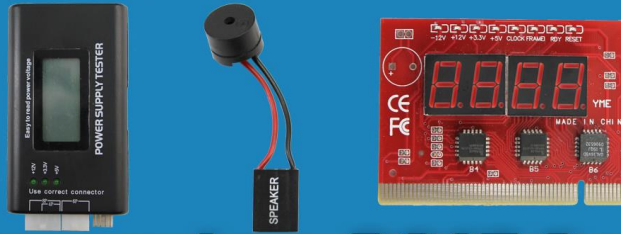


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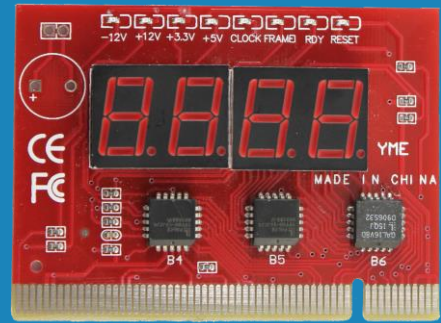


Beep codes, POST Cards and PSU Testers

For the free video please see
<http://itfreetraining.com/ap/1b67>

In this video from ITFreeTraining, I will be looking at some of the tools that you can use to troubleshoot a computer that is failing to start up. These tools will allow you to fix problems you may not have normally been able to and potentially speed up the troubleshooting process.

In This Video



Power Supply Tester Beep Codes POST Cards

0:16 Generally, when a computer is failing to start up, you will get a black screen. To troubleshoot this, I will first look at a power supply tester. If you have a dead computer, the power supply tester will quickly allow you to test if the power supply is the problem. The power supply tester will also allow you to test for a power supply that is malfunctioning, for example not outputting the correct voltages.

Next, I will look at the start-up beeps. Shown here is an example of a PC speaker that can be plugged into a motherboard. When there is a problem, the PC speaker is used to emit a number of beeps. The number of beeps will inform you what the problem may be. You may also get a text message giving you an idea what the problem is.

Although beep codes and text errors are useful, sometimes these can be misleading or maybe all you are getting is a black screen and no beeps. For example, a malfunctioning device can disrupt the POST process forcing the computer into an endless loop. This can look like the computer is dead when in fact it is not.

The next tool that I will look at is a POST card. The POST card plugs into the motherboard. The POST card contains a number of light-emitting diodes that display information about the computer. However, most importantly it displays a code which indicates which device the POST is currently testing. This information can be invaluable in the troubleshooting process.

The problem that you will come across is trying to find documentation for what the codes

mean. Every BIOS manufacturer and different versions of BIOS will use different codes. To start with, I will have a look at the power supply tester.

Power Supply Tester



Tolerance $\pm 5\%$ (Positive) $\pm 10\%$ (Negative)
Power Good (PG) between 100 and 500ms

ITFREETRAINING QUICK TIP

2:03 When troubleshooting, consider it as a logical problem. Most of the time a failed component will be causing the problem and will need to be replaced. On rare occasions you may have two failed components, but usually it will be only the one. It is just a matter of working out which component is not working. To do this, often it helps to find out what is working, eliminate it leaving what is left as possibly faulty.

The power supply tester allows you to test a power supply and its cables to ensure it is working and outputting the correct voltages. Shown here is the power supply tester. You can see next to it the power supply that I will be testing.

To start with, I will locate the P1 or ATX connector and plug it into the power supply tester and switch on the power supply. This is a 20 or 24-pin connector. Later in the course I will be going into more detail about the different connectors used inside a computer. It is the largest connector attached to the power supply and plugs into the motherboard, so it is easy to find.

You will notice that once it is plugged in, the LCD screen lights up and shows all the voltages the power supply is currently outputting. For positive voltages the tolerance is five percent and for negative voltages it is ten percent. The PG, or power good signal, needs to be between 100 and 500 milliseconds. The power good signal is a signal given to the motherboard when it is switched on and has had time to stabilize. When the power is cut to the power supply, the power good signal should drop immediately. The power supply will still have some power stored in its capacitors. This gives the computer a few milliseconds notice that the power has

been switched off and it is running off capacitors. This very small amount of notice gives the computer a very small amount of time to shut down its components.

