AORUS

X399 Overclocking Guide

GIGABYTE™

GIGABYTE X399 Guide to Overclocking AMD 2nd Gen. Ryzen Threadripper-Series Processors

Chapter 1: Intro

Ryzen Threadripper 2 establishes AMD at the top of HEDT systems

The King is back and stronger than ever! AMD set the bar high last year with the release of its highly anticipated Ryzen Threadripper Processor but has taken the game a step further with the 2nd Gen. Ryzen Threadripper Processor. The successor to the ground-breaking processor not only comes with plenty of upgrades over its predecessor, it has managed to set new world-records in the Cinebench R15 multi-threaded CPU test! For those of you who got your hands on one of these record setting HEDT ready processors, you'll want to get the best performance out of them. In this guide, we'll teach you how to bring out the best of this beast processor!.

Chapter 2: How to overclock your AMD 2nd Gen Ryzen Threadripper 2990WX CPU

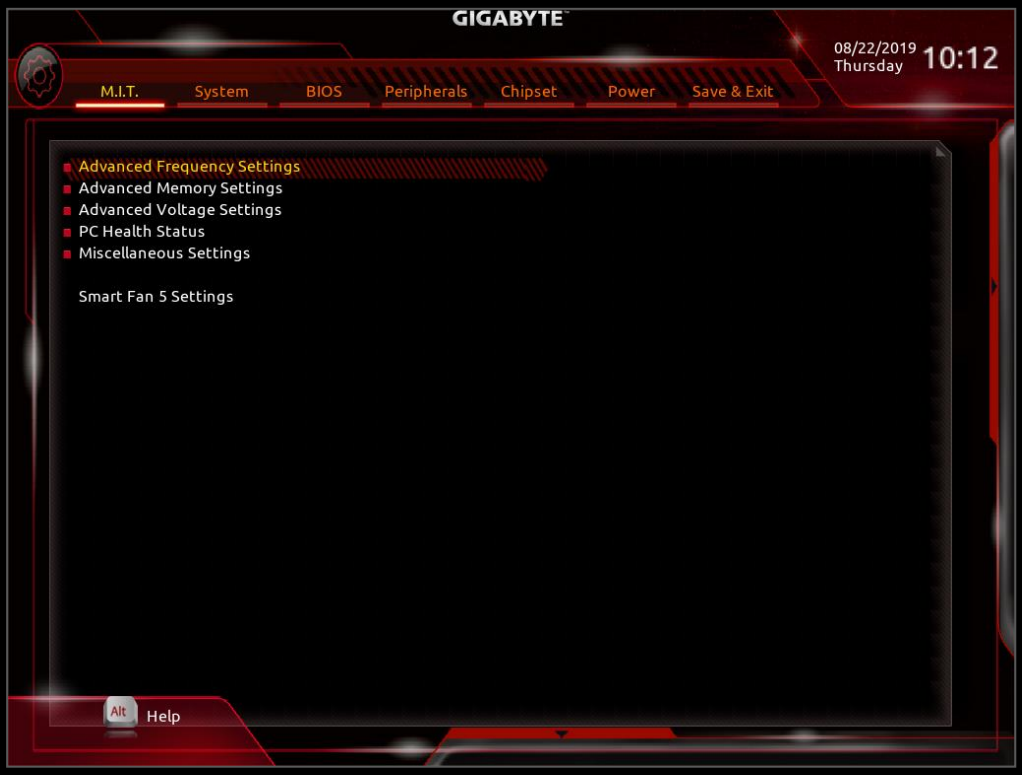
For reference we are using a GIGABYTE X399 AORUS XTREME motherboard, the 2990WX AMD 2nd Gen Ryzen Threadripper processor, AORUS RGB Memory 3200MHz 16GB, and a liquid cooler, the Enermax LIQTECH TR4 360.
Based on our testing, most Ryzen Threadripper 2990WX processors can hit around 4GHz on standard liquid coolers using a 1.2-1.25Vcore. In this guide we will be targeting a frequency of 4.0GHz from a stock frequency of 3.4GHz.
Disclaimer: Overclocking will technically void your warranty. Over-volting can potentially damage your CPU and inadequate cooling and airflow can also shorten the lifespan of your other components.

