XMG NEO 16 (A25) BIOS Tuning Guide

Introduction

The BIOS of XMG NEO 16 (A25/AMD) with **AMD Ryzen 9 9955HX/3D** offers some standard functions as well as a submenu for CPU and RAM adjustments.

This document is aimed at advanced users and provides an overview of which tuning options exist, how they work, and what steps you can take to safely utilize these options without voiding your warranty.

All options at a glance

The following links contain screenshots and a video of all BIOS setup options in the XMG NEO 16 (A25), plus a reference table with explanations:

Screenshots:	https://go.xmg.gg/xne16a25-bios-screenshots
Video:	https://go.xmg.gg/xne16a25-bios-video
Reference table:	https://go.xmg.gg/xne16a25-bios-tuning-reference-table

Standard options

Standard options are those options for which there are basically no incorrect settings.

The use, activation or deactivation of the **standard options** does not pose any risk to system stability.

- Display Mode (MSHybrid; Discrete GPU)
- Boot Media Select (F7); Fast Boot; Secure Boot
- Deactivate webcam or audio devices
- Deactivation of individual USB ports
- AMD SMT (similar to Intel Hyperthreading)
- AMD CCD Control (option to disable one Core Chiplet Die)
- AMD-V & AMD-Vi (virtualisation functions, incl. I/O MMU)
- PXE boot via Ethernet/LAN; RAID; deactivation of TPM
- Deactivation of RTC S4 Wake Up (scheduled wake-up from sleep/hibernate mode)
- Load Setup Defaults (F9); Save & Exit (F10)

Tuning options

The tuning options are divided into two categories:

1. Adjustment of frequency and timings of the system memory (DDR5 RAM)
2. CPU Curve Optimizer (undervolting)

The following risks exist when using the tuning options:

- Possible outcomes include reduced performance, instability, or decreased component longevity.
- RAM tuning: System may not immediately boot up, requiring a recovery procedure. See page 5 for details.

Is CPU and RAM tuning even worth it?

Since using the tuning options carries the risk that the system will either become unstable or may require recovery procedures, you first have to ask yourself: is it worth the risk?

We would like to contribute the following points:

- **Sensible defaults:** AMD platforms are already quite efficient out of the box and can be controlled very easily via preconfigured profiles (PPT power limits).
  There is therefore no immediate need for manual tuning.
- **Questionable benefits**: Possible performance gains from CPU and RAM adjustments are usually in the low, single-digit percentage range. It is also quite possible that improper tuning may reduce performance instead of improving it.

Therefore, we offer these options primarily for tinkerers and experts. We offer no guarantee of performance or efficiency gains when using these options, and no guarantee of system stability.

Before firmware updates: reset all tunings

CPU and RAM tuning can affect system stability. Software crashes or blue screens in Windows may still be tolerable - but instability during firmware updates can lead to the firmware update failing and the system no longer booting up afterwards.

You should therefore always reset all tunings before performing any firmware updates. This applies to EC/BIOS updates for the laptop as well as firmware updates for SSDs and external peripherals.

We recommend the following procedure:

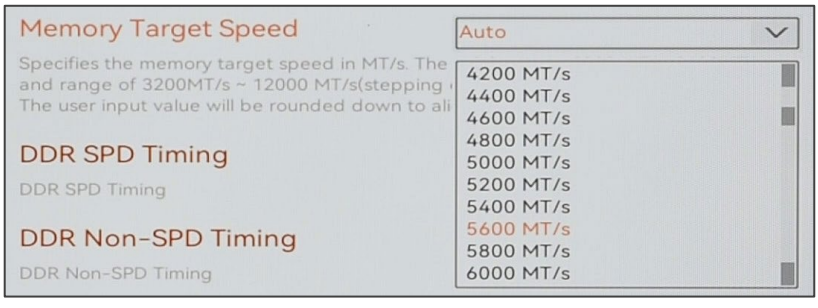
- Prepare firmware update.
- Reset all options: BIOS Setup (F2), Load Defaults (F9), Save & Exit (F10).
- Perform firmware update.

If you are updating the laptop's firmware, you should also load the BIOS defaults **for a second time** after the update (F9) and save them (F10). You can then set the previously tested adjustments again.

Adjustment of DDR RAM frequency and timings

These options are divided into the following submenus:

- Memory target speed
- DDR SPD Timing & DDR Non-SPD Timing



Memory target speed

The RAM speed is set in MT/s. The input allows values between 3200 and 12000, but only values between 3200 MT/s and perhaps 6000 MT/s are sensible and safe. Anything beyond 6000 MT/s is unknown territory…

The CPU supports 5600 MT/s as standard. An input of 5800 MT/s is therefore already considered overclocking.

An increase in the clock frequency automatically leads to a correct adjustment of the timings, provided these are still set to "Auto".