You can hear that the power supply tester is beeping. On the screen there are two L's flashing. If you get an LL or HH on the screen there is a problem with the power supply. In this case however, I know the problem is that I need to plug in the P4, otherwise known as the EPS connector.

As CPUs started using more power, the P1 connector could not provide enough power to the motherboard. Thus, a 4-pin or 8-pin connector was added. In some cases, your 8-pin connector may be able to be divided into two 4-pin connectors.

You will notice on the power supply connector the text, 8P, 4P and 6P. On this particular power supply there is an 8-pin connector that can be divided into two 4-pin connectors. I will plug this into the power supply tester.

You will notice that once plugged in, the beeping stops. All the voltages on the power supply are in tolerance range and thus, this is a good power supply. If you find your power supply is outside these ranges, you should consider replacing the power supply.

I will now demonstrate the 6P plug, but this essentially is used to provide extra power to PCI-E cards. Often this is required for graphics cards.

The power supply tester can also test other connectors. For example, the mini-Molex connector which was traditionally used to power floppy drives. You will notice that once I plug it in, the twelve volt and five-volt indicators light up. There is also a 3.3 voltage light.

Only one of these connectors can be tested at one time. If I want to test the Molex 4-pin connector, I need to unplug the mini-Molex connector and plug the Molex connector into the side of the power supply tester. You will notice that both lights light up indicating that power is being outputted.

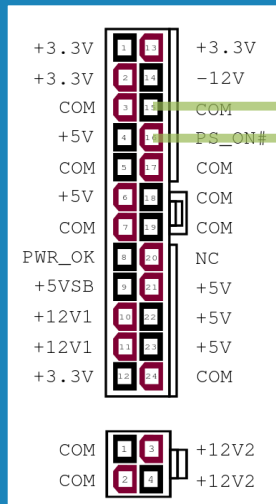
Lastly, I will test the SATA connector; the SATA connector plugs into the other side of the power supply tester. Once again, the same result, both lights will come on.

After all this testing, it is safe to say this power supply is working correctly. If you have a computer that will not start up, this is a quick test that you can do to check if the power supply is causing the problem.

If you do not have a power supply tester, or one is not available, there are some other

options available to you. On some computers, when you first plug the computer in, it will briefly test the power supply unit. When this occurs, you will hear the power supply fan spin for a few seconds then stop. Other motherboards may have an LED light on them to indicate power is going to the motherboard and yet with some others there may be no way of knowing. This of course does not test the voltages as the power supply tester does, but at least it will give you an indication that the power supply is working.

Testing A PSU With A Paperclip



- Connect green and black wires
- May need to be put under load

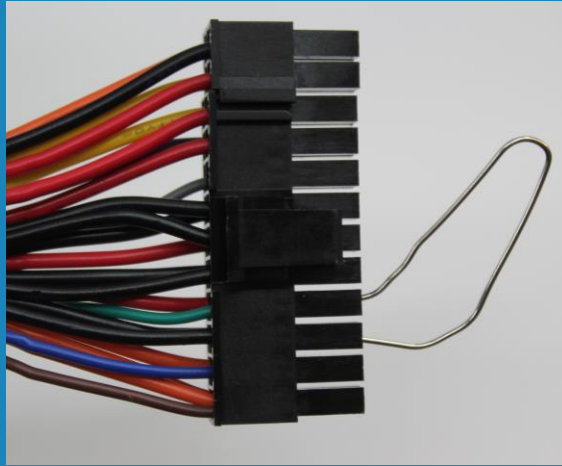
7:03 If your power supply is not starting up, it is also possible to start the power supply using a paper clip. This won't be tested in the CompTIA exam, but I think having an understanding of how different components work will give you a better understanding of how to trouble shoot them.

Shown here is the pinout for the P1 connector. This connects directly to the motherboard. What happens is, when you press the power button on a computer two pins are shorted which tells the power supply to switch on.

