

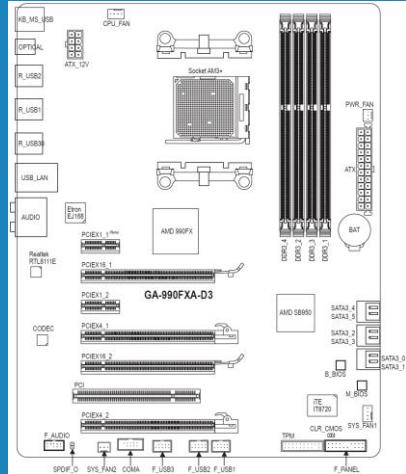
## Basics of Motherboards

For the free video please see  
<http://itfreetraining.com/ap/1b20>

In this video from ITFreeTraining I will look at the basic parts of a motherboard. Understanding the different parts of a motherboard is important for passing the CompTIA exam and also essential when troubleshooting motherboards.

# Motherboard Parts

- GA-990FXA-D3



0:13 The best way to start learning about motherboards is to have a look at one. Motherboards need to meet the same standards and so will be designed in similar ways. For this video I will look at a Gigabyte motherboard. By knowing what to look for, you will be able to look at any motherboard and be able to identify where certain components are. If you have trouble finding them, the motherboard manual will usually have a diagram showing where all the components are. The diagram will make it easier to find components on the motherboard.

# CPU Socket

- Keyed so CPU will only go in one way

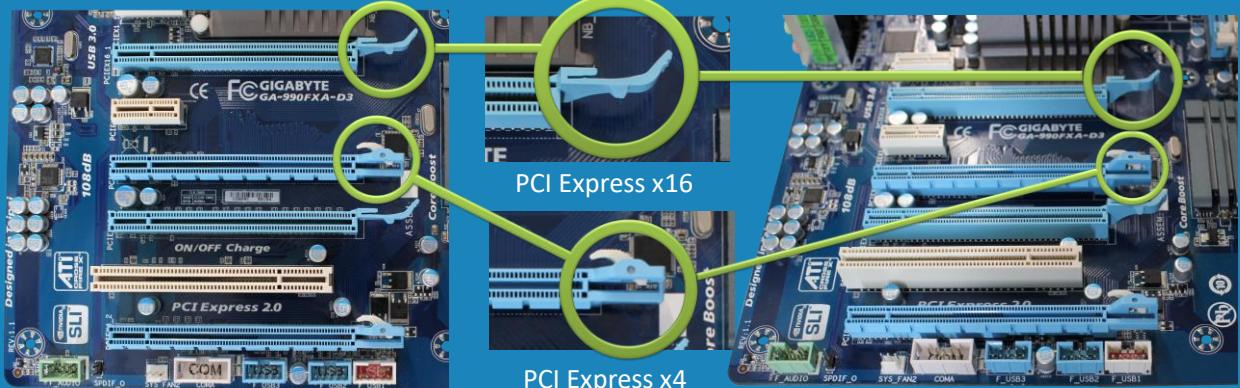


0:44 First, I will look at the CPU socket. The CPU socket has changed over the years, but it should be easy to spot. It is a large square shape. The CPU socket is keyed so the CPU will only go in one way. You will find in modern computers just about everything is keyed nowadays to prevent a plug or component being plugged in incorrectly.

In later videos I will look at putting a computer together, including putting the CPU in. Essentially, the CPU goes into the socket without any force and once in place the lever is moved, locking the CPU into place.

# Expansion Slots

- Color coded and keyed



1:22 Next, I will look at the expansion slots. The expansion slots, as the name suggests, allows the computer functionality to be expanded. Anything from a video card, sound card, RAID cards and network cards to name a few, can be plugged in an expansion slot.

