

**ROG  
CROSSHAIR  
X670E Series**

**BIOS Manual**



**Motherboard**

E20466  
First Edition  
October 2022

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# BIOS Setup

## 1. Knowing BIOS



The new ASUS UEFI BIOS is a Unified Extensible Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond the traditional keyboard-only BIOS controls to enable a more flexible and convenient mouse input. You can easily navigate the new UEFI BIOS with the same smoothness as your operating system. The term "BIOS" in this user manual refers to "UEFI BIOS" unless otherwise specified.

BIOS (Basic Input and Output System) stores system hardware settings such as storage device configuration, overclocking settings, advanced power management, and boot device configuration that are needed for system startup in the motherboard CMOS. In normal circumstances, the default BIOS settings apply to most conditions to ensure optimal performance. **DO NOT change the default BIOS settings** except in the following circumstances:

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.
- You have installed a new system component that requires further BIOS settings or update.



Inappropriate BIOS settings may result in instability or boot failure. **We strongly recommend that you change the BIOS settings only with the help of a trained service personnel.**



- When downloading or updating the BIOS file for your motherboard, rename it as **XXXXX.CAP** or launch the **BIOSRenamer.exe** application to automatically rename the file. The name of the CAP file varies depending on models. Refer to the user manual that came with your motherboard for the name.
- The screenshots in this manual are for reference only, please refer to the latest BIOS version for settings and options.
- BIOS settings and options may vary due to different BIOS release versions or CPU installed. Please refer to the latest BIOS version for settings and options.

## 2. BIOS setup program

Use the BIOS Setup to update the BIOS or configure its parameters. The BIOS screen include navigation keys and brief onscreen help to guide you in using the BIOS Setup program.

### Entering BIOS at startup

To enter BIOS Setup at startup, press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

### Entering BIOS Setup after POST

To enter BIOS Setup after POST:

- Press <Ctrl>+<Alt>+<Delete> simultaneously.
- Press the reset button on the system chassis.
- Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.

After doing either of the three options, press <Delete> key to enter BIOS.



- 
- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
  - Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
  - If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey <F5>. See section **Exit menu** for details.
  - If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. See your motherboard manual for information on how to erase the RTC RAM.
  - The BIOS setup program does not support Bluetooth devices.
- 

### BIOS menu screen

The BIOS Setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. You can change modes from **Setup Mode** in **Boot menu** or by pressing the <F7> hotkey.



---

The BIOS settings and options for each motherboard may differ slightly with the options in this manual. Please refer to the BIOS of your motherboard for the settings and options.

---

## 2.1 Advanced Mode

The Advanced Mode provides advanced options for experienced end-users to configure the BIOS settings. The figure below shows an example of the Advanced Mode. Refer to the following sections for the detailed configurations.



The default screen for entering the BIOS setup program can be changed. Refer to the **Setup Mode** item in section **Boot menu** for details.

The screenshot displays the ASUS ROG CROSSHAIR X670E Series BIOS in Advanced Mode. The interface is dark-themed with red accents. At the top, a menu bar includes 'My Favorites', 'Main', 'Extreme Tweaker' (highlighted), 'Advanced', 'Monitor', 'Boot', 'Tool', and 'Exit'. The 'Extreme Tweaker' section shows various overclocking options like 'AI Overclock Tuner' (set to Auto), 'Memory Frequency', 'FCLK Frequency', 'Core Performance Boost', 'CPU Core Ratio' (set to Auto), and 'CPU Core Ratio (Per CCX)'. A 'Hardware Monitor' sidebar on the right shows system status like CPU/Memory frequency, temperature, BCLK, Core Voltage, Ratio, DRAM Freq., MC Volt., and Capacity. A 'Prediction' section shows SP, Cooler, V for 5303MHz, Heavy Freq, V for 4500MHz, and Dos Thresh. The bottom of the screen shows 'Version 2.22.1284 Copyright (C) 2022 AMI', 'Last Modified', 'EZ Mode(F7)', and 'Hot Keys'. Red lines and labels point to various UI elements: 'Configuration fields' points to the top menu bar; 'Pop-up Menu' points to the 'My Favorites' button; 'Menu bar' points to the top navigation bar; 'Language' points to the 'Language' button; 'MyFavorite(F3)' points to the 'MyFavorite(F3)' button; 'Qfan Control (F6)' points to the 'Qfan Control(F6)' button; 'AI OC Guide(F11)' points to the 'AI OC Guide(F11)' button; 'AURA(F4)' points to the 'AURA(F4)' button; 'Search(F9)' points to the 'Search(F9)' button; 'ReSize BAR' points to the 'ReSize BAR' button; 'Scroll bar' points to the vertical scrollbar on the right; 'Submenu items' points to the 'CPU Core Ratio' dropdown; 'Menu items' points to the 'CPU Core Ratio (Per CCX)' dropdown; 'General help' points to the 'General help' button; 'Last modified settings' points to the 'Last Modified' text; 'Go back to EZ Mode' points to the 'EZ Mode(F7)' button; 'Hot keys' points to the 'Hot Keys' button; and a large box on the right labeled 'Displays a quick overview of the system status and prediction' encompasses the 'Hardware Monitor' and 'Prediction' sections.

Configuration fields  
Pop-up Menu  
Menu bar  
Language  
MyFavorite(F3)  
Qfan Control (F6)  
AI OC Guide(F11)  
AURA(F4)  
Search(F9)  
ReSize BAR  
Scroll bar

UEFI BIOS Utility - Advanced Mode  
09/15/2022 15:27 Thursday  
English MyFavorite(F3) Qfan Control(F6) AI OC Guide(F11) Search(F9) AURA(F4) ReSize BAR

My Favorites Main **Extreme Tweaker** Advanced Monitor Boot Tool Exit

LN2 Mode  
Target CPU Speed : 4500MHz  
Target DRAM Frequency : 4800MHz

AI Overclock Tuner Auto  
Memory Frequency Auto  
FCLK Frequency Manual  
Core Performance Boost AEMP  
CPU Core Ratio Auto

> CPU Core Ratio (Per CCX)  
> DRAM Timing Control  
> Precision Boost Overdrive  
> DIGI + VRM

[Manual]: When manual mode is selected, the BCLK (base clock) frequency can be assigned manually.  
[DOCP/EXPO]: Load the DIMM's default DOCP/EXPO memory timings (CL, TRCD, TRP, TRAS) and other memory parameters optimized by ASUS  
[AEMP]: Load the memory parameters profile optimized by ASUS if no DIMM profiles detected.

Hardware Monitor  
CPU/Memory  
Frequency 4500 MHz Temperature 64°C  
BCLK 100.0000 MHz Core Voltage 1.421 V  
Ratio 45x DRAM Freq. 4800 MHz  
MC Volt. 1.101 V Capacity 8192 MB

Prediction  
SP 114 Cooler 149 pts  
V for 5303MHz Heavy Freq 1.239 V @L5 5303MHz  
V for 4500MHz Dos Thresh 0.930 V @L5 71

Version 2.22.1284 Copyright (C) 2022 AMI  
Last Modified | EZ Mode(F7) | Hot Keys

General help  
Last modified settings  
Go back to EZ Mode  
Hot keys

Submenu items  
Menu items

Displays a quick overview of the system status and prediction

## Menu bar

The menu bar on top of the screen has the following main items:

<b>My Favorites</b>	For saving the frequently-used system settings and configuration.
<b>Main</b>	For changing the basic system configuration
<b>Extreme Tweaker</b>	For changing the overclocking settings
<b>Advanced</b>	For changing the advanced system settings
<b>Monitor</b>	For displaying the system temperature, power status, and changing the fan settings.
<b>Boot</b>	For changing the system boot configuration
<b>Tool</b>	For configuring options for special functions
<b>Exit</b>	For selecting the exit options and loading default settings

## Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting **Main** shows the Main menu items.

The other items on the menu bar have their respective menu items.

## Submenu items

An arrow sign (>) before each item on any menu screen means that the item has a submenu. To display the submenu, select the item and press <Enter>.

## Language

This button above the menu bar contains the languages that you can select for your BIOS. Click this button to select the language that you want to display in your BIOS screen.

## MyFavorite

This button above the menu bar shows all BIOS items in a Tree Map setup. Select frequently-used BIOS settings and save it to **My Favorites** menu. You may also access this item by pressing the <F3> key on the keyboard.



---

Refer to section **My Favorites** for more information.

---

## Qfan Control

This button above the menu bar displays the current settings of your fans. Use this button to manually tweak the fans to your desired settings. You may also access this item by pressing the <F6> key on the keyboard.



---

Refer to section **Qfan Control** for more information.

---

## AI OC Guide

This button above the menu bar allows you to view the descriptions of AI overclocking and enable it. You may also access this item by pressing the <F11> key on the keyboard.



- Refer to section **AI OC Guide** for more information.
- This function is only enabled when using an unlocked CPU.

## Search

This button allows you to search for BIOS items by entering its name, enter the item name to find the related item listing. You may also access this item by pressing the <F9> key on the keyboard.

## AURA

This button allows you to turn the RGB LED lighting or functional LED on or off. You may also access this item by pressing the <F4> key on the keyboard.

- [All On]: All LEDs (Aura or Functional) will be enabled.
- [Stealth Mode]: All LEDs (Aura and Functional) will be disabled.
- [Aura Only]: Aura LEDs will be enabled and functional LEDs will be disabled.
- [Aura Off]: Aura LEDs will be disabled, however functional LEDs will still be enabled.

## ReSize BAR

This button allows you to turn ReSize BAR function on or off.

- [On] Enable ReSize BAR support to fully harness GPU memory. CSM (Compatibility Support Module) will be disabled.
- [Off] ReSize BAR support will be disabled.

## Hot keys

This button at the bottom right contains the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings.

## Scroll bar

A scroll bar appears on the right side of a menu screen when there are items that do not fit on the screen. Press the Up/Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen.

## General help

At the bottom of the menu screen is a brief description of the selected item. Use <F12> key to capture the BIOS screen and save it to the removable storage device.

## Configuration fields

These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable.

A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

## Last Modified button

This button shows the items that you last modified and saved in BIOS Setup.



## 2.2 EZ Mode

The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance, mode and boot device priority. To access the Advanced Mode, select **Advanced Mode(F7)** or press the <F7> hotkey for the advanced BIOS settings.



To switch from Advanced Mode to EZ Mode, click **EZ Mode(F7)** or press the <F7> hotkey.

Displays a quick overview of the system status

Displays the system properties of the selected mode.  
Click < or > to switch modes

09/15/2022 Thursday 15:24 English AI OC Guide(F11) Search(F9) AURA(F4) ReSize BAR

**Information**  
ROG CROSSHAIR X670E HERO BIOS Ver. 0604  
AMD Ryzen 7 7700X 8-Core Processor  
Speed: 4500 MHz  
Memory: 8192 MB (DDR5 4800MHz)

**DRAM Status**  
DIMM\_A1: N/A  
DIMM\_A2: Micron Technology 8192MB 4800MHz  
DIMM\_B1: N/A  
DIMM\_B2: N/A

**AEMP**  
Disabled

**FAN Profile**  
CPU FAN 3515 RPM  
CHA1 FAN N/A  
CHA2 FAN N/A  
CHA3 FAN N/A  
CHA4 FAN N/A  
W\_PUMP+ N/A  
AIO PUMP N/A

**CPU FAN**  
QFan Control

**Storage Information**  
NVME:  
M.2\_1: WD\_BLACK SN850X 1000GB (1000.2GB)  
M.2\_2: WD\_BLACK SN850X 1000GB (1000.2GB)  
USB:  
JetFlashTranscend 4GB 8.07 (4.0GB)

**EZ System Tuning**  
Click the icon to specify your preferred performance mode  
Normal

**Boot Priority**  
Choose one and drag the items. Switch all  
UEFI: JetFlashTranscend 4GB 8.07, Partition 1 (4.0GB)

Default(F5) Save & Exit(F10) Advanced Mode(F7)

Displays the CPU Fan's speed. Click the button to manually tune the fans

Loads optimized default settings

Saves the changes and resets the system

Click to go to Advanced mode

Click to display boot devices

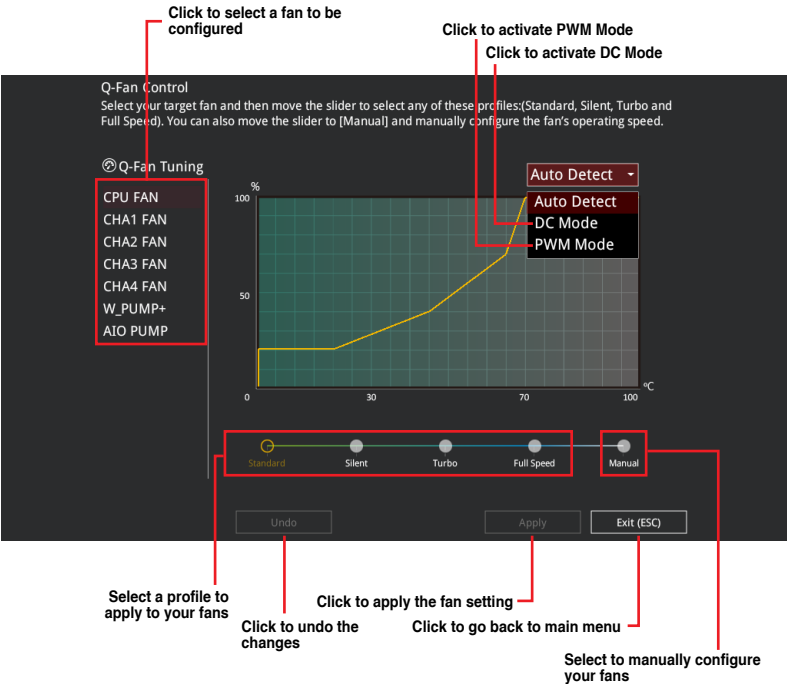
Selects the boot device priority



The boot device options vary depending on the devices you installed to the system.

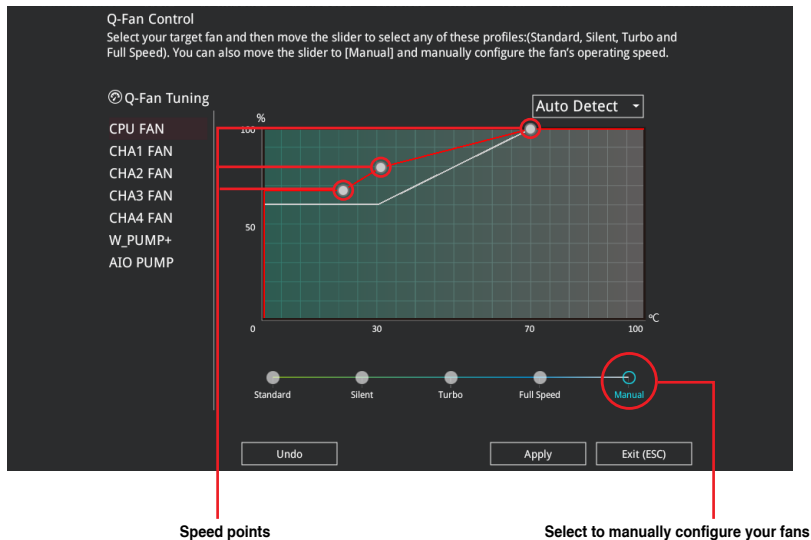
## 2.3 Qfan Control

The Qfan Control allows you to set a fan profile or manually configure the operating speed of your CPU and chassis fans.



## Configuring fans manually

Select **Manual** from the list of profiles to manually configure your fans' operating speed.



To configure your fans:

1. Select the fan that you want to configure and to view its current status.
2. Click and drag the speed points to adjust the fans' operating speed.
3. Click **Apply** to save the changes then click **Exit (ESC)**.

## 2.4 AI OC Guide



- The screenshot shown in this section is for reference purposes only, and may not exactly match what you see on your screen.
- This function is only enabled when using an unlocked CPU.

The AI OC Guide allows you to enable the Ai Overclocking feature, or view a quick guide of the Ai Overclocking feature which highlights the recommended setup procedure and descriptions of the AI Overclocking.

Clicking on **Enable AI** will enable AI Overclocking.

The screenshot shows the 'AI Overclocking Guide' window. On the left is a sidebar with a red box highlighting the 'Introduction' section, which contains the text: 'About the AI Overclocking monitor pane in UEFI', 'The AI Overclocking feature', and 'The following options are found within Extreme Tweaker->AI Features'. A red line connects this box to the label 'Quick guide topics' below. The main area contains text explaining AI Overclocking stats, including 'SP represents an assessment of the current platform.', 'Cooler Score refers to the efficiency of the cooler...', 'Heavy Freq refers to the frequency potential of the processor...', 'V for Vmhz at the bottom reflects the voltage setting required for a target frequency...', and 'DOS Thresh refers to the recommended Current Threshold to use with Dynamic OC Switch.'. At the bottom are four buttons: 'Previous', 'Next', 'Enable AI', and 'Cancel'. Red lines connect these buttons to labels below: 'Click to view the previous topic in the quick guide' (Previous), 'Click to view the next topic in the quick guide' (Next), 'Click to enable AI Overclocking' (Enable AI), and 'Click to go back to main menu' (Cancel).

**AI Overclocking Guide**

**Introduction**

▶ About the AI Overclocking monitor pane in UEFI

The AI Overclocking feature

The following options are found within Extreme Tweaker->AI Features

On the right-side of the UEFI window, a variety of AI Overclocking stats are shown. This portion of the guide explains what each item means.

SP represents an assessment of the current platform.

Cooler Score refers to the efficiency of the cooler. Depending upon configuration of the [Cooler efficiency customize] function, this value changes as data is collected by the motherboard. Contributing factors to the score include CPU Core temperatures, processor leakage, ambient temperatures, and CPU fan speeds. Typically, an air-cooler scores around 130pts, an AIO 150-160, and a custom water-loop around 170+ (ambient temps of 26 Celsius).

Heavy Freq refers to the frequency potential of the processor in maintaining stability under heavy workloads. V for XMHz at the left of this number reflects the voltage setting required for this frequency. This number takes into account your loadline setting reflected by @U.

V for Vmhz at the bottom reflects the voltage setting required for a target frequency you may have specified in your setting. Similarly, this number takes into account your loadline setting reflected by @U.

DOS Thresh refers to the recommended Current Threshold to use with Dynamic OC Switch.

Previous Next Enable AI Cancel

Quick guide topics

Click to view the previous topic in the quick guide

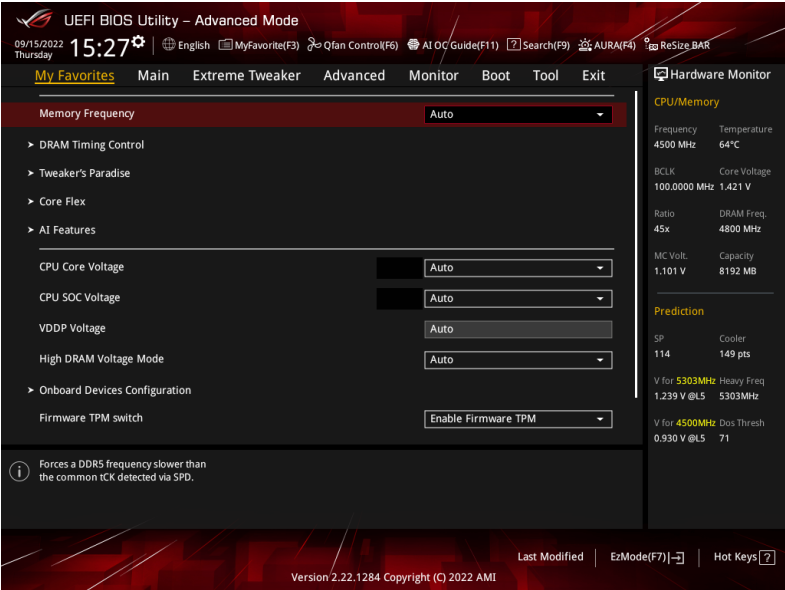
Click to view the next topic in the quick guide

Click to enable AI Overclocking

Click to go back to main menu

### 3. My Favorites

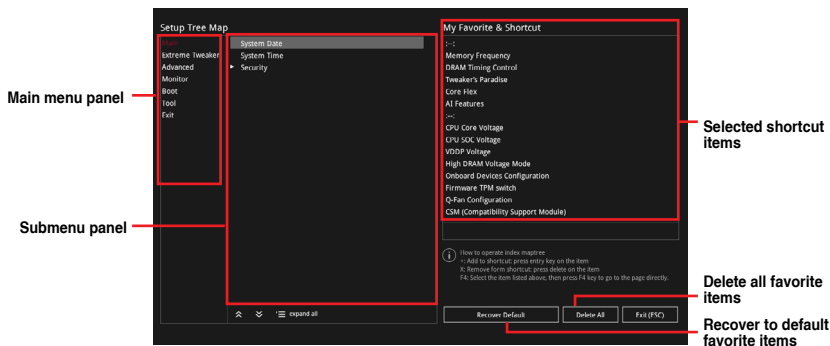
My Favorites is your personal space where you can easily save and access your favorite BIOS items. You can personalize this screen by adding or removing items.



