

# **Intel W790 Series**

**BIOS Manual**



# **Motherboard**

**Copyright© 2024 ASUSTeK COMPUTER INC. All Rights Reserved.**

No part of this manual, including the products and software described in it, may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form or by any means, except documentation kept by the purchaser for backup purposes, without the express written permission of ASUSTeK COMPUTER INC. ("ASUS").

Product warranty or service will not be extended if: (1) the product is repaired, modified or altered, unless such repair, modification or alteration is authorized in writing by ASUS; or (2) the serial number of the product is defaced or missing.

ASUS PROVIDES THIS MANUAL "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL ASUS, ITS DIRECTORS, OFFICERS, EMPLOYEES OR AGENTS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING DAMAGES FOR LOSS OF PROFITS, LOSS OF BUSINESS, LOSS OF USE OR DATA, INTERRUPTION OF BUSINESS AND THE LIKE), EVEN IF ASUS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES ARISING FROM ANY DEFECT OR ERROR IN THIS MANUAL OR PRODUCT.

SPECIFICATIONS AND INFORMATION CONTAINED IN THIS MANUAL ARE FURNISHED FOR INFORMATIONAL USE ONLY, AND ARE SUBJECT TO CHANGE AT ANY TIME WITHOUT NOTICE, AND SHOULD NOT BE CONSTRUED AS A COMMITMENT BY ASUS. ASUS ASSUMES NO RESPONSIBILITY OR LIABILITY FOR ANY ERRORS OR INACCURACIES THAT MAY APPEAR IN THIS MANUAL, INCLUDING THE PRODUCTS AND SOFTWARE DESCRIBED IN IT.

Products and corporate names appearing in this manual may or may not be registered trademarks or copyrights of their respective companies, and are used only for identification or explanation and to the owners' benefit, without intent to infringe.

# Contents

<b>1.</b>	<b>Knowing BIOS .....</b>	<b>5</b>
<b>2.</b>	<b>BIOS setup program .....</b>	<b>6</b>
<b>3.</b>	<b>Managing and updating your BIOS .....</b>	<b>7</b>
3.1	ASUS CrashFree BIOS 3 utility.....	7
3.2	ASUS EzFlash Utility.....	8
<b>4.</b>	<b>BIOS menu screen .....</b>	<b>9</b>
4.1	Menu bar.....	9
4.2	Menu items.....	10
4.3	Submenu items .....	10
4.4	Navigation keys.....	10
4.5	General help.....	10
4.6	Configuration fields .....	10
4.7	Pop-up window.....	10
4.8	Scroll bar.....	10
<b>5.</b>	<b>Main menu .....</b>	<b>11</b>
<b>6.</b>	<b>Ai Tweaker menu.....</b>	<b>14</b>
<b>7.</b>	<b>Advanced menu .....</b>	<b>43</b>
7.1	Trusted Computing.....	44
7.2	Redfish Host Interface Settings.....	45
7.3	UEFI Variables Protection.....	45
7.4	Serial Port Console Redirection .....	46
7.5	System Storage Configuration for VROC.....	48
7.6	PCI Subsystem Settings .....	49
7.7	USB Configuration .....	50
7.8	Network Stack Configuration.....	51
7.9	NVMe Configuration.....	51
7.10	HDD/SSD SMART Information .....	52
7.11	CPU Configuration .....	52
7.12	APM Configuration .....	55
7.13	Onboard Devices Configuration.....	57
7.14	PCIe Redriver Tuning.....	58
7.15	All Cpu Information.....	59
7.16	Intel(R) Virtual RAID on CPU .....	59
7.17	Intel(R) VROC SATA Controller .....	60
<b>8.</b>	<b>Platform Configuration menu .....</b>	<b>61</b>
8.1	PCH Configuration .....	62
8.2	Workstation ME Configuration .....	63
8.3	Runtime Error Logging.....	64

<b>9.</b>	<b>Socket Configuration menu .....</b>	<b>65</b>
9.1	Processor Configuration.....	66
9.2	Common RefCode Configuration.....	70
9.3	Uncore Configuration .....	71
9.4	Memory Configuration.....	72
9.5	IIO Configuration .....	74
<b>10.</b>	<b>Monitor menu .....</b>	<b>76</b>
<b>11.</b>	<b>Boot menu .....</b>	<b>84</b>
<b>12.</b>	<b>Tool menu.....</b>	<b>89</b>
12.1	ASUS User Profile.....	90
12.2	ASUS SPD Information.....	91
12.3	ASUS Armoury Crate.....	91
<b>13.</b>	<b>Server Mgmt menu.....</b>	<b>92</b>
13.1	System Event Log.....	93
13.2	BMC network configuration.....	94
13.3	View System Event Log .....	97
<b>14.</b>	<b>Exit menu .....</b>	<b>98</b>

# BIOS Setup

## 1. Knowing BIOS

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.
- 



This workstation motherboard comes with a Realtek 1 Gb LAN port that connects directly to the central server or to a router/hub using a LAN cable. When the BMC\_SW is enabled on your motherboard, this LAN controller will allow you to view and configure BMC network parameters in the BIOS menu. Please note that this LAN controller is dedicated to BMC and for the connections of IPMI only, you may not connect to the Internet using the Realtek 1 Gb LAN port.

---

## 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.
  - 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 the <F5> hotkey. 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.
-

### 3. Managing and updating your BIOS

The following utilities allow you to manage and update the motherboard Basic Input/Output System (BIOS) setup:

#### 1. ASUS CrashFree BIOS 3

To recover the BIOS using a bootable USB flash disk drive when the BIOS file fails or gets corrupted.

#### 2. ASUS EzFlash

Updates the BIOS using a USB flash disk.

### 3.1 ASUS CrashFree BIOS 3 utility

The ASUS CrashFree BIOS 3 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 update a corrupted BIOS file using a USB flash drive that contains the updated BIOS file.



---

Prepare a USB flash drive containing the updated motherboard BIOS before using this utility.

---

#### Recovering the BIOS from a USB flash drive

To recover the BIOS from a USB flash drive:

1. Insert the USB flash drive with the original or updated BIOS file to a USB port on the system.
2. The utility will automatically recover the BIOS. It resets the system when the BIOS recovery finished.



---

**DO NOT** shut down or reset the system while recovering the BIOS! Doing so would cause system boot failure!

---



---

The recovered BIOS may not be the latest BIOS version for this motherboard. Visit the ASUS website at [www.asus.com](http://www.asus.com) to download the latest BIOS file.

---

## 3.2 ASUS EzFlash Utility

The ASUS EzFlash Utility feature allows you to update the BIOS using a USB flash disk without having to use a DOS-based utility.



Download the latest BIOS from the ASUS website at [www.asus.com](http://www.asus.com) before using this utility.



The succeeding BIOS screens are for reference only. The actual BIOS screen displays may not be the same as shown.

To update the BIOS using EzFlash Utility:

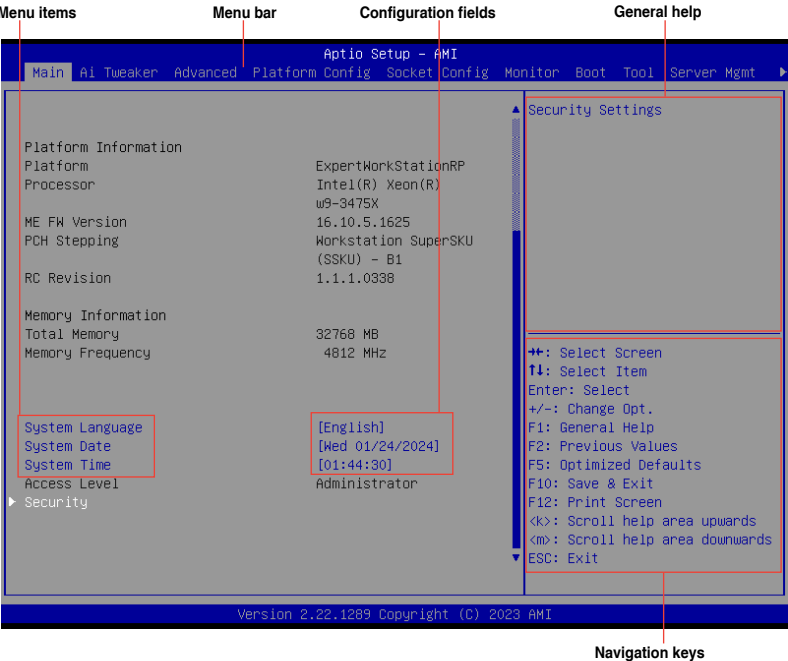
1. Insert the USB flash disk that contains the latest BIOS file to the USB port.
2. Enter the BIOS setup program. Go to the **Tool** menu to select **Start ASUS EzFlash** and press <Enter> to enable it.

ASUSTek. EzFlash Utility		
<b>Current Platform</b> Platform : Pro-WS-W790-ACE Version : 0101 Build Date :09/14/2022		<b>New Platform</b> Platform : Pro-WS-W790-ACE Version : 0207 Build Date :11/215/2022
<b>FS0</b>	Pro-WS-W790-ACE-ASUS-0207.cap	33558528 Bytes
[Up/Down/Left/Right]:Switch [Enter]:Choose [q]:Exit		

3. Press the Left arrow key to switch to the **Drive** field.
4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS then press <Enter>.
5. Press the Right arrow key to switch to the **Folder Info** field.
6. Press the Up/Down arrow keys to find the BIOS file then press <Enter>.
7. Reboot the system when the update process is done.



## 4. BIOS menu screen



### 4.1 Menu bar

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

- |                        |  |
|------------------------|--|
| <b>Main</b>            | For changing the basic system configuration  |
| <b>Ai Tweaker</b>      | For changing the overclocking settings   |
| <b>Advanced</b>        | For changing the advanced system settings  |
| <b>Platform Config</b> | For configuring the platform settings  |
| <b>Socket Config</b>   | For configuring the socket 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>Server Mgmt</b>     | For changing the Server Mgmt settings  |
| <b>Exit</b>            | For selecting the save & exit options  |

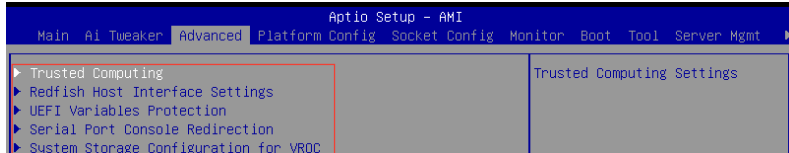
To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

## 4.2 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.

## 4.3 Submenu items

A solid triangle before each item on any menu screen means that the item has a submenu. To display the submenu, select the item and press <Enter>.



## 4.4 Navigation keys

At the bottom right corner of a menu screen are the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings.

## 4.5 General help

At the top right corner of the menu screen is a brief description of the selected item.

## 4.6 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 enclosed in brackets, and is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

## 4.7 Pop-up window

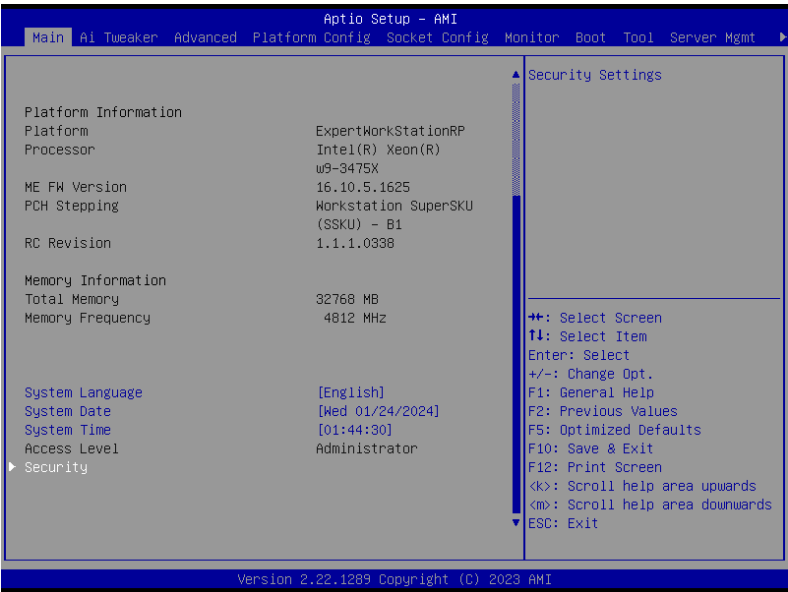
Select a menu item and press <Enter> to display a pop-up window with the configuration options for that item.

## 4.8 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.

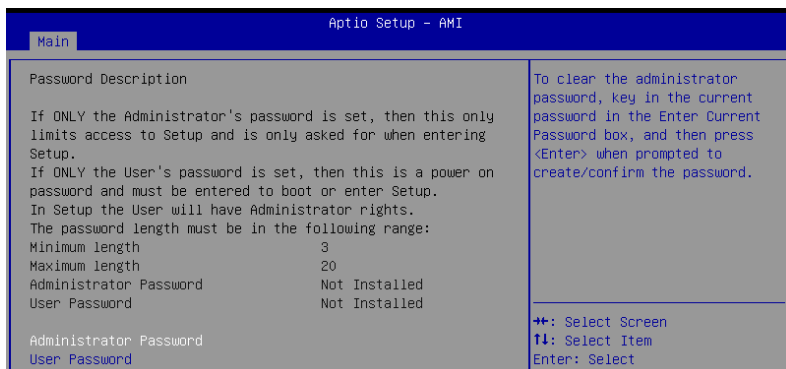
## 5. Main menu

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 jumper.
- 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]**.

## 6. Ai Tweaker menu

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

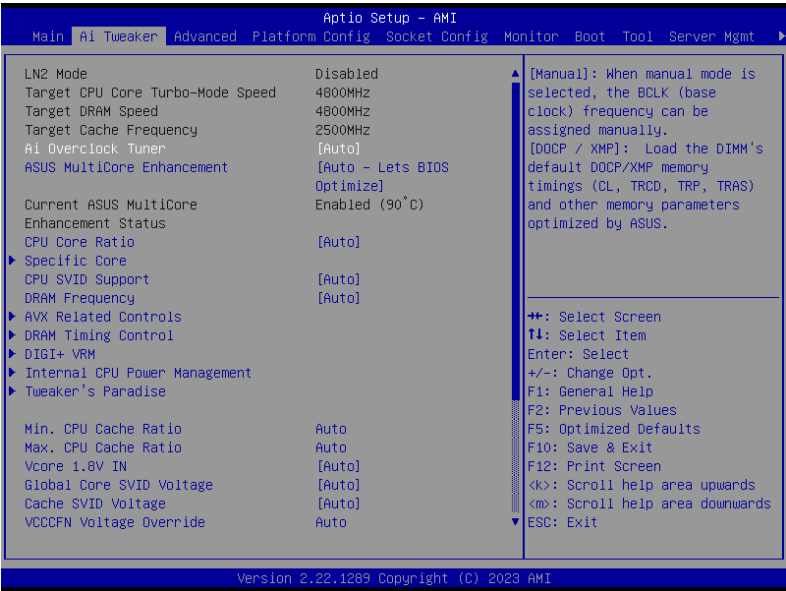


Be cautious when changing the settings of the Ai Tweaker menu items. Incorrect field values can cause the system to malfunction.



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] BLCK (base clock) frequency can be assigned manually.
- [XMP] Load the DIMM's default XMP memory timings (CL, TRCD, TRP, TRAS) and other memory parameters optimized by ASUS.
- [DOCP] Load the DIMM's default DOCP memory timings (CL, TRCD, TRP, TRAS) and other memory parameters optimized by ASUS.



The configuration options for this item depends on the DIMM installed.



---

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

---

## Bclk Frequency

Allows you to set the Bclk frequency. Press <Enter> then enter the frequency you would like to set.

Configuration options: [Auto] [40.0000] - [1000.0000]



---

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

---

## XMP

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



---

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

---

## DOCP

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

## ASUS MultiCore Enhancement

[Auto - Lets BIOS Optimize]

This item allows you to use ASUS optimized core ratio Turbo settings at default processor speeds.

[Disabled - Enforce All limits]

This item allows you to use Intel default Turbo core ratio settings.

[Enabled - Remove All limits]

This item allows you to use optimized power and current thresholds for maintaining maximum performance.

[Enabled - Remove All limits (90°C)]

This item allows you to use optimized power and current thresholds for maintaining maximum performance.

