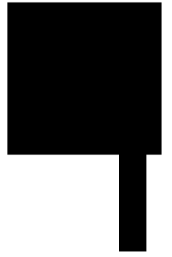


How to overclock your CPU



applying the right settings and having adequate cooling. It's not even as complicated as it once was, with many fantastic tools that will help you do the job efficiently and effectively.

[Should you overclock your CPU?](#) That's entirely up to you. It does have its risks, but you won't void your warranty if you don't go too crazy — and, within limits, it's a painless and almost risk-free endeavor.

A word of caution



your potential overclocking headroom is much lower than using a more advanced air or liquid cooling system in your PC.

Overclocking typically lower a CPU's lifespan, but not always and not even necessarily for a measurable period. Yet, forcing it to run faster and use more power can lead to some measure of speedier degradation. As long as you don't get

extreme with overclocking, you'll likely upgrade your system before this becomes



If you want to overclock a laptop CPU, you're probably out of luck. Few allow it, and fewer still possess the thermal headroom to make it viable. But even if

you can, we caution against it for your first overclocking venture.



much voltage through the chip.

Motherboard manufacturers may or may not cover overclocking. If you're concerned, check the warranty before trying.

Identify your CPU

Before you start overclocking the CPU, figure out what you have — the chip may



significantly. You can overclock the most recent CPUs from AMD, especially Ryzen. Typically, you can only overclock the Intel K and X series CPUs.

Below are several recent unlocked Intel processors primed for overclocking. If your CPU isn't on the list and doesn't have a K or X suffix in its name, overclocking may not be possible. Double-check if you're unsure.

SKU	Base clock	Turbo clock
Core i9-9900K	3.6GHz	5.0GHz
Core i7-9700K	3.6GHz	4.9GHz



AMD processors have remained completely unlocked and overclockable for generations. Whether you have an AMD FX-series CPU or one of the newer Ryzen chips, they can all be changed. We could list them all here, but that would be extensive. Chances are, if you have an AMD CPU, overclocking is on the table.



some disappointment.

Housekeeping

Since overclocking increases your system's operating temperature, it forces both your CPU and system cooling to work harder than usual. If this is your first overclocking attempt, give your PC a spring cleaning.

You can clean the dust filters on your front intake fans or remove all hardware and



where the majority of the additional heat accumulates.

Before cleaning, turn off the PC and wear an anti-static wristband. We also don't recommend using a vacuum cleaner to remove dust due to the potential for static buildup. If dust is hard to reach, use a can of compressed air sold by a store like Walmart or Best Buy.

When you're finally ready, skip ahead to the section for the brand of CPU you have,



you can overclock Intel CPUs using the BIOS. Since this is a beginner's guide to overclocking, we recommend Intel's Windows-based Extreme Tuning Utility (XTU), which you can [download here](#). It's a free software suite explicitly designed to overclock your Intel CPU.

Unlike some third-party software, the Intel XTU is stable, reliable, and unlikely to cause problems independently. It gives you

a detailed look at your CPU's current state.
Even if you're not overclocking, it's a great



