

# **RS300-E11 Series**

## **1U 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.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.



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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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### **Lithium-Ion Battery Warning**

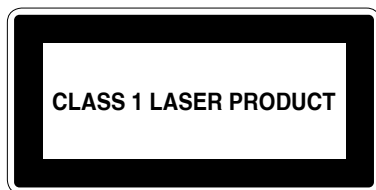
CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

### **Heavy System**

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

## **Optical Drive Safety Information**

### **Laser Safety Information**



To prevent exposure to the optical drive's laser, do not attempt to disassemble or repair the optical drive by yourself. For your safety, contact a professional technician for assistance.



# 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 Information**

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

**3. Chapter 3: Installation Options**

This chapter describes how to install optional components into the barebone server.

**4. Chapter 4: Motherboard Information**

This chapter gives information about the motherboard that comes with the server. This chapter includes the motherboard layout, jumper settings, and connector locations.

**5. Chapter 5: BIOS Setup**

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

**6. Chapter 6: 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. Visit [asuscontrolcenter.asus.com](https://www.asus.com/asuscontrolcenter) for more information.

### 2. ASUS websites

The ASUS websites provide updated information for all ASUS hardware and software products. Visit <https://www.asus.com> for more 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.

|                |   |
|----------------|---|
| Model Name     | RS300-E11-RS4, RS300-E11-PS4  |
| Chassis        | ASUS R11E 1U Rackmount Chassis  |
| Motherboard    | ASUS P12R-M/SYS Server Board  |
| Component      | 1 x 350W Single Power Supply(RS300-E11-PS4) or<br>1+1 450W Redundant Power Supply (RS300-E11-RS4) |
|                | 4 x Hot-swap 3.5" HDD trays   |
|                | 1 x SATA to miniSAS HD cable  |
|                | 1 x SAS/SATA/NVMe Backplane   |
|                | 1 x PCI Express Riser Card  |
|                | 1 x Front I/O Board   |
|                | 4 x System Fans (40 mm x 28 mm)   |
| Accessories    | 1 x RS300-E11 Series Support DVD (with User Guide)  |
|                | 1 x Bag of Screws   |
|                | 1 x AC Power Cable (RS300-E11-PS4) or<br>2 x AC Power Cable (RS300-E11-RS4)                       |
|                | 1 x CPU Heatsink  |
| Optional Items | ASUS PIKE II 3008/3108 card   |
|                | ASUS ASMB10-iKVM Remote management card   |
|                | Slim-type DVD-ROM/DVD-RW  |
|                | Second 450W Redundant Power Supply Module (RS300-E11-RS4)   |
|                | Single power supply module  |
|                | 1 x Riser card (2 NVMe configuration)   |
|                | 1 x X710 card (Proprietary Slot)  |
|                | Friction Rail Kit or Half Ball bearing Rail kit   |
|                | GPU Card  |

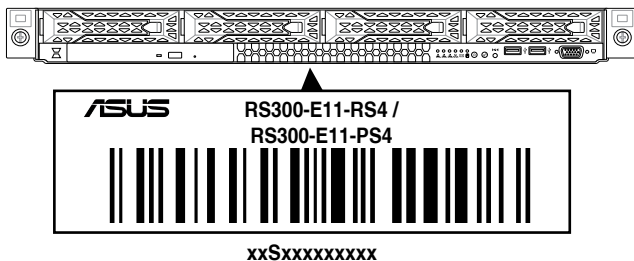


If any of the above items is damaged or missing, contact your retailer.

## 1.2 Serial number label

The product's serial number contains 12 characters such as xxSxxxxxxxxx and printed on the sticker at the server's front cover.

The correct serial number of the product is required if you need to request for support from the ASUS Technical Support team.



## 1.3 System specifications

The ASUS RS300-E11 Series features the ASUS P12R-M/SYS server board. The server supports Intel® Xeon® E and Intel® Pentium™ processors plus other latest technologies through the chipsets onboard.

| Model Name        |                           | RS300-E11-RS4  | RS300-E11-PS4 |
|-------------------|---------------------------|--|---------------|
| Motherboard       |                           | P12R-M/SYS   |               |
| Processor Support |                           | 1 x Socket H5 (LGA 1200)<br>Intel® Xeon® E processor (up to 95W)<br>Intel® Pentium™ processor  |               |
| Core Logic        |                           | Intel® C252 Chipset  |               |
| Memory            | Total Slots               | 4 (2-channels)   |               |
|                   | Capacity                  | Maximum up to 128GB (UDIMM)  |               |
|                   | Memory Type               | DDR4 3200/2933/2666 ECC UDIMM<br>* Please refer to <a href="http://www.asus.com">www.asus.com</a> for latest memory AVL update   |               |
|                   | Memory Size               | 32GB, 16GB, 8GB, 4GB (UDIMM)<br>* Refer to <a href="http://www.asus.com/support">www.asus.com/support</a> for more information   |               |
| Expansion Slots   | Total PCI/PCIe/PIKE Slots | Up to 3  |               |
|                   | Slot Type                 | <u>Butterfly Riser Slot A:</u><br>1 x PCIe x16 (Gen4 x16 Link, switch to x8 link when slot B occupied), FH/HL<br><u>Butterfly Riser Slot B:</u><br>1 x PCIe x8 (Gen4 x8 Link), HH/HL |               |
|                   | M.2                       | 1 x M.2 (Up to 2280)(from PCH)<br>(support PCIe M.2)   |               |
|                   | Proprietary Slot 1        | Motherboard SlotC:<br>1 x PCIe x 8 (Gen3 x 4 Link), Proprietary<br>(optional for Intel® X710 10G LAN card)   |               |
|                   | Proprietary Slot 2        | -  |               |
|                   |                           |  |               |
| Storage           | SATA Controller           | <u>Intel® C252:</u><br>6 x SATA 6Gb/s ports<br>Intel® VROC (Windows & Linux)<br>(Support software RAID 0, 1, 10 & 5)   |               |
|                   | SAS Controller            | <u>Optional kits:</u><br>ASUS PIKE II 3008 8-port SAS 12Gb/s HBA card<br>ASUS PIKE II 3108 8-port SAS HW 12Gb/s RAID card<br>Broadcom MegaRAID 9560-16i                              |               |

(continued on the next page)

| Model Name  |                                 | RS300-E11-RS4  | RS300-E11-PS4 |
|---|---------------------------------|--|---------------|
| Storage Bays  | Storage Bay                     | 4 x 3.5" Hot-Swap storage bays<br>- up to (2 x SATA/SAS/NVMe + 2 x SATA/SAS)<br>* SAS support only from optional SAS HBA/RAID card<br>* NVMe support only from optional NVMe upgrade kit   |               |
|   | Backplane connectors            | 2 x NVMe connectors<br>1 x Mini SAS HD connector   |               |
|   | Motherboard on-board connectors | 6 x SATA connectors<br>1 x M.2 connector   |               |
|   | Default cable                   | 1 x SATA to Mini SAS HD cable  |               |
|   | NVMe upgrade option             | NVMe upgrade option<br>Support 2 x NVMe: 2-port NVMe upgrade kit (1 x riser card + 1 x cables + 2 x NVMe HS)   |               |
| Networking  |                                 | 2 x Intel® I210-AT<br>1 x Management Port  |               |
| Graphic   | VGA                             | Aspeed AST2600 64MB<br>* VGA output from BMC   |               |
|   | HDMI                            | HDMI 1.4<br>* HDMI output from CPU   |               |
| Auxiliary Storage Device Bay (Floppy / Optical Drive) |                                 | 1 x Slim-type Optical Drive Bay<br>Options: No Device / DVD-RW / DVD-ROM   |               |
| Front I/O Ports                                       |                                 | 1 x VGA port<br>2 x USB 3.2 Gen 1 ports  |               |
| Rear I/O Ports  |                                 | 2 x USB 3.2 Gen 2 ports<br>1 x VGA port*<br>1 x HDMI™ port from CPU<br>1 x COM port<br>2 x RJ-45 ports<br>1 x RJ-45 ports (One for ASMB10-iKVM)(Optional)<br>* Only supported with ASMB10  |               |
| Switch/LED  |                                 | <u>Rear Switch/LED:</u><br>1 x Q-Code/Port 80 LED<br>1 x Power switch<br><br><u>Front Switch/LED:</u><br>1 x Power switch/LED<br>1 x Location switch/LED<br>1 x Reset switch<br>1 x HDD Access LED<br>1 x Message LED<br>LAN 1-2 LED |               |