On the P1 connector is a green wire. This tells the power supply to start. All you need to do is connect this to a black wire. There are number of black wires to choose from; in this case I will choose the wire next to it. All I need to do next is short these wires which can be done with a paperclip. If you do decide to do this, you do this at your own risk and we can't take any responsibility.

With some power supplies this will not work unless the power supply is under load. For example, a fan is plugged into the power supply. Let's have a look at how to achieve this.

PSU Paperclip Demonstration



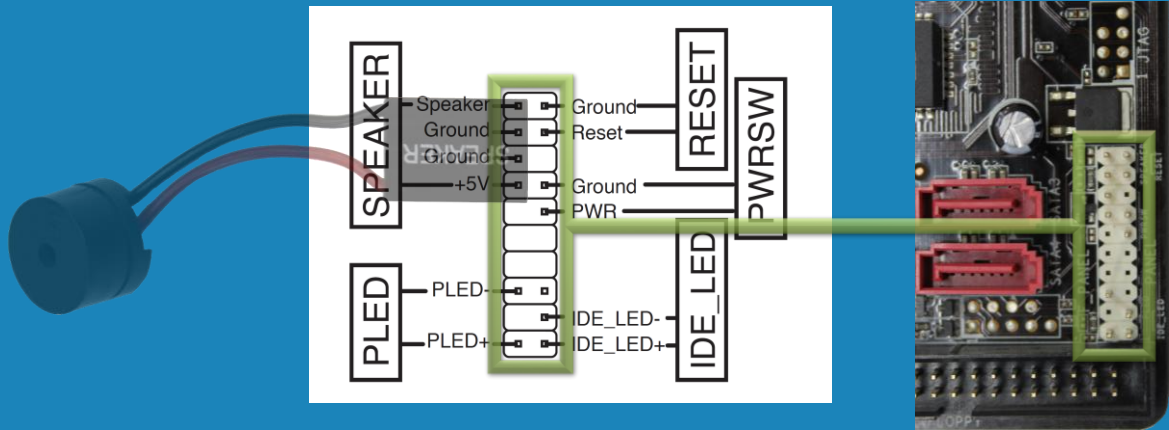
8:10 I have connected a fan to my power supply. Depending on your power supply you may or may not need to do this. I recommend before doing this, to make sure the power supply is unplugged. Keep in mind that power supplies can also hold a charge in their capacitors after they are unplugged.

You can see there is only one green cable. Most power supplies will have color-coded wires. In some power supplies all the wires will be of the same color. If this is the case you will need to count the pins to choose the right one.

Once I have put the paper clip in place, the next step is to plug the power supply in and switch it on. You will notice the power supply and the fan will start up. This is not as good as using the power supply tester, but if you are stuck without a power supply tester you can at least test the power supply is starting up.

Connecting The PC Speaker

- Connects to system panel connector/header



9:02 The next troubleshooting technique that I will look at is the PC speaker. In the early days of computing, the PC speaker was quite important. Nowadays with just about every motherboard having a built-in audio chip, there is no need for the PC speaker. The only real use for the PC speaker is to make audible beeps so we are aware there is a problem.

The PC speaker is connected to the motherboard by a connector called the system panel connector or system panel header. It also goes by the name of front panel connector or fpanel. All modern motherboards use a connector like this.

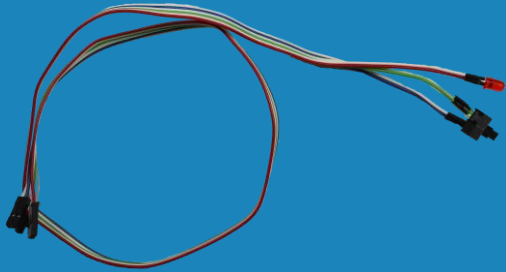
Shown here is a connector on the motherboard. Later in the course, I will go into more detail about this connector. Generally, on the motherboard there is writing next to the connector to tell you which pin does what. The writing however can be quite small and difficult to read.

If I have a look at the manual for the motherboard, there will be a diagram that will show what each pin connector does. It is just a matter of making sure the diagram is orientated the same way as the connector on the motherboard and then you can work out what each pin does.

