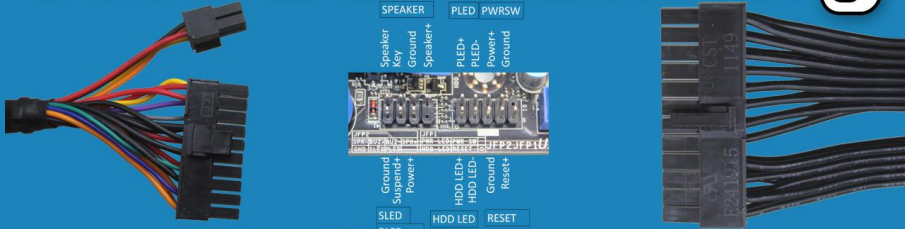


ITFreeTraining



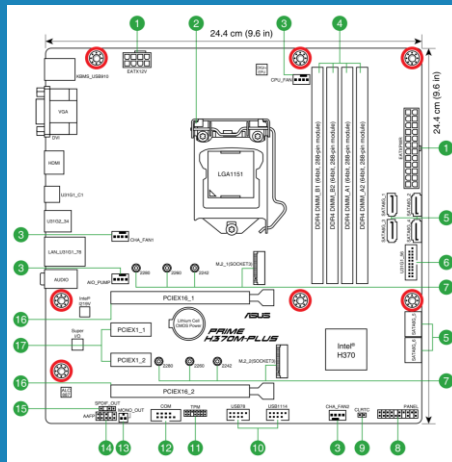
Motherboard Connectors

For the free video please see
<http://itfreetraining.com/ap/1b90>

In this video from ITFreeTraining I will look at all the different connectors on the motherboard. If you are planning on building a computer or upgrading a computer, you will need to understand what all these connectors do and how to plug them in.

Motherboard Diagram

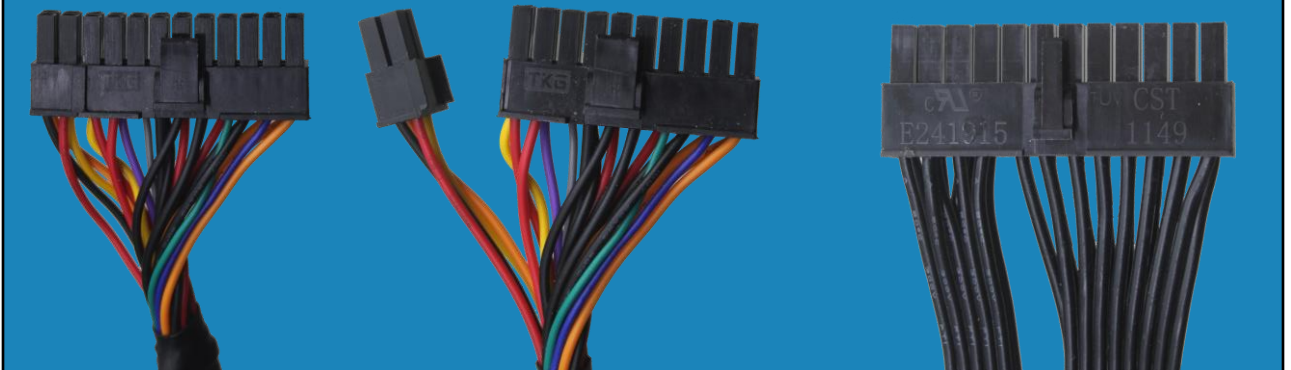
- Should be in motherboard manual



0:14 Every motherboard, I have yet to see one that has not, will have a diagram in the manual showing the locations of all the connectors on the motherboard. If you have trouble locating a connector, have a look in the manual. If you don't have the manual, you will be able to download a copy from the motherboard manufacturer's website.

Main Power Connector (P1)

- 20 or 24 pins
- 24 to 20 pin adapter available (Or tight squeeze)



0:33 To start with, I will have a look at the main power connector, otherwise known as the P1 connector. The connector will be 20 or 24 pins in size. The 20-pin size is an old connector and unless you're working with an old computer you won't come across it. Most power supplies will have a 24-pin connector that can be divided into a four pin and 20 pin plug if required.

With some power supplies, the connector will be all one part and cannot be divided. If you come across this and need the 20-pin connector you have two choices. You can purchase an adapter to change the 24-pin plug to a 20 pin plug or you can attempt to plug it in anyway. It will go in, but will be a tight fit and four of the pins will be hanging out of the plug. Just make sure if you do this that you are plugging it in the right way.

You will notice this P1 connector is 24 pins, however it can be divided into two separate plugs. This motherboard has a 24-pin connector so I will combine it back into one plug.

Every connection on a motherboard nowadays is keyed. This means it is not possible to put a connector in the wrong way unless you use a lot of force which most likely will damage something in the process. If you find you are having to force a connector, double check the plug, you probably have it the wrong way around.

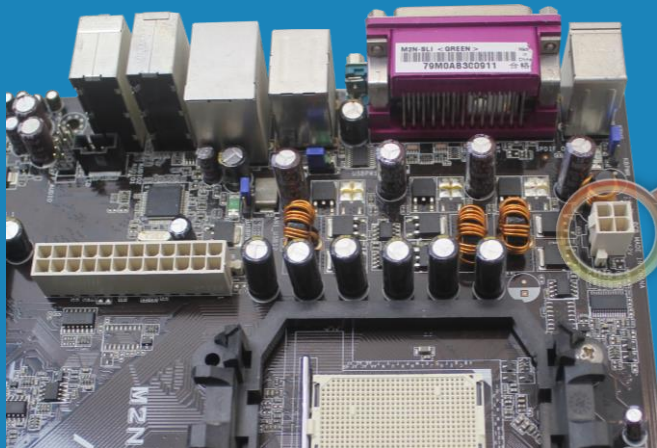
You will notice that the plug on the motherboard has a small notch. This will hook onto the latch on the plug. I will now plug in the P1 connector. When the P1 connector goes into place, you should hear a click.