(continued on the next page)

| Model Name  |                               | RS300-E11-RS4   | RS300-E11-PS4  |
|---|-------------------------------|---|--|
| OS Support  |                               | Windows® Server 2022<br>RedHat® Enterprise Linux<br>SuSE® Linux Enterprise Server<br>CentOS<br>* Please find the latest OS support from <a href="https://www.asus.com/">https://www.asus.com/</a> |  |
| Management Solution   | Software                      | ASUS Control Center   |  |
|   | Out of Band Remote Management | On-Board ASMB10-iKVM for KVM-over-IP  |  |
| Regulatory Compliance   |                               | BSMI, CE, C-TICK, FCC (Class A)   |  |
| Dimension   |                               | 497mm x 439.5mm x 44mm (2U)   |  |
| Net Weight Kg (CPU, DRAM & HDD not included)                    |                               | 10.3 Kg   | 8.47 Kg  |
| Gross Weight Kg (CPU, DRAM & HDD not included, Packing include) |                               | 15.3 Kg   | 13.47 Kg   |
| Power Supply<br>(different configuration by region)             |                               | 1+1 Redundant 450W 80 PLUS PLATINUM Power Supply<br>Rating: 100-240Vac, 6A (for each inlet), 50-60Hz, Class I   | Single 350W 80 PLUS Gold Power Supply<br>Rating: 100-240Vac, 6-3A (for each inlet), 50-60Hz, Class I |
| Environment   |                               | Operation temperature: 10°C ~ 35°C<br>Non operation temperature: -40°C ~70°C<br>Non operation humidity: 20% ~ 90% (Non condensing)  |  |

\*Specifications are subject to change without notice.

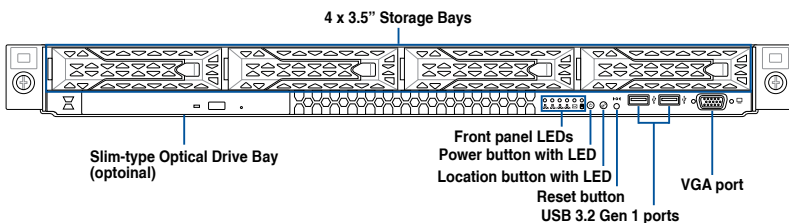


## 1.4 Front panel features

The barebone server displays a simple yet stylish front panel with easily accessible features. The power and reset buttons, LED indicators are located on the front panel.



Refer to section 1.7 LED information for the LED descriptions.

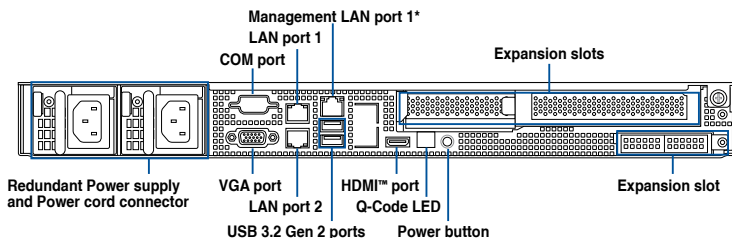


Bay 1 to bay 4 supports NVMe/SATA/SAS. SAS support requires optional HBA/RAID card.

## 1.5 Rear panel features

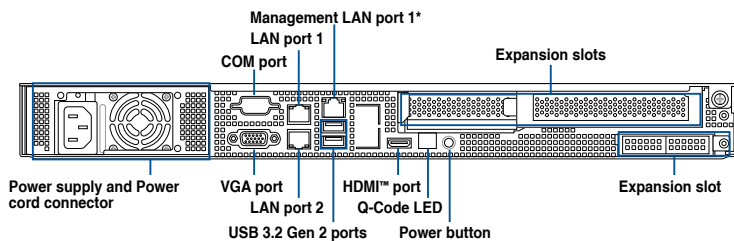
The rear panel includes the expansion slots, and system power sockets. The middle part includes the I/O shield with openings for the rear panel connectors on the motherboard.

### RS300-E11-RS4



- \* This port is for ASUS ASMB10-iKVM only.
- The Q-Code LED provides the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Refer to the Q-Code table for details.

## RS300-E11-PS4

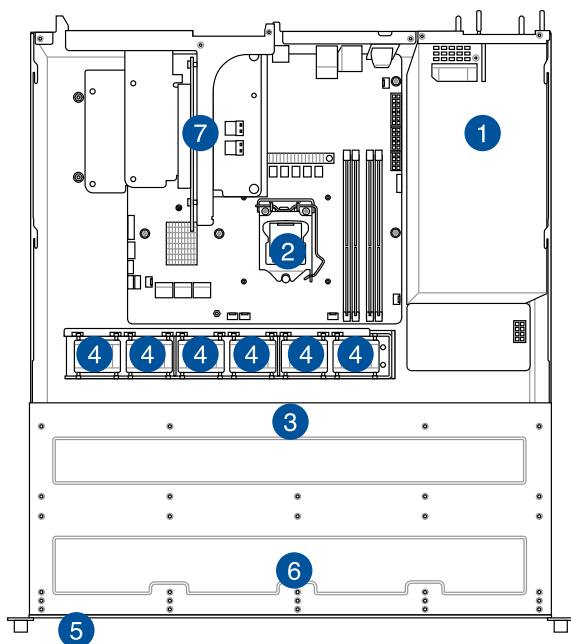


- \* This port is for ASUS ASMB10-iKVM only.
- The Q-Code LED provides the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Refer to the Q-Code table for details.

## 1.6 Internal features

The barebone server includes the basic components as shown.

### RS300-E11-RS4



- |                                 |                                  |
|---------------------------------|----------------------------------|
| 1. Redundant Power supply       | 5. Asset Tag (hidden)            |
| 2. ASUS P12R-M/SYS Server Board | 6. 4 x 3.5" storage device trays |
| 3. SATA/SAS/NVMe back panel     | 7. PCIe riser card               |
| 4. System fans                  |                                  |



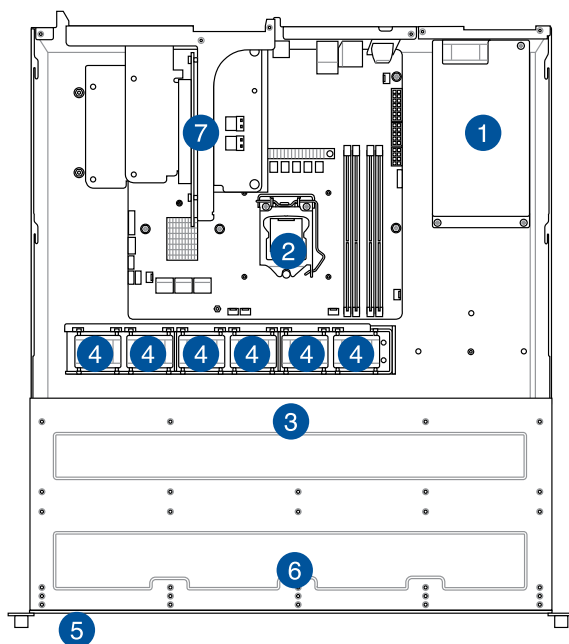
The barebone server does not include a floppy disk drive. Connect a USB floppy disk drive to any of the USB ports on the front or rear panel if you need to use a floppy disk.