## CPU Core Ratio

[Auto]

The system will adjust all CPU core ratios automatically.

[Sync All Cores]

Configure a core ratio limit to synchronize all Performance cores.

[By Core Usage]

Configure the ratio limits for active cores depending on how many Performance cores are being utilized.

[Water-Cooled OC Preset] The system will adjust all CPU core ratios to the water-cooled OC preset.



---

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

---

## ALL-Core Ratio Limit

The N-core ratio limit must be higher than or equal to the (N+1)-core ratio limit. (N stands for the number of CPU cores) The core ratio limit cannot be set to **[Auto]** when the core number is lower than N. The biggest core's ratio limit must be lower than or equal to the second biggest core's ratio limit. Use the <+> or <-> to adjust the value.  
Configuration options: **[Auto]** **[8]** - **[140]**



---

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

---

## By Core Usage

### Turbo Ratio Limit 1-8

User defined Ratio for TurboRatioLimits.  
Configuration options: **[Auto]** **[26]** - **[140]**

### Turbo Ratio Cores 1-8

User defined core# for TurboRatioLimits.  
Configuration options: **[Auto]** **[1]** - **[20]**



---

The following item appears only when **CPU Core Ratio** is set to **[Auto]**, **[Sync All Cores]**, or **[By Core Usage]**.

---

## Specific Core

### Core0-35 Specific Ratio Limit

Configure a ratio limit for certain CPU Cores. Use the <+> or <-> to adjust the value.  
Configuration options: **[Auto]** **[8]** - **[120]**

### CPU Core0-35 specific Voltage

Allows configuration of the voltage supply to the CPU cores. Setting to **[Auto]** will scale voltage according to the applied CPU core ratio. Do not confuse this setting with VCCIN (CPU Input voltage).  
Configuration options: **[Auto]** **[Manual Mode]** **[Adaptive Mode]**



---

The following item appears only when **Performance Core0-5 specific Voltage** is set to **[Manual Mode]**.

---

### CPU Core-0-35 Voltage Override

Allows configuration of the CPU core voltage. Use the <+> or <-> to adjust the value. The values range from 0.600V to 1.700V with an interval of 0.001V.  
Configuration options: **[Auto]** **[0.00600]** - **[1.70000]**



---

You need to save the changes and reset the system for the changes to take effect.

---





---

The following items appear only when **Performance Core0-19 specific Voltage** is set to **[Adaptive Mode]**.

---

### Offset Mode Sign

- [+] Offset the CPU core voltage by a positive value.
- [-] Offset the CPU core voltage by a negative value.

### Additional Turbo Mode CPU Core0-35 Voltage

Configure the amount of voltage fed to the CPU cores when running in the turbo mode. Increase the voltage when configuring a High CPU core frequency. This voltage will be affected by the offset value. Use the <+> or <-> to adjust the value. The values range from 0.001V to 1.920V with an interval of 0.001V.

Configuration options: [Auto] [0.00100] - [1.92000]

### Performance Core0-35 Offset

Configure the CPU core voltage offset value. Use the <+> or <-> to adjust the value. The values range from 0.001 V to 0.999 V with an interval of 0.001 V.

Configuration options: [Auto] [0.00100] - [0.99900]



---

You need to save the changes and reset the system for the changes to take effect.

---

## CPU SVID Support

Disable this item to stop the CPU from communicating with the external voltage regulator.

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

## DRAM Frequency

Allows you to set the memory operating frequency. The configurable options vary with the BCLK (base clock) frequency setting. Select the auto mode to apply the optimized setting.



---

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

---



---

The frequency ratios in grey are not recommended, use BCLK + ratios in white to reach your target frequency if needed.

---

## AVX Related Controls

### AVX2

Allows you to enable or disable the AVX 2 Instructions.

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

### AVX512

Allows you to enable or disable the AVX 512 Instructions.

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

### AMX

Allows you to enable or disable the AMX Instructions.

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

## AVX2 Ratio Offset to per-core Ratio Limit

Configuration options: [Auto] [User Specify]



The following item appears only when **AVX2 Ratio Offset to per-core Ratio Limit** is set to **[User Specify]**.

### AVX2 Ratio Offset

Specifies number of bins to decrease AVX ratio vs. Per-Core Ratio. AVX is a more stressful workload, it is helpful to lower the AVX ratio to ensure maximum possible ratio for SSE workloads. Uses Mailbox MSR 0x150, cmd 0x1B. Range 0-31. 0=No offset. Use the <+> or <-> to adjust the value.

Configuration options: [0] - [31]

## AVX512 Ratio Offset to per-core Ratio Limit

Configuration options: [Auto] [User Specify]



The following item appears only when **AVX512 Ratio Offset to per-core Ratio Limit** is set to **[User Specify]**.

### AVX512 Ratio Offset

Specifies number of bins to decrease AVX 512 ratio vs. Per-Core Ratio. AVX is a more stressful workload, it is helpful to lower the AVX ratio to ensure maximum possible ratio for SSE workloads. Uses Mailbox MSR 0x150, cmd 0x1B. Range 0-31. 0=No offset. Use the <+> or <-> to adjust the value.

Configuration options: [0] - [31]

## TMUL Ratio Offset to per-core Ratio Limit

Configuration options: [Auto] [User Specify]



The following item appears only when **TMUL Ratio Offset to per-core Ratio Limit** is set to **[User Specify]**.

### TMUL Ratio Offset

Specifies number of bins to decrease TMUL ratio vs. Per-Core Ratio. TMUL is a more stressful workload, it is helpful to lower the TMUL ratio to ensure maximum possible ratio for SSE workloads. Uses Mailbox MSR 0x150, cmd 0x1B. Range 0-31. 0=No offset. Use the <+> or <-> to adjust the value.

Configuration options: [0] - [31]

## 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**

### **Primary Timings Report**

This item allows you to view the Primary Timings Report.

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

Configuration options: [Auto] [2] - [98]

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

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

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

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

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

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

## **Secondary Timings**

### **Secondary Timings Report**

This item allows you to view the Secondary Timings Report.

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

Configuration options: [Auto] [1] - [33]

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

Configuration options: [Auto] [1] - [33]

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

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

#### **DRAM Refresh Interval**

Configuration options: [Auto] [1] - [32767]

#### **DRAM WRITE Recovery Time**

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

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

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

#### **DRAM FOUR ACT WIN Time**

Configuration options: [Auto] [1] - [65]

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

Configuration options: [Auto] [1] - [65]

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

Configuration options: [Auto] [1] - [65]

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

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

#### **DRAM Write Latency**

Configuration options: [Auto] [1] - [98]

## Skew Control

### Basic Dimm ODT Control

#### Sync DIMM ODT mode

Configuration options: [Disabled] [Enabled]

#### DIMM\_A1 Rank 0-1

##### DQ RTT WR

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT NOM RD

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT NOM WR

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT PARK

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT PARK DQS

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]



---

The following items appear only when **Sync DIMM ODT mode** is set to **[Disabled]**.

---

#### DIMM\_B1 Rank 0-1 / DIMM\_C1 Rank 0-1 / DIMM\_D1 Rank 0-1 / DIMM\_E1 Rank 0-1 / DIMM\_F1 Rank 0-1 / DIMM\_G1 Rank 0-1 / DIMM\_H1 Rank 0-1

##### DQ RTT WR

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT NOM RD

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT NOM WR

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT PARK

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

##### DQ RTT PARK DQS

Configuration options: [Auto] [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

## Advanced Dimm ODT Control

### DRAM RON

Configuration options: [Auto] [Manual]



The following items appear only when **DRAM RON** is set to **[Manual]**.

**DRAM RON A1 / DRAM RON B1 / DRAM RON C1 / DRAM RON D1 / DRAM RON E1 / DRAM RON F1 / DRAM RON G1 / DRAM RON H1**

Configuration options: [Auto] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock]

### MC Vref Percent

Configuration options: [Auto] [Manual]



The following items appear only when **MC Vref Percent** is set to **[Manual]**.

**MC Vref Percent A / MC Vref Percent B / MC Vref Percent C / MC Vref Percent D / MC Vref Percent E / MC Vref Percent F / MC Vref Percent G / MC Vref Percent H**

Configuration options: [Auto] [0] - [195]

### DRAM Vref Percent

Configuration options: [Auto] [Manual]



The following items appear only when **DRAM Vref Percent** is set to **[Manual]**.

**DRAM Vref Percent A1 / DRAM Vref Percent B1 / DRAM Vref Percent C1 / DRAM Vref Percent D1 / DRAM Vref Percent E1 / DRAM Vref Percent F1 / DRAM Vref Percent G1 / DRAM Vref Percent H1**

Configuration options: [Auto] [0] - [195]

### DRAM Ibt CA

Configuration options: [Auto] [Manual]



The following items appear only when **DRAM Ibt CA** is set to **[Manual]**.

**DRAM Ibt CA A1 / DRAM Ibt CA B1 / DRAM Ibt CA C1 / DRAM Ibt CA D1 / DRAM Ibt CA E1 / DRAM Ibt CA F1 / DRAM Ibt CA G1 / DRAM Ibt CA H1**

Configuration options: [Auto] [60 DRAM Clock] [TBT 1] [TBT 2] [0 DRAM Clock]

### DRAM CA Vref Percent

Configuration options: [Auto] [Manual]



The following items appear only when **DRAM CA Vref Percent** is set to **[Manual]**.

**DRAM CA Vref Percent A1 / DRAM CA Vref Percent B1 / DRAM CA Vref Percent C1 / DRAM CA Vref Percent D1 / DRAM CA Vref Percent E1 / DRAM CA Vref Percent F1 / DRAM CA Vref Percent G1 / DRAM CA Vref Percent H1**

Configuration options: [Auto] [60 DRAM Clock] [TBT 1] [TBT 2] [0 DRAM Clock]

### DRAM Ibt CS

Configuration options: [Auto] [Manual]



---

The following items appear only when **DRAM Ibt CS** is set to **[Manual]**.

---

**DRAM Ibt CS A1 / DRAM Ibt CS B1 / DRAM Ibt CS C1 / DRAM Ibt CS D1 /  
DRAM Ibt CS E1 / DRAM Ibt CS F1 / DRAM Ibt CS G1 / DRAM Ibt CS H1**

Configuration options: [Auto] [60 DRAM Clock] [TBT 1] [TBT 2] [0 DRAM Clock]

**DRAM CS Vref Percent**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM CS Vref Percent** is set to **[Manual]**.

---

**DRAM CS Vref Percent A1 / DRAM CS Vref Percent B1 / DRAM CS Vref  
Percent C1 / DRAM CS Vref Percent D1 / DRAM CS Vref Percent E1 /  
DRAM CS Vref Percent F1 / DRAM CS Vref Percent G1 / DRAM CS Vref  
Percent H1**

Configuration options: [Auto] [0] - [195]

**DRAM Ibt CLK**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM Ibt CLK** is set to **[Manual]**.

---

**DRAM Ibt Clk A1 / DRAM Ibt Clk B1 / DRAM Ibt Clk C1 / DRAM Ibt Clk D1 /  
DRAM Ibt Clk E1 / DRAM Ibt Clk F1 / DRAM Ibt Clk G1 / DRAM Ibt Clk H1**

Configuration options: [Auto] [60 DRAM Clock] [TBT 1] [TBT 2] [0 DRAM Clock]

**DRAM QCA ODT**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM QCA ODT** is set to **[Manual]**.

---

**DRAM QCA ODT Position 1-5 A1 / DRAM QCA ODT Position 1-5 B1 /  
DRAM QCA ODT Position 1-5 C1 / DRAM QCA ODT Position 1-5 D1 /  
DRAM QCA ODT Position 1-5 E1 / DRAM QCA ODT Position 1-5 F1 /  
DRAM QCA ODT Position 1-5 G1 / DRAM QCA ODT Position 1-5 H1**

Configuration options: [Auto] [0 DRAM Clock] [40 DRAM Clock] [60 DRAM  
Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM  
Clock]

**DRAM QCA VREF**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM QCA VREF** is set to **[Manual]**.

---

**DRAM QCA VREF A1 / DRAM QCA VREF B1 / DRAM QCA VREF C1 /  
DRAM QCA VREF D1 / DRAM QCA VREF E1 / DRAM QCA VREF F1 /  
DRAM QCA VREF G1 / DRAM QCA VREF H1**

Configuration options: [Auto] [0] - [195]

**DRAM RCD QCA R-On ODT**

Configuration options: [Auto] [Manual]



---

The following items appear only when **DRAM RCD QCA R-On ODT** is set to **[Manual]**.

---

**DRAM RCD QCA R-On ODT A1 / DRAM RCD QCA R-On ODT B1 / DRAM RCD QCA R-On ODT C1 / DRAM RCD QCA R-On ODT D1 / DRAM RCD QCA R-On ODT E1 / DRAM RCD QCA R-On ODT F1 / DRAM RCD QCA R-On ODT G1 / DRAM RCD QCA R-On ODT H1**

Configuration options: [Auto] [10 Ohm driver strength] [14 Ohm driver strength] [20 Ohm driver strength]

**DRAM QCS ODT**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM QCS ODT** is set to **[Manual]**.

---

**DRAM QCS ODT Position 1-5 A1 / DRAM QCS ODT Position 1-5 B1 / DRAM QCS ODT Position 1-5 C1 / DRAM QCS ODT Position 1-5 D1 / DRAM QCS ODT Position 1-5 E1 / DRAM QCS ODT Position 1-5 F1 / DRAM QCS ODT Position 1-5 G1 / DRAM QCS ODT Position 1-5 H1**

Configuration options: [Auto] [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

**DRAM QCS VREF**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM QCS VREF** is set to **[Manual]**.

---

**DRAM QCS VREF A1 / DRAM QCS VREF B1 / DRAM QCS VREF C1 / DRAM QCS VREF D1 / DRAM QCS VREF E1 / DRAM QCS VREF F1 / DRAM QCS VREF G1 / DRAM QCS VREF H1**

Configuration options: [Auto] [0] - [195]

**DRAM RCD QCS R-On ODT**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM RCD QCS R-On ODT** is set to **[Manual]**.

---

**DRAM RCD QCS R-On ODT A1 / DRAM RCD QCS R-On ODT B1 / DRAM RCD QCS R-On ODT C1 / DRAM RCD QCS R-On ODT D1 / DRAM RCD QCS R-On ODT E1 / DRAM RCD QCS R-On ODT F1 / DRAM RCD QCS R-On ODT G1 / DRAM RCD QCS R-On ODT H1**

Configuration options: [Auto] [10 Ohm driver strength] [14 Ohm driver strength] [20 Ohm driver strength]

**DRAM QCK ODT**

Configuration options: [Auto] [Manual]

---



---

The following items appear only when **DRAM QCK ODT** is set to **[Manual]**.

---

**DRAM QCK ODT Position 1-5 A1 / DRAM QCK ODT Position 1-5 B1 / DRAM QCK ODT Position 1-5 C1 / DRAM QCK ODT Position 1-5 D1 / DRAM QCK ODT Position 1-5 E1 / DRAM QCK ODT Position 1-5 F1 / DRAM QCK ODT Position 1-5 G1 / DRAM QCK ODT Position 1-5 H1**

Configuration options: [Auto] [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

## DRAM RCD QCK R-On ODT

Configuration options: [Auto] [Manual]



The following items appear only when **DRAM RCD QCK R-On ODT** is set to **[Manual]**.

**DRAM RCD QCK R-On ODT A1 / DRAM RCD QCK R-On ODT B1 / DRAM RCD QCK R-On ODT C1 / DRAM RCD QCK R-On ODT D1 / DRAM RCD QCK R-On ODT E1 / DRAM RCD QCK R-On ODT F1 / DRAM RCD QCK R-On ODT G1 / DRAM RCD QCK R-On ODT H1**

Configuration options: [Auto] [10 Ohm driver strength] [14 Ohm driver strength] [20 Ohm driver strength]

## Memory Training Algorithms

The items in this menu allows you to enable or disable different Memory Training Algorithms.

### LRDIMM Backside Vref

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

### TX Rise Fall Slew Rate Training

Allows you to enable or disable TX Rise Fall Slew Rate Training. AUTO will enable if DDR freq >=2933. Enable or Disable will control TXRFSR regardless of frequency.

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

### Tco Comp Training

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

### Duty Cycle Training

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

### Eye Digrams

Enables Rx and Tx Dq eye diagrams for each rank.