The click is the latch on the plug; once you hear that, you know the P1 connector is in place. Once the P1 connector is plugged in, five volts of power is supplied to the computer continuously. Essentially the computer is in standby mode and this five-volts powers standby devices. For example, if you have wake-on-LAN, the five volts allows the computer to monitor for a wake-on-LAN event and start the computer up. It is possible to have devices like the keyboard start the computer from standby if your computer supports it.

As time moved on, computers required more and more power. First, the 20-pin connector was not enough and then the 24-pin connector was not enough.

P4 Connector

- Four pin connector
- Supplies additional power to motherboard



Power supply
adapter cable

2:54 In 2003 the power supply standard was updated to include what is commonly referred to as the P4 connector. The P4 connector is a four-pin cable supplied by the power supply. It supplies the motherboard with additional power.

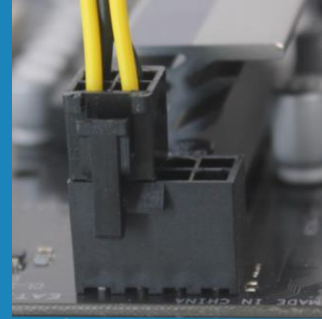
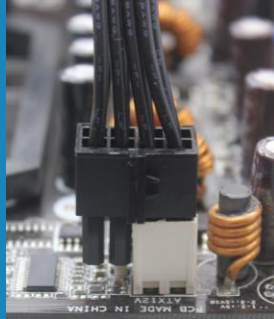
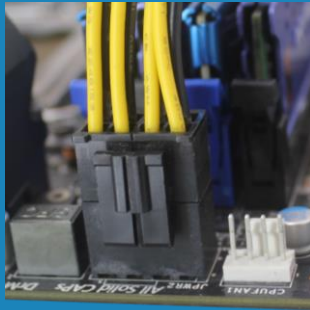
The P4 connector is generally near the CPU. Like the P1 connector, it can only be plugged in one way and you should hear a clicking noise when it is in place. Don't get this confused with the extra four pins of the P1 connector. These connectors are not compatible and are keyed differently.

If you find that your power supply does not have the P4 connector, you can always purchase an adapter cable. In some cases, you will find that some of the older motherboards may still work without a P4 connector. You may start experiencing problems if you add new or additional video cards that use a lot of power. New motherboards tend to require the P4 connector and won't start up without it.

The extra power supplied by the P4 connector was good, but as time passed, there was a need for even more.

EPS 12V

- 8 pin connector
- Connector can be split into two (Keyed differently)



EPS adapter cable



4:00 To provide more power to the motherboard, the four pin P4 connector was expanded to an eight-pin connector. This is called the EPS 12V. Most of the time it will be referred to just as the EPS connector.

To ensure compatibility with the P4 connector, most EPS connectors are able to be split into two four pin connectors. These two connectors are keyed differently. This ensures that if you split the cable into two, you will only be able to combine it back into the one cable one way. If you have a P1 connector that can be divided into a four-pin connector, this is keyed differently and thus not compatible with either of the two split four pin connectors.

Like the P1 and P4 connector, the EPS connector will click into the motherboard. The connector will generally be around the CPU somewhere. Most motherboards will require this connector to be plugged in, otherwise the computer will not start. On some motherboards, it may not require this connector unless more power intensive devices are added.

If you have a motherboard that supports only the P4 connector and you can't split the EPS connector, you will still be able to plug the connector into the motherboard. You will just find that four of the pins will hang out of the connector. Remember that the connector is keyed so it will only go in one way. If you find the connector will not go into the plug, try the other four pins.

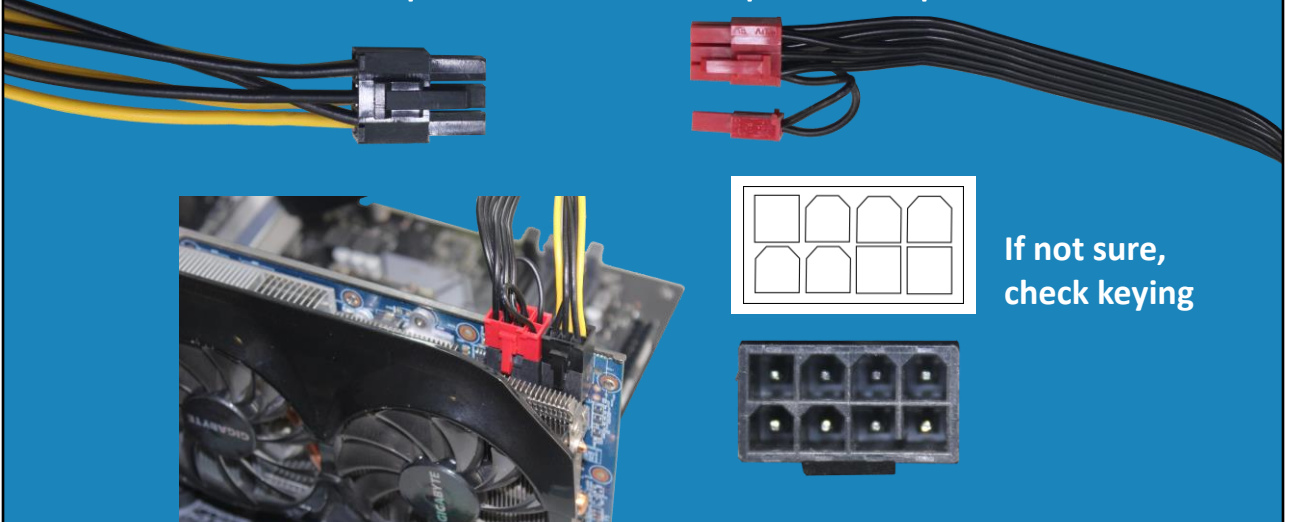
Lastly, if you only have a P4 connector, you can plug this into the EPS plug. You will only be powering half the pins. On some motherboards and with some configurations this may be

enough.