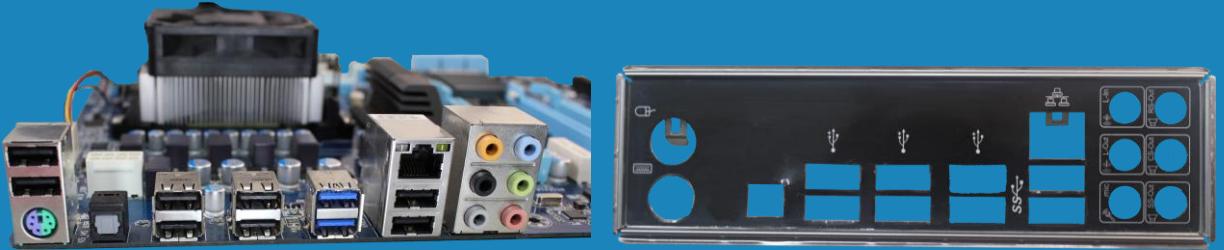
The slots are color coded and keyed. Keying essentially means that only the one connector can be put into the one slot or plug. It is like not being able to put a square peg into a round hole. In the case of expansion slots, the keying prevents the card being installed the wrong way or into the wrong slot. For example, PCI and ISA are keyed differently, so only a card of that type will go into a slot of that type.

Manufacturers of motherboards are free to use whatever color they want for each expansion slot. There is no common standard. You will generally find that similar slots will be the same color. In the case of this motherboard, blue is for PCI express by 16. The small white slots are for PCI express by one and the longer white slot is for PCI. The 'by' in the name refers to the number of lanes or lines of traffic going to each expansion slot.

In some cases, the same types of slots may be different colors for other reasons. For example, I have seen motherboards where a PCI express by 4 slots are a certain color and the PCI express by 16 are a different color. With this motherboard, you can see that the locking clip is different on PCI express slots. On this motherboard, this indicates the top one is 'by 16' and the next one is 'by 4'. Motherboard manufacturers are free to design the motherboard any way they want, use any locking clip they wish and any color. When you start looking at a motherboard, look for these little subtle things, as placing a video card in the wrong slot may mean it will underperform if it works at all.

# IO Area

- Each motherboard has custom IO Shield
- Keeps out dust and electromagnetic interference (EMI)



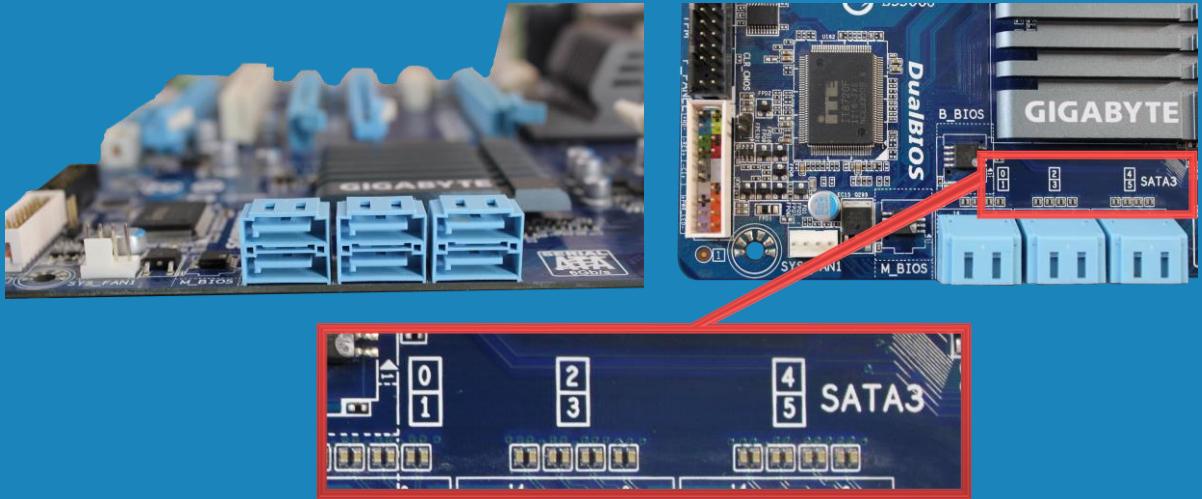
3:20 Next, I am going to look at the IO area. This is usually at the back of the computer and is used to connect devices and peripherals to the computer. For example, USB, audio and network. In the older days of computing, there was only a few standard connections that were found on all computers. For example, keyboard, serial and parallel connections.