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

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

## RS300-E11-PS4



- |                                 |                                  |
|---------------------------------|----------------------------------|
| 1. Power supply                 | 5. Asset Tag (hidden)            |
| 2. ASUS P12R-M/SYS Server Board | 6. 4 x 3.5" storage device trays |
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| 4. System fans                  |                                  |



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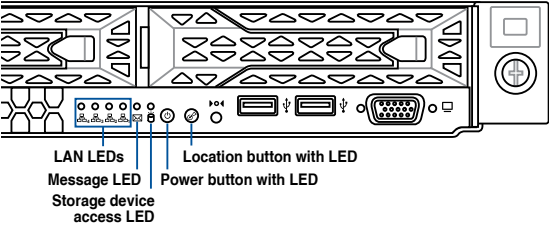


A protection film is pre-attached to the front cover before shipping. Please remove the protection film before turning on the system for proper heat dissipation.

**WARNING**  
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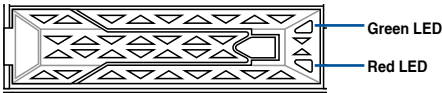
# 1.7 LED information

## 1.7.1 Front panel LEDs



| LED                       | Icon | Display status | Description   |
|---------------------------|------|----------------|---|
| Power LED                 |      | ON             | System power ON   |
| Storage device access LED |      | OFF            | No activity   |
|                           |      | Blinking       | Read/write data into the storage device                             |
| Message LED               |      | OFF            | System is normal; no incoming event                                 |
|                           |      | ON             | With the onboard ASMB10-iKVM: a hardware monitor event is indicated |
| LAN LEDs                  |      | OFF            | No LAN connection   |
|                           |      | Blinking       | LAN is transmitting or receiving data                               |
|                           |      | ON             | LAN connection is present   |
| Location LED              | ID   | ON             | Location switch is pressed  |
|                           |      | OFF            | Normal status (Press the location switch again to turn off)         |

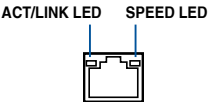
### 1.7.2 Storage device status LED



| Storage Device LED Description |          |   |
|--------------------------------|----------|---|
| Status (RED)                   | ON       | Storage device has failed                             |
|                                | Blinking | RAID rebuilding or locating                           |
| Activity (GREEN)               | ON       | Storage device power ON                               |
|                                | Blinking | Read/write data from/into the SATA/SAS storage device |
|                                | OFF      | Storage device not found                              |

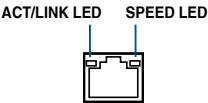
### 1.7.3 LAN (RJ-45) LEDs

#### Intel® I350-AM2 1G LAN port LEDs



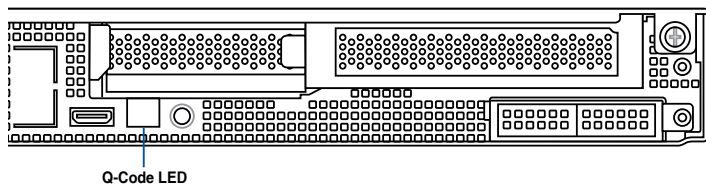
| ACT/LINK LED |               | SPEED LED |                     |
|--------------|---------------|-----------|---------------------|
| Status       | Description   | Status    | Description         |
| OFF          | No link       | OFF       | 10 Mbps connection  |
| GREEN        | Linked        |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

#### Dedicated Management LAN port (DM\_LAN1) LED indications



| 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   |

## 1.7.4 Rear panel LEDs



## 1.7.5 Q-Code table

### AMD EPYC™ 7002 Series processors

| Action       | PHASE                                    | POST CODE | TYPE     | DESCRIPTION   |
|--------------|--|-----------|----------|---|
| SEC Start up | Security Phase                           | 0x01      | Progress | First post code   |
|              |  | 0x02      | Progress | Load BSP microcode  |
|              |  | 0x03      | Progress | Perform early platform Initialization                                   |
|              |  | 0x04      | Progress | Set cache as ram for PEI phase  |
|              |  | 0x05      | Progress | Establish Stack   |
|              |  | 0x06      | Progress | CPU Early Initialization  |
| PSP Boot     | PSP Boot Loader phase (Error Post Codes) | 0x00      | Error    | General - Success   |
|              |  | 0x01      | Error    | Generic Error Code  |
|              |  | 0x02      | Error    | Generic Memory Error  |
|              |  | 0x03      | Error    | Buffer Overflow   |
|              |  | 0x04      | Error    | Invalid Parameter(s)  |
|              |  | 0x05      | Error    | Invalid Data Length   |
|              |  | 0x06      | Error    | Data Alignment Error  |
|              |  | 0x07      | Error    | Null Pointer Error  |
|              |  | 0x08      | Error    | Unsupported Function  |
|              |  | 0x09      | Error    | Invalid Service ID  |
|              |  | 0x0A      | Error    | Invalid Address   |
|              |  | 0x0B      | Error    | Out of Resource Error   |
|              |  | 0x0C      | Error    | Timeout   |
|              |  | 0x0D      | Error    | data abort exception  |
|              |  | 0x0E      | Error    | prefetch abort exception  |
|              |  | 0x0F      | Error    | Out of Boundary Condition Reached                                       |
|              |  | 0x10      | Error    | Data corruption   |
|              |  | 0x11      | Error    | Invalid command   |
|              |  | 0x12      | Error    | The package type provided by BR is incorrect                            |
|              |  | 0x13      | Error    | Failed to retrieve FW header during FW validation                       |
|              |  | 0x14      | Error    | Key size not supported  |
|              |  | 0x15      | Error    | Agesa0 verification error   |
|              |  | 0x16      | Error    | SMU FW verification error   |
|              |  | 0x17      | Error    | OEM SINGING KEY verification error                                      |
|              |  | 0x18      | Error    | Generic FW Validation error   |
|              |  | 0x19      | Error    | RSA operation fail - bootloader   |
|              |  | 0x1A      | Error    | CCP Passthrough operation failed - internal status                      |
|              |  | 0x1B      | Error    | AES operation fail  |
|              |  | 0x1C      | Error    | CCP state save failed   |
|              |  | 0x1D      | Error    | CCP state restore failed  |
|              |  | 0x1E      | Error    | SHA256 operation fail - internal status                                 |
|              |  | 0x1F      | Error    | ZLib Decompression operation fail                                       |
|              |  | 0x20      | Error    | HMAC-SHA256 operation fail - internal status                            |
|              |  | 0x21      | Error    | Booted from boot source not recognized by PSP                           |
|              |  | 0x22      | Error    | PSP directory entry not found   |
|              |  | 0x23      | Error    | PSP failed to set the write enable latch                                |
|              |  | 0x24      | Error    | PSP timed out because spirom took too long                              |
|              |  | 0x25      | Error    | Cannot find BIOS directory  |
|              |  | 0x26      | Error    | SpiRom is not valid   |
|              |  | 0x27      | Error    | slave die has different security state from master                      |
|              |  | 0x28      | Error    | SMI interface init failure  |
|              |  | 0x29      | Error    | SMI interface generic error   |
|              |  | 0x2A      | Error    | invalid die ID executes MCM related function                            |
|              |  | 0x2B      | Error    | invalid MCM configuration table read from bootrom                       |
|              |  | 0x2C      | Error    | Valid boot mode wasn't detected   |
|              |  | 0x2D      | Error    | NVStorage init failure  |
|              |  | 0x2E      | Error    | NVStorage generic error   |
|              |  | 0x2F      | Error    | MCM 'error' to indicate slave has more data to send                     |
|              |  | 0x30      | Error    | MCM error if data size exceeds 32B                                      |
|              |  | 0x31      | Error    | Invalid client id for SVC MCM call                                      |
|              |  | 0x32      | Error    | MCM slave status register contains bad bits                             |
|              |  | 0x33      | Error    | MCM call was made in a single die environment                           |
|              |  | 0x34      | Error    | PSP secure mapped to invalid segment (should be 0x400_0000)             |
|              |  | 0x35      | Error    | No physical x86 cores were found on die                                 |
|              |  | 0x36      | Error    | Insufficient space for secure OS (range of free SRAM to SVC stack base) |
|              |  | 0x37      | Error    | SYSHUB mapping memory target type is not supported                      |
|              |  | 0x38      | Error    | Attempt to unmap permanently mapped TLB to PSP secure region            |