If you find that you do not have an EPS connector on your power supply, you can always use an EPS adapter cable. This is a much cheaper option than purchasing a new power supply. Additional power is not just limited to the motherboard, however.

PCIe Power Connector

- 6/8 pin connector for PCI Express
- Provides extra power to PCI Express expansion cards



5:56 As technology advanced, other devices in the computer became more complex. In particular, high performance video cards got larger, increased in processing power and, thus, required more power. In order to provide this additional power, a six or eight pin power connector was added.

Depending on the power supply you buy, there may be multiple PCI Express power connectors. In the case of the power supply connector on the right, you can see that the connector can be divided into a six-pin connector or combined into an eight pin connector.

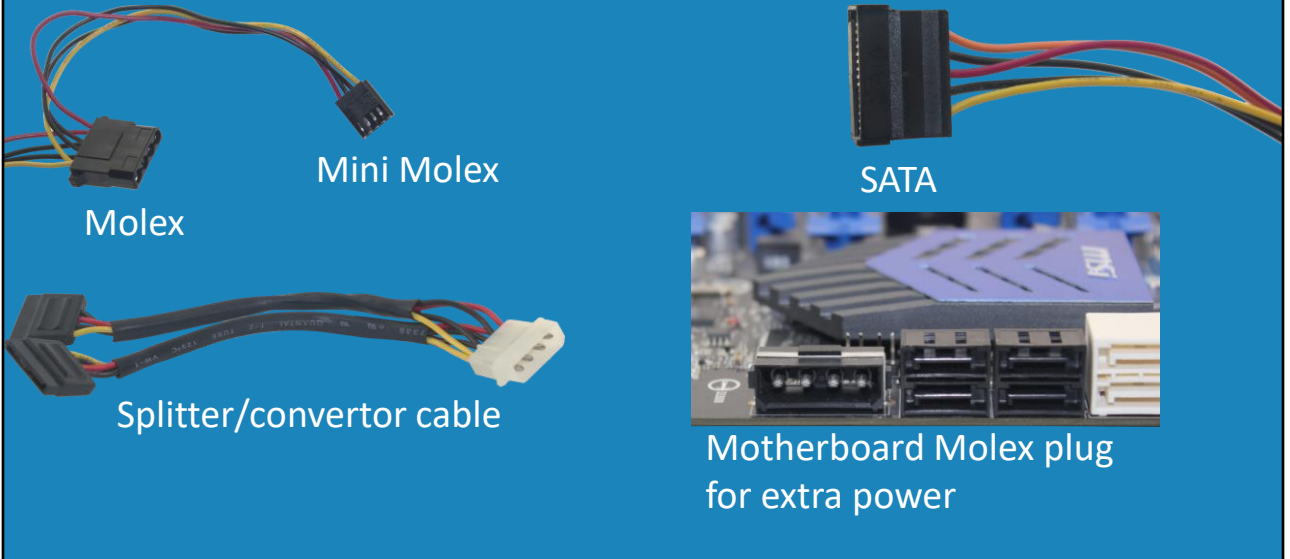
The connectors provide additional power to PCI Express expansion cards. These will most likely be video cards. Some video cards will require no additional connectors, some will require one connector, others two connectors. In the case of this video card, a six and eight pin connector are required to provide the extra power.

Keep in mind that this connector is keyed differently to the EPS connector that I just looked at. Some power supplies will have writing on the connector, so you can determine which connector is which. All connectors are keyed differently, so you won't be able to put the wrong connector in the wrong plug. If you are not sure, you can always look at the keying on the connector.

You can see the plug has a certain pattern. There are two different shapes in the connector that make up the pattern. Each connector will have a different pattern, preventing the connector being plugged in the wrong plug or being plugged in upside down. If you have trouble getting a connector in, don't force it, check the keying. You are most likely attempting to put it in the wrong plug or upside down.

Molex and SATA Power Connectors

- Molex old connector. SATA new connector



7:34 To provide power to other devices, the power supply will have a number of Molex and SATA connectors. The Molex connectors are old style connectors while the SATA connectors are the newer connectors. Generally, the older the power supplies will have more Molex connectors and the newer the power supplies will have more SATA connectors.

The Molex connector has four pins while the SATA connector has 15 pins. The larger number of pins in SATA allows for additional features like hot-swappable drives. The SATA connector is designed in an L-shape so it cannot be plugged in upside down while the Molex is also shaped so it can only be plugged in one way.

SATA connectors, however, tend to only be used for SATA drives. The Molex connectors were originally primarily used for hard disks, but nowadays are used for other devices, for example case fans. For this reason, I don't think that Molex connectors will disappear anytime soon.

On your power supply you should also have one or two mini Molex connectors. These traditionally were used for the floppy disk drive. Nowadays floppy disk drives are no longer used, so the mini Molex is there for backward compatibility. Sometimes a case fan may have a mini Molex connector so you can use it with the fan, otherwise the mini Molex does not get used.