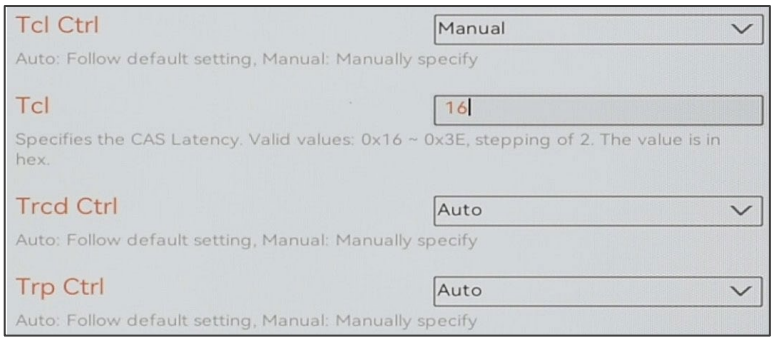
The clock frequency can be checked in Windows with programs such as HWiNFO64 or CPU-Z. Due to the nature of Double Data Rate (DDR) memory, software usually only displays half the frequency.

- Example: 5600 MT/s is displayed as 2800 MHz (or a little less, for example as 2791 MHz).

DDR SPD Timing & DDR Non-SPD Timing

DDR memory (Double Data Rate) is based on timings that are set either automatically via SPD (Serial Presence Detect), or manually. The most important of these include:

Tcl (CAS Latency)	Time for accessing data after a read request.
Trcd (RAS to CAS Delay)	Delay between line activation and read/write command.
Trp (Row Precharge Time)	Time to close a row before a new one can be opened.
Tras (Active to Precharge Delay)	Duration for which a memory line remains active.



Lower values mean faster memory access, but can affect stability or lead to "no boot" scenarios.

Only hexadecimal values are accepted; decimal input is not supported.

A standard value of CL42 therefore requires an input of 0x2A. Conversion from Dec to Hex is possible via online tools (https://go.xmg.gg/dec2hex) or formulas in spreadsheets [`=DEC2HEX()`].

Safe value limits (min & max)

Depending on the option, the BIOS setup allows you to enter a specific min/max "input range". However, the min/max values of that **input range** are usually **outside the safe or recommended values**. For us as an OEM, there is no way to further restrict the input range of these BIOS setup options. Safe values must therefore be selected manually.

When tuning the RAM, do not push the maximum possible values to their limits, as otherwise a "no boot" scenario will require a time-consuming recovery procedure.

When tuning the system memory, do not approach the possible upper/ lower limits of any individual setting. Instead, tune step-by-step!

For RAM tuning, which value lead to instability or even a "no boot" scenario, depends on the memory configuration, interactions between the respective settings, and potentially also on the CPU.

Example: If the system memory (RAM) is operated at a higher frequency, its manual timings (latency) may have different safe limits. It is therefore important to only ever change each value in small steps and to test for stability after each change.

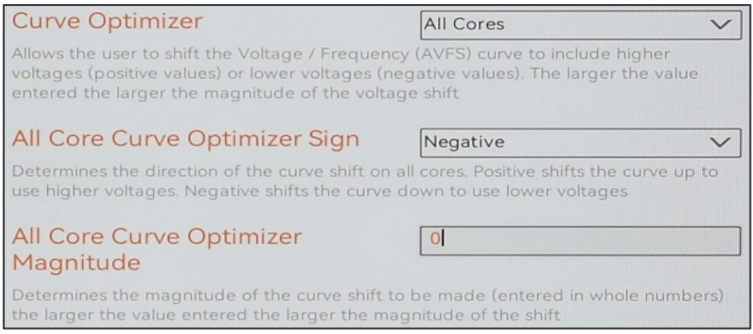
Please note: AMD reduces memory clock speed in idle (impacts hardware monitoring tools)

This AMD Ryzen platform is able to reduce the memory clock speed when the memory is idle or in low load.

When you check your clock speeds with tools such as **HWiNFO64**, **CPU-Z**, **AIDA64** or **ZenStates**, you may see these *reduced clock speeds* in real time.

Check the clock speeds of your tuning setup during a memory-intensive workload such as Prime95 stress test. When taking screenshots of your tuning results for other users, you may also want to take the screenshot during such high load in order to avoid public confusion.

CPU Curve Optimizer



The Curve Optimizer allows the processor's voltage-frequency curve to be adjusted, which ideally improves the efficiency of the CPU and delays the reaching of thermal limits. Essentially, higher CPU clock speeds can be achieved with equal CPU power consumption.

The settings can be made either for all CPU cores at the same time ("All Cores") or for each CCD or core individually ("Per CCD", "Per Core"). For beginners, we recommend the "All Cores" method.

First, you set the "Sign" prefix: "negative" is selected by default for undervolting. Setting the sign to "positive" is possible, but not recommended.