(continued on the next page)



| Action   | PHASE                                    | POST CODE | TYPE  | DESCRIPTION   |
|----------|--|-----------|-------|---|
| PSP Boot | PSP Boot Loader phase (Error Post Codes) | 0x39      | Error | Unable to map an SMN address to AXI space   |
|          |  | 0x3A      | Error | Unable to map a SYSHUB address to AXI space   |
|          |  | 0x3B      | Error | The count of CCXs or cores provided by bootrom is not consistent                      |
|          |  | 0x3C      | Error | Uncompressed image size doesn't match value in compressed header                      |
|          |  | 0x3D      | Error | Compressed option used in case where not supported                                    |
|          |  | 0x3E      | Error | Fuse info on all dies don't match   |
|          |  | 0x3F      | Error | PSP sent message to SMU; SMU reported an error  |
|          |  | 0x40      | Error | Function RunPostX86ReleaseUnitTests failed in memcmp()                                |
|          |  | 0x41      | Error | Interface between PSP to SMU not available.   |
|          |  | 0x42      | Error | Timer wait parameter too large  |
|          |  | 0x43      | Error | Test harness module reported an error   |
|          |  | 0x44      | Error | x86 wrote C2PMSG_0 interrupting PSP   |
|          |  | 0x45      | Error | A write to an L3 register failed  |
|          |  | 0x46      | Error | Mini-BL   |
|          |  | 0x47      | Error | Mini-BL CCP HMAC Unit-test failed   |
|          |  | 0x48      | Error | Potential stack corruption in jump to Mini BL   |
|          |  | 0x49      | Error | Error in Validate and Loading AGESA APOB SVC call                                     |
|          |  | 0x4A      | Error | Correct fuse bits for DIAG.BL loading not set   |
|          |  | 0x4B      | Error | The UmcProgramKeys() function was not called by AGESA                                 |
|          |  | 0x4C      | Error | Secure unlock error   |
|          |  | 0x4D      | Error | Syshub register programming mismatch during readback                                  |
|          |  | 0x4E      | Error | Family ID in MPO_SFUSE_SEC[7:3] not correct   |
|          |  | 0x4F      | Error | An operation was invoked that can only be performed by the GM                         |
|          |  | 0x50      | Error | Failed to acquire host controller semaphore to claim ownership of SMB                 |
|          |  | 0x51      | Error | Timed out waiting for host to complete pending transactions                           |
|          |  | 0x52      | Error | Timed out waiting for slave to complete pending transactions                          |
|          |  | 0x53      | Error | Unable to kill current transaction on host  |
|          |  | 0x54      | Error | One of: Illegal command   |
|          |  | 0x55      | Error | An SMBus transaction collision detected   |
|          |  | 0x56      | Error | Transaction failed to be started or processed by host                                 |
|          |  | 0x57      | Error | An unsolicited SMBus interrupt was received   |
|          |  | 0x58      | Error | An attempt to send an unsupported PSP-SMU message was made                            |
|          |  | 0x59      | Error | An error/data corruption detected on response from SMU for sent msg                   |
|          |  | 0x5A      | Error | MCM Steady-state unit test failed   |
|          |  | 0x5B      | Error | S3 Enter failed   |
|          |  | 0x5C      | Error | AGESA BL did not set PSP SMU reserved addresses via SVC call                          |
|          |  | 0x5E      | Error | CxSecBisEn not set in fuse RAM  |
|          |  | 0x5F      | Error | Received an unexpected result   |
|          |  | 0x60      | Error | VMG Storage Init failed   |
|          |  | 0x61      | Error | Failure in mbedTLS user app   |
|          |  | 0x62      | Error | An error occurred whilst attempting to SMN map a fuse register                        |
|          |  | 0x63      | Error | Fuse burn sequence/operation failed due to internal SOC error                         |
|          |  | 0x64      | Error | Fuse sense operation timed out  |
|          |  | 0x65      | Error | Fuse burn sequence/operation timed out waiting for burn done                          |
|          |  | 0x66      | Error | Failure status indicating that the given SecureOS has been                            |
|          |  | 0x67      | Error | This PSP FW was revoked   |
|          |  | 0x68      | Error | The platform model/vendor id fuse is not matching the BIOS public key token           |
|          |  | 0x69      | Error | The BIOS OEM public key of the BIOS was revoked for this platform                     |
|          |  | 0x6A      | Error | PSP level 2 directory not match expected value.                                       |
|          |  | 0x6B      | Error | BIOS level 2 directory not match expected value.                                      |
|          |  | 0x6C      | Error | HVB validation failure for BIOS RTM volume (OEM public/signature failed to validate). |
|          |  | 0x6D      | Error | Generic error indicating the CCP HAL initialization failed                            |
|          |  | 0x94      | Error | Knoll failed to idle correctly after being reset                                      |
|          |  | 0x95      | Error | Bad status returned by I2CKnollCheck  |
|          |  | 0x96      | Error | NACK to general call (no device on Knoll I2C bus)                                     |
|          |  | 0x97      | Error | Null pointer passed to I2CKnollCheck  |
|          |  | 0x98      | Error | Invalid device-ID found during Knoll authentication                                   |
|          |  | 0x99      | Error | Error during Knoll/Prom key derivation  |
|          |  | 0x9A      | Error | Null pointer passed to Crypto function  |
|          |  | 0x9B      | Error | Error in checksum from wrapped Knoll/Prom keys  |
|          |  | 0x9C      | Error | Knoll returned an invalid response to a command                                       |
|          |  | 0x9D      | Error | Bootloader failed in Knoll Send Command function                                      |
|          |  | 0x9E      | Error | No Knoll device found by verifying MAC  |

(continued on the next page)