## Adding items to My Favorites

To add BIOS items:

1. Press <F3> on your keyboard or click **MyFavorite** from the BIOS screen to open Setup Tree Map screen.
2. On the Setup Tree Map screen, select the BIOS items that you want to save in My Favorites screen.



3. Select an item from main menu panel, then click the submenu that you want to save as favorite from the submenu panel and click **+** or press <Enter> on your keyboard.



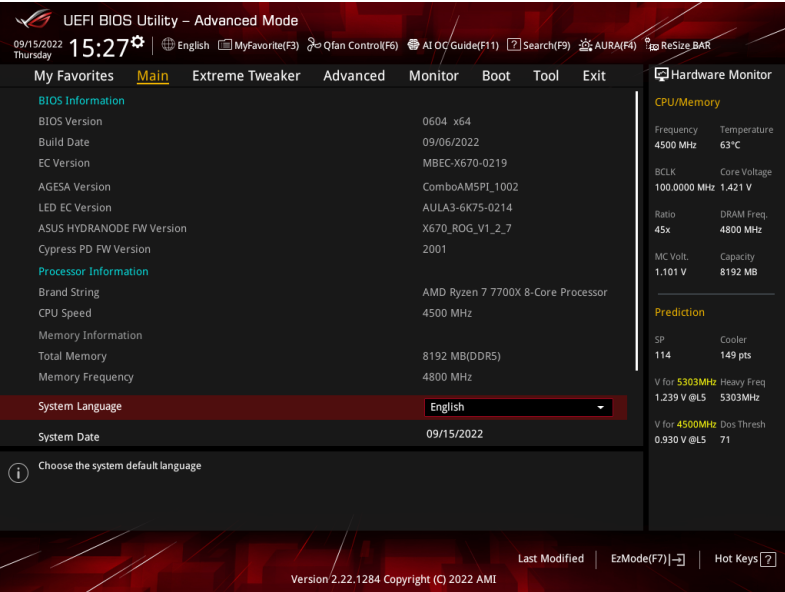
You cannot add the following items to My Favorite items:

- Items with submenu options.
- User-managed items such as language and boot order.
- Configuration items such as Memory SPD Information, system time and date.

4. Click **Exit (ESC)** or press <Esc> key to close Setup Tree Map screen.
5. Go to My Favorites menu to view the saved BIOS items.

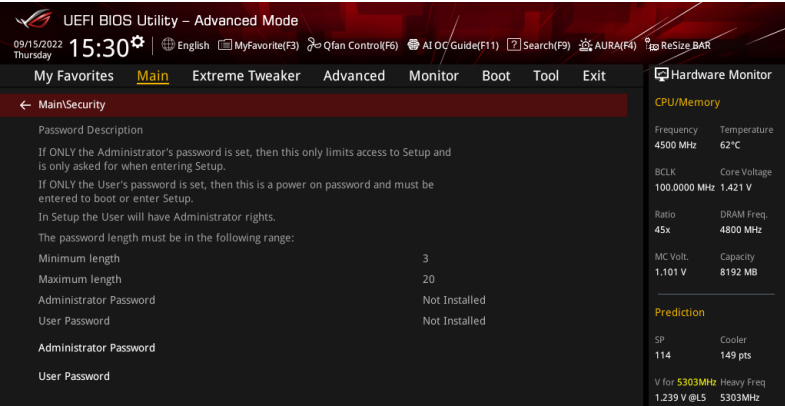
## 4. Main menu

The Main menu screen appears when you enter the Advanced Mode of the BIOS Setup program. The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, language, and security settings.



## Security

The Security menu items allow you to change the system security settings.





- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See the motherboard for information on how to erase the RTC RAM via the Clear CMOS header or button.
- The Administrator or User Password items on top of the screen show the default **[Not Installed]**. After you set a password, these items show **[Installed]**.

## Administrator Password

If you have set an administrator password, we recommend that you enter the administrator password for accessing the system. Otherwise, you might be able to see or change only selected fields in the BIOS setup program.

### To set an administrator password:

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Re-type to confirm the password then select **OK**.

### To change an administrator password:

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Re-type to confirm the password then select **OK**.

To clear the administrator password, follow the same steps as in changing an administrator password, but leave other fields blank then select **OK** to continue. After you clear the password, the **Administrator Password** item on top of the screen shows **[Not Installed]**.

## User Password

If you have set a user password, you must enter the user password for accessing the system. The User Password item on top of the screen shows the default **[Not Installed]**. After you set a password, this item shows **[Installed]**.

### To set a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Re-type to confirm the password then select **OK**.

### To change a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Re-type to confirm the password then select **OK**.

To clear the user password, follow the same steps as in changing a user password, but leave other fields blank then select **OK** to continue. After you clear the password, the **User Password** item on top of the screen shows **[Not Installed]**.



# 5. Extreme Tweaker menu

The Extreme Tweaker menu items allow you to configure overclocking-related items.

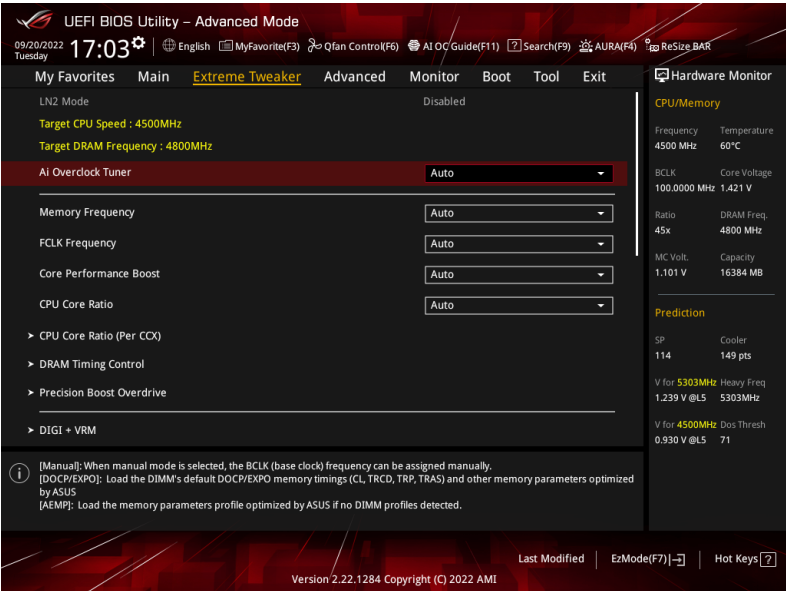


Be cautious when changing the settings of the Ai Tweaker menu items. Incorrect field values can cause the system to malfunction.



The configuration options for this section vary depending on the CPU and DIMM model you installed on the motherboard.

Scroll down to display other BIOS items.



## Ai Overclock Tuner

- [Auto] Loads the optimal settings for the system.
- [Manual] When the manual mode is selected, the BCLK (base clock) frequency can be assigned manually.
- [EXPO I] Load the DIMM's default EXPO I memory timings (CL, TRCD, TRP, TRAS) and other memory parameters optimized by ASUS.
- [EXPO II] Load the DIMM's default EXPO II memory timings (CL, TRCD, TRP, TRAS) and other memory parameters optimized by ASUS.
- [D.O.C.P.] Load the DIMM's default DOCP memory timings (CL, TRCD, TRP, TRAS) and other memory parameters optimized by ASUS.
- [AEMP] Loads the memory parameters profile which is optimized by ASUS if no DIMM profiles are detected.



The configuration options for this item vary depending on the DIMM model you installed on the motherboard.



---

The following items appear only when **Ai Overclock Tuner** is set to **[Manual]**, **[AEMP]** or **[EXPO I]**, **[EXPO II]**, or **[AEMP]**.

---

## eCLK Mode

Configuration options: [Auto] [Synchronous mode] [Asynchronous mode]

## BCLK1 Frequency

Allows you to set the BCLK (base clock) frequency to enhance the system performance. Use the <+> or <-> to adjust the value.



- We recommend you to set the value based on the CPU specification, as high BCLK frequencies may damage the CPU permanently.
  - Changing the BCLK will affect the stability of devices, SATA devices in particular.
- 



---

The following item appears only when **eCLK Mode** is set to **[Asynchronous mode]**.

---

## BCLK2 Frequency

Allows you to set the BCLK2 Frequency for CPU CLK only. Use the <+> or <-> to adjust the value. The values range from 80.0MHz to 200.0MHz with an interval of 0.050MHz. Configuration options: [Auto] [80.0000] - [200.0000]



---

The following item appears only when **Ai Overclock Tuner** is set to **[AEMP]**.

---

## AEMP

Allows you to select your ASUS Enhanced Memory Profile (AEMP). Each profile has its own DRAM frequency, timing and voltage.



---

The following item appears only when **Ai Overclock Tuner** is set to **[EXPO I]** or **[EXPO II]**.

---

## EXPO

Allows you to select your EXPO wProfile. Each profile has its own DRAM frequency, timing and voltage.



---

The following item appears only when **Ai Overclock Tuner** is set to **[D.O.C.P.]**.

---

## D.O.C.P.

Allows you to select your D.O.C.P. Profile. Each profile has its own DRAM frequency, timing and voltage.

## Memory Frequency

Forces a DDR5 frequency slower than the common tCK detected via SPD.



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The configuration options for this item vary depending on the motherboard.

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## FCLK Frequency

Configuration options: [Auto] [800MHz] - [3000MHz]

## Core Performance Boost

Automatically overlocks the CPU and DRAM to enhance system performance.

Configuration options: [Auto] [Enabled] [Disabled]

## CPU Core Ratio

Configuration options: [Auto] [CPU Core Ratio] [AI Optimized]



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The following item appears only when **CPU Core Ratio** is set to **[CPU Core Ratio]**.

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## CPU Core Ratio

Use the <+> or <-> to adjust the value. The values range from 80.0 to 100.0 with an interval of 0.25.

Configuration options: [Auto] [8.00] - [100.00]



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The following item appears only when **CPU Core Ratio** is set to **[AI Optimized]**.

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## Preference

[Performance] Better overall performance.

[Power Efficient] More energy saving.

## CPU Core Ratio (Per CCX)

The sub-items in this menu allow you to adjust Core Ratios for each CCX.

### Core VID

Allows you to specify a custom CPU core VID. Power saving features for idle cores (e.g. cc6 sleep) remain active.

Configuration options: [Auto] [0.700] - [1.700]

### CCD0

#### CCX0 Ratio

Allows you to specify a custom Core Ratio for this CCX.

Configuration options: [Auto] [12.00] - [100.00]

#### Dynamic OC Switcher

Enabling this dynamically switches back and forth between OC mode and Default modes based on current and temperature threshold specified.

Configuration options: [Auto] [Disabled] [Enabled]



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The following items appear only when **Dynamic OC Switcher** is set to **[Enabled]**.

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#### Current Threshold to Switch to OC Mode

Set this threshold to control when the CPU goes into OC Mode and when it comes back to default. Bigger than this value = OC Mode, smaller than this value = Default Mode. We recommend a value of 40A for single CCD and 60A for two CCDs.

Configuration options: [Auto] [0] - [255]

### **Calibrated Temperature Threshold to switch back**

Set this threshold to control when the CPU returns to default mode. When CPU Calibrated Temperature is bigger than this threshold, CPU returns to default. Likewise, when temperature is smaller than this threshold AND current is bigger than Current Threshold, CPU slips into OC Mode. In Celsius Unit.

Configuration options: [Auto] [0] - [140]

### **Hysteresis**

Higher numbers increase the time required to persist in state when crossing thresholds before switching. Set to 0 for fastest reaction and increase this to require longer times to remain said state before activation.

Configuration options: [Auto] [0] - [255]

## **DRAM Timing Control**

The sub-items in this menu allow you to set the DRAM timing control features. Use the <+> and <-> keys to adjust the value. To restore the default setting, type **[Auto]** using the keyboard and press the <Enter> key. You can also select various Memory Presets to load settings suitably tuned for some memory modules.



Changing the values in this menu may cause the system to become unstable! If this happens, revert to the default settings.

### **Primary Timings**

#### **DRAM CAS# Latency**

Configuration options: [Auto] [2] - [64]

#### **DRAM RAS# to CAS# Delay**

Configuration options: [Auto] [1] - [63]

#### **DRAM RAS# PRE Time**

Configuration options: [Auto] [1] - [63]

#### **DRAM RAS# ACT Time**

Configuration options: [Auto] [1] - [127]

### **Secondary Timings**

#### **DRAM Row Cycle Time**

Configuration options: [Auto] [1] - [255]

#### **DRAM WRITE to READ Delay**

Configuration options: [Auto] [2] - [126]

#### **DRAM REF Cycle Time**

Configuration options: [Auto] [1] - [4095]

#### **Trfc2**

Configuration options: [Auto] [1] - [4095]

#### **Trfcsb**

Configuration options: [Auto] [1] - [2047]

#### **DRAM READ to PRE Time**

Configuration options: [Auto] [1] - [31]

**DRAM RAS# to RAS# Delay L**

Configuration options: [Auto] [1] - [31]

**DRAM RAS# to RAS# Delay S**

Configuration options: [Auto] [1] - [31]

**Tfaw**

Configuration options: [Auto] [1] - [127]

**DRAM WRITE to READ Delay L**

Configuration options: [Auto] [1] - [127]

**DRAM WRITE to READ Delay S**

Configuration options: [Auto] [1] - [31]

**TrdrdScl**

Configuration options: [Auto] [1] - [15]

**TrdrdSc**

Configuration options: [Auto] [1] - [15]

**TrdrdSd**

Configuration options: [Auto] [1] - [15]

**Trdrddd**

Configuration options: [Auto] [1] - [15]

**TwrrwrScl**

Configuration options: [Auto] [1] - [63]

**TwrrwrSc**

Configuration options: [Auto] [1] - [15]

**TwrrwrSd**

Configuration options: [Auto] [1] - [15]

**TwrrwrDd**

Configuration options: [Auto] [1] - [15]

**Twrrrd**

Configuration options: [Auto] [1] - [15]

**Trdwr**

Configuration options: [Auto] [1] - [63]

**DRAM Signal Control****Proc CA Drive Strength**

Configuration options: [Auto] [120 ohm] [60 ohm] [40 ohm] [30 ohm]

**Proc Data Drive Strength**

Configuration options: [Auto] [High Impedance] [240 ohm] [120 ohm] [80 ohm] [60 ohm] [48 ohm] [40 ohm] [34.3 ohm]

**ProcODT**

Configuration options: [Auto] [High Impedance] [480 ohm] [240 ohm] [160 ohm] [120 ohm] [96 ohm] [80 ohm] [68.6 ohm] [60 ohm] [53.3 ohm] [48 ohm] [43.6 ohm] [40 ohm] [36.9 ohm] [34.3 ohm] [32 ohm] [30 ohm] [28.2 ohm] [26.7 ohm] [25.3 ohm]

## DRAM Data Drive Strength

Configuration options: [Auto] [48 ohm] [40 ohm] [34 ohm]

## Rtt Nom Wr

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

## Rtt Nom Rd

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

## Rtt Wr

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

## Rtt Park

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

## Rtt Park Dqs

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

## Power Down Enable

Configuration options: [Auto] [Enabled] [Disabled]

## Memory Context Restore

When enabled, DRAM re-retraining is avoided when possible and the POST latency is minimized.

Configuration options: [Auto] [Enabled] [Disabled]

## UCLK DIV1 MODE

Configuration options: [Auto] [UCLK=MEMCLK] [UCLK=MEMCLK/2]

## Precision Boost Overdrive

### Medium Load Boostit

Enabling may help improve performance under medium loads.

Configuration options: [Auto] [Disabled] [Enabled]

### Precision Boost Overdrive

When this item is enabled, it allows the processor to run beyond defined values for PPT, VDD\_CPU EDC, VDD\_CPU TDC, VDD\_SOC EDC, VDD\_SOC TDC to the limits of the board, and allows it to boost at higher voltages for longer durations than default operation.

Configuration options: [Auto] [Disabled] [Enabled] [Enhancement] [Manual]



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The following items appear only when **Precision Boost Overdrive** is set to **[Manual]**.

---

### PPT Limit

PPT Limit [W], Board Socket Power capability, adjustable up to motherboard's programmed PPT limit.

Configuration options: [Auto] [0] - [65535]

### TDC Limit

TDC Limit [A], Board thermally constrained current delivery capacity, adjustable up to motherboard's programmed board TDC limit.

Configuration options: [Auto] [0] - [65535]

### EDC Limit

EDC Limit [A], Board electrically constrained current delivery capacity, adjustable up to motherboard's programmed board EDC limit.

Configuration options: [Auto] [0] - [65535]

### Precision Boost Overdrive Scalar

[Auto] Part runs with a scalar of 1X, i.e. normal operation.

[Manual] Part runs with a scalar of customized value.



---

The following item appears only when **Precision Boost Overdrive Scalar** is set to **[Manual]**.

---

### Customized Precision Boost Overdrive Scalar

Precision Boost Overdrive increases the maximum boost voltage used (runs above parts specified maximum) and the amount of time spent at that voltage. The larger the value entered the larger the boost voltage used and the longer that voltage will be maintained.

Configuration options: [1X] - [10X]

### CPU Boost Clock Override

Allows you to increase (positive) or decrease (negative) the maximum CPU frequency that may be automatically achieved by the CPU Boost Algorithm.

Configuration options: [Auto] [Disabled] [Enabled (Positive)] [Enabled (Negative)]



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The following item appears only when **CPU Boost Clock Override** is set to **[Enabled (Positive)]**.

---

### Max CPU Boost Clock Override(+)

Increases the maximum CPU frequency that may be automatically achieved by the Precision Boost 2 algorithm.

Configuration options: [Auto] [0] - [200]



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The following item appears only when **CPU Boost Clock Override** is set to **[Enabled (Negative)]**.

---

### Max CPU Boost Clock Override(+)

Decreases the maximum CPU frequency that may be automatically achieved by the Precision Boost 2 algorithm.

Configuration options: [Auto] [0] - [200]

### Platform Thermal Throttle Limit

Allows you to decrease the maximum allowed processor temperature (celsius).

Configuration options: [Auto] [Manual]



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The following item appears only when **Platform Thermal Throttle Limit** is set to **[Manual]**.

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## **Platform Thermal Throttle Limit**

Configuration options: [0] - [256]

### **Curve Optimizer**

#### **Curve Optimizer**

Allows the user to shift the Voltage / Frequency (AVFS) curve to include higher voltages (positive values) or lower voltages (negative values). The larger the value entered the larger the magnitude of the voltage shift.

Configuration options: [Auto] [All Cores] [Per Core]

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---

The following items appear only when **Curve Optimizer** is set to **[All Cores]**.

---

#### **All Core Curve Optimizer Sign**

Determines the direction of the curve shift on all cores. Positive shifts the curve up to use higher voltages. Negative shifts the curve down to use lower voltages.

Configuration options: [Positive] [Negative]

#### **All Core Curve Optimizer Magnitude**

Determines the magnitude of the curve shift to be made (entered in whole numbers) the larger the value entered the larger the magnitude of the shift.

Configuration options: [0] - [60]

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The following items appear only when **Curve Optimizer** is set to **[Per Core]**.

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#### **Core 0-7 Curve Optimizer Sign**

Determines the direction of the curve shift on this core. Positive shifts the curve up to use higher voltages. Negative shifts the curve down to use lower voltages.

Configuration options: [Positive] [Negative]

#### **Core 0-7 Curve Optimizer Magnitude**

Determines the magnitude of the curve shift to be made to this core (entered in whole numbers) the larger the value entered the larger the magnitude of the shift.

Configuration options: [0] - [60]

---

## **GFX Curve Optimizer**

#### **GFX Curve Optimizer**

Allows the user to shift the GFX Voltage / Frequency (AVFS) curve to include higher voltages (positive values) or lower voltages (negative values). The larger the value entered the larger the magnitude of the voltage shift.

Configuration options: [Auto] [GFX Curve Optimizer]

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The following items appear only when **GFX Curve Optimizer** is set to **[GFX Curve Optimizer]**.

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#### **GFX Curve Optimizer Sign**

Determines the direction of the curve shift for GFX. Positive shifts the curve up to use higher voltages. Negative shifts the curve down to use lower voltages.