The "Magnitude" field is used to set how large the adjustment should be. The value does not directly translate to millivolts but reflects a relative offset within the voltage-frequency curve. The maximum values that can be set are -50 and +50.

First boot after any adjustment may take a while

Even with safe and reasonable settings, the first boot after "Save & Exit" may require a bit of effort. Either one of the following scenarios will occur:

1) System may reboot to BIOS setup (just reboot again):

Sometimes, the system will not boot immediately to the operating system (Windows). Instead, it will boot to the "Start" page of BIOS setup. In this case, press Ctrl+Alt+Del to restart. The second attempt should proceed to the operating system.

2) System may remain with black screen for a long time (memory training):

After any change to memory frequency or timings, the system will perform a so called "memory training" during the next boot. During this process, the screen remains black and only the keyboard backlight is lit. Training duration depends on total RAM capacity. On high capacities like 96 GB, it may take up to 10 minutes.

To avoid mistaking this for a system failure, always apply adjustments in small steps. If your last change was reasonable, wait patiently. Interrupting the process (e.g., by holding the power button) does not harm the system but will restart training from scratch.

Memory training and true "no boot" scenarios may appear identical initially. Both require no user input until completed. Patience is key.

Why a "no boot" scenario does not require user input on XMG NEO 16 (A25) is explained on the next page.

"No boot" scenario & recovery procedures

Extreme or invalid RAM tuning settings can prevent the system from booting, making it impossible to reset the settings via the BIOS setup (F2).

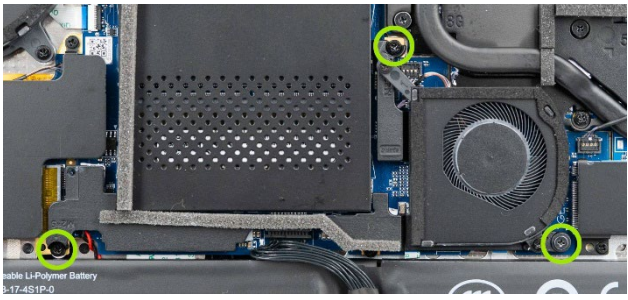
The recovery procedure in XMG NEO 16 (A25) differs from previous XMG models.

There are three potential procedures – normally, only the first one is needed. The other two methods are provided as backup.

1) <u>Automatic recovery procedure</u>:

- Hold power button to completely shut down the system. Wait a few seconds.
- Press the power button to power on. Wait for about 2.5 minutes.
  - The keyboard backlight will be on, but the screen will be black.
  - You do <u>not</u> need to press any hotkey. Just wait.
- After about 2.5 minutes, the laptop will reboot automatically.
  - Again, no hotkey needed. Screen will remain black.
- After about 30 seconds, the screen will turn on and your RAM tuning settings will have reset.

2) <u>Manual CMOS reset</u> (battery removal):



- Hold power button to completely shut down the system.
- Remove the power supply (charger) and open the bottom case of the laptop.
- Remove 4 screws from the 99 Wh battery.
- Shift the battery away from the mainboard to gain access to the battery connection cable.
- Unplug the battery connection cable from the mainboard.
- Remove 3 screws to remove the frame of the 3rd fan (see picture above).
  - Only remove the screws marked in the picture. The other two screws attach the fan to its frame – they do not need to be removed.
- Rotate the frame of the 3rd fan over its power cable to gain access to the CMOS battery connector.
  - You do <u>not</u> need to remove the fan's power cable for this step.
  - Tilting the frame will reveal the CMOS battery connector (twisted red/black cable in the bottom left corner of the picture above).
- Unplug the CMOS battery connector and wait a few seconds.
  - Unplugging the connector may require gentle tools. Do not pull the cable. Instead, push out the white connector using fingernails on one side and an opening tool on the other side. Avoid using metallic tools. <u>Do NOT use a screwdriver for this step.</u>
  - A few seconds after the cable is unplugged, the CMOS reset should now be complete.
- At this point, you could raise the laptop on its side (like a book), plug in the charger (without closing the laptop's bottom case) and check if the laptop is able to boot to BIOS setup again. If this is successful, shutdown and reassemble.
  - Attach the CMOS battery to the mainboard.
  - Assemble the frame of the 3rd fan.
  - Attach the 99 Wh battery to the mainboard.
  - Assemble all 4 screws of the 99 Wh battery.
  - Close and assemble the bottom case.

3) <u>CMOS reset through hotkey action</u>:

- The system has a recovery hotkey: Ctrl+Alt+F11 – this is implemented through EC firmware.
  - The recovery hotkey from some previous XMG NEO models (Ctrl+B) is ***<u>not</u>*** implemented in XMG NEO 16 (A25). Its place has been taken by Ctrl+Alt+F11.
- It is currently unclear in what situations this hotkey is required and when and for how long it would need to be pressed. The automatic recovery procedure has been working well, and pressing the hotkey during the automatic procedure (2.5 min waiting time) does ***<u>not</u>*** accelerate the process *at all*.

