



# ESC8000A-E11

## 4U Rackmount Server

### User Guide



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# Safety information

## Electrical Safety

- Before installing or removing signal cables, ensure that the power cables for the system unit and all attached devices are unplugged.
- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing any additional devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your dealer.

## Operation Safety

- Any mechanical operation on this server must be conducted by certified or experienced engineers.
- Before operating the server, carefully read all the manuals included with the server package.
- Before using the server, ensure all cables are correctly connected and the power cables are not damaged. If any damage is detected, contact your dealer as soon as possible.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Place the server on a stable surface.



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This product is equipped with a three-wire power cable and plug for the user's safety. Use the power cable with a properly grounded electrical outlet to avoid electrical shock.

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## Restricted Access Location

This product is intended for installation only in a Computer Room where:

- Access can only be gained by **SERVICE PERSONS** or by **USERS** who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken.
- Access is through the use of a **TOOL**, or other means of security, and is controlled by the authority responsible for the location.

### Heavy System

**CAUTION!** This server system is heavy. Ask for assistance when moving or carrying the system.

# About this guide

## Audience

This user guide is intended for system integrators and experienced users with at least basic knowledge of configuring a server.

## Contents

This guide contains the following parts:

**1. Chapter 1: Product Introduction**

This chapter describes the general features of the server, including sections on front panel and rear panel specifications.

**2. Chapter 2: Hardware Setup**

This chapter lists the hardware setup procedures that you have to perform when installing or removing system components.

**3. Chapter 3: BIOS Setup**

This chapter tells how to change system settings through the BIOS Setup menus and describes the BIOS parameters.

**4. Chapter 4: Driver Installation**

This chapter provides instructions for installing the necessary drivers for different system components.

## Conventions

To ensure that you perform certain tasks properly, take note of the following symbols used throughout this manual.



**DANGER/WARNING:** Information to prevent injury to yourself when trying to complete a task.



**CAUTION:** Information to prevent damage to the components when trying to complete a task.



**IMPORTANT:** Instructions that you **MUST** follow to complete a task.



**NOTE:** Tips and additional information to help you complete a task.

## Typography

### **Bold text**

Indicates a menu or an item to select.

### *Italics*

Used to emphasize a word or a phrase.

### <Key>

Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.

Example: <Enter> means that you must press the Enter or Return key.

### <Key1>+<Key2>+<Key3>

If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).

Example: <Ctrl>+<Alt>+<Del>

### Command

Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets.

Example: At the DOS prompt, type the command line: **format A: /S**

## References

Refer to the following sources for additional information, and for product and software updates.

### 1. **ASUS Control Center (ACC) user guide**

This manual tells how to set up and use the proprietary ASUS server management utility.

### 2. **ASUS websites**

The ASUS websites worldwide provide updated information for all ASUS hardware and software products. Refer to the ASUS contact information.



# Product Introduction

# 1

This chapter describes the general features of the chassis kit. It includes sections on front panel and rear panel specifications.

# 1.1 System package contents

Check your system package for the following items.

ESC8000A-E11	
Chassis	ASUS 4U Rackmount Chassis
Motherboard	ASUS KMPG-D32 Server Board
Accessory box	1 x MB Support DVD 1 x ACC Instruction Card 1 x ASMB10 Instruction Card 1 x Bag of Screws 4 x AC Power Cables 16 x VGA 6+2-pin Power Cables 8 x GPU 8-pin Power Cables 8 x GPU Air Ducts (for Nvidia/AMD) 2 x CPU Heatsinks
Optional Items	1 x Rail Kit 1 x Trend Micro Server Protect Anti-virus Software CD

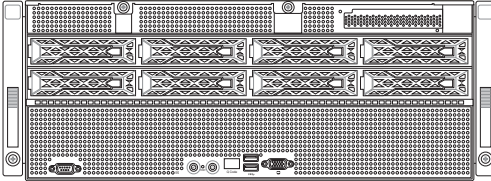


- 
- If any of the above items is damaged or missing, contact your retailer.
  - Optional items come bundled if you selected them when purchasing the system and cannot be bought separately.
-

## 1.2 Serial number label

Before requesting support from the ASUS Technical Support team, you must take note of the product's serial number containing 12 characters, such as xxSxxxxxxxxx. See the figure below.

With the correct serial number of the product, ASUS Technical Support team members can then offer a quicker and satisfying solution to your problems.



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The serial number on the ESC8000A-E11 is printed on the Asset tag.

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## 1.3 System specifications

The ASUS ESC8000A-E11 server features the ASUS KMPG-D32 server board. The server supports AMD EPYC™ 7003 Series processors plus other latest technologies through the chipsets onboard.

Model Name		ESC8000A-E11
Motherboard		KMPG-D32
Processor Support		2 x Socket SP3 (LGA 4094) AMD EPYC™ 7003 Series
Core Logic		System on Chip (SoC)
Memory	Total Slots	32 (8-channel per CPU, 16 DIMM per CPU)
	Capacity	Maximum up to 4096GB
	Memory Type	DDR4 3200/2933 RDIMM / LRDIMM / 3DS LRDIMM * Please refer to <a href="http://www.asus.com">www.asus.com</a> for latest memory AVL update
	Memory Size	64GB, 32GB, 16GB (RDIMM) 64GB, 128GB (LRDIMM) 64GB, 128GB, 256GB (LRDIMM 3DS / 3DS RDIMM) * Refer to <a href="http://www.asus.com/support">www.asus.com/support</a> for more information
Expansion Slots	Total PCI/PCIe Slots	11
	Slot Type	<b>Rear:</b> 8 x PCIe x16 (Gen4 x16 link), FHFL for dual-slot GPU cards 1 x PCIe x16 (Gen4 x16/x8 link), FHFL or 1 x OCP3.0 (Gen4 x16 link)* <b>1 x PCIe x8 (Gen4 x8 link), LPHL (optional)</b> <b>Front:</b> 1 x PCIe x16 (Gen4 x8 link), FHHL * For the configuration with an OCP3.0 socket, the front PCIe x8 slot will be limited to support PIKE cards only.
Storage	SATA Controller	<b>Optional kit(s):</b> ASUS PIKE II 3008 8-port SAS HBA card ASUS PIKE II 3108 8-port SAS HW RAID card 6Gbps SATA support
	SAS Controller	<b>Optional kit(s):</b> ASUS PIKE II 3008 8-port SAS HBA card ASUS PIKE II 3108 8-port SAS HW RAID card 12Gbps SAS support
	NVMe Controller	CPU integrated to support 2 NVMe devices

*(continued on the next page)*

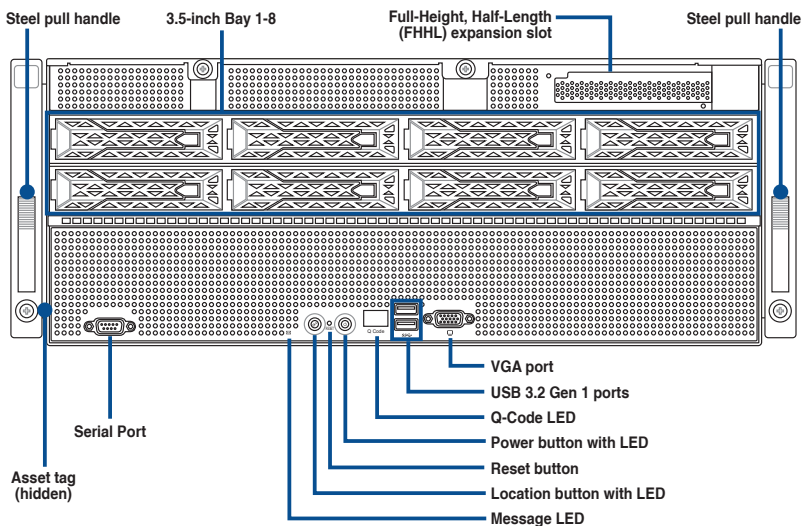
Model Name		ESC8000A-E11
Storage Bays		8 x 3.5" Front Hot-swap Storage Bays - Backplane supports up to 8x SATA/SAS/NVMe drives* - For storage bay location numbers, see the section <b>Storage Device</b> . * SATA/SAS drive support requires an optional HBA/RAID card.
Networking	LAN	<b>Optional OCP 3.0 Socket:</b> Supports up to 200GbE or HDR InfiniBand adapters
Graphic	VGA	BMC integrated (Aspeed AST2600)
Front I/O		2 x USB 3.2 Gen 1 ports 1 x VGA port 1 x COM port
Rear I/O		1 x Management port (RJ-45)
Switch/LED		<b>Front:</b> 1 x Q-Code/Port 80 LED 1 x Power switch/LED 1 x Location switch/LED 1 x Message LED <b>Rear:</b> 1 x Location LED
OS Support		Please find the latest OS support from <a href="http://www.asus.com/">http://www.asus.com/</a>
Management Solution		<b>Out of Band Remote Hardware</b> Onboard ASMB10-iKVM
		<b>Software</b> ASUS Control Center Enterprise
Regulatory Compliance		BSMI, CE, FCC (Class A)
Dimension (HH x WW x DD)		798 mm x 439 mm x 175.6 mm (4U)
Power Supply / Power Rating		2+2 Redundant 3000W 80PLUS Titanium Power Supply or 2+2 Redundant 2200W 80PLUS Titanium Power Supply
Environment		Operating temperature: 10°C ~ 35°C Non operating temperature: -40°C ~ 70°C Non operating humidity: 20% ~ 90% (Non-condensing)



- Specifications are subject to change without notice.
- Refer to [www.asus.com](http://www.asus.com) for the latest OS AVL update.

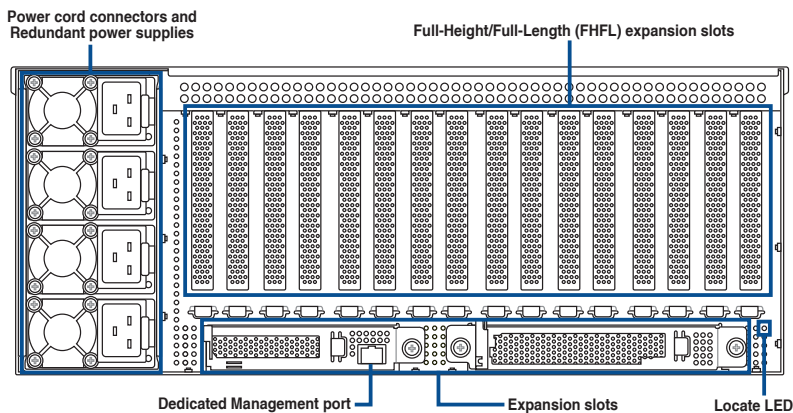
## 1.4 Front panel features

The barebone server features a simple yet stylish front panel. The power and reset buttons, LED indicators, and USB ports are located and easily accessible from the front panel.



## 1.5 Rear panel features

The expansion slots and system power sockets are located on the rear panel of the server.

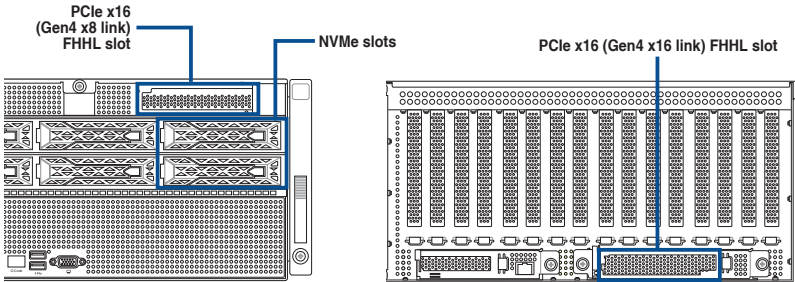


The Dedicated Management port is for ASUS ASMB10-iKVM only.

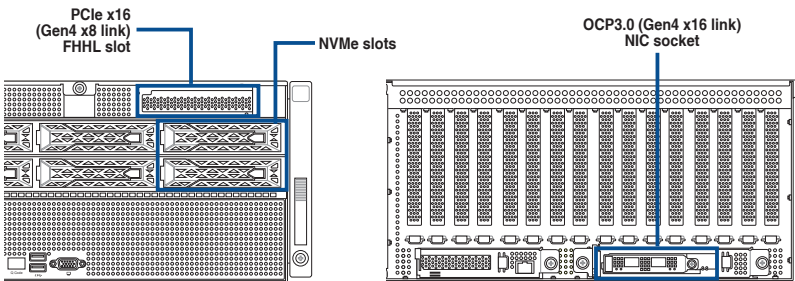
## 1.6 Base Unit SKU Options

In addition to support for eight (8) dual-slot GPU expansion cards, the ESC8000A-E11 server also comes with expansion slots that are configured in four (4) base unit SKUs to meet various expansion requirements.

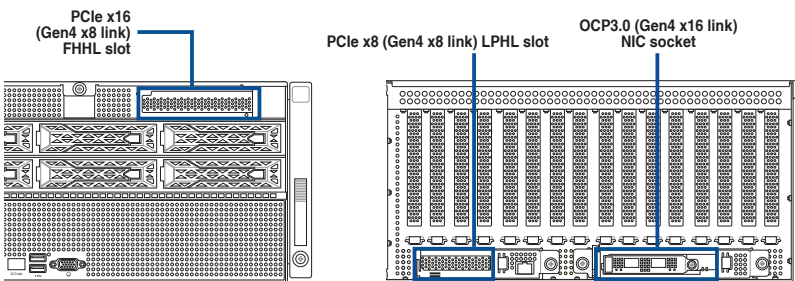
### 1.6.1 Support for 2 PCIe + 2 NVMe



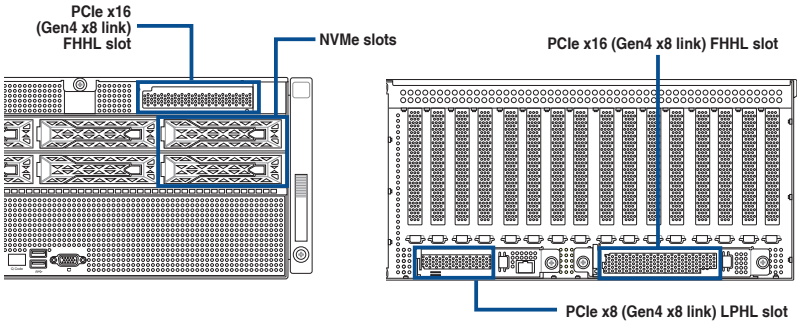
### 1.6.2 Support for 1 PCIe + 1 OCP3.0 + 2 NVMe



### 1.6.3 Support for 3 PCIe



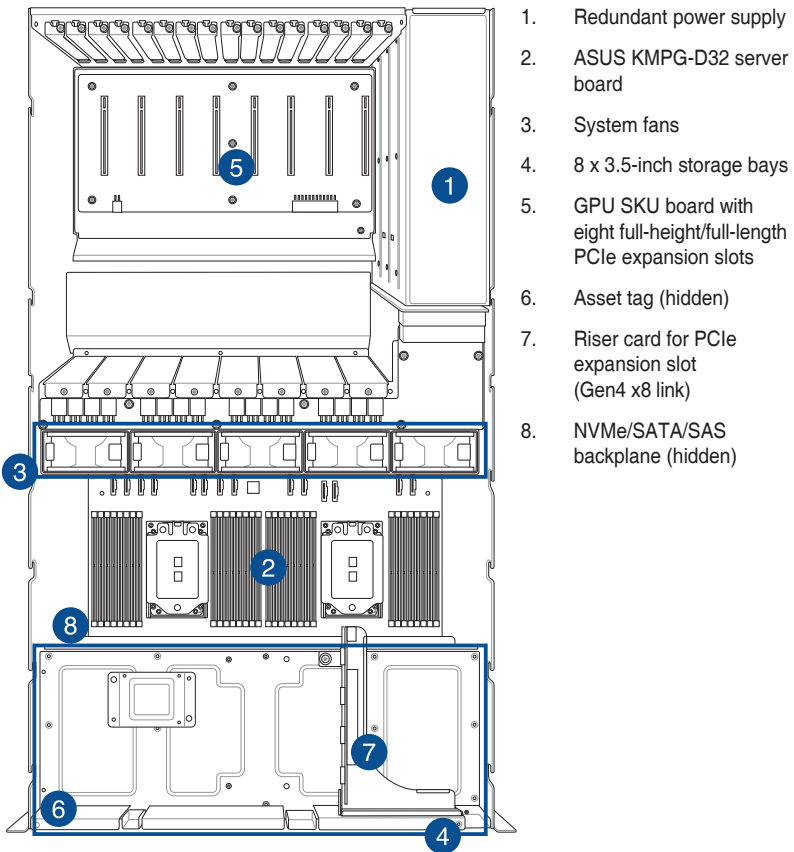
# 1.6.4 Support for 3 PCIe + 2 NVMe





## 1.7 Internal features

The barebone server includes the basic components as shown.



The barebone server does not include a floppy disk drive or an optical drive. Connect a USB floppy disk drive to any of the USB ports on the front or rear panel if you need to use a floppy disk.

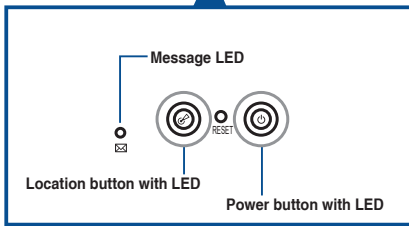
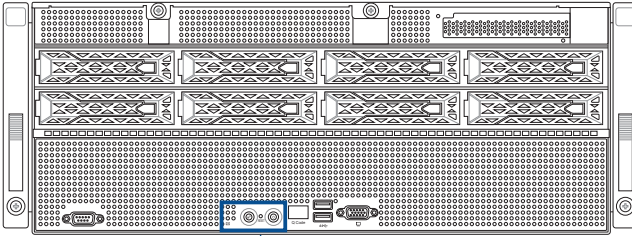


A protection film is pre-attached to the front cover before shipping. Remove the protection film before turning on the system for sufficient heat dissipation.

**WARNING**  
HAZARDOUS MOVING PARTS  
KEEP FINGERS AND OTHER BODY PARTS AWAY

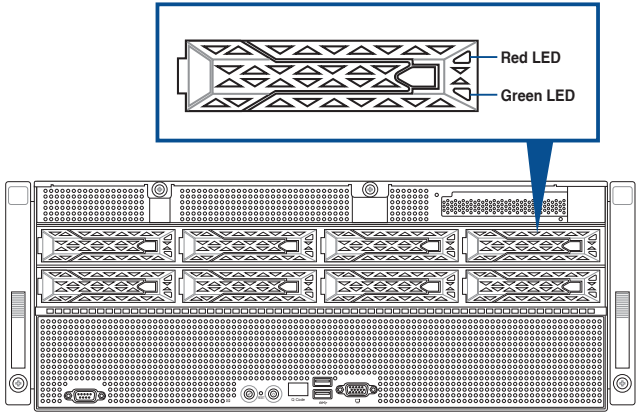
## 1.8 LED information

### 1.8.1 Front panel LEDs



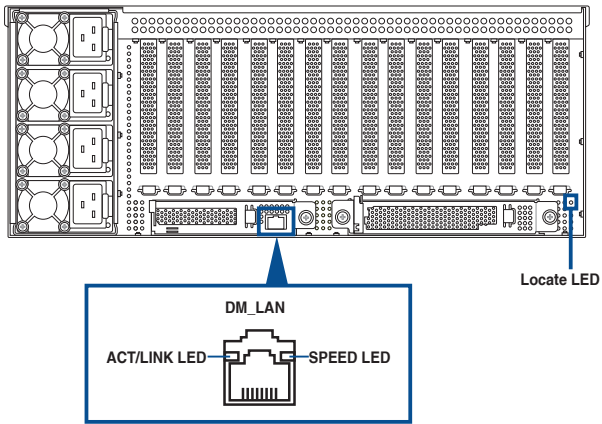
LED	Icon	Display status	Description
Message LED	✉	OFF ON	System is normal; no incoming event A hardware monitor event is indicated
Location button with LED	📍	OFF ON	Normal status Location switch is pressed (Press the location switch again to turn off)
Power button with LED	🔌	ON	System power ON

## 1.8.2 Storage device status LED



SATA/SAS Storage Device LED Description		
GREEN	ON	SATA/SAS storage device power ON
RED	ON	Storage device has failed and should be swapped immediately (For RAID card)
GREEN/ RED	Blinking	RAID rebuilding (For RAID card)
GREEN/ RED	Blinking	Locate (For RAID card)
GREEN/ RED	OFF	Storage device not found
GREEN	Blinking	Read/write data from/into the SATA/SAS/NVMe storage device

### 1.8.3 Back Panel LEDs



#### Dedicated Management LED (for ASUS ASMB10-iKVM and DM\_LAN)

ACT/LINK LED		SPEED LED	
Status	Description	Status	Description
OFF	No link	OFF	10 Mbps connection
GREEN	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection

#### Locate LED

Display status	Description
OFF	Normal status
ON	Location switch on the front panel is pressed (Press the location switch again to turn off)

# Hardware Setup

# 2

This chapter lists the hardware setup procedures that you have to perform when installing or removing system components.

## 2.1 Chassis cover

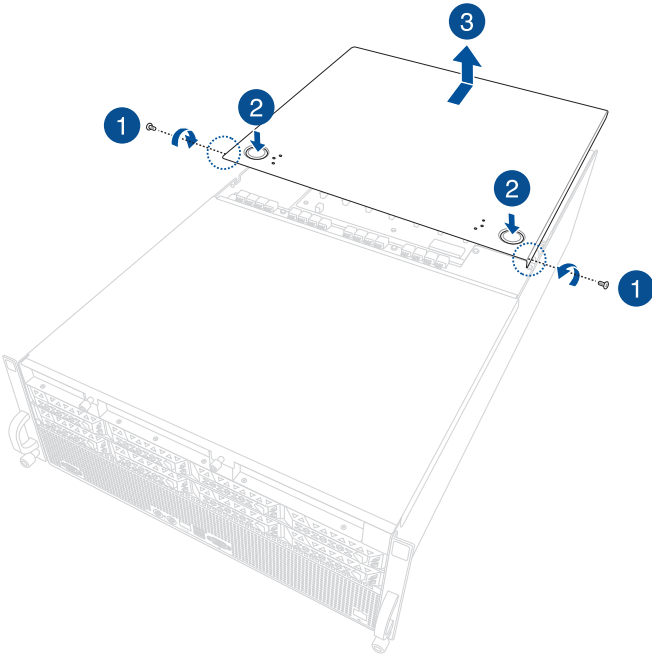
There are two parts of the chassis cover you may remove.



The diagrams in this section are for reference only. The system layout may vary with models, but the installation steps are the same for all models.

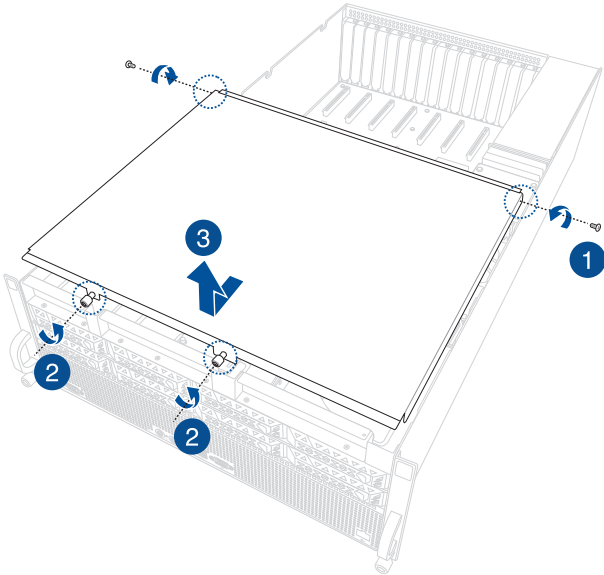
To remove the rear chassis cover:

1. Remove the two (2) screws on each side of the rear chassis cover with a Phillips screwdriver.
2. Push and hold the cover buttons down.
3. Slide the chassis cover towards the rear to disengage it from the chassis and lift the chassis cover to completely remove it from the chassis.