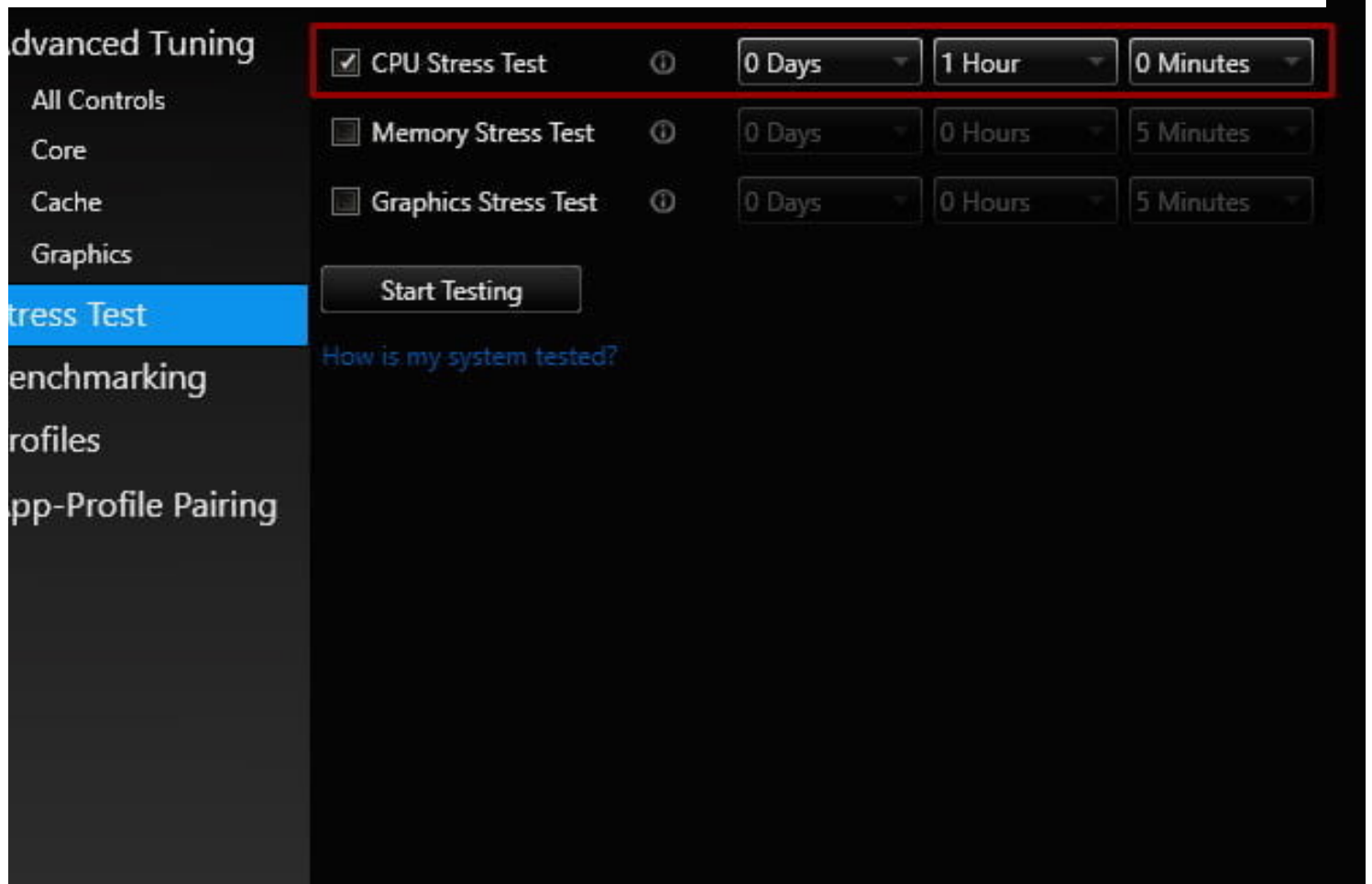




first, given its many highly-granular options. But once you grow familiar with the tool, everything makes sense. The reams of information become highly useful.

Step 1: Baseline temperatures and performance

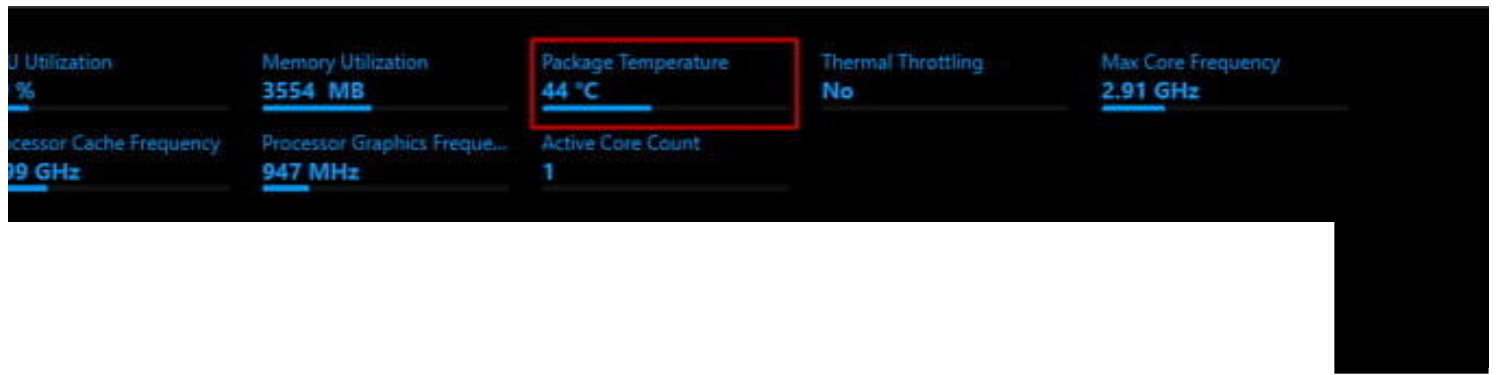
The first time you start XTU, take a few baseline readings to make sure your CPU is



