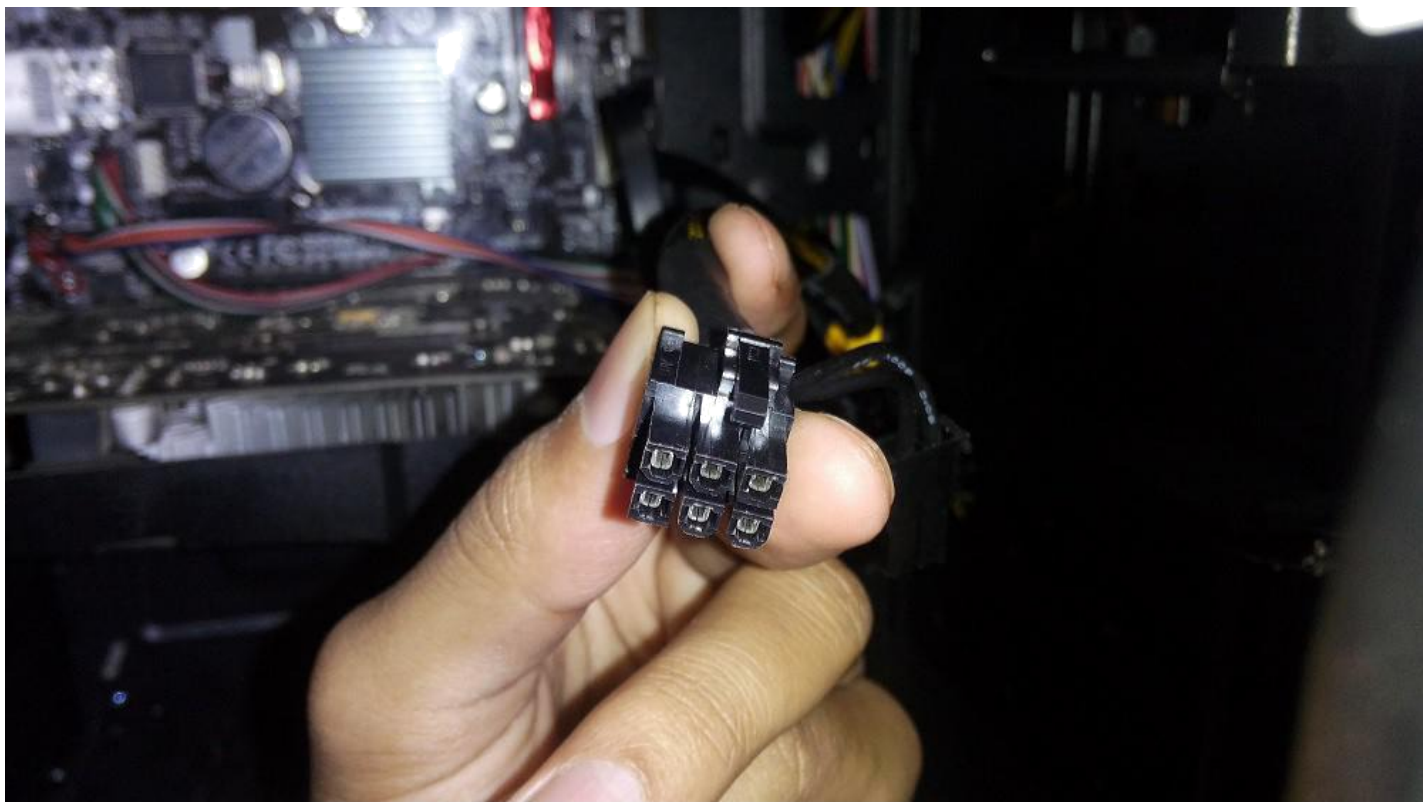
**STEP 11:** Now align your graphics card according to the PCI E x 16 slot and put a little bit of pressure on it so that it may get tightly fit into it.



**STEP 12:** Now take six pin or eight pin power connector according to your Graphics card power port as some graphics cards have 1 x 6 pin and some have 2 x 8 pin power ports.

In this case, the gpu has a single 6 pin power port therefore I will need only 1 x 6 pin power connector.