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

### One Rank Timing Mode

LRDIMM One Rank Timing Mode turnaround time optimization.

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

### memFlows

#### CrossoverCalibration

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

#### SenseAmpOffsetTraining

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

#### EarlyCmdClkTraining

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

#### ReceiveEnableTraining

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

#### ReadDqDqsTraining

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

#### WriteLevelingExtTraining

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

#### WriteLevelingIntTraining

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

#### WriteDqDqsTraining

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



**LateCmdClkTraining**

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

**ReadAdvancedCenteringTraining**

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

**WriteAdvancedCenteringTraining**

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

**ReadVrefTraining**

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

**WriteVrefTraining**

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

**RoundTripOptimizeTraining**

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

**RxTxPerBitDeskewTraining**

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

**TxEqTraining**

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

**ImodeTraining**

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

**EarlyReadIdTraining**

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

**DqSwizzlingDiscovery**

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

**LrdimmBacksideMreTraining**

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

**LrdimmBacksideDwtTraining**

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

**RcdDcaTimingSimplePattern**

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

**EarlyWriteVrefCenteringTraining**

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

**EarlyReadVrefCenteringTraining**

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

**LrdimmReadVrefCenteringTraining**

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

**MemInitialization**

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

**DqSwizzlingDiscoveryTest**

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

**NormalModeSwitch**

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

**CmdVrefCenteringTraining**

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

**LrdimmWriteVrefCenteringTraining**

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

**AdvancedMemoryTest**

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

**EarlyCtClkTraining**

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

**memFlowsExt****RxCtleTraining**

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

**PhaseCrosstalkTraining**

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

**CmdNormalization**

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

**LrdimmBacksideDqTraining**

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

**DramRxEWqTraining**

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

**LrdimmBcomTraining**

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

**CheckPorCompatibility**

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

**DdrIoInitExecution**

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

**EarlyInitThermalThrottling**

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

**InitThermalThrottling**

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

**PostTrainingInitialization**

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

**EarlyMemoryControllerConfig**

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

**LateMemoryControllerConfig**

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

**SsaRankMarginTool**

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

**Mc0dtTraining**

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

**McR0nTraining**

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

**DramR0nTraining**

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

**CaClkTrainingBackSide**

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

**DqSwizzlingDiscoveryX16**

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

**TcoCompTraining**

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

**TxRiseFallSlewRateTraining**

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

**InitializeMemoryMap**

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

**CmdTxEqTraining**

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

**RcompStaticLeg**

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

**TxDdcTraining**

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

**RxDfeTraining**

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

**EarlyCsClkTraining**

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

**EarlyBacksideCsClkTraining**

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

**RcdDcsaVrefComplexPattern**

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

**RcdDcaTimingComplexPattern**

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

**InitializeCmiCreditProgramming**

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

**BacksideCmdCtlTraining**

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

**memFlowsExt2****WriteDqDqsPreDfe2DCenteringTraining**

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

**WriteDqDqsPostDfe2DCenteringTraining**

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

**DcaDckDutyCycleTraining**

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

**RcdDcaDfeDdr5**

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

**ReadDqDqsPreDfe2DCenteringTraining**

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

**ReadDqDqsPostDfe2DCenteringTraining**

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

**PeriodicTxReTraining**

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

**CaSlewRateTraining**

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

**DcaTcoTraining**

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

**EarlyReqClkTraining**

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

**TurnaroundTraining**

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

**RxDfeDdr5Training**

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

**TxDfeDdr5Training**

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

**DqSlewRateTraining**

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

**LrdimmDbDfe**

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

**DramDutyCycleAdjusterTraining**

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

**TcoDqDqsTraining**

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

**PbaEnumerateId**

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

**DbDfeDdr5Training**

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

**Tx0dtLatencyTraining**

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

**PostPackageRepairFlow**

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

**HwRcdDcsTraining**

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

**McrEarlySwizzleTraining**

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

**RxXTalkCancellationTraining**

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

**LdoTraining**

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

**RxJitterCancellationTraining**

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

**RcdDcaVrefSimplePattern**

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

**LrdimmBacksideMrdTraining**

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

**LrdimmBacksideMwdTraining**

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

**CteDramInit**

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

**PdaEnumerateId**

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

**memFlowsExt3****RcdDcsDfeTraining**

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

**LrdimmBacksideTxPerTxnTraining**

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

**PatternCheckout**

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

**RxPerBitDeskewTraining**

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

**CaTimingSimplePattern**

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

**CaVrefComplexPattern**

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

**BuildUnusedMemoryControllerBitMask**

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

**TrainingResultCheckWarning**

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

**ReadDqDqsPosrDfeLateTraining**

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

**DisplayTrainingResults**

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

**CheckDdrIoPowerStatus**

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

**PeriodicRxReTraining**

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

**CaTempCompensation**

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

**Third Timings****Third Timings Report**

This item allows you to view the Third Timings Report.

**tRRSG**

Configuration options: [Auto] [0] - [31]

**tWWSG**

Configuration options: [Auto] [0] - [63]

**tRWSG**

Configuration options: [Auto] [0] - [127]

**tWRSG**

Configuration options: [Auto] [0] - [127]

**tRRSR**

Configuration options: [Auto] [0] - [31]

**tWWSR**

Configuration options: [Auto] [0] - [63]

**tRWSR**

Configuration options: [Auto] [0] - [127]

**tWRSR**

Configuration options: [Auto] [0] - [127]

**tRRDR**

Configuration options: [Auto] [0] - [31]

**tWWDR**

Configuration options: [Auto] [0] - [31]

**tRWDR**

Configuration options: [Auto] [0] - [63]

**tWRDR**

Configuration options: [Auto] [0] - [31]

**tRRDD**

Configuration options: [Auto] [0] - [127]

**tWWDD**

Configuration options: [Auto] [0] - [127]

**tRWDD**

Configuration options: [Auto] [0] - [127]

**tWRDD**

Configuration options: [Auto] [0] - [127]

**tRRDS**

Configuration options: [Auto] [0] - [31]

**tWWDS**

Configuration options: [Auto] [0] - [63]

**tRWDS**

Configuration options: [Auto] [0] - [127]

**tWRDS**

Configuration options: [Auto] [0] - [127]

**tRRD\_DLR**

Configuration options: [Auto] [0] - [31]

**tCCD\_L\_tDLLK**

Configuration options: [Auto] [0] - [15]

**tCCD**

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

**tCCD\_WR**

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

**tCCD\_L**

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

**tCCD\_WR\_L**

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

## Misc.

### Attempt Fast Boot

- |            |   |
|------------|---|
| [Disabled] | Disables this feature.  |
| [Enabled]  | Portions of memory reference code will be skipped when possible to increase boot speed on warm boots. |

### Attempt Fast Cold Boot

- |            |   |
|------------|---|
| [Disabled] | Disables this feature.  |
| [Enabled]  | Portions of memory reference code will be skipped when possible to increase boot speed on cold boots. |

### Dynamic ECC Mode Selection

Configuration options: [Disabled] [Enabled] [Enable + Allow Partial Poison Mode]

### Registering Clock Driver

Allows you to select the PLL setting on the RCD.

Configuration options: [Auto] [PLL: 3200 Mode] [PLL: 3600 Mode] [PLL: 4000 Mode] [PLL: 4400 Mode] [PLL: 4800 Mode] [PLL: 5200 Mode] [PLL: 5600 Mode] [PLL: 6000 Mode] [PLL: 6400 Mode] [Reserved1] [Reserved2] [Reserved3] [Reserved 4] [Reserved5] [PLL: 2100 Mode] [PLL: Bypass Mode]

### DRAM CLK Period

Configuration options: [Auto] [0] - [57]

## 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

The load-line is defined by the Intel VRM specification and affects the level of voltage supplied to the processor. Higher load-line calibration settings result in reduced VDrop at the expense of voltage overshoot and will increase CPU temperatures due to higher voltage under load. Select from level 1 to 8 to adjust the load-line slope.

Level 1 = greater VDrop, Level 8 = minimum VDrop.

Configuration options [Auto] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5 (Default)] [Level 6] [Level 7] [Level 8]



---

The actual performance boost may vary depending on your CPU specification.

---



---

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

---

## CPU Current Capability

Allows you to set the shut-off current limit for external voltage regulator. A higher setting will allow the voltage regulator to supply more current while a lower setting will cause the voltage regulator to shut off the system when the supplied current is higher than the set value.

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



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

## CPU VRM Switching Frequency

This item affects the VRM transient response speed and the component thermal production. Select **[Manual]** to configure a higher frequency for a quicker transient response speed. 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.



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

## VRM Spread Spectrum

Allows you to reduce the magnitude of peak noise from the VRM. Enable to reduce peak noise. 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)

Allows you to set a higher frequency for a quicker transient response speed. Use the <+> or <-> to adjust the value. The values range from 800 KHz to 1000 KHz with an interval of 50 KHz.

Configuration options: [800] - [1000]

## CPU Power Duty Control

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

[Auto] Sets to the default setting.

[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]	Sets to optimized mode.
[Extreme]	Sets full phase mode.



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

### CPU Power Thermal Control

Sets the VRM thermal cut-off trip point. 120 Celsius is default and recommended for all overclocking and normal use. Use the <+> or <-> to adjust the value. The values range from 110 to 120 with an interval of 5.

Configuration options: [110] - [125]



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

### FIVRA Load-Line Calibration

Configuration options [Auto] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5 (Default)] [Level 6] [Level 7] [Level 8]

### FIVRA VRM Switching Frequency

Configuration options: [Auto] [Manual]



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

### Fixed FIVRA VRM Switching Frequency(KHz)

Use the <+> or <-> to adjust the value. The values range from 800 KHz to 1000 KHz with an interval of 50 KHz.

Configuration options: [800] - [1000]

### FAON Load-Line Calibration

Configuration options [Auto] [Level 1] [Level 2 (Default)] [Level 3] [Level 4] [Level 5] [Level 6] [Level 7] [Level 8]

### FAON VRM Switching Frequency

Configuration options: [Auto] [Manual]



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

### Fixed FAON VRM Switching Frequency(KHz)

Use the <+> or <-> to adjust the value. The values range from 800 KHz to 1000 KHz with an interval of 50 KHz.

Configuration options: [800] - [1000]

## EHV VRM Switching Frequency

Configuration options: [Auto] [Manual]



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

### Fixed EHV VRM Switching Frequency(KHz)

Use the <+> or <-> to adjust the value. The values range from 800 KHz to 1000 KHz with an interval of 50 KHz.

Configuration options: [800] - [1000]

## Internal CPU Power Management

The items in this submenu allow you to set the CPU ratio and features.

### Maximum CPU Core Temperature

Set the maximum allowable temperature for CPU cores. The CPU will throttle or shutdown when it reaches this temperature to prevent damaging the cores.

Configuration options: [Auto] [105] - [115]



DO NOT set this value too high as high temperatures may damage the CPU permanently.

### CPU Core/Cache Current Limit Max.

Allows you to configure a current limit for frequency or power throttling when overclocking. Can be set to maximum value (511.75) to prevent throttling when overclocking. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [0.00] - [511.75]

### Long Duration Package Power Limit

An Intel parameter known as [power limit 1] and specified in Watts. The default value is defined by TDP of the processor. Increasing the value will allow the Turbo ratio to be maintained for a longer duration under higher current loads.

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

### Package Power Time Window

An Intel parameter of [power limit 1] and specified in seconds. The applied value indicates how long the Turbo ratio can be active when TDP is exceeded.

Configuration options: [Auto] [1] [1.25] [1.5] [1.75] [2] [2.5] [3] [3.5] [4] [5] [6] [7] [8] [10] [12] [14] [16] [20] [24] [28] [32] [40] [48] [56] [64] [80] [96] [112] [128] [160] [192] [224] [256] [320] [384] [448]

### Short Duration Package Power Limit

An Intel parameter known as [power limit 2] and specified in Watts. It is the second Intel power limit which provides protection when package power exceeds power limit 1. The default setting is 1.25 times power limit 1. According to Intel, the platform must support this value for up to 10msec when power consumption exceeds power limit 2. ASUS motherboards are engineered to support this duration for a longer time as required to facilitate overclocking.

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

### **Package Power Time Window**

An Intel parameter of [power limit 2] and specified in seconds. The applied value indicates how long the Turbo ratio can be active when TDP is exceeded.

Configuration options: [Auto] [0.0012] [0.0015] [0.0017] [0.002] [0.0024] [0.003] [0.0034] [0.004] [0.005] [0.007] [0.008] [0.01] [0.012] [0.014] [0.016] [0.02] [0.023] [0.027] [0.031] [0.039] [0.047] [0.055] [0.063] [0.078] [0.094] [0.109] [0.125] [0.156] [0.188] [0.219] [0.25] [0.313] [0.375] [0.438]

### **CPU Integrated VR Fault Management**

Disable this item to prevent the FIVR (fully integrated voltage regulator) from tripping when doing over-voltage. It is recommended to disable this item when overclocking.

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

### **CPU Integrated VR Efficiency Management**

Set the balanced mode to improve power saving when the CPU is in a low power state. Select the high performance mode to make the FIVR (fully integrated voltage regulator) work in a high performance at all times.

Configuration options: [Auto] [High Performance] [Balanced]

## **Tweaker's Paradise**

### **Initial BCLK Frequency**

Allows setting a different BCLK value during POST. May be useful for setting a lower BCLK in scenarios where memory training is not stable at a higher BCLK (a large frequency gap between BCLK Frequency and Initial frequency is not recommended). Applies same value as BCLK Frequency if left at default. Use the <+> or <-> to adjust the value. The values range from 40.0 MHz to 1000.0 MHz with an interval of 0.05 MHz.

Configuration options: [Auto] [40.00] - [1000.00]

### **BCLK Amplitude**

Sets the signal magnitude of the reference PCIE/DMI CLK supplied to the processor. Higher values may improve overclocking stability.

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

### **BCLK Slew Rate**

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

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

### **BCLK Spread Spectrum**

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

### **Cold Boot BCLK Frequency**

Sets the frequency at cold boot. Use the <+> or <-> to adjust the value. The values range from 40.0 MHz to 1000.0 MHz with an interval of 0.05 MHz.

Configuration options: [Auto] [40.00] - [1000.00]

### **Core PLL Voltage**

Allows you to configure the offset for the Core PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.

Configuration options: [Auto] [0.90000] - [1.84500]

### Ring PLL Voltage

Allows you to configure the offset for the Ring PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.

Configuration options: [Auto] [0.90000] - [1.84500]

### Memory Controller PLL Voltage

Allows you to configure the offset for the Memory Controller PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.

Configuration options: [Auto] [0.90000] - [1.84500]

### PCH 1.05V Voltage

Allows you to configure the voltage for the PCH 1.05V. Use the <+> and <-> keys to adjust the value. The values range from 0.800V to 1.600V with an interval of 0.010V.

Configuration options: [Auto] [0.80000] - [1.60000]

### PCH 0.82V Voltage

Allows you to configure the voltage for the PCH 0.82V. Use the <+> and <-> keys to adjust the value. The values range from 0.700V to 1.000V with an interval of 0.010V.

Configuration options: [Auto] [0.70000] - [1.00000]

### VCCMDFIA Voltage Override

MDFI Analog supply. Use the <+> and <-> keys to adjust the value. The values range from 0.000V to 2.050V with an interval of 0.001V.

Configuration options: [Auto] [0.00000] - [2.05000]

### VCCMDFI Voltage Override

IO low voltage supply for MDFI. Use the <+> and <-> keys to adjust the value. The values range from 0.000V to 2.050V with an interval of 0.001V.

Configuration options: [Auto] [0.00000] - [2.05000]

### VCCDDRD Voltage Override

DDR digital supply (for MC and DDRIO). Use the <+> and <-> keys to adjust the value. The values range from 0.000V to 2.050V with an interval of 0.001V.

Configuration options: [Auto] [0.00000] - [2.05000]

### VCCDDRA Voltage Override

DDR analog supply (for DDRIO only). Use the <+> and <-> keys to adjust the value. The values range from 0.000V to 2.050V with an interval of 0.001V.

Configuration options: [Auto] [0.00000] - [2.05000]

### Performance Mode

Performance Mode enhances Processor's lighter work load performance. Certain rare combinations of Drivers and hardware may cause a longer boot time with it enabled.

Configuration options: [Enabled] [Disabled]

### UnderVolt Protection

When UnderVolt Protection is enabled, user will not be able to program under voltage in OS runtime.