As computers developed, the number of connections required increased and different motherboards supported different features. For example, one motherboard may support a speaker mic plug only, while another may have six plugs for surround sound.

For this reason, it is impossible for computer case manufacturers to support every configuration, so an area on the motherboard is dedicated to connectors. The motherboard manufacturer is then free to use this space as they see fit, but they will need to supply their own custom IO/Shield.

The IO/Shield is placed between the connectors and the computer case. It prevents dust and electromagnetic interference from entering the case. In some cases you will find that the motherboard manufacturer may provide two or more IO/Shields. These may be different colors or in some cases hide some of the connections if they are not required. Despite the fact that the IO/Shield may change in color and design, the connectors will always be found in the same place on the motherboard.

# SATA Connectors



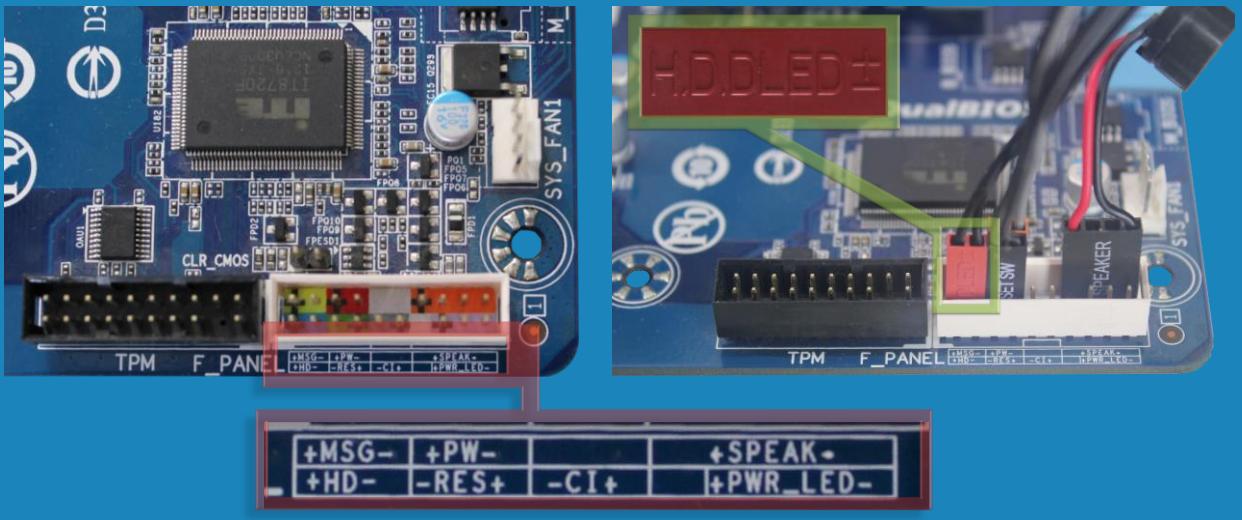
4:47 On modern motherboards, you will most likely have a number of SATA connectors. On older motherboards you may also have IDE connectors. On a server motherboard you may have SAS ports. Generally, they will be in and around the same location, but motherboard manufacturers are free to place these where they like.

In some cases, particularly with SATA ports, they may support certain things. For example, a certain SATA port may support SATA 3 while the others may support only SATA 2. Certain RAID functions may require storage devices to be plugged into certain SATA ports.

In some cases, the motherboard manufacturer may make the SATA connectors different colors to make it easier to determine which are which, however this is not guaranteed. This motherboard has printed on it a number to indicate the different SATA ports. Most motherboards will have something printed on them to help you determine which port is which. It can be difficult to see, otherwise if you look in the motherboard manual this will tell you which port is which.

# Front Panel Header

- Negative wire black/white or marked



5:49 The next connectors I will look at are on the front panel header. This allows the computer case to be connected to the motherboard. This includes things like the power switch, reset switch, indicator lights and the PC speaker.