To remove the front chassis cover:

1. Remove the two (2) screws on each side of the rear chassis cover with a Phillips screwdriver.
2. Loosen the two (2) thumbscrews on the front of the chassis.
3. Firmly hold the cover and slide it towards the front to disengage it from the chassis and lift the chassis cover to completely remove it from the chassis.



---

A protection film is pre-attached to the system cover before shipping. Please remove the protection film before turning on the system for proper heat dissipation.

---

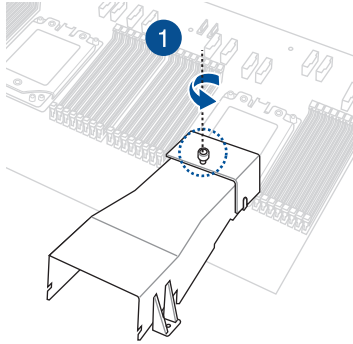
## 2.2 Air ducts



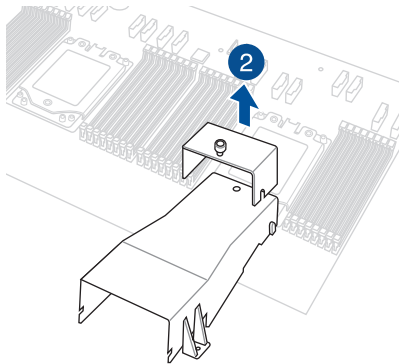
The diagrams in this section are for reference only. The system layout may vary with models, but the installation steps are the same for all models.

To remove the air duct to install a CPU:

1. Loosen the thumb screw holding the intake end of the air duct to the main body of the air duct.



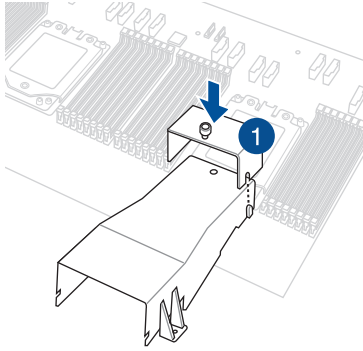
2. Lift the intake end of the air duct to remove it from the motherboard.



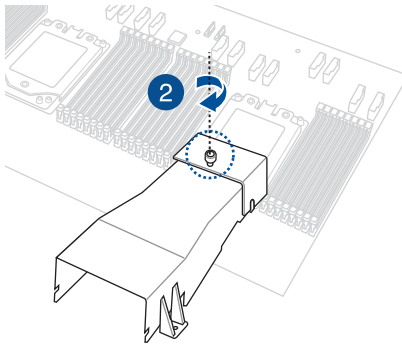


To reinstall the air duct:

1. Align and insert the slot on the intake end of the air duct to the self-locating tab on the air duct's main body.



2. Secure the air duct to the motherboard by tightening the thumb screw.

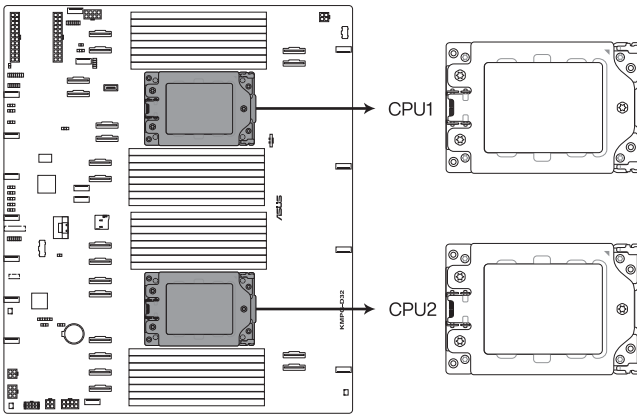


## 2.3 Central Processing Unit (CPU)

The motherboard comes with two (2) surface mount Socket SP3 sockets designed for AMD EPYC™ 7003 Series CPUs.



- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the Socket SP3.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

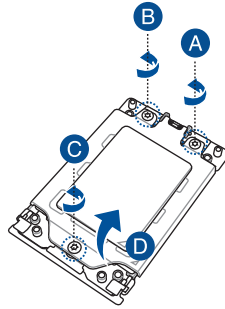


**KMPG-D32 CPU Socket SP3**

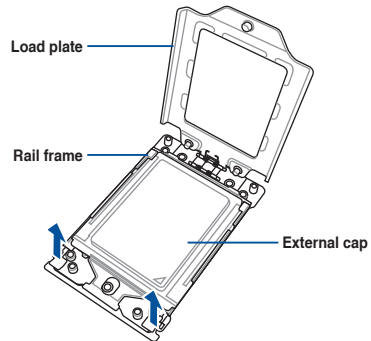
## Installing the CPU and heatsink

To install the CPU and heatsink:

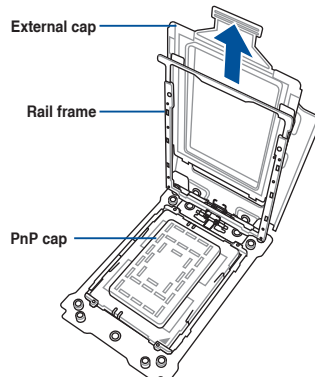
1. Remove the front cover. For more information, see the section **Chassis cover**.
2. Remove the air ducts. For more information, see the section **Air ducts**.
3. Loosen the screws on the socket one by one in the sequence shown to open the load plate.



4. Slightly lift open the rail frame.



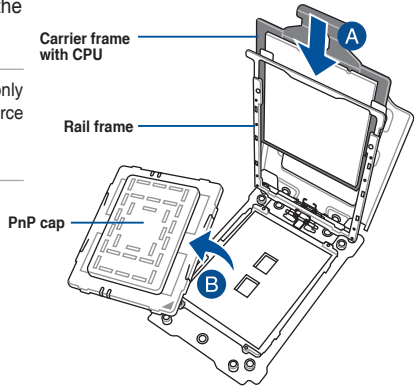
5. Slide the external cap out of the rail frame.



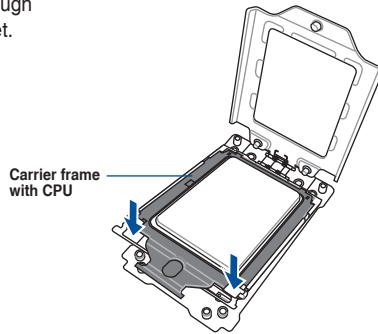
6. Slide the carrier frame with CPU into the rail frame, then remove the PnP cap.



The carrier frame with CPU fits in only one correct orientation. DO NOT force the carrier frame with CPU into the rail frame.



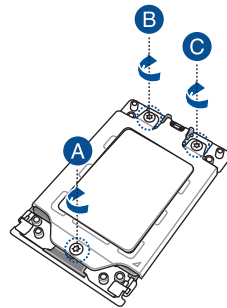
7. Gently push the rail frame just enough to let it sit on top of the CPU socket.



8. Close the load plate just enough to let it sit on top of the CPU, then secure each screw one by one in the sequence shown on the socket to completely secure the load plate.



The load plate screws are T20 models. A torque value of  $16.1 \pm 1.2$  kgf-cm ( $14.0 \pm 1.0$  lbf-in) is recommended.



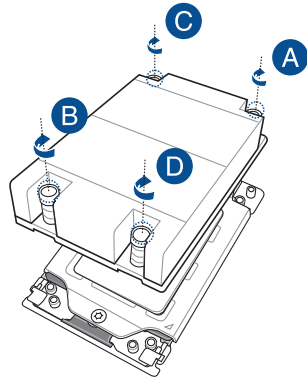
9. Align the heatsink in the correct orientation, then place the heatsink on top of the CPU socket.
10. Twist each of the four screws with a screwdriver just enough to attach the heatsink to the motherboard. When the four screws are attached, tighten them one by one in the sequence shown in the illustration to completely secure the heatsink.



---

The heatsink screws are T20 models. A torque value of  $16.1 \pm 1.2$  kgf-cm ( $14.0 \pm 1.0$  lbf-in) is recommended.

---



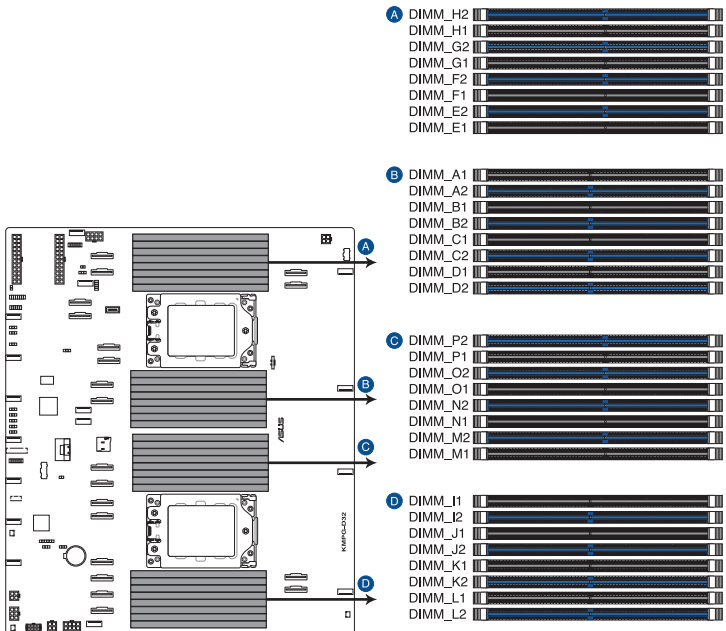
11. Reinstall the air ducts to complete the CPU and heatsink installation. For more information, refer to section **Air ducts**.

# 2.4 System memory

## 2.4.1 Overview

The motherboard comes with 32 Double Data Rate 4 (DDR4) Dual Inline Memory Modules (DIMM) sockets.

The figure illustrates the location of the DDR4 DIMM sockets:



KMPG-D32 288-pin DDR4 DIMM sockets

## 2.4.2 Memory Configurations

You may install 16GB, 32GB, 64GB, and 128GB RDIMMs into the DIMM sockets. If you are not sure on which slots to install the DIMMs, you can use the recommended memory configuration in this section for reference.



- Refer to ASUS Server AVL for the updated list of compatible DIMMs.
- Always install DIMMs with the same CAS latency. For optimum compatibility, it is recommended that you obtain memory modules from the same vendor.
- All memory modules for 2DPC should be the same.

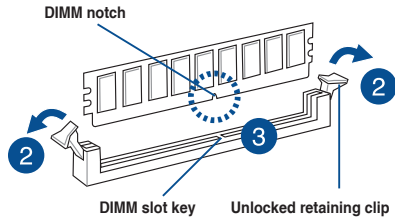
Recommended dual CPU configuration					
	DIMMs				
	2	4	8	16	32
DIMM_H2			•	•	•
DIMM_H1					•
DIMM_G2			•	•	•
DIMM_G1					•
DIMM_F2				•	•
DIMM_F1					•
DIMM_E2				•	•
DIMM_E1					•
DIMM_A1					•
DIMM_A2				•	•
DIMM_B1					•
DIMM_B2				•	•
DIMM_C1					•
DIMM_C2	•	•	•	•	•
DIMM_D1					•
DIMM_D2		•	•	•	•
DIMM_P2			•	•	•
DIMM_P1					•
DIMM_O2			•	•	•
DIMM_O1					•
DIMM_N2				•	•
DIMM_N1					•
DIMM_M2				•	•
DIMM_M1					•
DIMM_I1					•
DIMM_I2				•	•
DIMM_J1					•
DIMM_J2				•	•
DIMM_K1					•
DIMM_K2	•	•	•	•	•
DIMM_L1					•
DIMM_L2		•	•	•	•

### 2.4.3 Installing a DIMM



Ensure to unplug the power supply before adding or removing DIMMs or other system components. Failure to do so may cause severe damage to both the motherboard and the components.

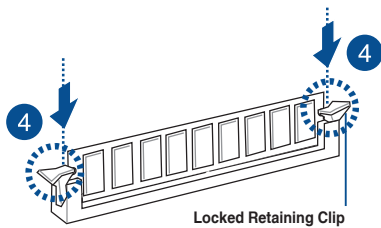
1. Unlock a DIMM socket by pressing the retaining clips outward.
2. Align a DIMM on the socket such that the notch on the DIMM matches the DIMM slot key on the socket.



A DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket in the wrong direction to avoid damaging the DIMM.

3. Hold the DIMM by both of its ends then insert the DIMM vertically into the socket. Apply force to both ends of the DIMM simultaneously until the retaining clips snap back into place.

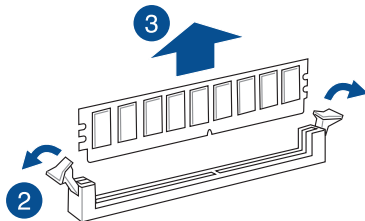
Ensure that the DIMM is sitting firmly in the DIMM slot.



Always insert the DIMM into the socket VERTICALLY to prevent DIMM notch damage.

### 2.4.4 Removing a DIMM

1. Remove the chassis cover. For more information, see the section **Chassis cover**.
2. Simultaneously press the retaining clips outward to unlock the DIMM.
3. Remove the DIMM from the socket.

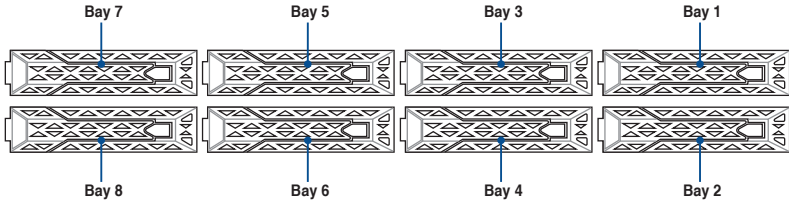


Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it springs out with extra force.



## 2.5 Storage devices

The system supports eight (8) 3.5" SATA/SAS or eight (8) 2.5" hot-swap NVMe storage devices. Storage devices installed on storage device trays connect to the motherboard or HBA/RAID card via the NVMe/SATA/SAS backplane.

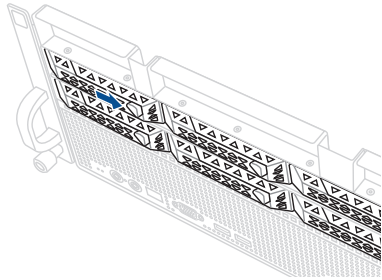


- Bays 1 to 4 support NVMe/SATA/SAS. SATA/SAS support requires an optional HBA/RAID card. (supports tri-mode card)
- All bays support 3.5"/2.5" drives with trays.

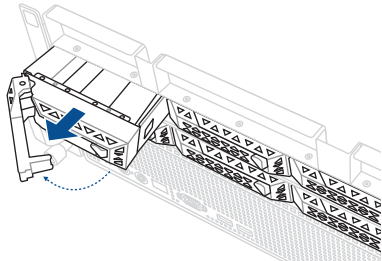
### 2.5.1 Installing a 3.5-inch storage device

To install a 3.5-inch storage device:

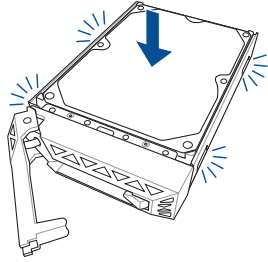
1. Press the spring lock.



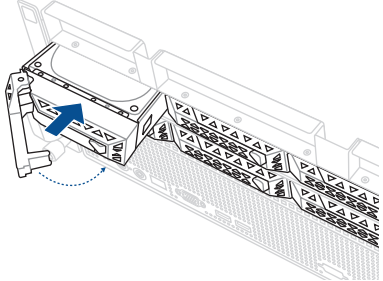
2. Pull the tray lever outwards to remove the storage device tray.



3. Prepare the 3.5" storage device then place the 3.5" storage device into the tray until it clicks into place.



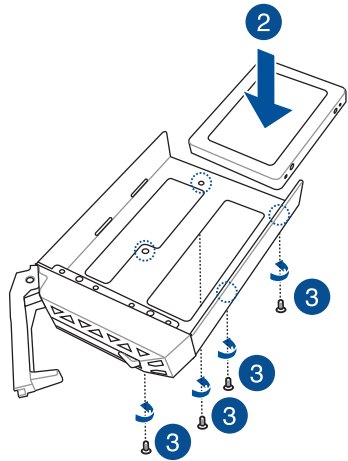
4. Push the drive tray and HDD assembly all the way into the depth of the bay until the tray lever and spring lock click and secure the drive tray in place.
5. Repeat steps 1 to 4 to install the other 3.5" storage devices.



- 
- When installed, the SATA/SAS connector on the drive connects to the SATA/SAS/NVMe interface on the backplane.
  - The drive tray is correctly placed when its front edge aligns with the bay edge.
-

## 2.5.2 Installing a 2.5-inch storage device

1. Follow steps 1 and 2 of the **Installing a 3.5-inch storage device** section to remove the drive tray from the chassis.
2. Prepare the 2.5" storage device and align it to the screw holes on the bottom of the drive tray.
3. Secure the 2.5" storage device to the drive tray using the bundled screws.



4. Follow step 4 of the **Installing a 3.5-inch storage device** section to replace the drive tray.



- When installed, the SATA/SAS/NVMe connector on the drive connects to the SATA/SAS/NVMe interface on the backplane.
- The drive tray is correctly placed when its front edge aligns with the bay edge.

5. Repeat steps 1 to 4 to install the other 2.5" storage devices.

## 2.6 Expansion slots



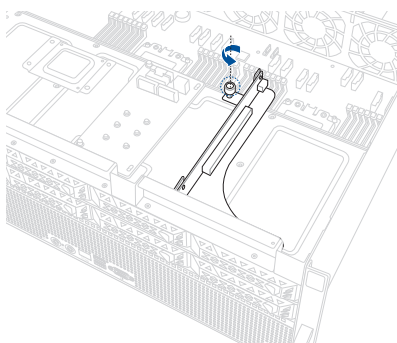
Ensure to unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.

### 2.6.1 Installing an expansion card to the front PCIe riser card bracket (on select models)

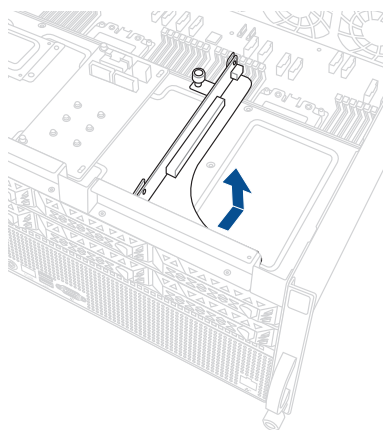
The server system comes pre-installed with a front riser card bracket that supports one x16 slot (Gen4 x8 link) for installing a full-height, half-length PCIe expansion card.

To install a PCIe expansion card to the front PCIe riser card bracket:

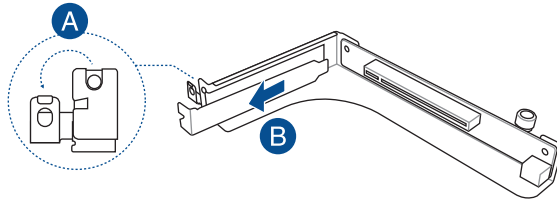
1. Loosen the screw that secures the riser card bracket to the chassis.



2. Firmly hold the riser card bracket, slide it towards the back of the chassis to unlock it, then pull it up to detach it from the chassis.



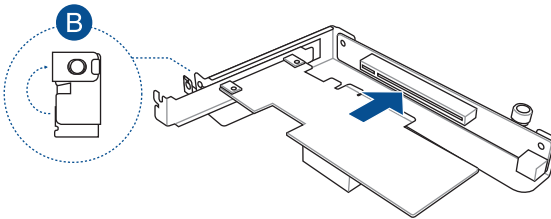
3. Place the riser card bracket on a flat and stable surface.
4. Push the metal bracket lock counter clockwise (A) until the metal bracket can be removed, then remove the metal bracket (B).



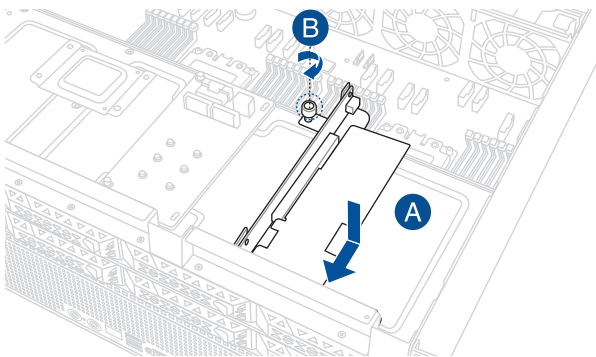
5. Insert the expansion card into the PCIe slot (A). Ensure that the golden fingers are totally inserted into the slot, then push the metal bracket lock clockwise until it locks and secures the expansion card to the riser card bracket (B).



Before installing an expansion card, read the documentation that came with it and ensure to make the necessary hardware settings.

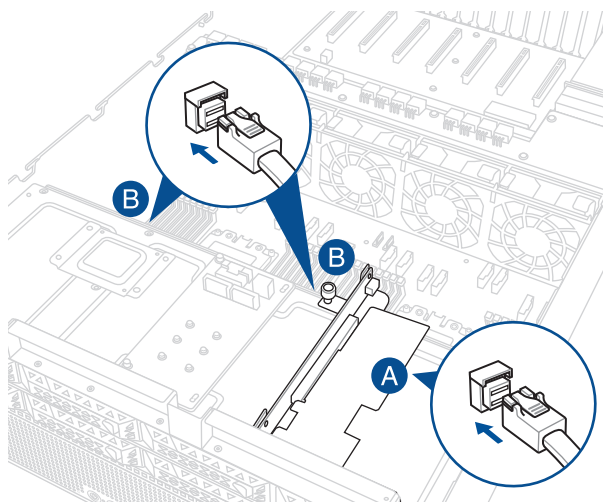


6. Align and insert the riser card and expansion card assembly into the chassis, then slide it towards the front of the chassis (A). Once in place, tighten the riser thumbscrew (B).

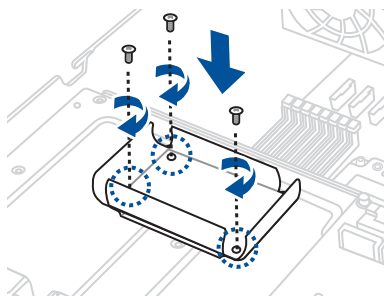


## 2.6.2 Installing an ASUS PIKE II card

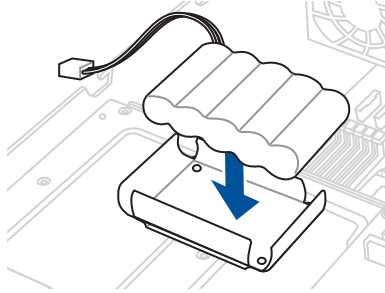
1. Prepare the ASUS PIKE II card.
2. Follow steps 1-6 from the section **Installing an expansion card to the front PCIe expansion card bracket** to install the card to the riser bracket.
3. Connect the mini-SAS HD cables from the ASUS PIKE II card (A) to the NVMe/SATA/SAS backplane (B). Refer to the section **NVMe/SATA/SAS backplane** for the locations of the mini-SAS connectors.



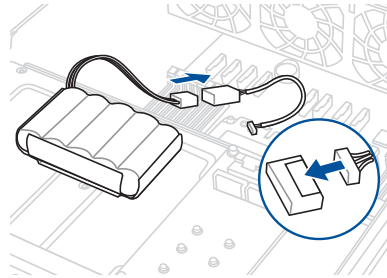
4. Align the three screw holes on the Cache Vault Power Module clip to the three screw holes on the Cache Vault bracket, then secure the clip with the three (3) bundled screws and three (3) bundled nuts.