Configuration options: [Positive] [Negative]



### GFX Curve Optimizer Magnitude

Determines the magnitude of the GFX curve shift to be made (entered in whole numbers) the larger the value entered the larger the magnitude of the shift. Field defaults to 0 and the user can enter whole integer numbers. Value entered, combined with the sign above, is used to send the SMU and GFX Curve Optimizer.  
Configuration options: [0] - [30]

## Digi+ VRM

### VRM Initialization Check

When any error occurs during VRM initialization, the system will hang at POST code 76/77 if this function is enabled.

Configuration options: [Disabled] [Enabled]

### CPU Load-line Calibration

CPU Load-Line Calibration is defined by AMD VRM spec and affects CPU voltage. The CPU working voltage will decrease proportionally to CPU loading. Higher value could get higher voltage and good overclocking performance but increase the CPU and VRM thermal.

Configuration options [Auto] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5:Recommended for OC] [Level 6] [Level 7] [Level 8]



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DO NOT remove the thermal module. The thermal conditions should be monitored.

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### CPU Current Capability

A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.

Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%]



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Configure higher values when overclocking or under a high loading for extra power support.

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### CPU Current Reporting Scale

The scale for the current reported to the CPU via the SVI Bus.

Configuration options: [Auto] [100%] [75%] [50%] [25%]

### Core Voltage Suspension

Manipulates voltage output, effective in both over-ride and non over-ride modes.

Configuration options: [Auto] [Enabled] [Disabled]



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The following items appear only when **Core Voltage Suspension** is set to **[Enabled]**.

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### Voltage Floor Mode

[Static]

Fixed minimum voltage.

[Dynamic]

Customized minimum voltage that actively moves based on CPU temperature.



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The following item appears only when **Voltage Floor Mode** is set to **[Static]**.

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### Voltage Floor

Boosts output to keep voltage above this level, efficacy up to 0.3v. Use the <+> or <-> to adjust the value. The values range from 0.000V to 1.700V with an interval of 0.00625V.

Configuration options: [Auto] [0.00000] - [1.70000]



---

The following items appear only when **Voltage Floor Mode** is set to **[Dynamic]**.

---

### Floor Low VMin

The lowest minimum voltage point that maps to Floor Hot Temp should the processor temperature move to hotter or equal to Floor Hot Temp. Use the <+> or <-> to adjust the value. The values range from 0.000V to 1.700V with an interval of 0.00625V.

[Auto] is 1.05V.

Configuration options: [Auto] [0.00000] - [1.70000]

### Floor Hot Temp

The hottest temperature point that maps to Floor Low VMin should the processor temperature move to hotter or equal to Floor Hot Temp. Use the <+> or <-> to adjust the value. [Auto] is 95C.

Configuration options: [Auto] [0] - [255]

### Floor High VMin

The highest minimum voltage point that maps to Floor Cold Temp should the processor temperature move to colder or equal to Floor Cold Temp. Use the <+> or <-> to adjust the value. The values range from 0.000V to 1.700V with an interval of 0.00625V. [Auto] is 1.30V.

Configuration options: [Auto] [0.00000] - [1.70000]

### Floor Hot Temp

The coldest temperature point that maps to Floor High VMin should the processor temperature move to colder or equal to Floor Cold Temp. Use the <+> or <-> to adjust the value. [Auto] is 50C.

Configuration options: [Auto] [0] - [255]

### Voltage ceiling Mode

[Static] Fixed maximum voltage.

[Dynamic] Customized maximum voltage that actively moves based on CPU temperature.



---

The following item appears only when **Voltage ceiling Mode** is set to **[Static]**.

---

### Voltage ceiling

Suppresses output to keep voltage below this level, efficacy up to 0.3v. Use the <+> or <-> to adjust the value. The values range from 0.000V to 3.000V with an interval of 0.00625V.

Configuration options: [Auto] [0.00000] - [3.00000]



---

The following items appear only when **Voltage Floor Mode** is set to **[Dynamic]**.

---

### **Ceiling Low VMax**

The lowest maximum voltage point that maps to Ceiling Hot Temp should the processor temperature move to hotter or equal to Ceiling Hot Temp. Use the <+> or <-> to adjust the value. The values range from 0.000V to 3.000V with an interval of 0.00625V. **[Auto]** is 1.20V.

Configuration options: **[Auto]** [0.00000] - [3.00000]

### **Ceiling Hot Temp**

The hottest temperature point that maps to Ceiling Low VMax should the processor temperature move to hotter or equal to Ceiling Hot Temp. Use the <+> or <-> to adjust the value. **[Auto]** is 88C.

Configuration options: **[Auto]** [0] - [255]

### **Ceiling High VMax**

The highest maximum voltage point that maps to Ceiling Cold Temp should the processor temperature move to colder or equal to Ceiling Cold Temp. Use the <+> or <-> to adjust the value. The values range from 0.000V to 3.000V with an interval of 0.00625V. **[Auto]** is 1.450V.

Configuration options: **[Auto]** [0.00000] - [3.00000]

### **Ceiling Hot Temp**

The coldest temperature point that maps to Ceiling High VMax should the processor temperature move to colder or equal to Ceiling Cold Temp. Use the <+> or <-> to adjust the value. **[Auto]** is 65C.

Configuration options: **[Auto]** [0] - [255]

### **CPU VRM Switching Frequency**

Sets the VRM switching frequency. VRM switching frequency affects transient response and VRM component temperatures. Setting a higher switching frequency will result in better transient response at the expense of higher VRM temperatures. Active cooling of the VRM heatsink is recommended when running high CPU voltage and high load-line calibration values.

Configuration options: **[Auto]** **[Manual]**



---

DO NOT remove the thermal module. The thermal conditions should be monitored.

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The following item appears only when **CPU VRM Switching Frequency** is set to **[Auto]**.

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### **VRM Spread Spectrum**

Reach the magnitude of peak noiseq from the VRM. When enabled, peak noise is reduced. Disable this setting when overclocking.

Configuration options: **[Auto]** **[Disabled]** **[Enabled]**



---

The following item appears only when **CPU VRM Switching Frequency** is set to **[Manual]**.

---

### Fixed CPU VRM Switching Frequency(KHz)

The switching frequency will affect the VRM transient response speed and the component thermal production. Allows you to set a higher frequency for a quicker transient response speed. The values range from 250 KHz to 800 KHz with an interval of 50 KHz.

### CPU Power Duty Control

CPU power duty control adjusts the duty cycle of each VRM phase based upon current and/or temperature.

- |            |                                                          |
|------------|----------------------------------------------------------|
| [T. Probe] | Sets the buck controller to balance VRM FET temperatures |
| [Extreme]  | Select to set the VRM current balance mode.              |



---

DO NOT remove the thermal module when setting this item to **[Extreme]**. The thermal conditions should be monitored.

---

### CPU Power Phase Control

Allows you to set the power phase control of the CPU.

- |             |                                                       |
|-------------|-------------------------------------------------------|
| [Auto]      | Automatically selects the power phase control.        |
| [Standard]  | The number of active phases is controlled by the CPU. |
| [Optimized] | Set to the ASUS optimized phase tuning profile.       |
| [Extreme]   | Sets full phase mode.                                 |
| [Manual]    | Manually select the power phase response speed.       |



---

DO NOT remove the thermal module when setting this item to **[Extreme]**. The thermal conditions should be monitored.

---



---

The following item appears only when **CPU Power Phase Control** is set to **[Manual]**.

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### Power Phase Response

Select ultra fast mode for a faster power phase response. The reaction time will be longer when regular mode is selected.

Configuration options: [Ultra Fast] [Fast] [Medium] [Regular]

### VDDSOC Load-Line Calibration

Configuration options: [Auto] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5] [Level 6] [Level 7] [Level 8]

### VDDSOC Current Capability

Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%]

### VDDSOC Current Reporting Scale

The scale for the current reported to the CPU via the SVI Bus.

Configuration options: [Auto] [100%] [75%] [50%] [25%]

### VDDSOC Switching Frequency

Configuration options: [Auto] [Manual]



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The following item appears only when **VDDSOC Switching Frequency** is set to **[Manual]**.

---

### **Fixed VDDSOC VRM Switching Frequency(KHz)**

The switching frequency will affect the VDDSOC transient response speed and the component thermal production. Allows you to set a higher frequency for a quicker transient response speed. The values range from 400 KHz to 700 KHz with an interval of 100 KHz.

### **VDDSOC Power Phase Control**

Configuration options: [Auto] [Standard] [Optimized] [Extreme] [Manual]



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DO NOT remove the thermal module when setting this item to **[Extreme]**. The thermal conditions should be monitored.

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The following item appears only when **VDDSOC Power Phase Control** is set to **[Manual]**.

---

### **Power Phase Response**

Select ultra fast mode for a faster power phase response. The reaction time will be longer when regular mode is selected.

Configuration options: [Ultra Fast] [Fast] [Medium] [Regular]

### **DRAM Current Capability**

Configuration options: [Auto] [100%] [110%] [120%] [130%]

### **DRAM Switching Frequency**

Configuration options: [Auto] [Manual]



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The following item appears only when **DRAM Switching Frequency** is set to **[Manual]**.

---

### **Fixed DRAM Switching Frequency(KHz)**

The switching frequency will affect the VDDIO transient response speed and the component thermal production. Allows you to set a higher frequency for a quicker transient response speed. The values range from 400 KHz to 700 KHz with an interval of 100 KHz.

### **DRAM Power Phase Control**

Configuration options: [Optimized] [Extreme]

### **MISC Switching Frequency**

Configuration options: [Auto] [Manual]



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The following item appears only when **MISC Switching Frequency** is set to **[Manual]**.

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### **Fixed MISC Switching Frequency(KHz)**

The switching frequency will affect the MISC transient response speed and the component thermal production. Allows you to set a higher frequency for a quicker transient response speed. The values range from 400 KHz to 700 KHz with an interval of 100 KHz.

## Performance Bias

Different Values may help different Software's performance.

Configuration options: [Auto] [None] [CB R23] [GB3]

## Tweaker's Paradise

### Clock Spread Spectrum

Configuration options: [Auto] [Enabled] [Disabled]

### BCLK1 Amplitude

Sets the signal magnitude of the reference BCLK1 supplied to the processor. Higher values may improve overclocking stability.

Configuration options: [Auto] [800mV] [900mV]

### BCLK1 Slew Rate

The speed at which the base clock rises or falls. Set a high value for overclocking stability.

Configuration options: [Auto] [Slow] [Fast]

### 1.8V PLL Voltage

Use the <+> or <-> to adjust the value. The values range from 1.500V to 2.500V with an interval of 0.010V.

Configuration options: [Auto] [1.50000] - [2.50000]

### 1.8V Standby Voltage

Use the <+> or <-> to adjust the value. The values range from 1.500V to 2.500V with an interval of 0.010V.

Configuration options: [Auto] [1.50000] - [2.50000]

### Misc\_ALW

Use the <+> or <-> to adjust the value. The values range from 0.600V to 1.500V with an interval of 0.010V.

Configuration options: [Auto] [0.60000] - [1.50000]

### Chipset0 VDD Voltage

Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.400V with an interval of 0.005V.

Configuration options: [Auto] [0.80000] - [1.40000]

### Chipset1 VDD Voltage

Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.400V with an interval of 0.005V.

Configuration options: [Auto] [0.80000] - [1.40000]

### CPU 3.3V

Allows you to set the CPU 3.3V Voltage. Use the <+> or <-> to adjust the value. The values range from 2.800V to 4.000V with an interval of 0.020V.

Configuration options: [Auto] [2.80000] - [4.00000]

### DDR\_testA-B

Configuration options: [Auto] [0] - [255]

### SMU\_Comp1-3

Configuration options: [Auto] [0] - [255]

### R1-3

Configuration options: [Auto] [0] - [255]

### Sense MI Skew 1-4

Configuration options: [Auto] [Disabled] [Enabled]

### Sense MI Skew 1-4

Use the <+> or <-> to adjust the value. The values range from 0.000 to 2.800 with an interval of 0.00625V

Configuration options: [Auto] [0.0000] - [2.80000]

### Raise RComp

Configuration options: [Auto] [Disabled] [Enabled]

## Core Flex

Customize your own algorithms to adjust boosting behavior for more optimized power efficiency, temperatures, and performance. Customize up to 3 concurrent algorithms.

### Algorithm 1-3

Set to **[Enabled]** to customize this algorithm.

Configuration options: [Auto] [Enabled] [Disabled]



---

The following items appear only when **Algorithm 1-3** is set to **[Enabled]**.

---

### Algorithm 1-3 Condition

Select the condition to monitor for and take action upon. When multiple Algorithms watch for the same condition then the result is 'AND' and the smaller of the 2 Action Values get written.

Configuration options: [Auto] [CPU Temperature] [Core Voltage] [Core Current]

### Algorithm 1-3 Action

Select the action to take when targeted condition crosses the threshold. When multiple Algorithms execute the same Actions, then the result is 'AND' and the smaller of the 2 Action Values get written.

Configuration options: [Auto] [Package Power Limit Fast] [Package Power Limit Slow] [Thermal Limit] [Vcore TDC Limit] [Vcore EDC Limit] [SOC TDC Limit] [SOC EDC Limit] [ECLK ASynch BCLK]

### Level 1 Threshold Value

Set the boundary separating the Level1 Action Value and Level2 Action Value. When condition is below or equal to this value, then Level1 Action Value gets written. If above but below Level2 Threshold Value, then Level2 Action Value gets written. Temperature is in degrees Celsius, Voltage is in millivolts, and current is in Ampere.

Configuration options: [Auto] [0] - [65000]

### Level 2 Threshold Value

Set the boundary separating the Level2 Action Value and Level3 Action Value. When condition is below or equal to this value and above Level1 Threshold Value, then Level2 Action Value gets written. If above, then Level3 Action Value gets written. Temperature is in degrees Celsius, Voltage is in millivolts, and current is in Ampere.

Configuration options: [Auto] [0] - [65000]

### Level 1 Action Value

Set the value for Action to take when condition lies below the first boundary. Power in Watt, Temperature in degrees Celsius, Current is in Ampere, and BCLK is in MHz.  
Configuration options: [Auto] [0] - [65000]

### Level 2 Action Value

Set the value for Action to take when condition lies between the first boundary and second boundary. Power in Watt, Temperature in degrees Celsius, Current is in Ampere, and BCLK is in MHz.  
Configuration options: [Auto] [0] - [65000]

### Level 3 Action Value

Set the value for Action to take when condition lies above the second boundary. Power in Watt, Temperature in degrees Celsius, Current is in Ampere, and BCLK is in MHz.  
Configuration options: [Auto] [0] - [65000]

## AI Features

Allows you to configure AI features.

### Cooler Efficiency Customize

- [Keep Training] Continuous evaluations will be performed on Cooler efficiency and updated accordingly.
- [Stop Training] Cooler efficiency evaluations will stop and current evaluated efficiency will be used.
- [User Specify] You can specify the Cooler efficiency manually and all predictions will be based off this manual setting.



---

The following item appears only when **Cooler Efficiency Customize** is set to **[User Specify]**.

---

### Cooler Score

The value of the Cooler's pts.  
Configuration options: [Auto] [30] - [250]

### Recalibrate Cooler

This option will recalibrate your Cooler efficiency from scratch.

### Cooler Re-evaluation

Configuration options: [Normal] [More inclined to update] [Very inclined to update]  
[Less inclined to update] [Least inclined to update]

### Optimism Scale

The value of the Cooler's pts.  
Configuration options: [Auto] [30] - [250]

## CPU Core Voltage

Allows you to increase to help CPU Core Frequency overclock.  
Configuration options: [Auto] [Manual Mode] [Offset Mode]





---

The following item appears only when **CPU Core Voltage** is set to **[Manual Mode]**.

---

### CPU Core Voltage Override

Allows you to configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.625V to 1.700V with an interval of 0.005V.

Configuration options: [Auto] [0.62500] - [1.70000]



---

The following items appear only when **CPU Core Voltage** is set to **[Offset Mode]**.

---

### Offset Mode Sign

[+] To offset the CPU core voltage by a positive value.

[-] To offset the CPU core voltage by a negative value.

### CPU Core Voltage Offset

Allows you to configure the input voltage for the CPU by the external voltage regulator. Use the <+> or <-> to adjust the value. The values range from 0.005V to 0.500V with an interval of 0.005V.

Configuration options: [Auto] [0.00500] - [0.50000]

### CPU SOC Voltage

Allows you to increase to help Memory Frequency overclock.

Configuration options: [Auto] [Manual Mode] [Offset Mode]



---

The following item appears only when **CPU SOC Voltage** is set to **[Manual Mode]**.

---

### VDDSOC Voltage Override

Use the <+> and <-> keys to adjust the value. The values range from 0.625V to 1.700V with an interval of 0.005V.

Configuration options: [Auto] [0.62500] - [1.70000]



---

The following items appear only when **CPU SOC Voltage** is set to **[Offset Mode]**.

---

### VDDSOC Offset Mode Sign

[+] To offset the CPU SOC voltage by a positive value.

[-] To offset the CPU SOC voltage by a negative value.

### VDDSOC Voltage Offset

Use the <+> or <-> to adjust the value. The values range from 0.005V to 0.500V with an interval of 0.005V.

Configuration options: [Auto] [0.00500] - [0.50000]

### CPU VDDIO / MC Voltage

Configuration options: [Auto] [Manual Mode]



---

The following item appears only when **CPU VDDIO / MC Voltage** is set to **[Manual Mode]**.

---

### VDDIO Override

Use the <+> or <-> to adjust the value. The values range from 0.6240V to 1.7004V with an interval of 0.0039V.

Configuration options: [Auto] [0.62400] - [1.70040]

### Misc Voltage

Configuration options: [Auto] [Manual Mode] [Offset Mode]



---

The following items appear only when **Misc Voltage** is set to **[Manual Mode]**.

---

### Misc Voltage Override

Use the <+> or <-> to adjust the value. The values range from 0.625V to 1.700V with an interval of 0.005V.

Configuration options: [Auto] [0.62500] - [1.70000]



---

The following items appear only when **Misc Voltage** is set to **[Offset Mode]**.

---

### Offset Mode Sign

[+] To offset the Misc voltage by a positive value.

[-] To offset the Misc voltage by a negative value.

### Misc Voltage Offset

Use the <+> or <-> to adjust the value. The values range from 0.005V to 0.500V with an interval of 0.005V.

Configuration options: [Auto] [0.00500] - [0.50000]

### VDDP Voltage

Use the <+> or <-> to adjust the value. The values range from 0.700V to 1.800V with an interval of 0.001V.

Configuration options: [Auto] [0.70000] - [1.80000]

### High DRAM Voltage Mode

If disabled, the upper range for DRAM Voltage will be 1.435V. If enabled, the upper range will be 2.070V. If enabled on non-supported DRAM, the voltage will be lower than requested.

Configuration options: [Auto] [Disabled] [Enabled]

### DRAM VDD Voltage

Allows you to set the power for the DRAM IC's VDD portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.

Configuration options: [Auto] [0.80000] - [1.43500]

### DRAM VDDQ Voltage

Allows you to set the power for the DRAM IC's VDD Data portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.

Configuration options: [Auto] [0.80000] - [1.43500]

## Advanced Memory Voltages

### PMIC Voltages

Configuration options: [Auto] [Sync All PMICs]



---

The following items appear only when **PMIC Voltages** is set to **[Sync All PMICs]**.

---

#### SPD HUB VLDO (1.8V)

Allows you to set the main power for the SPD Hub Logic. Default set to 1.8V. Use the <+> or <-> to adjust the value. The values range from 1.700V to 2.000V with an interval of 0.100V.

Configuration options: [Auto] [1.70000] - [2.00000]

#### SPD HUB VDDIO (1.0V)

Allows you to set the main power for the SPD Hub side-band interface. Default set to 1.0V. Use the <+> or <-> to adjust the value. The values range from 0.900V to 1.200V with an interval of 0.100V.

Configuration options: [Auto] [0.90000] - [1.20000]

#### Memory VDD Voltage

Allows you to set the power for the DRAM IC's VDD portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.

Configuration options: [Auto] [0.80000] - [1.43500]

#### Memory VDDQ Voltage

Allows you to set the power for the DRAM IC's Data portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.

Configuration options: [Auto] [0.80000] - [1.43500]

#### Memory VPP Voltage

Allows you to set the power for the DRAM Activating Power Supply. Use the <+> or <-> to adjust the value. The values range from 1.500V to 2.135V with an interval of 0.005V.

Configuration options: [Auto] [1.50000] - [2.13500]

#### Memory Voltage Switching Frequency

Allows you to set the switching frequency of memory voltage regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.

Configuration options: [Auto] [0.75000] - [1.50000]

#### Memory Current Capability

Allows you to set the current capability for the Switching Regulators in Amps. Use the <+> or <-> to adjust the value. The values range from 0.125A to 7.875A with an interval of 0.125A.

