

How to overclock for IL-2 in VR

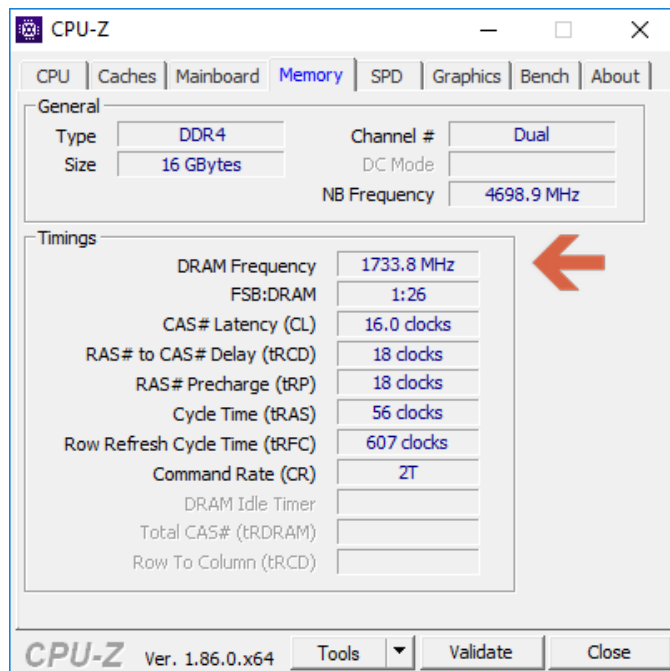
This guide assumes you have an 8-series Intel chip on a Z370 motherboard. This is a rough guide. Always try to change only one or two things at a time and test for stability between each. Write down “known good” settings or use your BIOS “save profile” feature to remember setups that have worked.

This is a [complete overclocking guide to Z370](#) motherboards and it’s quite good. There’s also an [MSI bios guide video](#) that is a good overview for MSI. In this guide I’ll just say things like “set X to Y” -- look in the guide to see how to do that exactly. Your motherboard may vary. This guide is for IL-2 for VR and will focus on that.