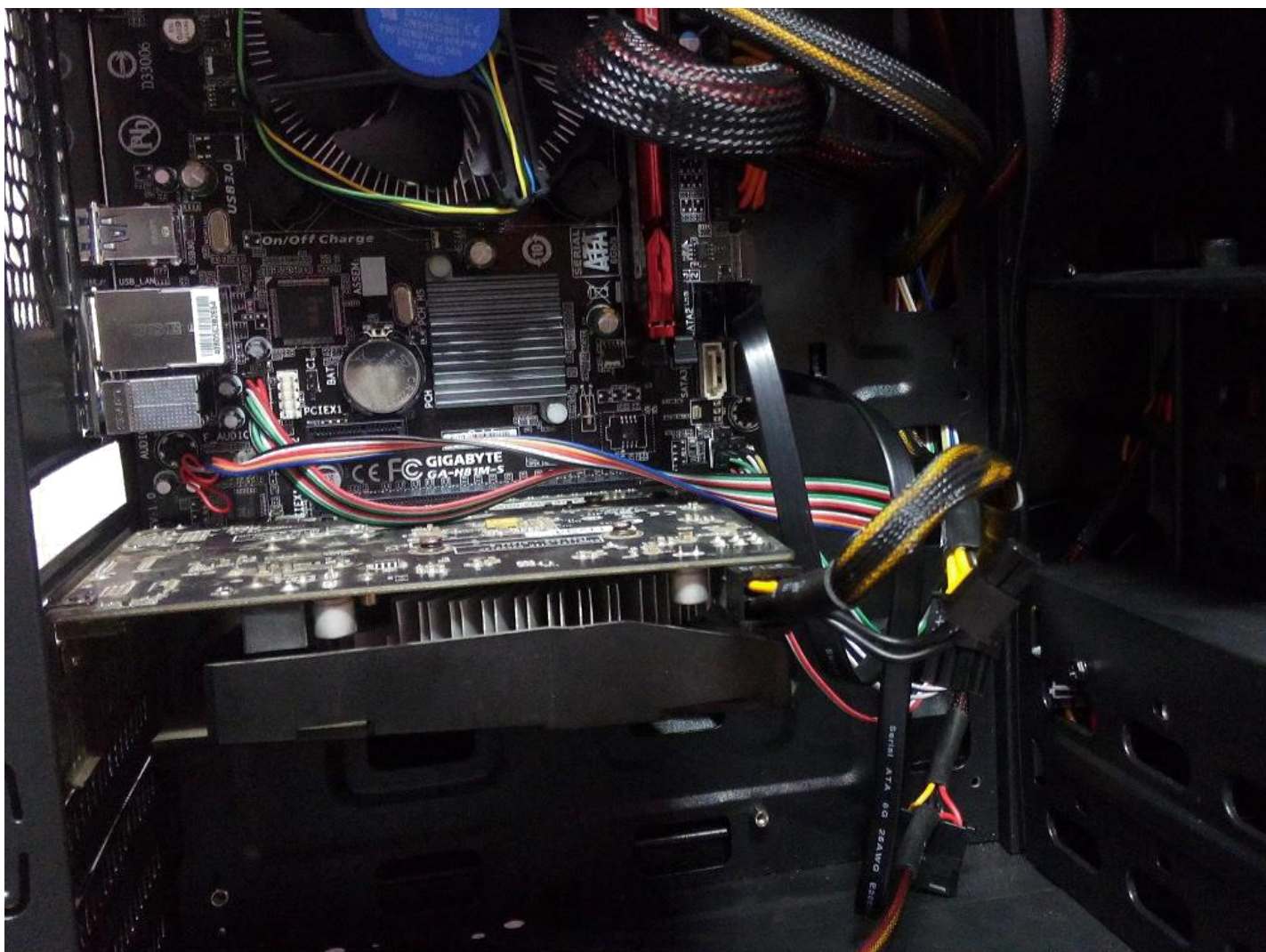


Generally that of lower end graphics card may need not external power supply. Like Gt 210, which can draw the power from PCIEx16 slot. Now a days some of the best budget graphics cards like gtx 1050/1050 ti have this feature too.

But when we use more powerful graphics card it will require more power and thus the power supply given to the motherboard will not be enough for the graphics card as PCIEX16 can only provide 75 watts.

The very high or extremely high end graphics card use more than 200 watts but the graphics card I am using will only require around 100 watts.

Power consumption also depends on the architecture on which it is made. The latest and better the architecture, the better will be the power efficiency and lesser will be the power consumption of the graphics card.