[Enabled] Allow Boot-time undervolting, but enable UnderVolt Protection in OS Runtime.

[Disabled] No UnderVolt Protection in OS Runtime.

### Min. CPU Cache Ratio

Allows you to set the minimum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [8] - [80]

### Max. CPU Cache Ratio

Allows you to set the maximum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [8] - [80]

### VCore 1.8V In

Allows you to configure the VRM output rail for Core Voltage. Manual mode allows user-defined values. Offset mode modifies values by SVID.

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



---

The following item appears only when **VCore 1.8V In** 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. LN2 Disabled: The values range from 0.500V to 2.700V with an interval of 0.010V. LN2 Enabled: The values range from 0.500V to 3.040V with an interval of 0.010V.

Configuration options: **LN2 Disabled** [Auto] [0.50000] - [2.70000]

**LN2 Enabled** [Auto] [0.50000] - [3.04000]



---

The following items appear only when **VCore 1.8V In** is set to **[Offset Mode]**.

---

#### - Offset Mode Sign

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

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

#### - CPU Core Voltage Offset

Configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.010V to 1.270V with an interval of 0.010V.

Configuration options: [Auto] [0.01000] - [1.27000]

### Global Core SVID Voltage

Configure the global Core Voltage requested by the cores. Result may be influenced by Actual VRM Core Voltage.

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



---

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

---

### - CPU Core Voltage Override

Allows you to configure the global Core Voltage requested by the cores. Result may be influenced by Actual VRM Core Voltage. Use the <+> and <-> keys to adjust the value. The values range from 0.600V to 1.700V with an interval of 0.001V.

Configuration options: [Auto] [0.60000] - [1.70000]



---

The following item appears only when **Global Core SVID Voltage** is set to **[Adaptive Mode]**.

---

### - Offset Mode Sign

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

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

### - Additional Turbo Mode CPU Core Voltage

Allows you to configure the amount of voltage fed to the CPU cores when running in Turbo mode. Increase the voltage when configuring a high CPU core frequency. This voltage will be affected by the offset value. Use the <+> and <-> keys to adjust the value. The values range from 0.250V to 1.920V with an interval of 0.001V.

Configuration options: [Auto] [0.25000] - [1.92000]

### - Offset Voltage

Allows you to configure the CPU core voltage offset value. Save changes and reset the system for the change to take effect. Use the <+> and <-> keys to adjust the value. The values range from 0.001V to 0.999V with an interval of 0.001V.

Configuration options: [Auto] [0.00100] - [0.99900]

## Cache SVID Voltage

Configure the Cache Voltage requested by the Ring Domain. Result may be influenced by Actual VRM Core Voltage.

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



---

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

---

### - Cache Voltage Override

Allows you to configure the global Core Voltage requested by the cores. Result may be influenced by Actual VRM Core Voltage. Use the <+> and <-> keys to adjust the value. The values range from 0.600V to 1.700V with an interval of 0.001V.

Configuration options: [Auto] [0.60000] - [1.70000]



---

The following item appears only when **Cache SVID Voltage** is set to **[Adaptive Mode]**.

---

### - Offset Mode Sign

[+] Offset the Cache voltage by a positive value.

[-] Offset the Cache voltage by a negative value.

### - Additional Turbo Mode CPU Core Voltage

Allows you to configure the amount of voltage fed to the CPU cores when running in Turbo mode. Increase the voltage when configuring a high CPU core frequency. This voltage will be affected by the offset value. Use the <+> and <-> keys to adjust the value. The values range from 0.250V to 1.920V with an interval of 0.001V.

Configuration options: [Auto] [0.25000] - [1.92000]

### - Offset Voltage

Allows you to configure the Cache voltage offset value. Save changes and reset the system for the change to take effect. Use the <+> and <-> keys to adjust the value. The values range from 0.001V to 0.999V with an interval of 0.001V.

Configuration options: [Auto] [0.00100] - [0.99900]

### VCCCFN Voltage Override

Configure the voltage for the CPU Core. Use the <+> and <-> keys to adjust the value. The values range from 0.000V to 2.050V with an interval of 0.001V.

Configuration options: [Auto] [0.00000] - [2.05000]

### VCCIO Voltage Override

Configure the voltage for the CPU Core. Use the <+> and <-> keys to adjust the value. The values range from 0.000V to 2.050V with an interval of 0.001V.

Configuration options: [Auto] [0.00000] - [2.05000]

### 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

Power for the DRAM ICs' VDD portion. Use the <+> and <-> keys 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

Power for the DRAM ICs' VDD Data portion. Use the <+> and <-> keys 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]

### FIVRA 1.8V In

Configure the VRM output rail for FIVRA Voltage. Manual mode allows user-defined values. Offset mode modifies values by SVID.

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



---

The following item appears only when **FIVRA 1.8V In** is set to **[Manual Mode]**.

---

### - CPU FIVRA 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. LN2 Disabled: The values range from 0.500V to 2.700V with an interval of 0.010V. LN2 Enabled: The values range from 0.500V to 3.040V with an interval of 0.010V.

Configuration options: **LN2 Disabled** [Auto] [0.50000] - [2.70000]

**LN2 Enabled** [Auto] [0.50000] - [3.04000]



---

The following items appear only when **FIVRA 1.8V In** is set to **[Offset Mode]**.

---

### - Offset Mode Sign

- [+] Offset the CPU FIVRA voltage by a positive value.
- [-] Offset the CPU FIVRA voltage by a negative value.

### - CPU FIVRA Voltage Offset

Configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.010V to 1.270V with an interval of 0.010V.

Configuration options: [Auto] [0.01000] - [1.27000]

### FAON 1.05V In

Configure the VRM output rail for FAON Voltage. Manual mode allows user-defined values. Offset mode modifies values by SVID.

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



---

The following item appears only when **FAON 1.05V In** is set to **[Manual Mode]**.

---

### - CPU FAON 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. LN2 Disabled: The values range from 0.250V to 2.100V with an interval of 0.005V. LN2 Enabled: The values range from 0.250V to 2.800V with an interval of 0.005V.

Configuration options: **LN2 Disabled** [Auto] [0.25000] - [2.10000]

**LN2 Enabled** [Auto] [0.25000] - [2.80000]



---

The following items appear only when **FAON 1.05V In** is set to **[Offset Mode]**.

---

### - Offset Mode Sign

- [+] Offset the CPU FAON voltage by a positive value.
- [-] Offset the CPU FAON voltage by a negative value.

### - CPU FAON Voltage Offset

Configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.005V to 0.635V with an interval of 0.005V.

Configuration options: [Auto] [0.00500] - [0.63500]

### EHV 1.8V In

Configure the VRM output rail for EHV Voltage. Manual mode allows user-defined values. Offset mode modifies values by SVID.

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





---

The following item appears only when **FAON 1.05V In** is set to **[Manual Mode]**.

---

### - CPU EHV 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. LN2 Disabled: The values range from 0.500V to 2.700V with an interval of 0.010V. LN2 Enabled: The values range from 0.500V to 3.040V with an interval of 0.010V.

Configuration options: **LN2 Disabled** [Auto] [0.50000] - [2.70000]

**LN2 Enabled** [Auto] [0.50000] - [3.04000]



---

The following items appear only when **EHV 1.8V In** is set to **[Offset Mode]**.

---

### - Offset Mode Sign

[+] Offset the CPU EHV voltage by a positive value.

[-] Offset the CPU EHV voltage by a negative value.

### - CPU EHV Voltage Offset

Configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.010V to 1.270V with an interval of 0.010V.

Configuration options: [Auto] [0.01000] - [1.27000]

### VNN Main 1.02V In

Use the <+> and <-> keys to adjust the value. The values range from 0.800V to 1.500V with an interval of 0.010V.

Configuration options: [Auto] [0.80000] - [1.50000]

## Advanced Memory Voltages

### VCCD HV 1.14V In / MC Voltage

Configure the VRM output rail for VCCD HV Voltage. Manual mode allows user-defined values.

Configuration options: [Auto] [Manual Mode]



---

The following item appears only when **VCCD HV 1.14V In / MC Voltage** is set to **[Manual Mode]**.

---

### - CPU VCCD HV Voltage Offset

Configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 1.100V to 1.520V with an interval of 0.00125V.

Configuration options: [Auto] [1.10000] - [1.52000]

### DRAM VPP Voltage

Power for the DRAM ICs' VPP portion. Use the <+> and <-> keys 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]

**SPD HUB VLDO (1.8V)**

Main power for the SPD Hub Logic. Default is 1.8V. Use the <+> and <-> keys 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)**

Power for the SPD Hub side-band interface. Default is 1.0V. Use the <+> and <-> keys 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]

**DRAM Voltage Switching Frequency**

Switching Frequency of DRAM Voltage Regulator in MHz. Use the <+> and <-> keys to adjust the value. The values range from 0.500MHz to 1.250MHz with an interval of 0.250MHz.

Configuration options: [Auto] [0.50000] - [1.25000]

**DRAM Current Capability**

Current Capability for the Switching Regulators in Amps. Use the <+> and <-> keys to adjust the value. The values range from 0.125A to 7.875A with an interval of 0.125A.

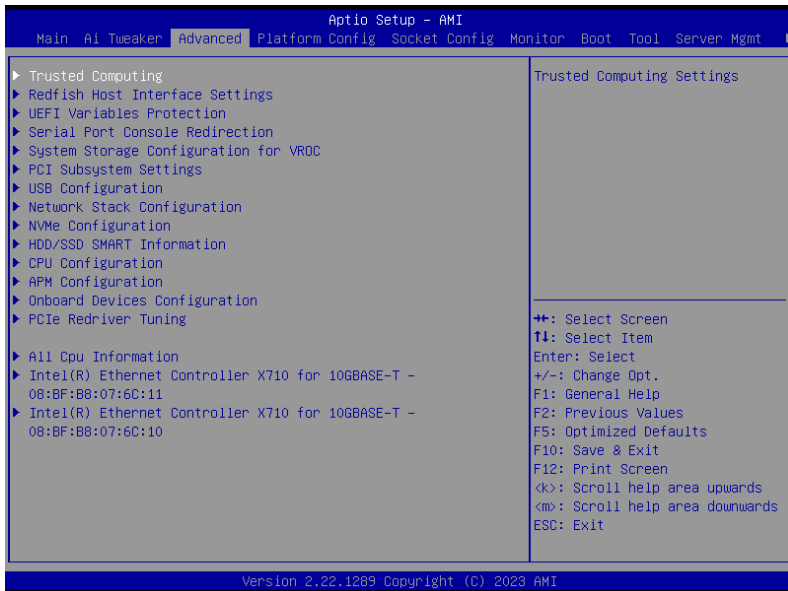
Configuration options: [Auto] [0.12500] - [7.87500]

## 7. 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.



# 7.1 Trusted Computing

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

Advanced			Aptio Setup - AMI
TPM 2.0 Device Found			Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Security Device Support		[Enable]	
Active PCR banks		SHA256	
Available PCR banks		SHA256	
SHA256 PCR Bank		[Enabled]	
Pending operation		[None]	
Platform Hierarchy		[Enabled]	
Storage Hierarchy		[Enabled]	
Endorsement Hierarchy		[Enabled]	
Physical Presence Spec Version		[1.3]	
			↔: Select Screen ↑↓: Select Item

## 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: [Disabled] [Enabled]



- The following items appear only when **Security Device Support** is set to **[Enabled]**.
- The availability of the following items depends on support of the TPM device installed.

## SHA256 PCR Bank

Allows you to enable or disable SHA256 PCR Bank.

Configuration options: [Disabled] [Enabled]

## Pending Operation

Schedule and 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 Platform Hierarchy.

Configuration options: [Disabled] [Enabled]

## Storage Hierarchy

Allows you to enable or disable Storage Hierarchy.

Configuration options: [Disabled] [Enabled]


## Endorsement Hierarchy

Allows you to enable or disable Endorsement Hierarchy.

Configuration options: [Disabled] [Enabled]

Physical Presence Spec Version

Select to tell O.S. to support PPI Spec Version 1.2 or 1.3.  
Configuration options: [1.2] [1.3]



Some HCK tests might not support 1.3.


7.2 Redfish Host Interface Settings

The items in this menu allow you to configure Redfish Host Interface Settings.

Aptio Setup - AMI		
Advanced		
Redfish Host Interface Settings		Enable/Disable AMI Redfish
Redfish	[Disabled]	

Redfish

Allows you to enable or disable AMI Redfish.  
Configuration options: [Disabled] [Enabled]



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

Authentication mode

Allows you to select the authentication mode.  
Configuration options: [Basic Authentication] [Session Authentication]

7.3 UEFI Variables Protection

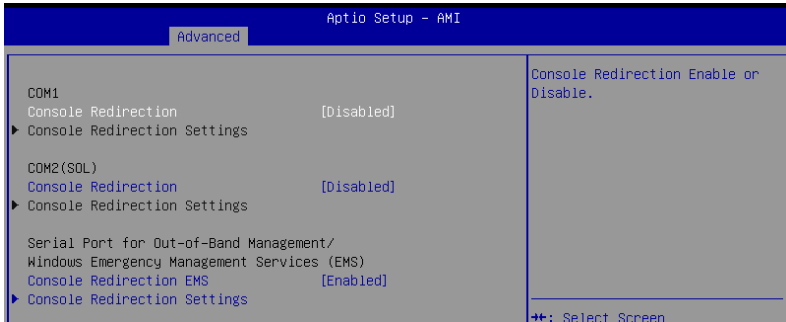
Aptio Setup - AMI		
Advanced		
Password protection of Runtime Variables	[Enable]	Control the NVRAM Runtime Variable protection through System Admin Password

Password protection of Runtime Variables

Control the NVRAM Runtime Variable protection through System Admin Password.  
Configuration options: [Enable] [Disable]

## 7.4 Serial Port Console Redirection

The items in this menu allow you to configure serial port console redirection settings.



### COM1 / COM2(SOL)

#### Console Redirection

Allows you to enable or disable the console redirection feature.

Configuration options: [Disabled] [Enabled]



The following item appears only when **Console Redirection** is set to **[Enabled]**.

#### Console Redirection Settings

These items become configurable only when you enable the Console Redirection item. The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

#### Terminal Type

Allows you to set the terminal type.

- [VT100] ASCII char set.
- [VT100Plus] Extends VT100 to support color, function keys, etc.
- [VT-UTF8] Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
- [ANSI] Extended ASCII char set.

#### Bits per second

Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.

Configuration options: [9600] [19200] [38400] [57600] [115200]

#### Data Bits

Configuration options: [7] [8]

### Parity

A parity bit can be sent with the data bits to detect some transmission errors. [Mark] and [Space] parity do not allow for error detection. They can be used as an additional data bit.

[None]	None
[Even]	Parity bit is 0 if the num of 1's in the data bits is even.
[Odd]	Parity bit is 0 if num of 1's in the data bits is odd.
[Mark]	Parity bit is always 1.
[Space]	Parity bit is always 0.

### Stop Bits

Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning.) The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.  
Configuration options: [1] [2]

### Flow Control

Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a "stop" signal can be sent to stop the data flow. Once the buffers are empty, a "start" signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.  
Configuration options: [None] [Hardware RTS/CTS]

### VT-UTF8 Combo Key Support

This allows you to enable the VT-UTF8 Combination Key Support for ANSI/VT100 terminals.  
Configuration options: [Disabled] [Enabled]

### Recorder Mode

With this mode enabled only text will be sent. This is to capture Terminal data.  
Configuration options: [Disabled] [Enabled]

### Resolution 100x31

This allows you enable or disable extended terminal solution.  
Configuration options: [Disabled] [Enabled]

### Putty Keypad

This allows you to select the FunctionKey and Keypad on Putty.  
Configuration options: [VT100] [LINUX] [XTERMR6] [SCO] [ESCN] [VT400]

## Serial Port for Out-of-Band Management/ Windows Emergency Management Services (EMS)

### Console Redirection EMS

Allows you to enable or disable the console redirection feature.  
Configuration options: [Disabled] [Enabled]



---

The following item appears only when **Console Redirection EMS** is set to **[Enabled]**.

---

### Console Redirection Settings

The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

## Out-of-Band Mgmt Port

Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.

Configuration options: [COM1] [COM2(SOL)]

## Terminal Type EMS

VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+, and then VT100. See above, in Console Redirection Settings page for more help with Terminal Type/Emulation.