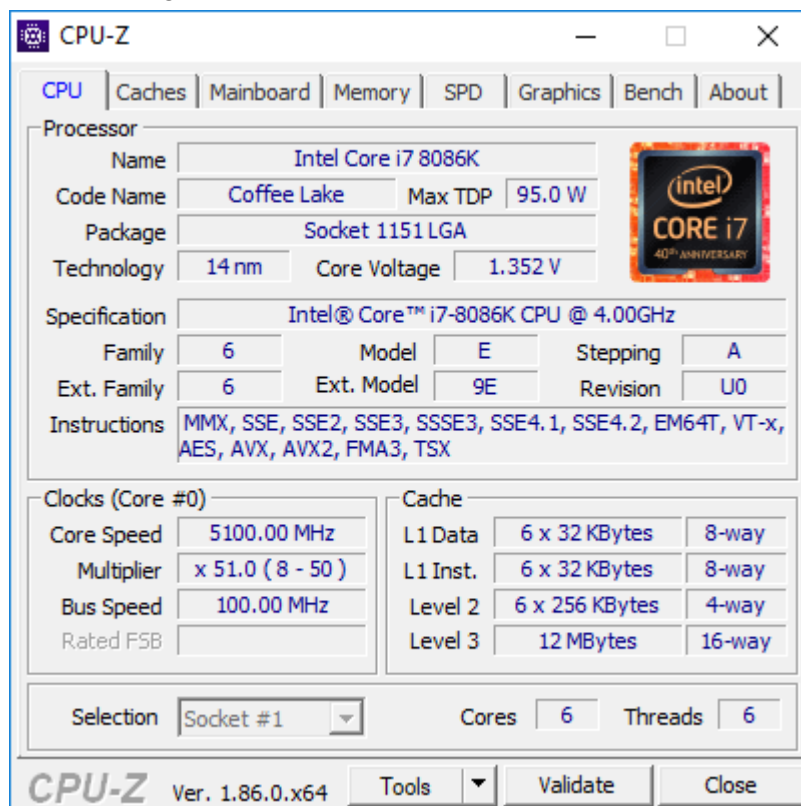
Get to a stable baseline

- Update your motherboard BIOS. It’s very important to be on the latest bios because they contain bug fixes and stability enhancements.
- Uninstall or disable motherboard-vendor overclocking tools. OC via bios is usually more predictable, but it will be more time consuming since you have to reboot all the time.
- Get the latest [Prime95](#), [CPU-Z](#) and [CoreTemp](#) software.
- In BIOS, set your XMP memory setting. This sounds like it’s overclocking your memory but in fact is setting it to run at the factory-guaranteed rate.
- Set your CPU ratio to 50. If there’s an option in your BIOS, make sure that *all* cores will run at 50, not just a single core.
- Set AVX offset to -3
- Set your Ring Ratio (or Uncore ratio) to 45.
- Set your CPU voltage to an “offset” of negative 0.01. Do NOT use “auto” voltage.
- Set Load Line Calibration (LLC) to level 5 (if you have settings from 1-8) or somewhere about “High” if LLC is described using words.
- Increase the CPU power limits
 - Switch OFF Intel Adaptive Thermal Monitor (if your motherboard has this setting)
 - Set Long Duration Power Limit, Long Duration Maintained, Short Duration Power Limit and CPU Current Limit to maximum values. Just type 99999 into the text box and the motherboard will set it to like 4096 or 256 depending on the value.
- Reboot to Windows. If you get some kind of boot error, increase CPU voltage by 0.01 until you can boot. Voltage is safe up to about 1.4V (as measured in CPU-Z) but be gentle with it. You might need to go from negative offset to positive offset on the voltage.
- Run CPU-Z and CoreTemp.
- Check that your memory is running at the speed you expect by looking in CPU-Z on the “memory” tab. You should see DRAM frequency of *half* your rated memory

speed. So if you have 3200 memory, you should see 1600 here:

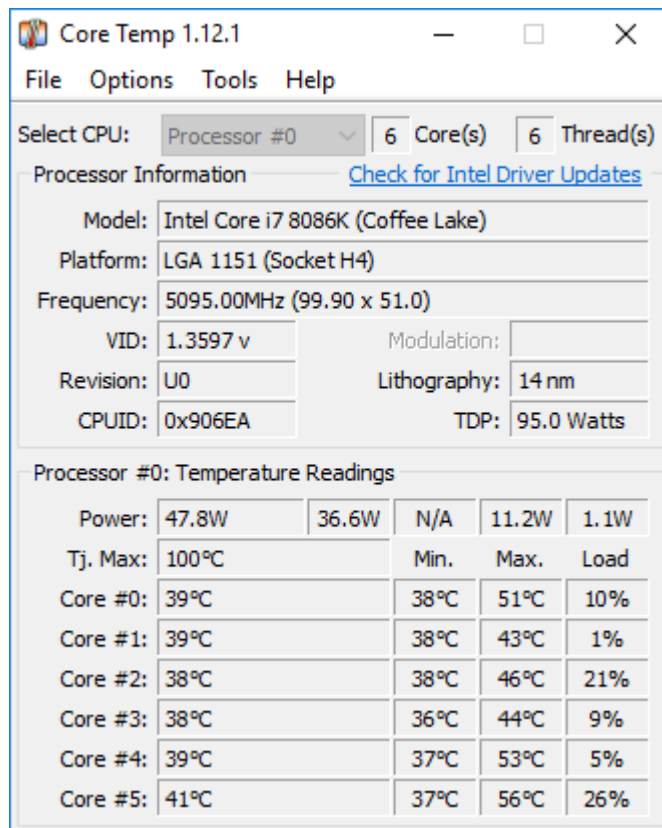


- If your RAM isn't running at the speed you expect, go back to BIOS and check your XMP settings.
- Check your CPU is running at the speed you expect. It may jump around due to power saving but should be about 5000 MHz.