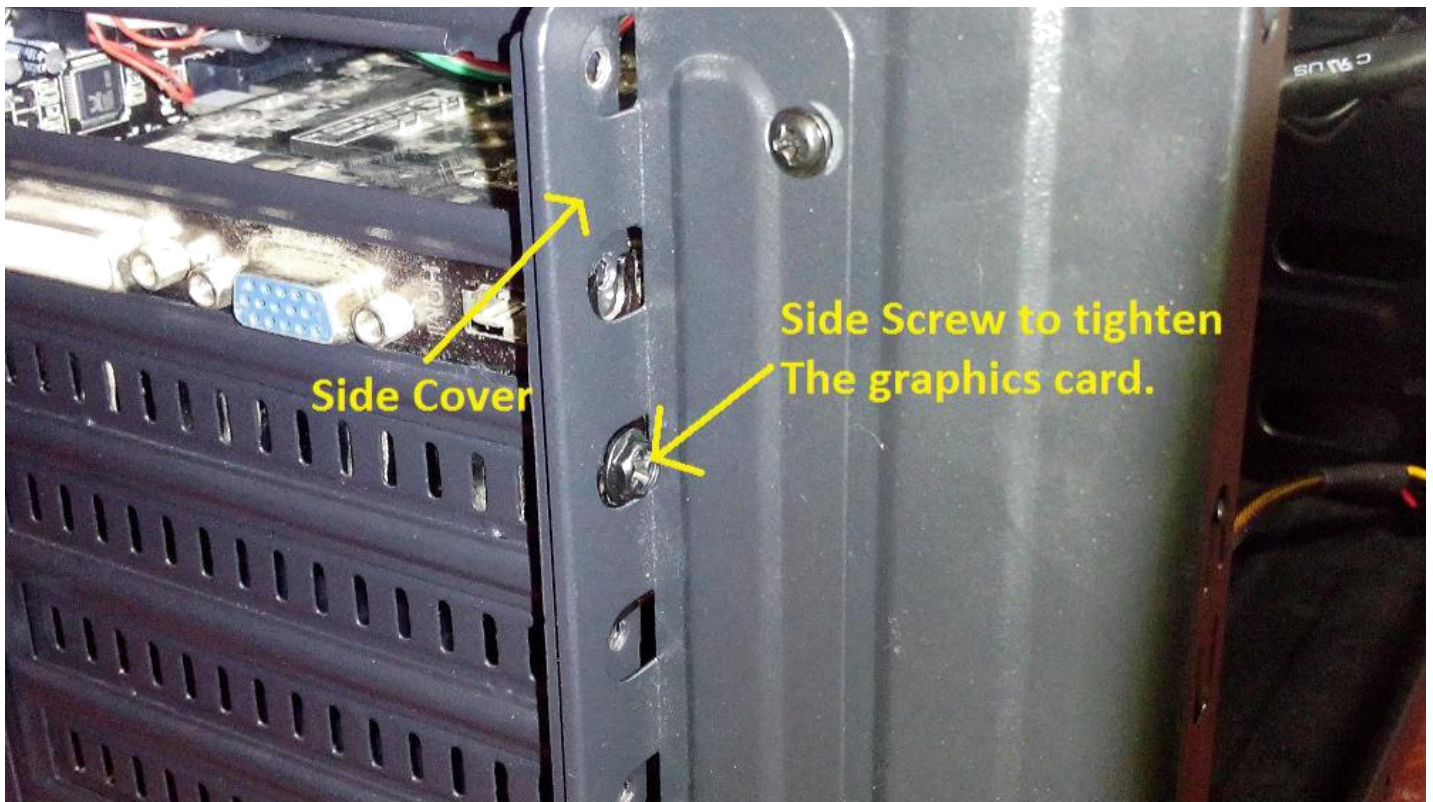


Now you have connected your GPU power connector successfully.

**STEP 13:** Put the screws in the graphics card where the display ports are present and from here you can tighten your graphics card by screwing it tightly to the case so that it may not move.

Then put the side cover again which we removed previously.





At last, check everything is connected properly or not. If your graphics card is loose then tighten it and if it is still moving make sure you have mounted your motherboard properly because sometimes the motherboard is not able to give enough support to graphics card.

*“Congratulations, You have successfully installed your graphics card.”*

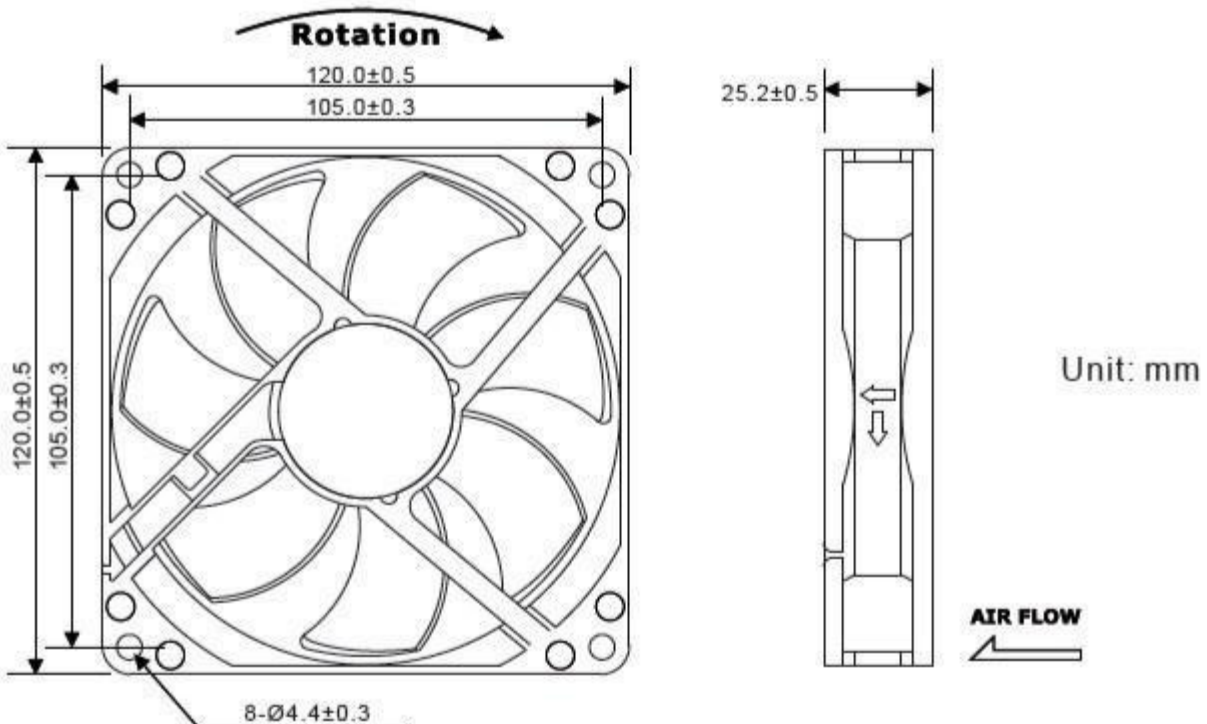
# Chapter 15: Installing Other components