You can sit and watch the test or do something else. If you leave, return toward



Take note of the Package Temperature. If your CPU is hotter than 80 degrees, you don't have the thermal headroom to overclock. We recommend improving your cooling before continuing any further.



thermal wiggle room to push your chip at a higher frequency (with relative safety).

Step 2: Multipliers

Although you can overclock your CPU using the *Basic* tab, learning about the different components of an overclock will help you better understand what's happening with

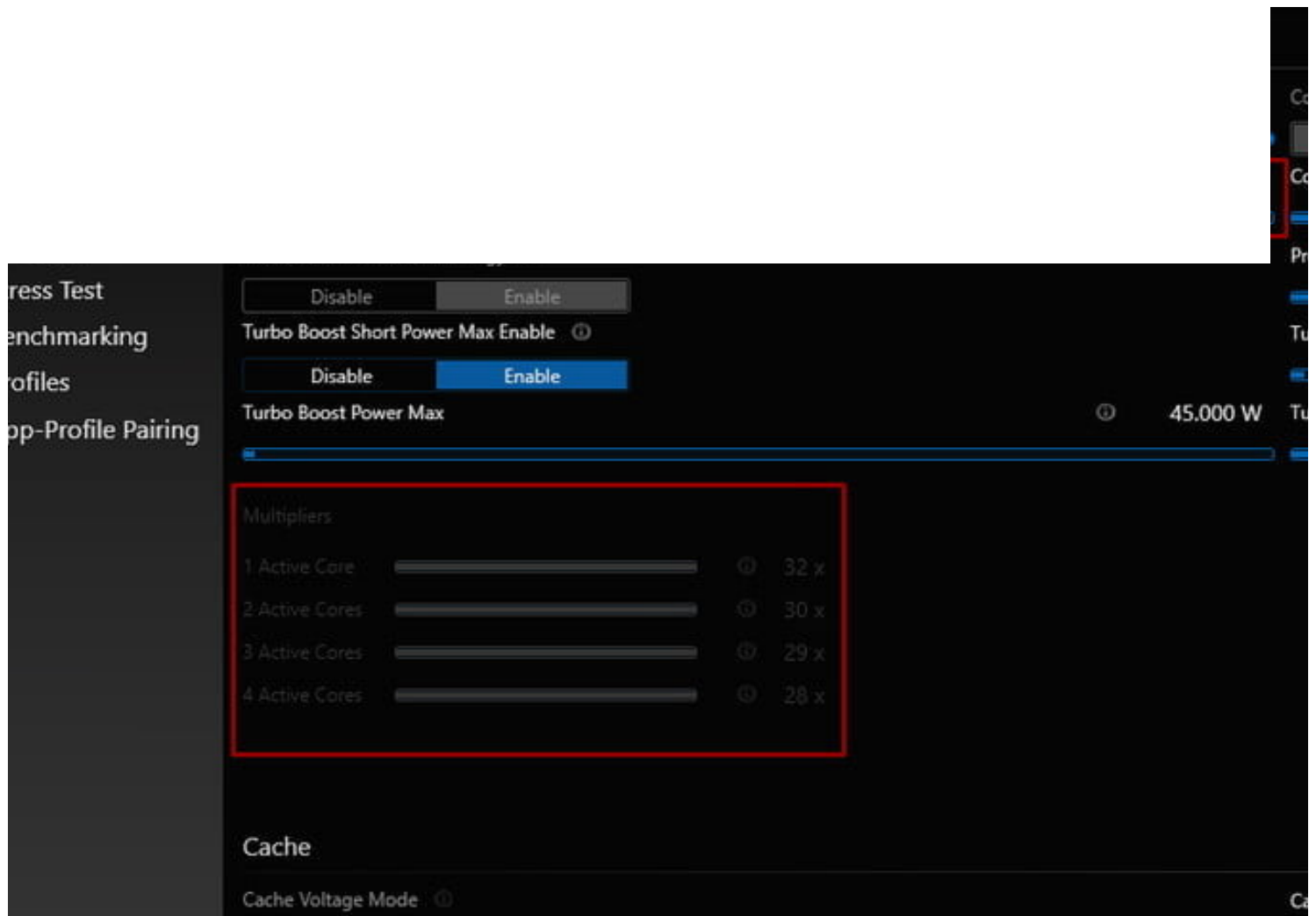
the chip. It also makes it easier to achieve a stable overclock. Select the *Advanced*