Taking Your CPU to the Next Level – Overclocking

Simply follow the steps below and you'll be enjoying your overclocked 2nd Gen.Ryzen Threadripper powerhouse in no time.

Step 1: Enter the BIOS

Enter the BIOS by restarting your computer and pressing the “delete” button before the OS launches.



Step 2: Enter “Advanced Frequency Settings”

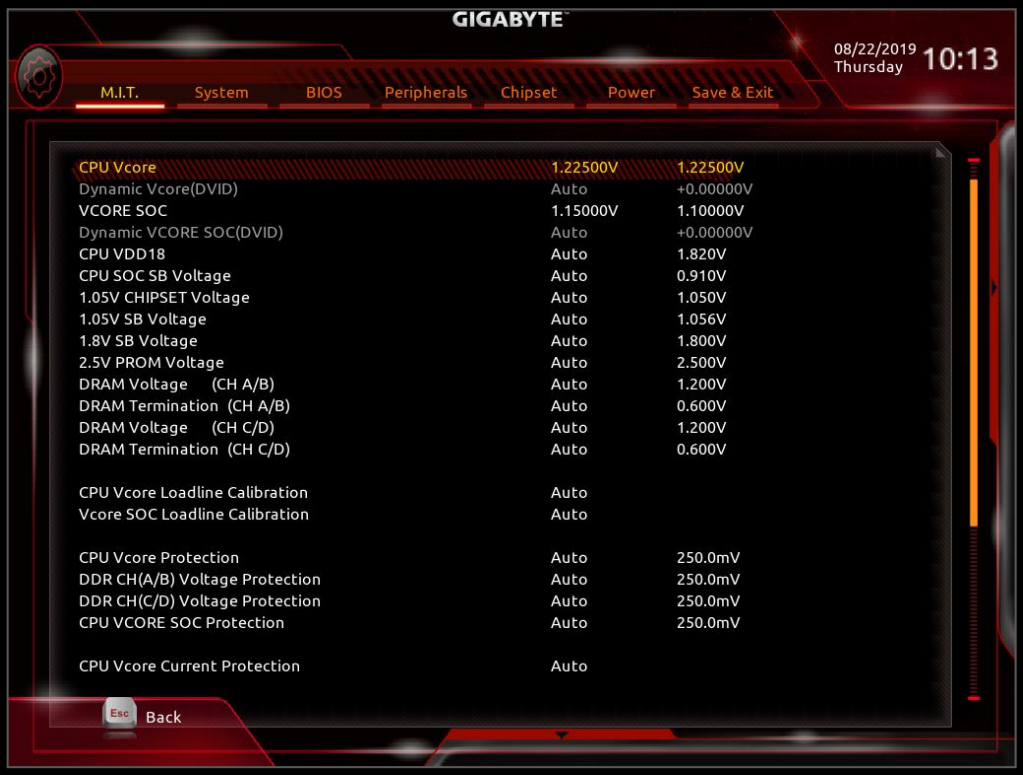
Change your “CPU Clock Ratio” to “40.00”. A CPU clock ratio of 40 multiplied by 100 (our default “Host Clock Value”) gives you a frequency of 4000 MHz.
The CPU comes with a default CPU frequency of 3000 MHz, which means that it has a default “CPU Clock Ratio” of “30.00” and a default “Host Clock Value” of “100”.
Different from Intel, “CPU Clock Ratio” can be adjusted in increments of 0.25x instead of 1.0x. For example “CPU Clock Ratios” of 37.25, 37.50, 37.75 etc are possible.

Step 3: Adjust Your Voltage Settings

Now that we have tuned almost all the settings and the frequencies, we need to tune the voltage as well. When CPU is overclocked to run higher speeds, you may need to supply higher voltage to the CPU to make sure it is stable. Every CPU acts different and some may not need an increase while others will need a large increase from stock (default voltage). There's a large component of luck involved in finding a CPU that will do high frequency and use low voltage. Some call this process binning (when you test multiple CPUs for such specifications).
Go to the starting BIOS page (M.I.T.) and select the "Advanced Voltage Settings" option.