If you want to make your computer more faster or cooler than you may install additional components that may include additional system fans and SSD's.

## Installing a System Fan

**STEP 1:** Buy a custom fan for your case according to the fan mount size where you want to put it. If your fan mount's length is 80mm, buy an 80mm fan. Similarly if your fan mount has a length of 120mm or 140mm you have to buy a 120mm or a 140mm fan for it. Many cases support an 80mm fan on a 120mm and 140mm mount. Check that too!

**STEP 2:** Align the fan according to the screw holes in the case and put all the four screws one by one diagonally.





**STEP 3:** From the image above at the right, you can see that there are two arrow signs on the side of fan. One is directed outwards and one is downwards.

If you want to make your fan work as an exhaust then the arrow directing towards left should be in your case directing outwards and if you want your fan work as a intake cooler then it should be inwards.

This is how you put a fan in your case.

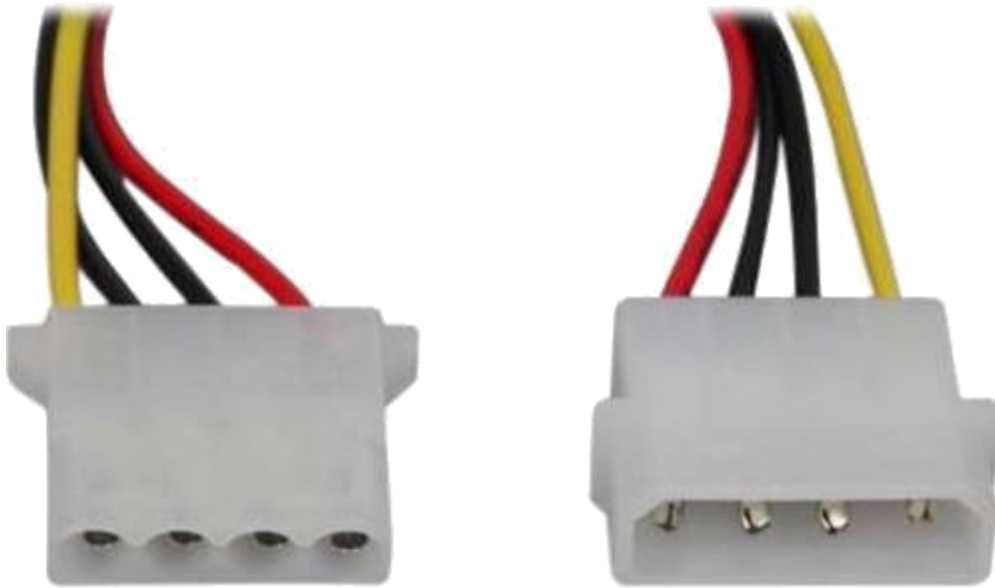
Now best places to put a custom cooler are the rear top and the front bottom. If you have two mounts in your case exactly as what I mentioned then you can use one fan at the front bottom as intake and one fan at the rear top as exhaust.

The front one will intake the cold air from outside and the rear one will eliminate the heat to the outside. This will ensure the proper temperature maintenance of your system.

**STEP 5:** After you have mounted your fan, connect the 4 pin power connector of the fan to the **SYSTEM FAN** port on the motherboard. This port looks like the Cpu fan port but the name **SYS FAN** will be written above or below it. So, there will be no confusion.

Or if you want to connect it to the power supply, it has a 4 pin power connector that you can connect to the power supply's 4 pin molex power connector easily.