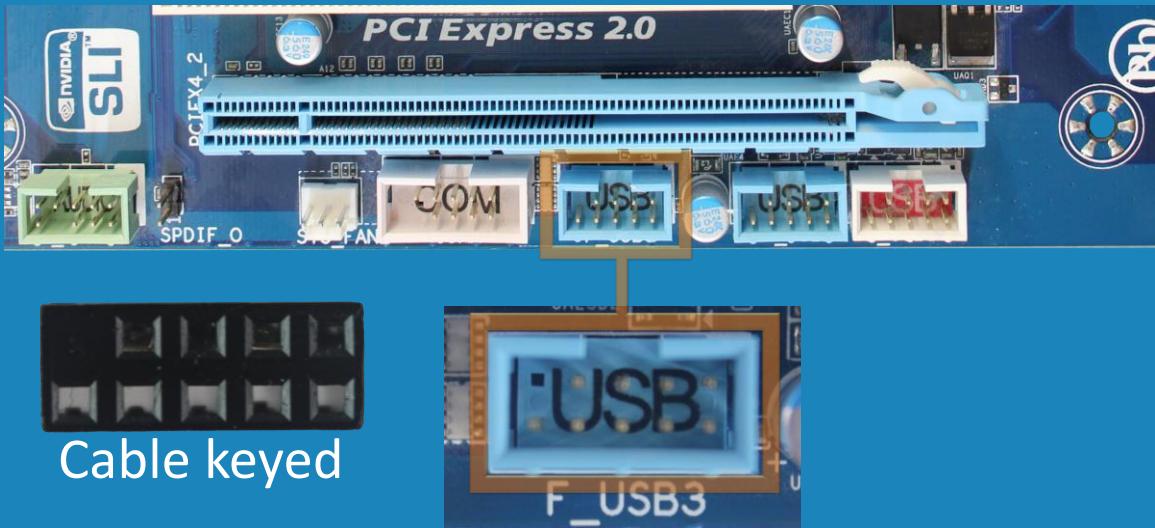
Since different cases come with different features, the header allows the cables to be plugged directly into it. If the computer case does not support it, you simply don't plug it in. Of course, things like the on/off switch you will need to plug in and all computer cases come with that.

To determine which connectors are connected where, most motherboards will have writing next to the header. It is quite small and difficult to read; otherwise you can find the information in the manual. For connectors like switches, it does not matter which way they are plugged in; however, lights and the PC speaker need to be plugged in the correct way. To determine which way to plug the connector in, the negative wire will either be black or white. With this particular computer case all the wires are black. When this is the case, you will need to look at the plug to determine which is the negative and positive wire.

On modern motherboards, generally the connectors will be in a header like the one shown. On some older motherboards, you may find the connectors are spread out over the motherboard and not in a header like the one shown.

# Other Headers

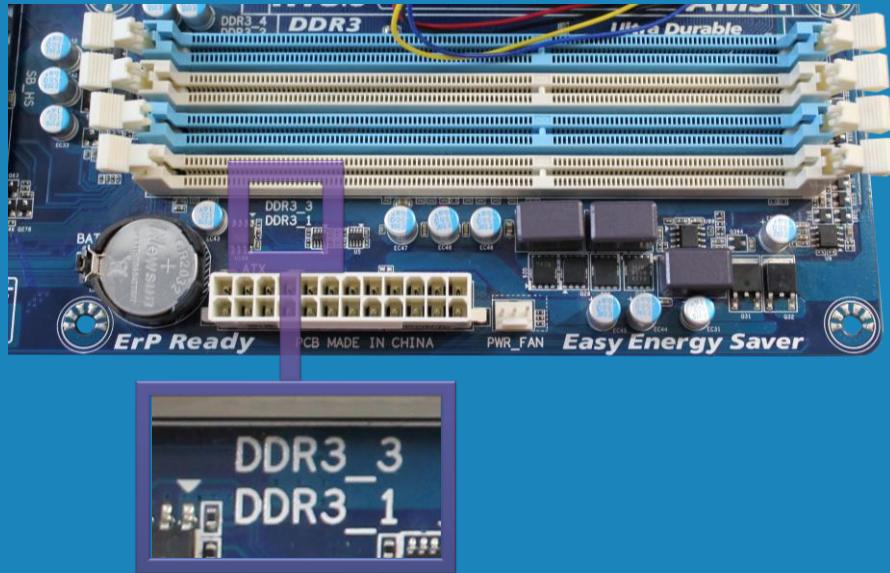
- Can be found anywhere on the motherboard



7:09 There will also be other headers on the motherboard. In the case of this motherboard, most of them are close together. However, these headers can be found anywhere on the motherboard. If you have trouble finding a particular one, have a look in the motherboard manual.