5. Align and install the Cache Vault Power Module into the Cache Vault Power Module clip.

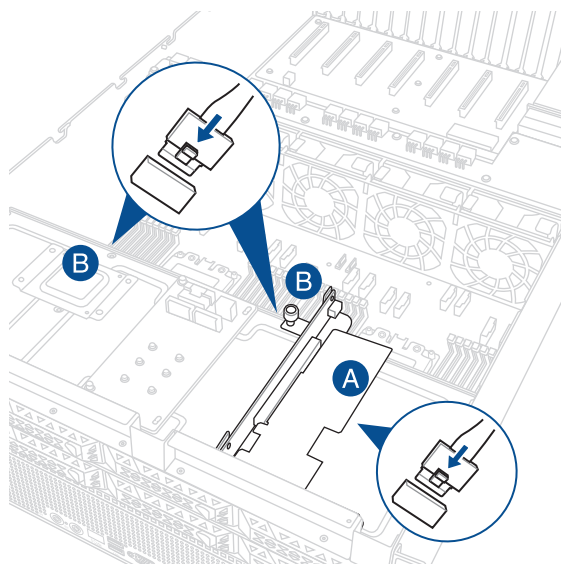


6. Connect the cable extender to the Cache Vault Flash Module (A), then connect the cable to the Cache Vault Power Module (B) to complete.



## 2.6.3 Installing an HBA/RAID card

1. Prepare the HBA/RAID card.
2. Follow steps 1-6 from **The front PCIe riser card bracket** to install the card to the riser bracket.
3. Connect the Slimline SAS cables from the HBA/RAID card (A) to the NVMe/SATA/SAS backplane (B). Refer to the section **NVMe/SATA/SAS backplane** for the locations of the SLMPCIE connectors.



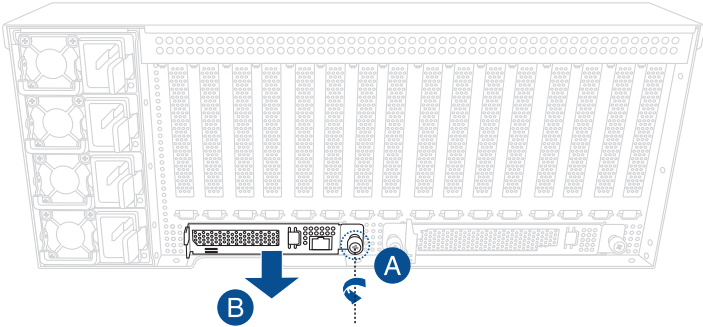
- The illustration above is for reference only.
- For more information or assistance, please refer to [www.asus.com](http://www.asus.com).



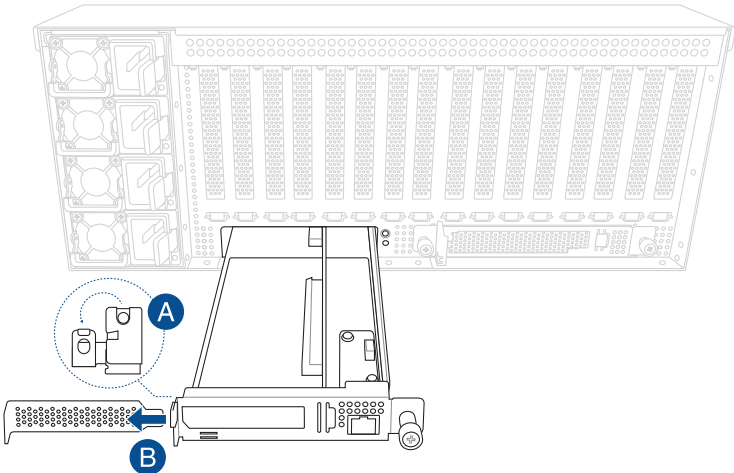
## 2.6.4 Installing an expansion card to the rear left PCIe expansion card bracket (on select models)

To install a PCIe expansion card to the rear left riser card bracket:

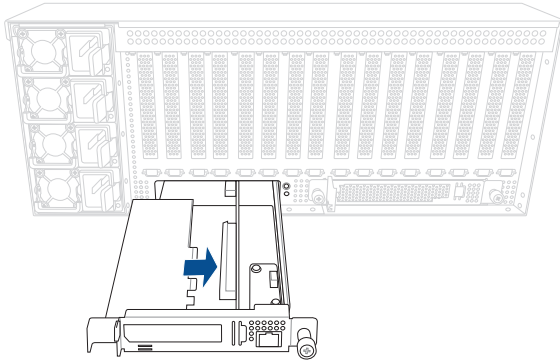
1. Loosen the thumb screw that secures the riser card bracket to the chassis (A). Firmly hold and pull the riser card bracket out and away from the chassis to detach it from the chassis (B).



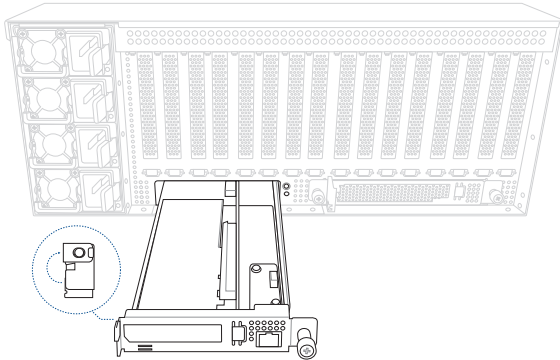
2. Flip the metal bracket lock open (A) then slide the metal bracket out of the left PCIe riser card bracket (B) and remove it.



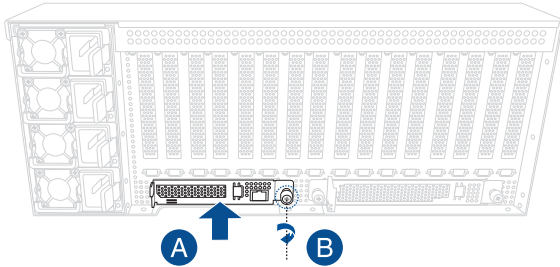
3. Prepare your expansion card and insert it into the PCIe x8 slot on the left PCIe riser card bracket.



4. Once your expansion card is installed, flip the metal bracket lock back to secure the expansion card to the bracket.



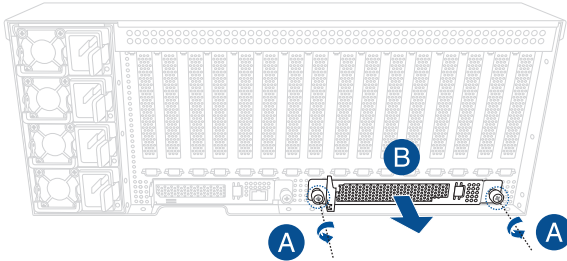
5. Push the riser card bracket back into the chassis until it is seated firmly in place (A), then secure it with the thumbscrews (B).



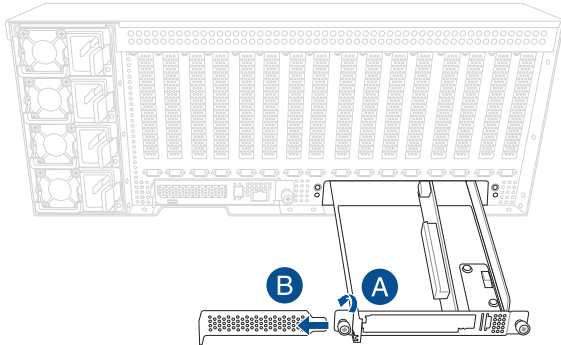
## 2.6.5 Installing an expansion card to the rear right PCIe expansion card bracket (on select models)

To install a PCIe expansion card to the rear right riser card bracket:

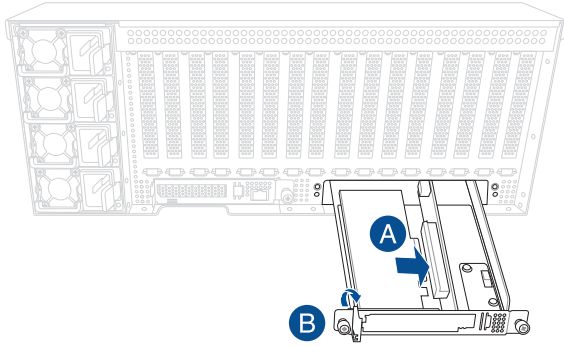
1. Loosen the two (2) thumb screws securing the riser card bracket to the chassis (A). Firmly hold and pull the riser card bracket out and away from the chassis to detach it (B).



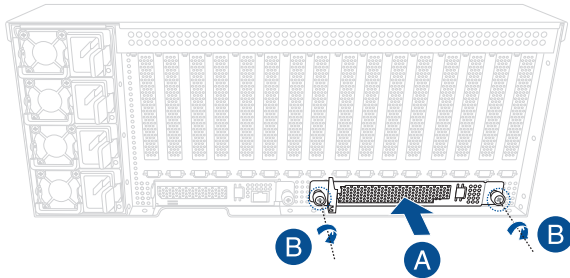
2. Flip the metal bracket lock up (A), and slide out the metal bracket (B).



3. Insert and push the card all the way into the PCIe slot on the riser card (A), then flip the metal bracket lock back down to secure the card to the riser card bracket (B).



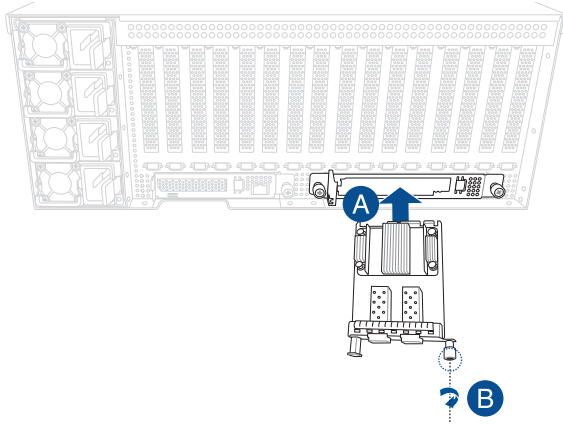
4. Push the riser card bracket back into the chassis until it is seated firmly in place (A), then secure it with the thumbscrews (B).



## 2.6.6 Installing an OCP 3.0 card to the rear right OCP 3.0 socket board (on select models)

To install an OCP 3.0 card to the rear right socket board:

1. Insert and push the OCP 3.0 card all the way into the socket board (A), then secure the card with the thumb screw (B).



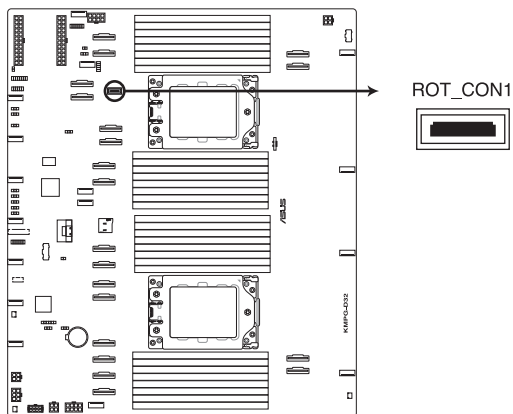
## 2.6.7 (optional) Installing the PFR module

The optional PFR module will come pre-installed on your system and is connected to the PFR module connector on your motherboard.



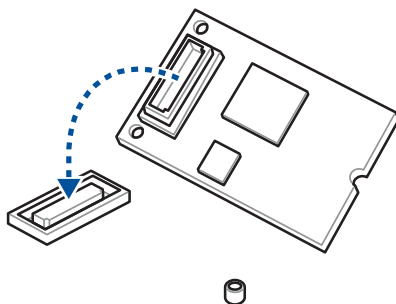
- The illustration below is for reference only.
- For more information or assistance, please refer to [www.asus.com](http://www.asus.com).

1. Locate the PFR module connector on your motherboard.

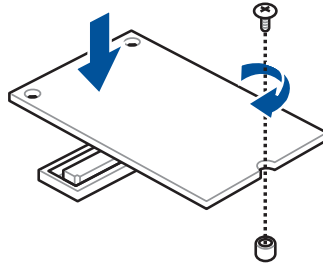


**KMPG-D32 PFR module connector**

2. Align and connect the PFR module to the PFR module connector.



3. Push the PFR module down so that it is seated securely on the PFR module connector, then secure it using a screw.

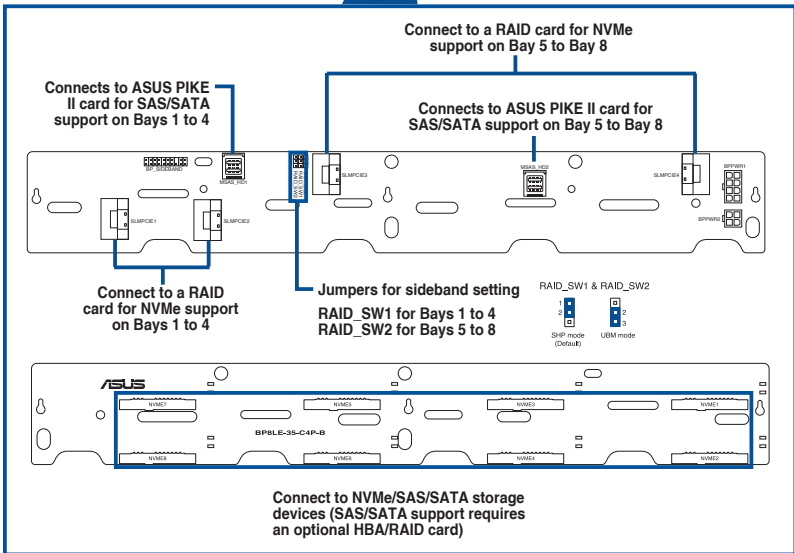
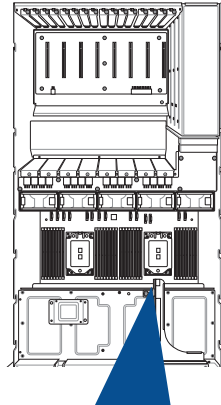


## 2.7 Cable connections



The bundled system cables are pre-connected before shipment. You do not need to disconnect these cables unless you remove the pre-installed components to install additional devices.

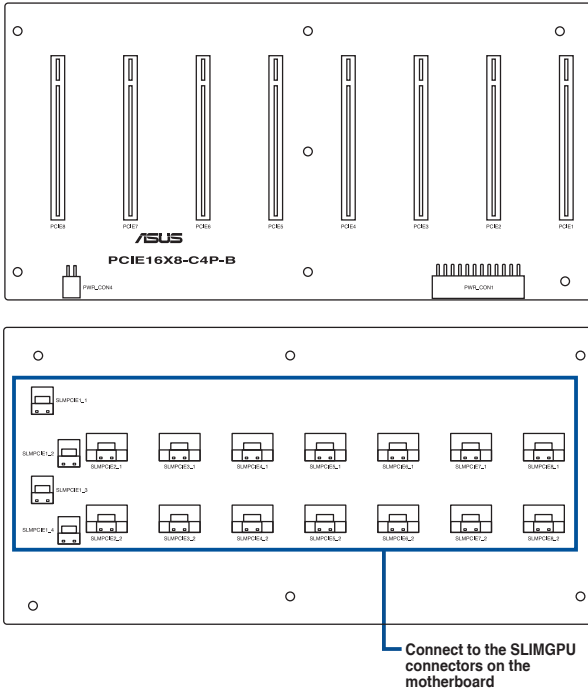
### 2.7.1 NVMe/SATA/SAS backplane



If a RAID card is connected to SLMPCE3 and SLMPCE4 connectors to support NVMe storage devices on storage bays 5 to 8, make sure the RAID\_SW2 jumper is set to 2-3.



## 2.7.2 PCIe SKU board



## 2.8 Removable/optional components

You may need to remove previously installed system components when installing or removing system devices. You may need to install the optional components into the system. This section tells how to remove/install the following components:

1. GPU fans
2. Redundant power supply units

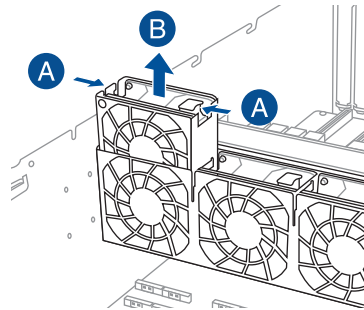


Ensure that the system is turned off before removing any components.

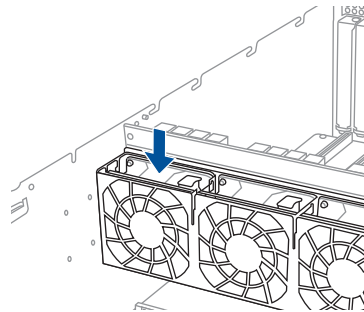
## 2.8.1 GPU fans

To uninstall the GPU fans:

1. Press the latch inwards (A) to release the GPU fan, then lift the fan from the fan cage (B).
2. Set the fan aside.
3. Repeat steps 1 to 2 to uninstall the other GPU fans.



To reinstall the GPU fans, insert the fan into the fan cage. Ensure the fan connector is seated firmly within the cable holder.



## 2.8.2 Redundant power supply units



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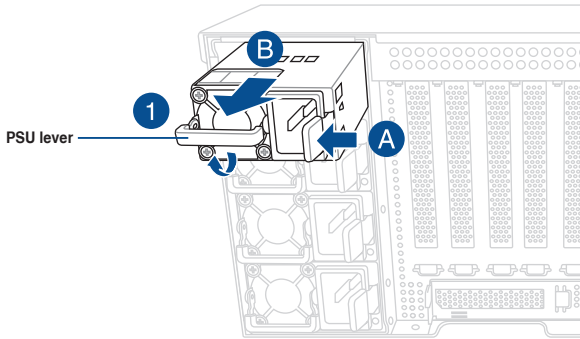
We recommend that you use both of your hands in performing the following steps.

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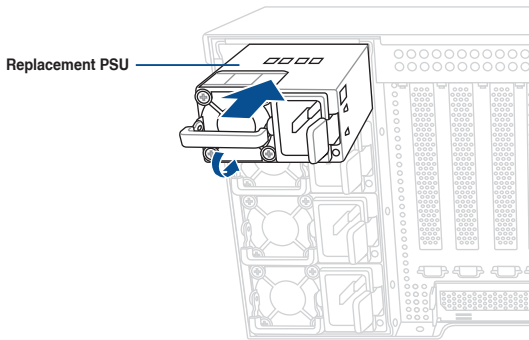
To replace a power supply unit (PSU):

1. Lift up the PSU lever.

2. Hold the PSU lever, press the PSU latch (A) then carefully pull the PSU out of the system chassis (B).



3. Prepare the replacement PSU.
4. Align and insert the replacement PSU into the empty PSU bay until it clicks in place.



- The system automatically combines the two power supply modules as a single one. The combined output power varies with input voltages.
- To enable the hot-swap feature (redundant mode), keep the total power consumption of the system under the maximum output power of an individual power supply module.



- Always use PSUs with the same watt and power rating. Combining PSUs with different wattages may yield unstable results and potential damage to your system.
- For a stable operating environment, make sure that at least two (2) working power supply units are connected before turning on the system.
- For a steady power input, use only the power cables that come with the server system package.

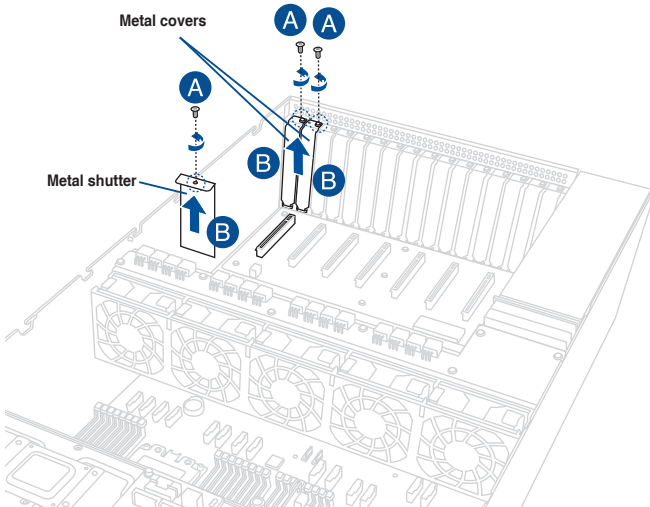
## 2.9 Installing GPU cards



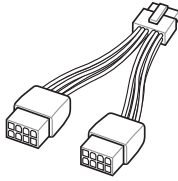
- Use both of your hands in performing the following steps.
- Read the documentation that comes with your GPU card before installing them.
- When installing more than one GPU card, it is recommended to install the cards in the following order: PCIe1 > PCIe4 > PCIe2 > PCIe3 > PCIe5 > PCIe8 > PCIe6 > PCIe7. Refer to **PCIe SKU board** for location of the PCIe slots.

To install a GPU card to the system:

1. Remove the screws on the metal covers on the rear panel and the corresponding metal shutter at the middle of the server system (A), then remove the metal covers and the metal shutter from the chassis (B).

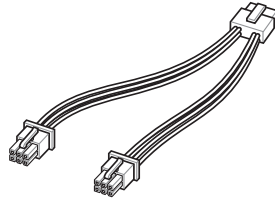


- (optional) For Nvidia® GPU-12V or above GPU cards, prepare the GPU card dongle or power cable.



Nvidia GPU-12V GPU card dongle

OR



ASUS GPU 8-pin power cable

A dongle may be required to connect the system's GPU power cable to the GPU card. The Nvidia® GPU-12V GPU card will not work, or may even cause damage to the system, if the dongle is not used.

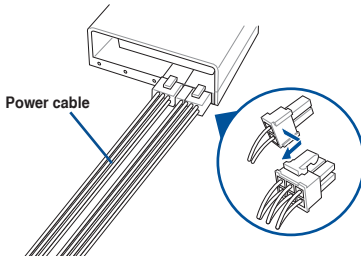
The ASUS GPU 8-pin power cable may be used to connect to the GPU card and 6-pin power connector.



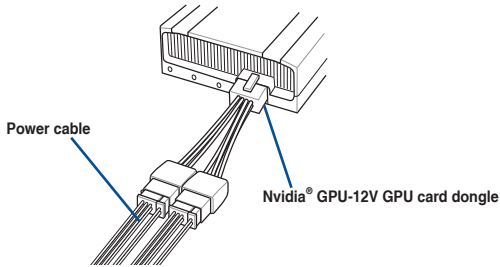
The Nvidia® GPU-12V GPU card dongle comes with your Nvidia® GPU-12V GPU card. Ask your vendor or retailer if the dongle is missing.

- Connect the GPU power cable, Nvidia® GPU-12V GPU card dongle, or ASUS GPU 8-pin power cable to the connector on the GPU card as shown.

