

# XMG APEX 15 MAX (E22)

## Firmware Documentation

Schenker Technologies GmbH  
Version 2 / 2022-09-26

### Introduction

This document explains some important details about the firmware of XMG APEX 15 MAX (E22):

- How is it different from the ODM standard firmware?
- How is it compatible with non-XMG systems based on the same ODM barebone?
- How can it be installed? What risks and safeguards needs to be considered?

The ODM barebone that XMG APEX 15 MAX (E22) is based on includes these two models:

- NH5xVPS (with RTX 3060)
- NH5xVR (with RTX 3070)

The “x” after “NH5” may be any other number, indicating non-essential cosmetic differences.

### BIOS 1.07.09A01 | Release: September 2022

This is the second major release. It introduces the following improvements:

- Introduces AGESA 1.2.0.7 (previous BIOS was based on 1.2.0.1)
- Introduces support for AMD Ryzen 7 5800X3D
- Introduces advanced overclocking features in BIOS Setup (F2) for all CPUs **except** R7 5800X3D.
- Increases the power of the default performance profile when Control Center is **not** running

This BIOS also includes all improvements from the previous version 1.07.08F4a (see next page for details). To fully benefit from this release, you also need **XMG VRM Firmware** (see page 2).

### AMD Overdrive with Precision Boost Overdrive 2 and Curve Optimizer

BIOS 1.07.09A01 introduce a new “AMD Overclocking” menu structure in the advanced BIOS Setup (F2) menu. See these screenshots: <https://go.xmg.gg/apex-max-bios-screenshots>

A general workflow might look like this:

- Use special software to find and test optimal frequency/voltage values for each core.
- Apply those values in software first and test them for a long period of time.
- Once the values are sufficiently stable, you may apply them to BIOS Setup.

It’s an extremely time-consuming process and should only be handled by expert users. Related software:

Project Hydra	<a href="https://www.patreon.com/1usmus">https://www.patreon.com/1usmus</a>
PBO2 Tuner	<a href="https://github.com/Prime07/How-to-undervolt-AMD-RYZEN-5800X3D-Guide-with-PBO2-Tuner">https://github.com/Prime07/How-to-undervolt-AMD-RYZEN-5800X3D-Guide-with-PBO2-Tuner</a>



**WARNING! EXTREME CAUTION! Invalid overclocking settings may cause your system to become unbootable. Such a system CANNOT BE RECOVERED except with special SPI 8-pin SOIC hardware access or by assembling a special CPU. Settings must be tested in little steps in software first. Only recommended for EXPERT USERS. Failure is not covered by warranty.**

## BIOS 1.07.08F4a | Release: May 2022

This was the first major release that allowed us reasonable support for 105 W TDP CPUs in this chassis.

### Differences between ODM Standard and XMG BIOS:

	ODM Standard BIOS	XMG BIOS
<b>CPU Power Limits</b>	Unlimited Power at Boot.	Limits Power to 65 W at Boot.
<b>CPU Support</b>	Supports only CPUs with 65 W TDP.	Limited Support for CPUs with 105 W TDP, running at 65 W or 88 W PPT (ECO Mode).

**Explanation:** the limited CPU support for 105W SKUs in XMG BIOS is achieved by forcing the CPU to run at 65 W at boot.

- XMG BIOS prevents the CPU from demanding 105 W of power consumption, instead forcing it to run at no more than 65 W.
- As soon as Windows is loaded, the ODM Control Center and/or AMD Ryzen Master takes over and allows the CPU to run at higher power (up to 88 W).

The power limit at boot is an important safeguard. The lack of power limits in the ODM Standard BIOS poses a danger: when a CPU calls more than 88 W, the system will perform an emergency shutdown. If this happens during a critical operation, such as a BIOS update, the system may become permanently unbootable.



**Warning: if you run ODM Standard BIOS with a 105 W CPU and you perform an EC or BIOS update under this condition, there is a high chance that your system will suddenly shut down during the EC/BIOS update. This will render the firmware update incomplete and leave the system in a non-bootable condition which can not be recovered without special SPI 8-pin SOIC hardware access.**

This warning is further explained on the FAQ page of this document.

For a full CPU list, see appendix at the end of this document.