Each of these are keyed so the cable cannot be put in the wrong way. You will notice that certain pins are missing. If you have a look at the plug for the cable, the missing pin will be blanked out. Different headers will have different blanked-out pins; this prevents even cables with the same number of pins being put into the wrong plug. If you find that a plug does not go into the motherboard, check the pins on the plug. It may be the wrong plug or the cable is upside down. If you find you are having to use force, you most likely are trying to plug it in the wrong connector.

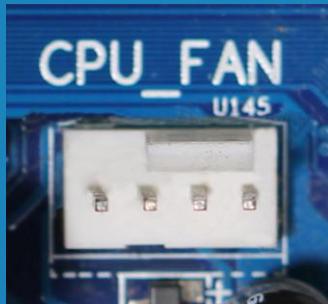
# Memory Slots



7:59 Next, I will look at the memory slots. You will find that memory slots are next to the CPU. Each slot is given a number, usually printed on the motherboard. When installing memory, it is important to ensure it is installed in the right slot. Some motherboards will not work unless a particular memory slot has memory in it, usually slot 1. In some cases, the slots will be color coded. Generally, placing memory in the same color slots will allow it to be used together giving a performance increase.

## Fan Connectors

- Three-pin uses different voltages to control speed
- Four-pin uses extra pin for speed control
- Three-pin may work in four-pin connector
  - If not the fan spins at max speed (need four-pin)



8:31 The next connectors I will look at are the fan connectors. There will normally be a number of these around the motherboard. The connectors will be either three-pin or four-pin. The three-pin uses voltages to control the speed of the fan. The four-pin connectors use the extra pin to control the speed of the fan.

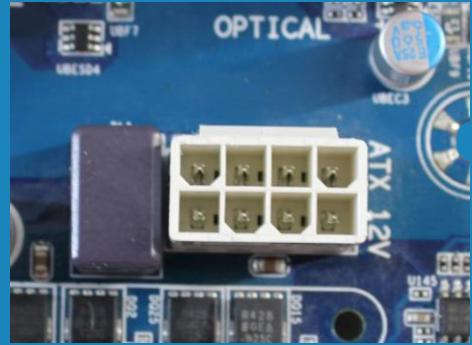
A three-pin connector will plug into a four-pin connector. Nowadays, a motherboard will generally detect which type of fan has been connected. On some devices like video cards, if you plug a three-pin fan into a four-pin connector it will not work. You will know it does not work because the fan will spin at full speed the whole time. If this occurs, replace the three-pin fan with a four-pin fan.

On your motherboard, all the fan connectors may have the same type of connector and support three- and four-pin connectors, however you should take care to plug the fan into the correct connector. For example, you could connect the CPU fan to a connector that is labeled system or power fan. This will work; however, the BIOS or UEFI will detect the CPU fan is not running. If you ignore this error, the computer will treat the CPU like a case fan and may not spin it at the required speed to cool the CPU. So, it is a good idea to connect these correctly so they are reported correctly and also function correctly.

# Power Connectors



P1 20/24 ATX Pin connector



P4 4/8 Pin connector

9:56 The last connector I will look at is the power connector. Your motherboard will have one or two of these connectors. Older motherboards will only have the P1 connector which is 20 or 24 pins in size. Newer motherboards will also have a P4 connector. This will either have 4 pins or 8 pins. Like everything else, it is keyed so you won't be able to plug it in the wrong way.

This covers the basic parts of a motherboard. In later videos, I will look into these topics in more detail. Until those videos, I would like to thank you for watching.

## References

"The Official CompTIA A+ Core Study Guide (Exam 220-1101)" Chapter 3 Position 5474-5661 "CompTIA A+ Certification Exam Guide Tenth Edition" pages 214-215

## Credits

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