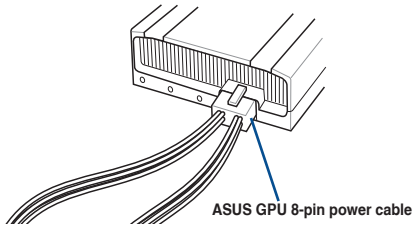
### Intel® / AMD / Nvidia® GPU cards with power cable



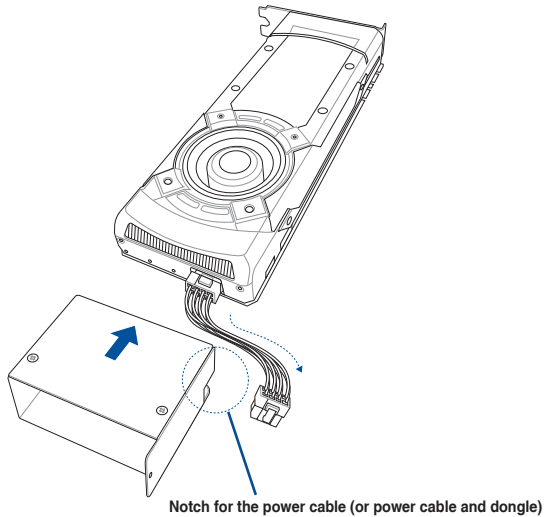
**Nvidia® GPU-12V or above GPU cards with power cable and Nvidia® GPU-12V GPU card dongle**



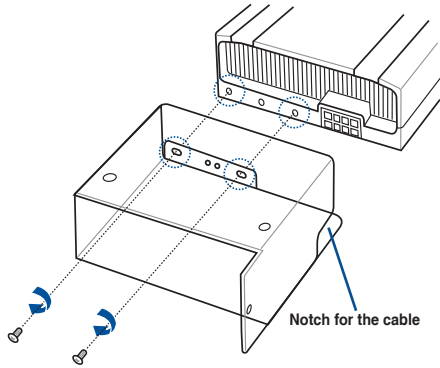
**Nvidia® GPU-12V or above GPU cards with ASUS GPU 8-pin power cable**



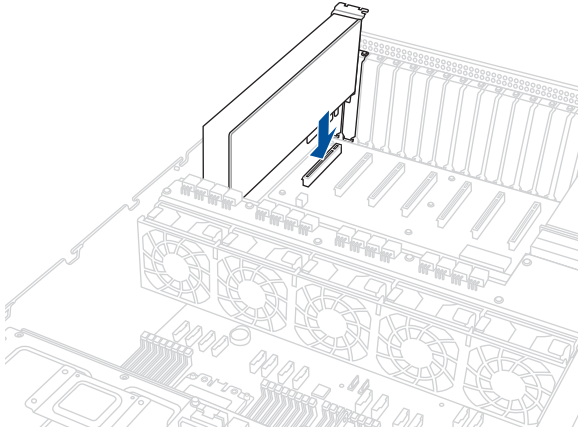
4. Align the air duct to the GPU card and pass the power cable (or power cable and dongle) through the notched area on the air duct.



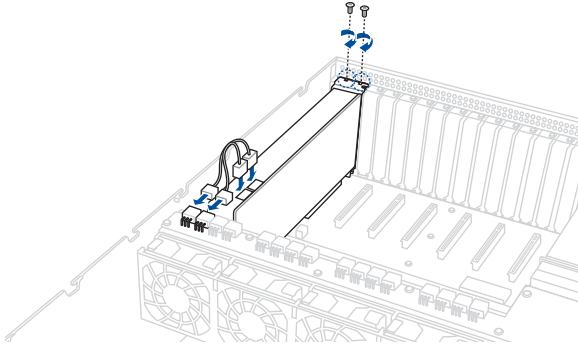
5. From inside the air duct, secure the air duct to the GPU card with two (2) screws.



6. Align and insert the golden fingers of the GPU card into the PCIe slot on the PCIe SKU board



7. Attach the other end of the power cable (6-pin power connector) to an available 6-pin power connector on the middle of the server system, then secure the GPU card with the two (2) screws that you removed earlier in step 1.



8. Repeat steps 1-7 if you need to install additional GPU cards.

## 2.10 Installing Optional Kits

To install an optional rail kit and/or cable management arm (CMA), refer to the user manual that is included with the kit.



# **BIOS Setup**

# 3

This chapter tells how to change the system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

## 3.1 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. **BUPDATER**

Updates the BIOS in DOS mode using a bootable USB flash disk drive.

Refer to the corresponding sections for details on these utilities.



---

Save a copy of the original motherboard BIOS file to a bootable USB flash disk drive in case you need to restore the BIOS in the future. Copy the original motherboard BIOS using the BUPDATER utility.

---

### 3.1.1 **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 one 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.

---

### 3.1.2 ASUS EZ Flash Utility

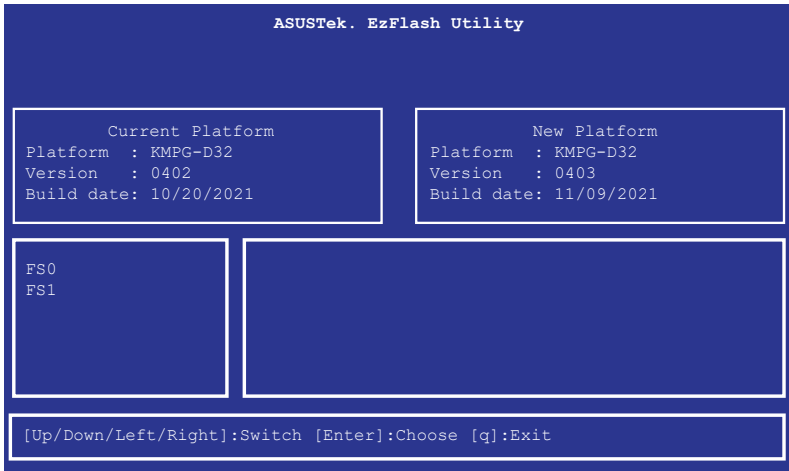
The ASUS EZ Flash Utility feature allows you to update the BIOS without having to use a DOS-based utility.



Before you start using this utility, download the latest BIOS from the ASUS website at [www.asus.com](http://www.asus.com).

To update the BIOS using EZ Flash Utility:

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



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



- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!



Ensure to load the BIOS default settings to ensure system compatibility and stability. Press <F5> and select **Yes** to load the BIOS default settings.

### 3.1.3 BUPDATER utility



---

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

---

The BUPDATER utility allows you to update the BIOS file in the DOS environment using a bootable USB flash disk drive with the updated BIOS file.

#### Updating the BIOS file

To update the BIOS file using the BUPDATER utility:

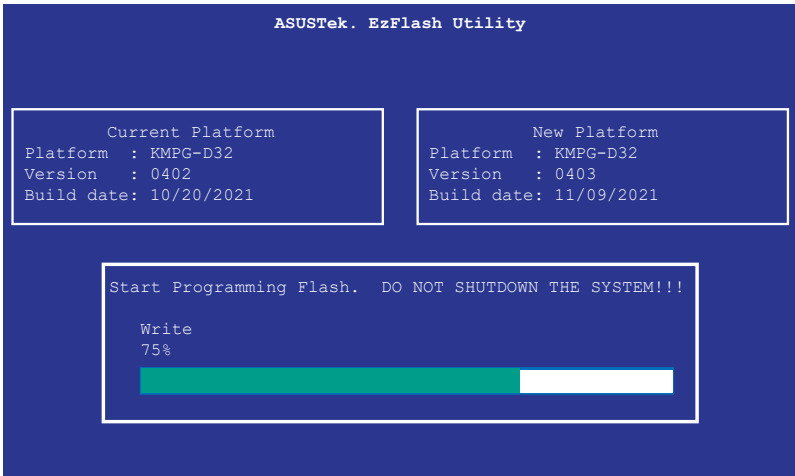
1. Visit the ASUS website at [www.asus.com](http://www.asus.com) and download the latest BIOS file for the motherboard. Save the BIOS file to a bootable USB flash disk drive.
2. Copy the BUPDATER utility (BUPDATER.exe) from the ASUS support website at [www.asus.com/support](http://www.asus.com/support) to the bootable USB flash disk drive you created earlier.
3. Boot the system in DOS mode, then at the prompt, type:

```
BUPDATER /i[filename].CAP
```

where [filename] is the latest or the original BIOS file on the bootable USB flash disk drive, then press <Enter>.

```
A:\>BUPDATER /i[file name].CAP
```

- The utility verifies the file, then starts updating the BIOS file.

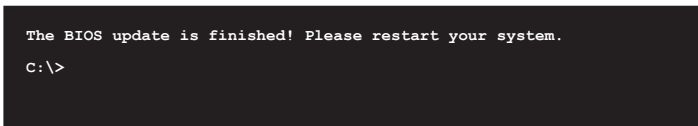


---

DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

---

- The utility returns to the DOS prompt after the BIOS update process is completed. Reboot the system from the hard disk drive.



## 3.2 BIOS setup program

This motherboard supports a programmable firmware chip that you can update using the provided utility described in section 3.1 **Managing and updating your BIOS**.

Use the BIOS Setup program when you are installing a motherboard, reconfiguring your system, or prompted to “Run Setup.” This section explains how to configure your system using this utility.

Even if you are not prompted to use the Setup program, you can change the configuration of your computer in the future. For example, you can enable the security password feature or change the power management settings. This requires you to reconfigure your system using the BIOS Setup program so that the computer can recognize these changes and record them in the CMOS RAM of the firmware chip.

The firmware chip on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press <Del> during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

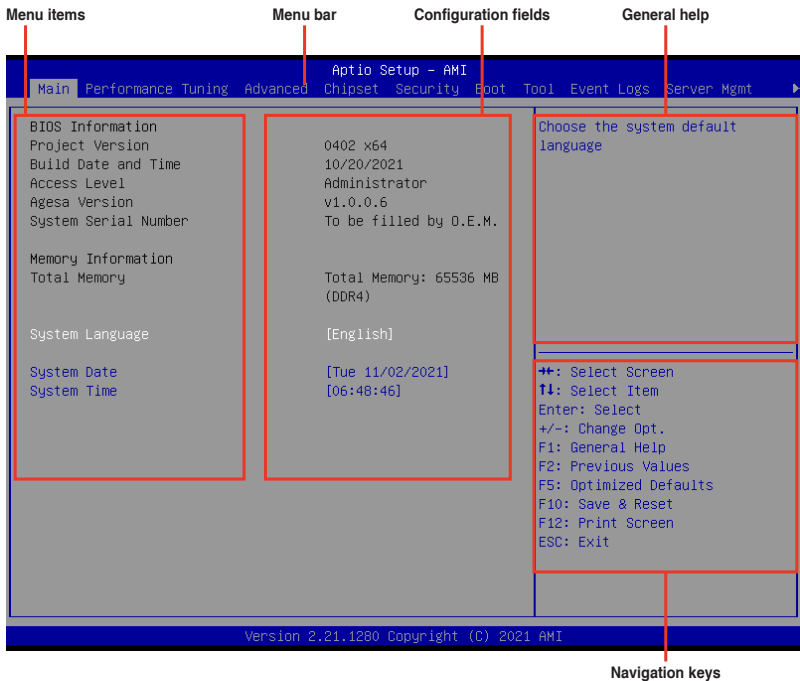
If you wish to enter Setup after POST, restart the system by pressing <Ctrl>+<Alt>+<Delete>, or by pressing the reset button on the system chassis. You can also restart by turning the system off and then back on. Do this last option only if the first two failed.

The Setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various sub-menus and make your selections from the available options using the navigation keys.



- 
- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Press <F5> and select **Yes** to load the BIOS default settings.
  - The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
  - Visit the ASUS website ([www.asus.com](http://www.asus.com)) to download the latest BIOS file for this motherboard.
-

## 3.2.1 BIOS menu screen



## 3.2.2 Menu bar

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

- Main** For changing the basic system configuration
- Performance Tuning** For changing the performance settings
- Advanced** For changing the advanced system settings
- Chipset** For changing the chipset settings
- Security** For changing the security settings
- Boot** For changing the system boot configuration
- Tool** For configuring options for special functions
- Event Logs** For changing the event log settings
- Server Mgmt** For changing the Server Mgmt settings
- Save & Exit** For selecting the 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.

### **3.2.3 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 (such as **Advanced**) on the menu bar have their respective menu items.

### **3.2.4 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 then press <Enter>.

### **3.2.5 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.

### **3.2.6 General help**

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

### **3.2.7 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.

### **3.2.8 Pop-up window**

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

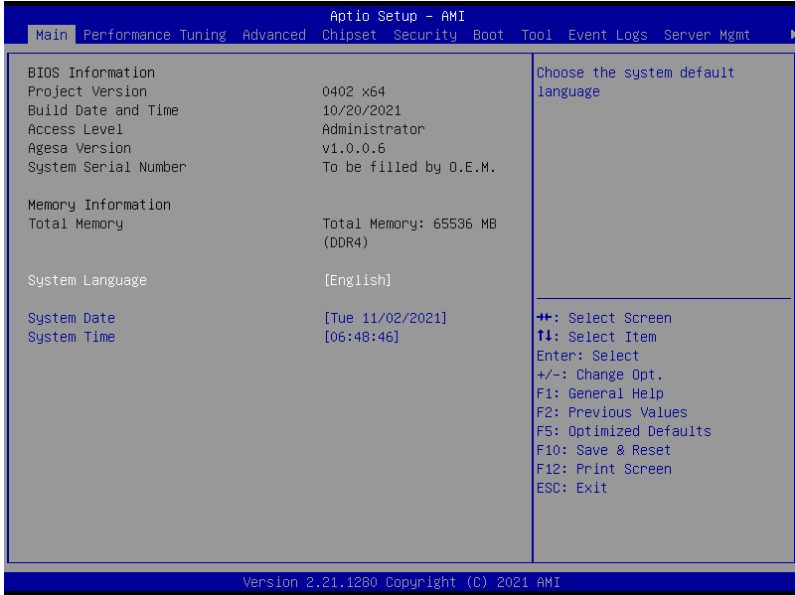
### **3.2.9 Scroll bar**

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.



### 3.3 Main menu

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



#### 3.3.1 System Language [English]

Allows you to select the system default language.

#### 3.3.2 System Date [Day xx/xx/xxxx]

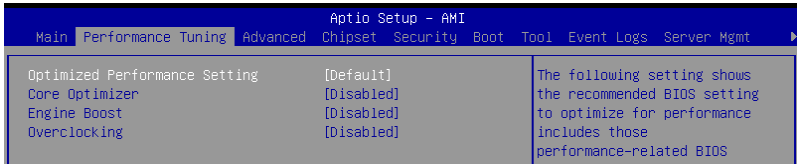
Allows you to set the system date.

#### 3.3.3 System Time [xx:xx:xx]

Allows you to set the system time.

### 3.4 Performance Tuning menu

The Performance Tuning menu items allow you to change performance related settings for different scenarios.



#### Optimized Performance Setting [Default]

Allows you to select performance settings for different scenarios.

[Default] Default settings.

[By Benchmark] Optimize for different kinds of benchmarks. Select this option, then select a benchmark type from the >> list.

[By Workload] Optimize for different kinds of workloads. Select this option, then select a workload type from the >> list.

Configuration options:

**[Peak Frequency Optimized]** - Applies settings with performance and power consumption balance. Recommended for users that need higher performance.

**[Latency Optimized]** - Applies settings with low latency results. Recommended for latency-sensitive users.

**[Power Efficient Optimized]** - Applies settings with power efficiency. Recommended for general users.

**[HPC]** - Applies settings with optimized compute capability. Recommend for traditional HPC applications.



---

**Core Optimizer** and **Engine Boost** appear only when you set **Optimized Performance Setting** to **[Default]** or **[By Benchmark]**.

---

#### Core Optimizer [Disabled]

Enable this item to keep the processor operating at the turbo frequency.

Configuration options: [Disabled] [Enabled]



---

Linux support may vary by version of the OS.

---

#### Engine Boost [Disabled]

Enable this item to boost the CPU's frequency.

Configuration options: [Disabled] [Level1] [Level2] [Level3(Max)]

## Overclocking [Disabled]

Enable this item to increase the CPU's clock. Please use an external PCIe storage controller for your hard drives when enabling this feature.

Configuration options: [Disabled] [Enabled]



---

Operate with an ambient temperature of 25°C or lower for optimized performance.

---



---

Please note that overclocking might cause component damage or system crashes, which may reduce the lifespan of the system and the CPU. Use this tool at your own risk.

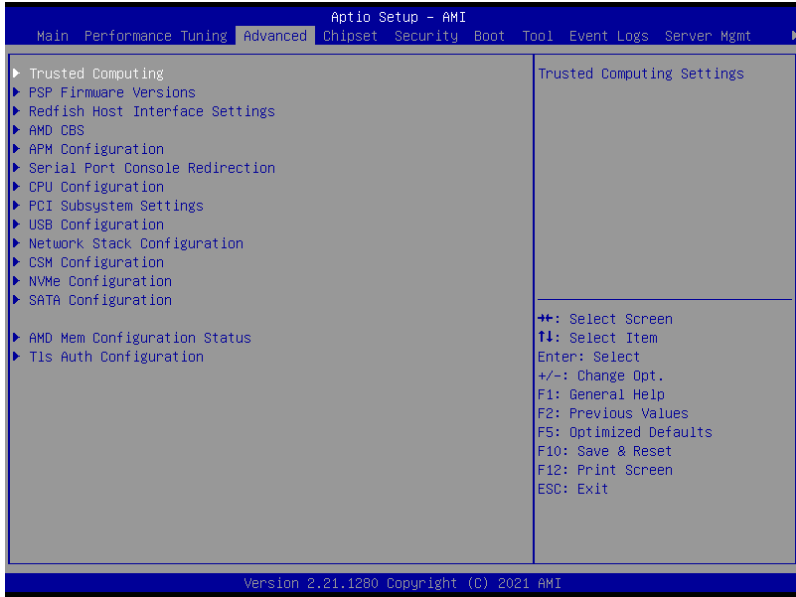
---

## 3.5 Advanced menu

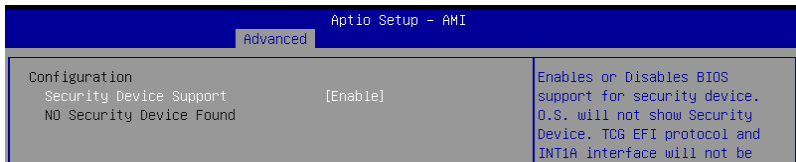
The Advanced menu items allow you to change the settings for the CPU and other system devices.



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



### 3.5.1 Trusted Computing



#### Configuration

##### Security Device Support [Enable]

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

Configuration options: [Disable] [Enable]

### 3.5.2 PSP Firmware Versions

This page displays the PSP firmware versions.

Advanced		Aptio Setup - AMI	
PSP Firmware Versions			
PSP Directory Level 1 (Fixed)			
PSP Recovery BL Ver		FF.13.0.67	
SMU FW Version		0.45.81.0	
ABL Version		10065011	
PSP Directory Level 2 (Updateable)			
PSP BootLoader Version		0.13.0.67	
SMU FW Version		0.45.81.0	
ABL Version		10065011	

### 3.5.3 Redfish Host Interface Settings

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

#### Redfish [Disabled]

Allows you to enable or disable Redfish.

Configuration options: [Disabled] [Enabled]

## 3.5.4 AMD CBS

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



The **AMD CBS** menu will appear in the top menu for AMD EPIC™ 7002 Series processors.



### CPU Common Options

#### Performance

##### **OC Mode [Normal Operation]**

Configuration options: [Normal Operation] [Customized]



The following items appear only when **OC Mode** is set to **[Customized]**.

##### **Custom Core Pstates**

This option allows you to enable Core Pstates. Read the disclaimer and select **I Accept** to continue.



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



The following items appear only when **[Accept]** is selected for **Custom Core Pstates**.

##### **Custom Pstate0 [Auto]**

Configuration options: [Auto] [Custom]



---

The following items appear only when **Custom Pstate0** is set to **[Custom]**.

---

***Pstate0 Freq (MHz) [0]***

Allows you to specify core frequency (MHz).

***CCD/Core/Thread Enablement***

This option allows you to enable CCD/Core/Thread Enablement.

---



S3 is not supported on systems where cores/threads have been removed/disabled.

---

***CCD Control [Auto]***

Sets the number of CCDs to be used. Once this option has been used to remove any CCDs, a POWER CYCLE is required in order for future selections to take effect.

Configuration options: [Auto] [2 CCDs] [3 CCDs] [4 CCDs] [6 CCDs]

***Core Control [Auto]***

Sets the number of cores to be used. Once this option has been used to remove any cores, a POWER CYCLE is required in order for future selections to take effect.

Configuration options: [Auto] [ONE (1 + 0)] [TWO (2 + 0)] [THREE (3 + 0)] [FOUR (4 + 0)] [FIVE (5 + 0)] [SIX (6 + 0)] [SEVEN (7 + 0)]

***SMT Control [Auto]***

Can be used to disable symmetric multithreading. To re-enable SMT, a POWER CYCLE is needed after selecting the [Enable] option. Select [Auto] based on BIOS PCD (PcdAmdSmtMode) default setting.

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

---



S3 is not supported on systems where cores/threads have been removed/disabled.

---

## **Prefetcher settings**

***L1 Stream HW Prefetcher [Auto]***

Allows you to enable or disable L1 Stream HW Prefetcher.

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

***L1 Stride Prefetcher [Auto]***

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

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

***L1 Region Prefetcher [Auto]***

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

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

***L2 Stream HW Prefetcher [Auto]***

Allows you to enable or disable L2 Stream HW Prefetcher.

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

***L2 Up/Down Prefetcher [Auto]***

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

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

## Core Watchdog

### **Core Watchdog Timer Enable [Auto]**

Allows you to enable or disable CPU Watchdog Timer.  
Configuration options: [Disable] [Enable] [Auto]

---



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

---

### **Core Watchdog Timer Interval [Auto]**

Configuration options: [21.461s] [10.730s] [5.364s] [2.681s] [1.340s]  
[669.41ms] [334.05ms] [166.37ms] [82.53ms] [40.61ms] [20.970ms]  
[10.484ms] [5.241ms] [2.620ms] [1.309ms] [654.08us] [326.4us] [162.56us]  
[80.64us] [39.68us] [Auto]

### **Core Watchdog Timer Severity [Auto]**

Allows you to specify the CPU watch dog timer severity.  
Configuration options: [No Error] [Transparent] [Corrected] [Deferred]  
[Uncorrected] [Fatal] [Auto]

### **RedirectForReturnDis [Auto]**

This option is from a workaround for GCC/C000005 issue for XV Core on CZ A0, setting MSRC001\_1029 Decode Configuration (DE\_CFG) bit 14 [DecfgNoRdrctForReturns] to 1.  
Configuration options: [Auto] [1] [0]

### **Platform First Error Handling [Auto]**

This option is from a workaround for GCC/C000005 issue for XV Core on CZ A0, setting MSRC001\_1029 Decode Configuration (DE\_CFG) bit 14 [DecfgNoRdrctForReturns] to 1.  
Configuration options: [Auto] [1] [0]

### **Core Performance Boost [Auto]**

This option allows you to enable or disable CPB.  
Configuration options: [Disabled] [Auto]

### **Global C-state Control [Auto]**

This option allows you to control IO based C-state generation and DF C-states.  
Configuration options: [Disabled] [Enabled] [Auto]

### **Power Supply Idle Control [Auto]**

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

### **SEV ASID Count [Auto]**

This field specifies the maximum valid ASID, which affects the maximum system physical address space. 16TB of physical address space is available for systems that support 253 ASIDs, while 8TB of physical address space is available for systems that support 509 ASIDs.  
Configuration options: [253 ASIDs] [509 ASIDs] [Auto]

### **SEV-ES ASID Space Limit Control [Auto]**

Configuration options: [Auto] [Manual]





---

The following item appears only when **SEV-ES ASID Space Limit Control** is set to **[Manual]**.

---

### **SEV-ES ASID Space Limit [1]**

SEV Vms using ASIDs below the SEV-ES ASID Space Limit must enable the SEV-ES feature. ASIDs from SEV-ES ASID Space Limit to (SEV ASID Count + 1) can only be used with SEV VMs. If this field is set to (SEV ASID Count + 1), all ASIDs are forced to be SEV-ES ASIDs. Hence, the valid values for this field is 1 - (SEV ASID Count + 1).

### **Streaming Stores Control [Auto]**

Allows you to enable or disable the streaming stores functionality.  
Configuration options: [Disabled] [Enabled] [Auto]

### **Local APIC Mode [Auto]**

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

### **ACPI \_CST C1 Declaration [Auto]**

Determines whether or not to declare the C1 state to the OS.  
Configuration options: [Disabled] [Enabled] [Auto]

### **MCA error thresh enable [Auto]**

Allows you to enable or disable MCA error thresholding.  
Configuration options: [False] [True] [Auto]



---

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

---

### **MCA error thresh count [FF5]**

Allows you to set the effective error threshold count = 4095(0xFFFF) - <this value> (e.g., the default value of 0xFF5 results in a threshold of 10).