A mini Molex is designed to be plugged in only one way, however unlike the other connectors, it does not take as much force to plug it in incorrectly. So, if you do use one of these connectors, make sure you are plugging it in the correct way. If you ever plug a mini Molex

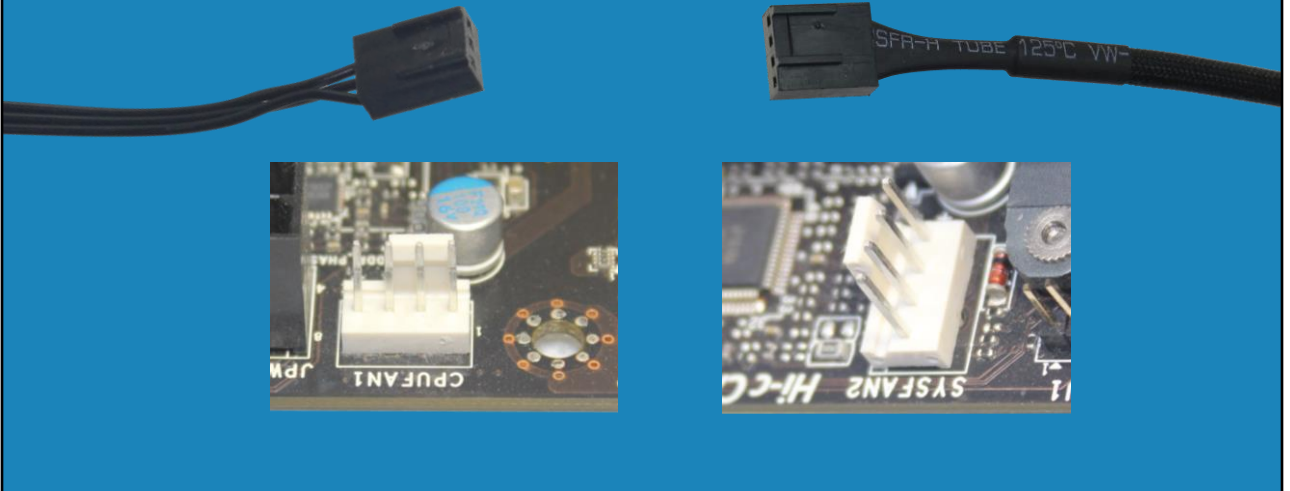
incorrectly into a floppy drive, you will soon realize the mistake with the unusual smell the floppy drive will make when the computer is switched on. When you get this smell, you will know you need to replace your floppy drive.

If you find that you do not have enough of a particular connector, you can always purchase a splitter or convertor cable. The splitter cable will turn one connector into two and the convertor will convert one type to another. In this example, this adapter does both. The adapter converts one Molex connector into two SATA connectors.

In some cases, you may find that your motherboard has a Molex plug for providing extra power. This is pretty rare, but this essentially gives the motherboard even more power than the standard P1 and EPS connectors can provide. Usually this connector provides extra power to the graphics card. This is particularly important on motherboards that support SLI or CrossFire. SLI and CrossFire allow two or more video cards to be combined together to work as one.

CPU/Case Fan

- 4 Pin connector with a 3 or 4 pin plug
- Fourth wire for Pulse-width modulation (PWM)



10:13 The next connectors that I will look at are for the CPU and case fans. These will either be three pin or four pin connectors. Regardless of which one is used, both will plug into the same connectors on the motherboard.

It is important when plugging in these connectors to read the print on the motherboard as to which plug it is. It is possible to plug a CPU fan connector into a case fan plug. However, if you do this, it will mean the fan is being misreported to the motherboard. This will cause it to appear as the wrong fan in any monitoring software and if the computer is attempting to change the speed of a fan, the computer will be trying to change the speed of the wrong fan.

The additional fourth wire on the fan is for pulse-width modulation or PWM. This essentially means the speed of the fan is controlled by the fourth wire. In three pin fans, the speed of the fan is controlled by the voltage, whereas in four pin fans, the speed is controlled by changing the signal in the fourth wire.

So this brings up the question, which one would you use? The four pin fans tend to be more expensive but offer slightly better fan control. The other big difference is that since the voltage going to the fan does not change, if there are LED lights in the fan, they will not be affected. LED lights are generally not used on three pin fans as the changing voltage would cause the LED lights to dim and brighten depending on how fast the fan is going.

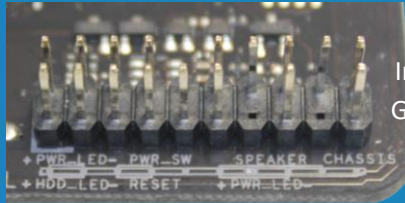
Motherboards will generally support either three pin or four pin fans, so it does not matter which you use. If you replace a fan on a video card, you may find that it will require a four-pin

fan. Keep in mind that the video card will most likely use a different plug. You will know that you require a four-pin fan when you plug a three-pin fan in and the fan is running at top speed all the time. Since the voltage does not change with four pin fans, a three-pin fan will always run at top speed. If you have a fan that runs at top speed as soon as the computer is switched on and never changes, replace it with a four-pin fan.