General step-by-step procedure for CPU and memory tuning

Patience is required for overclocking and undervolting. If you want to avoid instability and the dreaded "no boot" scenario, you must proceed according to the principle of "small, gradual adjustments".

⚠ This procedure applies in particular to RAM tuning, as improper memory settings will quickly lead to "no boot" situations.

Preparation:

- Make sure that you have installed the latest EC/BIOS versions.
- Download benchmarks for stability tests (e.g. Prime95, AIDA64).
- Create a backup of important data in case something goes wrong.

Step 1: Make a small adjustment

- Start with the default value (e.g. for frequency and timing).
- Make a small adjustment, such as slightly increasing the clock rate or reducing the latency by 1–2 steps.
- Do not overdo it! Excessive jumps can cause immediate instability or result in the system no longer booting up.

Step 2: Perform stability test

- Restart the system and run the first stability test (Prime95 w/o AVX; or AIDA64).
  - Prime95 "Small FFT" for CPU tuning
  - Prime95 "Large FFT" for RAM tuning
- Let the test run for at least 10-15 minutes to draw initial conclusions.
- Watch out for blue screens, crashes, freezes or graphics errors.

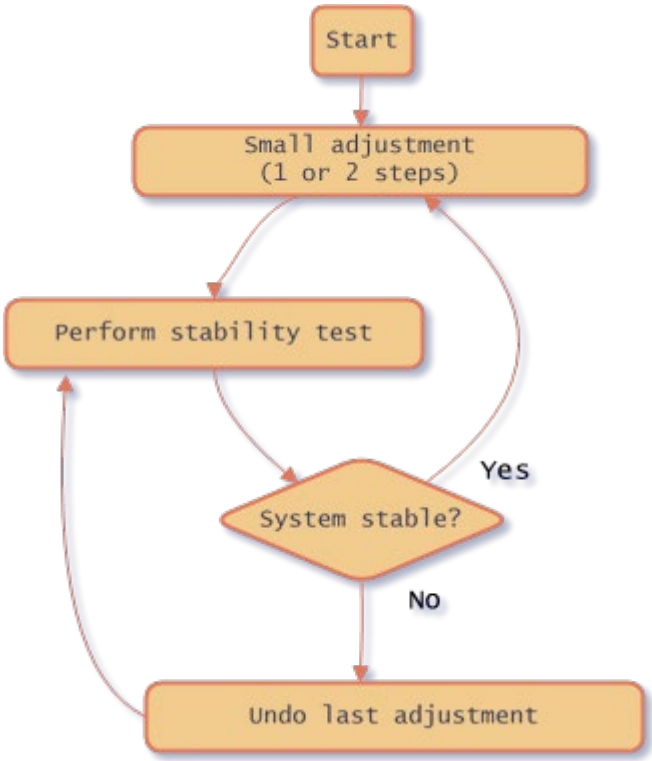
Step 3: Evaluate result

- System stable?
  - No problems? Good! Go back to step 1 and make another small adjustment.
- System unstable?
  - If you notice blue screens, crashes or other errors: Cancel the last adjustment immediately. Adjust the values back to the previous stable status or reset them to the default values.

Step 4: Repeat process

- Continue by repeating steps 1 to 3 until you achieve the desired result.
- Always proceed in **small steps**. Patience is the key to successful overclocking.

The illustration on the right shows the procedure described here as a flowchart.



Warranty information

Please note:

- Overvolting, undervolting, and changes to the clock rate and timings of system memory can impair system stability. We offer no guarantee of performance or efficiency gains with CPU and memory tuning, and no guarantee of system stability.
- We recommend to reset all adjustments before any firmware update, as unstable tunings may otherwise cause firmware updates to fail, leading to potentially unrecoverable damage ("brick"). Such situations would not fall under warranty.



Voltage and memory tuning may impair stability and void your warranty in the event of a failed firmware update. Reset tunings before updating!

Contact, support & feedback

The following channels are available to answer questions and provide further guidance:

Contact page:	https://www.xmg.gg/en/contact/
Reddit thread:	https://go.xmg.gg/xne16a25-bios-tuning-reddit-thread
Reference table:	https://go.xmg.gg/xne16a25-bios-tuning-reference-table
Usage examples:	https://go.xmg.gg/memory-tuning-xmg-neo-a25-e25-results
Discord server:	https://discord.gg/xZykwQf

Downloads

This document, all drivers and future EC/BIOS updates are available in the download portal.

Download portal:	https://go.xmg.gg/xne16a25
This document:	https://go.xmg.gg/xne16a25-bios-tuning-guide