Configuration options: [Auto] [0.12500] - [7.87500]

# 6. Advanced menu

The Advanced menu items allow you to change the settings for the CPU and other system devices. Scroll down to display other BIOS items.

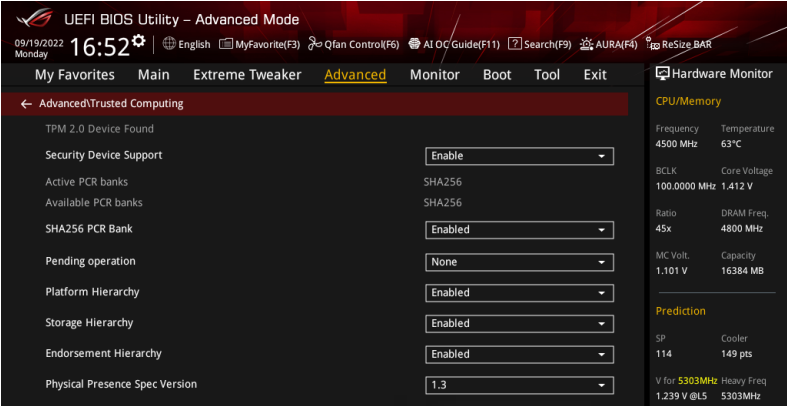


Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.



# 6.1 Trusted Computing

The items in this menu allow you to configure the Trusted Computing settings.



## Security Device Support

Allows you to enable or disable the BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.  
Configuration options: [Disable] [Enable]



The following items appear only when **Security Device Support** is set to **[Enable]**.

## SHA256 PCR Bank

Allows you to enable or disable the SHA256 PCR Bank.  
Configuration options: [Disabled] [Enabled]

## Pending operation

Allows you to schedule an Operation for the Security Device.  
Configuration options: [None] [TPM Clear]



Your computer will reboot during restart in order to change the State of the Security Device.

## Platform Hierarchy

Allows you to enable or disable the Platform Hierarchy.  
Configuration options: [Disabled] [Enabled]

## Storage Hierarchy

Allows you to enable or disable the Storage Hierarchy.  
Configuration options: [Disabled] [Enabled]

## Endorsement Hierarchy

Allows you to enable or disable the Endorsement Hierarchy.  
Configuration options: [Disabled] [Enabled]

Physical Presence Spec Version

Allows you to select to Tell O.S. to support PPI Version 1.2 or 1.3.  
Configuration options: [1.2] [1.3]



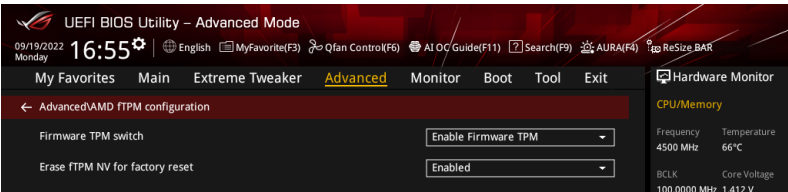
Some HCK tests might not support 1.3.

Disable Block Sid

Allows you to override to allow SID authentication in TCG Storage device.  
Configuration options: [Enabled] [Disabled]

6.2 AMD fTPM configuration

The items in this menu show the AMD fTPM configuration options.



Firmware TPM switch

Allows you to enable or disable Firmware TPM.  
[Enable Firmware TPM] Enables platform Firmware TPM.  
[Disable Firmware TPM] Disables platform Firmware TPM.




When [Disable Firmware TPM] is selected, fTPM will be disabled and all data saved on it will be lost.

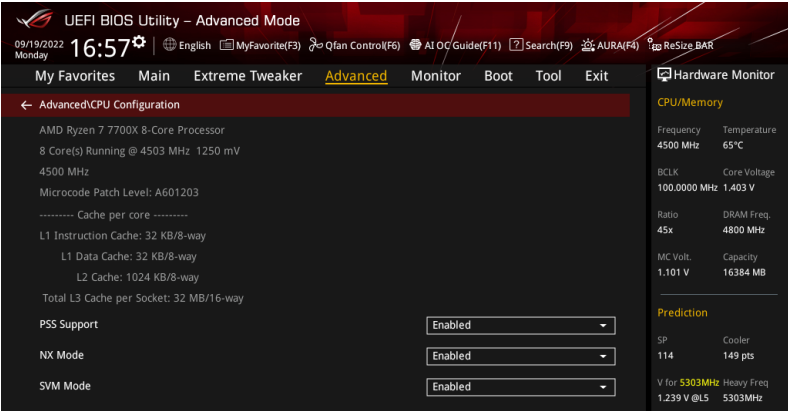
Erase fTPM NV for factory reset

Allows you to enable or disable fTPM reset for newly installed CPUs.  
[Disabled] Keep previous fTPM records and continue system boot, fTPM will not be enabled with the new CPU unless fTPM is reset (reinitialized). Swapping back to the old CPU may allow you to recover TPM related keys and data.  
[Enabled] Reset fTPM, if you have Bitlocker or encryption-enabled system, the system will not boot without a recovery key.

### 6.3 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects. Scroll down to display other BIOS items.

 The items in this menu may vary based on the CPU installed.



#### PSS Support

Allows you to enable or disable the generation of ACPI\_PPC, and \_PCT objects.  
Configuration options: [Disabled] [Enabled]

#### NX Mode

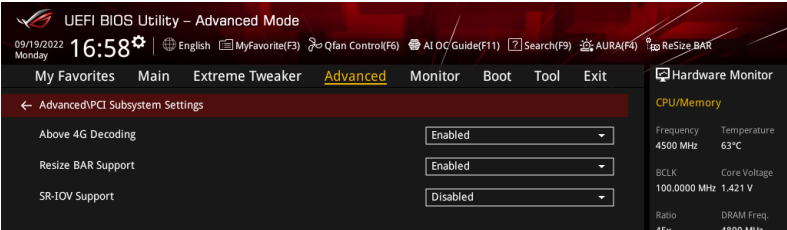
Allows you enable or disable No-execute page protection Function.  
Configuration options: [Disabled] [Enabled]

#### SVM Mode

Allows you to enable or disable CPU Virtualization.  
Configuration options: [Disabled] [Enabled]

# 6.4 PCI Subsystem Settings

The items in this menu allow you to configure PCI, PCI-X, and PCI Express settings.



## Above 4G Decoding

Allows you to enable or disable 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System supports 64 bit PCI Decoding).

Configuration options: [Disabled] [Enabled]



- Only enabled under 64bit operating system.
- The following item appears only when **Above 4G Decoding** is set to **[Enabled]**.

## Re-Size BAR Support

If the system has Resizable BAR capable PCIe Devices, this option enables or disables Resizable BAR Support (Only if System supports 64 bit PCI Decoding).

Configuration options: [Disabled] [Enabled]



To enable Re-Size BAR Support for harnessing full GPU memory, please go to the **Boot** section and set **CSM(Compatibility Support Module)** to **[Disabled]**.

## SR-IOV Support

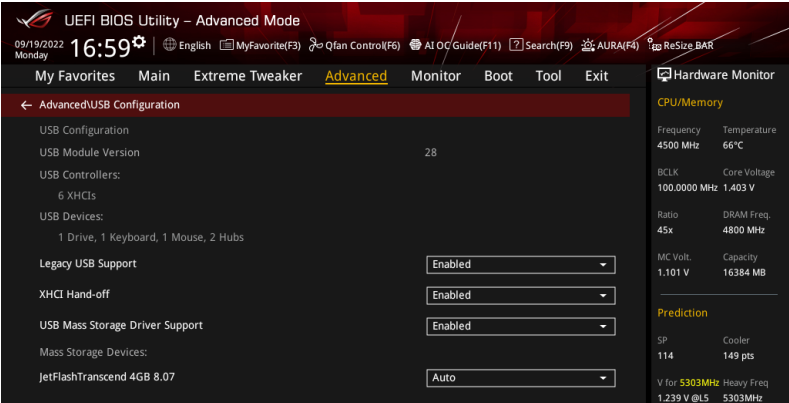
Allows you to enable or disable Single Root IO Virtualization Support if the system has SR-IOV capable PCIe devices.

Configuration options: [Disabled] [Enabled]



# 6.5 USB Configuration

The items in this menu allow you to change the USB-related features.



The **Mass Storage Devices** item shows the auto-detected values. If no USB device is detected, the item shows **None**.

## Legacy USB Support

- [Enabled] Your system supports the USB devices in legacy operating systems.
- [Disabled] Your USB devices can be used for BIOS setup only and cannot be recognized in the boot devices list.
- [Auto] Your system automatically detects the presence of USB devices at startup. If any USB devices are detected, the legacy USB support is enabled.

## XHCI Hand-off

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

- [Disabled] Support XHCI by XHCI drivers for operating systems with XHCI support.
- [Enabled] Support XHCI by BIOS for operating systems without XHCI support.

## USB Mass Storage Driver Support

Allows you to enable or disable USB Mass Storage Driver Support  
Configuration options: [Disabled] [Enabled]

## Mass Storage Devices:

Allows you to select the mass storage device emulation type for devices connected. [Auto] enumerates devices according to their media format. Optical drives are emulated as [CD-ROM], drives with no media will be emulated according to a drive type.  
Configuration options: [Auto] [Floppy] [Forced FDD] [Hard Disk] [CD-ROM]

## USB Single Port Control

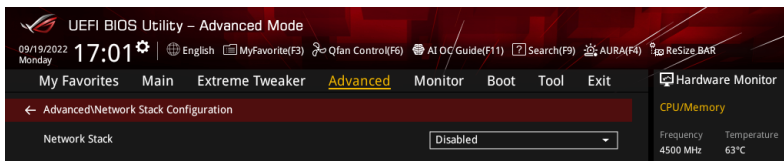
Allows you to enable or disable the individual USB ports.



Refer to section **Motherboard layout** and **Rear I/O connection** in your motherboard's user manual for the location of the USB ports.

## 6.6 Network Stack Configuration

The items in this menu allow you to change the Network Stack Configuration.



### Network stack

Configuration options: [Disabled] [Enabled]



The following items appear only when **Network Stack** is set to **[Enabled]**.

### Ipv4/Ipv6 PXE Support

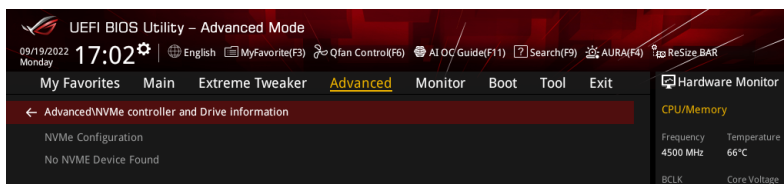
Configuration options: [Disabled] [Enabled]

## 6.7 NVMe Configuration

This menu displays the NVMe controller and Drive information of the connected devices. You may press <Enter> on a connected NVMe device which appears in this menu to view more information on the NVMe device.



The options displayed in this menu may vary depending on the devices connected to your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.

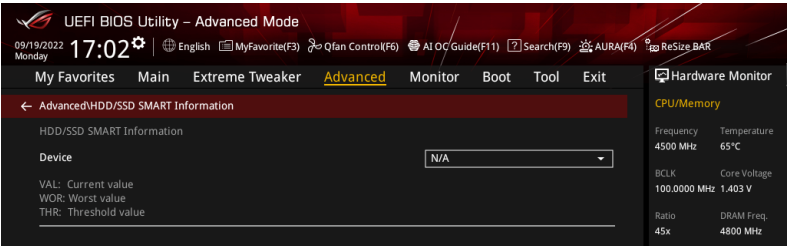


### 6.8 HDD/SSD SMART Information

The items in this menu allow you to view the SMART information for connected storage devices.



The options displayed in this menu may vary depending on the devices connected to your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



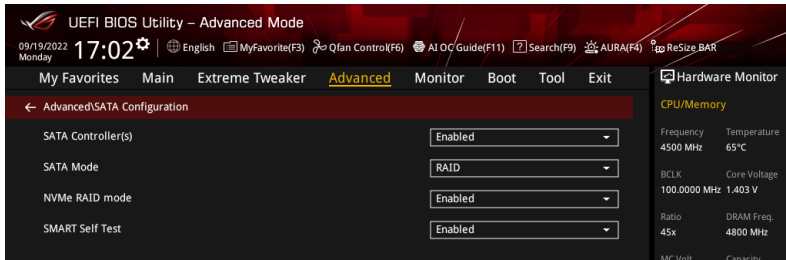
NVM Express devices do not support SMART information.

## 6.9 SATA Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show **Empty** if no SATA device is installed to the corresponding SATA port. Scroll down to display the other BIOS items.



The settings and options of this menu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



### SATA Controller(s)

Allows you to enable or disable the SATA Device.

Configuration options: [Disabled] [Enabled]



The following items appear only when **SATA Controller(s)** is set to **[Enabled]**.

### SATA Mode

This item allows you to set the SATA configuration.

[AHCI] Set to [AHCI] when you want the SATA hard disk drives to use the AHCI (Advanced Host Controller Interface). The AHCI allows the onboard storage driver to enable advanced Serial ATA features that increases storage performance on random workloads by allowing the drive to internally optimize the order of commands.

[RAID] Set to [RAID] when you want to create a RAID configuration from the SATA hard disk drives.

### NVMe RAID Mode

This item allows you to enable or disable the NVMe RAID mode.

Configuration options: [Disabled] [Enabled]

### SMART Self Test

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a monitoring system that shows a warning message during POST (Power-on Self Test) when an error occurs in the hard disks.

Configuration options: [Disabled] [Enabled]



The following items appear only when **SATA Mode** is set to **[AHCI]**.

## SATA6G

Allows you to enable or disable the selected SATA port.

Configuration options: [Disabled] [Enabled]

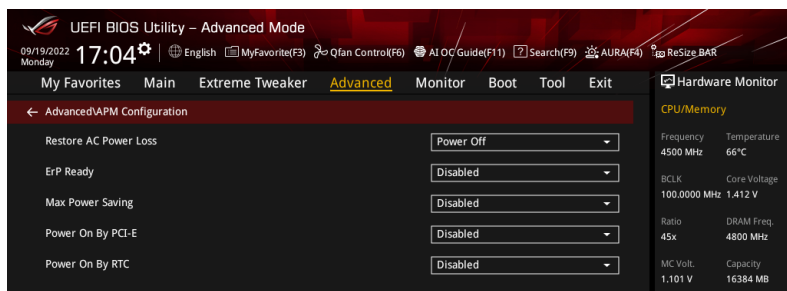
## SATA6G Hot Plug

Designates this port as Hot Pluggable.

Configuration options: [Disabled] [Enabled]

## 6.10 APM Configuration

The items in this menu allow you to change the advanced power management settings.



### Restore AC Power Loss

Allows your system to go to ON state, OFF state, or both states after an AC power loss.

When setting your system to **[Last State]**, it goes to the previous state before the AC power loss.

Configuration options: [Power Off] [Power On] [Last State]

### ErP Ready

Allows you to switch off some power at S4+S5 or S5 to get the system ready for ErP requirement. When set to **[Enabled]**, all other PME options are switched off. RGB LEDs and RGB/Addressable RGB Headers will also be disabled.

Configuration options: [Disabled] [Enabled (S4+S5)] [Enabled (S5)]

### Max Power Saving

Configuration options: [Disabled] [Enabled]

### Power On By PCI-E

Allows you to enable or disable the Wake-on-LAN function of the onboard LAN controller or other installed PCI-E LAN cards.

Configuration options: [Disabled] [Enabled]

Power On By RTC

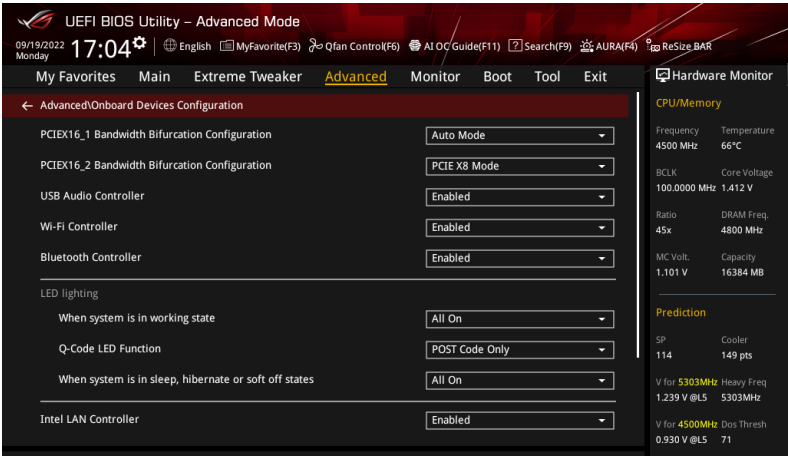
Allows you to enable or disable the RTC (Real-Time Clock) to generate a wake event and configure the RTC alarm date. When enabled, you can set the days, hours, minutes, or seconds to schedule an RTC alarm date.  
Configuration options: [Disabled] [Enabled]

6.11 Onboard Devices Configuration

The items in this menu allow you to change the onboard devices settings. Scroll down to view the other BIOS items.



The settings and options of this menu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



PCIEX16\_1 Bandwidth Bifurcation Configuration

- [Auto Mode] Auto-detect and switch. If PCIe device is inserted to PCIEX16\_2, switch PCIEX16\_1 to x8. If no device is inserted to PCIEX16\_2, switch to PCIEX16\_1 to x16.
- [PCIe X16 Mode] Switch PCIEX16\_1 to x16, and disable PCIEX16\_2.
- [PCIe RAID Mode] Up to 4 SSDs installed onto the Hyper M.2 X16 Series card can be detected.



Use **[PCIe RAID Mode]** when installing the Hyper M.2 X16 series card or other M.2 adapter cards. Installing other devices may result in a boot-up failure. The number of SSDs supported varies with the PCIe bifurcation abilities enabled by each processor.

## PCIEX16\_2 Bandwidth Bifurcation Configuration

[PCIEX8 Mode]	Switch PCIEX16_2 to x8.
[PCIEX16 Mode]	Up to 2 SSDs installed onto the Hyper M.2 X16 Series card can be detected.



Use **[PCIEX16 Mode]** when installing the Hyper M.2 X16 series card or other M.2 adapter cards. Installing other devices may result in a boot-up failure. The number of SSDs supported varies with the PCIe bifurcation abilities enabled by each processor.

## USB Audio Controller

Configuration options: [Disabled] [Enabled]

## Wi-Fi Controller

Configuration options: [Disabled] [Enabled]

## Bluetooth Controller

Configuration options: [Disabled] [Enabled]

## LED lighting

### When system is in working state

Allows you to turn the RGB LED lighting on or off when the system is in the working state.

[All On]	RGB LEDs and Functional will behave normally.
[Stealth Mode]	All LEDs will be disabled.
[Aura Only]	RGB LEDs will light up, while all functional LEDs will be disabled.
[Aura Off]	Functional LEDs behave normally, while RGB LEDs will be disabled.



The RGB Header(s) and Addressable Header(s) will only work under the S0 (working) state.

## Q-Code LED Function

[Disabled]	Turn off Q-Code LED.
[POST Code Only]	Show POST (Power-On-Self-Test) code on Q-Code LED.
[Auto]	Automatically display POST (Power-On-Self-Test) code and CPU temperature on Q-Code LED.

### When system is in sleep, hibernate or soft off states

Allows you to turn the RGB LED lighting on or off when the system is in the sleep, hibernate or soft off states.

[All On]	RGB LEDs and Functional will behave normally.
[Stealth Mode]	All LEDs will be disabled.
[Aura Only]	RGB LEDs will light up, while all functional LEDs will be disabled.
[Aura Off]	Functional LEDs behave normally, while RGB LEDs will be disabled.



The RGB Header(s) and Addressable Header(s) will only work under the S0 (working) state.

## Intel LAN Controller

Configuration options: [Disabled] [Enabled]

## 10G LAN Card

Configuration options: [Disabled] [Enabled]

## USB power delivery in Soft Off state (S5)

Allows you to enable or disable USB power when your PC is in the S5 state.

Configuration options: [Disabled] [Enabled]

## U32G2\_C3 Type C Power Mode

[Auto] Power will be provided to USB 3.2 Gen 2 Type-C ports automatically when a device is detected.

[Enable] Power will always be on for USB 3.2 Gen 2 Type-C ports.



---

Improper connection may damage the system permanently.

---

## Serial Port Configuration

This submenu allows you to set parameters for Serial Port.



---

This item will only function if there is a serial port (COM) connector on your motherboard.

---

### Serial Port

Allows you to enable or disable the Serial port.

Configuration options: [Enabled] [Disabled]



---

The following item appears only when **Serial Port** is set to **[Enabled]**.