3a. Change CPU Vcore:

Raising this helps keeps the system stable at higher CPU frequencies. However, it also increases the amount of heat your CPU produces. We suggest you to keep Vcore from 1.2 to 1.25v when overclocking to around 4GHz.



3b. Adjust the six new voltage settings: VCORE SOC, CPU VDD18, CPU SOC SB Voltage, 1.05V PROM Voltage, 1.8V SB Voltage, 2.5V PROM Voltage

These are new settings that only exist on our AORUS X399 Chipset motherboards. For a little extra boost in stability while overclocking we suggest you to change VCORE SOC up to 1.15-1.2 volts when using standard air or liquid cooling. For the rest of the voltages we suggest you to leave them at Auto when using standard air or liquid cooling. If you still want to experiment raise them maximum +0.2V from their initial values.

3c. Adjust CPU Loadline Calibration Setting

If you need some extra stability, adjust this setting to either “High” or “Turbo”. You may notice that after this adjustment your CPU Vcore is higher.

■ Step 4: Optimize Your Memory Settings

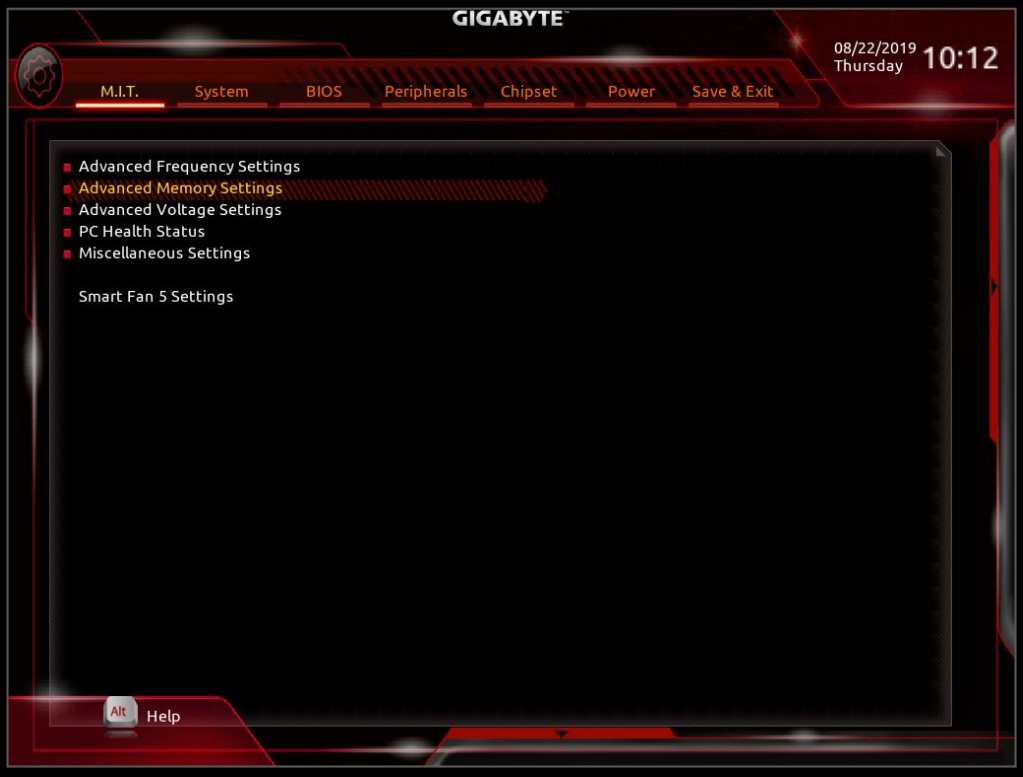
There are two different methods of optimizing your memory settings, the easy way through the Extreme Memory Profile (X.M.P.) option, and the more difficult way through manually adjusting your ram settings.