The image for both the power connectors is shown below:-



## **Installing a Solid State Drive**

If you want more speed and faster performance, then you may install a Solid State Drive. It will help you reduce your system's booting time and will also reduce application loading time.

**STEP 1:** Mount the SSD in the 2.5 inch mounting panel present in your case. Your case may have more than 2 mounting panels. Depending on that you can install two or more SSD's.

**STEP 2:** Put the screws and tighten them enough so that your SSD may not move.

**STEP 3:** And finally connect the SSD to motherboard through the SATA cable. Remember you have to connect the cable to SATA 3 port on motherboard.

And now connect the 15 pin power connector to the SSD which is like the one I used for hard drive and optical drive.



*“Congratulations, you have successfully installed a custom fan and a Solid State Drive.”*

# Chapter 15: Making it work/Troubleshooting

Now is the time to test your build and the time you spent building your computer.

**STEP 1:** Recheck every wire and every component in your system.

**STEP 2:** Tighten every wire and every component again.

**STEP 3:** Connect the power cord and display cable to the monitor and the system.

**STEP 4:** Switch on your system and see whether your system starts or not.

If your system starts, then check whether your monitor shows the display or not. If not, then check that cpu fan and other components are working properly.

**STEP 5:** In case your system doesn't boot at all. Recheck every wire again. Sometimes we do silly mistakes. So, don't be overconfident that you have connected every wire because I did the same mistake with my friend's build.

I connected every wire but forgot to connect the Cpu power connector and was not aware of it. And because of that my cpu fan, gpu fan, led's and everything was working but the display wasn't showing on the monitor and that was the silliest mistake I ever did.

**STEP 6:** If your system doesn't boot up after all these steps then check if



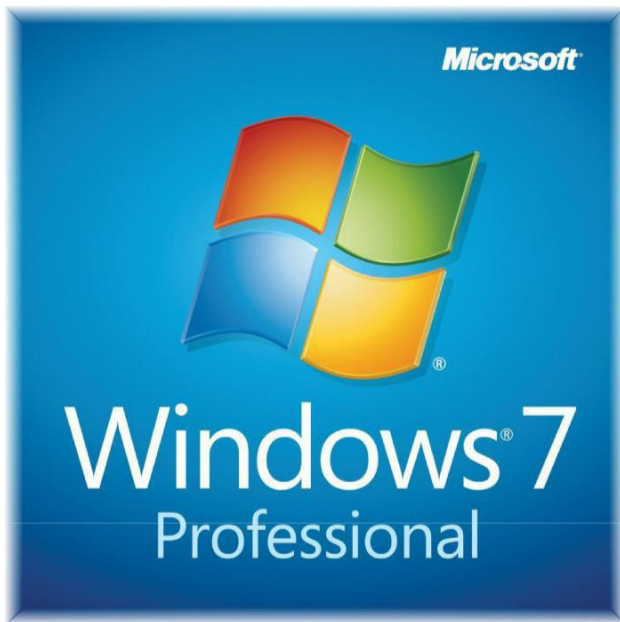
your motherboard isn't touching the metal body of the case and is properly installed on the stand off screws.

*(Note:- If you don't want to face this trouble then it's better to check everything out of the case. Simple install everything on your motherboard and check the system boots or not. If it does, you can install everything in the case like I have explained above.)*

## Chapter 16: O/S and Drivers Installation

If your system boots up and monitor shows display then it will ask you a bootable storage device containing your Operating system.

You can use either a bootable USB or a DVD for OS installation. The best operating systems are Windows 7 64 bit and Windows 8 which you can buy from below links. But do not buy windows 10 for now as it is not compatible with many games and applications.



[Windows 7 64-bit](#)



[Windows 8.1 64-bit](#)

Never buy 32 bit operating system because they will not allow you to maximize your usage. If you install windows 7 32 bit and have 8gb or 32gb of Ram in your system you will be able to use only 3.52gb of all the available memory.

My preference of both the windows is windows 7 because it's interface is simple and it supports every application and every game better than 8.

# Steps for installing the Windows

**STEP 1:** Put the DVD inside the writer or connect the USB to the system when your system opts for O/S.

**STEP 2:** Your Windows installation will start automatically but if it doesn't then go to your bios settings by pressing DEL key on system startup and change your first priority device for booting to either DVD or USB depending upon what you want to use.