Configuration options: [VT100] [VT100Plus] [VT-UTF8] [ANSI]

## Bits per second EMS

Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.

Configuration options: [9600] [19200] [57600] [115200]

## Flow Control EMS

Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a “stop” signal can be sent to stop the data flow. Once the buffers are empty, a “start” signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.

Configuration options: [None] [Hardware RTS/CTS] [Software Xon/Xoff]

## 7.5 System Storage Configuration for VROC

The items in this menu allow you to configure the system storage.



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

Aptio Setup - AMI		
Advanced		
PCIEX16(G5)_1	[Disabled]	[Disabled]: PCIe slot will not support VROC. [Enabled]: Allows PCIe slot to support VROC. Disable VROC to install a graphics card to this PCIe slot.
PCIEX16(G5)_2	[Disabled]	
PCIEX16(G5)_3	[Disabled]	
PCIEX16(G5)_4	[Disabled]	
PCIEX16(G5)_5	[Disabled]	
PCIEX16(G5)_6	[Disabled]	
PCIEX16(G5)_7	[Disabled]	
M.2_1	[Disabled]	
M.2_2	[Disabled]	
M.2_3	[Disabled]	
SlimSAS_1	[Disabled]	
SlimSAS_2	[Disabled]	

### PCIEX16(G5)

[Disabled] PCIe slot will not support VROC.

[Enabled] Allows PCIe slot to support VROC.



- After saving your changes, enter the BIOS setup again and go to **Advanced > Intel(R) Virtual RAID on CPU** to configure your settings.
- Disable VROC to install a graphics card to this PCIe slot.



## M.2

[Disabled]	M.2 will not support VROC.
[Enabled]	Allows M.2 slot to support VROC.



After saving your changes, enter the BIOS setup again and go to **Advanced > Intel(R) Virtual RAID on CPU** to configure your settings.

## SlimSAS

[Disabled]	SlimSAS connector will not support VROC.
[Enabled]	Allows SlimSAS connector to support VROC.



After saving your changes, enter the BIOS setup again and go to **Advanced > Intel(R) Virtual RAID on CPU** to configure your settings.

## 7.6 PCI Subsystem Settings

The items in this menu allows you to configure PCI, PCI-X, and PCI Express Settings.

Aptio Setup - AMI		
Advanced		
Above 4G Decoding	[Enabled]	Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only, if System Supports 64
Resize BAR Support	[Enabled]	
SR-IOV Support	[Enabled]	

### Above 4G Decoding

Allows you to enable or disable 64-bit capable devices to be decoded in above 4G address space. It only works if the 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 system has Resizable BAR capable PCIe Devices, this option enables or disables Resizable BAR Support.

Configuration options: [Disabled] [Enabled]

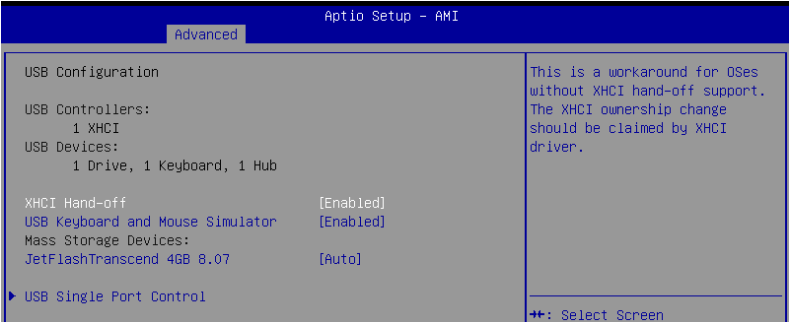
### SR-IOV Support

Allows you to enable or disable Single Root IO Virtualization Support if the system has SR-IOV capable PCIe devices. To enable SR-IOV, PCI Express Native Power Management must also be enabled. When SR-IOV is enabled, PCI Express Native Power Management can't be disabled.

Configuration options: [Disabled] [Enabled]

# 7.7 USB Configuration

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



## 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 Keyboard and Mouse Simulator

Enable this item to simulate USB keyboard and mouse to PS/2 module in Windows 7.

Ensure to install the USB driver in your system before you disable this item.

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]



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

## USB Single Port Control

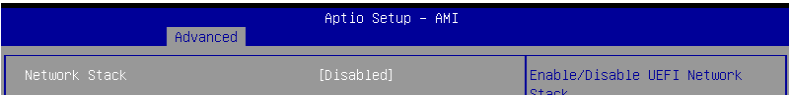
Allows you to enable or disable the individual USB ports.



Refer to section **Rear panel features** in your motherboard's user manual for the location of the USB ports.

# 7.8 Network Stack Configuration

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



## Network stack

Configuration options: [Disable] [Enable]



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

### IPv4 PXE Support

Allows you to enable or disable the IPv4 PXE Boot Support. If disabled IPv4 PXE boot option will not be created.

Configuration options: [Disabled] [Enabled]

### IPv6 PXE Support

Allows you to enable or disable the IPv6 PXE Boot Support. If disabled IPv6 PXE boot option will not be created.

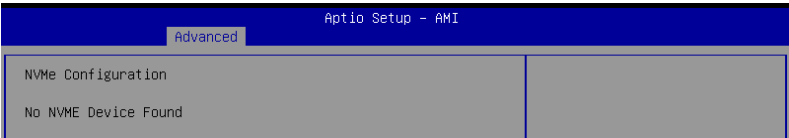
Configuration options: [Disabled] [Enabled]

# 7.9 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.



## 7.10 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.

Aptio Setup - AMI		
Advanced		
HDD/SSD SMART Information		Select one device and display its SMART information
Device	[N/A]	
VAL: Current value		
WOR: Worst value		
THR: Threshold value		



NVM Express devices do not support SMART information.

## 7.11 CPU Configuration

The items in this menu allow you to configure the CPU Configuration Parameters.

Aptio Setup - AMI		
Advanced		
Processor Version	Intel(R) Xeon(R)	Enables Logical processor (Software Method to Enable/Disable Logical Processor threads)
CPU Signature	w9-3475X	
Microcode Revision	0x806F6	
Enable LP [Global]	2B0004D0	
	[ALL LPs]	
► CPU Power Management Configuration		
► CPU Disable Core Configuration		
► CPU Thermal Management		

### Enable LP [Global]

Enables Logicia processor (Software Method to enable or disable Logical Processor threads).

Configuration options: [All LPs] [Single LP]

### CPU Power Management Configuration

#### Boot performance mode

Allows you to select the performance state that the BIOS will set before OS hand off.

Configuration options: [Max Performance] [Max Efficient]

#### SpeedStep (Pstates)

Allows you to enable or disable EIST (P-States).

Configuration options: [Disabled] [Enabled]

## Hardware P-States

Allows you to switch between Hardware P-States mode.

[Disable]	Hardware chooses a P-state based on OS Request (Legacy P-States).
[Native Mode]	Hardware chooses a P-state based on OS guidance.
[Out of Band Mode]	Hardware autonomously chooses a P-state (no OS guidance).
[Native Mode with no Legacy Support]	Hardware chooses a P-state based on OS guidance (without Legacy support).



When HWP mode is set to **[Disabled]** or **[Out of Band Mode]**, Dynamic SST-PP, SST-BF and SST-CP will be disabled.

## Intel(R) Turbo Boost Max Technology 3.0

Allows you to enable or disable Intel(R) Turbo Boost Max Technology 3.0 support by B2P Mailbox PCU\_MISC\_CONFIG [3].

Configuration options: [Disabled] [Enabled]

### Turbo Mode

Allows you to enable or disable processor Turbo Mode (requires EMTM enabled too).

Configuration options: [Disabled] [Enable]

### CPU C-states

Allows you to enable or disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.

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



The following items appear only when **CPU C-states** is set to **[Enabled]**.

### CPU C1 auto demotion

Allows CPU to automatically demote to C1. Takes effect after reboot.

Configuration options: [Disabled] [Enabled]

### CPU C1 auto undemotion

Allows CPU to automatically undemote from C1. Takes effect after reboot.

Configuration options: [Disabled] [Enabled]

### Enhanced Halt State (C1E)

Core C1E auto promotion Control. Takes effect after reboot. Will be enforced to enable when Optimized Power Mode is enabled.

Configuration options: [Disabled] [Enabled]

### Package C State

Allows you to select Package C State limit, the state Auto maps is program specific.

Configuration options: [Auto] [C0/C1 state] [C2 state] [C6(non Retention state)] [C6(Retention state)] [No Limit]

### Enable Monitor MWAIT

Allows you to enable or disable Monitor and MWAIT instructions. Auto maps to Enable.

Configuration options: [Disabled] [Enable] [Auto]u/ e9

### AVX License Pre-Grant Override

Enables AVX ICCP pre-grant level override.

Configuration options: [Disabled] [Enabled]



---

The following item appears only when **AVX License Pre-Grant Override** is set to **[Enabled]**.

---

### AVX ICCP pre-grant level

Pre-grants an AVX level to the core. Base frequency is not updated.

Configuration options: [128 Heavy] [256 Light] [256 Heavy] [512 Light] [512 Heavy]

### AVX P1

AVX P1 level selection.

Configuration options: [Nominal] [Level 1] [Level 2]

### Energy Efficient Turbo

Allows you to enable or disable Energy Efficient Turbo feature. This feature will opportunistically lower the turbo frequency to increase efficiency. Recommended only to disable in overclocking situations where turbo frequency must remain constant. Otherwise, leave enabled.

Configuration options: [Enable] [Disabled]

### Power Performance Tuning

Options to decide who controls EPB. Will be enforced to **[BIOS controls EPB]** when Optimized Power Mode is enabled.

[Auto]	Sets default setting.
[OS Controls EPB]	IA32_ENERGY_PERF_BIAS is used.
[BIOS Controls EPB]	ENERGY_PERF_BIAS_CONFIG is used.
[PECI Controls EPB]	PCS53 is used.



---

The following item appears only when **Power Performance Tuning** is set to **[BIOS Controls EPB]**.

---

### ENERGY\_PERF\_BIAS\_CFG mode

Use input from ENERGY\_PERF\_BIAS\_CONFIG mode selection. PERF/Balanced Perf/Balanced Power/Power. Will be enforced to **[PERF]** when Optimized Power Mode is enabled.

Configuration options: [Performance] [Balanced Performance] [Balanced Power] [Power]

### SAPM Control

MSR 1FCh Bit[32] = PWR\_PERF\_TUNING\_DISABLE\_SAPM\_CTRL.

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

## CPU Disable Core Configuration



---

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

---

### Core0-35

Check to disable Core0-35

Configuration options: [Enabled] [Disabled]

## CPU Thermal Management

### PROCHOT Modes

When a processor thermal sensor trips (either core), the PROCHOT# will be driven.

Configuration options: [Disabled] [Input-only]

### Thermal Monitor

Allows you to enable or disable Thermal Monitor.

Configuration options: [Disabled] [Enabled]



The following item appears only when **Thermal Monitor** is set to **[Enabled]**.

### Therm-Monitor-Status Filter

Allows you to enable Filter based therm\_monitor\_status (IA32\_THERM\_STATUS[0]) reporting.

Configuration options: [Disabled] [Enabled]



The following item appears only when **Therm-Monitor-Status Filter** is set to **[Enabled]**.

### Therm-Monitor-Status-Filter Time Window

Time window (seconds) for the filter.

Configuration options: [0.07] [0.1] [0.24] [0.4] [1.1] [2.2] [4.64] [9.29] [18.8] [37.7] [75.5] [151] [302]

### PROCHOT RATIO

Controls the CPU response to an inbound platform assertion of xxPROCHOT# by capping to the programmed ratio. Default value 0 will allow ME to control this value. If ME does not set ratio, default 0 equates to Pn. A non-zero value will override ME setting. The min allowed ratio is defined by PLATFORM\_INFO[MIN\_OPERATING\_RATIO].

## 7.12 APM Configuration

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

Aptio Setup - AMI		
Advanced		
Restore AC Power Loss	[Power Off]	Select AC power state when power is re-applied after a power failure.
ErP Ready	[Disabled]	
Power On By PCI-E	[Disabled]	
Power On By RTC	[Disabled]	

### 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)]

## 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]



---

The following items appear only when **Power On By RTC** is set to **[Enabled]**.

---

### RTC Alarm Date (Days)

Sets RTC Alarm Date in days. 0: Everyday.

Configuration options: [0] - [31]

#### - Hour

Configuration options: [0] - [23]

#### - Minute

Configuration options: [0] - [59]

#### - Second

Configuration options: [0] - [59]

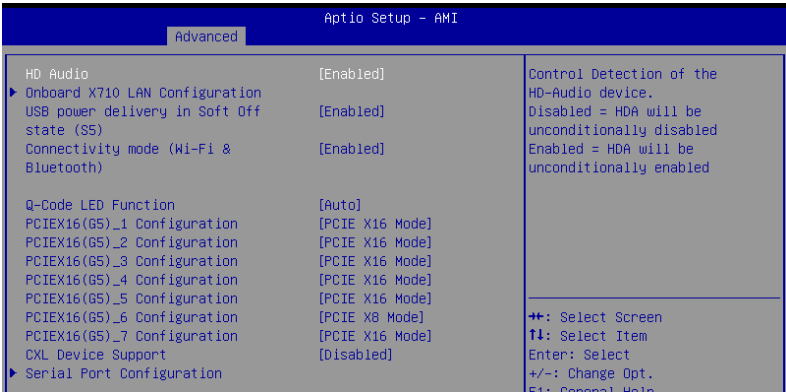


## 7.13 Onboard Devices Configuration

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



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



### HD Audio

Control detection of HD-Audio device.

[Disabled] HDA will be unconditionally disabled.

[Enabled] HDA will be unconditionally enabled.

### Onboard LAN Configuration

#### Intel LAN1 and LAN2

#### LAN Enable

Allows you to enable or disable onboard LAN.

Configuration options: [Disabled] [LAN1, LAN2 Enabled]

### USB Power delivery in Soft Off State (S5)

Use this option to disable USB power when your PC is in the S5 state.

Configuration options: [Disabled] [Enabled]

### Connectivity mode (Wi-Fi & Bluetooth)

Allows you to enable or disable the Wi-Fi & Bluetooth connectivity module.

Configuration options: [Disabled] [Enabled]

### 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.

**PCIEX16(G5) Configuration**

- [PCIe X16 Mode]      PCIe slot runs at x16.
- [PCIe X8 Mode]      PCIe slot runs at x8.
- [PCIe Bifurcation Mode]      PCIe slot will support up to 4 x M.2 drives / PCIe slot will support up to 2 x M.2 drives.
- [GPU with M.2 storage]      PCIe slot will support a graphics card running at x8 and an NVMe M.2 SSD running at x4.


 ONLY install a graphics card to a PCIe slot in PCIe X16 mode and disable VROC support.

**CXL Device Support**

Allows you to enable devices that support CXL (Compute Express Link) protocol.  
Configuration options: [Disabled] [Enabled]


**Serial Port Configuration**

This submenu allows you to set parameters for Serial Port.

 This item functions only if there is a serial port (COM) connector on the motherboard.

**Serial Port**

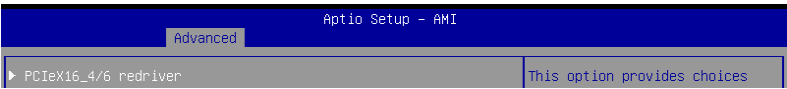
Configuration options: [Disabled] [Enabled]

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

**7.14      PCIe Redriver Tuning**

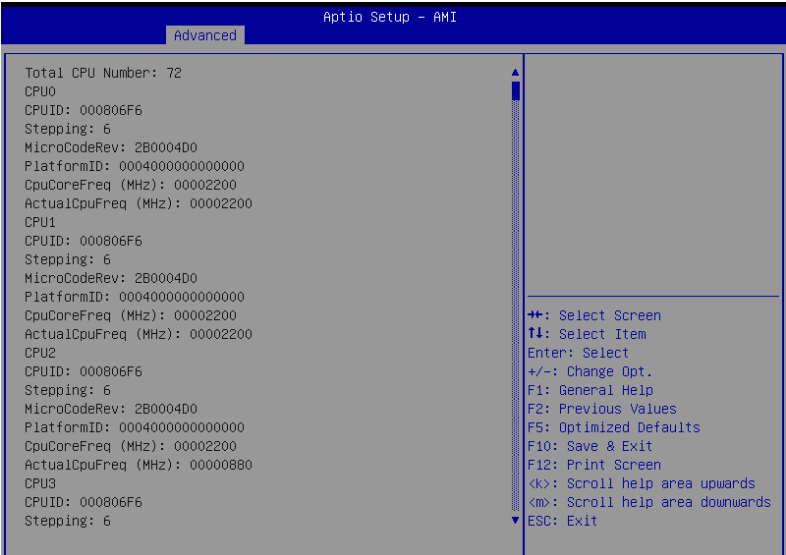


**PCIeX16\_4/6 redriver**

This option provides choices of different parameters to optimize signal integrity of high speed signals.