| Action   | PHASE                                     | POST CODE | TYPE     | DESCRIPTION  |
|----------|---|-----------|----------|--|
| PSP Boot | PSP Boot Loader phase (Status Post Codes) | 0xA0      | Progress | Bootloader successfully entered C Main                       |
|          |   | 0xA1      | Progress | Master initialized C2P / slave waited for master to init C2P |
|          |   | 0xA2      | Progress | HMAC key successfully derived                                |
|          |   | 0xA3      | Progress | Master got Boot Mode and sent boot mode to all slaves        |
|          |   | 0xA4      | Progress | SpiRom successfully initialized                              |
|          |   | 0xA5      | Progress | BIOS Directory successfully read from SPI to SRAM            |
|          |   | 0xA6      | Progress | Early unlock check   |
|          |   | 0xA7      | Progress | Inline Aes key successfully derived                          |
|          |   | 0xA8      | Progress | Inline-AES key programming is done                           |
|          |   | 0xA9      | Progress | Inline-AES key wrapper derivation is done                    |
|          |   | 0xAA      | Progress | Bootloader successfully loaded HW IP configuration values    |
|          |   | 0xAB      | Progress | Bootloader successfully programmed MBAT table                |
|          |   | 0xAC      | Progress | Bootloader successfully loaded SMU FW                        |
|          |   | 0xAD      | Progress | PSP and SMU configured WAFL                                  |
|          |   | 0xAE      | Progress | User mode test harness completed successfully                |
|          |   | 0xAF      | Progress | Bootloader loaded Agesa0 from SpiRom                         |
|          |   | 0xB0      | Progress | AGESA phase has completed                                    |
|          |   | 0xB1      | Progress | RunPostDramTrainingTests() completed successfully            |
|          |   | 0xB2      | Progress | SMU FW Successfully loaded to SMU Secure DRAM                |
|          |   | 0xB3      | Progress | Sent all required boot time messages to SMU                  |
|          |   | 0xB4      | Progress | Validated and ran Security Gasket binary                     |
|          |   | 0xB5      | Progress | UMC Keys generated and programmed                            |
|          |   | 0xB6      | Progress | Inline AES key wrapper stored in DRAM                        |
|          |   | 0xB7      | Progress | Completed FW Validation step                                 |
|          |   | 0xB8      | Progress | Completed FW Validation step                                 |
|          |   | 0xB9      | Progress | BIOS copy from SPI to DRAM complete                          |
|          |   | 0xBA      | Progress | Completed FW Validation step                                 |
|          |   | 0xBB      | Progress | BIOS load process fully complete                             |
|          |   | 0xBC      | Progress | Bootloader successfully release x86                          |
|          |   | 0xBD      | Progress | Early Secure Debug completed                                 |
|          |   | 0xBE      | Progress | GetFWVersion command received from BIOS is completed         |
|          |   | 0xBF      | Progress | SMInfo command received from BIOS is completed               |
|          |   | 0xC0      | Progress | Successfully entered WarmBootResume()                        |
|          |   | 0xC1      | Progress | Successfully copied SecureOS image to SRAM                   |
|          |   | 0xC2      | Progress | Successfully copied trustlets to PSP Secure Memory           |
|          |   | 0xC3      | Progress | About to jump to Secure OS (SBL about to copy and jump)      |
|          |   | 0xC4      | Progress | Successfully restored CCP and UMC state on S3 resume         |
|          |   | 0xC5      | Progress | PSP SRAM HMAC validated by Mini BL                           |
|          |   | 0xC6      | Progress | About to jump to <1>-base in Mini BL                         |
|          |   | 0xC7      | Progress | VMG ECDH unit test started                                   |
|          |   | 0xC8      | Progress | VMG ECDH unit test passed                                    |
|          |   | 0xC9      | Progress | VMG ECC CDH primitive unit test started                      |
|          |   | 0xCA      | Progress | VMG ECC CDH primitive unit test passed                       |
|          |   | 0xCB      | Progress | VMG SP800-108 KDF-CTR HMAC unit test started                 |
|          |   | 0xCC      | Progress | VMG SP800-108 KDF-CTR HMAC unit test passed                  |
|          |   | 0xCD      | Progress | VMG LAUNCH - * test started                                  |
|          |   | 0xCE      | Progress | VMG LAUNCH - * test passed                                   |
|          |   | 0xCF      | Progress | MP1 has been taken out of reset                              |
|          |   | 0xD0      | Progress | PSP and SMU Reserved Addresses correct                       |
|          |   | 0xD1      | Progress | Reached Naples steady-state WFI loop                         |
|          |   | 0xD2      | Progress | Knoll device successfully initialized                        |
|          |   | 0xD3      | Progress | 32-byte RandOut successfully returned from Knoll             |
|          |   | 0xD4      | Progress | 32-byte MAC successfully received from Knoll.                |
|          |   | 0xD5      | Progress | Knoll device verified successfully                           |
|          |   | 0xD6      | Progress | Done enabling power for Knoll                                |
|          |   | 0xD7      | Progress | Enter recovery mode due to trustlet validation fail.         |
|          |   | 0xD8      | Progress | Enter recovery mode due to OS validation fail.               |
|          |   | 0xD9      | Progress | Enter recovery mode due to OEM public key not found.         |

(continued on the next page)

| Action      | PHASE                                   | POST CODE | TYPE     | DESCRIPTION                                  |
|-------------|---|-----------|----------|--|
| Quick VGA   | PEI(Pre-EFI Initialization) phase       | 0x10      | Progress | PEI Core Entry                               |
|             |   | 0x11      | Progress | PEI cache as ram CPU initial                 |
|             |   | 0x15      | Progress | NB Initialization before installed memory    |
|             |   | 0x19      | Progress | SB Initialization before installed memory    |
|             |   | 0x32      | Progress | CPU POST-Memory Initialization               |
|             | DXE(Driver Execution Environment) phase | 0x33      | Progress | CPU Cache Initialization                     |
|             |   | 0x34      | Progress | Application Processor(s) (AP) Initialization |
|             |   | 0x35      | Progress | BSP Selection                                |
|             |   | 0x36      | Progress | CPU Initialization                           |
|             |   | 0x37      | Progress | Pre-memory NB Initialization                 |
|             |   | 0x3B      | Progress | Pre-memory SB Initialization                 |
|             |   | 0x4F      | Progress | DXE Initial Program Load(IPL)                |
|             |   | 0x60      | Progress | DXE Core Started                             |
|             |   | 0x61      | Progress | DXE NVRAM Initialization                     |
|             |   | 0x62      | Progress | SB run-time Initialization                   |
|             |   | 0x63      | Progress | CPU DXE Initialization                       |
|             |   | 0x68      | Progress | PCI HB Initialization                        |
|             |   | 0x69      | Progress | NB DXE Initialization                        |
|             |   | 0x6A      | Progress | NB DXE SMM Initialization                    |
|             |   | 0x70      | Progress | SB DXE Initialization                        |
|             |   | 0x71      | Progress | SB DXE SMM Initialization                    |
|             |   | 0x72      | Progress | SB DEVICES Initialization                    |
|             |   | 0x78      | Progress | ACPI Module Initialization                   |
|             |   | 0x79      | Progress | CSM Initialization                           |
|             |   | 0xD0      | Progress | CPU PM Structure Initialization              |
| Normal boot | BDS(Boot Device Selection) phase        | 0x90      | Progress | BDS started                                  |
|             |   | 0x91      | Progress | Connect device event                         |
|             |   | 0x92      | Progress | PCI Bus Enumeration                          |
|             |   | 0x93      | Progress | PCI Bus Enumeration                          |
|             |   | 0x94      | Progress | PCI Bus Enumeration                          |
|             |   | 0x95      | Progress | PCI Bus Enumeration                          |
|             |   | 0x96      | Progress | PCI Bus Enumeration                          |
|             |   | 0x97      | Progress | Console outout connect event                 |
|             |   | 0x98      | Progress | Console input connect event                  |
|             |   | 0x99      | Progress | AMI Super IO start                           |
|             |   | 0x9A      | Progress | AMI USB Driver Initialization                |
|             |   | 0x9B      | Progress | AMI USB Driver Initialization                |
|             |   | 0x9C      | Progress | AMI USB Driver Initialization                |
|             |   | 0x9D      | Progress | AMI USB Driver Initialization                |
|             |   | 0xb2      | Progress | Legacy Option ROM Initialization             |
|             |   | 0xb3      | Progress | Reset system                                 |
|             |   | 0xb4      | Progress | USB hotplug                                  |
|             |   | 0xb6      | Progress | NVRAM clean up                               |
|             |   | 0xb7      | Progress | NVRAM configuration reset                    |
|             |   | 0xA0      | Progress | IDE, AHCI Initialization                     |
|             |   | 0xA1      | Progress | IDE, AHCI Initialization                     |
|             |   | 0xA2      | Progress | IDE, AHCI Initialization                     |
|             |   | 0xA3      | Progress | IDE, AHCI Initialization                     |
|             |   | 0x00-0xFF | Progress | Wait BMC ready                               |
|             |   | 0xA8      | Progress | BIOS Setup Utility password verify           |
|             |   | 0xA9      | Progress | BIOS Setup Utility start                     |
|             |   | 0xAB      | Progress | BIOS Setup Utility input wait                |
|             |   | 0xAD      | Progress | Ready to boot event                          |
|             |   | 0xAE      | Progress | Legacy boot event                            |
|             | Operating system phase                  | 0xAA      | Progress | APIC mode                                    |
|             |   | 0xAC      | Progress | PIC mode                                     |