**STEP 3:** Now you start your system again and the setup window will open where it will say install new windows. Let's take an example of Windows 7, the following window will pop up first:-



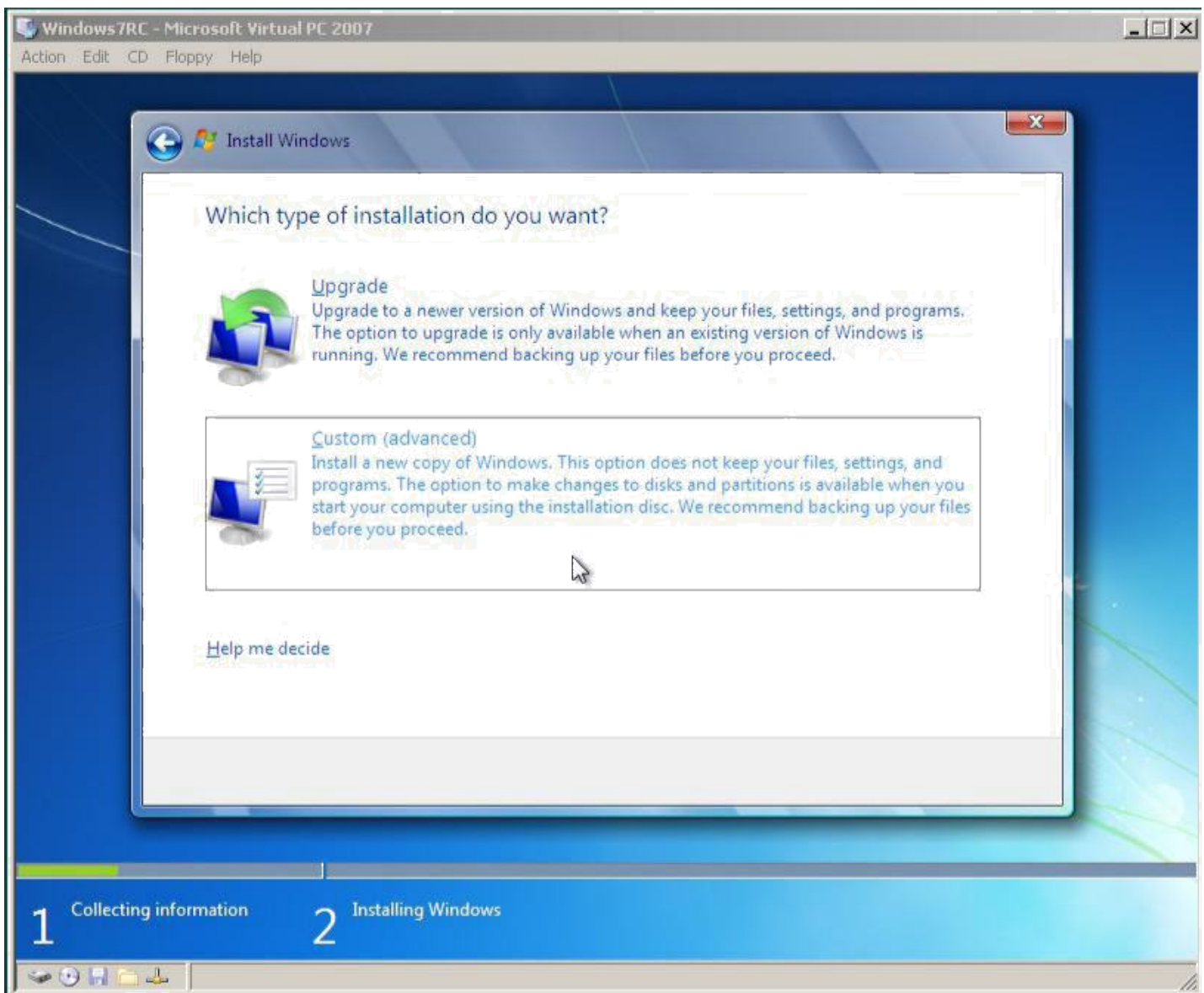
**STEP 4:** Just click on “**Install now**” and then you will be prompted for choosing your language, time and currency etc. Choose them according to your country or the language you want.



**STEP 5:** A window will pop up which will ask you to either upgrade or install a fresh copy of windows in your hard drive. Choose the fresh copy installation.