Once you work out which pins are for the PC speaker, it is just a matter of plugging it in. Generally, the negative wire will either be black or white in color. In this case, the negative pin is at the top, so it is just a matter of plugging in the PC speaker so the black wire is at the top. It is important to get this right, otherwise the PC speaker may not work.

If I have a look at my motherboard, you can see the PC speaker at the side of the motherboard. To install the PC speaker, it is just a simple matter to plug it in as shown. Just make sure that you plug it in the right way, otherwise it may not work.

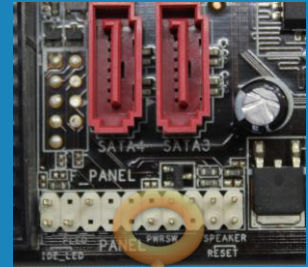
Switching On The Computer



On/Off button



Screwdriver



Short Here

10:48 The next step should be fairly obvious, the computer needs to be switched on. This can be done with the traditional on/off switch if it is working. I have had computers in the past where the on/off switch was not working and thus was the problem. To get around this, you can plug a cable with a switch attached into the motherboard like the one shown. These may also come with additional lights on them. If you don't want to use a case, either you don't have one or don't want to waste time putting the motherboard in a case, you can put the motherboard on a table and use it that way. If you do this, I would suggest putting the motherboard on an anti-static mat if one is available.

The other method I will look at is using a screwdriver. If you recall back to the start of the video, the power supply can be started up by shorting two pins using a paper clip. Essentially what happens is that a circuit is being closed. By using a screwdriver, we can close the circuit making the power supply start up.

To get a better understanding, I will have a closer look at the motherboard. On the motherboard, most likely abbreviated, will be written the words power switch. If this is not present or is hard to read, refer to the motherboard manual. Once you locate the correct pins, it is just a matter of shorting the circuit to close the switch.

When you are repairing a computer, it is sometimes useful and faster to test a computer on a table rather than put it into a case just for the purpose of switching it on. Let's take a look.

For this demonstration, I have placed my motherboard on my anti-static mat on my table. I have also placed a fan to the side of the motherboard. This is not required and is only there so you can see when the computer is running. In other words, if the fan is spinning the computer is running.

First of all, I will plug my switch into the panel connector. You can see that it is basically just some wires with a switch and some lights. This is essentially replacing the switch in your computer.

It is just a simple matter to plug it into the panel connector. The wires are color-coded with white for negative, but since it is only a switch, if you get it around the wrong way, it won't matter. Once connected, all I need to do is press the button just as if I was pressing the button on the computer case. Just like the button on the computer case, if I hold the button down for five seconds, you will notice that the computer will switch off.

To switch it on using the screwdriver method, all I need to do is unplug the switch and press the screwdriver up against the two pins. The computer will start up and you will hear one long beep followed by three short beeps. This leads us on to our next topic, the beep codes.

Beep Codes

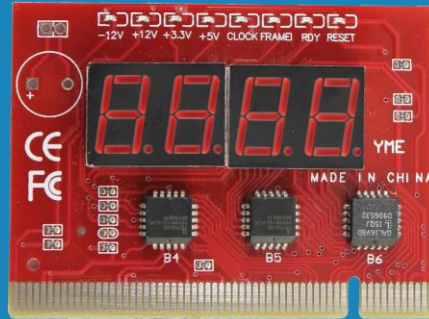
- No common standard
- Common beep codes
 - One beep (All tests passed. No errors)
 - One long, two/three short beeps (Video cards)
 - Indefinite beep/long beep (Memory errors)

13:34 When there is a problem with the computer starting up, the computer will let you know what the problem may be using a series of beeps. Unfortunately, there is no common standard for beep codes, but some of the more common ones are shown. You will also find that documentation in regards to the beep codes may be out of date. CompTIA refer to the beep codes as POST code beeps.

On this computer, I had one long and three short beeps, which for this BIOS means there is no video card installed. In the case of this motherboard, there is no in-built video card so I will have to install one. If there is a problem with the video card you may also get this series of beeps. This is generally caused by the video card not being seated correctly, so you may need to unplug it and plug it back in again. It may be a problem with the slot, for example the slot may have dust in it or the video card is not working.