## AMD EPYC™ 7003 Series processors

| Action       | PHASE                                    | POST CODE | TYPE     | DESCRIPTION   |
|--------------|--|-----------|----------|---|
| SEC Start up | Security Phase                           | 0x01      | Progress | First post code   |
|              |  | 0x02      | Progress | Load BSP microcode  |
|              |  | 0x03      | Progress | Perform early platform Initialization                                   |
|              |  | 0x04      | Progress | Set cache as ram for PEI phase  |
|              |  | 0x05      | Progress | Establish Stack   |
|              |  | 0x06      | Progress | CPU Early Initialization  |
| PSP Boot     | PSP Boot Loader phase (Error Post Codes) | 0x00      | error    | General - Success   |
|              |  | 0x01      | error    | Generic Error Code  |
|              |  | 0x02      | error    | Generic Memory Error  |
|              |  | 0x03      | error    | Buffer Overflow   |
|              |  | 0x04      | error    | Invalid Parameter(s)  |
|              |  | 0x05      | error    | Invalid Data Length   |
|              |  | 0x06      | error    | Data Alignment Error  |
|              |  | 0x07      | error    | Null Pointer Error  |
|              |  | 0x08      | error    | Unsupported Function  |
|              |  | 0x09      | error    | Invalid Service ID  |
|              |  | 0x0A      | error    | Invalid Address   |
|              |  | 0x0B      | error    | Out of Resource Error   |
|              |  | 0x0C      | error    | Timeout   |
|              |  | 0x0D      | error    | data abort exception  |
|              |  | 0x0E      | error    | prefetch abort exception  |
|              |  | 0x0F      | error    | Out of Boundary Condition Reached                                       |
|              |  | 0x10      | error    | Data corruption   |
|              |  | 0x11      | error    | Invalid command   |
|              |  | 0x12      | error    | The package type provided by BR is incorrect                            |
|              |  | 0x13      | error    | Failed to retrieve FW header during FW validation                       |
|              |  | 0x14      | error    | Key size not supported  |
|              |  | 0x15      | error    | Agesa0 verification error   |
|              |  | 0x16      | error    | SMU FW verification error   |
|              |  | 0x17      | error    | OEM SINGING KEY verification error                                      |
|              |  | 0x18      | error    | Generic FW Validation error   |
|              |  | 0x19      | error    | RSA operation fail - bootloader   |
|              |  | 0x1A      | error    | CCP Passthrough operation failed - internal status                      |
|              |  | 0x1B      | error    | AES operation fail  |
|              |  | 0x1C      | error    | CCP state save failed   |
|              |  | 0x1D      | error    | CCP state restore failed  |
|              |  | 0x1E      | error    | SHA256/384 operation fail - internal status                             |
|              |  | 0x1F      | error    | ZLib Decompression operation fail                                       |
|              |  | 0x20      | error    | HMAC-SHA256/384 operation fail - internal status                        |
|              |  | 0x21      | error    | Booted from boot source not recognized by PSP                           |
|              |  | 0x22      | error    | PSP directory entry not found   |
|              |  | 0x23      | error    | PSP failed to set the write enable latch                                |
|              |  | 0x24      | error    | PSP timed out because spirom took too long                              |
|              |  | 0x25      | error    | Cannot find BIOS directory  |
|              |  | 0x26      | error    | SpiRom is not valid   |
|              |  | 0x27      | error    | slave die has different security state from master                      |
|              |  | 0x28      | error    | SMI interface init failure  |
|              |  | 0x29      | error    | SMI interface generic error   |
|              |  | 0x2A      | error    | invalid die ID executes MCM related function                            |
|              |  | 0x2B      | error    | invalid MCM configuration table read from bootrom                       |
|              |  | 0x2C      | error    | Valid boot mode wasn't detected   |
|              |  | 0x2D      | error    | NVStorage init failure  |
|              |  | 0x2E      | error    | NVStorage generic error   |
|              |  | 0x2F      | error    | MCM 'error' to indicate slave has more data to send                     |
|              |  | 0x30      | error    | MCM error if data size exceeds 32B                                      |
|              |  | 0x31      | error    | Invalid client id for SVC MCM call                                      |
|              |  | 0x32      | error    | MCM slave status register contains bad bits                             |
|              |  | 0x33      | error    | MCM call was made in a single die environment                           |
|              |  | 0x34      | error    | PSP secure mapped to invalid segment (should be 0x400_0000)             |
|              |  | 0x35      | error    | No physical x86 cores were found on die                                 |
|              |  | 0x36      | error    | Insufficient space for secure OS (range of free SRAM to SVC stack base) |
|              |  | 0x37      | error    | SYSHUB mapping memory target type is not supported                      |
|              |  | 0x38      | error    | Attempt to unmap permanently mapped TLB to PSP secure region            |
|              |  | 0x39      | error    | Unable to map an SMN address to AXI space                               |

(continued on the next page)

| Action   | PHASE                                    | POST CODE | TYPE  | DESCRIPTION   |
|----------|--|-----------|-------|---|
| PSP Boot | PSP Boot Loader phase (Error Post Codes) | 0x3A      | error | Unable to map a SYSHUB address to AXI space                                 |
|          |  | 0x3B      | error | The count of CCXs or cores provided by bootrom is not consistent            |
|          |  | 0x3C      | error | Uncompressed image size doesn't match value in compressed header            |
|          |  | 0x3D      | error | Compressed option used in case where not supported                          |
|          |  | 0x3E      | error | Fuse info on all dies don't match   |
|          |  | 0x3F      | error | PSP sent message to SMU; SMU reported an error                              |
|          |  | 0x40      | error | Function RunPostX86ReleaseUnitTests failed in memcomp()                     |
|          |  | 0x41      | error | Interface between PSP to SMU not available.                                 |
|          |  | 0x42      | error | Timer wait parameter too large  |
|          |  | 0x43      | error | Test harness module reported an error                                       |
|          |  | 0x44      | error | x86 wrote C2PMSG_0 interrupting PSP, but the command has an invalid format  |
|          |  | 0x45      | error | Failed to read from SPI the Bios Directory or Bios Combo Directory          |
|          |  | 0x46      | error | Mini-BL, validation of the PSP SRAM image failed on HMAC compare            |
|          |  | 0x47      | error | Failed to read the combo bios header  |
|          |  | 0x48      | error | Potential stack corruption in jump to Mini BL                               |
|          |  | 0x49      | error | Error in Validate and Loading AGESA APOB SVC call                           |
|          |  | 0x4A      | error | Correct fuse bits for DIAG_BL loading not set                               |
|          |  | 0x4B      | error | The UmcProgramKeys() function was not called by AGESA                       |
|          |  | 0x4C      | error | Unconditional Unlock based on serial numbers failure                        |
|          |  | 0x4D      | error | Syshub register programming mismatch during readback                        |
|          |  | 0x4E      | error | Family ID in MP0_SFUSE_SEC[7:3] not correct                                 |
|          |  | 0x4F      | error | An operation was invoked that can only be performed by the GM               |
|          |  | 0x50      | error | Failed to acquire host controller semaphore to claim ownership of SMB       |
|          |  | 0x51      | error | Timed out waiting for host to complete pending transactions                 |
|          |  | 0x52      | error | Timed out waiting for slave to complete pending transactions                |
|          |  | 0x53      | error | Unable to kill current transaction on host, to force idle                   |
|          |  | 0x54      | error | One of: Illegal command, Unclaimed cycle, or Host time out                  |
|          |  | 0x55      | error | An smbus transaction collision detected, operation restarted                |
|          |  | 0x56      | error | Transaction failed to be started or processed by host, or not completed     |
|          |  | 0x57      | error | An unsolicited smbus interrupt was received                                 |
|          |  | 0x58      | error | An attempt to send an unsupported PSP-SMU message was made                  |
|          |  | 0x59      | error | An error/data corruption detected on response from SMU for sent msg         |
|          |  | 0x5A      | error | MCM Steady-state unit test failed   |
|          |  | 0x5B      | error | S3 Enter failed   |
|          |  | 0x5C      | error | AGESA BL did not set PSP SMU reserved addresses via SVC call                |
|          |  | 0x5E      | error | CcxSecBisIEn not set in fuse RAM  |
|          |  | 0x5F      | error | Received an unexpected result   |
|          |  | 0x60      | error | VMG Storage Init failed   |
|          |  | 0x61      | error | failure in mbedTLS user app   |
|          |  | 0x62      | error | An error occurred whilst attempting to SMN map a fuse register              |
|          |  | 0x63      | error | Fuse burn sequence/operation failed due to internal SOC error               |
|          |  | 0x64      | error | Fuse sense operation timed out  |
|          |  | 0x65      | error | Fuse burn sequence/operation timed out waiting for burn done                |
|          |  | 0x66      | error | The PMU FW Public key certificate loading or authentication fails           |
|          |  | 0x67      | error | This PSP FW was revoked   |
|          |  | 0x68      | error | The platform model/vendor id fuse is not matching the BIOS public key token |
|          |  | 0x69      | error | The BIOS OEM public key of the BIOS was revoked for this platform           |
|          |  | 0x6A      | error | PSP level 2 directory not match expected value.                             |
|          |  | 0x6B      | error | BIOS level 2 directory not match expected value.                            |
|          |  | 0x6C      | error | Reset image not found   |
|          |  | 0x6D      | error | Generic error indicating the CCP HAL initialization failed                  |
|          |  | 0x6E      | error | failure to copy NVRAM to DRAM.  |
|          |  | 0x6F      | error | Invalid key usage flag  |
|          |  | 0x71      | error | RSMU signaled a security violation  |
|          |  | 0x72      | error | Error programming the WAFL PCS registers                                    |
|          |  | 0x73      | error | Error setting wait PCS threshold value                                      |
|          |  | 0x74      | error | Error loading OEM trustlets   |
|          |  | 0x75      | error | Recovery mode across all dies is not sync'd                                 |
|          |  | 0x76      | error | Uncorrectable WAFL error detected   |
|          |  | 0x77      | error | Fatal MP1 error detected  |
|          |  | 0x78      | error | Bootloader failed to find OEM signature                                     |
|          |  | 0x79      | error | Error copying BIOS to DRAM  |
|          |  | 0x7A      | error | Error validating BIOS image signature                                       |