Front Panel Connectors

PLED PWR SW SPEAKER

Power+
Power-
Power+
Ground
Speaker+
Ground
Key
Speaker-



Intruder
Ground

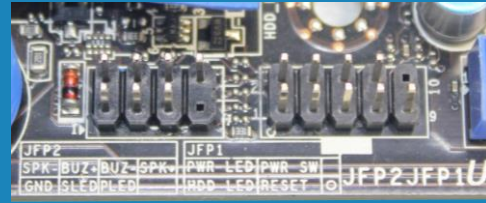
CHASSIS

HDD LED+
HDD LED-
Ground
Reset+
Power+
Power-

HDD LED RESET PLED

SPEAKER PLED PWR SW

Speaker
Key
Ground
Speaker+
PLED+
PLED-
Power+
Ground



Ground
Suspend+
Power+

SLED
PLED

HDD LED+
HDD LED-
Ground
Reset+

HDD LED RESET

12:22 The next connectors that I will look at are front panel connectors. These connect the computer's lights and buttons to the motherboard. On a lot of motherboards, you will find a header with all these connectors in the one place; however, they don't need to be.

In order to find out what goes where, it will generally be written on the motherboard, otherwise if you look in the motherboard manual, this will tell you which is which. Every motherboard manufacturer is free to configure these connectors how they want, so they will most likely be different for every motherboard you come across.

On this particular motherboard, the first two pins are for the power LED. A LED or Light Emitting Diode is essentially like a light globe. The big difference is that, unlike a light globe, if you get the positive and negative wires around the wrong way, the LED will not work. Not to worry however, if you connect anything up wrongly on the front panel connector, you won't break anything, it just won't work.

The first thing to notice with the power LED is that there is a second set of two connectors for the power LED. Generally, most motherboards will have two pin and three pin connectors for the power LED. This is for compatibility reasons. On some older motherboards and computer cases, you may find that you have a two-pin connector but a three-pin connector on the motherboard. If this occurs, you can cut the two-pin connector in half to plug it into the motherboard.

The next two pins are the power switch. There is a positive and negative connector, but with

switches it does not matter if you connect the connector the wrong way.

Next there are four pins for the PC speaker. On modern computers, only the outer two pins are used. There is a positive and negative wire, however most speakers will still work if you put the connector on the wrong way. It does however slightly distort the sound, so I would recommend connecting the PC speaker the right way.

The next two pins are the hard disk LED. This will light up when there is activity on any of the storage devices on the computer. Like the power LED, if you connect it up the wrong way the LED will not work, but it won't damage anything.

The next two pins are for the reset switch. Like the power switch, it is just a switch, so it does not matter if you get the positive and negative wires around the wrong way. These are the standard connectors you will find on most motherboards.

On this particular motherboard there is also a chassis connector. Some computer cases will have a switch in the case that detects if the computer case has been opened. If your case supports this, you can connect that switch here. If the computer case is opened, even when the computer is switched off, this switch will be triggered. When the computer starts up, a message will be displayed saying the computer case has been opened. Additional options can be configured in the BIOS to prevent the computer from starting up until the message is cleared by an administrator.

The manufacturer is free to put the connectors where they like on the motherboard. If I look at a different motherboard, you will notice in this example there are two separate headers. Most pins you will find are the same as for the previous motherboard, but just in a different place. At the top is the PC speaker, power LED and power switch.

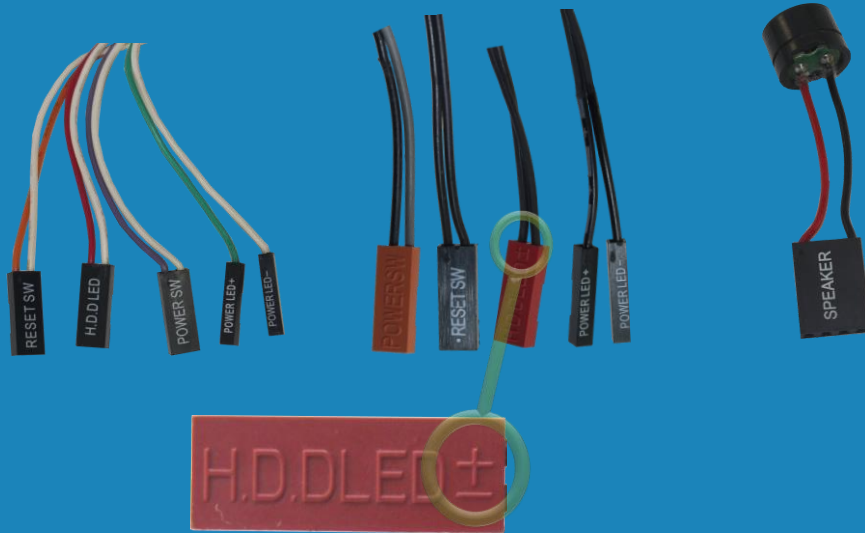
At the bottom is the hard drive LED and reset button. Everything so far is the same as the previous example, just the layout is different.

Like before, there is a second three pin power LED connector. Unlike before, there is also a suspend connector. If your computer case has a suspend LED, you can connect this here rather than connect the power LED. In this case, you would most likely connect the power LED to the two pin connector.

Some motherboards support certain features while others do not. What you connect and what you don't connect is up to you. In the real world, as long as you connect the power switch to switch the computer on and off, all the other connectors are optional.

Front Panel Wires

- White or black wire is negative or ground wire



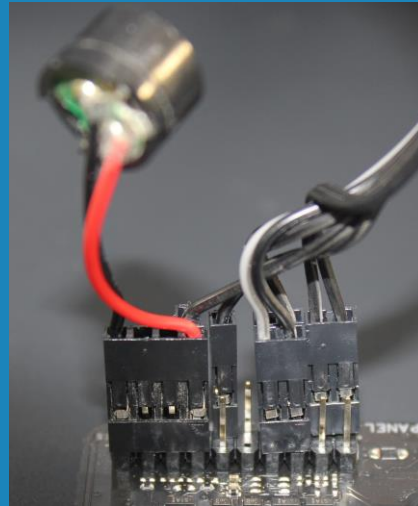
16:30 Different computer cases will have different connectors depending on what features the computer case supports. The wires are also different colors, but a rule of thumb is a white or a black wire is a negative or ground wire.