or reference clock. A x32 multiplier would typically mean a turbo frequency of 3.2GHz.

Raise your multiplier by one number (x33 in our example) across all cores. Although

you can adjust frequencies individually on different cores, we'll push for an all-core



Now test the overclock's stability.

Select *Stress Test* from the left-hand menu



crash. When that happens, step back to the previous multiplier setting.

If you're happy with the final overclock, run more extended stress tests and play a few games for several hours to ensure the overclock remains stable. If not, reduce the multiplier another step and begin the stress testing process again. When you reach a point where you can happily use

your PC as usual at a higher frequency, pat yourself on the back for a successful



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Step 3: Core voltage

Many voltage parameters can affect a CPU's operation, but arguably the most important and impactful is core voltage (VCore). You can adjust the voltage using Intel's XTU, similar to how you changed the multipliers. This process can differentiate

between unstable and stable overlocks, or even the difference between modest and



But be warned: You need to take more care when adjusting the CPU voltage than you do with multipliers. If you push the CPU to run at a ridiculously high multiplier, it will just crash and restart your system. If you try and force too much voltage through your CPU, it can kill it, so proceed with caution.

Use Google to see what settings other people use for your specific CPU, especially



A general rule of thumb is that anything over 1.4 volts is dangerous. However, it is very much dependent on the particular chip in your PC, so additional research is worth considering.

When ready, select the *Advanced Tuning* tab in the left-hand menu of the XTU and increase your core voltage by about .025. For example, If you're starting

at 1.250, move to 1.275. Select *Apply*. If the system doesn't crash, you can rerun the



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Step 4: Tweak, test, repeat

At this point, you have all the tools for finding your CPU's stable overclock. Take it steady. Change settings only in small increments. Run at least one short stress test after each change. Make sure your CPU temperatures do not exceed 80

degrees after a lengthy stress test. Finally, don't set your voltages too high.



CPU. It's fun to push it to run at a much higher frequency, but if it's not sturdy enough to run applications or play games without crashing, it's not much use outside of bragging rights.

Once you're happy with a stable frequency, take note of your settings so that you can reapply them later on if needed.

AMD: Ryzen Master



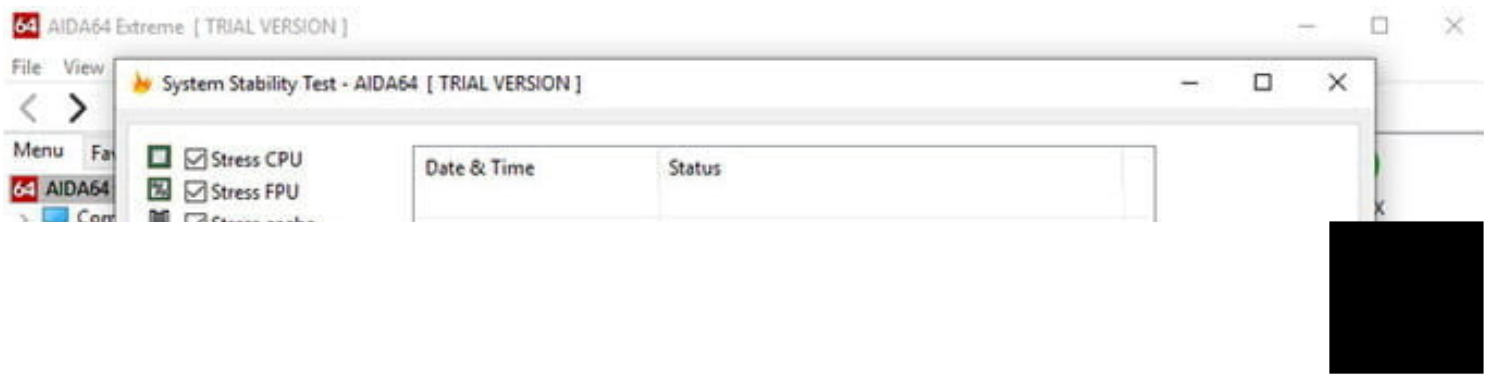
[website here.](#)

