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Hardware testing tools are usually for testing a computer while it off, and to diagnose/fix more complex hardware problems. These tools I am about to compare all have different uses and so are hard to compare in this format.

2.1 Multi-meter
A multi-meter is used to measure the electrical properties flowing through a cable, such as amperage, voltage and electrical resistance. It can measure other electrical variables as well, but these are mostly not used for computer maintenance purposes.

When performing computer maintenance a multi-meter is more of a specialist tool for diagnosing problems with power supplies. The multi-meter is used to measure the voltages being outputted from the power supply, to make sure that they are within acceptable tolerances for the parts it’s connected to. Repairing a power supply is generally not considered safe, due to them holding an electrical charge of dangerous levels. So because of this they are generally just replaced, which doesn’t cost too much.

The multi-meter is generally just used to narrow down the problem to the power supply. However it can also be used to check if the power source the computer’s power supply is connected to, is also running within tolerances.

2.2 Ethernet Cable Tester
An ethernet cable tester is used to test an ethernet cable’s ability to send/receive data. The tester will usually send some test data or power to the other end, which the tester then checks to see if it receives it at the other end. It also tests whether the cable has been wired correctly, which is very helpful since ethernet cables are very tricky to assemble, so mistakes are pretty easy to make.

More advanced cable testers will even test the maximum data transfer rate of the cable and identify if it’s CAT6, 5, 5e, etc. This tool will probably be used when a problem with a network is determined to be not software or router related. Which means that the problem is most likely with the cable, if the cable is faulty re-crimping both ends may fix it or a full replacement may be necessary.
2.3 Temperature Probe

A Temperature probe is not often used, because a software tool can get a more precise reading from a sensor built in to the hardware. However, there are a few cases where it might be unsafe to wait for the system to boot up fully and load the software. These can include extreme overheating that will damage components if left too long. It could also be used when a temperature sensor inside the computer is producing an anomalous reading or not working at all.

Most temperature probes work using an infrared laser to determine the temperature of the surface it is pointed at. This is not as accurate as the temperature probes built inside the hardware, because all it can measure is the surface temperature.

3 Software Testing Tools

Software testing tools are used to diagnose a system while it is still in a mostly working condition (powers on). I have chosen 3 testing tools with slightly different functionality, but might look very similar from their interfaces. They cover three of the main things you need when diagnosing a system:

- Temperature Readouts
- Hardware Detailed Information & Voltages
- Benchmarking Tests

3.1 HWMonitor

HWMonitor is a temperature monitoring tool by CPUID. It can provide temperature readouts from every sensor in the computer, usually Hard Drive, Graphics Card, Processor and the general system/case temperature. It’s a very simple program with no configurable options, it just works “out of the box”.

It also displays the wattage being used currently by a processor, which can help when trying to calculate power use. It will also show fan speed of any PWM (Pulse-width modulation) fans, however you have no control over them. To control fans you will need a program like SpeedFan.

It also gives some basic voltages, but doesn’t describe what exactly each voltage is from. Which makes it a lot weaker in comparison to the next program CPU-Z.

HWMonitor also shows you the maximum, minimum and current values of all of these variables, so while running a benchmark you don’t need to actively monitoring the tool as it will store the maximum reached temperature.
3.2 CPU-Z

CPU-Z is also made by CPUID and gathers details on the hardware installed in a computer. These details can include the name of the part, manufacturer, model number and more specialist details for each part.

On the CPU tab you can monitor the voltages, clock speed and bandwidth of the cache. These details can help when overclocking the CPU and making sure that it is a stable overclock, because if it isn’t the CPU could overheat or short-out due to the increased voltage outside of its specified range.

CPU-Z can also give some information on the Motherboard, or the Mainboard as the program calls it. From here it will tell you the manufacturer, model and revision number. It will also tell you which North & South bridge chipsets the motherboard contains.

On the same page it also gives some information on the BIOS such as the brand and version number, which can help if you are planning on flashing (Upgrading) the BIOS.

It can also give information on RAM such as its frequency, size and type. This can be helpful when planning on upgrading your RAM because it tells you the size and frequency, so you know if you need to buy higher frequency RAM or just larger sized RAM.

I also provides a very limited amount of information about the GPU, unfortunately it didn’t recognize mine fully, so it didn’t give me much useful information. It did give me the make, version number and GPU memory size, which are some of the most important GPU information. However it didn’t give me any measure of the GPU clock speed, so I have no idea how powerful the GPU really is.

3.3 PassMark Performance Test

The PassMark Performance Test unlike the other tools is not free to use but is one of the best tools to benchmark a computer. Like CPU-Z it also gives you the ability to look through all the hardware details through a graphically rendered mock-up of a motherboard, where you can click individual components for more details. Compared to CPU-Z it lacks some details and also does not auto update the values when they change.

On top of these features it also has a powerful benchmarking tool that can test many components of a computer. The results from these tests can then be compared with other system profiles from other users. But more importantly you can test that the CPU is running at its maximum performance compared to another of the same model. These tests can massively help in the diagnostic process because you can see when a piece of hardware isn’t running at its full ability.
It can test the GPU, CPU, Hard Drive, Memory, CD/DVD drive and Networking. These tests can stress components to their maximum potential, so it is a very good way to look for overheating components in tandem with a temperature monitoring program such as HWMonitor. Although while running these tests you have to remain vigilant, so that an overheating component isn't permanently damaged during the process.

The software can also give you an overall PassMark system rating, which could be helpful to see the change in performance of an upgraded system.