---

### Change settings

Allows you to select an optimal setting for super IO device.

Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4]  
[IO=2E8h; IRQ=3]

## ASM1061 Configuration

This submenu allows you to set parameters for ASM1061 controller.

### ASMedia Storage Controller

Configuration options: [Disabled] [Enabled]

### Windows Hot-plug Notification

Configuration options: [Disabled] [Enabled]

### ASPM Support

Configuration options: [Disabled] [Enabled]

## PCIe Link Speed

This submenu allows you to set parameters for PCIe Link Speed.



---

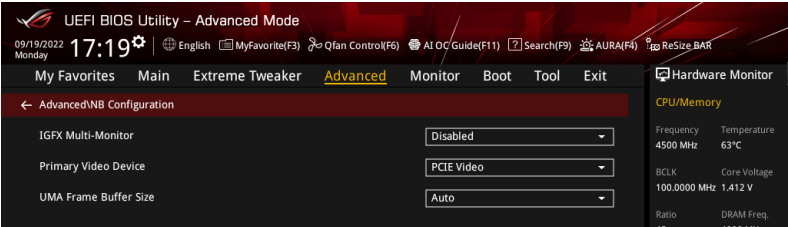
The settings and options in this submenu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.

---



## 6.12 NB Configuration

The items in this menu allow you to change the NB Configurations.



### Primary Video Device

Allows you to select Primary Video Device BIOS will use for output.

Configuration options: [IGFX Video] [PCIE Video]

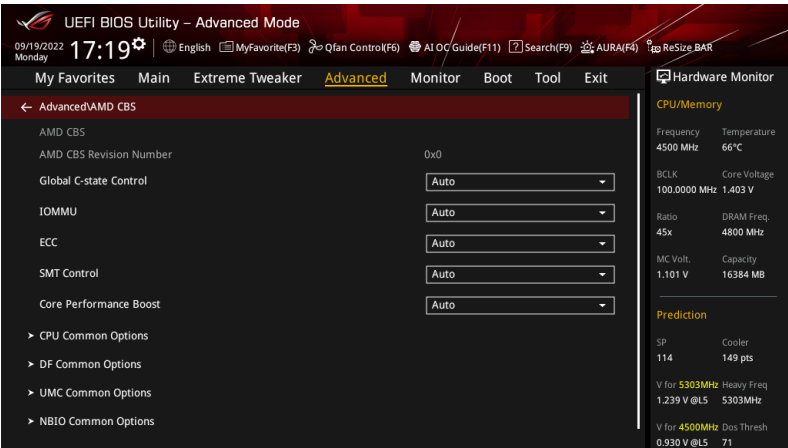
### UMA Frame Buffer Size

Allows you to set the UMA FB Size.

Configuration options: [Auto] [64M] [80M] [96M] [128M] [256M] [384M] [512M] [768M] [1G] [2G] [3G] [4G] [8G]

## 6.13 AMD CBS

The items in this menu shows the AMD Common BIOS Specifications.



### Global C-state Control

Allows you to control IO based C-state generation and DF C-states.

Configuration options: [Disabled] [Enabled] [Auto]

### IOMMU

Configuration options: [Disabled] [Enabled] [Auto]

## SMT Control

Can be used to disable symmetric multithreading. To re-enable SMT, a POWER CYCLE is needed after setting this item to **[Auto]**.

Configuration options: [Disable] [Auto]

## Core Performance Boost

Configuration options: [Disabled] [Auto]

## CPU Common Options

### Thread Enablement

### Performance

### Prefetcher settings

#### L1 Stream HW Prefetcher

Configuration options: [Disable] [Enable] [Auto]

#### L2 Stream HW Prefetcher

Configuration options: [Disable] [Enable] [Auto]

#### L1 Stride Prefetcher

Uses memory access history of individual instructions to fetch additional lines when each access is a constant distance from the previous.

Configuration options: [Disable] [Enable] [Auto]

#### L1 Region Prefetcher

Uses memory access history to fetch additional lines when the data access for a given instruction tends to be followed by other data accesses.

Configuration options: [Disable] [Enable] [Auto]

#### L2 Up/Down Prefetcher

Uses memory access history to determine whether to fetch the next or previous line for all memory accesses.

Configuration options: [Disable] [Enable] [Auto]

## Core Watchdog

### Core Watchdog Timer Enable

Configuration options: [Disabled] [Enabled] [Auto]



---

The following items appear only when **Core Watchdog Timer Enable** is set to **[Enabled]**.

---

### Core Watchdog Timer Interval

Configuration options: [Auto] [39.68us] [80.64us] [162.56us] [326.4us] [654.08us] [1.309ms] [2.620ms] [5.241ms] [10.484ms] [20.970ms] [40.64ms] [82.53ms] [166.37ms] [334.05ms] [669.41ms] [1.340s] [2.681s] [5.364s] [10.730s] [21.461s]

### Core Watchdog Timer Severity

Configuration options: [No Error] [Transparent] [Corrected] [Deferred] [Uncorrected] [Fatal] [Auto]

## Platform First Error Handling

Allows you to enable or disable PFEH, cloak individual banks, and mask deferred error interrupts from each bank.

Configuration options: [Enabled] [Disabled] [Auto]

### Opcache Control

Configuration options: [Disabled] [Enabled] [Auto]

### Streaming Stores Control

Configuration options: [Disabled] [Enabled] [Auto]

### Local APIC Mode

Allows you to select local APIC operation modes.

Configuration options: [Compatibility] [xAPIC] [x2APIC] [Auto]

### ACPI \_CST C1 Declaration

Determines whether or not to declare the C1 state to the OS.

Configuration options: [Disabled] [Enabled] [Auto]

### MCA error thresh enable

Configuration options: [False] [True] [Auto]



---

The following item appears only when **MCA error thresh enable** is set to **[True]**.

---

### MCA error thresh count

Effective error threshold count = 4095(0xFFFF) - <this value> (e.g. the default value of 0xFF5 results in a threshold of 10)

Configuration options: [1] - [4095]

### SMU and PSP Debug Mode

When this item is set to **[Enabled]**, uncorrected errors detected by the PSP FW or SMU FW that should cause a cold reset, will hang and not restart the system.

Configuration options: [Disabled] [Enabled] [Auto]

### PPIN Opt-in

Allows you to turn on PPIN feature.

Configuration options: [Disabled] [Enabled] [Auto]

### Enhanced REP MOVSB/STOSB

This item is set to 1 by default, but can be set to zero for analysis purposes as long as OS supports it.

Configuration options: [Disabled] [Enabled]

### REP-MOV/STOS Streaming

Allow REP-MOV/STOS to use non-caching streaming store for large sizes.

Configuration options: [Disabled] [Enabled]

### Power Supply Idle Control

Configuration options: [Low Current Idle] [Typical Current Idle] [Auto]

### Xtrig7 Workaround

This workaround is only applicable for Rev A. For Rev A, by default (Auto), the Bronze workaround is applied. For Rev B, no workaround is applied and changing the selection for this option will not result in any changes.

[Auto] Bronze workaround is applied.

[No Workaround] No workaround is applied.

[Bronze Workaround] DbReq and PDM function as expected, breakpoint redirect capability compromised.

[Silver Workaround] DbReq, PDM, and breakpoint redirect function as expected, SCAN capability compromised.

## SNP Memory (RMP Table) Coverage

When this item is set to **[Enabled]**, the ENTIE system memory is covered.

Configuration options: [Disabled] [Enabled] [Custom] [Auto]



---

The following item appears only when **SNP Memory (RMP Table) Coverage** is set to **[Custom]**.

---

## Amount of Memory to Cover

Specify MB of System Memory to be covered in Hex.

Configuration options: [0] - [100000]

## SMEE

Control secure memory encryption enable.

Configuration options: [Disable] [Enable] [Auto]

## Action on BIST Failure

Allows you to set the action to take when a CCD BIST failure is detected.

Configuration options: [Do nothing] [Down-CCD] [Auto]

## DF Common Options

### Memory Addressing

#### Memory interleaving

Configuration options: [Disabled] [Auto]

#### Memory interleaving size

Controls the memory interleaving size. The valid values are AUTO, 256 bytes, 512 bytes, 1 Kbytes, or 2 Kbytes. This determines the starting address of the interleave (bit 8, 9, 10 or 11).

Configuration options: [256 Bytes] [512 Bytes] [1KB] [2KB] [Auto]

#### DRAM map inversion

Inverting the map will cause the highest memory channels to get assigned the lowest addresses in the system.

Configuration options: [Disable] [Enable] [Auto]

#### Location of private memory regions

Controls whether or not the private memory regions (PSP, SMU and CC6) are at the top of DRAM pair or distributed. Note that distributed requires memory on all dies. Note that it will always be at the top of DRAM if some dies don't have memory regardless of this option's setting.

Configuration options: [Distributed] [Consolidated] [Consolidated to 1st DRAM pair] [Auto]

### ACPI

#### ACPI SRAT L3 Cache as NUMA Domain

[Disabled] Memory Addressing \ NUMA nodes per socket will be declared.

[Enabled] Each CCX in the system will be declared as a separate NUMA domain.

[Auto] Sets to the default option.

## Disable DF to external downstream IP Sync Flood Propagation

Disables Error propagation to UMC or any downstream slaves eg. FCH. Use this to avoid reset in failure scenario.

Configuration options: [Sync flood disabled] [Sync flood enabled] [Auto]

### Disable DF sync flood propagation

Disables propagation from PIE to other DF components and eventually to SDP ports.  
Configuration options: [Sync flood disabled] [Sync flood enabled] [Auto]

### Freeze DF module queues on error

This item allows you to enable or disable freezing of all DF queues on error and also forces a sync flood on HWA even if MCAs are disabled.

Configuration options: [Disabled] [Enabled] [Auto]

### DF Cstates

When DF Cstate feature is set to **[Enabled]**, FW programs the registers required to enable this feature is the DF HW. (For **[Auto]** option, it means this option will synchronize with Global C State).

Configuration options: [Disabled] [Enabled] [Auto]

### PSP error injection support

Configuration options: [False] [True]

## UMC Common Options

### DDR Options

#### DDR Timing Configuration

This item allows you to configure DRAM timing configuration.



Damage caused by use of your AMD processor outside of specification or in excess of factory settings are not covered by your system manufacturers warranty.



The following items appear only when **[Accept]** is selected for **DRAM Timing Configuration**.

#### Active Memory Timing Settings

Configuration options: [Auto] [Enabled]

#### Memory Target Speed

Specifies the memory target speed in MT/s. The valid input is 2000 MT/s, 2400 MT/s, and range of 3200 MT/s ~ 12000 MT/s (stepping of 200 MT/s). The value is in decimal. The user input value will be rounded down to align with the stepping of 200 MT/s. The maximum speed defined in the JEDEC spec is 8400 MT/s, any input value that is greater than 8400 MT/s will be limited to 8400 MT/s.

#### DDR SPD Timing

##### Tcl Ctrl

[Auto]

Follow default setting.

[Manual]

Manually specify.



The following item appears only when **Tcl Ctrl** is set to **[Manual]**.

##### Tcl

Specifies the CAS Latency. Valid values: 0x16 ~ 0x40, with a stepping of 2. The value is in hex.

##### Trcd Ctrl

[Auto]

Follow default setting.

[Manual]

Manually specify.



---

The following item appears only when **Trcd Ctrl** is set to **[Manual]**.

---

**Trcd**

Specifies the RAS# Active to CAS# Read Delay Time. Valid values: 0x8 ~ 0x3E. The value is in hex.

**Trp Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trp Ctrl** is set to **[Manual]**.

---

**Trp**

Specifies Row Precharge Delay Time. Valid values: 0x8 ~ 0x3E. The value is in hex.

**Tras Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Tras Ctrl** is set to **[Manual]**.

---

**Tras**

Specifies Active to Precharge Delay Time. Valid values: 0x1E ~ 0x7E.

**Trc Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trc Ctrl** is set to **[Manual]**.

---

**Trc**

Specifies Active to Active/Refresh Delay Time. Valid values: 0x20 ~ 0xFF. The value is in hex.

**Twr Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Twr Ctrl** is set to **[Manual]**.

---

**Twr**

Specifies the Minimum Write Recovery Time. Valid values: 0x30 ~ 0x60. The value is in hex.

**Trfc1 Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trfc1 Ctrl** is set to **[Manual]**.

---

**Trfc1**

Specifies the Refresh Recovery Delay Time (tRFC1). Valid values: 0x32 ~ 0xFFF. The value is in hex.

### Trfc2 Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **Trfc2 Ctrl** is set to **[Manual]**.

### Trfc2

Specifies the Refresh Recovery Delay Time (tRFC2). Valid values: 0x32 ~ 0xFF. The value is in hex.

### TrfcSb Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **TrfcSb Ctrl** is set to **[Manual]**.

### TrfcSb

Specifies the Refresh Recovery Delay Time (tRFCsb). Valid values: 0x32 ~ 0xFF. The value is in hex.

## DDR Non-SPD Timing

### Trtp Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **Trtp Ctrl** is set to **[Manual]**.

### Trtp

Specifies the Read CAS# to Precharge command delay time. Valid values: 0x5 ~ 0x1F. The value is in hex.

### TrrdL Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **TrrdL Ctrl** is set to **[Manual]**.

### TrrdL

Specifies the Activate to Activate Delay Time, same bank group (tRRD\_L). Valid values: 0x4 ~ 0x20. The value is in hex.

### TrrdS Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **TrrdS Ctrl** is set to **[Manual]**.

### TrrdS

Specifies the Activate to Activate Delay Time, same bank group (tRRD\_S). Valid values: 0x4 ~ 0x14. The value is in hex.

### Tfaw Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Tfaw Ctrl** is set to **[Manual]**.

---

**Tfaw**

Specifies the Four Activate Window Time. Valid values: 0x14 ~ 0x50. The value is in hex.

**TwtrL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwtrL Ctrl** is set to **[Manual]**.

---

**TwtrL**

Specifies the Minimum Write to Read Time, the same bank group. Valid values: 0x8 ~ 0x30. The value is in hex.

**TwtrS Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwtrS Ctrl** is set to **[Manual]**.

---

**TwtrS**

Specifies the Minimum Write to Read Time, different bank group. Valid values: 0x2 ~ 0x10. The value is in hex.

**TrdrdScL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdScL Ctrl** is set to **[Manual]**.

---

**TrdrdScL**

Specifies the CAS to CAS delay time, same bank group. Valid values: 0x1 ~ 0xF. The value is in hex.

**TrdrdSc Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdSc Ctrl** is set to **[Manual]**.

---

**TrdrdSc**

Specifies the Read to Read turnaround timing in the same chipselect. Valid values: 0x1 ~ 0xF. The value is in hex.

**TrdrdSd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdSd Ctrl** is set to **[Manual]**.

---

**TrdrdSd**

Specifies the Read to Read turnaround timing in the same DIMM. Valid values: 0x1 ~ 0xF. The value is in hex.



### **TrdrdDd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdDd Ctrl** is set to **[Manual]**.

---

### **TrdrdDd**

Specifies the Read to Read turnaround timing in a different DIMM.  
Valid values: 0x1 ~ 0xF. The value is in hex.

### **TwrrwrScL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrScL Ctrl** is set to **[Manual]**.

---

### **TwrrwrScL**

Specifies the CAS to CAS Delay Time, same bank group. Valid values: 0x1 ~ 0x3F. The value is in hex.

### **TwrrwrSc Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrSc Ctrl** is set to **[Manual]**.

---

### **TwrrwrSc**

Specifies the Write to Write turnaround timing in the same chipselect.  
Valid values: 0x1 ~ 0xF. The value is in hex.

### **TwrrwrSd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrSd Ctrl** is set to **[Manual]**.

---

### **TwrrwrSd**

Specifies the Write to Write turnaround timing in the same DIMM.  
Valid values: 0x1 ~ 0xF. The value is in hex.

### **TwrrwrDd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrDd Ctrl** is set to **[Manual]**.

---

### **TwrrwrDd**

Specifies the Write to Write turnaround timing in a different DIMM.  
Valid values: 0x1 ~ 0xF. The value is in hex.

### **Trrrrd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.




---

The following item appears only when **Twrrd Ctrl** is set to **[Manual]**.

---

#### **Twrrd**

Specifies the Write to Read turnaround timing. Valid values: 0x1 ~ 0xF. The value is in hex.

#### **Trdwr Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.




---

The following item appears only when **Trdwr Ctrl** is set to **[Manual]**.

---

#### **Trdwr**

Specifies the Read to Write turnaround timing. Valid values: 0x1 ~ 0x1F. The value is in hex.

### **DDR BUS Configuration**

This item allows you to configure DDR BUS configuration.

#### **Processor CK drive strengths**

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm]

#### **Processor CA drive strengths**

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm]

#### **Processor CS drive strengths**

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm]

#### **DRAM ODT impedance RTT\_NOM\_WR**

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

#### **DRAM ODT impedance RTT\_NOM\_RD**

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

#### **DRAM ODT impedance RTT\_WR**

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

#### **DRAM ODT impedance RTT\_PARK**

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

#### **DRAM ODT impedance DQS\_RTT\_PARK**

Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

#### **Processor ODT impedance**

Configuration options: [Auto] [High Impedance] [480 ohm] [240 ohm] [160 ohm] [120 ohm] [96 ohm] [80 ohm] [68 ohm] [60 ohm] [53 ohm] [48 ohm] [43 ohm] [40 ohm] [36 ohm] [34 ohm] [32 ohm] [30 ohm] [28 ohm] [26 ohm] [25 ohm]

#### **Processor DQ drive strengths**

Configuration options: [Auto] [High Impedance] [480 ohm] [25.3 ohm]

#### **DRAM DQ drive strengths**

Configuration options: [Auto] [48 ohm] [40 ohm] [34 ohm]

### **DDR Controller Configuration**

This item allows you to configure DDR controller configuration.

## **DDR Power Options**

### **Power Down Enable**

Configuration options: [Disabled] [Enabled] [Auto]

## **DDR RAS**

This item allows you to configure DDR RAS.

### **Disable Memory Error Injection**

Configuration options: [False] [True] [Auto]

### **DDR ECC Configuration**

## **DDR Security**

This item allows you to configure DDR Security.

### **TSME**

Configuration options: [Auto] [Enabled] [Disabled]

### **Data Scramble**

Configuration options: [Enabled] [Disabled] [Auto]

## **DDR Addressing Options**

This item allows you to configure DDR Addressing Options.

### **Chipselect Interleaving**

Interleave memory blocks across the DRAM chip selects for node 0.

Configuration options: [Disabled] [Auto]

### **Address Hash Bank**

Configuration options: [Disabled] [Enabled] [Auto]

### **Address Hash CS**

Configuration options: [Auto] [Enabled] [Disabled]

### **Address Hash Subchannel**

Configuration options: [Auto] [Enabled] [Disabled]

### **BankSwapMode**

Configuration options: [Auto] [Disabled] [SwapCPU] [Swap APU]

## **DDR Training Options**

This item allows you to configure DDR Training Options.

### **DFE Read Training**

Perform 2D Read Training with DFE on.

Configuration options: [Auto] [Enable] [Disable]

### **DRAM PDA Enumerate ID Programming Mode**

Configuration options: [Auto] [Sequential PDA enumeration mode] [Legacy PDA enumeration mode]

### **TX DFE Taps**

Specifies the number of TX DFE taps.

Configuration options: [Auto] [1 Tap] [2 Taps] [3 Taps] [4 Taps]

### **PPT Control**

Configuration options: [Auto] [Disabled]

## **DDR Memory MBIST**

This item allows you to configure DDR Memory MBIST.

### **MBIST Enable**

Allows you to enable or disable Memory MBIST.

Configuration options: [Disabled] [Enabled] [Auto]



---

The following items appear only when **MBIST Enable** is set to **[Enabled]**.

---

#### **MBIST Test Mode**

Allows you to select the MBIST Test Mode - Interface Mode (Tests Single and Multiple CS transactions and Basic Connectivity) or Data Eye Mode (Measures Voltage vs. Timing).

Configuration options: [Interface Mode] [Data Eye Mode] [Both] [Auto]

#### **MBIST Aggressors**

Configuration options: [Disabled] [Enabled] [Auto]

#### **MBIST Per Bit Slave Die Reporting**

Reports 2D Data Eye Results in ABL Log for each DQ, Chipselect, and Channel.

Configuration options: [Disabled] [Enabled] [Auto]

#### **DDR Data Eye**

##### **Pattern Select**

Configuration options: [PRBS] [SSO] [Both]

##### **Pattern Length**

This token helps to determine the pattern length. The possible options are N=3...12.

Configuration options: [3] - [9]

##### **Aggressor Channel**

This helps read the aggressors channels. If set to [Enabled], you can read from one or more than one aggressor channel. The default is set to **[Disabled]**.