For older AMD processors, we recommend AMD Overdrive instead. The following instructions still apply, but the software layout differs slightly. Make sure to

double-check what you're doing before making any changes.



Step 1: Stress test



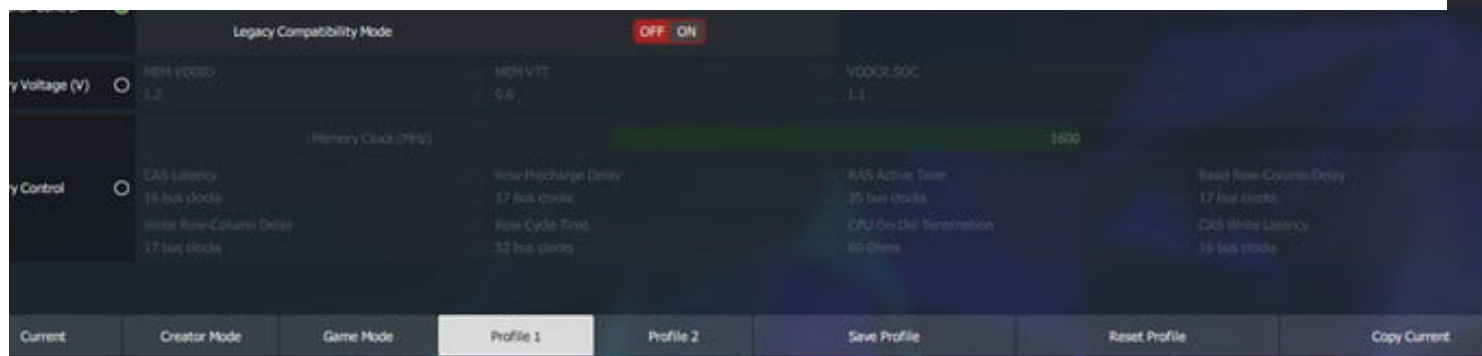
Before you begin overclocking the CPU, make sure that it won't exceed safe temperatures. Although Ryzen Master has its built-in stress test, it doesn't last very long. Instead, we recommend the AIDA64 Extreme tool and its stability test ([free](#)

[trial](#)). If you like this tool, a full license costs \$40, covering up to three PCs.



exceed 80 degrees. If they do, improve your CPU cooling before trying to overclock. If you have some temperature headroom, move on to overclocking your system.

Step 2: Frequencies



Ryzen Master doesn't give you manual control over CPU multipliers. Instead, it has clock speeds for each physical core that you can adjust individually or across the board. To do so, select *Profile 1* or *2* from

the bottom menu and then set *Control Mode* to manual. Make sure that the *All*



the frequency by 25MHz. Once completed, press *Apply And Test* from the top menu to apply the frequency adjustment you just made. Next, run Ryzen Master's built-in stability test tool to make sure you have a stable overclock. Keep an eye on the temperature reading in the top-left of the window.

If the test passes successfully and temperatures remain low enough, raise it



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Note: You can raise the frequency in larger increments if you prefer, but you stand a greater risk of your system locking or crashing if you do so.