4a. Easy Way

Go back to the “M.I.T.” starting page. Select “Advanced Memory Settings”. Here you see the “Extreme Memory Profile (X.M.P.)” option. Enable it. The system will choose the optimal memory frequency and DRAM timings for you.

4b. More Difficult Way

AMD now supports from the X470 higher memory dividers as when the X370 chipset launches. You should be able to see higher frequencies than 3200 Mhz. Select the frequency that your memory sticks run at. Since X.M.P. is not enabled, your memory timings will be automatically set by the CPU. Next, go back to “M.I.T.” and select “Advanced Voltage Settings”. Set your DRAM Voltage to your specific memory modules’ recommended voltage setting.



Now that you’ve set your overclocks, it’s time to make sure that your system is stable!

Chapter 3: Stability Testing & Results

Congratulations! You have obtained a clock rate of around 4 GHz. Now it's time to make sure that it's stable. We're going to use the software below to monitor our system, stability test, and adjust our overclocks.

Prime95 – This is used to stress test our CPU in order to ensure that it's stable in the most taxing of conditions.

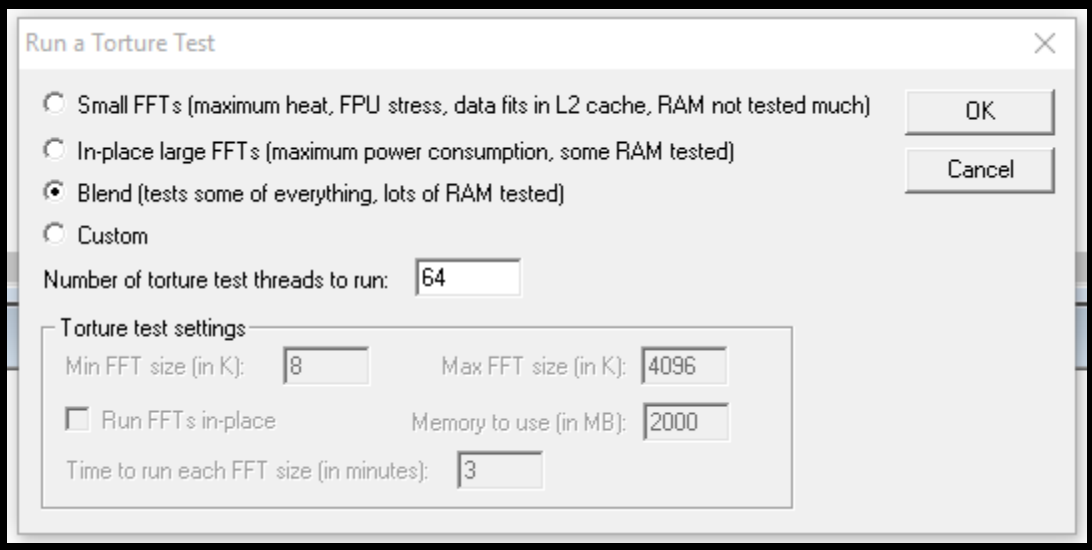
CPU-Z – Used to monitor our CPU frequencies. Version 1.86 is preferred.

HWiNFO – Used to monitor idle and load temperatures and vcore settings.

How to Stability Test

■ Step 1: Prepare Stability Testing and Monitoring Applications

Open up CPU-Z, HWiNFO, and Prime95 so you are able to stress test and monitor CPU temperature, frequency, and memory timings all on the same screen.



Step 2 : Start Prime95

After starting the Prime95 torture test highlight the Prime95 tray icon—all cores should say "self-test", if it shows "not working" that means that specific core has failed to pass the test. Another form of failing the stability test is that your system may simply just reboot or freeze, which means your settings were too aggressive and your CPU has failed the stability test. We normally test Prime95 for 1 hour. This duration can be increased for more assurance.
The Small FFTs is considered the most extreme torture test for Prime95 so the other torture test options are more than sufficient as well as practical to use.