Configuration options: [Disabled] [1 Aggressor Channel] [3 Aggressor Channels] [7 Aggressor Channels]

#### **DDR Memory Features**

This item allows you to configure DDR Memory Features.

##### **Memory Context Restore**

Allows you to configure the memory context restore mode. When enabled, DRAM re-training is avoided when possible and the POST latency is minimized.

Configuration options: [Auto] [Enabled] [Disabled]

#### **NBIO Common Options**

##### **PCIe ARI Support**

Configuration options: [Disabled] [Enabled] [Auto]

##### **PCIe ARI Enumeration**

Allows you to enable or disable ARI forwarding for each downstream port.

Configuration options: [Disabled] [Enabled] [Auto]

##### **PSPP Policy**

Configuration options: [Disabled] [Balanced] [Auto]

##### **GFX Configuration**

This item allows you to configure GFX Configuration.

##### **UMA Version**

[Legacy]

UMA Legacy Version

[Non-Legacy]

UMA Non-Legacy Version

[Auto]

Hybrid Secure

##### **GPU Host Translation Cache**

Configuration options: [Disabled] [Enabled] [Auto]

## Audio Configuration

This item allows you to configure Audio Configuration.

### NB Azalia

Allows you to enable or disable the integrated HD audio controller.  
Configuration options: [Disabled] [Enabled] [Auto]

### Audio I/Os

Configuration options: [Auto] [HDA(3SDI) + PDM(2CH)(Default)] [HDA (1SDI) + PDM(6CH)] [HDA(1SDI) + SW0(1MDATA) + PDM(2CH)] [SW0(4MDATA) + PDM(6CH)] [SW0(4MDATA) + SW1(1MDATA) + PDM(2CH)]

### PCIe loopback Mode

Allows you to enable or disable PCIeLoopBackMode.  
Configuration options: [Auto] [Disabled] [Enabled]

## SMU Common Options

### TDP Control

[Auto] Use the default sustained power limit.  
[Manual] User can set customized sustained power limit.



The following item appears only when **TDP Control** is set to **[Manual]**.

### TDP

Allows you to set the sustained power limit [mW].

### PPT Control

[Auto] Use the default PPT Limits.  
[Manual] User can set customized PPT Limits.



The following item appears only when **PPT Control** is set to **[Manual]**.

### PPT

Allows you to set the PPT [mW].

### Thermal Control

[Auto] Use the default TctlMax.  
[Manual] User can set customized TctlMax.



The following item appears only when **Thermal Control** is set to **[Manual]**.

### TjMax

Allows you to set the maximum operating temperature [°C] (IRM limit will be enforced).

### TDC Control

[Auto] Use the default TDC Limits.  
[Manual] User can set customized TDC Limits.



The following item appears only when **TDC Control** is set to **[Manual]**.

### TDC\_VDDCR\_VDD

Allows you to set the VDDCR\_VDD TDC Limit [mA] (IRM limit will be enforced).

### EDC Control

[Auto] Use the default EDC Limits.  
[Manual] User can set customized EDC Limits.



---

The following item appears only when **EDC Control** is set to **[Manual]**.

---

#### **EDC\_VDDCR\_VDD**

Allows you to set the VDDCR\_VDD EDC Limit [mA] (IRM limit will be enforced).

#### **PROCHOT Control**

[Auto] Use the default PROCHOT deassertion ramp time.

[Manual] User can set customized PROCHOT deassertion ramp time.

---



---

The following item appears only when **PROCHOT Control** is set to **[Manual]**.

---

#### **PROCHOT Deassertion Ramp Time**

Allows you to set the PROCHOT deassertion ramp time [ms] (IRM limit will be enforced).

#### **Fan Control**

[Auto] Use the default fan controller settings.

[Manual] User can set customized fan controller setting.

---



---

The following item appears only when **Fan Control** is set to **[Manual]**.

---

#### **Fan Table Control**

[Auto] Use the default fan table.

[Manual] User can set customized fan table.

---



---

The following items appear only when **Fan Table Control** is set to **[Manual]**.

---

#### **Low Temperature**

Allows you to set the low temperature [°C].

Configuration options: [0] - [255]

#### **Medium Temperature**

Allows you to set the medium temperature [°C].

Configuration options: [0] - [255]

#### **High Temperature**

Allows you to set the high temperature [°C].

Configuration options: [0] - [255]

#### **Critical Temperature**

Allows you to set the critical temperature [°C].

Configuration options: [0] - [255]

#### **Low Pwm**

Configuration options: [0] - [100]

#### **Medium Pwm**

Configuration options: [0] - [100]

#### **High Pwm**

Configuration options: [0] - [100]

#### **Temperature Hysteresis**

Allows you to set the temperature hysteresis [°C].

Configuration options: [0] - [255]

### **PWM Frequency**

[Auto] Sets to the default option

[1] 100Hz

[0] 25kHz

### **Fan Polarity**

[Auto] Sets to the default option

[1] Positive

[0] Negative

### **VDDP Voltage Control**

[Auto] Use the default VDDP Voltage.

[Manual] User can set custom VDDP Voltage.



---

The following items appear only when **VDDP Voltage Control** is set to **[Manual]**.

---

### **VDDP Voltage**

Allows you to specify the target VDDP voltage [mV].

Configuration options: [0] - [2000]

### **Infinity Fabric Frequency and Dividers**

Configuration options: [Auto] [100 MHz] - [3000 MHz]

### **FEATURE FCLK DPM**

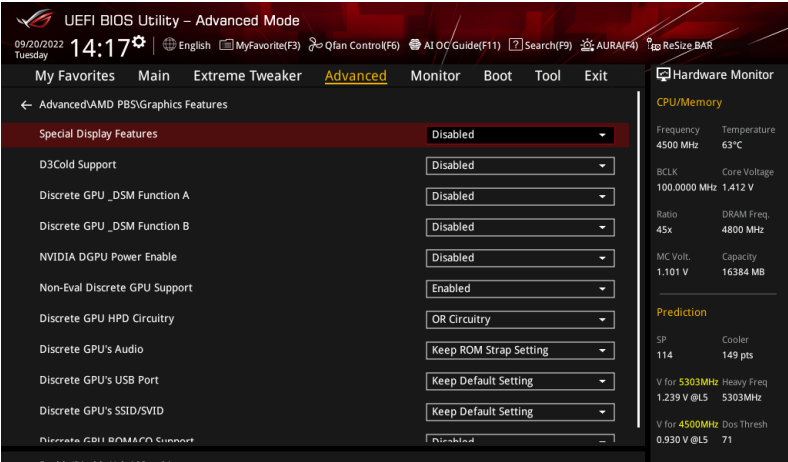
Configuration options: [Auto] [Disabled] [Enabled]

### **SyncFifo Mode Override**

Configuration options: [Disable] [Enable] [Auto]

# 6.14 AMD PBS

The items in this menu shows the AMD PBS Setup page.



## Graphics Features

This submenu allows you to configure Graphics Features - HG, DGPU Features and BOMACO configurations.

### Special Display Features

Configuration options: [Disabled] [HybridGraphics]

### D3Cold Support

Allows you to enable or disable PCIe x8 Slot D3Cold.

Configuration options: [Disabled] [Enabled] [Dummy D3Cold]

### Discrete GPU\_DSM Function A

Allows you to enable or disable PCI-SIG ECN\_DSM Function A for Discrete GPU's GPP Bridge.

Configuration options: [Disabled] [Enabled]

### Discrete GPU\_DSM Function B

Allows you to enable or disable PCI-SIG ECN\_DSM Function B for Discrete GPU's GPP Bridge.

Configuration options: [Disabled] [Enabled]

### NVIDIA DGPU Power Enable

For NVIDIA mobile DGPU card only. Output DGPU\_EN# A19 pin and DGPU\_SEL# B17 pin to high at every power on state.

Configuration options: [Disabled] [Enabled]

### Non-Eval Discrete GPU Support

Set to [Enabled] to support Non-Eval Discrete GPU that doesn't have specific EVAL\_PWRGD(B30), EVAL\_PRESENT#(A5).

Configuration options: [Disabled] [Enabled]



### **Discrete GPU HPD Circuitry**

Configuration options: [OR Circuitry] [Pulse Circuitry]

### **Discrete GPU's Audio**

Configuration options: [Disabled] [Keep ROM Strap Setting]

### **Discrete GPU's USB Port**

Configuration options: [Keep Default Setting] [Disabled]

### **Discrete GPU's SSID/SVID**

Program Discrete GPU's SSID/SVID depends on HybridGraphics setting.

Configuration options: [Keep Default Setting] [Program by Vendor]

### **Discrete GPU BOMACO Support**

Configuration options: [Disabled] [Enabled]

## **Thunderbolt / USB4 Support**

Allows you to enable or disable Thunderbolt / USB4 support.

Configuration options: [Disabled] [Enabled]



---

The following items appear only when **Thunderbolt / USB4 Support** is set to **[Enabled]**.

---

### **Thunderbolt / USB4 Security Level**

Allows you to select the Thunderbolt / USB4 Security Level.

Configuration options: [No Security] [USB4 controller only]

### **Thunderbolt / USB4 MMIO Resource**

Allows you to select Thunderbolt / USB4 PCIE MMIO Resource.

Configuration options: [Full Size] [Half Size] [Three Quarters]

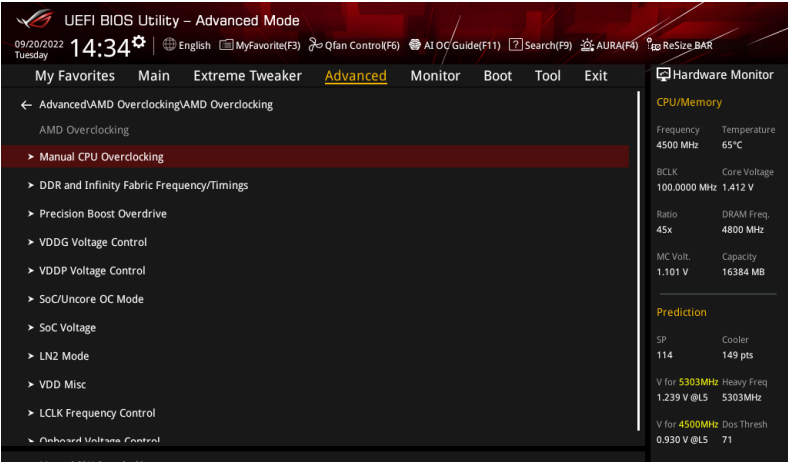
### **Thunderbolt / USB4 Wake Up Command**

Allows you to select Thunderbolt / USB4 Wake Up Command.

Configuration options: [GOSX Command] [GO2SX\_NO\_WAKE Command]

# 6.15 AMD Overclocking

The items in this menu shows the AMD Overclocking Setup page.



Damage caused by use of your AMD processor outside of specification or in excess of factory settings are not covered by your system manufacturers warranty.



The following items appear only when **[Accept]** is selected for **DRAM Timing Configuration**.

## Manual CPU Overclocking

### CPU Frequency

Specifies a custom CPU core frequency. Should be combined with a custom CPU voltage. Power saving features for idle cores (e.g. cc6 sleep) remain active.

### CPU Voltage

Specifies a custom CPU core voltage (mV). Should be combined with a custom CPU voltage. Power saving features for idle cores (e.g. cc6 sleep) remain active. Stepping is 5mV

### CPU Core Count Control

#### CCD 00 Bit Map Down Core Control

Setting this item to 1 means core is enabled, setting this item to 0 means core is software down.

#### Bit Map Down Core Discard Changes

Discard changes.

#### Bit Map Down Core Apply Changes

Check and apply changes, need to make sure core number is equalled in each CCD.

### SMT Control

Can be used to disable symmetric multithreading. To re-enable SMT, a POWER CYCLE is needed after selecting the **[Auto]** option.  
Configuration options: [Auto] [Disable]



S3 is NOT SUPPORTED on systems where SMT is disabled.

## DDR and Infinity Fabric Frequency/Timings

### DDR Options

#### DDR Timing Configuration

##### Active Memory Timing Settings

Configuration options: [Auto] [Enabled]



The following items appear only when **Active Memory Timing Settings** is set to **[Enabled]**.

##### Memory Target Speed

Specifies the memory target speed in MT/s. The valid input is 2000 MT/s, 2400 MT/s, and range of 3200 MT/s ~ 12000 MT/s (stepping of 200 MT/s). The user input value will be rounded down to align with the stepping of 200 MT/s.

##### DDR SPD Timing

###### Tcl Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **Tcl Ctrl** is set to **[Manual]**.

###### Tcl

Specifies the CAS Latency. Valid values: 0x16 ~ 0x40, with a stepping of 2. The value is in hex.

###### Trcd Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **Trcd Ctrl** is set to **[Manual]**.

###### Trcd

Specifies the RAS# Active to CAS# Read Delay Time. Valid values: 0x8 ~ 0x3E. The value is in hex.

###### Trp Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



The following item appears only when **Trp Ctrl** is set to **[Manual]**.

###### Trp

Specifies Row Precharge Delay Time. Valid values: 0x8 ~ 0x3E, with a stepping of 2. The value is in hex.

### Tras Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Tras Ctrl** is set to **[Manual]**.

---

### Tras

Specifies Active to Precharge Delay Time. Valid values: 0x1E ~ 0x7E, with a stepping of 2.

### Trc Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trc Ctrl** is set to **[Manual]**.

---

### Trc

Specifies Active to Active/Refresh Delay Time. Valid values: 0x20 ~ 0xFF. The value is in hex.

### Twr Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Twr Ctrl** is set to **[Manual]**.

---

### Twr

Specifies the Minimum Write Recovery Time. Valid values: 0x30 ~ 0x60, with a stepping of 6. The value is in hex.

### Trfc1 Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trfc1 Ctrl** is set to **[Manual]**.

---

### Trfc1

Specifies the Refresh Recovery Delay Time (tRFC1). Valid values: 0x32 ~ 0xFFFF. The value is in hex.

### Trfc2 Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trfc2 Ctrl** is set to **[Manual]**.

---

### Trfc2

Specifies the Refresh Recovery Delay Time (tRFC2). Valid values: 0x32 ~ 0xFFFF. The value is in hex.

### TrfcSb Ctrl

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrfcSb Ctrl** is set to **[Manual]**.

---

#### **TrfcSb**

Specifies the Refresh Recovery Delay Time (tRFCSB). Valid values: 0x32 ~ 0x7FF. The value is in hex.

#### **Trtp Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trtp Ctrl** is set to **[Manual]**.

---

#### **Trtp**

Specifies the Read CAS# to Precharge command delay time. Valid values: 0x5 ~ 0x1F. The value is in hex.

#### **TrrdL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrrdL Ctrl** is set to **[Manual]**.

---

#### **TrrdL**

Specifies the Activate to Activate Delay Time, same bank group (tRRD\_L). Valid values: 0x4 ~ 0x20. The value is in hex.

#### **TrrdS Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrrdS Ctrl** is set to **[Manual]**.

---

#### **TrrdS**

Specifies the Activate to Activate Delay Time, different bank group (tRRD\_S). Valid values: 0x4 ~ 0x14. The value is in hex.

#### **Tfaw Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Tfaw Ctrl** is set to **[Manual]**.

---

#### **Tfaw**

Specifies the Four Activate Window Time. Valid values: 0x14 ~ 0x50. The value is in hex.

#### **TwtrL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwtrL Ctrl** is set to **[Manual]**.

---

#### **TwtrL**

Specifies the Minimum Write to Read Time, the same bank group. Valid values: 0x8 ~ 0x30. The value is in hex.

### **TwtrS Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwtrS Ctrl** is set to **[Manual]**.

---

### **TwtrS**

Specifies the Minimum Write to Read Time, different bank group.  
Valid values: 0x2 ~ 0x10. The value is in hex.

### **DDR Non-SPD Timing**

#### **TrdrdScL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdScL Ctrl** is set to **[Manual]**.

---

#### **TrdrdScL**

Specifies the CAS to CAS delay time, same bank group. Valid values: 0x1 ~ 0xF. The value is in hex.

#### **TrdrdSc Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdSc Ctrl** is set to **[Manual]**.

---

#### **TrdrdSc**

Specifies the Read to Read turnaround timing in the same chipselect.  
Valid values: 0x1 ~ 0xF. The value is in hex.

#### **TrdrdSd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdSd Ctrl** is set to **[Manual]**.

---

#### **TrdrdSd**

Specifies the Read to Read turnaround timing in the same DIMM.  
Valid values: 0x1 ~ 0xF. The value is in hex.

#### **TrdrdDd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TrdrdDd Ctrl** is set to **[Manual]**.

---

#### **TrdrdDd**

Specifies the Read to Read turnaround timing in a different DIMM.  
Valid values: 0x1 ~ 0xF. The value is in hex.

#### **TwrrrScL Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrScL Ctrl** is set to **[Manual]**.

---

#### **TwrrwrScL**

Specifies the CAS to CAS Delay Time, same bank group. Valid values: 0x1 ~ 0x3F. The value is in hex.

#### **TwrrwrSc Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrSc Ctrl** is set to **[Manual]**.

---

#### **TwrrwrSc**

Specifies the Write to Write turnaround timing in the same chipselect. Valid values: 0x1 ~ 0xF. The value is in hex.

#### **TwrrwrSd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrSd Ctrl** is set to **[Manual]**.

---

#### **TwrrwrSd**

Specifies the Write to Write turnaround timing in the same DIMM. Valid values: 0x1 ~ 0xF. The value is in hex.

#### **TwrrwrDd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **TwrrwrDd Ctrl** is set to **[Manual]**.

---

#### **TwrrwrDd**

Specifies the Write to Write turnaround timing in a different DIMM. Valid values: 0x1 ~ 0xF. The value is in hex.

#### **Twrrrd Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Twrrrd Ctrl** is set to **[Manual]**.

---

#### **Twrrrd**

Specifies the Write to Read turnaround timing. Valid values: 0x1 ~ 0xF. The value is in hex.

#### **Trdwr Ctrl**

[Auto]	Follow default setting.
[Manual]	Manually specify.



---

The following item appears only when **Trdwr Ctrl** is set to **[Manual]**.

---

#### **Trdwr**

Specifies the Read to Write turnaround timing. Valid values: 0x1 ~ 0xF. The value is in hex.

## DDR BUS Configuration

### Processor CA drive strengths

Specifies the drive strength for all CA0-13 IOs.  
Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm]

### Processor DQ drive strengths

Specifies the drive strength for all DQ and DMI IOs.  
Configuration options: [Auto] [High Impedance] [240 ohm] [120 ohm] [80 ohm] [60 ohm] [48 ohm] [40 ohm] [34.3 ohm]

### Processor ODT impedance

Specifies the ODT Impedance for all DBYTE IOs.  
Configuration options: [Auto] [High Impedance] [480 ohm] [240 ohm] [160 ohm] [120 ohm] [96 ohm] [80 ohm] [68.8 ohm] [60 ohm]

### Dram DQ drive strengths

Specifies the Dram Pull-up and Pull-down Output Driver Impedance for all DQ and DMI IOs.  
Configuration options: [Auto] [48 ohm] [40 ohm] [34 ohm]

### Dram ODT impedance RTT\_NOM\_WR

Specifies the DRAM On-die Termination impedance for RTT\_NOM\_WR.  
Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

### Dram ODT impedance RTT\_NOM\_RD

Specifies the DRAM On-die Termination impedance for RTT\_NOM\_RD.  
Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

### Dram ODT impedance RTT\_WR

Specifies the DRAM On-die Termination impedance for RTT\_WR.  
Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

### Dram ODT impedance RTT\_PARK

Specifies the DRAM On-die Termination impedance for RTT\_PARK.  
Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

### Dram ODT impedance DQS RTT\_PARK

Specifies the DRAM On-die Termination impedance for DQS RTT\_PARK.  
Configuration options: [Auto] [RTT\_OFF] [RZQ (240)] [RZQ/2 (120)] [RZQ/3 (80)] [RZQ/4 (60)] [RZQ/5 (48)] [RZQ/6 (40)] [RZQ/7 (34)]

## DDR Controller Configuration

### DDR Power Options

#### Power Down Enable

Configuration options: [Disabled] [Enabled] [Auto]

## Infinity Fabric Frequency and Dividers

### Infinity Fabric Frequency and Dividers

Allows you to set Infinity Fabric Frequency (FCLK). Auto = FCLK = MCLK. Manual = FCLK must be less than MCLK for best performance in most cases. Latency penalties are incurred if FCLK and MCLK are mismatched, but sufficiently high MCLK can negate or overcome this penalty.

Configuration options: [Auto] [100 MHz] - [3000 MHz]

### UCLK DIV1 MODE

Allows you to set UCLK DIV mode.