## 7.15 All Cpu Information

Displays all CPU information. Scroll down to view the other BIOS items.

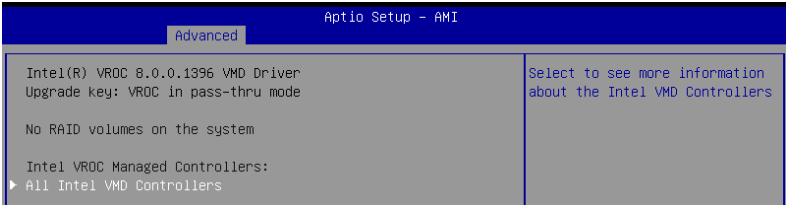


## 7.16 Intel(R) Virtual RAID on CPU

The items in this menu allow you manage Intel(R) Virtual RAID on CPU.



- The settings and options of this menu may vary depending on the storage devices connected. Please refer to the BIOS of your motherboard for the actual settings and options.
- Ensure to set the **System Storage Configuration** settings before using Intel(R) Virtual RAID on CPU to create a RAID set.

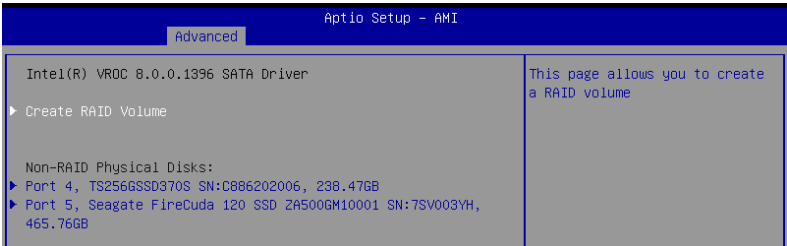


# 7.17 Intel(R) VROC SATA Controller

The items in this menu allow you manage RAID volumes on the Intel(R) RAID Controller.



- The settings and options of this menu may vary depending on the storage devices connected. Please refer to the BIOS of your motherboard for the actual settings and options.
- Ensure to set the **System Storage Configuration** settings before using Intel(R) Virtual RAID on CPU to create a RAID set.

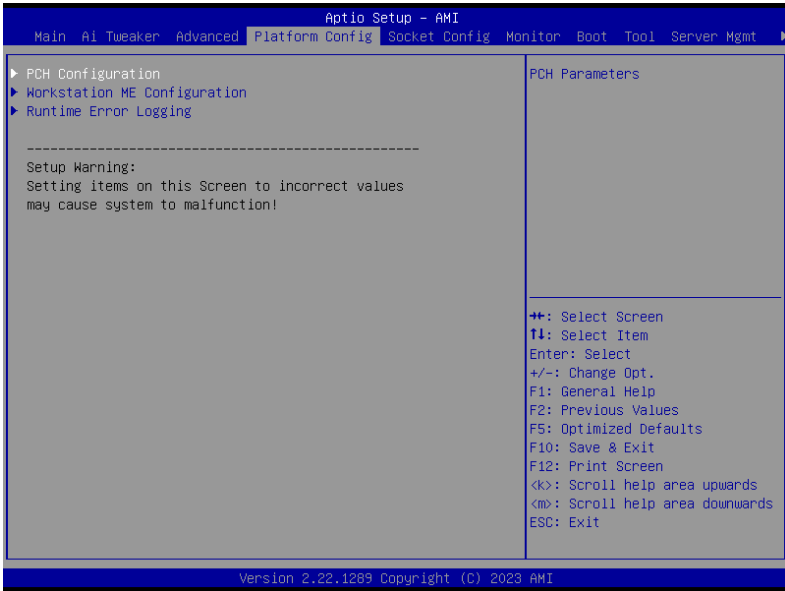


## 8. Platform Configuration menu

The Platform Configuration menu items allow you to change the platform settings.



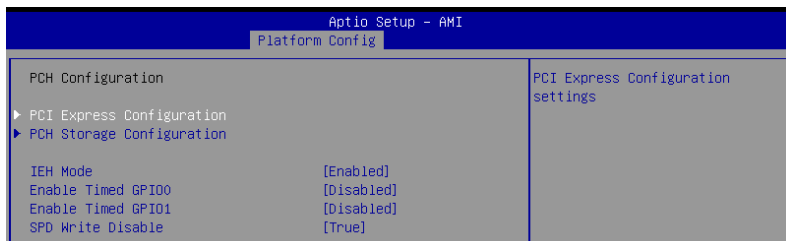
Settings items in this menu to incorrect values may cause the system to malfunction!



## 8.1 PCH Configuration



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.



### PCI Express Configuration

This option allows you to make PCI Express Configuration settings.

#### SlimSAS Link Speed

Allows you to configure the PCIe Speed.

Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

#### M.2 Link Speed

Allows you to configure the PCIe Speed.

Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4]

#### PCIe Speed

Allows you to configure the PCIe Speed.

Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4]

### PCH Storage Configuration

#### Controller SATA And RST Configuration

##### SATA Controller(s)

Allows you to enable or disable SATA device.

Configuration options: [Disabled] [Enabled]



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

##### SATA Mode Selection

Determines how SATA controller(s) operate.

Configuration options: [AHCI] [RAID]

##### SMART Self Test

The S.M.A.R.T. (Self-Monitoring Analysis and Reporting Technology) is a monitor system. Enable this item to show a warning message during the POST (Power-On Self-Test) when any error occurs in hard disks.

Configuration options: [Disabled] [Enabled]

##### SATA6G

Allows you to enable or disable this SATA port.

Configuration options: [Disabled] [Enabled]

### SATA6G Hot Plug

Allows you to designate this port as Hot Pluggable.

Configuration options: [Disabled] [Enabled]

### Spin Up Device

If enabled for any of the ports Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]

## IEH Mode

Allows you to enable or bypass IEH mode.

Configuration options: [Bypass Mode] [Enabled]

## Enable Timed GPIO0

Allows you to enable or disable Timed GPIO0. When disabled, it disables cross time stamp time-synchronization as extension of Hammock Harbor time synchronization.

Configuration options: [Disabled] [Enabled]

## Enable Timed GPIO1

Allows you to enable or disable Timed GPIO1. When disabled, it disables cross time stamp time-synchronization as extension of Hammock Harbor time synchronization.

Configuration options: [Disabled] [Enabled]

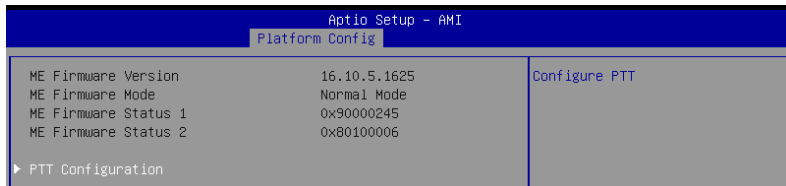
## SPD Write Disable

Allows you to enable or bypass SPD Write Disable.

Configuration options: [True] [False]

## 8.2 Workstation ME Configuration

Configure Management Engine Technology Parameters.



## PTT Configuration

### TPM Device Selection

Selects TPM device between firmware TPM or Discrete TPM.

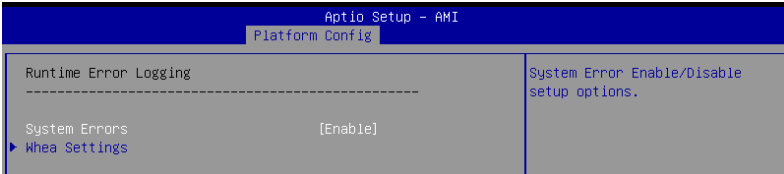
[Enable Discrete TPM]

Enable discrete TPM and disable platform firmware TPM, if you plug in a discrete TPM card on your motherboard, make sure to select this option.

[Enable Firmware TPM]

Enable platform firmware TPM and disable discrete TPM.

## 8.3 Runtime Error Logging



### System Errors

Allows you to enable or disable System Errors setup options.

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



The following items are only available when **System Errors** is set to **[Enable]** or **[Auto]**.

### Whea Settings

#### Whea Support

Allows you to enable or disable Whea support.

Configuration options: [Disable] [Enable]



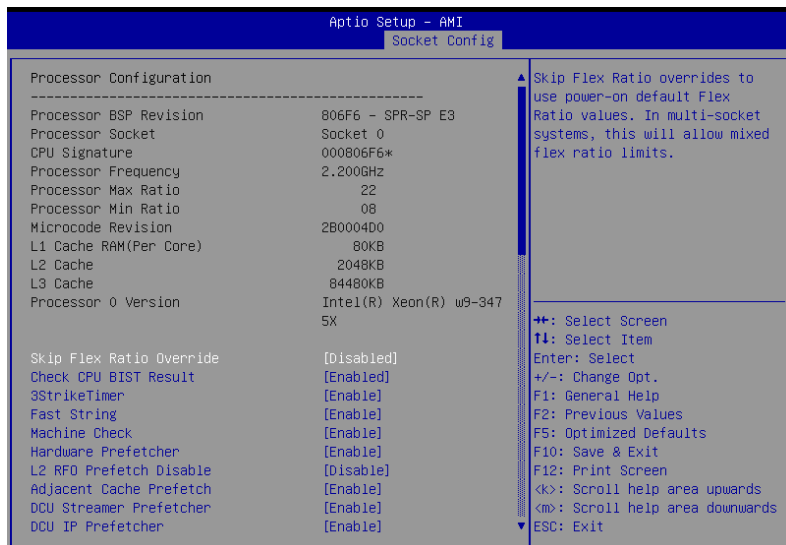
## 9. Socket Configuration menu

The Socket Configuration menu items allow you to change the socket settings.



## 9.1 Processor Configuration

Scroll using the <Page Up> / <Page Down> keys to view more items.



### Skip Flex Ratio Override

Allows you to skip Flex Ratio Overrides power-on default Flex Ratio values. In multi-socket systems, this will allow mixed flex ratio limits.

Configuration options: [Disabled] [Enable]

### Check CPU BIST Result

When enabled, this item disables failed BIST core. Otherwise, it ignores BIST result.

Configuration options: [Disabled] [Enable]

### 3StrikeTimer

The 3 strike counter can be turned off by writing into the MISC\_FEATURE\_CONTROL\_DISABLE\_THREE\_STRIKE\_CNT(MSR 0x01a4).

Configuration options: [Enable] [Disabled]

### Fast String

Allows you to enable or disable fast strings for REP MOVSB/STOSB.

Configuration options: [Disabled] [Enable]

### Machine Check

This item allows you to enable or disable machine check.

Configuration options: [Disabled] [Enable]

### Hardware Prefetcher

Allows you to enable or disable MLC streamer prefetcher (MSR 1A4h Bit[0]).

Configuration options: [Disabled] [Enable]

## **L2 RFO Prefetch Disable**

Allows you to enable or disable L2 RFO prefetcher (MSR 6Dh Bit[35]).

Configuration options: [Disabled] [Enable]

## **Adjacent Cache Prefetch**

Allows you to enable or disable MLC spatial prefetcher (MSR 1A4h Bit[1]).

Configuration options: [Enable] [Disabled]

## **DCU Streamer Prefetcher**

Allows you to enable or disable DCU streamer prefetcher, which is a L1 data cache prefetcher (MSR 1A4h Bit[2]).

Configuration options: [Enable] [Disabled]

## **DCU IP Prefetcher**

Allows you to enable or disable DCU IP prefetcher, which is a L1 data cache prefetcher (MSR 1A4h Bit[3]).

Configuration options: [Enable] [Disabled]

## **LLC Prefetch**

Allows you to enable or disable LLC prefetch on all threads.

Configuration options: [Disabled] [Enable]

## **Homeless Prefetch**

Allows you to enable or disable Homeless Prefetch on all threads, the setting Auto maps is program specific.

Configuration options: [Disabled] [Enable] [Auto]

## **FB Thread Slicing**

Allows you to enable or disable FB (Fill Buffer) Thread Slicing per thread.

Configuration options: [Disabled] [Enable]

## **AMP Prefetch**

Allows you to enable or disable MLC AMP prefetch (MSR 1A4h [4]).

Configuration options: [Enable] [Disabled]

## **Extended APIC**

Allows you to enable or disable extended APIC support.

Configuration options: [Disabled] [Enable]



---

Enabling this item will automatically enable VT-d and Interrupt Remapping.

---

## **APIC Physical Mode**

Allows you to enable or disable APIC physical destination mode.

Configuration options: [Disabled] [Enable]

## **PECI Trust Mode**

Allows you to set Peci trust configuration.

Configuration options: [All Peci Agents untrusted] [All Peci Agents trusted] [Use per-PECI agent trust mode]



---

The following items appear only when **PECI Trust Mode** is set to **[Use per-PECI agent trust mode]**.

---

### **Legacy Agent**

Allows you to enable or disable the legacy PECI agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **SMBus Agent**

Allows you to enable or disable the SMBus PECI agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **IE Agent**

Allows you to enable or disable the IE PECI agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **Generic Agent**

Allows you to enable or disable the generic PECI agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **eSPI Agent**

Allows you to enable or disable the eSPI PECI agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **DfxRedManu Agent**

Allows you to enable or disable the Dfx RedManu agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **DfxOrange Agent**

Allows you to enable or disable the Dfx Orange agent in trust bit enable.

Configuration options: [Disabled] [Enable]

### **DBP-F**

Allows you to enable or disable DBP-F. DBP-F can be turned off by writing into the MSR 6Dh [2:3].

Configuration options: [Enable] [Disabled]

### **IIO LLC Ways [14:0] (Hex)**

Allows you to adjust the LLC value of MSR\_IIO\_LLC\_WAYS bitmask. All bits set in the mask must be contiguous to each other.

Configuration options: [0] - [7FFF]

### **SMM Blocked and Delayed**

Allows you to enable or disable SMM Blocked and Delayed.

Configuration options: [Disabled] [Enable]

### **eSMM Save State**

Allows you to enable or disable the eSMM Save State Feature.

Configuration options: [Disabled] [Enable]

## Smbus Error Recovery

Allows you to enable or disable Smbus Error Recovery.

Configuration options: [Disabled] [Enabled]

## VMX

Allows you to enable or disable Vanderpool Technology. Changes take effect only after reboot.

Configuration options: [Disabled] [Enabled]

## Enable SMX

Allows you to enable or disable Safer Mode Extensions.

Configuration options: [Disabled] [Enabled]

## Lock Chipset

Allows you to lock or unlock the chipset.

Configuration options: [Enabled] [Disabled]

## MSR Lock Control

Allows you to enable or disable the locking of MSR 3Ah and CSR 80h. Power Good reset is needed to remove lock bits.

Configuration options: [Disabled] [Enabled]

## PPIN Control

Allows you to unlock and enable or lock and disable the PPIN control.

Configuration options: [Lock/Disable] [Unlock/Enable]

## AES-NI

Allows you to enable or disable AES-NI support.

Configuration options: [Disabled] [Enabled]

## TME, TME-MT, TDX

### Memory Encryption (TME)

Allows you to enable or disable memory encryption (TME).

Configuration options: [Disabled] [Enabled]



---

The following items appear only when **Memory Encryption (TME)** is set to **[Enabled]**.

---

### Total Memory Encryption (TME) Bypass

Allows you to enable or disable Total Memory Encryption (TME).

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



---

The following items appear only when **Socket Configuration > Uncore Configuration > Uncore General Configuration > Limit CPU PA to 46 bits** is set to **[disabled]**, and **Memory Encryption (TME)** is set to **[Enabled]**.

---

### Total Memory Encryption Multi-Tenant (TME-MT)

Allows you to enable or disable Total Memory Encryption - Multi-Tenant (TME-MT). Can be enabled only if **Socket Configuration > Uncore Configuration > Uncore General Configuration > Limit CPU PA to 46 bits** is disabled.