Step 3a (Fail) : Close Prime95

Close Prime95 by right clicking the Prime95 icon on the tray bar in the lower right side of your screen and selecting "Exit". This closes Prime95.

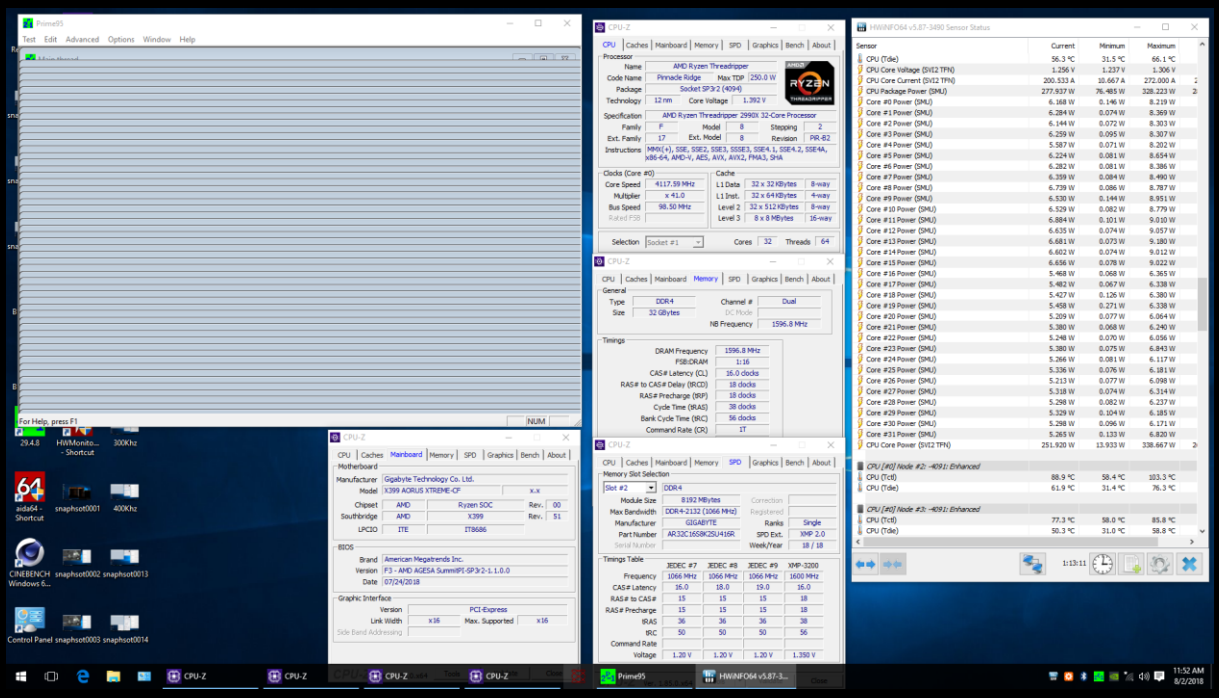
Step 3b (Fail) : Adjust Frequency or Voltage

Now it's time adjust your frequency or voltage settings. You can do this either through the BIOS or using EasyTune which is available through the GIGABYTE App Center. You have two options: Either increase CPU Vcore or decrease "CPU Clock Control". We recommend you to stay under 100° C on your CPU along with a CPU Vcore below 1.3 volts if possible. After making adjustments go back to Step 1. If it continues to fail, dial down your "CPU Clock Control" until you pass stability testing.

Step 4 (Success): Enjoy Overclock or Increase Frequency

Congratulations, your current overclock is stable. You may want to try for a higher frequency. To do so, experiment with raising your CPU Clock Control and CPU Vcore settings either in BIOS or EasyTune and go back to Step 1 for stability testing to ensure that it's stable.