Configuration options: [Auto] [UCLK=MEMCLK] [UCLK=MEMCLK/2]



## Precision Boost Overdrive

### Precision Boost Overdrive

When this item is enabled, it allows the processor to run beyond defined values for PPT, VDD\_CPU EDC, VDD\_CPU TDC, VDD\_SOC EDC, VDD\_SOC TDC to the limits of the board, and allows it to boost at higher voltages for longer durations than default operation.

Configuration options: [Auto] [Disabled] [Enabled] [Advanced]



---

The following items appear only when **Precision Boost Overdrive** is set to **[Advanced]**.

---

### PBO Limits

- |               |                                                                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [Auto]        | Loads AMD default socket power (PPT), electrically-limited VRM current (EDC), and thermally-limited VRM current (TDC) limits.                              |
| [Disable]     | Disabled PBO limits.                                                                                                                                       |
| [Motherboard] | Allows the processor to run according to increased PPT, EDC, and TDC limits defined by your motherboard.                                                   |
| [Manual]      | Allows the processor to ignore AMD default limits for PPT, EDC, and TDC and instead use manual values (up to the maximum capabilities of the motherboard). |



---

The following items appear only when **PBO Limits** is set to **[Manual]**.

---

### PPT Limit [mW]

Adjust total CPU socket power delivery capability. Adjustable up to the limit supported by your motherboard.

### TDC Limit [mA]

Adjust peak current from your motherboard's CPU core VRM phases in thermally-limited scenarios. Adjustable up to the limit supported by you motherboard.

### EDC Limit [mA]

Adjust peak current from your motherboard's CPU core VRM phases in electrically-limited scenarios. Adjustable up to the limit supported by you motherboard.

### Precision Boost Overdrive Scalar Ctrl

Configuration options: [Auto] [Manual]



---

The following item appears only when **Precision Boost Overdrive Scalar Ctrl** is set to **[Manual]**.

---

### Precision Boost Overdrive Scalar

Overrides the AMD default silicon health management to potentially achieve higher sustained frequencies under CPU load.

Configuration options: [1X] - [10X]

### CPU Boost Clock Override

Increases (Positive) or Decreases (Negative) the maximum CPU frequency that may be automatically achieved by the CPU Boost Algorithm.

Configuration options: [Disabled] [Enabled (Positive)] [Enabled (Negative)]



---

The following item appears only when **CPU Boost Clock Override** is set to **[Enabled (Positive)]**.

---

### **Max CPU Boost Clock Override(+)**

Increases the maximum CPU frequency that may be automatically achieved by the Precision Boost 2 algorithm. Use the <+> or <-> to adjust the value. The values range from 25 to 200 with an interval of 25.

Configuration options: [Auto] [0] - [200]



---

The following item appears only when **CPU Boost Clock Override** is set to **[Enabled (Negative)]**.

---

### **Max CPU Boost Clock Override(-)**

Decreases the maximum CPU frequency that may be automatically achieved by the Precision Boost 2 algorithm. Use the <+> or <-> to adjust the value. The values range from 25 to 200 with an interval of 25.

Configuration options: [Auto] [0] - [200]

### **Platform Thermal Throttle Ctrl**

Allows the user to decrease the maximum allowed processor temperature (celsius)

Configuration options: [Manual] [Auto]



---

The following item appears only when **Platform Thermal Throttle Ctrl** is set to **[Manual]**.

---

### **Platform Thermal Throttle Limit**

Configuration options: [0] - [255]

### **GFX Curve Optimizer**

#### **GFX Curve Optimizer**

Allows the user to shift the GFX Voltage / Frequency (AVFS) curve to include higher voltages (positive values) or lower voltages (negative values). The larger the value entered the larger the magnitude of the voltage shift.

Configuration options: [Disable] [GFX Curve Optimizer]



---

The following items appear only when **GFX Curve Optimizer** is set to **[GFX Curve Optimizer]**.

---

#### **GFX Curve Optimizer Sign**

Determines the direction of the curve shift for GFX. Positive shifts the curve up to use higher voltages. Negative shifts the curve down to use lower voltages.

Configuration options: [Positive] [Negative]

#### **GFX Curve Optimizer Magnitude**

Determines the magnitude of the GFX curve shift to be made (entered in whole numbers) the larger the value entered the larger the magnitude of the shift. Field defaults to 0 and the user can enter whole integer numbers. Value entered, combined with the sign above, is used to send the SMU and GFX Curve Optimizer.

Configuration options: [0] - [30]

## Curve Optimizer

### Curve Optimizer

Allows the user to shift the Voltage / Frequency (AVFS) curve to include higher voltages (positive values) or lower voltages (negative values). The larger the value entered the larger the magnitude of the voltage limit.

Configuration options: [Disable] [All Cores] [Per Core]



---

The following items appear only when **Curve Optimizer** is set to **[All Cores]**.

---

#### All Core Curve Optimizer Sign

Determines the direction of the curve shift on all cores. Positive shifts the curve up to use higher voltages. Negative shifts the curve down to use lower voltages.

Configuration options: [Positive] [Negative]

#### All Core Curve Optimizer Magnitude

Determines the magnitude of the curve shift to be made (entered in whole numbers) the larger the value entered the larger the magnitude of the shift.

Configuration options: [0] - [30]



---

The following items appear only when **Curve Optimizer** is set to **[Per Core]**.

---

#### Core 0-7 Curve Optimizer Sign

Determines the direction of the curve shift on this core. Positive shifts the curve up to use higher voltages. Negative shifts the curve down to use lower voltages.

Configuration options: [Positive] [Negative]

#### Core 0-7 Curve Optimizer Magnitude

Determines the magnitude of the curve shift to be made to this core (entered in whole numbers) the larger the value entered the larger the magnitude of the shift.

Configuration options: [0] - [30]

## VDDG Voltage Control

### VDDG Voltage Control

VDDG represents voltage for the data portion of the Infinity Fabric. It is derived from the CPU SoC/Uncore Voltage (VDD\_SOC). VDDG can approach but not exceed VDD\_SOC.

Configuration options: [Auto] [Global VDDG Voltage Control] [Per-CCD VDDG Voltage Control]



---

The following items appear only when **VDDG Voltage Control** is set to **[Global VDDG Voltage Control]**.

---

#### Global VDDG CCD Voltage

VDDG CCD represents voltage for the data portion of the Infinity Fabric. Range is 650mV - 1650mV. Stepping is 10mV.

#### Global VDDG IOD Voltage

VDDG IOD represents voltage for the data portion of the Infinity Fabric. Range is 650mV - 1650mV. Stepping is 10mV.



---

The following items appear only when **VDDG Voltage Control** is set to **[Per-CCD VDDG Voltage Control]**.

---

### **CCD0-CCD VDDG Voltage**

VDDG CCD represents voltage for the data portion of the Infinity Fabric. Range is 650mV - 1650mV. Stepping is 10mV.

### **CCD0-IOD VDDG Voltage**

VDDG IOD represents voltage for the data portion of the Infinity Fabric. Range is 650mV - 1650mV. Stepping is 10mV.

## **VDDP Voltage Control**

### **VDDP Voltage Control**

[Auto] VDDP is system default.

[Manual] Set voltage for the DDR bus signaling (PHY).



---

The following items appear only when **VDDP Voltage Control** is set to **[Manual]**.

---

### **VDDP Voltage Adjust**

VDDP is a voltage for the DDR bus signaling (PHY), and it is derived from your DRAM Voltage (VDDIO\_Mem). As a result, VDDP voltage in mV can approach but not exceed your DRAM Voltage.

Configuration options: [0] - [2000]

## **SoC/Uncore OC Mode**

### **SoC/Uncore OC Mode**

Forces CPU SoC/Uncore components (e.g. Infinity Fabric, memory, and integrated graphics) to run at their maximum specified frequency at all times. May improve performance at the expense of idle power savings.

Configuration options: [Auto] [Enabled] [Disabled]

## **SoC Voltage**

### **SoC Voltage**

Specifies the SoC/Uncore voltage (VDD\_SOC) in mV to support memory and Infinity Fabric overclocking. VDD\_SOC also determines the GPU voltage on processors with integrated graphics. Stepping is 5mv.

Configuration options: [0] - [2800]

## **LN2 Mode**

### **LN2 Mode**

Enables settings that provide additional stability at extreme cold operating temperatures.

Configuration options: [Auto] [Disabled] [Enabled]

## **VDD Misc**

### **VDD Misc Control**

[Auto] VDD MISC is set to system default.

[Manual] Set voltage for the GMI PHY.



---

The following item appears only when **VDD Misc Control** is set to **[Manual]**.

---

### **VDD Misc Voltage**

Specifies the VDD MISC Voltage in mV, definitely follow SV13 type 2 Slave VID (500-5600mV, step 10mV).

Configuration options: [500] - [5600]

## **LCLK Frequency Control**

### **LCLK Frequency Control**

[Auto] Use default settings.

[Manual] Manually configure LCLK frequency.



---

The following item appears only when **LCLK Frequency Control** is set to **[Manual]**.

---

### **Maximum Frequency**

Allows you to set the maximum LCLK frequency.

Configuration options: [1029] - [2500]

## **Onboard Voltage Control**

### **VDDIO Voltage Control**

#### **VDDIO Ctrl**

Allows the user to adjust the VDDIO voltage.

[Auto] Use the default VDDIO voltage.

[Manual] Set DIMM VDD/VDDQ to synchronize to APU VDDIO.

[Separate] Independent control of APU VDDIO, DIMM VDD/VDDQ.



---

Running VDDQ != VDD is non-standard and may cause memory stability issues. Take care that during ramp down and ramp up, the VDDQ-VDD voltage must be less than 200mV.

---



---

The following item appears only when **LCLK Frequency Control** is set to **[Manual]** or **[Separate]**.

---

#### **DIMM VDD Adjust**

Adjust DIMM Power Supply, stepping is 10mV. Range is from 800mV to 1430mV. Take care that during ramp down and ramp up, the VDDQ-VDD voltage must be less than 200mV.

Configuration options: [800] - [1430]



---

The following items appear only when **LCLK Frequency Control** is set to **[Separate]**.

---

#### **DIMM VDDQ Adjust**

Adjust DIMM DQ Power Supply, stepping is 10mV. Range is from 800mV to 1430mV. Take care that during ramp down and ramp up, the VDDQ-VDD voltage must be less than 200mV, and Vpp must always be equal to or greater than VDDQ.

Configuration options: [800] - [1430]

### APU VDDIO Adjust

Adjust APO VDDIO, stepping is 2mV. Range is from 700mV to 2668mV.  
Configuration options: [700] - [2668]

## VPP Voltage Control

### VPP Ctrl

[Auto] Use the default setting.  
[Manual] Manually specify the memory VPP Voltage.



The following item appears only when **VPP Ctrl** is set to **[Manual]**.

### VPP Adjust

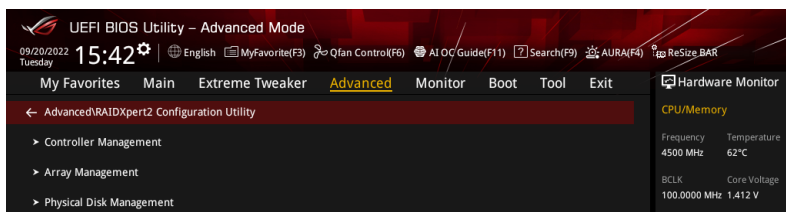
Adjust MEM VPP, stepping is 10mV. Range is from 1500mV to 2135mV.  
Configuration options: [1500] - [2135]

## 6.16 RAIDXpert2 Configuration Utility

The items in this menu allow you to configure RAIDXpert2 controller.



This menu, as well as the settings and options will only be available when you are building RAID drives. Please refer to the RAID Configuration Guide at [www.asus.com](http://www.asus.com) for more information on building RAID drives.



### Controller Management

This submenu allows you to manage controller properties.

#### View Controller Information

This item allows you to view information on the controller.

#### Rescan Disks

Performs a rescan of all physical disks and arrays connected to this controller.



The rescan operation may take 10 to 20 seconds to complete. After selecting this function, please wait for the operation to be completed before performing other actions.

### Array Management

This submenu displays array properties and allows you to perform operations such as creating or deleting arrays.

#### Create Array

This item allows you to create an array.

**Manage Array**

This item allows you to view information on the array and manage array properties.

**Delete Array**

This item allows you to delete a created array.

**Physical Disk Management**

This submenu displays properties of physical disks, and allows you to perform operations such as assign or unassign hot spare.

**View Physical Disk Properties**

This item allows you to view the physical disk properties.

**Select Physical Disk Operations**

This item allows you to execute physical disk operations.

**View Global Hot Spares**

This item allows you to display all the assigned global hot spare on the RAID controller.

## 7. Monitor menu

The Monitor menu displays the system temperature/power status, and allows you to change the fan settings. Scroll down to display the other BIOS items.



The settings and options of this menu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



### Temperature Monitor

**CPU Temperature, CPU Package Temperature, MotherBoard Temperature, VRM Temperature, Chipset Temperature, T\_Sensor Temperature, Water In T Sensor Temperature, Water Out T Sensor Temperature, DIMM A1-2 Temperature, DIMM B1-2 Temperature [xxx°C/xxx°F]**

The onboard hardware monitor automatically detects and displays the temperatures for the different components. Select **[Ignore]** if you do not wish to display the detected temperatures.

### Fan Speed Monitor

**CPU Fan Speed, CPU Optional Fan Speed, Chassis Fan Speed, Water Pump+Speed, AIO PUMP Speed [xxxx RPM]**

The onboard hardware monitor automatically detects and displays the fan speeds in rotations per minute (RPM). If the fan is not connected to the motherboard, the field shows N/A. Select **[Ignore]** if you do not wish to display the detected speed.

#### Flow Rate

The onboard hardware monitor automatically detects the flow rate. Select **[Ignore]** if you do not want to detect this item.



## Voltage Monitor

### CPU Core Voltage, 12V Voltage, 5V Voltage, 3.3V Voltage, CPU VDDIO / MC Voltage [x.xxx V]

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators. Select **[Ignore]** if you do not want to detect this item.

## Q-Fan Configuration

### Q-Fan Tuning

Click this item to automatically detect the lowest speed and configure the minimum duty cycle for each fan.



The process may take 2 to 5 minutes. DO NOT shut down or reset your system during the tuning process.

### HYDRANODE Fan Association

The ASUS HYDRANODE function can be used to build up a communication platform between the motherboard and other devices. For fan control, you can enjoy this function when you use fans which support ASUS HYDRANODE, and will provide you with more advanced fan control options. This function will be in effect when you use compatible fans.

[Enabled] ASUS HYDRANODE fan function can be used.

[Disabled] Fans will not support the ASUS HYDRANODE fan function.

### HYDRANODE Fan Reset

Click this item to reassociate all ASUS HYDRANODE fans when reconnecting or replacing the fans.

### CPU Q-Fan Control

Allows you to set the CPU Q-Fan operating mode.

[Auto Detect] Detects the type of installed fan/pump and automatically switches the control modes.

[DC Mode] Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.

[PWM Mode] Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.

### CPU Fan Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.

Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]



---

The following items appear only when **CPU Fan Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual]**.

---

### **CPU Fan Step Up**

Step down allows you to adjust the time delay before the fan rotation speed increases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### **CPU Fan Step Down**

Step down allows you to adjust the time delay before the fan rotation speed decreases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, which may result in longer period with more noise.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### **CPU Fan Speed Low Limit**

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if **[Ignore]** is selected.

Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]



---

The following items appear only when **CPU Fan Profile** is set to **[Manual]**.

---

### **CPU Fan Point4 Temperature**

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

### **CPU Fan Point4 Duty Cycle (%)**

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

### **CPU Fan Point3 Temperature**

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

### **CPU Fan Point3 Duty Cycle (%)**

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

## CPU Fan Point2 Temperature

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

## CPU Fan Point2 Duty Cycle (%)

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

## CPU Fan Point1 Temperature

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

## CPU Fan Point1 Duty Cycle (%)

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

## Chassis Fan(s) Configuration

### Chassis Fan Q-Fan Control

Allows you to set the Chassis Fan 1-5 operating mode.

[Auto Detect]	Detects the type of installed fan/pump and automatically switches the control modes.
[DC Mode]	Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.
[PWM Mode]	Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.

### Chassis Fan Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.

Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]



The following items appear only when **CPU Fan Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual]**.

### Chassis Fan Q-Fan Source

The assigned fan/pump will be controlled according to the selected temperature source. Configuration options: [CPU] [MotherBoard] [VRM] [T\_Sensor] [Water In T Sensor] [Water Out T Sensor] [Multiple Sources]

### Chassis Fan Step Up

Step down allows you to adjust the time delay before the fan rotation speed increases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### Chassis Fan Step Down

Step down allows you to adjust the time delay before the fan rotation speed decreases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, which may result in longer period with more noise.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### Chassis Fan Speed Low Limit

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if [Ignore] is selected.

Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

### Chassis Fan Point4 Temperature

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

### Chassis Fan Point4 Duty Cycle (%)

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

### Chassis Fan Point3 Temperature

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

### Chassis Fan Point3 Duty Cycle (%)

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

### Chassis Fan Point2 Temperature

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

### Chassis Fan Point2 Duty Cycle (%)

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

### Chassis Fan Point1 Temperature

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

### Chassis Fan Point1 Duty Cycle (%)

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

### Allow Fan Stop

This function allows the fan to run at 0% duty cycle when the temperature of the source is dropped below the lower temperature.

Configuration options: [Disabled] [Enabled]

### Water Pump+ Q-Fan Control

Allows you to set the Water Pump+ operating mode.

[Auto Detect]	Detects the type of installed fan/pump and automatically switches the control modes.
[DC Mode]	Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.
[PWM Mode]	Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.

### Water Pump+ Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.

Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]



---

The following items appear only when **Water Pump+ Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual]**.

---

### Water Pump+ Q-Fan Source

The assigned fan/pump will be controlled according to the selected temperature source.

Configuration options: [CPU] [MotherBoard] [VRM] [T\_Sensor] [Water In T Sensor] [Water Out T Sensor] [Multiple Sources]

### Water Pump+ Step Up

Step down allows you to adjust the time delay before the fan rotation speed increases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### Water Pump+ Step Down

Step down allows you to adjust the time delay before the fan rotation speed decreases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, which may result in longer period with more noise.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### Water Pump+ Low Limit

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if **[Ignore]** is selected.

Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]



---

The following items appear only when **Water Pump+ Profile** is set to **[Manual]**.

---

#### **Water Pump+ Point4 Temperature**

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

#### **Water Pump+ Point4 Duty Cycle (%)**

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

#### **Water Pump+ Point3 Temperature**

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

#### **Water Pump+ Point3 Duty Cycle (%)**

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

#### **Water Pump+ Point2 Temperature**

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

#### **Water Pump+ Point2 Duty Cycle (%)**

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

#### **Water Pump+ Point1 Temperature**

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

#### **Water Pump+ Point1 Duty Cycle (%)**

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

### AIO Pump Q-Fan Control

Allows you to set the AIO Pump operating mode.

- |               |                                                                                      |
|---------------|--------------------------------------------------------------------------------------|
| [Auto Detect] | Detects the type of installed fan/pump and automatically switches the control modes. |
| [DC Mode]     | Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.                     |
| [PWM Mode]    | Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.                    |

### AIO Pump Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.

Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]



---

The following items appear only when **AIO Pump Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual]**.

---

### AIO Pump Q-Fan Source

The assigned fan/pump will be controlled according to the selected temperature source.

Configuration options: [CPU] [MotherBoard] [VRM] [T\_Sensor] [Water In T Sensor] [Water Out T Sensor] [Multiple Sources]

### AIO Pump Step Up

Step down allows you to adjust the time delay before the fan rotation speed increases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### AIO Pump Step Down

Step down allows you to adjust the time delay before the fan rotation speed increases (level 0 is an instantaneous change in speed). The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.

Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

### AIO Pump Speed Low Limit

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if **[Ignore]** is selected.

Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]



---

The following items appear only when **AIO Pump Profile** is set to **[Manual]**.

---

#### **AIO Pump Point4 Temperature**

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

#### **AIO Pump Point4 Duty Cycle (%)**

When the temperature source is lower than the temperature of P4, the duty cycle will be determined according to the P3-P4 and the temperature source. When the temperature source is higher than the temperature of P4, the fan will operate at the duty cycle of P4. Use the <+> or <-> keys to adjust the Point4 temperature.

#### **AIO Pump Point3 Temperature**

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

#### **AIO Pump Point3 Duty Cycle (%)**

When the temperature source is lower than the temperature of P3, the duty cycle will be determined according to the P2-P3 and the temperature source. When the temperature source is higher than the temperature of P3, the duty cycle will be determined according to the P3-P4 and the temperature source. Use the <+> or <-> keys to adjust the Point3 temperature.

