

# Overclocking: Getting More From Your Computer

## I. What is Overclocking?

Overclocking is the process of changing the internal settings of a computer so that the hardware of the computer runs faster than originally intended. The purpose of this is to enhance the performance of the computer using very little money. The three most popular pieces of hardware in the machine to overclock are the CPU, the memory, and the graphics card. Of the three, an overclocked CPU will gain the most overall



A Computer Processor or CPU

increase of system performance. This guide provides the information you need to take new or existing computer hardware and get the maximum performance possible out of it by overclocking the CPU and memory.

## II. Drawbacks

First and foremost, the main drawback of overclocking a computer is that it will immediately void any warranty on the hardware. Also if overdone or not done properly, there is a potential to permanently damage pieces of hardware while overclocking. Overclocking is almost like a game to see how fast the computer will go, just as someone tweaking a car engine tries to increase the maximum speed of the car. Overclocking is also a completely random game. Two seemingly identical pieces of hardware may overclock to completely different levels. One piece of hardware may make huge increases in performance where the other may not run any faster than the stock (or default) setting. This is another drawback, because someone buying

hardware specifically with the intent to overclock it may not get anywhere close to the amount of performance gains expected.

### III. How to Overclock

#### 1. Tools

In order to overclock, you will need to have specific physical and software tools before you begin. The first thing that you will obviously need is a computer. However this computer must contain at least some custom pieces. Name brand computers such as Dell and HP will most likely *not* overclock. These computers have been locked so that someone who is a novice cannot damage their computer, thus saving these companies many customer service calls.

Before you begin, make sure that the computer has adequate cooling. You will need a good air flow through the case and, depending upon the configuration, multiple case fans. Also, an advanced copper and aluminum heatsink will be needed to cool the CPU. High quality thermal compound made of microscopic particles can also be used in between the heatsink and CPU to provide even more cooling. The reason for this extra cooling is that an overclocked computer produces much more heat than a computer running at stock settings. Heat is also one of the limiting factors in how high a piece of hardware can be pushed because after the build up of excess heat, the hardware will fail.



An Advanced Heatsink

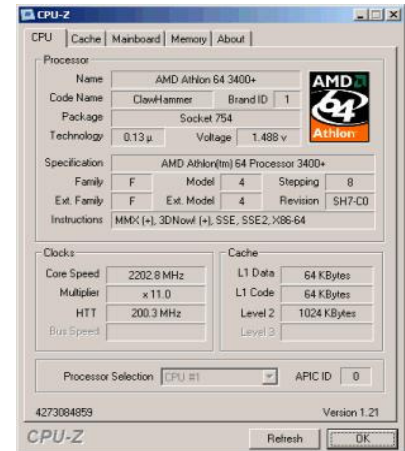
To overclock, you need access to the BIOS. The BIOS is the basic piece of software that controls how the hardware interacts. It can be accessed when the

computer is booting up by normally pushing the DELETE key. However, different motherboard manufacturers use different key combinations, and this information is contained in the motherboard manual. A basic temperature checking utility is needed to monitor how hot the system is getting when changing settings. This utility is normally included with the motherboard. Also, a utility such as CPU-Z (<http://www.cpuid.com/cpuz.php>) is needed to check the actual speed at which various pieces of hardware are running.

## 2. Types of Overclocking

Almost every piece of hardware in the computer can be overclocked in some way. However, to have the highest performance gains, the processor should be the first component overclocked. All processors run at a certain internal frequency, also known as its clock speed. For example, an Athalon XP 3200+ runs at 2.2 GHz or 2200 MHz, and a Pentium 4 3.2 runs at 3.2 GHz. While processor speed is not the first indicator of overall processor performance (both of the previously mentioned chips have comparable performance), all processors will gain performance with increased frequency or clock speed. The goal of overclocking is to increase that clock speed to higher than the manufacturer's preset.

The processor clock speed is made up of two parts: the bus speed and the multiplier. These two numbers are multiplied together to get the overall speed of the chip. For example, a processor with an overall clock speed of 2200 MHz that has a bus speed of 200 MHz would have a multiplier of 11x. Increasing this multiplier to 12x



CPU-Z

would produce a clock speed of 2400 MHz. That is a full 200 MHz jump in speed. However, in an effort to combat overclocking and force people to buy a higher priced CPU, most chip makers have locked the multiplier on the CPU so that it cannot be changed up or down. This leaves only one option in processor overclocking—increasing the bus speed. This type of overclocking has the added benefit of increasing the overall system performance because the data transfer and memory speed is increased at the same time. The memory in the system runs directly proportional to the system bus speed.

### 3. Procedure

To perform an overclock, the first thing that you need to do, after downloading the previously mentioned tools and checking the cooling, is open the BIOS. Once the BIOS is loaded, search the options until you find the bus speed and multiplier settings. This is normally on the first or second menu page. On this page, you should see



A Computer's BIOS

multiple other options such as voltages, memory timings, and memory/CPU ratio; these settings are used during an advanced overclock.

For a first time overclock it is best to take it very slowly and carefully. Turn up the bus speed by two or three MHz and save and exit the BIOS. Load Windows and perform some CPU intensive tasks, such as a 3D game or video encoding, to make sure that the processor is still stable. Open your temperature checking utility and look at the temperature. Anything that is lower than 60° C should be fine for the processor. However, the lower the

temperature the better. Repeat this process over and over, diligently checking the temperature and stability each time.

Once you encounter the first sign of instability in the computer, stop the process. You then have two options. One, you can be satisfied with the gains in performance you have made, back the bus speed down about five MHz, and stop. Two, you can try to get even more performance out of the system by advanced overclocking techniques. If you choose the latter, move on to the next section.

#### IV. Advanced Overclocking

Up to this point, overclocking is fairly safe. There is very little risk of causing any permanent damage to the processor using the techniques described in the previous section. This advanced procedure is only for the person who really wants to get the absolute maximum possible performance out of their system. The reason that the processor and/or memory are acting unstable is because they are not receiving enough power to perform at the newly attained frequency. To reach higher speeds, one must turn up the previously mentioned voltages in the BIOS.

Increase the CPU voltage *very slowly*, such as one interval at a time, and never under any circumstances turn up the CPU voltage more than .2 or .3 volts. If the voltage is set too high it *will* eventually *burn out your processor*. However, small increases in voltage have small chances of doing any harm. After increasing the voltage, repeat the process in the previous section until instability is again reached. Depending upon how high the voltage has already been increased, either turn it up again and repeat, or stop.

## V. Conclusion

After reading this guide, you should have a fairly good grasp of overclocking, what it is and how to accomplish it. Remember, overclocking is done at your own risk, and you will in no way have any support from the manufacturer of the hardware. However, the performance gained can be worth the slight risk, and it can save a lot of money compared to buying hardware that is comparable to the overclocked processor.

## Works Researched

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