In this example, you can see the positive wire is the colored wire and the negative wire is white. You will also notice that the power LED is two separate wires. It is quite common for computer cases to do it this way. By splitting the wire like this, you are free to put the power LED in either the two-pin connector or the three-pin power connector.

In other cases, all the wires may be the same color, most likely black as in this example. When this occurs, the positive and negative wire will be printed on the connector. It may be difficult to see. If you are not sure, take a guess. If it does not work, try it the other way.

In the case of the PC speaker, there is no white wire and thus the black wire will be the negative wire. In the old days, the PC speaker was included in the computer case and was quite large. Nowadays, the PC speaker is a small adapter that is attached directly to the motherboard and is quite small.

Demonstration



17:41 I have a computer case and a motherboard. Later in the course I will look at installing a motherboard in a computer case. Generally, before I install a motherboard in a computer case, I will install the CPU, memory and front side connectors. The reason I do this is that it is generally easier to do it when the motherboard is not in the case.

Once the motherboard is in the case and screwed in, particularly with larger motherboards, it can be difficult to get to the front side header and even harder to see the writing on the motherboard.

In this case, this motherboard is quite small and the computer case is quite large, so I can place the motherboard into the computer case to connect the front side header. The only thing that I have done is rotated the motherboard 90 degrees to make it easy to get to the front side header.

You can see five connectors here – power LED counts as two connectors. To start with, I will plug in the two power LED connectors. In this case, I will plug it into the three-pin connector, so the middle pin will not be used.

The next connector that I will plug in is the reset switch. Since the reset switch is a switch and not a LED, it does not matter which way this connector is plugged in. You will notice with this particular computer case, the plug is not marked with any positive or negative markings and the wires are black, so there is no way of me knowing which is the positive and which is the negative wire.

When I have a situation like this, usually the header follows a pattern of the positive on one side and the negative on the other. So, I place the connector in so that the writing on the connector is facing the same direction as the other connectors. You will notice that both the power and reset writing are facing the same direction. Usually this trick works, but on the off chance it does not, you can always reverse the connector.

The next connector I will plug in is the hard disk connector. Since this is an LED connector, it will need to be plugged in the correct way. You can see the plus and negative signs at the top of the connector to indicate positive and negative.

In order to find out which way the connector goes, most motherboards like this one will have print on the motherboard itself; you can also look in the motherboard manual to work out which pin is which. On some motherboards, the header will be color coded for the different connectors and may have a symbol on them to indicate which is the positive connector. If you cannot work it out, use trial and error.

The next connector that I will plug in is the power switch. This plugs in on the other side of the header. Since it is a switch, it does not matter which way it is plugged in, but just to keep things consistent, I will have the writing on the connector face the same direction as the others.

Lastly, I will plug in the PC speaker. The red wire is the positive wire, so I will need to turn the PC speaker so that it is facing the correct way. Notice that the writing is facing the same direction as the others. There is no guarantee that this will occur, but it happens a lot.

All the connectors are now connected and the next step is to test them. To do this, I will press the "on" button on the computer. Notice that the blue power light will come on. Shortly afterwards you will hear the PC speaker beep to indicate everything started up o.k. You will also notice that the red hard disk light is flashing, indicating it is working.

The last thing that I need to test is the reset button. The computer will restart. You can't see the computer restarting, but you can hear another PC speaker beep indicating the computer restarted and has passed its POST checks.

All the connectors are working correctly. It is always a good idea to do this quick test before giving anyone a computer. It is embarrassing to get a phone call from a customer saying that there is a problem with a computer and the problem was caused by a connector that was not plugged in or plugged in the wrong way.

USB Case Connectors

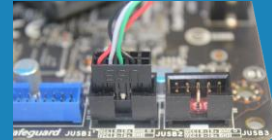


USB 3 Plug

USB 2 plug for backward compatibility



USB 2 Plug



Some USB headers may provide extra power

21:36 Your computer case may also support other types of connectors. One common type of connector is USB. These connectors plug into the motherboard and allow one to plug USB devices directly into the computer case. Usually these are located at the front or top of the computer case.

In this particular example, the computer case has a USB 3 and USB 2 port in the front of the case. Inside the case is a USB 3 cable. Notice that part of the connector's plug is blue. It is common for USB 3 ports and plugs to be blue in color to make them visually different from USB 2 connectors and plugs.

Notice also that the cable has an additional plug. This plug is a USB 2 plug and is included for backward compatibility. In order to use USB 3, your motherboard has to have a header for a USB 3 plug. If it does not, plug the USB 2 plug into a USB 2 header. You will still be able to use the USB 3 port on the front of the case, but the port will only support USB 2.

This case also has a USB 2 only cable. Like the USB 3 cable, it is just a matter of finding the USB 2 header on the motherboard and plugging it in. Like everything else on the motherboard, both headers are keyed so you can't put the plug in the wrong way.

When plugging in the USB 2 cable, note that, in some cases, different USB headers may provide additional power. Usually inside the USB header it will be a different color. Refer to your motherboard manual to determine what the difference is, if any. Plugging into a USB header with additional power will mean that devices like an iPad will charge faster than they would normally.

Audio Case Connector

- AC'97 if present is older audio standard



23:23 The next common case connector that I will look at is the audio case connector. Most computer cases will have a headphone and microphone plug in the case. To attach these two plugs to the motherboard, you must have a HD Audio plug. The HD Audio plug will plug directly into the motherboard.