POST Cards/PC Analyzer

- LED lights display voltages and other indicators
- Hexadecimal display of last code from BIOS
- Debug codes BIOS and version specific



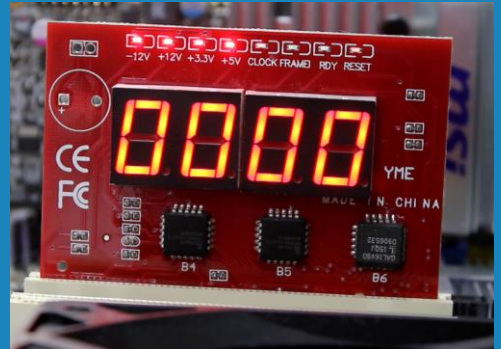
14:29 The next topic that I will look at is POST cards otherwise also referred to as PC Analyzers. This is a card that plugs into the motherboard. Different POST cards on the market will have different features. Many POST cards will have LED lights that display the presence of voltages and other indicators.

The POST cards will also have a hexadecimal display. As the BIOS is testing different hardware the codes will change. If you have faulty hardware, this display will tell you the last bit of hardware that was tested.

Sounds simple enough! However, the codes, otherwise known as debug codes, are BIOS and version specific. The documentation that comes with the POST card will cover the more common BIOSs and their codes, otherwise if you search the internet hopefully you be able to find them. If you're lucky your BIOS will be well documented, but in a lot of cases it will not be. Let's take a look at the POST card in action.

PC Card Demonstration

- 12 volts negative
- 12 volts positive
- 3.3 volts positive
- 5 volts positive
- Clock (No CPU)
- Frame (Frame sent on PCI)
- Ready (Detects ready signal)
- Reset (Reset button pressed)



15:28 You can see the POST card next to the motherboard. To use it, just plug it in. Once plugged in, I will switch the computer on.

You will notice that the LED display will change. The code indicates what is currently being tested by the BIOS. In the case of this computer, only two digits codes are used so the second two digits will always be the same as the first. On some POST cards, the first two digits show the current code and the second two digits show the previous code. In the case of this BIOS, once all testing is complete it will display the code 8080.

There are a number of LED lights on the PC card. The first four are for voltages. These should be on to indicate the power supply is sending the required voltages. If they are not, there is probably a problem with your power supply and it needs to be replaced.

The clock light will only come on if there is no CPU on the motherboard. If you have a CPU installed and this light is on, reseal the CPU and try again. The frame light is used when data is sent over the PCI bridge.

The ready signal indicates the POST card is ready to go. This will flash on from time to time.

The reset light indicates that the reset button has been pressed. You can see, that if I short the reset pins with my screwdriver, the reset light will flash on. You can see that using a POST card can give you some useful troubleshooting information.

In The Real World



- Black screen, check everything plugged in
- Beep codes give quick indication what is wrong
- Power supply tester can test power supply
- Use Post card for rare troubleshooting problems

17:00 In the real world when troubleshooting, the first step I do when I have a black screen is check everything is plugged in. Besides making sure the computer is plugged into the power supply, a memory module or video card that has come loose is enough to prevent the computer starting up.

If you hear anything other than a single beep, there is a problem. Look up the beep code and this will let you know what the problem is. This is a quick way to narrow down the problem, for example there is a problem with the memory.

If the power supply will not start or suddenly without warning the computer is switching off, it could be a problem with the power supply. This is a good time to use the power supply tester. If the power supply is working outside the tolerances or does not work at all, it is time to replace it.

Lastly, I only tend to use POST cards with rare troubleshooting problems that I have not been able to solve using other methods. Although the POST cards can be good, you really need to know what the debug codes means for them to be useful. These debug codes are BIOS specific and can be difficult to find. In most cases, you will be able to resolve most problems using other methods.

This concludes this video from ITFreeTraining. I hope you have found this video useful and I look forward to seeing you in other videos from us. Until the next video, thank you for

watching.

References

“CompTIA A+ Certification Exam Guide Tenth Edition” pages 193-216

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

Credits

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

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