### **SMU and PSP Debug Mode [Auto]**

When this option is set to [Enabled], specific uncorrected errors detected by the PSP FW or SMU FW will hang and not reset the system.  
Configuration options: [Disabled] [Enabled] [Auto]

### **PPIN Opt-in [Auto]**

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

### **SNP Memory (RMP Table) Coverage [Auto]**

Setting this option to [Enabled] will cover the entire system's memory.  
Configuration options: [Disabled] [Enabled] [Custom] [Auto]



---

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

---

### **Amount of Memory to Cover [0]**

Allows you to specify MB of System Memory to be covered in Hex.

**Amount of Memory to Cover [0]**

Allows you to specify MB of System Memory to be covered in Hex.

**SMEE [Auto]**

Allows you to enable or disable secure memory encryption control.  
Configuration options: [Disabled] [Enabled] [Auto]

**Action on BIST Failure [Auto]**

Allows you to set action to take when a CCD BIST failure is detected.  
Configuration options: [Do Nothing] [Down-CCD] [Auto]

**Fast Short REP MOVSB (FSRM) [Auto]**

Can be set to disabled for analysis purposes as long as OS supports it.  
Configuration options: [Disabled] [Enabled] [Auto]

**Enhanced REP MOVSB/STOSB (ERMSB) [Auto]**

Can be set to disabled for analysis purposes as long as OS supports it.  
Configuration options: [Disabled] [Enabled] [Auto]

**REP-MOV/STOS Streaming [Disabled]**

Allows REP-MOV/STOS to use non-caching streaming stores for large sizes.  
Configuration options: [Disabled] [Enabled]

**IBS hardware workaround [Auto]**

Set this option if using IBS execution sampling without software workaround for erratum 1,285. May impact performance.  
Configuration options: [Auto] [Enabled]

**DF Common Options****Scrubber*****DRAM scrub time [Auto]***

Allows you to set a number of hours to scrub memory.  
Configuration options: [Disabled] [1 hour] [4 hours] [8 hours] [16 hours] [24 hours] [48 hours] [Auto]

***Poison scrubber control [Auto]***

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

***Redirect scrubber control [Auto]***

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

***Redirect scrubber limit [Auto]***

Configuration options: [2] [4] [8] [Infinite] [Auto]

***Periodic Directory Rinse [Auto]***

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

## Memory Addressing

### ***NUMA nodes per socket [Auto]***

Specifies the number of desired NUMA nodes per socket. Zero will attempt to interleave the two sockets together.

Configuration options: [NPS1] [NPS2] [NPS4] [Auto]

### ***Memory interleaving [Auto]***

This item allows for disabling memory interleaving. Note that NUMA nodes per socket will be honored regardless of this setting.

Configuration options: [Disabled] [Auto]

### ***Memory interleaving size [Auto]***

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

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

### ***1TB remap [Auto]***

Attempt to remap DRAM out of the space just below the 1TB boundary. The ability to remap depends on DRAM configuration, NPS, and interleaving selection, and may not always be possible.

Configuration options: [Do not remap] [Attempt to remap] [Auto]

### ***DRAM map inversion [Auto]***

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

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

### ***Location of private memory regions [Auto]***

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

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

## ACPI

### ***ACPI SRAT L3 Cache As NUMA Domain [Auto]***

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

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

[Auto] Auto.

### ***ACPI SLIT Distance Control [Auto]***

This option determines how the SLIT distances are declared.

Configuration options: [Manual] [Auto]



---

The following item appears only when **ACPI SLIT Distance Control** is set to **[Auto]**.

---

***ACPI SLIT remote relative distance [Auto]***

Allows you to set the remote socket distance for 2P systems as near (2.8) or far (3.2).

Configuration options: [Near] [Far] [Auto]

---



---

The following items appear only when **ACPI SLIT Distance Control** is set to **[Manual]**.

---

***ACPI SLIT same socket distance [C]***

Specify the distance to other physical domains within the same socket.

***ACPI SLIT remote socket distance [20]***

Specify the distance to domains the remote socket.

***ACPI SLIT local SLink distance [32]***

Specify the distance to an SLink domain on the same socket.

***ACPI SLIT remote SLink distance [3C]***

Specify the distance to an SLink domain on the other socket.

***ACPI SLIT local inter-SLink distance [FF]***

Specify the distance between two SLink domains on the same socket.

***ACPI SLIT remote inter-SLink distance [FF]***

Specify the distance between two SLink domains, each on a different socket.

## Link

***GMI encryption control [Auto]***

Allows you to control the GMI link encryption.

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

***xGMI encryption control [Auto]***

Allows you to control the xGMI link encryption.

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

***CAKE CRC perf bounds control [Auto]***

Configuration options: [Auto] [Manual]

---



---

The following item appears only when **CAKE CRC perf bounds control** is set to **[Manual]**.

---

***CAKE CRC perf bounds [100]***

This item specifies the amount of performance loss that is acceptable to enable CRC protection. Units are in 0.00001%, RangeL disabled (0) - 10% (1000000).

***xGMI Link Configuration [Auto]***

Allows you to configure the number of xGMI2 links used on a multi-socket system.

Configuration options: [Auto] [2 xGMI Links] [3 xGMI Links] [4 xGMI Links]

**4-link xGMI max speed [Auto]**

Configuration options: [8.533Gbps] [9.6Gbps] [10.667Gbps] [11Gbps] [12Gbps] [13Gbps] [14Gbps] [15Gbps] [16Gbps] [17Gbps] [18Gbps] [19Gbps] [20Gbps] [21Gbps] [22Gbps] [23Gbps] [24Gbps] [25Gbps] [Auto]

**3-link xGMI max speed [Auto]**

Configuration options: [8.533Gbps] [9.6Gbps] [10.667Gbps] [11Gbps] [12Gbps] [13Gbps] [14Gbps] [15Gbps] [16Gbps] [17Gbps] [18Gbps] [19Gbps] [20Gbps] [21Gbps] [22Gbps] [23Gbps] [24Gbps] [25Gbps] [Auto]

**xGMI TXEQ Mode [Auto]**

Allows you to select the XGMI TXEQ/RX vetting mode.

Configuration options: [TXEQ\_Disabled] [TXEQ\_Lane] [TXEQ\_Link] [TXEQ\_RX\_Vet] [Auto]

**xGMI 18GACOFB [Auto]**

Allows you to enable or disable the 18GACOFB control.

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

**Disable DF to external IP SyncFloodPropagation [Auto]**

Allows you to enable or disable Error propagation to UMC or any downstream slaves e.g., FCH. Use this to avoid reset in failure scenario.

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

**Disable DF sync flood propagation [Auto]**

Allows you to enable or disable propagation from PIE to other DF components and eventually to SDP ports.

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

**Freeze DF module queues on error [Auto]**

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

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

**CC6 memory region encryption [Auto]**

Allows you to control whether or not the CC6 save/restore memory is encrypted.

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

**System probe filter [Auto]**

Allows you to control whether or not the probe filter is enabled. Has no effect on parts where the probe filter is fuse disabled.

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

**Memory Clear [Auto]**

Allows you to enable or disable memory clear. When this item is set to [Disabled], BIOS does not implement MemClear after memory training (only if non-ECC DIMMs are used).

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

**PSP error injection support [False]**

Configuration options: [False] [True]

## UMC Common Option

### DDR4 Common Options

#### **DRAM Timing Configuration**

Allows you to enable DRAM timing configuration.



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



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

#### **Overclock [Auto]**

Configuration options: [Auto] [Enabled]



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

#### **Memory Clock Speed [Auto]**

Specifies the memory clock frequency.

Configuration options: [Auto] [667MHz] [800MHz] [933MHz] [1067MHz] [1200MHz] [1333MHz] [1467MHz] [1600MHz] [1633MHz] [1667MHz] [1700MHz] [1733MHz] [1767MHz] [1800MHz] [400MHz]

#### **Tcl [Auto]**

Specifies the CAS latency.

Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk] [20h Clk] [21h Clk]

#### **Trcdrd [Auto]**

Specifies the RAS# Active to CAS# Read Delay Time.

Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]

#### **Trcdwr [Auto]**

Specifies the RAS# Active to CAS# Write Delay Time.

Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]

#### **Trp [Auto]**

Specifies the Row Precharge Delay Time.

Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]

#### **Tras [Auto]**

Specifies the Active to Precharge Delay Time.

Configuration options: [Auto] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk] [20h Clk] [21h Clk] [22h Clk] [23h Clk] [24h Clk] [25h Clk] [26h Clk] [27h Clk] [28h Clk] [29h Clk] [2Ah Clk] [2Bh Clk] [2Ch Clk] [2Dh Clk] [2Eh Clk] [2Fh Clk] [30h Clk] [31h Clk] [32h Clk] [33h Clk] [34h Clk] [35h Clk] [36h Clk] [37h Clk] [38h Clk] [39h Clk] [3Ah Clk]

**Trc Ctrl [Auto]**

Specifies Trc.

Configuration options: [Auto] [Manual]



---

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

---

**Trc [39]**

Specifies Active to Active/Refresh Delay Time. Valid values 87h-1Dh.

**TrrdS [Auto]**

Specifies the Activate to Activate Delay Time, different back group (tRRD\_S).

Configuration options: [Auto] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]

**TrrdL [Auto]**

Specifies the Activate to Activate Delay Time, same back group (tRRD\_L).

Configuration options: [Auto] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]

**Tfaw Ctrl [Auto]**

Specifies Tfaw.

Configuration options: [Auto] [Manual]



---

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

---

**Tfaw [1A]**

Specifies the Four Activate Window Time. Valid values 36h-6h.

**TwtrS [Auto]**

Specifies the Minimum Write to Read Time, different bank group.

Configuration options: [Auto] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk]

**TwtrL [Auto]**

Specifies the Minimum Write to Read Time, same bank group.

Configuration options: [Auto] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk]

**Twr Ctrl [Auto]**

Specifies Twr.

Configuration options: [Auto] [Manual]



---

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

---

**Twr [12]**

Specifies the Minimum Write Recovery Time. Valid values 51h-Ah.

**Trcpage Ctrl [Auto]**

Specifies Trcpage.

Configuration options: [Auto] [Manual]



---

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

---

**Trcpage [0]**

SDRAM Optional Features (tMAW MAC). Valid values 3FFh-0h.

***TrdrdScL Ctrl [Auto]***

Specifies TrdrdScL.

Configuration options: [Auto] [Manual]



---

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

---

***TrdrdScL [3]***

Specifies the CAS to CAS Delay Time, same bank group. Valid values Fh-1h.

***TrwrScL Ctrl [Auto]***

Specifies TrwrScL.

Configuration options: [Auto] [Manual]



---

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

---

***TrwrScL [3]***

Specifies the CAS to CAS Delay Time, same bank group. Valid values 3Fh-1h.

***Trfc Ctrl [Auto]***

Specifies Trfc.

Configuration options: [Auto] [Manual]



---

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

---

***Trfc [138]***

Specifies the Refresh Recovery Delay Time (tRFC1). Valid values 3DEh-3Ch.

***Trfc2 Ctrl [Auto]***

Specifies Trfc2.

Configuration options: [Auto] [Manual]



---

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

---

***Trfc2 [C0]***

Specifies the Refresh Recovery Delay Time (tRFC2). Valid values 3DEh-3Ch.

***Trfc4 Ctrl [Auto]***

Specifies Trfc4.

Configuration options: [Auto] [Manual]



---

The following item appears only when **Trfc4 Ctrl** is set to **[Manual]**.

---

***Trfc4 [84]***

Specifies the Refresh Recovery Delay Time (tRFC4). Valid values 3DEh-3Ch.

***Tcwl [Auto]***

Specifies the CAS Write Latency.

Configuration options: [Auto] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Eh Clk] [10h Clk] [12h Clk] [14h Clk]



**Trtp [Auto]**

Specifies the Read CAS# to Precharge Delay Time.

Configuration options: [Auto] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk]

**Tcke [Auto]**

Specifies the CKE minimum high and low pulse width in memory clock cycles.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk]

**Trdwr [Auto]**

Specifies the Read to Write turnaround timing.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk]

**Twrrd [Auto]**

Specifies the Write to Read turnaround timing.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**TwrrSc [Auto]**

Specifies the Write to Write turnaround timing in the same chipselect.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**TwrrSd [Auto]**

Specifies the Write to Write turnaround timing in the same DIMM.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**TwrrDd [Auto]**

Specifies the Write to Write turnaround timing in a different DIMM.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**TrdrSc [Auto]**

Specifies the Read to Read turnaround timing in the same chipselect.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**TrdrSd [Auto]**

Specifies the Read to Read turnaround timing in the same DIMM.

Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**TrdrdDd [Auto]**

Specifies the Read to Read turnaround timing in a different DIMM.  
 Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

**ProcODT [Auto]**

Specifies the Processor ODT.  
 Configuration options: [Auto] [High Impedance] [480 ohm] [240 ohm] [160 ohm] [120 ohm] [96 ohm] [80 ohm] [68.6 ohm] [60 ohm] [53.3 ohm] [48 ohm] [43.6 ohm] [40 ohm] [36.9 ohm] [34.3 ohm] [32 ohm] [30 ohm] [28.2 ohm]

**DRAM Controller Configuration****DRAM Power Options****Power Down Enable [Auto]**

Allows you to enable or disable power down mode.  
 Configuration options: [Disabled] [Enabled] [Auto]

**Power Down Entry Delay [BB8]**

Allows you to specify value at UMC::CH::DramTiming17 [19:8] PwrDownDly.

**SubUrgRefLowerBound [4]**

Specifies the stored refresh limit required to enter sub-urgent refresh mode. Constraint: SubUrgRefLowerBound <= UrgRefLimit. Valid value: 6-1

**UrgRefLimit [6]**

Specifies the stored refresh limit required to enter urgent refresh mode. Constraint: SubUrgRefLowerBound <= UrgRefLimit. Valid value: 6-1

**DRAM Maximum Activate Count [Auto]**

Override DIMM SPD Byte 7 [3:0]. Maximum Activate Count (MAC). When set to [Auto] it will be based on SPD setting.  
 Configuration options: [Untested MAC] [700 K] [600 K] [500 K] [400 K] [300 K] [200 K] [Unlimited MAC] [Auto]

**DRAM Refresh Rate [7.8 usec]**

Configuration options: [7.8 usec] [3.9 usec]

**Self-Refresh Exit Staggering [Disabled]**

Tcksr<sub>x</sub> += (Trfc/n \* (UMC\_Number % 4)), here n = 3 or 4.  
 Configuration options: [Disabled] [Trfc / 3] [Trfc / 4]

**Cmd2T**

Select between 1T and 2T mode on ADDR/CMD.  
 Configuration options: [Auto] [1T] [2T]

**Gear Down Mode**

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

**CAD Bus Configuration****CAD Bus Timing User Controls [Auto]**

Allows you to set the CAD bus signals to Auto or Manual.  
 Configuration options: [Auto] [Manual]



---

The following items appear only when you set **CAD Bus Timing User Controls** to **[Manual]**.

---

***AddrCmdSetup [0]***

Allows you to setup time on CAD bus signals.  
Configuration options: [0] – [39]

***CsOdtSetup [0]***

Allows you to setup time on CAD bus signals.  
Configuration options: [0] – [39]

***CkeSetup [0]***

Allows you to setup time on CAD bus signals.  
Configuration options: [0] – [39]

***CAD Bus Drive Strength User Controls [Auto]***

Allows you to set the CAD bus signals to Auto or Manual.  
Configuration options: [Auto] [Manual]

---



The following items appear only when you set **CAD Bus Drive Strength User Controls** to **[Manual]**.

---

***ClkDrvStren [Auto]***

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

***AddrCmdDrvStren [Auto]***

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

***CsOdtDrvStren [Auto]***

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

***CkeDrvStren [Auto]***

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

***Data Bus Configuration***

***Data Bus Configuration User Controls [Auto]***

Allows you to specify the mode for drive strength.  
Configuration options: [Auto] [Manual]

---



The following items appear only when you set **Data Bus Configuration User Controls** to **[Manual]**.

---

***RttNom [Auto]***

Configuration options: [Rtt\_Nom Disable] [RZQ/4] [RZQ/2] [RZQ/6] [RZQ/1] [RZQ/5] [RZQ/3] [RZQ/7] [Auto]

***RttWr [Auto]***

Configuration options: [Dynamic ODT Off] [RZQ/2] [RZQ/1] [Hi-Z] [RZQ/3] [Auto]

***RttPark [Auto]***

Configuration options: [Rtt\_PARK Disable] [RZQ/4] [RZQ/2] [RZQ/6] [RZQ/1] [RZQ/5] [RZQ/3] [RZQ/7] [Auto]

---

## Common RAS

### **Data Poisoning [Auto]**

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

### **DRAM Post Package Repair [Disable]**

Allows you to enable or disable DRAM POST Package Repair.

Configuration options: [Enable] [Disable]

### **RCD Parity [Auto]**

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

### **DRAM Address Command Parity Retry [Auto]**

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

### **Max Parity Error Replay [8]**

The values in hex, 1, 2, or 3 is invalid.

Configuration options: [0] – [39]

### **Write CRC Enable [Auto]**

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

### **DRAM Write CRC Enable and Retry Limit [Auto]**

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

### **Max Write CRC Error Replay [8]**

The values in hex, 1, 2, or 3 is invalid.

Configuration options: [0] – [39]

### **Disable Memory Error Injection [True]**

Configuration options: [False] [True]

## **ECC Configuration**

### **DRAM ECC Symbol Size [Auto]**

Configuration options: [x4] [x8] [x16] [Auto]

### **DRAM ECC Enable [Auto]**

This option allows you to enable or disable DRAM ECC. Auto will set ECC to enable.

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

### **DRAM UECC Retry [Auto]**

This option allows you to enable or disable DRAM UECC Retry.

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

## Security

### **TSME [Auto]**

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

### **Data Scramble [Auto]**

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

## Phy Configuration

### **PMU Training**

#### **DFE Read Training [Auto]**

Perform 2D Read Training with DFE on.

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

#### **FFE Write Training [Auto]**

Perform 2D Read Write Training with FFE on.

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

#### **PMU Pattern Bits Control [Auto]**

Configuration options: [Auto] [Manual]



---

The following item appears only when you set **PMU Pattern Bits Control** to **[Manual]**.

---

***PMU Pattern Bits [0]***

Configuration options: [0] - [9]

**DRAM Memory Mapping**

***Chipselect Interleaving [Auto]***

Allows you to set interleave memory blocks across the DRAM chip selects for node 0.

Configuration options: [Disabled] [Auto]

***BankGroupSwap [Auto]***

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

***BankGroupSwapAlt [Auto]***

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

***Address Hash Bank [Auto]***

Allows you to enable or disable bank address hashing.

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

***Address Hash CS [Auto]***

Allows you to enable or disable CS address hashing.

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

***Address Hash Rm [Auto]***

Allows you to enable or disable RM address hashing.

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

***SPD Read Optimization [Auto]***

Allows you to enable or disable SPD Read Optimization, if set to [Enabled], SPD reads are skipped for Reserved fields and most of upper 256 Bytes. If set to [Disabled], read all 512 SPD Bytes.

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

**NVDIMM**

***Disable NVDIMM-N Feature [No]***

Allows you to disable NVDIMM-N feature for memory margin tool.

Configuration options: [No] [Yes]

**Memory MBIST**

***MBIST Enable [Disabled]***

Allows you to enable or disable Memory MBIST.

Configuration options: [Enabled] [Disabled]



---

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

---

***MBIST Test Mode [Auto]***

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

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

***MBIST Aggressors [Auto]***

Allows you to enable or disable Memory Aggressor test.

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

### **MBIST Per Bit Slave Die Reporting [Auto]**

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

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

### **Data Eye**

#### **Pattern Select [PRBS]**

Configuration options: [PRBS] [SS0] [Both]

#### **Pattern Length [3]**

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

Configuration options: [3] – [9]

#### **Aggressor Channel [1 Aggressor Channel]**

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

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

#### **Aggressor Static Lane Control [Disabled]**

Configuration options: [Disabled] [Enabled]



---

The following items are available only when **Aggressor Static Lane Control** is set to **[Enabled]**.

---

#### **Aggressor Static Lane Select Upper 32 bits [0]**

Static Lane Select for Upper 32 bits. The bit mask represents the bits to be read.

Configuration options: [0] - [99999999]

#### **Aggressor Static Lane Select Lower 32 bits [0]**

Static Lane Select for Lower 32 bits. The bit mask represents the bits to be read.

Configuration options: [0] - [99999999]

#### **Aggressor Static Lane Select ECC [0]**

Static Lane Select for ECC Lanes. The bit mask represents the bits to be read.

Configuration options: [0] - [9]

#### **Aggressor Static Lane Value [0]**

Configuration options: [0] - [9]

#### **Target Static Lane Control [Disabled]**

Configuration options: [Disabled] [Enabled]



---

The following items appear only when **Target Static Lane Control** is set to **[Enabled]**.

---

#### **Target Static Lane Select Upper 32 bits [0]**

Static Lane Select for Upper 32 bits. The bit mask represents the bits to be read.

Configuration options: [0] - [99999999]

#### **Target Static Lane Select Lower 32 bits [0]**

Static Lane Select for Lower 32 bits. The bit mask represents the bits to be read.

Configuration options: [0] - [99999999]

**Target Static Lane Select ECC [0]**

Static Lane Select for ECC Lanes. The bit mask represents the bits to be read.

Configuration options: [0] - [9]

**Target Static Lane Value [0]**

Configuration options: [0] - [9]

**Worst Case Margin Granularity [Per Chip Select]**

Configuration options: [Per Chip Select] [Per Nibble]

**Read Voltage Sweep Step Size [1]**

This option determines the step size for Read Data Eye voltage sweep.

Configuration options: [1] [2] [4]

**Read Timing Sweep Step Size [1]**

This option supports step size for Read Data Eye.

Configuration options: [1] [2] [4]

**Write Voltage Sweep Step Size [1]**

This option determines the step size for write Data Eye voltage sweep.

Configuration options: [1] [2] [4]

**Write Timing Sweep Step Size [1]**

This option supports step size for write Data Eye.

Configuration options: [1] [2] [4]

**Memory Healing BIST [Disabled]**

Allows you to enable a full memory test. The testing will increase the boot time. BIOS mem BIST tests the full memory after training. Failing memory will be repaired using soft or hard PPR depending on the PPC configuration. The test will take 3 minutes per 16GN of installed memory. Self-Healing BIST runs the JEDEC DRAM self healing if the device supports the feature. The DRAM will do a hard repair for failing memory. The test will take 10 seconds per memory rank per channel.

Configuration options: [Disabled] [BIOS Mem BIST] [Self-Healing Mem BIST] [PMU Mem BIST] [BIOS and Self-Healing Mem BIST] [BIOS and PMU Mem BIST] [PMU and Self-Healing Mem BIST] [BIOS and PMU Self-Healing Mem BIST]



---

The following items are available only when **Memory Healing BIST** is set to **[BIOS Mem BIST]** or **[BIOS and Self-Healing Mem BIST]**.

---

**Mem BIST Test Select [Vendor Tests Enabled]**

Select the vendor specific tests to use with BIOS memory healing BIST.

Configuration options: [Vendor Tests Enabled] [Vendor Tests Disabled] [All Tests - All Vendors]

**Mem BIST Post Package Repair Type [Soft Repair]**

For DRAM errors found in the BIOS memory BIST select the repair type, soft, hard, or test only and do not attempt to repair.