In some cases, you may also have an AC'97 plug on the same cable as the HD Audio cable. AC'97 is the older audio standard. This was replaced by HD Audio. In some cases, you may have a motherboard and computer case that supports both. When this occurs, always use the HD Audio plug rather than the AC'97. HD Audio has a lot of features AC'97 does not have, but most importantly it has improved audio quality.

SATA

- Different colored ports usually have different features
- Usually low numbered ports have more features



24:12 The next connectors that I will look at are SATA connectors. Different motherboards will have a different number of SATA connectors. The number of SATA connectors and the speed they support will be determined by the chipset on the motherboard.

Most of the time, different colored SATA ports will indicate different features. In the case of this example, the white SATA ports are SATA 3 and the black SATA ports are SATA 2. In some cases, motherboards may have all the same colored SATA ports; however, they may not have the same features. In some cases, certain ports will support certain RAID functions while others will not.

A good rule of thumb is that lower numbered ports have more features. If you are not sure what features a motherboard supports or what speed the SATA ports are, I would start from the lower SATA port numbers and work my way up.

M.2 Connector

- Allows for internally mounted expansion cards
- Supports PCI Express and SATA devices



M Key
Up to four PCIe lanes



B Key
Up to two PCIe lanes
Additional interfaces



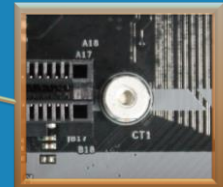
M & B Keys
Same speed as B Key



Placed in key slot



Pushed and screwed
into place



XXYY Format
XX Width
YY Length
E.g. 22mmx80mm

25:03 The next connector I will look at is the M.2 Connector. The M.2 connector allows for an expansion card to be mounted internally onto the motherboard. To use the M.2 connector, the M.2 device is placed in the keyed M.2 slot. Once placed in the slot, it is pushed down and a single screw holds it in place.

The M.2 connector supports PCI Express and SATA devices. Presently it is mainly used in two instances – for high-speed solid-state drives and devices in laptops. It is used in solid-state drives due to solid-state drives becoming faster than the interface that SATA 3 can provide. You could also use the solid-state drive in an expansion card, however doing it this way would make it very large. You can see why they went for a small option.

M.2 devices are keyed in a number of different ways. The keying is done by removing some pins which determine what the device supports. Removing the pins also ensures it cannot be put in the incorrect way or in a slot that does not support it.

There are a number of different types of keying, but I will only look at the two most common. The first one is called M Key. M Key allows up to four PCI Express lanes to the device. Remember that M.2 supports SATA connections as well. Your motherboard may either have dedicated PCI Express lanes to the device or may just have it attached to a SATA connection. If it is attached to a SATA connection, this will limit the speed it can operate at. If you want the best performance, before buying a motherboard, make sure the M.2 connection is connected to PCI Express if performance is important to you.

You will notice at the bottom there is a notch missing. If the notch is missing in this position, it is an M Key device. Like all other connections on the motherboard, this prevents the device being put into a connection that does not support it.

The next key type I will look at is B Key. Notice that the notch is at the top rather than the bottom. They may look similar, but they are in a slightly different position and a different size to ensure a particular keyed device cannot be put in the wrong slot.

B Key supports SATA connections like M Key, but only supports up to two PCI Express lanes. However, B Key supports additional interfaces types like USB, audio and SMBus.

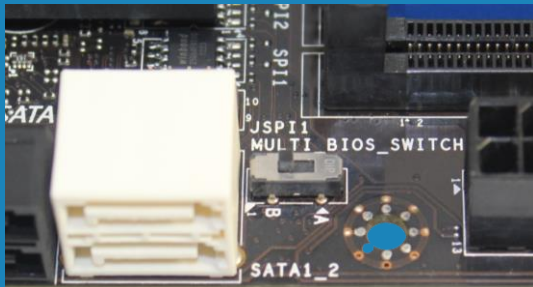
B Key will usually be found in laptops. There are currently six keying types on the market out of a possible of 12. For this reason, don't assume that keying in the laptop is B Key just because it is a laptop.

Due to B Key supporting additional interfaces, it is often used for devices like wireless or Bluetooth, whereas M Key generally gets used for solid-state drives.

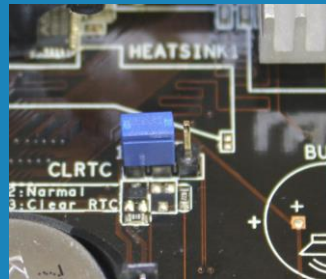
It is also possible to combine multiple keys together. In this example, the M and B keys have been combined together. This allows a solid-state drive to be used in an M Key connector or a B Key connector. The connector itself won't support both types, it will be one or the other, but having dual keying allows it to be used in either. The cost of this is the device will only be able to run at B Key speed. This is because the missing pins reduce the number of PCI Express lanes that can go to the device. So essentially, you are trading some speed for compatibility. B Key is still pretty fast compared with SATA 3, so it is an acceptable tradeoff for the moment.

The last point to consider is the size of the device. On this motherboard there are three screw holes for different devices. The last one you can see is 2280. This means the following; the device is 22 millimeters wide and 80 millimeters long. 22 is quite common for the width, so generally you will see only the length change. You just need to ensure that the device you buy fits. For example, if you purchase a 2280 solid-state device, you need to ensure that your computer has room and screw holes for a 2280 device. This is generally more of a problem if you are attempting to put the device in a laptop where there may not be a lot of space.