The below picture shows a 4.1 GHz OC on liquid cooling passing 1 hour of stability testing:

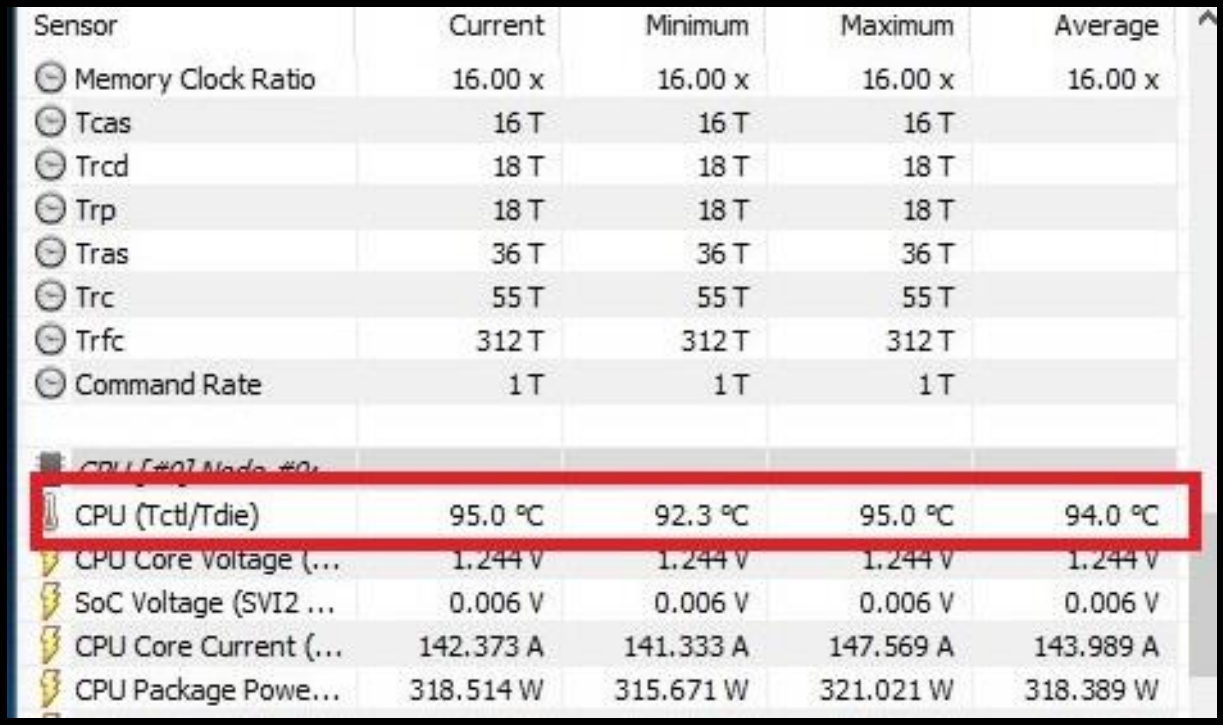


Thermals

We wouldn't recommend you to use an air cooler to overclock an AMD 2nd Gen Ryzen Threadripper processor, use a liquid cooler instead. These CPUs runs hot and even liquid coolers may not be able to handle the heat if voltage is very high or ambient temperature is very high.

Our Liquid Cooling Setup

Liquidcooler: Enermax Liqtech 360 All-In-One CPU Liquid Cooler
Motherboard: GIGABYTE X399 AORUS XTREME