Configuration options: [Soft Repair] [Hard Repair] [No Repairs - Test only]



---

The following items are available only when **Memory Healing BIST** is set to **[PMU Mem BIST]**, **[BIOS and PMU Mem BIST]**, **[PMU and Self-Healing Mem BIST]** or **[BIOS and PMU and Self-Healing Mem BIST]**.

---

### ***PMU Mem BIST Test Select [Algorithm #1, #2, #3]***

Allows you to select the algorithms to use with PMU Mem BIST.

Algorithm #1: Simple Write-Read Static Refresh test; Algorithm #2: Write/Read/Write data test; Algorithm #3: Agressor Row stress test

Configuration options: [Algorithm #1] [Algorithm #2] [Algorithm #1, #2]  
[Algorithm #1, #3] [Algorithm #2, #3] [Algorithm #1, #2, #3]

## **NBIO Common Options**

### ***IOMMU [Auto]***

Allows you to enable or disable IOMMU.

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

### ***DMAr Support [Auto]***

Allows you to enable DMAr system protection during POST.

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

### ***DRTM Virtual Device Support [Auto]***

Allows you to enable DRTM ACPI virtual device.

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

### ***ACS Enable [Auto]***

AER must be enabled for ACS enable to work.

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

### ***PCIe ARI Support [Auto]***

This item enables Alternative Routing-ID Interpretation.

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

### ***PCIe ARI Enumeration [Auto]***

Allows ARI Forwarding for each downstream port.

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

### ***PCIe Ten Bit Tag Support [Auto]***

This item enables PCIe ten bit tags for supported devices. [Auto] = [Disabled].

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

### ***HD Audio Enable [Auto]***

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

## ***SMU Common Options***

### ***Determinism Control [Manual]***

[Auto] Use the fused Determinism.

[Manual] User can set customized Determinism.



---

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

---

### ***Determinism Slider [Power]***

Configuration options: [Auto] [Power] [Performance]

Fan Control

Fan Table Control [Auto]

[Auto] Use the default fan table.

[Manual] User can set customized fan table.

### ***Determinism Slider [Power]***

Configuration options: [Auto] [Power] [Performance]





---

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

---

**Low Temperature [0]**

Allows you to set the low temperature in °C.

**Medium Temperature [0]**

Allows you to set the medium temperature in °C.

**High Temperature [0]**

Allows you to set the high temperature in °C.

**Critical Temperature [0]**

Allows you to set the critical temperature in °C.

**Low Pwm [0]**

Allows you to set the low Pwm from 0-100.

**Medium Pwm [0]**

Allows you to set the medium Pwm from 0-100.

**High Pwm [0]**

Allows you to set the high Pwm from 0-100.

**Temperature Hysteresis [0]**

Allows you to set the temperature hysteresis in °C.

**Pwm Frequency [25kHz]**

Configuration options: [100Hz] [25kHz]

**Fan Polarity [Negative]**

Configuration options: [Negative] [Positive]

**cTDP Control [Manual]**

[Auto] Use the fused TDP.

[Manual] User can set customized TDP.



---

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

---

**cTDP [280]**

Allows you to customize cTDP.

**EfficiencyModeEn [Auto]**

[Auto] Use performance optimized CCLK DPM settings.

[Enabled] Use power efficiency optimized CCLK DPM settings.

**Power Package Limit Control [Manual]**

[Auto] Use the fused PPT.

[Manual] User can set customized PPT.



---

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

---

**Power Package Limit [280]**

Allows you to customize PPT.

**xGMI Link Width Control [Auto]**

[Auto] Use default xGMI link width controller settings.

[Manual] User can set custom xGMI link width controller settings.



---

The following items appear only when **xGMI Link Width Control** is set to **[Manual]**.

---

**xGMI Force Link Width Control [Unforce]**

[Unforce] Do not force the xGMI to a fixed width.

[Force] Force the xGMI to the user specified width.

---



The following item appears only when **xGMI Force Link Width Control** is set to **[Force]**.

---

**xGMI Force Link Width [2]**

[0] Force xGMI link width to x2.

[1] Force xGMI link width to x8.

[2] Force xGMI link width to x16.

**xGMI Max Link Width Control [Auto]**

[Auto] Use default xGMI max supported link width.

[Manual] User can set custom xGMI max link width.

---



The following item appears only when **xGMI Max Link Width Control** is set to **[Manual]**.

---

**APBDIS [Auto]**

[0] Not APBDIS (mission mode)

[1] APBDIS

[Auto] Auto

**DF Cstates [Auto]**

Allows you to enable or disable DF C-states.

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

**CPPC [Auto]**

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

**HSMP Support [Auto]**

This option allows you to enable or disable HSMP support.

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

**DLWM Support [Auto]**

This option allows you to enable or disable DLWM support.

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

**BoostFmaxEn [Auto]**

[Auto] Use the default Fmax.

[Manual] User can set the boost Fmax.

---



The following item appears only when **Boost FmaxEn** is set to **[Manual]**.

---

**BoostFmax [0]**

Allows you to specify the boost Fmax frequency limit to apply to all cores (MHz).

**EDC Current Tracking [Disable]**

The generation of a correctable MCE when the telemetry current value is over the set threshold defined by EDC Current Tracking Current Threshold.

Configuration options: [Disable] [Enable]



---

The following items appears only when **EDC Current Tracking** is set to **[Enable]**.

---

***EDC Tracking Current Threshold [0]***

The current threshold in AMPs for EDC Current Tracking feature.

***EDC Tracking Report Interval [1]***

Reporting interval. Every nth observed excursion results in SMU logging a correctable MCE.

***LCLK Frequency Control***

***Root Complex 0x00 LCLK Frequency [Auto]***

Set Root Complex LCLK Frequency (Bus range 0x00-0x1F).

[Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).

[593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

***Root Complex 0x20 LCLK Frequency [Auto]***

Set Root Complex LCLK Frequency (Bus range 0x20-0x3F).

[Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).

[593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

***Root Complex 0x40 LCLK Frequency [Auto]***

Set Root Complex LCLK Frequency (Bus range 0x40-0x5F).

[Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).

[593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

***Root Complex 0x60 LCLK Frequency [Auto]***

Set Root Complex LCLK Frequency (Bus range 0x60-0x7F).

[Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).

[593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

***Root Complex 0x80 LCLK Frequency [Auto]***

Set Root Complex LCLK Frequency (Bus range 0x80-0x9F).

[Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).

[593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

***Root Complex 0xA0 LCLK Frequency [Auto]***

Set Root Complex LCLK Frequency (Bus range 0xA0-0xBF).

[Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).

[593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

### **Root Complex 0xC0 LCLK Frequency [Auto]**

Set Root Complex LCLK Frequency (Bus range 0xC0-0xDF).

- [Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).
- [593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

### **Root Complex 0xE0 LCLK Frequency [Auto]**

Set Root Complex LCLK Frequency (Bus range 0xE0-0xFF).

- [Auto] Dynamic Frequency Control (Enhanced PIO setting will be in effect).
- [593MHz] Set LCLK Frequency at 593MHz (Overrides Enhanced PIO setting).

### **DF PState Mode Select [Auto]**

- [Normal] Normal
- [Limit Highest] FCLK is limited to DF Pstate FCLK Limit, only the highest DF Pstate is used.
- [Limit All] FCLK is limited to DF Pstate FCLK limit, all DF Pstates are used.
- [Auto] Auto

### **EDC Control [Auto]**

- [Auto] Use the fused VDDCR\_CPU EDC limit.
- [Manual] User can set customized VDDCR\_CPU EDC limit.



---

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

---

#### **EDC [0]**

Allows you to set the VDDCR\_CPU EDC Limit [A].

#### **EDC Platform Limit [0]**

Allows you to set the EDC Platform Limit [W].

## **NBIO RAS Common Options**

### **NBIO RAS Control [Auto]**

Configuration options: [Disabled] [MCA] [Legacy] [Auto]

### **Egress Poison Severity High [30011]**

Each bit set to 1 enables HIGH severity on the associated IOHC egress port. A bit of 0 indicates LOW severity.

### **Egress Poison Severity Low [4]**

Each bit set to 1 enables HIGH severity on the associated IOHC egress port. A bit of 0 indicates LOW severity.

### **NBIO SyncFlood Generation [Auto]**

This value may be used to mask SyncFlood caused by NBIO RAS options. When set to TRUE, SyncFlood from NBIO is masked. When set to FALSE, NBIO is capable of generating SyncFlood.  
Configuration options: [Disabled] [Enabled] [Auto]

### **NBIO SyncFlood Reporting [Auto]**

This value may be used to enable SyncFlood reporting to APML. When set to TRUE, SyncFlood will be reported to APML. When set to FALSE, the reporting will be disabled.  
Configuration options: [Disabled] [Enabled] [Auto]

**Egress Poison Mask High [FFFCFFFF]**

These set the enable mask for masking of errors logged in EGRESS\_POISON\_STATUS. For each bit set to 1, errors are masked. For each bit set to 0, errors trigger response actions.

**Egress Poison Mask Low [FFFFFFFB]**

These set the enable mask for masking of errors logged in EGRESS\_POISON\_STATUS. For each bit set to 1, errors are masked. For each bit set to 0, errors trigger response actions.

**Uncorrected Converted to Poison Enable Mask High [30000]**

These set the enable mask for masking of uncorrectable parity errors on internal arrays. For each bit set to 1, a system fatal error event is triggered for UCP errors on arrays associated with that egress port. For each bit set to 0, errors are masked.

**Uncorrected Converted to Poison Enable Mask Low [4]**

These set the enable mask for masking of uncorrectable parity errors on internal arrays. For each bit set to 1, a system fatal error event is triggered for UCP errors on arrays associated with that egress port. For each bit set to 0, errors are masked.

**System Hub Watchdog Timer [A28]**

This value specifies the timer interval of the SYSHUB Watchdog Timer in milliseconds.

**SLINK Read Response OK [Disabled]**

This value specifies whether SLINK read response errors are converted to an Okay response. When this value is set to TRUE, read response errors are converted to Okay responses with data of all FFs. When set to FALSE, read response errors are not converted.

Configuration options: [Disabled] [Enabled]

**SLINK Read Response Error Handling [Log Errors in MCA]**

This value specifies whether SLINK write response errors are converted to an Okay response. When this value is set to 0, write response errors will be logged in the MCA. When set to 1, write response errors will trigger an MCOMMIT error. When this value is set to 2, write response errors are converted.

Configuration options: [Enabled] [Trigger MCOMMIT Error] [Log Errors in MCA]

**Log Poison Data from SLINK [Disabled]**

This value specifies whether poison data propagated from SLINK will generate a deferred error. When this value is set to TRUE, deferred errors are enabled. When set to FALSE, errors are not generated.

Configuration options: [Disabled] [Enabled]

**PCIe Aer Reporting Mechanism [Auto]**

This value selects the method of reporting AER errors from PCI Express. A value of 0 indicates that the hardware will report the error through MCA. A value of 1 allows OS First handling of the errors through generation of a system control interrupt (SCI). A value of 2 allows Firmware First handling of the errors through generation of a system control interrupt (SCI).

Configuration options: [Firmware First] [OS First] [Auto]

**Edpc Control [Auto]**

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

**NBIO Poison Consumption [Auto]**

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

**Sync Flood on PCIe Fatal Error [Auto]**

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

**Enable AER Cap [Auto]**

Allows you to enable or disable Advanced Error Reporting Capability.  
Configuration options: [Enable] [Disabled] [Auto]

**Early Link Speed [Auto]**

Allows you to set Early Link Speed.  
Configuration options: [Auto] [Gen1] [Gen2]

**Hot Plug Handling mode [Auto]**

Allows you to control the Hot Plug Handling mode.  
Configuration options: [OS First] [Firmware First] [Auto]

**Presence Detect Select mode [Auto]**

Allows you to control the Presence Detect Select mode.  
Configuration options: [OR] [AND] [Auto]

**Preferred IO [Auto]**

Allows you to select the preferred IO select type.  
Configuration options: [Bus] [Auto]

**Data Link Feature Cap [Auto]**

Allows you to set Data Link Feature Capability.  
Configuration options: [Enabled] [Disabled] [Auto]

**CV test [Auto]**

Set this to [Enabled] to support running PCIECV tool. Selecting [Auto] will preserve h/w defaults.

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

**SEV-SNP Support [Disable]**

Configuration options: [Disabled] [Enabled]

**SRIS [Auto]**

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

**Compliance Loopback [Auto]**

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

**FCH Common Options****SATA Configuration Options*****SATA Enable [Auto]***

Allows you to enable or disable OnChip SATA controller.  
Configuration options: [Disabled] [Enabled] [Auto]



---

The following item appears only when **SATA Enable** is set to **[Enabled]**.

---

***SATA Mode [AHCI]***

Allows you to select the OnChip SATA Type.  
Configuration options: [AHCI] [AHCI as ID 0x7904] [Auto]

### **Sata RAS Support [Auto]**

Allows you to enable or disable Sata RAS Support.

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

### **Sata Disabled AHCI Prefetch Function [Auto]**

Allows you to enable or disable Sata Disabled AHCI Prefetch Function.

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

### **Aggressive SATA Device Sleep Port 0 [Auto]**

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



---

The following item appears only when **Aggressive SATA Device Sleep Port 0** is set to **[Enabled]**.

---

### **DevSleep0 Port Number [0]**

Allows you to set the DEVSLP port 0.

Configuration options: [0] - [7]

### **Aggressive SATA Device Sleep Port 1 [Auto]**

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



---

The following item appears only when **Aggressive SATA Device Sleep Port 1** is set to **[Enabled]**.

---

### **DevSleep1 Port Number [0]**

Allows you to set the DEVSLP port 1.

Configuration options: [0] - [7]

### **SATA Controller options**

#### **SATA Controller Enable**

##### **Sata0 Enable [Auto]**

Allows you to enable or disable Sata0. Each IOD has 4 Sata Controllers.

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

##### **Sata1 Enable [Auto]**

Allows you to enable or disable Sata1. Each IOD has 4 Sata Controllers.

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

##### **Sata2 Enable [Auto]**

Allows you to enable or disable Sata2. Each IOD has 4 Sata Controllers.

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

##### **Sata3 Enable [Auto]**

Allows you to enable or disable Sata3. Each IOD has 4 Sata Controllers.

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

##### **Sata4 (Socket1) Enable [Auto]**

Allows you to enable or disable Sata4 on Socket 1 (IOD1). Each IOD has 4 Sata Controllers.

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

##### **Sata5 (Socket1) Enable [Auto]**

Allows you to enable or disable Sata5 on Socket 1 (IOD1). Each IOD has 4 Sata Controllers.

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

**Sata6 (Socket1) Enable [Auto]**

Allows you to enable or disable Sata6 on Socket 1 (IOD1). Each IOD has 4 Sata Controllers.

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

**Sata7 (Socket1) Enable [Auto]**

Allows you to enable or disable Sata7 on Socket 1 (IOD1). Each IOD has 4 Sata Controllers.

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

**SATA Controller eSATA****SATA Controller DevSlp****Socket1 DevSlp****Socket1 DevSlp0 Enable [Auto]**

Only Sata0 on each IOD/socket supports DevSlp.

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



---

The following item appears only when **Socket1 DevSlp0 Enable** is set to **[Enabled]**.

---

**DevSleep0 Port Number [0]**

Allows you to set DEVSLP port 0.

Configuration options: [0] - [7]

**Socket1 DevSlp1 Enable [Auto]**

Only Sata0 on each IOD/socket supports DevSlp.

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



---

The following item appears only when **Socket1 DevSlp1 Enable** is set to **[Enabled]**.

---

**DevSleep0 Port Number [1]**

Allows you to set DEVSLP port 1.

Configuration options: [0] - [7]

**SATA Controller SGPIO****Sata0 SGPIO [Auto]**

Allows you to enable or disable SataSgpios on Sata0.

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

**Sata1 SGPIO [Auto]**

Allows you to enable or disable SataSgpios on Sata1.

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

**Sata2 SGPIO [Auto]**

Allows you to enable or disable SataSgpios on Sata2.

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

**Sata3 SGPIO [Auto]**

Allows you to enable or disable SataSgpios on Sata3.

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

**Sata4 SGPIO [Auto]**

Allows you to enable or disable SataSgpios on Sata4.

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



**Sata5 SGPIO [Auto]**

Allows you to enable or disable SataSgpio on Sata5.  
Configuration options: [Disabled] [Enabled] [Auto]

**Sata6 SGPIO [Auto]**

Allows you to enable or disable SataSgpio on Sata6.  
Configuration options: [Disabled] [Enabled] [Auto]

**Sata7 SGPIO [Auto]**

Allows you to enable or disable SataSgpio on Sata7.  
Configuration options: [Disabled] [Enabled] [Auto]

**USB Configuration Options**

**XHCI Controller0 enable [Auto]**

Allows you to enable or disable USB3 controller.  
Configuration options: [Enabled] [Disabled] [Auto]

**XHCI Controller1 enable [Auto]**

Allows you to enable or disable USB3 controller.  
Configuration options: [Enabled] [Disabled] [Auto]

**USB ecc SMI Enable [Auto]**

**MCM USB enable**

**XHCI2 enable (Socket1) [Auto]**

Allows you to enable or disable USB3 controller.  
Configuration options: [Disabled] [Enabled] [Auto]

**XHCI3 enable (Socket1) [Auto]**

Allows you to enable or disable USB3 controller.  
Configuration options: [Disabled] [Enabled] [Auto]

**SD Dump Options**

**SD Configuration Mode [SD Dump disabled]**

Configuration options: [SD Dump disabled] [SD Dump enabled]

**Ac Power Loss Options**

**AC Loss Control [Always On]**

Allows you to select Ac Loss Control Method.  
Configuration options: [Always Off] [Always On] [Reserved] [Previous] [Auto]

**I2C Configuration Options**

**I2C 0 Enable [Auto]**

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

**I2C 1 Enable [Auto]**

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

**I2C 2 Enable [Auto]**

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

**I2C 3 Enable [Auto]**

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

**I2C 4 Enable [Auto]**

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

**I2C 5 Enable [Auto]**

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

## Uart Configuration Options

### **Uart 0 Enable [Auto]**

Uart 0 has no HW FC is Uart 2 is enabled.  
Configuration options: [Disabled] [Enabled] [Auto]

---



The following item appears only when **Uart 0 Enable** is set to **[Enabled]**.

---

### **Uart 0 Legacy Options [Auto]**

Configuration options: [Disabled] [0x2E8] [0x2F8] [0x3E8] [0x3F8] [Auto]

### **Uart 1 Enable [Auto]**

Uart 1 has no HW FC is Uart 3 is enabled.  
Configuration options: [Disabled] [Enabled] [Auto]

---



The following item appears only when **Uart 1 Enable** is set to **[Enabled]**.

---

### **Uart 1 Legacy Options [Auto]**

Configuration options: [Disabled] [0x2E8] [0x2F8] [0x3E8] [0x3F8] [Auto]

### **Uart 2 Enable (no HW FC) [Auto]**

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

---



The following item appears only when **Uart 2 Enable (no HW FC)** is set to **[Enabled]**.

---

### **Uart 2 Legacy Options [Auto]**

Configuration options: [Disabled] [0x2E8] [0x2F8] [0x3E8] [0x3F8] [Auto]

### **Uart 3 Enable (no HW FC) [Auto]**

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

---



The following item appears only when **Uart 3 Enable (no HW FC)** is set to **[Enabled]**.

---

### **Uart 3 Legacy Options [Auto]**

Configuration options: [Disabled] [0x2E8] [0x2F8] [0x3E8] [0x3F8] [Auto]

## FCH RAS Options

### **ALink RAS Support [Auto]**

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

### **Reset after sync flood [Auto]**

Enable AB to forward downstream sync-flood message to system controller.  
Configuration options: [Disabled] [Enabled] [Auto]

## Miscellaneous Options

### **Boot Timer Enable [Auto]**

[Disabled] Force PMx44 bit 27 = 1.

[Enabled] Force PMx44 bit 27 = 0.

[Auto] PMx44 bit 27 = PcdBootTimerEnable.

## Soc Miscellaneous Control

### ABL Console Out Control [Auto]

[Disable] Disable ConsoleOut Function for ABL.

[Enable] Enable ConsoleOut Function for ABL.

[Auto] Keep default behavior.



---

The following items are available only when **ABL Console Out Control** is set to **[Enable]**.

---

### ABL Console Out Serial Port [Auto]

[LPC UART] Enable serial port through LPC UART.

[SOC UART0] Enable serial port through SOC UART0.

[SOC UART1] Enable serial port through SOC UART1.

[Auto] Keep default behavior.

### ABL Basic Console Out Control [Enable]

[Enable] Enable Basic ConsoleOut Function for ABL.

[Disable] Disable Basic ConsoleOut Function for ABL.

[Auto] Keep default behavior.

### ABL PMU message Control [Auto]

Allows you to control the total number of PMU debug messages. Several major controls are listed below:

1. Detailed debug messages (e.g., Eye delays)
2. Coarse debug messages (e.g., rank information)
3. Stage completion
4. Firmware completion message only

Configuration options: [Detailed debug message] [Coarse debug messages] [Stage completion] [Firmware completion message only] [Auto]

## Workload Tuning

### Workload Profile [Auto]

Allows you to select the profile for different workloads.

[Disabled] Don't use any workload profile.

[CPU Intensive] Tuned for CPU intensive workloads, providing optimal integer and floating point performance.

[Java Throughput] Tuned for the highest level of throughput with java workloads.

[Java Latency] Tuned for the latency sensitive java workloads, to meet critical SLA's.

[Power Efficiency] Tuned for optimal power efficiency.

[Memory Throughput Intensive] Tuned for the highest memory throughput available.

[Storage IO Intensive] Tuned for the highest storage IO bandwidth.

[NIC Throughput Intensive] Tuned for maximum TCP/IP and RDMA network throughput.

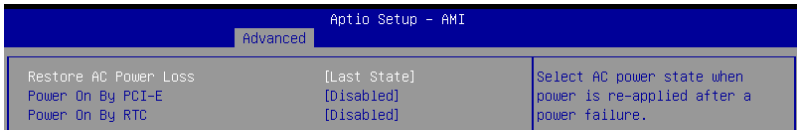
[NIC Latency Sensitive]	Tuned for network performance where the kernel performs L3 packet forwarding.
[Accelerator Throughput]	Tuned to maximum peer-to-peer PCIe throughput with accelerators such as GPU's.
[VMware vSphere Optimized]	Tuned for general virt+P3+Q4.
[Linux KVM Optimized]	Tuned for general virtualization performance when using Linux KVM.
[Container Optimized]	Optimized for container performance.
[RDBMS Optimized]	Tuned for relational databases.
[Big Data Analytics Optimized]	Tuned for big data analytics.
[IOT Gateway]	Tuned for throughput analytics as observed by IOT gateways.
[HPC Optimized]	Tuned for general HPC performance.
[OpenStack NFV]	Tuned for Openstack based NFV workloads.
[OpenStack for RealTime Kernel] enabled.	Tuned for Openstack with RealTime kernel enabled.
[Auto]	Use BIOS default workload profile.

**Performance Tracing [Auto]**

Allows you to enable or disable allow capturing performance traces.  
 Configuration options: [Disabled] [Enabled] [Auto]

### 3.5.5 APM Configuration

Allows you to configure the Advance Power Management (APM) settings.



**Restore AC Power Loss [Last State]**

- [Power Off] The system goes into off state after an AC power loss.
- [Power On] The system will reboot after an AC power loss.
- [Last State] The system goes into either off or on state, whatever the system state was before the AC power loss.