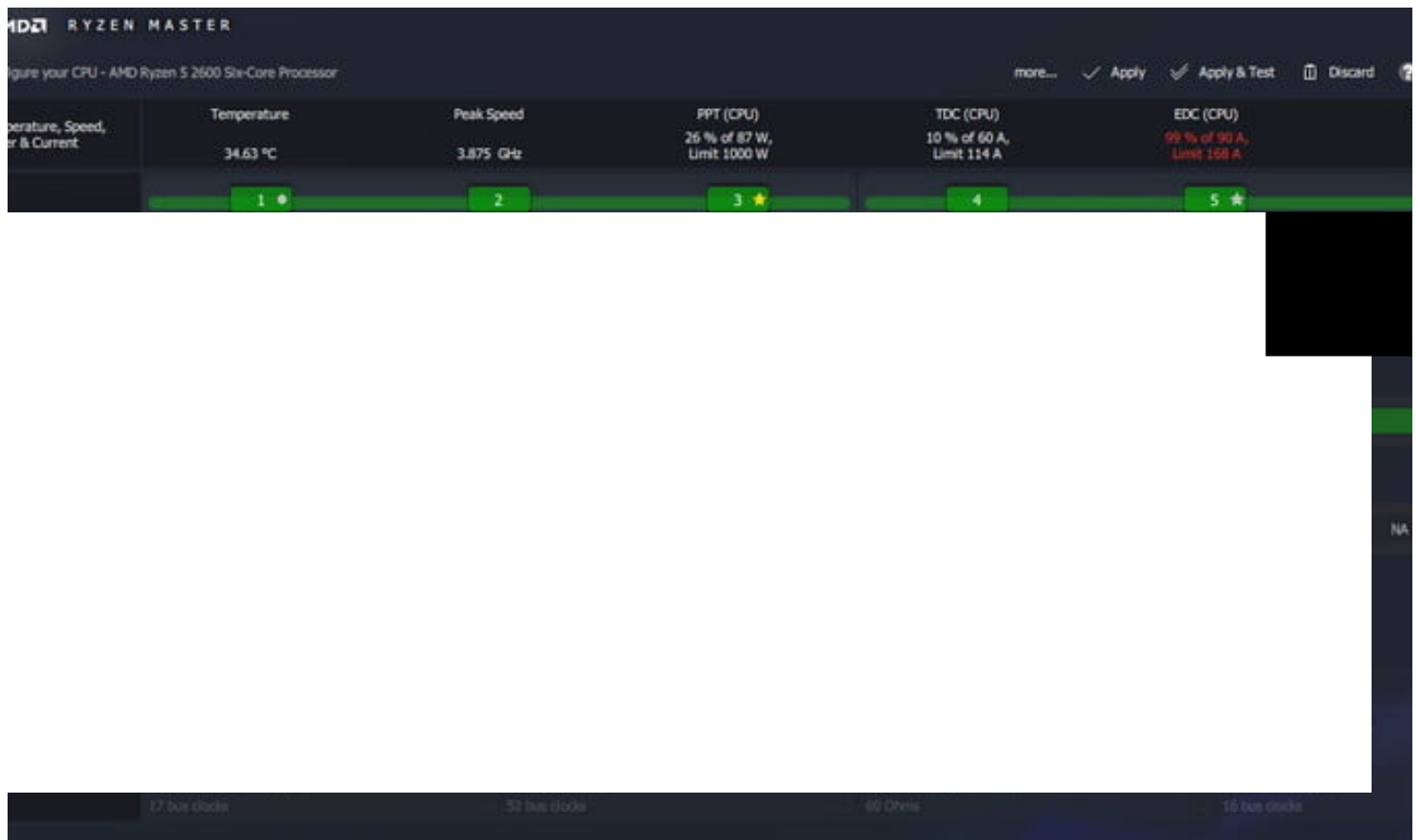
When you've found the highest frequency, you can get without failing the test or



frequency that safely completes the test.

If you want to overclock further or make an overclock stable, try adjusting voltages, too.

Step 3: Voltage control



Increasing the CPU's voltage can improve the stability of an overclock. It also allows you to overclock even further. The drawback is that it can dramatically increase temperatures. Pushing the voltage too high can damage your processor as well, so proceed with caution. Only make small adjustments at a time.



If you are happy to proceed, select your chosen profile and check that a green circle resides next to *Voltage Control*. Manually select this option if you don't see the green circle. Next, increase the voltage by one using the arrows to the right of the setting. Press *Apply And Test* to see if the overclock remains stable.

If your overclock is stable, run the AIDA64 test for an hour to see if it maintains



Step 4: Rinse and repeat

Pat yourself on the back once you find a stable frequency and voltage. Now you can further increase frequencies as long as you have additional headroom for voltage and temperature. Saving your profile will lock

down all these settings so you can use them again in the future.



... ..
overclock.