#### **AIO Pump Point2 Temperature**

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

#### **AIO Pump Point2 Duty Cycle (%)**

When the temperature source is lower than the temperature of P2, the duty cycle will be determined according to the P1-P2 and the temperature source. When the temperature source is higher than the temperature of P2, the duty cycle will be determined according to the P2-P3 and the temperature source. Use the <+> or <-> keys to adjust the Point2 temperature.

#### **AIO Pump Point1 Temperature**

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.

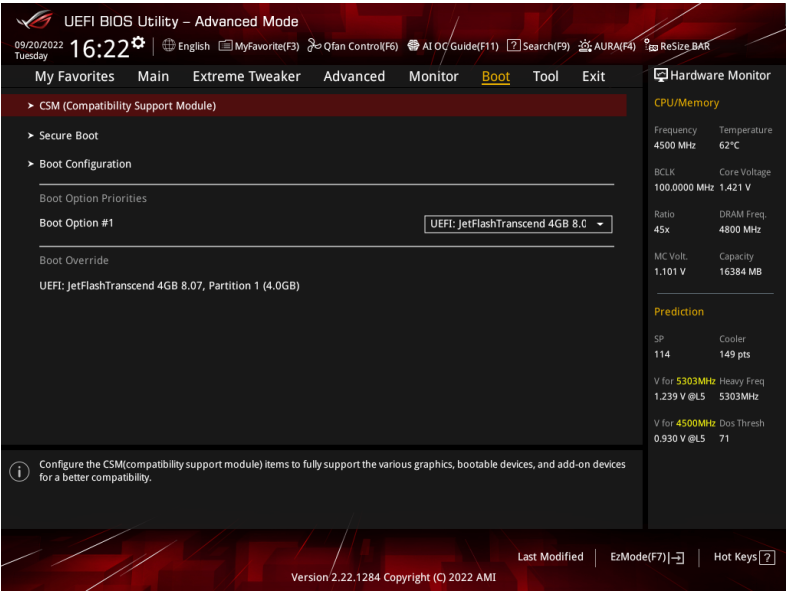
#### **AIO Pump Point1 Duty Cycle (%)**

When the temperature source is lower than the temperature of P1, the fan will operate at the duty cycle of P1. When the temperature source is higher than the temperature of P1, the duty cycle will be determined according to the P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the Point1 temperature.



## 8. Boot menu

The Boot menu items allow you to change the system boot options.



### CSM (Compatibility Support Module)

Allows you to configure the CSM (Compatibility Support Module) items to fully support the various VGA, bootable devices and add-on devices for better compatibility.



**Launch CSM** will be set to **[Disabled]** and cannot be configured when using the integrated graphics.

#### Launch CSM

- [Enabled]** For better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.
- [Disabled]** Disable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.



The following items appear only when **Launch CSM** is set to **[Enabled]**.

#### Boot Device Control

Allows you to select the type of devices that you want to boot.  
Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

#### Boot from Network Devices

Allows you to select the type of network devices that you want to launch.  
Configuration options: [Ignore] [Legacy only] [UEFI only]

### Boot from Storage Devices

Allows you to select the type of storage devices that you want to launch.

Configuration options: [Ignore] [Legacy only] [UEFI only]

### Boot from PCI-E/PCI Expansion Devices

Allows you to select the type of PCI-E/PCI expansion devices that you want to launch.

Configuration options: [Ignore] [Legacy only] [UEFI only]

## Secure Boot

Allows you to configure the Windows® Secure Boot settings and manage its keys to protect the system from unauthorized access and malwares during POST.

### OS Type

- |                     |                                                                                                                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [Windows UEFI Mode] | This item allows you to select your installed operating system. Execute the Microsoft® Secure Boot check. Only select this option when booting on Windows® UEFI mode or other Microsoft® Secure Boot compliant OS. |
| [Other OS]          | Get the optimized function when booting on Windows® non-UEFI mode. Microsoft® Secure Boot only supports Windows® UEFI mode.                                                                                        |



---

The Microsoft secure boot can only function properly on Windows UEFI mode.

---

### Secure Boot Mode

This option allows you to select the Secure Boot mode from between Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.

Configuration options: [Standard] [Custom]



---

The following item appears only when **Secure Boot Mode** is set to **[Custom]**.

---

## Key Management

### Install Default Secure Boot keys

Allows you to immediately load the default Security Boot keys, Platform key (PK), Key-exchange Key (KEK), Signature database (db), and Revoked Signatures (dbx). When the default Secure boot keys are loaded, the PK state will change from Unloaded mode to loaded mode.

### Clear Secure Boot keys

This item appears only when you load the default Secure Boot keys. Allows you to clear all default Secure Boot keys.

### Save all Secure Boot variables

Allows you to save all secure boot keys to a USB storage device.

### PK Management

The Platform Key (PK) locks and secures the firmware from any permissible changes. The system verifies the PK before your system enters the OS.

#### Save To File

Allows you to save the PK to a USB storage device.

### **Set New key**

Allows you to load the downloaded PK from a USB storage device.

### **Delete key**

Allows you to delete the PK from your system. Once the PK is deleted, all the system's Secure Boot keys will not be active.

Configuration options: [Yes] [No]



The PK file must be formatted as a UEFI variable structure with time-based authenticated variable.

## **KEK Management**

The KEK (Key-exchange Key or Key Enrollment Key) manages the Signature database (db) and Revoked Signature database (dbx).



Key-exchange Key (KEK) refers to Microsoft® Secure Boot Key-Enrollment Key (KEK).

### **Save to file**

Allows you to save the KEK to a USB storage device.

### **Set New key**

Allows you to load the downloaded KEK from a USB storage device.

### **Append Key**

Allows you to load the additional KEK from a storage device for an additional db and dbx loaded management.

### **Delete key**

Allows you to delete the KEK from your system.

Configuration options: [Yes] [No]



The KEK file must be formatted as a UEFI variable structure with time-based authenticated variable.

## **DB Management**

The db (Authorized Signature database) lists the signers or images of UEFI applications, operating system loaders, and UEFI drivers that you can load on the single computer.

### **Save to file**

Allows you to save the db to a USB storage device.

### **Set New key**

Allows you to load the downloaded db from a USB storage device.

### **Append Key**

Allows you to load the additional db from a storage device for an additional db and dbx loaded management.

### **Delete key**

Allows you to delete the db file from your system.

Configuration options: [Yes] [No]



The db file must be formatted as a UEFI variable structure with time-based authenticated variable.

## DBX Management

The dbx (Revoked Signature database) lists the forbidden images of db items that are no longer trusted and cannot be loaded.

### Save to file

Allows you to save the dbx to a USB storage device.

### Set New key

Allows you to load the downloaded dbx from a USB storage device.

### Append Key

Allows you to load the additional dbx from a storage device for an additional db and dbx loaded management.

### Delete key

Allows you to delete the dbx file from your system.

Configuration options: [Yes] [No]



---

The dbx file must be formatted as a UEFI variable structure with time-based authenticated variable.

---

## Boot Configuration

### Fast Boot

Allows you to enable or disable boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

Configuration options: [Disabled] [Enabled]



---

The following item appears only when **Fast Boot** is set to **[Enabled]**.

---

### Next Boot after AC Power Loss

[Normal Boot]

Returns to normal boot on the next boot after an AC power loss.

[Fast Boot]

Accelerates the boot speed on the next boot after an AC power loss.

### Boot Logo Display

[Auto]

Automatically adjust the boot logo size for Windows requirements.

[Full Screen]

Maximize the boot logo size.

[Disabled]

Hide the logo during POST.



---

The following item appears only when **Boot Logo Display** is set to **[Auto]** or **[Full Screen]**.

---

### Post Delay Time

Allows you to select a desired additional POST waiting time to easily enter the BIOS Setup. You can only execute the POST delay time during normal boot.

Configuration options: [0 sec] - [10 sec]



---

This feature only works when set under normal boot.

---



---

The following item appears only when **Boot Logo Display** is set to **[Disabled]**.

---

### Post Report

Allows you to select a desired POST report waiting time or until ESC is pressed.

Configuration options: [1 sec] - [10 sec] [Until Press ESC]

### Boot up NumLock State

Allows you to select the keyboard NumLock state.

Configuration options: [On] [Off]

### Wait For 'F1' If Error

Allows your system to wait for the <F1> key to be pressed when error occurs.

Configuration options: [Disabled] [Enabled]

### Option ROM Messages

[Force BIOS]            The Option ROM Messages will be shown during the POST.

[Keep Current]        Only the ASUS logo will be shown during the POST.

### Interrupt 19 Capture

Enable this item to allow the option ROMs to trap the interrupt 19.

Configuration options: [Enabled] [Disabled]

### AMI Native NVMe Driver Support

Allows you to enable or disable AMI Native NVMe driver.

Configuration options: [Disabled] [Enabled]

### Setup Mode

[Advanced Mode]    This item allows you to go to Advanced Mode of the BIOS after POST.

[EZ Mode]            This item allows you to go to EZ Mode of the BIOS after POST.

## Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.



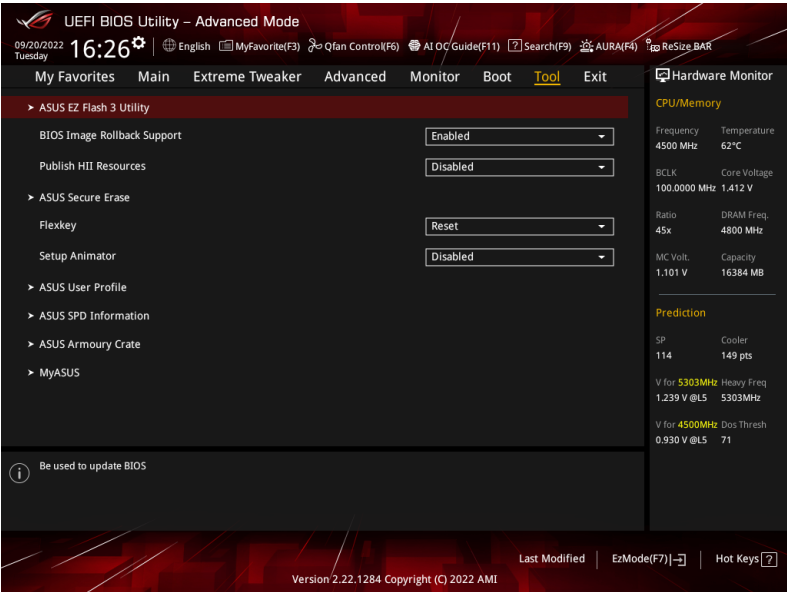
- To access Windows® OS in Safe Mode, press <F8 > after POST (Windows® 8 not supported).
  - To select the boot device during system startup, press <F8> when ASUS Logo appears.
- 

## Boot Override

These item displays the available devices. The number of device items that appear on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

## 9. Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.



### BIOS Image Rollback Support

- [Enabled] Support roll back your BIOS to a previous version, but this setting violates the NIST SP 800-147 requirement.
- [Disabled] Only support updating your BIOS to a newer version, and this setting meets the NIST SP 800-147 requirement.

### Publish HII Resources

Configuration options: [Disabled] [Enabled]

### Flexkey

- [Reset] Reboots the system.
- [Aura On/Off] Enable or Disable Aura LEDs. This setting does not sync with the BIOS/software option.
- [DirectKey] Boot directly into the BIOS.
- [Safe Boot] Force the system to reboot into the BIOS safe mode.

### Setup Animator

Allows you to enable or disable the Setup animator.

Configuration options: [Disabled] [Enabled]

## 9.1 ASUS EZ Flash 3 Utility

This item allows you to run ASUS EZ Flash 3. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.



For more details, refer to section **ASUS EZ Flash 3**.

## 9.2 ASUS Secure Erase

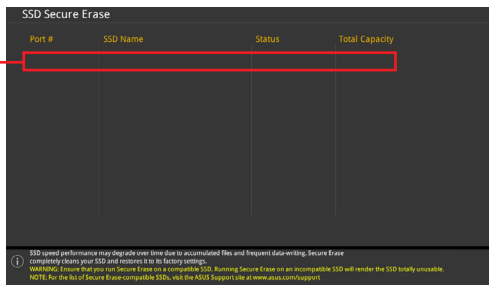
SSD speeds may lower over time as with any storage medium due to data processing. Secure Erase completely and safely cleans your SSD, restoring it to factory performance levels.

To launch Secure Erase, click **Tool > ASUS Secure Erase** on the Advanced mode menu.



- The time to erase the contents of your SSD may take a while depending on its size. Do not turn off the system during the process.
- Secure Erase is only supported on Intel SATA port. For more information about Intel SATA ports, refer to section **Motherboard layout** in your user manual.

Displays the available SSDs

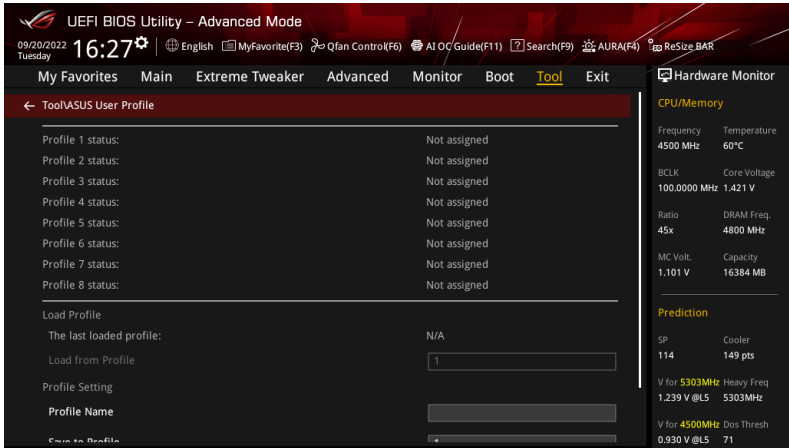


### Status definition:

- **Frozen.** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure Erase.
- **Locked.** SSDs might be locked if the Secure Erase process is either incomplete or was stopped. This may be due to a third party software that uses a different password defined by ASUS. You have to unlock the SSD in the software before proceeding with Secure Erase.

### 9.3 ASUS User Profile

This item allows you to store or load multiple BIOS settings.



#### Load from Profile

Allows you to load the previous BIOS settings saved in the BIOS Flash. Key in the profile number that saved your BIOS settings, press <Enter>, and then select **Yes**.



- DO NOT shut down or reset the system while updating the BIOS to prevent the system boot failure!
- We recommend that you update the BIOS file only coming from the same memory/CPU configuration and BIOS version.

#### Profile Name

Allows you to key in a profile name.

#### Save to Profile

Allows you to save the current BIOS settings to the BIOS Flash, and create a profile. Key in a profile number from one to eight, press <Enter>, and then select **Yes**.

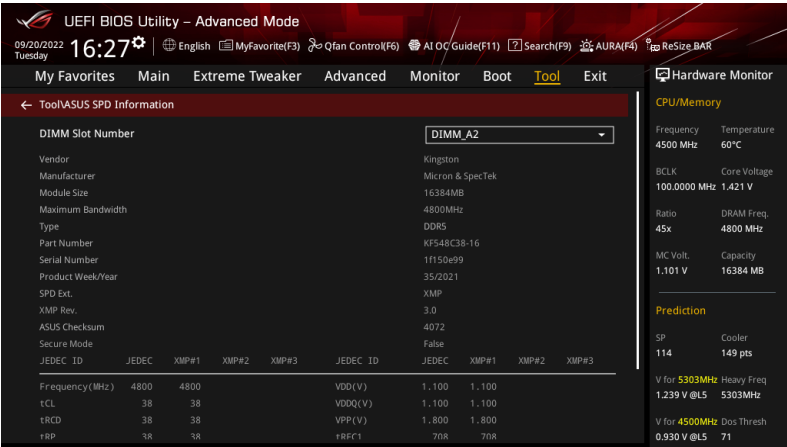
#### Load/Save Profile from/to USB Drive

Allows you to load or save profile from your USB drive, load and save profile to your USB drive.



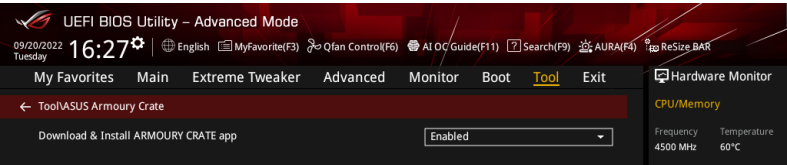
### 9.4 ASUS SPD Information

This item allows you to view the DRAM SPD information.



### 9.5 ASUS Armoury Crate

This item allows you to enable or disable downloading and installing of the Armoury Crate app in the Windows® OS. The Armoury Crate app can help you manage and download the latest drivers and utilities for your motherboard.



#### Download & Install ARMOURY CRATE app

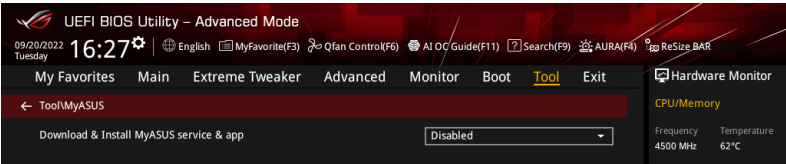
Configuration options: [Disabled] [Enabled]

## 9.6 MyASUS

This item allows you to enable or disable downloading and installing of the MyASUS app in the Windows® OS.



The availability of this menu, as well as the settings and options may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



### Download & Install MyASUS service & app

Configuration options: [Disabled] [Enabled]

## 10. Exit menu

The Exit menu items allow you to load the optimal default values for the BIOS items, and save or discard your changes to the BIOS items. You can access the EZ Mode from the Exit menu.



### Load Optimized Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F5>, a confirmation window appears. Select **OK** to load the default values.

### Save Changes & Reset

Once you are finished making your selections, choose this option from the Exit menu to ensure the values you selected are saved. When you select this option or if you press <F10>, a confirmation window appears. Select **OK** to save changes and exit.

### Discard Changes & Exit

This option allows you to exit the Setup program without saving your changes. When you select this option or if you press <Esc>, a confirmation window appears. Select **Yes** to discard changes and exit.

### Launch EFI Shell from USB drives

This option allows you to attempt to launch the EFI Shell application (shellx64.efi) from one of the available filesystem devices.

## 11. Updating BIOS

The ASUS website publishes the latest BIOS versions to provide enhancements on system stability, compatibility, and performance. However, BIOS updating is potentially risky. If there is no problem using the current version of BIOS, DO NOT manually update the BIOS. Inappropriate BIOS updating may result to system's failure to boot. Carefully follow the instructions in this chapter to update your BIOS when necessary.



Visit <http://www.asus.com> to download the latest BIOS file for this motherboard.

The following utilities allow you to manage and update the motherboard BIOS setup program.

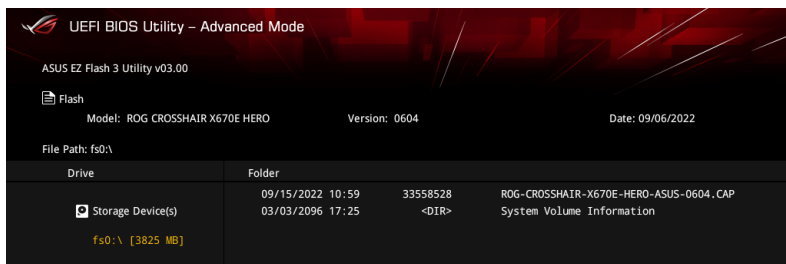
1. ASUS EZ Flash 3: Updates the BIOS using a USB flash drive.
2. ASUS CrashFree BIOS 3: Restores the BIOS using the motherboard support DVD or a USB flash drive when the BIOS file fails or gets corrupted.

### 11.1 ASUS EZ Flash 3

ASUS EZ Flash 3 allows you to download and update to the latest BIOS using a USB drive.

#### To update the BIOS:

1. Insert the USB flash drive that contains the latest BIOS file to a USB port.
2. Enter the Advanced Mode of the BIOS setup program. Go to the **Tool** menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.
3. Press Left arrow key to switch to the Drive field.
4. Press the Up/Down arrow keys to find the USB flash drive that contains the latest BIOS, and then press <Enter>.
5. Press Right arrow key to switch to the Folder Info field.
6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.



## 11.2 ASUS CrashFree BIOS 3

The ASUS CrashFree BIOS 3 utility is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using the motherboard support DVD or a USB flash drive that contains the BIOS file.



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The BIOS file in the motherboard support DVD may be older than the BIOS file published on the ASUS official website. If you want to use the newer BIOS file, download the file at <https://www.asus.com/support/> and save it to a USB flash drive.

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### Recovering the BIOS

#### To recover the BIOS:

1. Turn on the system.
2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.
4. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.



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DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

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