It will be named as CUSTOM and the window will be like following:-



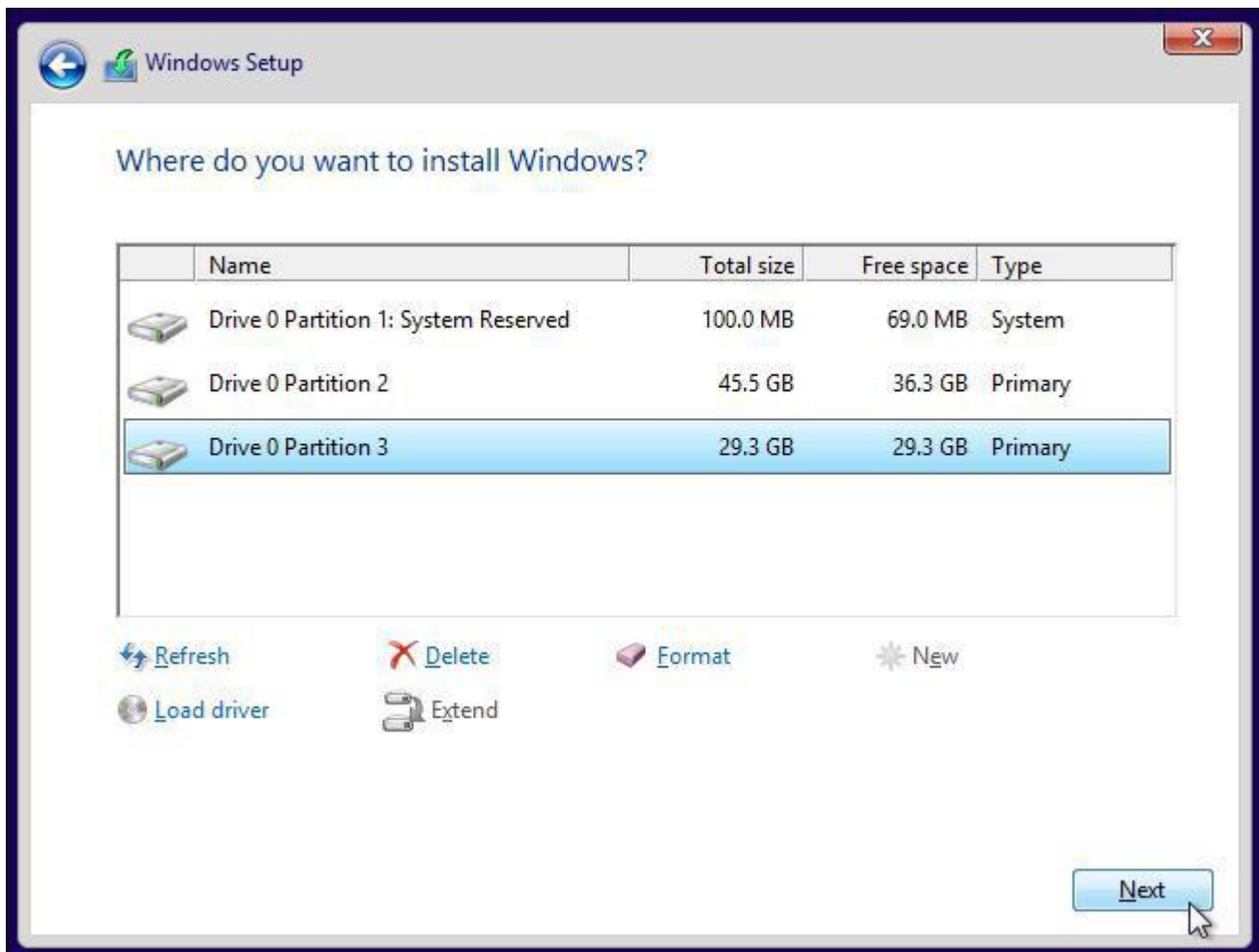


**STEP 6:** After choosing the desired option check the “I accept the license ” tick box in the next window and then a window for formatting your hard drive will appear from where you can create partition and choose the drive for windows installation.