Configuration options: [Disabled] [Enabled]

Memory integrity

Allows you to enable or disable memory Integrity globally. This knob has no action when TDX is enabled in SPR.

Configuration options: [Disabled] [Enabled]

PSMI Configuration

Global PSMI Enable

Configuration options: [Disabled] [Enable] [Force setup]



The following items appear only when **Global PSMI Enable** is set to **[Enable]**, or **[Force Setup]**.

Socket 0 Configuration

PSMI Enable

Configuration options: [Disabled] [Enable]

Processor CFR Configuration

Displays and provides options to change the Processor CFR Settings.

Provision S3M CFR

Configuration options: [Disabled] [Enable]

Manual Commit S3M FW CFR

Configuration options: [Disabled] [Enable] [Auto]

Provision PUCode CFR

Configuration options: [Disabled] [Enable]

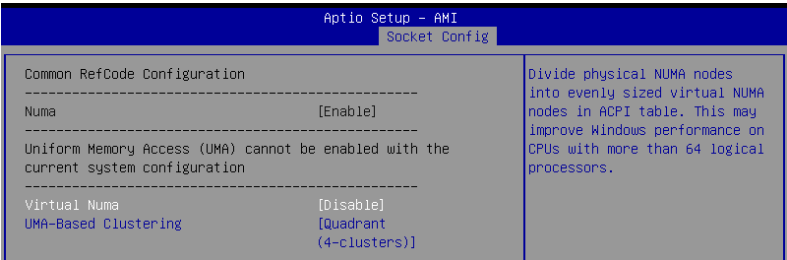
Manual commit PUCode CFR

Configuration options: [Disabled] [Enable] [Auto]

Socket CFR Revision Info

Displays each socket CFR Revision Info.

9.2 Common RefCode Configuration



Virtual Numa

Enabling this option divides physical NUMA nodes into evenly sized virtual NUMA modes in ACPI table. This may improve Windows performance on CPUs with more than 64 logical processors.

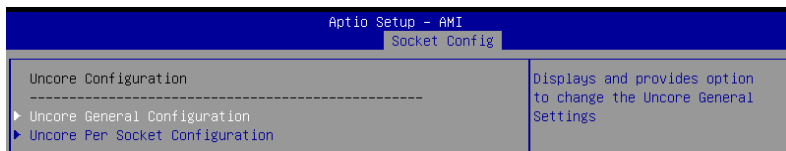
Configuration options: [Disabled] [Enable]

## UMA-Based Clustering

UMA Based Clustering options include Disable (All2All), Hemisphere (2 cluster), and Quadrant (4 cluster, not supported on ICX). These options are only valid when SNC is disabled. If SNC is enabled, UMA-Based Clustering is automatically disabled by BIOS. Configuration options: [Hemisphere (2-clusters)] [Quadrant (4-clusters)]

## 9.3 Uncore Configuration

Displays and provides option to change the Uncore Settings.



### Uncore General Configuration

Displays and provides option to change the Uncore General Settings.

#### Uncore Status

Displays uncore status

#### MMCFG Base

Allows you to select the MMCFG base. Selecting **[Auto]** will decide based on Si Compatibility.

Configuration options: [1G] [1.5G] [1.75G] [2G] [2.25G] [3G] [Auto]

#### MMCFG Size

Allows you to select the MMCFG size. Selecting **[Auto]** will decide based on Si Compatibility.

Configuration options: [64MB] [128M] [256M] [512M] [1G] [2G] [Auto]

#### MMIO High Base

Allows you to select the MMIO high base.

Configuration options: [56T] [40T] [32T] [24T] [16T] [4T] [2T] [1T] [512G] [3584T]

#### MMIO High Granularity Size

Allows you to select the allocation size used to assign mmioh resources. Total mmioh space can be up to 32xgranularity.

Configuration options: [1G] [4G] [16G] [64G] [256G] [1024G]

#### Limit CPU PA to 46 bits

Allows you to limit CPU physical address to 46 bits to support older Hyper-v. If enabled, automatically disables TME-MT.

Configuration options: [Disabled] [Enable]

## Uncore Per Socket Configuration

### CPU0

#### Bus Resources Allocation Ratio

Allows you to set bus resources allocation ratio.

Configuration options: [0] - [8]

#### HIOP STACK DISABLE

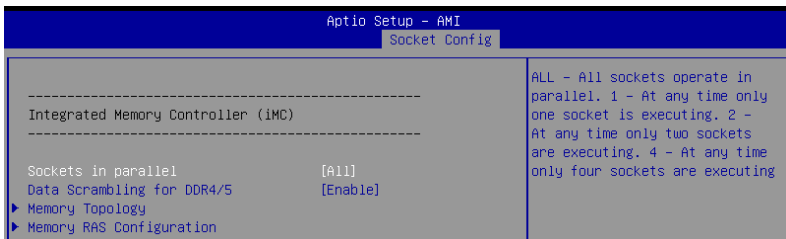
Allows you to enable or disable given HIOP STACK. Default is AUTO no stack is disabled. 1 - The stacks indicated by the bit locations are disabled. 0 - The stacks indicated by the bit locations are not modified. The stack order is abstracted so each bit 0 = stack 0 ..., bit n = stack n. For PE numbering convention bits are incrementally mapped from bit0 to instances PE(0->n) then PE(a->x) and HC(a->x). The bit setting for each stack can be overridden by BIOS based on CPU-knob compatibility.

Configuration options: [0] - [FFFF]

## 9.4 Memory Configuration



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



### Sockets in parallel

Allows you to set how many sockets are executing at any time.

- |       |   |
|-------|---|
| [ALL] | All sockets operate in parallel.                  |
| [1]   | At any one time, only one socket is executing.    |
| [2]   | At any one time, only two sockets are executing.  |
| [4]   | At any one time, only four sockets are executing. |

### Data Scrambling for DDR4/5

- |            |  |
|------------|--|
| [Disabled] | Disables this feature.                     |
| [Enable]   | Enables data scrambling for DDR4 and DDR5. |

### Memory Topology

Displays memory topology with DIMM population information.

### Memory RAS Configuration

Displays and provides options to change the memory RAS Settings.



### Enable Pcode WA for SAI PG

Allows you to enable or disable Pcode Work Around for SAI Policy group for A Step.  
Configuration options: [Disabled] [Enabled]

### Mirror Mode

Full Mirror Mode will set entire 1LM memory in system to be mirrored, consequently reducing the memory capacity by half. Partial Mirror Mode will enable the required size of memory to be mirrored. If rank sparing is enabled partial mirroring will not take effect. Enabling any type of Mirror Mode will disable XPT Prefetch.

Configuration options: [Disabled] [Full Mirror Mode]

### Memory Correctable Error Flood Policy

[Disabled] Don't deal with Memory CE flood.

[Once] Only First Memory CE will trigger SMI, and BIOS will disable this rank silicon side to trigger SMI.

[Frequency] Disable SMI when Memory CE reaches threshold within time limits.

### Correctable Error Threshold

Correctable Error Threshold (0x01 - 0x7fff) used for sparing and leaky bucket.

Configuration options: [0] - [7FFF]

### Trigger SW Error Threshold

Allows you to enable to disable sparing trigger DDR SW error match threshold.

Configuration options: [Disabled] [Enabled]

### Leaky bucket time window based interface

Allows you to enable to disable leaky bucket time window based interface for DDR.

Configuration options: [Disabled] [Enabled]



---

The following items appear only when **Leaky bucket time window based** is set to **[Enabled]**

---

### Leaky bucket time window based interface Hour

Allows you to set the leaky bucket time window based interface Hour for DDR.

Configuration options: [0] - [24]

### Leaky bucket time window based interface Minute

Allows you to set the leaky bucket time window based interface Minute for DDR.

Configuration options: [0] - [59]



---

The following items appear only when **Leaky bucket time window based** is set to **[Disabled]**

---

### Leaky bucket low bit

Allows you to set the leaky bucket low bit used for DDR.

Configuration options: [1] - [29]

### Leaky bucket high bit

Allows you to set the leaky bucket high bit used for DDR.

Configuration options: [1] - [29]

### ADDDC Sparing

Allows you to enable to disable ADDDC Sparing.

Configuration options: [Disabled] [Enabled]



The following item appears only when **ADDDC Sparing** is set to **[Enabled]**.

### Enable ADDDC Error Injection

Allows you to enable to disable ADDDC error injection, which is required forcing the interleave granularity to 64B for B/L step parts.

Configuration options: [Disabled] [Enabled]

### Patrol Scrub

Allows you to enable to disable patrol scrub.

Configuration options: [Disabled] [Enable at End of POST]

### Patrol Scrub Interval

Select the number of hours (1-24) required to complete full scrub. A value of zero means auto!

Configuration options: [0] - [24]

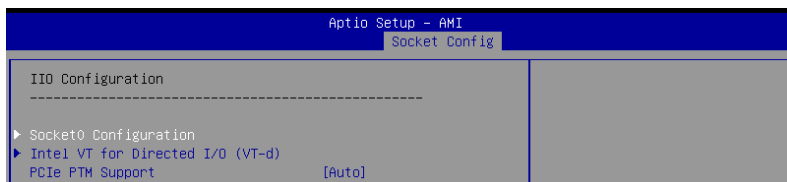
### DDR5 ECS

Allows you to enable to disable DDR5 Error Check and Scrub (ECS).

Configuration options: [Disabled] [Enabled]

## 9.5 IIO Configuration

Displays and provides option to change the IIO Settings.



### Socket0 Configuration

#### Port DMI / PCIe16(G5) / M.2

#### Link Speed

Choose Link Speed for this PCIe port.

Configuration options: [Auto] [Gen 1 (2.5 GT/s)] [Gen 2 (5 GT/s)] [Gen 3 (8 GT/s)] [Gen 4 (16 GT/s)] [Gen 5 (32 GT/s)]

## Intel VT for Directed I/O (VT-d)

Press <Enter> to bring up the Intel Virtualization Technology for Directed I/O (VT-d) configuration menu.

### Intel VT for Directed I/O

Allows you to enable or disable Intel Virtualization Technology for Directed I/O (VT-d) by reporting the I/O device assignment to VMM through DMAR ACPI Tables. To disable VT-d, X2APIC must also be disabled.

Configuration options: [Enable] [Disabled]



---

The following items appear only when **Intel VT for Directed I/O** is set to **[Enable]**

---

### DMA Control Opt-In Flag

Allows you to enable or disable DMA\_CTRL\_PLATFORM\_OPT\_IN\_FLAG in DMAR table in ACPI. Not compatible with Direct Device Assignment (DDA).

Configuration options: [Enable] [Disable]

### Pre-boot DMA Protection

Allows you to enable DMA Protection in Pre-boot environment (If DMAR table is installed in DXE and If VTD\_INFO\_PPI is installed in PEI).

Configuration options: [Enable] [Disable]

## PCIe PTM Support

Allows you to enable or disable Precision Time Management support in PCI hierarchy. **[Auto]** keeps hardware default.

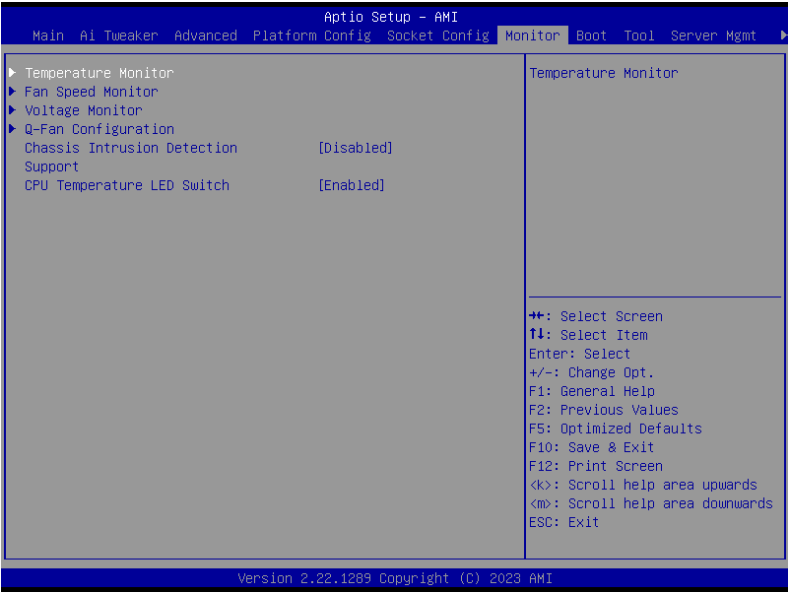
Configuration options: [Disable] [Enable] [Auto]

# 10. 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 [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 [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.

## Voltage Monitor

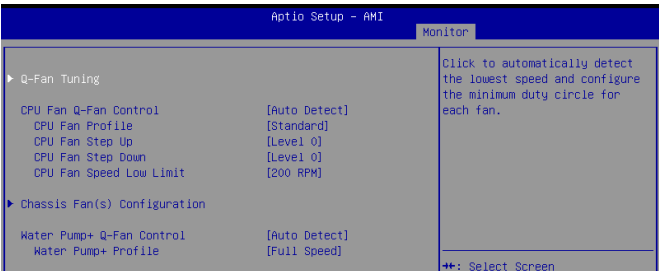
### CPU Core Voltage, 12V Voltage, 5V Voltage, 3.3V Voltage, VCCD HV 1.14V In / MC Voltage [x.xxx V]

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



For BMC models (such as Pro WS W790E-SAGE SE), **Q-Fan Configuration** will only appear when the **BMC\_SW** is set to disabled. For more information on the location of the **BMC\_SW**, please refer to the motherboard's user guide.



### 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.

### 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 up 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 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 fan/pump duty cycle.

### **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 fan will operate at the duty cycle of P3-P4. Use the <+> or <-> keys to adjust the 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 fan will operate at the duty cycle of P3-P4. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

## 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 fan will operate at the duty cycle of P2-P3. Use the <+> or <-> keys to adjust the 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 fan will operate at the duty cycle of P2-P3. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

## 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 P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the 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 P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

## Chassis Fan(s) Configuration

### Chassis Fan Q-Fan Control

Allows you to set the Chassis 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.

### 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] [Chipset] [T\_Sensor] [Multiple Sources]



---

For Multiple Sources, select up to three temperature sources and the fan will automatically change based on the highest temperature.

---

### Chassis Fan Step Up

Step up 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]



---

The following items appear only when **Chassis Fan Profile** is set to **[Manual]**.

---

### 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 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 fan/pump duty cycle.

### 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 fan will operate at the duty cycle of P3-P4. Use the <+> or <-> keys to adjust the 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 fan will operate at the duty cycle of P3-P4. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

### 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 fan will operate at the duty cycle of P2-P3. Use the <+> or <-> keys to adjust the 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 fan will operate at the duty cycle of P2-P3. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

### 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 P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the 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 P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

### 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] [Chipset] [T\_Sensor] [Multiple Sources]

### Water Pump+ Step Up

Step up 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+ 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 **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 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 fan/pump duty cycle.

#### **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 fan will operate at the duty cycle of P3-P4. Use the <+> or <-> keys to adjust the 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 fan will operate at the duty cycle of P3-P4. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

#### **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 fan will operate at the duty cycle of P2-P3. Use the <+> or <-> keys to adjust the 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 fan will operate at the duty cycle of P2-P3. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

#### **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 P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the 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 P1-P2 and the temperature source. Use the <+> or <-> keys to adjust the fan/pump duty cycle.

### **Chassis Intrusion Detection Support**

Set this item to **[Enabled]** to enable the chassis intrusion detection function.