## XMG VRM Firmware | Release: May 2022

The VRM firmware is located on the mainboard, outside of the EC and BIOS firmware chips. It controls the behavior of the Monolithic Power Systems (MPS) voltage regulator MP2855.

The XMG VRM Firmware has already been installed on **all shipped units** of **XMG APEX 15 MAX (E22)**.

(There have only been a small number of exceptions; those customers have been informed by e-mail.)

### Differences between ODM Standard and XMG VRM Firmware:

	ODM Standard VRM Firmware	XMG VRM Firmware
<b>LLC (Load Line Calibration)</b>	Very aggressive.	Somewhat relaxed.

**Explanation:** the XMG VMR Firmware is better tuned to handle the voltage and current (amp) requirements of the 105 W CPUs while at the same time not sacrificing performance and efficiency of lower-core 65 W CPUs.

Although it is theoretically possible to run the 105 W CPUs without XMG VRM Firmware, the very aggressive LLC in the ODM Standard VRM Firmware causes the system to be unstable in rendering, benchmark and stress test situations because it causes the system to apply too much voltage on average and also too high voltage spikes, which also increases the current-draw and makes the CPU hit TDP power limits prematurely. This in turn will lower performance (CPU can not reach high clock speeds) and will risk to trigger OCP protection shutdowns. **Further reading:** [https://en.wikichip.org/wiki/load-line\\_calibration](https://en.wikichip.org/wiki/load-line_calibration)

## EC Firmware (Embedded controller)

**Current Version:** EC 1.07.03

XMG has not performed any modifications on the XMG firmware. The EC Firmware on XMG APEX 15 MAX (E22) is identical with the ODM Standard version.

## AMD Ryzen Master and Curve Optimizer



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When applying manual performance tuning via 'Curve Optimizer' in AMD Ryzen Master, please proceed in very small steps and with utmost caution as the system might be rendered unbootable when exaggerated or invalid settings are applied. Each step must be carefully stress tested to see if it is stable under load. Do not make big jumps in your settings. CMOS Reset (e.g. removing the CMOS battery) is **not** able to reset Frequency/Voltage curve settings.

## FAQ – Frequently Asked Questions

**Q: Is it safe to install the XMG BIOS on a non-XMG system?**

**A:** It is generally safe to install the XMG BIOS on a non-XMG system, but only if your system has currently a 65 W CPU installed. If you currently have a 105 W CPU installed and you are still on the ODM Standard BIOS, then you should **not** perform any EC or BIOS updates.

If you plan to keep on using a 65 W CPU, XMG BIOS will not provide you with any significant benefits.

Outside of the CPU-related power settings, the XMG BIOS does not come with any modifications that would make it incompatible with non-XMG systems. For example, there is **no** modified keyboard layout nor any other functional modification aside from the CPU support.

The XMG BIOS can be fully uninstalled by flashing either the ODM Original BIOS or by flashing the BIOS of your 3<sup>rd</sup> party brand.

**Q: Is it safe to run a 105 W CPU after installing XMG BIOS?**

**A:** It depends. The key benefit of XMG BIOS is to safeguard the system from triggering OCP shutdowns before Windows OS is loaded. Thus, if you have XMG BIOS installed first and then install a 105 W CPU, the system will not be at risk to crash in BIOS Setup, during BIOS updates, in EFI Shell or similar situations.

However, in order to really benefit from the performance potential of a 105 W CPU (running at 88 W PPT), you will need *both* components: XMG BIOS **and** XMG VRM Firmware.

Neither XMG BIOS nor XMG VRM Firmware can prevent the system from becoming un-bootable when the user is applying exaggerated or invalid settings in AMD Ryzen Master and specifically in AMD Curve Optimizer (see warning on previous page).

**Q: Is it safe to run a 105 W CPU without installing XMG BIOS?**

**A:** Running a 105 W CPU without XMG BIOS is risky because the lack of power limits in the ODM Standard BIOS may cause the system to shutdown during certain critical operations, such as when performing BIOS updates.