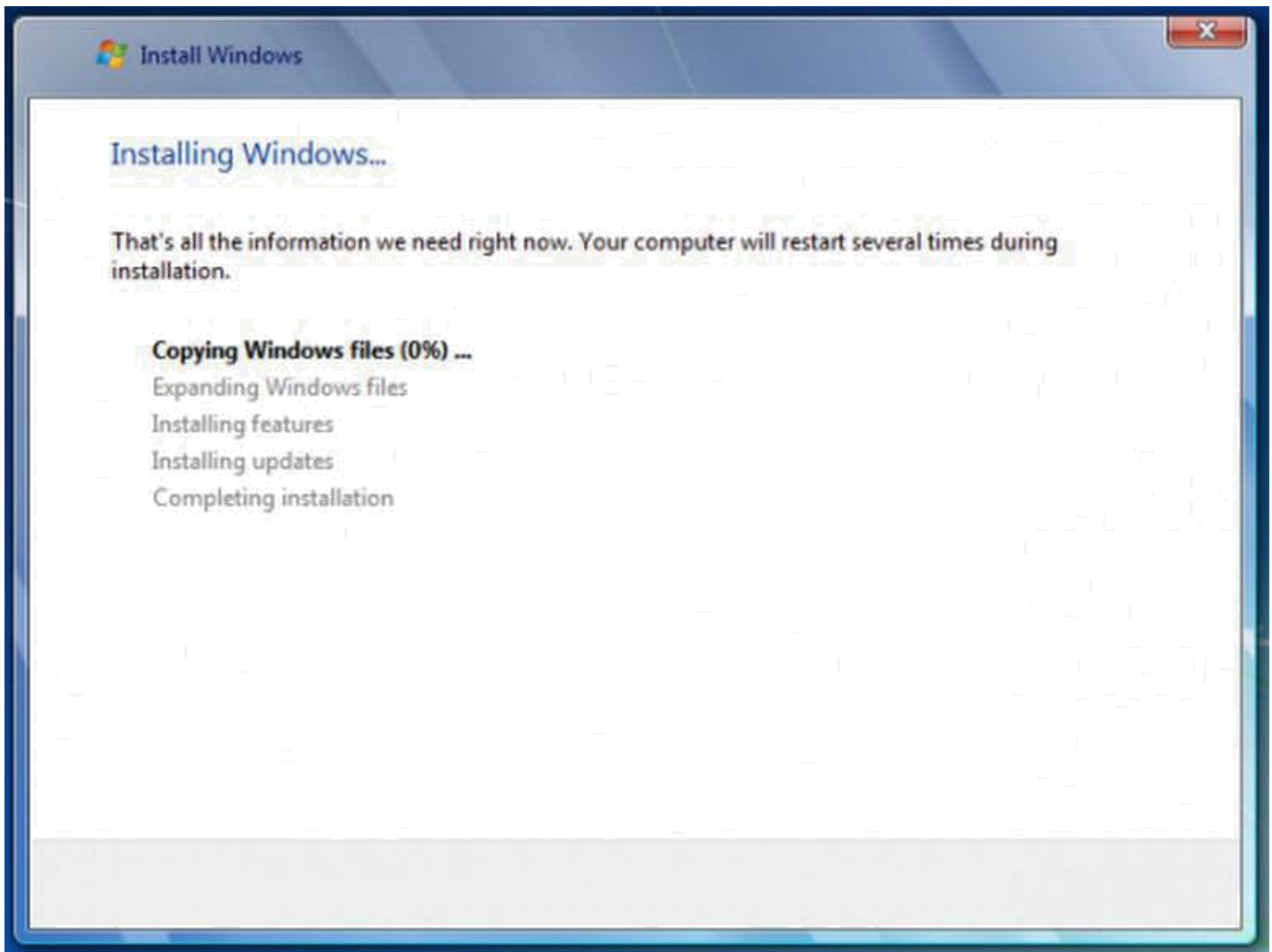
Depending upon your hard drive size and choice you can create 2 or more partition for easy working. But do not make more than 4 drives as it will make you face problems in installing huge games in future if you create multiple small sized drives.

**STEP 7:** You will see “**Unallocated Space**” in the list and to create a partition just click the “**advanced options** ” and from here choose the create option and enter the size according to yourself.

Make your C drive as big as you can to make your computer run faster because you will have to install many applications in your C drive which will make your system run slower.



**STEP 8:** Select Partition 2 and then format it to install the windows. Then Click on “**Next**”. Your Windows installation will start and you will see a window where you will see the progress.



Your system may restart a few times after each progress and finally when the installation is complete you will be able to see your HomePage. Now you may go to mycomputer properties and provide your license key to activate your windows. This option also occurs in between your windows installation. You can provide your Key there also.

**STEP 10:** Put the drivers installation DISC inside your writer that came with your motherboard and install every component present in it. You may need to update some of the drivers. Do it by connecting to internet through an ethernet cable.

**STEP 11:** Now insert the Graphics card disk to install the drivers for your graphics card. But if you have internet connection then you can skip this step or you can update to latest drivers because the driver disc is always outdated.

If you own a Nvidia graphics card then go to [geforce.com](https://www.nvidia.com/geforce) and from here choose your graphics card and install the GeForce Experience and if you have the AMD graphics card then install AMD Evolved. These two softwares will increase your Gpu compatibility with games and increase performance.



## Chapter 17: Benchmarking your PC

Now you have successfully installed every driver it's time to benchmark your computer and see its performance. You have to install a few softwares for doing this.

Just download software called Unigine Heaven from [Here](#). This software will allow you to benchmark your Cpu and Graphics card according to the graphics settings you choose in it.

Another Software for benchmarking your Cpu is Futuremark Strike 3D which is an intense software for Cpu benchmarking. Download it from [Here](#).

And to measure the Frames per second in games you need to install Fraps from [Here](#).

For Overclocking your graphics card you can use a software called MSI Afterburner which you can download from [Here](#). This is the best and easiest software for overclocking your graphics card safely. If you want to know how to overclock a graphics card with MSI afterburner then head to my step by step simple tutorial for doing this [Here](#).

There are more softwares for benchmarking your system but the above ones are enough for getting good results. Now the best thing to check your system's performance is to check it by playing graphical Intensive games.

Just start your games and before starting run the fraps application and you will be able to see the fps counter at the top left or right of your screen.

## Chapter 18: Congratulations! You did it :)

You know I am happy more than you because I feel very good when someone learns building a computer from scratch with me and you did the same.

I hope this guide has helped you in one way or another. But this is not the end of this guide, you can ask me any question if you get in trouble on my blog [www.xtremegaminerd.com](http://www.xtremegaminerd.com).

Thanks for having patience reading this guide. You finally did it!