Configuration options: [Enabled] [Disabled]

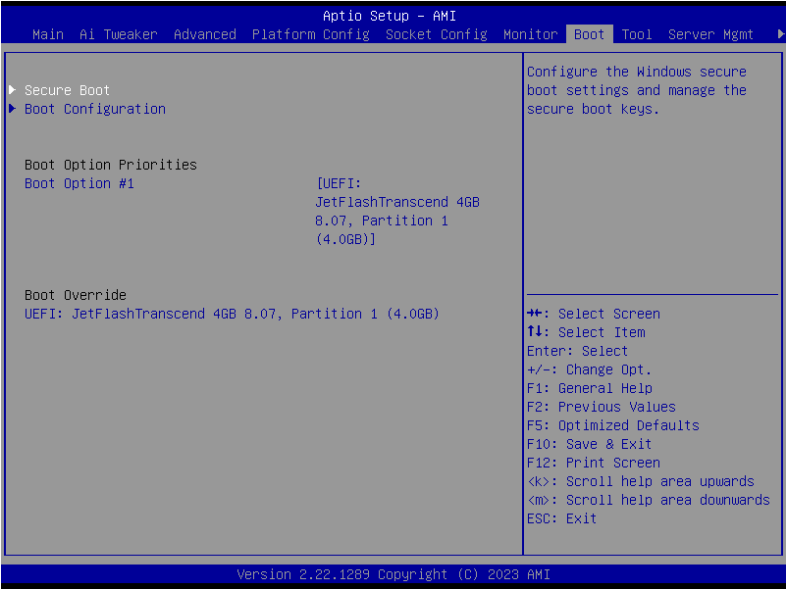
### **CPU Temperature LED Switch**

Set this item to **[Enabled]** and the CPU\_LED will light up to indicate high CPU temperature.

Configuration options: [Enabled] [Disabled]

# 11. Boot menu

The Boot menu items allow you to change the system boot options.



## 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]

### AMI Native NVMe Driver Support

Allows you to enable or disable AMI Native NVMe driver.  
Configuration options: [Disabled] [Enabled]

### Boot Sector (MBR/GPT) Recovery Policy

[Auto Recovery]	Follow UEFI Rule.
[Local User Control]	You can enter setup page and select Boot Sector (MBR/GPT) Recovery Policy to recovery MBR/GPT on the next boot time.



---

The following item appears only when **Boot Sector (MBR/GPT) Recovery Policy** is set to **[Local User Control]**.

---

### Next Boot Recovery Action

Choose the (MBR/GPT) recovery action on the next boot.

Configuration options: [Skip] [Recovery]

### 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.



# 12. 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

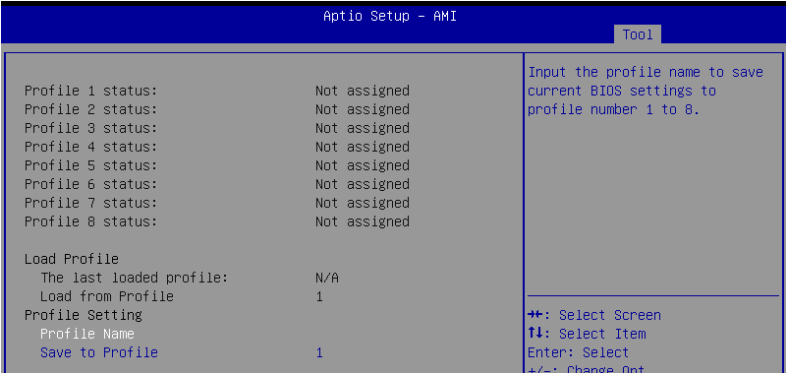
- [Reset] Reboots the system.
- [DirectKey] Boot directly into the BIOS.
- [Safe Boot] Force the system to reboot into the BIOS safe mode.

## Start ASUS EzFlash

Allows you to run ASUS EzFlash BIOS ROM Utility when you press <Enter>. Refer to the **ASUS EzFlash Utility** section for details.

# 12.1 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

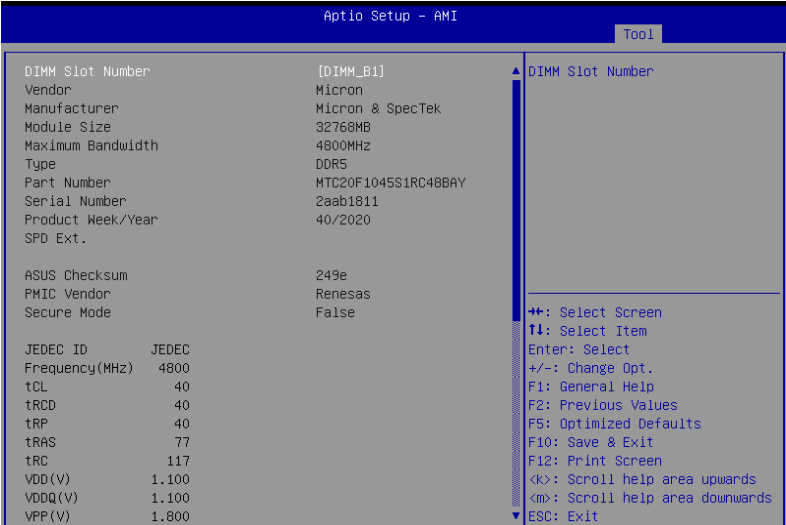
Allows you to key in a profile name.

## 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**.

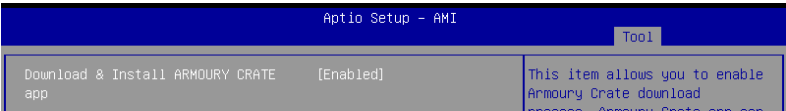
## 12.2 ASUS SPD Information

This item allows you to view the DRAM SPD information.



## 12.3 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.

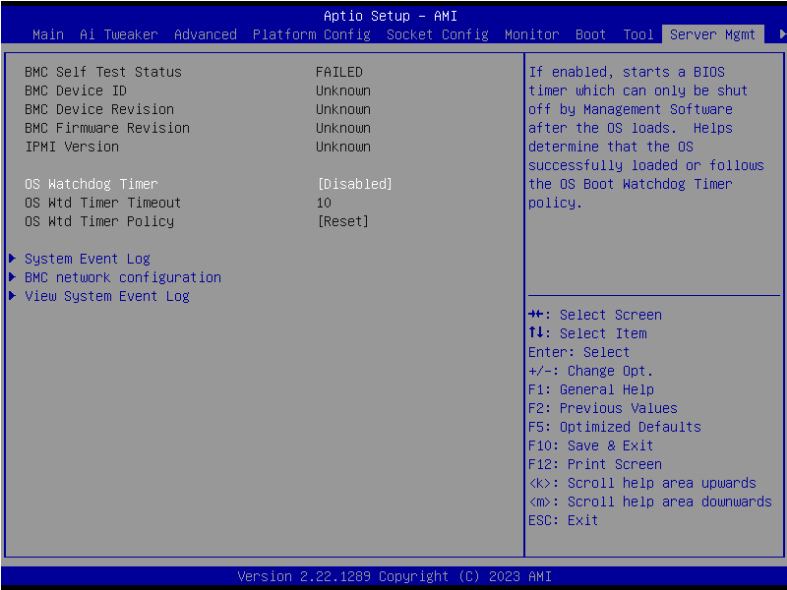


### Download & Install ARMOURY CRATE app

Configuration options: [Disabled] [Enabled]

# 13. Server Mgmt menu

The Server Mgmt menu items allow you to configure Server management settings.



## OS Watchdog Timer

When this option is set to **[Enabled]** it starts a BIOS timer which can only be shut off by Management Software after the OS loads. Helps determine if the OS successfully loaded or follows the OS Boot Watchdog Timer policy.

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



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

## OS Wtd Timer Timeout

Enter a value between 1 and 30 min for OS Boot Watchdog Expiration, Not available if OS Boot Watchdog Timer is disabled.

Configuration options: **[1]** - **[30]**

## OS Wtd Timer Policy

This item allows you to configure the how the system should respond if the OS Boot Watch Timer expires.

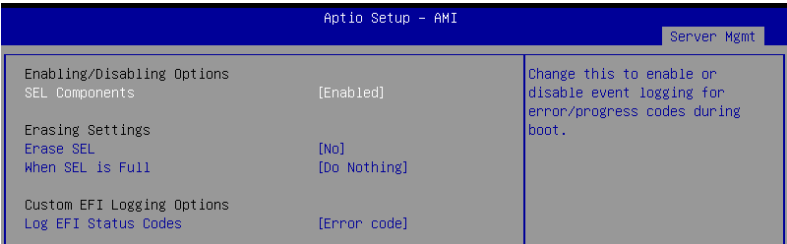
Configuration options: **[Do Nothing]** **[Reset]** **[Power Down]** **[Power Cycle]**

# 13.1 System Event Log

Allows you to change the SEL event log configuration.



All values changed here do not take effect until computer is restarted.



## SEL Components

Allows you to enable or disable event logging for error/progress codes during boot.

Configuration options: [Disabled] [Enabled]



The following item appears only when **SEL Components** is set to **[Enabled]**.

## Erase SEL

Allows you to choose options for erasing SEL.

Configuration options: [No] [Yes, On next reset] [Yes, On every reset]

## When SEL is Full

Allows you to choose options for reactions to a full SEL.

Configuration options: [Do Nothing] [Erase Immediately]

## Log EFI Status Codes

Disable the logging of EFI Status Codes or log only error code or only progress code or both.

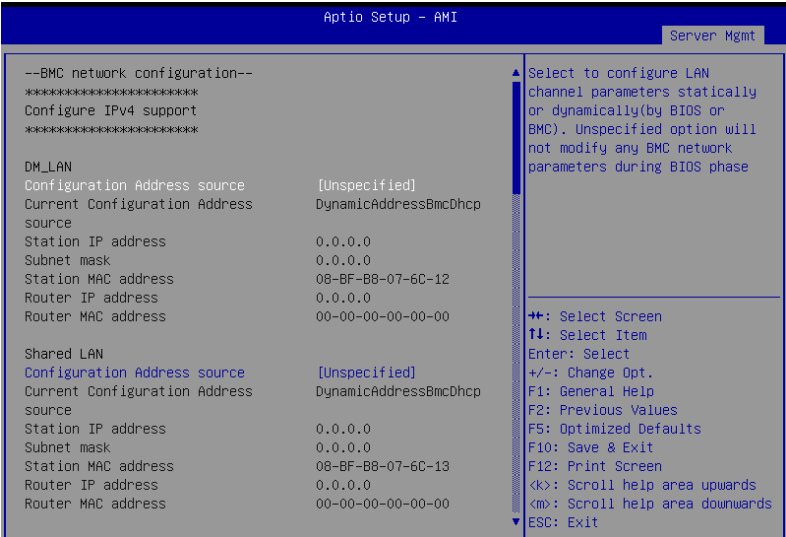
Configuration options: [Disabled] [Both] [Error code] [Progress code]

# 13.2 BMC network configuration

The sub-items in this configuration allow you to configure the BMC network parameters.



Ensure to enable the BMC\_SW on your motherboard to view and configure BMC network parameters. This LAN controller is dedicated to BMC and for the connections of IPMI only, you may not connect to the Internet using the Realtek 1Gb LAN port.



## Configure IPV4 support

### DM\_LAN / Shared LAN

#### Configuration Address source

This item allows you to configure LAN channel parameters statistically or dynamically (by BIOS or BMC). **[Unspecified]** option will not modify any BMC network parameters during BIOS phase.

Configuration options: **[Unspecified]** **[Static]** **[DynamicBmcDhcp]**



The following items are available only when **Configuration Address source** is set to **[Static]**.

#### Station IP address

Allows you to set the station IP address.

#### Subnet mask

Allows you to set the subnet mask. We recommend that you use the same Subnet Mask you have specified on the operating system network for the used network card.

## Router IP Address

Allows you to set the router IP address.

## Router MAC Address

Allows you to set the router MAC address.

## Configure IPv6 support

### DM\_LAN

#### IPv6 support

Allows you to enable or disable IPv6 support.

Configuration options: [Enabled] [Disabled]



---

The following items appear only when **IPv6 support** is set to **[Enabled]**.

---

#### Configuration Address source

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Unspecified]** option will not modify any BMC network parameters during BIOS phase.

Configuration options: [Unspecified] [Static] [DynamicBmcDhcp]



---

The following items are available only when **Configuration Address source** is set to **[Static]**.

---

#### Station IPv6 address

Allows you to set the station IPv6 address.

#### Prefix Length

Allows you to set the prefix length (maximum of Prefix Length is 128).

#### Configuration Router Lan Address source

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Unspecified]** option will not modify any BMC network parameters during BIOS phase.

Configuration options: [Unspecified] [Static] [DynamicBmcDhcp]



---

The following items are available only when **Configuration Router Lan Address source** is set to **[Static]**.

---

#### IPv6 Router1 IP address

Allows you to set the IPv6 Router1 IP address.

#### IPv6 Router1 Prefix Length Lan1

Allows you to set the IPv6 Router prefix length (maximum of Prefix Length is 128).

#### IPv6 Router1 Prefix Value Lan1

Allows you to set the IPv6 Router prefix value.

## Shared\_LAN

### IPV6 support

Allows you to enable or disable IPV6 support.

Configuration options: [Enabled] [Disabled]



---

The following items appear only when **IPV6 support** is set to **[Enabled]**.

---

### Configuration Address source

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Unspecified]** option will not modify any BMC network parameters during BIOS phase.

Configuration options: [Unspecified] [Static] [DynamicBmcDhcp]



---

The following items are available only when **Configuration Address source** is set to **[Static]**.

---

### Station IPV6 address

Allows you to set the station IPV6 address.

### Prefix Length

Allows you to set the prefix length (maximum of Prefix Length is 128).

### Configuration Router Lan Address source

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Unspecified]** option will not modify any BMC network parameters during BIOS phase.

Configuration options: [Unspecified] [Static] [DynamicBmcDhcp]



---

The following items are available only when **Configuration Router Lan Address source** is set to **[Static]**.

---

### IPV6 Router1 IP address

Allows you to set the IPV6 Router1 IP address.

### IPV6 Router1 Prefix Length Lan2

Allows you to set the IPV6 Router prefix length (maximum of Prefix Length is 128).

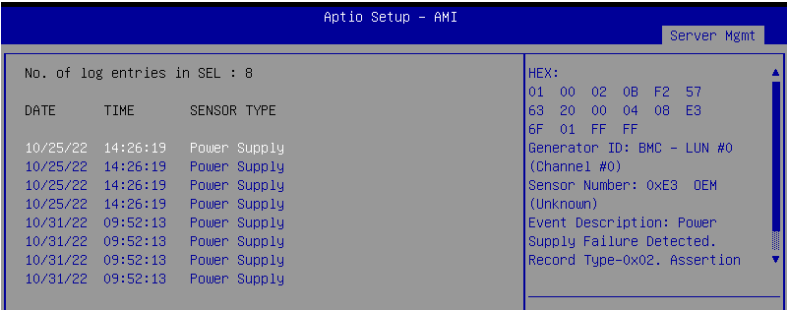
### IPV6 Router1 Prefix Value Lan2

Allows you to set the IPV6 Router prefix value.



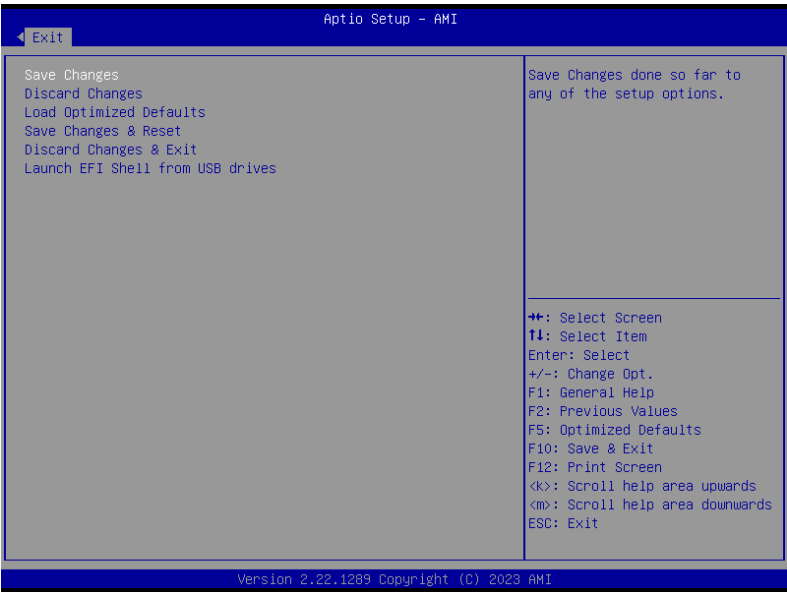
### 13.3 View System Event Log

This item allows you to view the system event log records.



# 14. 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.



## Save Changes

Save changes done so far to any of the setup options.

## Discard Changes

Discard changes done so far to any of the setup options.

## Load Optimized Defaults

Restores/loads the default values for all the setup options. When you select this option or if you press <F5>, a confirmation window appears. Select **OK** to load the default values.

## Save Changes & Reset

Resets the system after saving the changes made. 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.