### **Q: How can I install the XMG VRM Firmware on non-XMG systems?**

**A:** Installing the VRM firmware modification is currently ***not possible*** via software, neither via Windows, Linux nor EFI Shell. It can ***only*** be installed with a special hardware tool with direct access at mainboard-level. Thus, installing this firmware is out-of-scope for end-users. At time of writing, only fully-branded XMG APEX 15 MAX (E22) systems (sold through bestware.com and official resellers) are equipped with XMG VRM Firmware.

Due to an NDA with our vendors, we are currently not able to share additional details on this matter.

### **Q: How can I recover the system if I applied invalid or extreme overclocking or undervolting settings?**

**A:** As mentioned in this document, invalid overclocking settings will cause your system to become unbootable. This will make it impossible to perform a BIOS/CMOS reset to recover your settings. The only available recovery methods are these:

- **Special SPI 8-pin SOIC hardware access.** This requires a special tool which connects directly to the BIOS chipset on the mainboard. This is much more complicated than it sounds and should be avoided at all costs.
- **Change CPU to a AMD Ryzen 7 5800X3D.** This unique CPU SKU is in the special situation that it seems to be able to boot the system even at extremely low Curve Optimizer settings. The lowest possible setting is “-30 CO”. In our experience, the 5800X3D has been able to boot this. However, this is not a 100% safe method. It might be down to silicon lottery, so some CPU samples might not be able to make it. *If* the system can boot, you can then reset your overclocking settings back to factory default and change the CPU back to your previous/original CPU.

As you can see, these recovery methods are complicated and not 100% foolproof. It is therefor strongly recommended to abstain from any reckless overclocking. Do not apply settings blindly. Instead, follow tutorials on how to use ‘Project Hydra’ and/or ‘PBO2 Overclocker’ to find your safe settings in small, incremental steps. This should only be performed by expert users.

## **Credits**

XMG sends out special thanks to:

- **3DAndStuff** ([YouTube channel](#), [website](#))
- **Compwxr** (José Silva)

for indispensable input during the co-development of this firmware.

## Appendix: CPU List

### CPUs with 65 W TDP

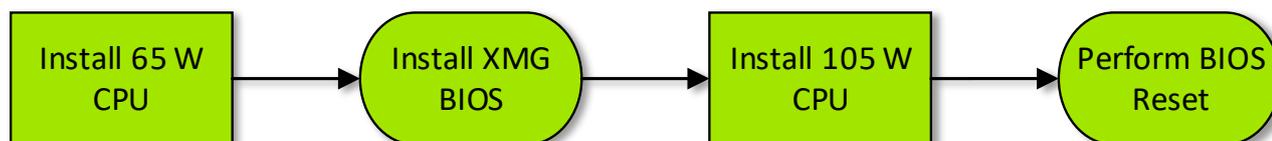
Name	Cores	Threads	TDP	Remark
Ryzen 3 3100	4	8	65 W	
Ryzen 3 3300X	4	8	65 W	
Ryzen 5 3600	6	12	65 W	
Ryzen 5 5600X	6	12	65 W	
Ryzen 7 3700X	8	16	65 W	
Ryzen 7 5700X	8	16	65 W	
Ryzen 7 5800	8	16	65 W	OEM-only
Ryzen 9 3900	12	24	65 W	OEM-only
Ryzen 9 PRO 3900	12	24	65 W	OEM-only
Ryzen 9 5900	12	24	65 W	OEM-only

### CPUs with 105 W TDP

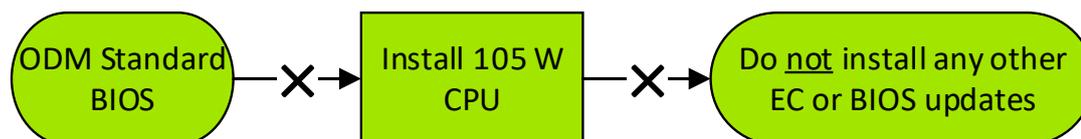
Name	Cores	Threads	TDP	Remark
Ryzen 7 5800X	8	16	105 W	See FAQ on previous page.
Ryzen 9 3950X	16	24	105 W	
Ryzen 9 5900X	12	24	105 W	
Ryzen 9 5950X	16	32	105 W	

## Appendix: how to install a 105 W CPU (flowchart)

### Recommended:



### Not recommended:



If you do not have XMG BIOS installed yet, you should not perform any EC or BIOS updates while having a 105W CPU installed.