(continued on the next page)

| Action    | PHASE                                     | POST CODE | TYPE     | DESCRIPTION   |
|-----------|---|-----------|----------|---|
| PSP Boot  | PSP Boot Loader phase (Status Post Codes) | 0x7B      | error    |   |
|           |   | 0x7C      | error    | Platform Vendor ID and/or Model ID binding violation  |
|           |   | 0x7D      | error    | Bootloader detects BIOS request boot from SPI-ROM, which is unsupported for PSB.                    |
|           |   | 0x7E      | error    | Requested fuse is already blown, reblow will cause ASIC malfunction                                 |
|           |   | 0x7F      | error    | Error with actual fusing operation  |
|           |   | 0x80      | error    | (Local Master PSP on P1 socket) Error reading fuse info   |
|           |   | 0x81      | error    | (Local Master PSP on P1 socket) Platform Vendor ID and/or Model ID binding violation                |
|           |   | 0x82      | error    | (Local Master PSP on P1 socket) Requested fuse is already blown, reblow will cause ASIC malfunction |
|           |   | 0x83      | error    | (Local Master PSP on P1 socket) Error with actual fusing operation                                  |
|           |   | 0x84      | error    | SEV FW Rollback attempt is detected   |
|           |   | 0x85      | error    | / SEV download FW command fail to broadcast and clear the IsInSRAM field on slave dies              |
|           |   | 0x86      | error    | Agesa error injection failure   |
|           |   | 0x87      | error    | Uncorrectable TWIX error detected   |
|           |   | 0x88      | error    | Error programming the TWIX PCS registers  |
|           |   | 0x89      | error    | Error setting TWIX PCS threshold value  |
|           |   | 0x8A      | error    | SW CCP queue is full, cannot add more entries   |
|           |   | 0x8B      | error    | CCP command description syntax error detected from input  |
|           |   | 0x8C      | error    | Return value stating that the command has not yet been scheduled                                    |
|           |   | 0x8D      | error    | The command is scheduled and being worked on  |
|           |   | 0x8E      | error    | The DXIO PHY SRAM Public key certificate loading or authentication fails                            |
|           |   | 0x8F      | error    | TPM binary size exceeds limit allocated in Private DRAM, need to increase the limit                 |
|           |   | 0x90      | error    | The TWIX link for a particular CCD is not trained Fatal error                                       |
|           |   | 0x91      | error    | Security check failed (not all dies are in same security state)                                     |
|           |   | 0x92      | error    | FW type mismatch between the requested FW type and the FW type embedded in the FW binary header     |
|           |   | 0x93      | error    | SVC call input parameter address violation  |
|           |   | 0x94      | error    | Knoll failed to idle correctly after being reset  |
|           |   | 0x95      | error    | Bad status returned by I2CKnollCheck  |
|           |   | 0x96      | error    | NACK to general call (no device on Knoll I2C bus)   |
|           |   | 0x97      | error    | Null pointer passed to I2CKnollCheck  |
|           |   | 0x98      | error    | Invalid device-ID found during Knoll authentication   |
|           |   | 0x99      | error    | Error during Knoll/Prom key derivation  |
|           |   | 0x9A      | error    | Null pointer passed to Crypto function  |
|           |   | 0x9B      | error    | Error in checksum from wrapped Knoll/Prom keys  |
|           |   | 0x9C      | error    | Knoll returned an invalid response to a command   |
|           |   | 0x9D      | error    | Bootloader failed in Knoll Send Command function  |
|           |   | 0x9E      | error    | No Knoll device found by verifying MAC  |
|           |   | 0x9F      | error    | The maximum allowable error post code   |
| Quick VGA | PEI(Pre-EFI Initialization) phase         | 0x10      | Progress | PEI Core Entry  |
|           |   | 0x11      | Progress | PEI cache as ram CPU initial  |
|           |   | 0x15      | Progress | NB Initialization before installed memory   |
|           |   | 0x19      | Progress | SB Initialization before installed memory   |
|           | DXE(Driver Execution Environment) phase   | 0x32      | Progress | CPU POST-Memory Initialization  |
|           |   | 0x33      | Progress | CPU Cache Initialization  |
|           |   | 0x34      | Progress | Application Processor(s) (AP) Initialization  |
|           |   | 0x35      | Progress | BSP Selection   |
|           |   | 0x36      | Progress | CPU Initialization  |
|           |   | 0x37      | Progress | Pre-memory NB Initialization  |
|           |   | 0x3B      | Progress | Pre-memory SB Initialization  |
|           |   | 0x4F      | Progress | DXE Initial Program Load(PL)  |
|           |   | 0x60      | Progress | DXE Core Started  |
|           |   | 0x61      | Progress | DXE NVRAM Initialization  |
|           |   | 0x62      | Progress | SB run-time Initialization  |
|           |   | 0x63      | Progress | CPU DXE Initialization  |
|           |   | 0x68      | Progress | PCI HB Initialization   |
|           |   | 0x69      | Progress | NB DXE Initialization   |
|           |   | 0x6A      | Progress | NB DXE SMM Initialization   |
|           |   | 0x70      | Progress | SB DXE Initialization   |
|           |   | 0x71      | Progress | SB DXE SMM Initialization   |
|           |   | 0x72      | Progress | SB DEVICES Initialization   |
|           |   | 0x78      | Progress | ACPI Module Initialization  |
|           |   | 0x79      | Progress | CSM Initialization  |
|           |   | 0xD0      | Progress | CPU PM Structure Initialization   |