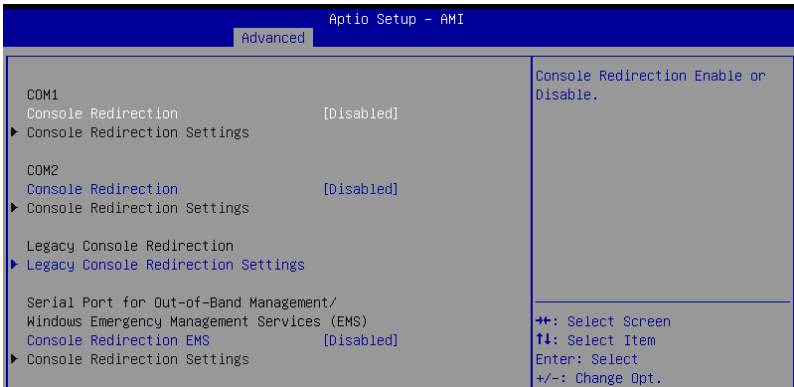
**Power On By PCI-E [Disabled]**

- [Disabled] Disables the PCIe devices to generate a wake event.
- [Enabled] Enables the PCIe devices to generate a wake event.

**Power On By RTC [Disabled]**

- [Disabled] Disables RTC to generate a wake event.
- [Enabled] When set to [Enabled], the items **RTC Alarm Date (Days)** and **Hour/Minute/Second** will become user-configurable with set values.

## 3.5.6 Serial Port Console Redirection



### COM1

#### Console Redirection [Disabled]

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 [ANSI]

Allows you to set the terminal type.

[VT100] ASCII char set.

[VT100+] 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 [115200]

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 [8]

Configuration options: [7] [8]

### **Parity [None]**

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.

[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 [1]**

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 [None]**

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 [Enabled]**

This allows you to enable the VT -UTF8 Combination Key Support for ANSI/VT100 terminals.

Configuration options: [Disabled] [Enabled]

### **Recorder Mode [Disabled]**

With this mode enabled only text will be sent. This is to capture Terminal data.

Configuration options: [Disabled] [Enabled]

### **Resolution 100x31 [Enabled]**

This allows you enable or disable extended terminal resolution.

Configuration options: [Disabled] [Enabled]

### **Putty Keypad [VT100]**

This allows you to select the FunctionKey and Keypad on Putty.

Configuration options: [VT100] [LINUX] [XTERMR6] [SCO] [ESCN] [VT400]

## **COM2**

### **Console Redirection [Disabled]**

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 [ANSI]**

Allows you to set the terminal type.

[VT100] ASCII char set.

[VT100+] 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 [57600]**

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 [8]**

Configuration options: [7] [8]

#### **Parity [None]**

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.

[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 [1]**

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 [None]**

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 [Enabled]**

This allows you to enable the VT -UTF8 Combination Key Support for ANSI/VT100 terminals.

Configuration options: [Disabled] [Enabled]

### **Recorder Mode [Disabled]**

With this mode enabled only text will be sent. This is to capture Terminal data.

Configuration options: [Disabled] [Enabled]

### **Resolution 100x31 [Enabled]**

This allows you enable or disable extended terminal resolution.

Configuration options: [Disabled] [Enabled]

### **Putty Keypad [VT100]**

This allows you to select the FunctionKey and Keypad on Putty.

Configuration options: [VT100] [LINUX] [XTERMR6] [SCO] [ESCN] [VT400]

## **Legacy Console Redirection Settings**

### **Legacy Console Redirection Port [COM1]**

Allows you to select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.

Configuration options: [COM1] [COM2]

### **Resolution [80x24]**

This allows you to set the number of rows and columns supported on the Legacy OS.

Configuration options: [80x24] [80x25]

### **Redirection After POST [Always Enable]**

This setting allows you to specify if Bootloader is selected than Legacy console redirection.

Configuration options: [Always Enable] [Bootloader]

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

### **Console Redirection [Disabled]**

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**

#### **Out-of-Band Mgmt Port [COM1]**

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

Configuration options: [COM1] [COM2]



### Terminal Type [VT-UTF8]

Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.  
Configuration options: [VT100] [VT100+] [VT-UTF8] [ANSI]

### Bits per second [115200]

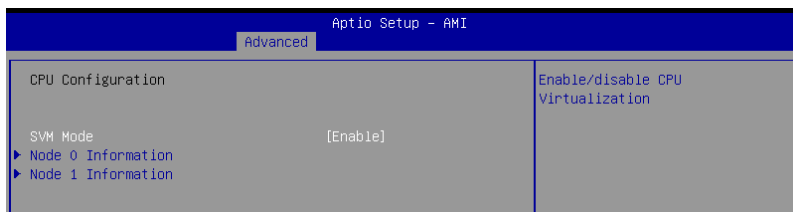
Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.  
Configuration options: [9600] [19200] [57600] [115200]

### Flow Control [None]

Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.  
Configuration options: [None] [Hardware RTS/CTS] [Software Xon/Xoff]

## 3.5.7 CPU Configuration

This page displays the CPU node information.



### SVM Mode [Enable]

This item allows you enable or disable CPU Virtualization.  
Configuration options: [Disabled] [Enable]

### Node 0 Information

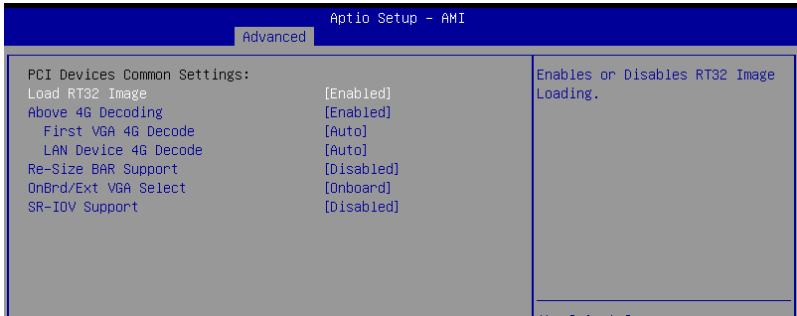
This item allows you to view memory information related to Node 0.

### Node 1 Information

This item allows you to view memory information related to Node 1.

### 3.5.8 PCI Subsystem Settings

Allows you to configure PCI, PCI-X, and PCI Express Settings.



#### VGA Palette Snoop [Disabled]

This option enables or disables VGA Palette Registers Snooping.  
Configuration options: [Disabled] [Enabled]

#### Load RT32 Image [Enabled]

This option enables or disables RT32 Image Loading.  
Configuration options: [Disabled] [Enabled]

#### Above 4G Decoding [Enabled]

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]



The following items appear only when **Above 4G Decoding** is set to **[Enabled]**.

#### First VGA 4G Decode [Auto]

- [Auto]            Auto
- [Above\_4G]      Force First VGA to above 4G

#### LAN Device 4G Decode [Auto]

LAN Device 4G Decode.  
Configuration options: [Auto] [Above\_4G]

#### Re-Size BAR Support [Disabled]

This option enables or disables Re-Size BAR Support.  
Configuration options: [Disabled] [Enabled]



To enable Re-Size BAR Support for harnessing full GPU memory, please disable CSM (Compatibility Support Module).

#### OnBrd/Ext VGA Select [Onboard]

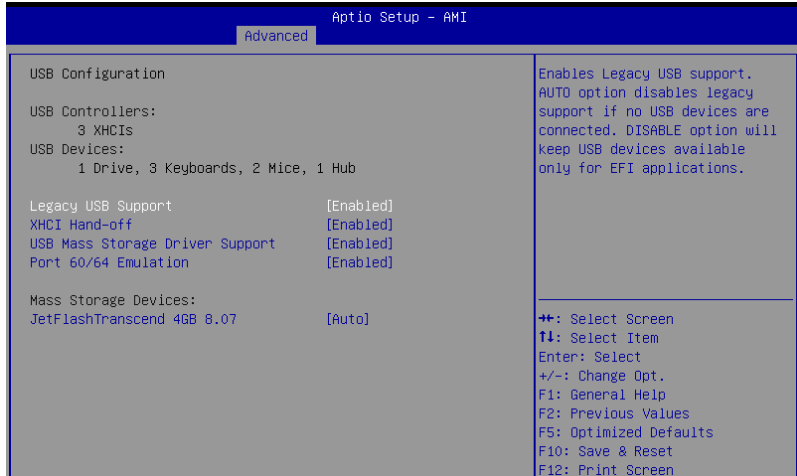
This allows you to select between onboard or external VGA support.  
Configuration options: [Auto] [Onboard] [External]

## SR-IOV Support [Disabled]

This option enables or disables Single Root IO Virtualization Support if the system has SR-IOV capable PCIe devices.

Configuration options: [Disabled] [Enabled]

## 3.5.9 USB Configuration



### Legacy USB Support [Enabled]

Allows you to enable or disable Legacy USB device support.

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

### XHCI Hand-off [Enabled]

Allows you to enable or disable workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

Configuration options: [Enabled] [Disabled]

### USB Mass Storage Driver Support [Enabled]

Allows you to enable or disable the USB Mass Storage driver support.

Configuration options: [Disabled] [Enabled]

### Port 60/64 Emulation [Enabled]

Allows you to enable or disable I/O port 60h/64h emulation support. This should be enabled for the complete keyboard legacy support for non-USB aware OSes.

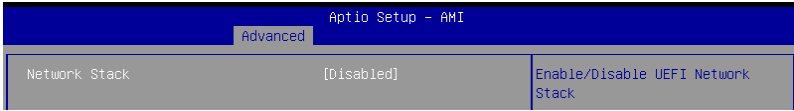
Configuration options: [Disabled] [Enabled]

### Mass Storage Devices

Allows you to select the mass storage device emulation type for devices connected.

Configuration options: [Auto] [Floppy] [Forced FDD] [Hard Disk] [CD-ROM]

## 3.5.10 Network Stack Configuration



### Network stack [Disabled]

Enables or disables the network stack feature.

Configuration options: [Disable] [Enable]



---

The following item appears only when **Network stack** is set to **[Enabled]**.

---

#### **Ipv4 PXE Support [Disabled]**

Enables or disables the Ipv4 PXE Boot Support. If disabled, Ipv4 PXE boot option will not be created.

Configuration options: [Disabled] [Enabled]

#### **Ipv4 HTTP Support [Disabled]**

Enables or disables the Ipv4 HTTP Boot Support. If disabled, Ipv4 HTTP boot option will not be created.

Configuration options: [Disabled] [Enabled]

#### **Ipv6 PXE Support [Disabled]**

Enables or disables the Ipv6 PXE Boot Support. If disabled, Ipv6 PXE boot option will not be created.

Configuration options: [Disabled] [Enabled]

### **Ipv6 HTTP Support [Disabled]**

Enables or disables the Ipv6 HTTP Boot Support. If disabled, Ipv6 HTTP boot option will not be created.

Configuration options: [Disabled] [Enabled]

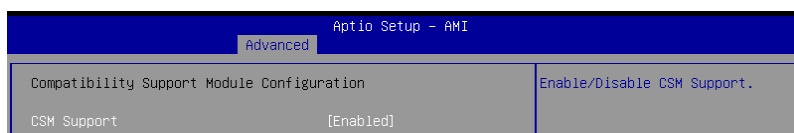
### **PXE boot wait time [0]**

Set the wait time to press ESC key to abort the PXE boot. Use the <+> or <-> to adjust the value. The values range from 0 to 5.

### **Media detect count [1]**

Set the number of times presence of media will be checked. Use the <+> or <-> to adjust the value. The values range from 1 to 50.

## **3.5.11 CSM Configuration**



### **CSM Support [Enabled]**

This option allows you to enable or disable CSM Support.

Configuration options: [Enabled] [Disabled]



---

The following item appears only when **CSM Support** is set to **[Enabled]**.

---

### **GateA20 Active [Upon Request]**

This allows you to set the GA20 option.

Configuration options: [Upon Request] [Always]

### **Option ROM Messages [Force BIOS]**

This allows you to set the display mode for option ROM.

Configuration options: [Force BIOS] [Keep Current]

### **INT19 Trap Response [Immediate]**

The BIOS reaction on INT19 trapping by Option ROM.

[Immediate]           Execute the trap right away.

[Postponed]           Execute the trap during legacy boot.

### **HDD Connection Order [Adjust]**

This option allows you to select the HDD Connection Order. Some OS require HDD handles to be adjusted, i.e. OS is installed on drive 80h.

Configuration options: [Adjust] [Keep]

### **Boot Option filter [UEFI and Legacy]**

This option allows you to control the Legacy/UEFI ROMs priority.

Configuration options: [UEFI and Legacy] [Legacy only] [UEFI only]

### Network / Storage / Other PCI devices [UEFI]

This option allows you to control the execution of UEFI and Legacy PXE / Storage / Other PCI devices.

Configuration options: [UEFI] [Legacy]

### Video [Legacy]

This item determines the OpROM execution policy for Video.

Configuration options: [Legacy] [UEFI]

## 3.5.12 NVMe Configuration

This page will display the NVMe controller and drive information.



### Device



The devices and names shown in the NVMe configuration list depends on the connected devices. If no devices are connected, **No NVMe Device Found** will be displayed.

### Self Test Option [Short]

This option allows you to select either Short or Extended Self Test. Short option will take couple of minutes, and the extended option will take several minutes to complete.

Configuration options: [Short] [Extended]

### Self Test Action [Controller Only Test]

This item allows you to select either to test Controller alone or Controller and NameSpace. Selecting Controller and NameSpace option will take a lot longer to complete the test.

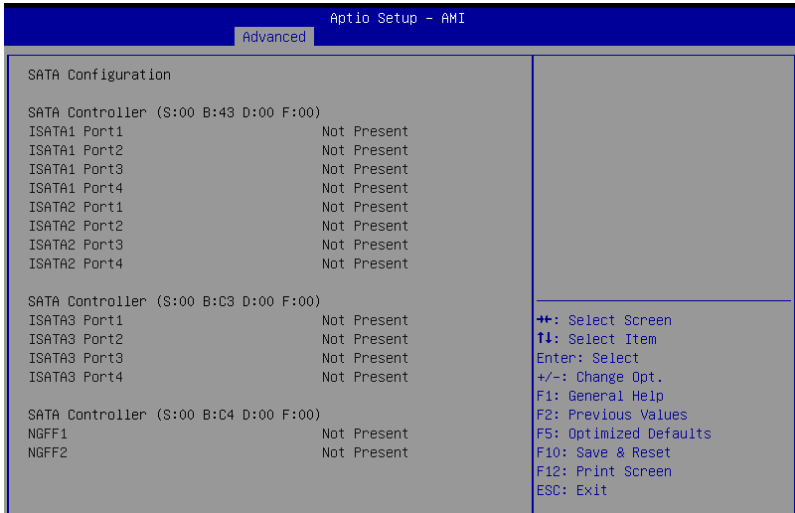
Configuration options: [Controller Only Test] [Controller and NameSpace Test]

### Run Device Self Test

Press <Enter> to perform device self test for the corresponding Option and Action selected by the user. Pressing the <ESC> key will abort the test. The results shown below is the most recent result logged in the device.

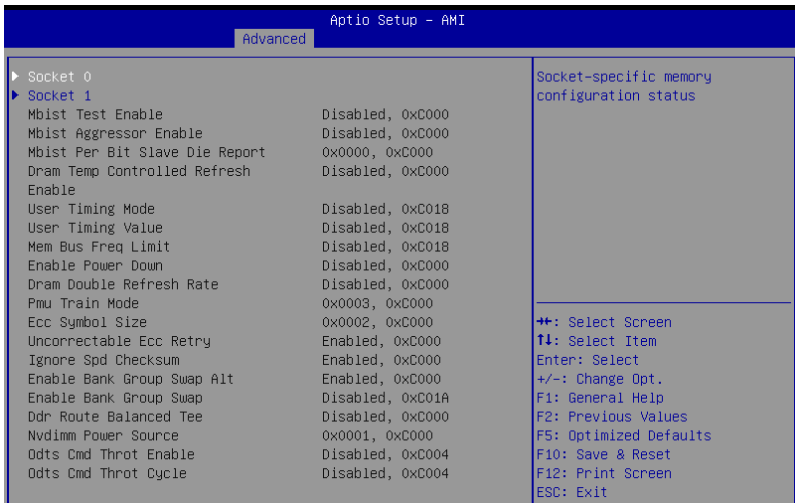
### 3.5.13 SATA Configuration

This page will display the SATA controller and drive information.



### 3.5.14 AMD Mem Configuration Status

The items in this menu display the memory configuration (initialized by ABL) status.



### 3.5.15 Tls Auth Configuration

The items in this menu allows you to set the authentication mode.



#### Server CA Configuration

This option allows you to configure the server's CA. This allows to both enroll the required certificate files and also to delete the certificates that are not required.

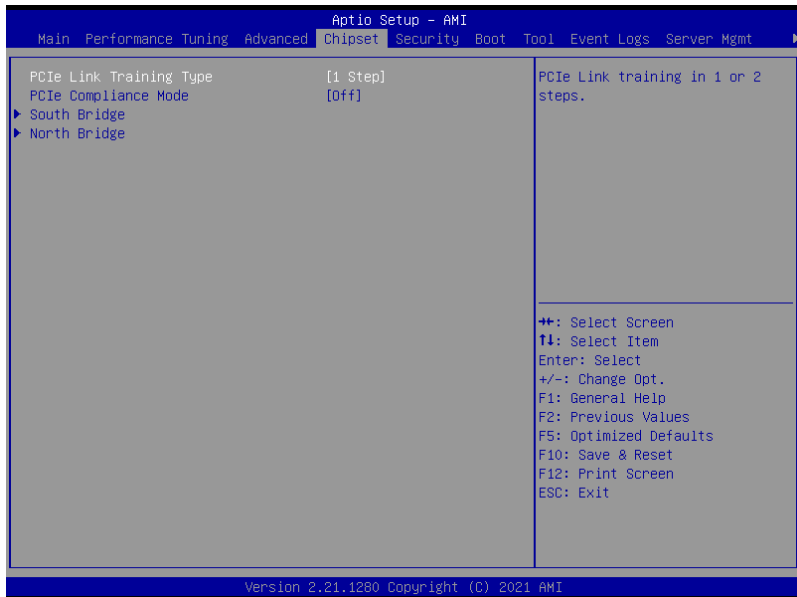
#### Client CA Configuration

This option allows you to configure client certificate configuration.



## 3.6 Chipset menu

The Chipset menu items allow you to change the Chipset settings.



### PCIe Link Training Type [1 Step]

Allows you to select PCIe Link Training in 1 or 2 steps.

Configuration options: [1 Step] [2 Step]

### PCIe Compliance Mode [Off]

Allows you to turn the PCIe Compliance Mode on or off.

### South Bridge

#### SB Debug Configuration

#### SB SATA DEBUG Configuration

The items in this submenu contains options for SATA DEBUG Configuration.

#### **Aggressive Link PM Capability [Enabled]**

Indicates whether Host Bus Adapter (HBA) can support Auto-generating Link Requests to the partial or slumber states when there are no commands to process.

Configuration options: [Disabled] [Enabled]

#### **Port Multiplier Capability [Enabled]**

Indicates whether Host Bus Adapter (HBA) can support a port multiplier.

Configuration options: [Disabled] [Enabled]

#### **SATA Ports Auto Clock Control [Enabled]**

Allows you to enable or disable SATA Ports Auto Clock Control.

Configuration options: [Disabled] [Enabled]

**SATA Partial State Capability [Enabled]**

Indicates whether Host Bus Adapter (HBA) can support transitions to the partial state.

Configuration options: [Disabled] [Enabled]

**SATA FIS Based Switching [Enabled]**

Indicates whether Host Bus Adapter (HBA) can support port multiplier FIS-based switching.

Configuration options: [Disabled] [Enabled]

**SATA Command Completion Coalescing Support [Disabled]**

Indicates whether Host Bus Adapter (HBA) can support command completion coalescing.

Configuration options: [Disabled] [Enabled]

**SATA Slumber State Capability [Enabled]**

Indicates whether Host Bus Adapter (HBA) can support transitions to the slumber state.

Configuration options: [Disabled] [Enabled]

**SATA Target Support 8 Devices [Disabled]**

Indicates whether SATA target support 8 devices function.

Configuration options: [Disabled] [Enabled]

**Generic Mode [Disabled]**

Allows you to SATA disable Generic Mode.

Configuration options: [Disabled] [Enabled]

**SATA AHCI Enclosure [Disabled]**

Allows you to enable or disable SATA AHCI Enclosure Management.

Configuration options: [Disabled] [Enabled]

**SATA SGPIO 0 [Disabled]**

Allows you to enable or disable SATA Serial General Purpose Input/Output (SGPIO) 0.

Configuration options: [Disabled] [Enabled]

**SB FUSION DEBUG Configuration**

The items in this submenu contains options for SB FUSION DEBUG Configuration.

**TimerTick Tracking [Disabled]**

Configuration options: [Disabled] [Enabled]

**Clock Interrupt Tag [Disabled]**

Configuration options: [Disabled] [Enabled]

**SB MISC DEBUG Configuration**

The items in this submenu contains options for SB DEBUG Configuration.

**SB Clock Spread Spectrum [Enabled]**

Allows you to enable or disable CG1\_PLL Spread Spectrum.

Configuration options: [Disabled] [Enabled]

**HPET In SB [Enabled]**

Allows you to enable or disable the HPET Function Switch.

Configuration options: [Disabled] [Enabled]

**MsiDis in HPET [Enabled]**

Expose MSI capability in HPET Capability register.

Configuration options: [Disabled] [Enabled]

## **North Bridge**

### **Socket 0 Information**

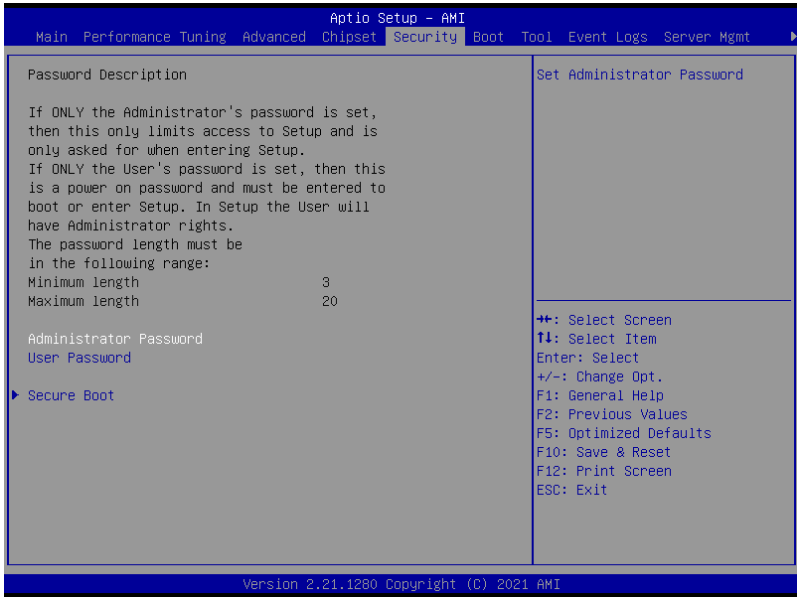
This item displays the memory information on Socket 0.

### **Socket 1 Information**

This item displays the memory information on Socket 1.

### 3.7 Security menu

This menu allows a new password to be created or a current password to be changed. The menu also enables or disables the Secure Boot state and lets the user configure the System Mode state.



#### Administrator Password

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. Confirm the password when prompted.

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. Confirm the password when prompted.



---

To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password.

---

## User Password

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. Confirm the password when prompted.

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. Confirm the password when prompted.

To clear a user password:

1. Select the Clear User Password item and press <Enter>.
2. Select **Yes** from the Warning message window then press <Enter>.

## Secure Boot

This item allows you to customize the Secure Boot settings.

Aptio Setup - AMI		
Security		
System Mode	User	Secure Boot feature is Active if Secure Boot is Enabled, Platform Key(PK) is enrolled and the System is in User mode. The mode change requires platform reset
Secure Boot	[Disabled] Not Active	
Secure Boot Mode	[Custom]	
▶ Restore Factory Keys		
▶ Reset To Setup Mode		

### Secure Boot [Disabled]

Secure Boot can be enabled if the system is running in User mode with enrolled platform Key (EPK) or if the CSM function is disabled.