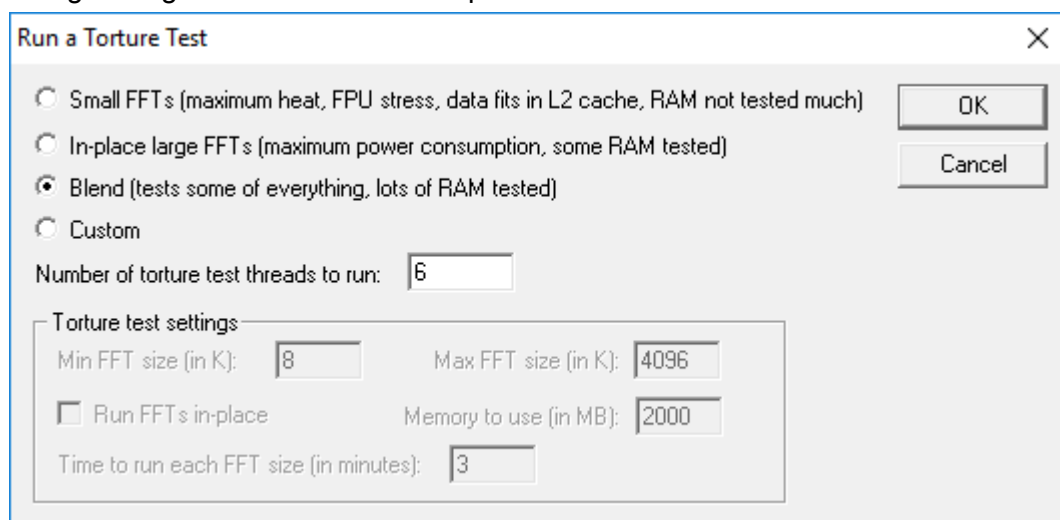


- Run CoreTemp and check that your idle temperatures are OK. Anything over 90C is starting to be a worry. Voltage is needed to run the CPU at higher clock speeds, but

voltage causes heat, so the idea is to get high clock speeds at the lowest possible voltage that is still stable.



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- Run Prime95 and just let it run the default “torture test” for 20 minutes. Check the worker windows closely--if anything crashes you don’t have a stable system and you should increase the CPU voltage a little bit in BIOS. Monitor temperatures and CPU voltage using CPU-Z and Core Temp.



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- Once you get stable, you have a stable baseline and should save those BIOS settings to a profile.
- To recap, we are at CPU ratio 50, AVX -3, Ring Ratio 45, and XMP-default memory settings.

Start overclocking one thing at a time

IL-2 likes CPU frequency and low memory latency. For each of these tweaks, run a bit of Prime95 to ensure that your system is stable.

- To test CPU overclock changes, do Prime95 “small FFTs”
- To test memory overclock changes and ring ratio changes, do “custom” in Prime95 with min FFT size 512, max 4096, and about ¾ of your system RAM in “memory to use”. For my 16GB system I use 12000 MB memory.

Increase AVX to -2, -1 or even (if you're lucky and have great cooling) -0. IL-2 uses AVX instructions so you'll notice CPU-Z telling you that even though your CPU is set to 5ghz, it's running at 4.7, 4.8 or 4.9 during Prime95 and IL-2. You may need to increase voltage to have a stable system with higher AVX speeds. Be careful, increase voltage slowly by 0.01 at most, and monitor temperatures during testing.

Increase Ring Ratio to 46 or 47.

Manually overclock your memory higher than XMP default. To do this, make note of the default timings (mine is 16-18-18-56 at 3200mhz) and manually set the mhz a couple of notches higher, e.g. 3466mhz. Make sure you keep the timings -- running faster but with 'looser' timings doesn't help.

If you're feeling like IL-2 is the only thing you really want to run, consider disabling hyper-threading. This turns your 6-core 12-thread processor into a 6-core 6-thread processor but it will decrease heat and actually improve IL-2 performance.

8086k baseline

My 8086k is currently configured as follows:

- CPU Clock ratio 51, AVX -0
- Ring Ratio 47
- 3200mhz ram set to 3466
- Core voltage observed during a Prime95 run 1.36 volts

How FPS works in IL-2 and Oculus Rift

The Rift display refreshes at 90fps, regardless of the application (game) frame rate. Oculus has two ways to help when an application falls below 90fps:

- Asynchronous Time Warp (ATW). This is older technology where the Rift uses the old frame from the game but updates (warps) it to account for your current head movement. This helps reduce sickness, but you will see objects in game juddering.
- Asynchronous Space Warp (ASW). This is newer tech where the Rift uses the old frame from the game but updates it with both your head movement *and* movement of objects in game, guessing where things should be based on their previous movement.

When ASW is set to “on” or “Auto” if the game falls below 90fps, the Rift will instead switch to 45fps rendering from the game, with every other frame filled in using ASW. With ASW disabled, if a game goes below 90fps, any missed frame will be interpolated using ATW. The only time the Rift actually runs at *less* than 90fps is if the Compositor misses its frame time. Since the Compositor only takes about 1ms to run, something very bad is happening to cause a compositor miss (e.g. Afterburner querying the power state on the GPU to draw a pretty graph for you, or other things causing issues on your system).

Oculus have recently announced ASW 2.0, coming “soon” which has a better algorithm for predicting object movement using depth buffers and other smarts. This may help the blurring or juddering we see on moving objects such as aircraft and the prop when we’re using 45fps ASW mode.