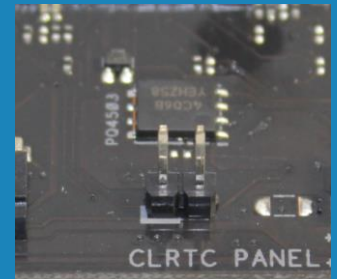
BIOS



Multi BIOS switch determines which BIOS chip is used



3 pin clear CMOS



2 pin clear CMOS

29:30 Next, I will look at some of the BIOS features you may have on your motherboard. Some motherboards on the market will have what is called dual BIOS. The motherboard will have two identical BIOS chips on the motherboard, however only one can be used at a time.

To determine which is used, there will be a switch on the motherboard. This is useful if you attempt to update the BIOS firmware and the process fails. When this occurs, you can switch to the other BIOS and start the computer up using it.

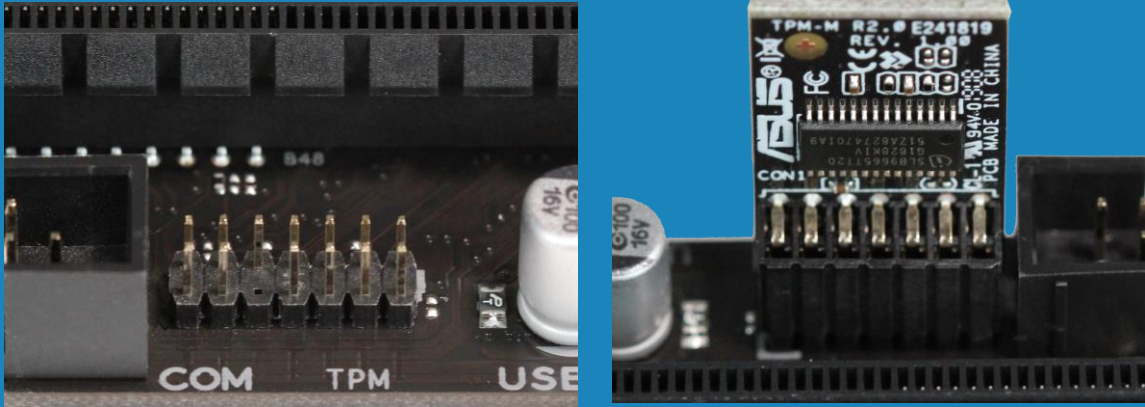
BIOS settings are stored on the motherboard and corrupt settings may prevent the computer from starting up. The most common example of this is a startup password being put on the computer and nobody knowing what it is.

In order to clear the settings, the motherboard will have a clear CMOS jumper. On older motherboards, there will generally be three pins. On newer motherboards, there will generally be a two-pin jumper. In either case, if the pins are shorted when the computer is switched on, all the BIOS settings will be cleared.

On older motherboards jumpers were used to configure the bus speed of the motherboard. This was required to be set correctly to match the CPU. Now days, settings that were traditionally configured using jumpers are now automatically detected. Thus, besides clearing the BIOS settings, you may not find any jumpers on your motherboard.

Trusted Platform Module (TPM)

- Contains cryptographic keys
- Disk encryption/Platform integrity



30:54 The last header I will look at is the Trusted Platform Module or TPM. Your motherboard may or may not have this header. Generally, the more expensive motherboards or motherboards aimed at the business market will have this header.

The TPM is a chip that contains cryptographic keys and other encryption related features. The TPM is used to securely store these keys so they can be used in functions like disk encryption and platform integrity. Platform integrity is used in systems like secure boot to check that the computer has not been tampered with.

Different motherboards will have different TPM headers. Generally, different manufacturers will use the same TPM header for all of their motherboards. In this example, you can see the free TPM header. It is just a matter of buying a TPM and placing it in the header as in this motherboard. It can be difficult to purchase TPMs, so personally I would check to ensure you can purchase a TPM for that motherboard before you buy the motherboard. If you have trouble getting a TPM, eBay is often a good place to locate one.

In The Real Word



- Exception is front side panel connector
- LED lights need to be put in the correct way
- Don't force it if it does not fit
- Refer to manual if you cannot locate something

32:03 In the real world, remember that all motherboard connectors are keyed. This essentially means they cannot be put in the wrong place or upside down. I often refer to building computers as Lego for adults. Just like Lego, if it is not designed to go together it won't.

The only exception to this is the front side panel connectors. In the case of these connectors, the only one you can get wrong is the LED lights. If you find the LED lights are not working, reverse the connector. You won't damage anything by trying.

With the other connectors, don't force them if they do not fit. If you apply a lot of force you may be able to get the connector in, but if it is not the correct one you can damage the plug and possibly damage the motherboard when you switch the power on. If you are having trouble getting the connector in, have a look at the plug and the header. Generally, there will be a missing pin or blocked pin. It is just a matter of lining these up with the header and the plug.

If you have trouble locating something on the motherboard, have a look in the manual. All motherboard manuals have a diagram showing where everything is. Sometimes they can be difficult to locate, as a lot of these headers look similar.

That concludes this video, I hope you have found this information useful. I look forward to seeing you in the next video. Until then, I would like to thank you for watching.

References

"The Official CompTIA A+ Core Study Guide (Exam 220-1001)" Chapter 3 Position 8196-8785

“Power supply unit (computer)”

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“Computer fan control” https://en.wikipedia.org/wiki/Computer_fan_control

“M.2” <https://en.wikipedia.org/wiki/M.2>

“Trusted Platform Module” https://en.wikipedia.org/wiki/Trusted_Platform_Module

Credits

Trainer: Austin Mason <http://ITFreeTraining.com>

Voice Talent: HP Lewis <http://hplewis.com>

Quality Assurance: Brett Batson <http://www.pbb-proofreading.uk>