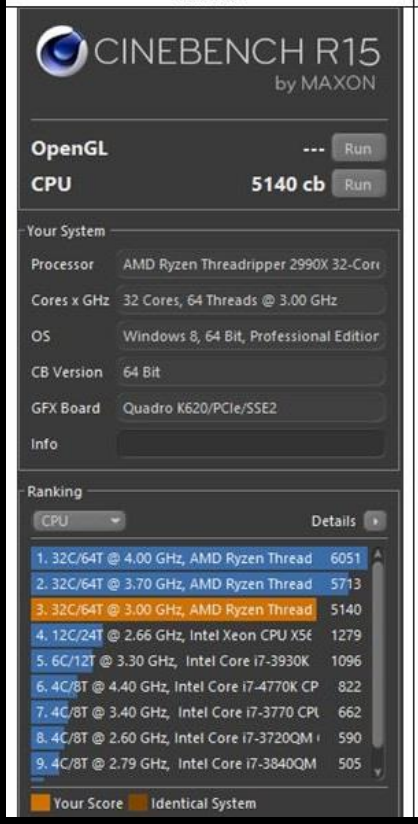
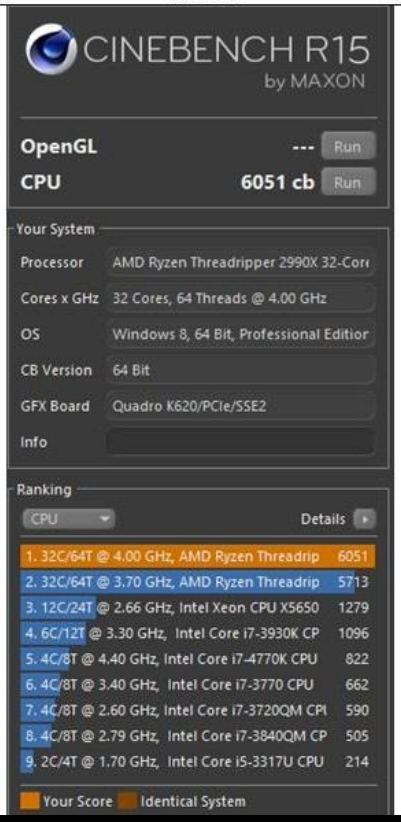
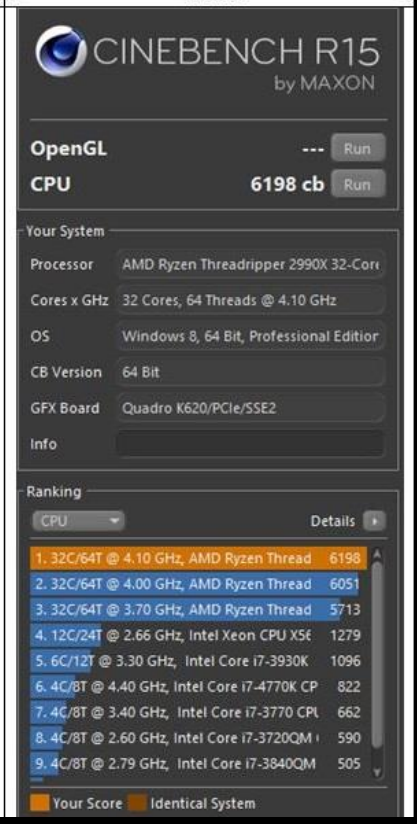
Sensor	Current	Minimum	Maximum	Average
Memory Clock Ratio	16.00 x	16.00 x	16.00 x	16.00 x
Tcas	16 T	16 T	16 T	
Trcd	18 T	18 T	18 T	
Trp	18 T	18 T	18 T	
Tras	36 T	36 T	36 T	
Trc	55 T	55 T	55 T	
Trfc	312 T	312 T	312 T	
Command Rate	1 T	1 T	1 T	
CPU (Tctl/Tdie)	95.0 °C	92.3 °C	95.0 °C	94.0 °C
CPU Core Voltage (...	1.244 V	1.244 V	1.244 V	1.244 V
SoC Voltage (SVI2 ...	0.006 V	0.006 V	0.006 V	0.006 V
CPU Core Current (...	142.373 A	141.333 A	147.569 A	143.989 A
CPU Package Powe...	318.514 W	315.671 W	321.021 W	318.389 W

	Stock frequency	4.2 GHz	4.3 GHz
Idle	38.3 °C	39.9 °C	44.3 °C
Load	72.8 °C	81.5 °C	89.6 °C

Results

At a stock frequency of 3.4GHz we obtained 5140cb on Cinebench R15.

Our goal was 4GHz CPU while using memory XMPs at a frequency of 3200 MHz. With this new frequency we obtained a Cinebench R15 score of 6051cb. **That's a 911 point difference!**

3.4GHz	4.00GHz	4.1GHz
		

The tested CPU was able to pass Prime95(Blend test) and Cinebench R15 at 4.1GHz!