Configuration options: [Disabled] [Enabled]

### Secure Boot Mode [Custom]

Allows you to set the Secure Boot selector.

Configuration options: [Custom] [Standard]



The following items are only available when **Secure Boot Mode** is set to **[Custom]**.

### Restore Factory Keys

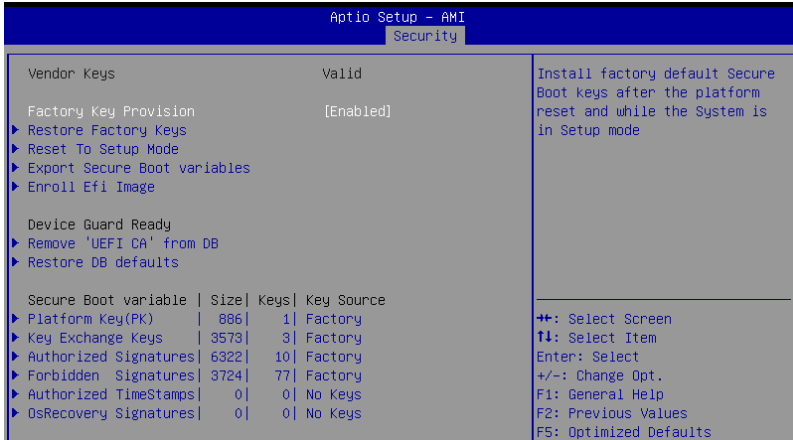
This option will force the system to User Mode, and install factory default Secure Boot key databases.

## Reset to Setup Mode

This option will delete all Secure Boot key databases from NVRAM.

## Key Management

This item only appears when the item **Secure Boot Mode** is set to **[Custom]**. The Key Management item allows you to modify Secure Boot variables and set Key Management page.



### Factory Key Provision [Disabled]

Allows you to provision factory default Secure Boot keys when the system is in Setup Mode.

Configuration options: [Disabled] [Enabled]

### Restore Factory keys

This item will install all Factory Default keys.

### Reset to Setup Mode

This item appears only when you load the default Secure Boot keys. This item allows you to clear all default Secure Boot keys.

### Export Secure Boot Variables

This item will ask you if you want to save all secure boot variables. Select Yes if you want to save all secure boot variables, otherwise select No.

### Enroll Efi Image

This item will allow the image to run in Secure Boot mode.

Configuration options: [Set New] [Append]

### Device Guard Ready

#### Remove 'UEFI CA' from DB

Remove Microsoft UEFI CA from Secure Boot DB.

#### Restore DB defaults

Restore DB variable to factory defaults.

### Platform Key (PK)

Configuration options: [Details] [Export] [Update] [Delete]

### Key Exchange Keys (KEK) / Authorized Signatures (DB) / Forbidden Signatures (DBX)

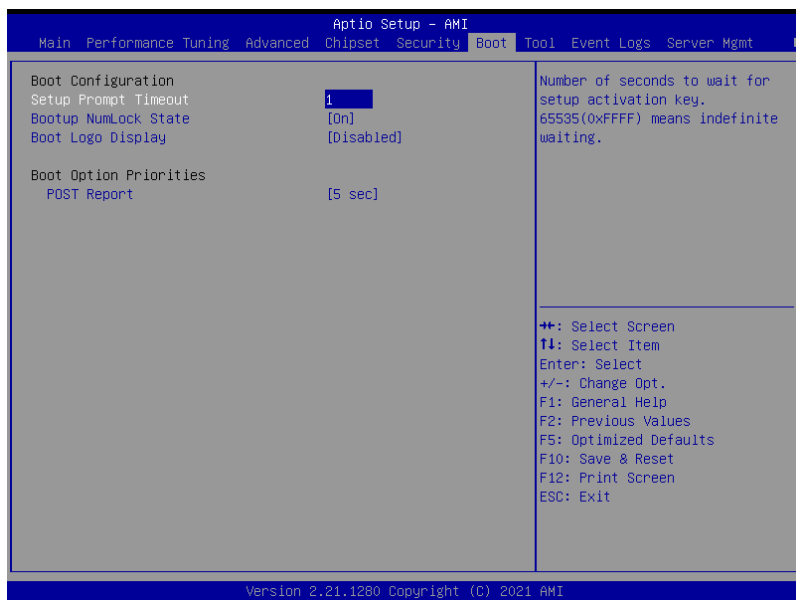
Configuration options: [Details] [Export] [Update] [Append] [Delete]

### Authorized TimeStamps (DBT) / OsRecovery Signatures

Configuration options: [Update] [Append]

## 3.8 Boot menu

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



### Setup Prompt Timeout [1]

Allows you to set the number of seconds that the firmware waits before initiating the original default boot selection. 65535(0xFFFF) means indefinite waiting. Use the <+> or <-> to adjust the value.

### Bootup NumLock State [On]

Allows you to select the power-on state for the NumLock.

Configuration options: [Off] [On]

### Boot Logo Display [Disabled]

Allows you to enable or disable Quiet Boot option.

Configuration options: [Disabled] [Enabled]

## 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 select the boot device during system startup, press <F8> when ASUS Logo appears.
- To access Windows OS in Safe Mode, please press <F8> after POST.

### POST Report [5 sec]

Allows you to set the desired POST Report waiting time from 1 to 10 seconds.  
Configuration options: [1 sec] ~ [10 sec] [Until Press ESC]

## 3.9 Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.



### 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.

### IPMI Hardware Monitor

Allows you to run the IPMI hardware monitor.

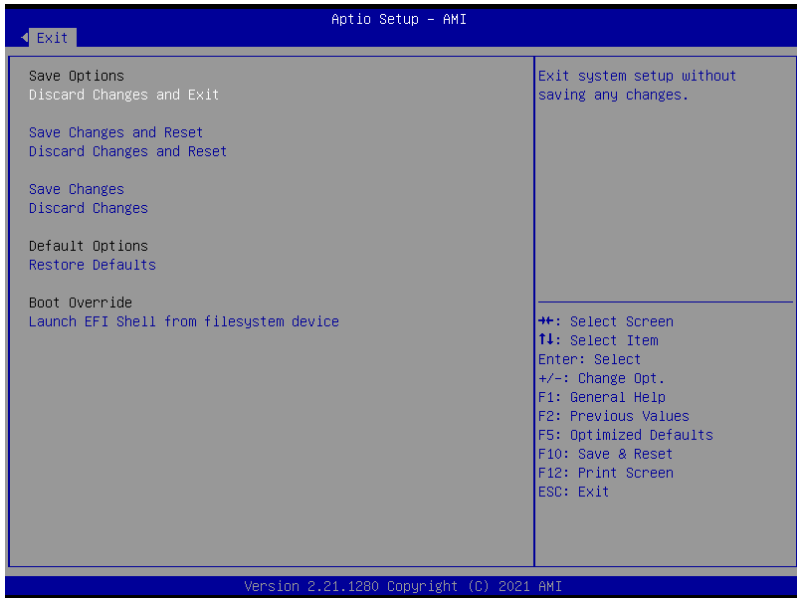
### ASUS SMBIOS Viewer

Allows you to start ASUS SMBIOS Viewer.



## 3.10 Save & Exit menu

The Exit menu items allow you to save or discard your changes to the BIOS items.



Pressing <Esc> does not immediately exit this menu. Select one of the options from this menu or <F10> from the legend bar to exit.

### Discard Changes and Exit

Exit system setup without saving any changes.

### Save Changes and Reset

Reset system after saving the changes.

### Discard Changes and Reset

Restart system setup without saving any changes.

### 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.

### Restore Defaults

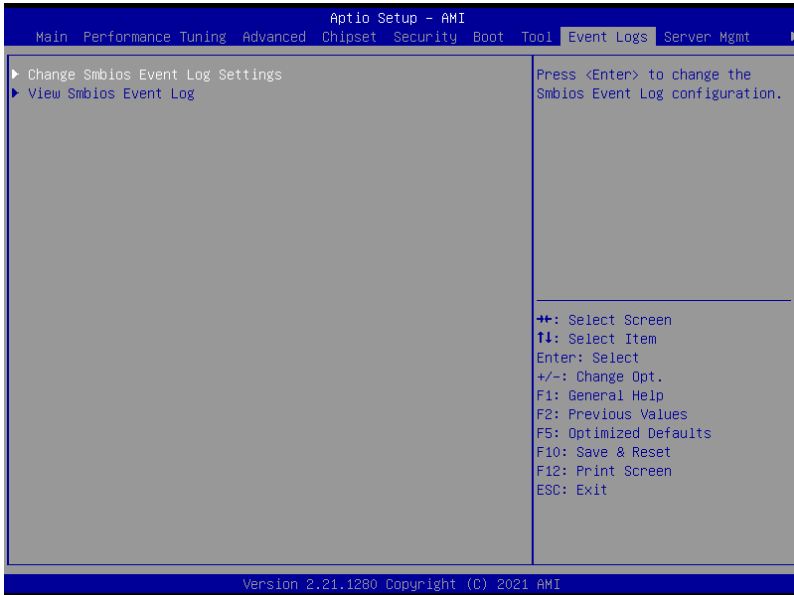
Restore/load default values for all the setup options.

## Boot Override

These items displays the available devices. The device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

## 3.11 Event Logs menu

The Event Logs menu items allow you to change the event log settings and view the system event logs.



### 3.11.1 Change Smbios Event Log Settings

Press <Enter> to change the Smbios Event Log configuration.



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

#### Enabling/Disabling Options

##### Smbios Event Log [Enabled]

Change this to enable or disable all features of Smbios Event Logging during boot. Configuration options: [Disabled] [Enabled]



The following items appear only when **Smbios Event Log** is set to **[Enabled]**.

## Erasing Settings

### Erase Event Log [No]

Choose options for erasing Smbios Event Log. Erasing is done prior to any logging activation during reset.

Configuration options: [No] [Yes, Next reset] [Yes, Every reset]

## Smbios Event Log Standard Settings

### Log System Boot Event [Disabled]

This option allows you to enable or disable logging System boot event.

Configuration options: [Disabled] [Enabled]

### MECI [1]

The Multiple Event Count Increment is the occurrences of a duplicate event that must pass before the multiple-event counter of log entry is updated. The values range from 1 to 255.

### METW [60]

The Multiple Event Time Window is the number of minutes which must pass between duplicate log entries which utilize a multiple-event counter. The values range from 0 to 99 minutes.

## Custom Options

### Log EFI Status Code [Enabled]

This option allows you to enable or disable logging of the EFI Status Codes.

Configuration options: [Disabled] [Enabled]



---

The following item appears only when **Log EFI Status Code** is set to **[Enabled]**.

---

### Convert EFI Status Codes to Standard Smbios Type [Disabled]

This option allows you to enable or disable converting of EFI Status Codes to Standard Smbios Type (Not all may be translated).

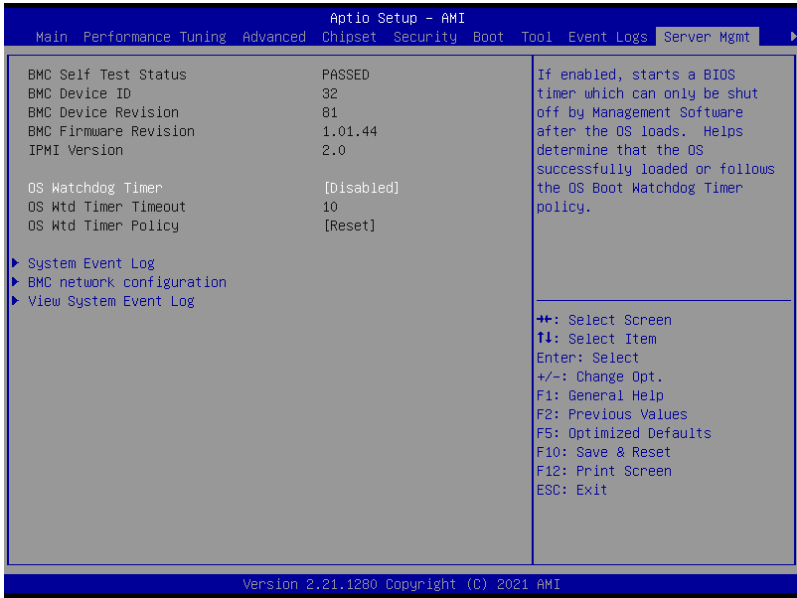
Configuration options: [Disabled] [Enabled]

## 3.11.2 View Smbios Event Log

Press <Enter> to view all smbios event logs.

### 3.12 Server Mgmt menu

The Server Management menu displays the server management status and allows you to change the settings.



#### OS Watchdog Timer [Disabled]

This item allows you to start a BIOS timer which can only be shut off by Management Software after the OS loads.

Configuration options: [Disabled] [Enabled]



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

#### OS Wtd Timer Timeout [10]

Allows you to configure the length (in minutes) for the OS Boot Watchdog Timer.

Configuration options: [1] - [30]

#### OS Wtd Timer Policy [Reset]

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]

## System Event Log

Allows you to change the SEL event log configuration.

### Erase SEL [No]

Allows you to choose options for erasing SEL.

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



---

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

---

## BMC network configuration

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

### Configure IPV4 support

#### DM\_LAN1/Shared LAN

#### Configuration Address source [Previous State]

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

Configuration options: [Previous State] [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. **Shared LAN**

### Configure IPV6 support

#### DM\_LAN1/Shared LAN

#### IPV6 Support [Enabled]

Allows you to enable or disable LAN1 IPV6 Support.

Configuration options: [Disabled] [Enabled]



---

The following item appears only when **IPV6 Support** is set to [Enabled].

---

### **Configuration Address source [Previous State]**

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

Configuration options: [Previous State] [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 Lan1 Address**

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

### **View System Event Log**

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

# Driver Installation

# 4

This chapter provides instructions for installing the necessary drivers for different system components.

## Running the Support DVD

The support DVD that is bundled with your motherboard contains drivers, management applications, and utilities that you can install to maximize the features of your motherboard.



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The contents of the support DVD are subject to change at any time without notice. Visit the ASUS website ([www.asus.com](http://www.asus.com)) for the latest updates on software and utilities.

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The main screen of the Support DVD contains the following tabs:

1. Drivers - Shows the available device drivers that the system detects.
2. Utilities - Displays the software applications and utilities that the motherboard supports.
3. Manual - Provides the link to the user guide(s).



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You need an internet browser installed in your OS to view the User Guide.

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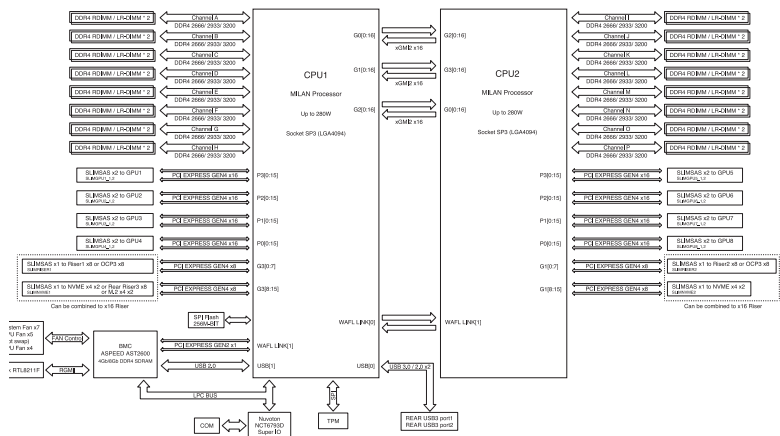
4. Contact - Displays the ASUS contact information, e-mail addresses, and useful links if you need more information or technical support for your motherboard.



# Appendix

This appendix includes additional information that you may refer to when configuring the motherboard.

# ESC8000A-E11 block diagram



## Q-Code table

Code	Description
00	Not used
02	microcode
03	CACHE_ENABLED
04	PCH initialization
06	CPU_EARLY_INIT
10	PEI Core is started
11 – 14	Pre-memory CPU initialization is started
15 – 18	Pre-memory System Agent initialization is started
19 – 1C	Pre-memory PCH initialization is started
2B – 2F	Memory initialization
30	Reserved for ASL (see ASL Status Codes section below)
31	Memory Installed
32 – 36	CPU post-memory initialization
37 – 3A	Post-Memory System Agent initialization is started
3B – 3E	Post-Memory PCH initialization is started
4F	DXE IPL is started
50 – 53	Memory initialization error. Invalid memory type or incompatible memory speed
4F	DXE IPL is started
54	Unspecified memory initialization error
55	Memory not installed
56	Invalid CPU type or Speed
57	CPU mismatch
58	CPU self test failed or possible CPU cache error
59	CPU micro-code is not found or micro-code update is failed
5A	Internal CPU error
5B	Reset PPI is not available
5C – 5F	Reserved for future AMI error codes
E0	S3 Resume is started (S3 Resume PPI is called by the DXE IPL)
E1	S3 Boot Script execution
E2	Video repost
E3	OS S3 wake vector call
E4 – E7	Reserved for future AMI progress codes
E8	S3 Resume Failed
E9	S3 Resume PPI not Found
EA	S3 Resume Boot Script Error
EB	S3 OS Wake Error
EC – EF	Reserved for future AMI error codes
F0	Recovery condition triggered by firmware (Auto recovery)
F1	Recovery condition triggered by user (Forced recovery)
F2	Recovery process started
F3	Recovery firmware image is found
F4	Recovery firmware image is loaded
F5 – F7	Reserved for future AMI progress codes
F8	Recovery PPI is not available
F9	Recovery capsule is not found

*(continued on the next page)*

Code	Description
FA	Invalid recovery capsule
FB – FF	Reserved for future AMI error codes
60	DXE Core is started
61	NVRAM initialization
62	Installation of the PCH Runtime Services
63 – 67	CPU DXE initialization is started
68	PCI host bridge initialization
69	System Agent DXE initialization is started
6A	System Agent DXE SMM initialization is started
6B – 6F	System Agent DXE initialization (System Agent module specific)
70	PCH DXE initialization is started
71	PCH DXE SMM initialization is started
72	PCH devices initialization
73 – 77	PCH DXE Initialization (PCH module specific)
78	ACPI module initialization
79	CSM initialization
7A – 7F	Reserved for future AMI DXE codes
90	Boot Device Selection (BDS) phase is started
91	Driver connecting is started
92	PCI Bus initialization is started
93	PCI Bus Hot Plug Controller Initialization
94	PCI Bus Enumeration
95	PCI Bus Request Resources
96	PCI Bus Assign Resources
97	Console Output devices connect
98	Console input devices connect
99	Super IO Initialization
9A	USB initialization is started
9B	USB Reset
9C	USB Detect
9D	USB Enable
9E – 9F	Reserved for future AMI codes
A0	IDE initialization is started
A1	IDE Reset
A2	IDE Detect
A3	IDE Enable
A4	SCSI initialization is started
A5	SCSI Reset
A6	SCSI Detect
A7	SCSI Enable
A8	Setup Verifying Password
A9	Start of Setup
AA	Reserved for ASL (see ASL Status Codes section below)
AB	Setup Input Wait

*(continued on the next page)*

Code	Description
AC	Reserved for ASL (see ASL Status Codes section below)
AD	Ready To Boot event
AE	Legacy Boot event
AF	Exit Boot Services event
B0	Runtime Set Virtual Address MAP Begin
B1	Runtime Set Virtual Address MAP End
B2	Legacy Option ROM Initialization
B3	System Reset
B4	USB hot plug
B5	PCI bus hot plug
B6	Clean-up of NVRAM
B7	Configuration Reset (reset of NVRAM settings)
B8– BF	Reserved for future AMI codes
D0	CPU initialization error
D1	System Agent initialization error
D2	PCH initialization error
D3	Some of the Architectural Protocols are not available
D4	PCI resource allocation error. Out of Resources
D5	No Space for Legacy Option ROM
D6	No Console Output Devices are found
D7	No Console Input Devices are found
D8	Invalid password
D9	Error loading Boot Option (LoadImage returned error)
DA	Boot Option is failed (StartImage returned error)
DB	Flash update is failed
DC	Reset protocol is not available

#### ACPI/ASL Checkpoints (under OS)

Code	Description
03	System is entering S3 sleep state
04	System is entering S4 sleep state
05	System is entering S5 sleep state
30	System is waking up from the S3 sleep state
40	System is waking up from the S4 sleep state
AC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.
AA	System has transitioned into ACPI mode. Interrupt controller is in APIC mode.

## Notices

### Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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### Compliance Statement of Innovation, Science and Economic Development Canada (ISED)

This device complies with Innovation, Science and Economic Development Canada licence exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

CAN ICES-003(A)/NMB-003(A)

### Déclaration de conformité de Innovation, Sciences et Développement économique Canada (ISED)

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-003(A)/NMB-003(A)

## Australia statement notice

From 1 January 2012 updated warranties apply to all ASUS products, consistent with the Australian Consumer Law. For the latest product warranty details please visit <https://www.asus.com/support/>. Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

If you require assistance please call ASUS Customer Service 1300 2787 88 or visit us at <https://www.asus.com/support/>.



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DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

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DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.

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## Japan JATE

本製品は電気通信事業者（移动通信会社、固定通信会社、インターネットプロバイダ等）の通信回線（公衆無線LANを含む）に直接接続することができません。本製品をインターネットに接続する場合は、必ずルーター等を経由し接続してください。

## Japan statement notice

This product cannot be directly connected to the Internet (including public wireless LAN) of a telecom carrier (mobile network companies, landline network companies, Internet providers, etc.). When connecting this product to the Internet, be sure to connect it through a router or switch.

## Declaration of compliance for product environmental regulation

ASUS follows the green design concept to design and manufacture our products, and makes sure that each stage of the product life cycle of ASUS product is in line with global environmental regulations. In addition, ASUS disclose the relevant information based on regulation requirements.

Please refer to <http://csr.asus.com/Compliance.htm> for information disclosure based on regulation requirements ASUS is complied with:

### EU REACH and Article 33

Complying with the REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) regulatory framework, we publish the chemical substances in our products at ASUS REACH website at <http://csr.asus.com/english/REACH.htm>.

## EU RoHS

This product complies with the EU RoHS Directive. For more details, see <http://csr.asus.com/english/article.aspx?id=35>

## Japan JIS-C-0950 Material Declarations

Information on Japan RoHS (JIS-C-0950) chemical disclosures is available on <http://csr.asus.com/english/article.aspx?id=19>

## India RoHS

This product complies with the “India E-Waste (Management) Rules, 2016” and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in concentrations exceeding 0.1% by weight in homogenous materials and 0.01% by weight in homogenous materials for cadmium, except for the exemptions listed in Schedule II of the Rule.

## Vietnam RoHS

ASUS products sold in Vietnam, on or after September 23, 2011, meet the requirements of the Vietnam Circular 30/2011/TT-BCT.

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 năm 2011 trở về sau, đều phải đáp ứng các yêu cầu của Thông tư 30/2011/TT-BCT của Việt Nam.

## Turkey RoHS

AEEE Yönetmeliğine Uygundur

## ASUS Recycling/Takeback Services

ASUS recycling and takeback programs come from our commitment to the highest standards for protecting our environment. We believe in providing solutions for you to be able to responsibly recycle our products, batteries, other components as well as the packaging materials. Please go to <http://csr.asus.com/english/Takeback.htm> for detailed recycling information in different regions.

## Ecodesign Directive

European Union announced a framework for the setting of ecodesign requirements for energy-related products (2009/125/EC). Specific Implementing Measures are aimed at improving environmental performance of specific products or across multiple product types. ASUS provides product information on the CSR website. The further information could be found at <https://csr.asus.com/english/article.aspx?id=1555>.

## Service and Support

Visit our multi-language website at <https://www.asus.com/support>.