(continued on the next page)

| Action      | PHASE                            | POST CODE | TYPE     | DESCRIPTION                        |
|-------------|----------------------------------|-----------|----------|------------------------------------|
| Normal boot | BDS(Boot Device Selection) phase | 0x90      | Progress | BDS started                        |
|             |                                  | 0x91      | Progress | Connect device event               |
|             |                                  | 0x92      | Progress | PCI Bus Enumeration                |
|             |                                  | 0x93      | Progress | PCI Bus Enumeration                |
|             |                                  | 0x94      | Progress | PCI Bus Enumeration                |
|             |                                  | 0x95      | Progress | PCI Bus Enumeration                |
|             |                                  | 0x96      | Progress | PCI Bus Enumeration                |
|             |                                  | 0x97      | Progress | Console outout connect event       |
|             |                                  | 0x98      | Progress | Console input connect event        |
|             |                                  | 0x99      | Progress | AMI Super IO start                 |
|             |                                  | 0x9A      | Progress | AMI USB Driver Initialization      |
|             |                                  | 0x9B      | Progress | AMI USB Driver Initialization      |
|             |                                  | 0x9C      | Progress | AMI USB Driver Initialization      |
|             |                                  | 0x9D      | Progress | AMI USB Driver Initialization      |
|             |                                  | 0xb2      | Progress | Legacy Option ROM Initialization   |
|             |                                  | 0xb3      | Progress | Reset system                       |
|             |                                  | 0xb4      | Progress | USB hotplug                        |
|             |                                  | 0xb6      | Progress | NVRAM clean up                     |
|             |                                  | 0xb7      | Progress | NVRAM configuration reset          |
|             |                                  | 0xA0      | Progress | IDE, AHCI Initialization           |
|             |                                  | 0xA1      | Progress | IDE, AHCI Initialization           |
|             |                                  | 0xA2      | Progress | IDE, AHCI Initialization           |
|             |                                  | 0xA3      | Progress | IDE, AHCI Initialization           |
|             |                                  | 0x00-0xFF | Progress | Wait BMC ready                     |
|             |                                  | 0xA8      | Progress | BIOS Setup Utility password verify |
|             |                                  | 0xA9      | Progress | BIOS Setup Utility start           |
|             |                                  | 0xAB      | Progress | BIOS Setup Utility input wait      |
|             |                                  | 0xAD      | Progress | Ready to boot event                |
|             |                                  | 0xAE      | Progress | Legacy boot event                  |
|             | Operating system phase           | 0xAA      | Progress | APIC mode                          |
|             |                                  | 0xAC      | Progress | PIC mode                           |





# Hardware Information

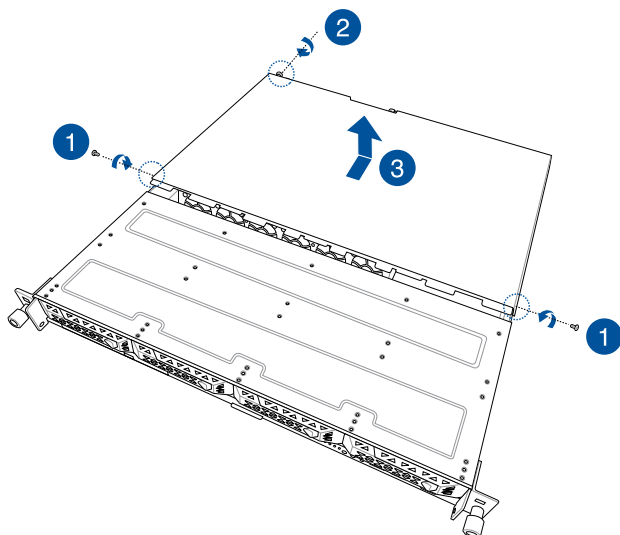
# 2

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

## 2.1 Chassis cover

### 2.1.1 Removing the rear cover

1. Remove the two (2) screws on both sides of the rear cover with a Phillips screwdriver.
2. Loosen the thumbscrew on the rear of the chassis.
3. Slide the rear cover towards the rear panel then lift to remove the rear cover from the chassis.



## 2.2 Central Processing Unit (CPU)

The motherboard comes with a Socket H5 (LGA1200) designed for the Intel® Xeon® E and Intel® Pentium™ processors.

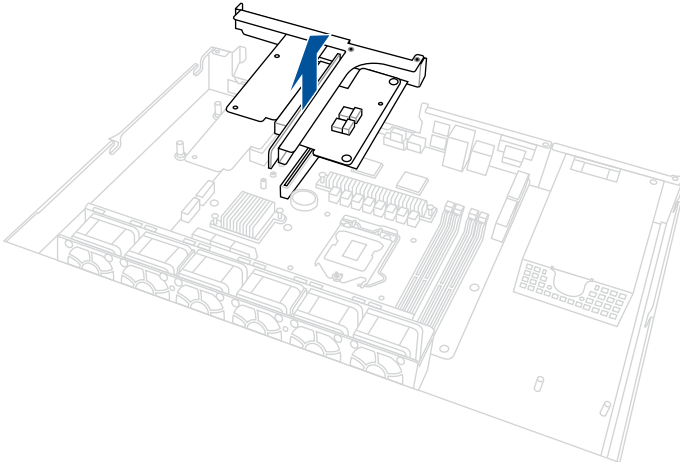


- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if 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 H5.
- 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.

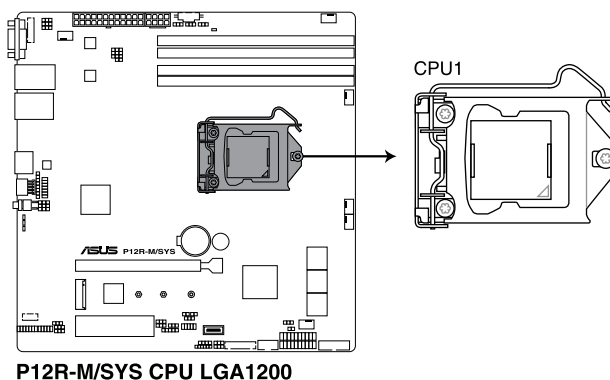
### 2.2.1 Installing the CPU and heatsink

To install the CPU and heatsink:

1. Remove the rear cover. For more information, refer to **Chassis cover**.
2. Lift and remove the butterfly riser card out of the chassis.



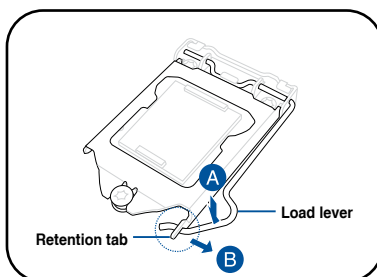
4. Locate the CPU socket on your motherboard..



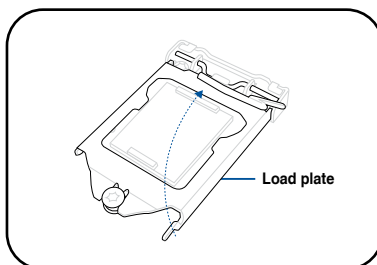
5. Press the load lever with your thumb (A), then move it to the right (B) until it is released from the retention tab.



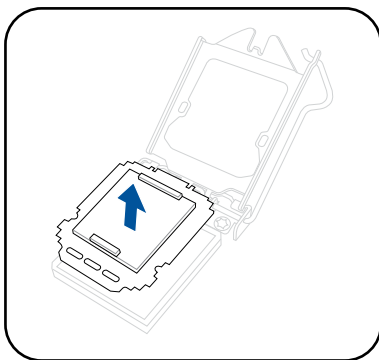
Do not remove the PnP cap yet from the CPU socket. Doing so may bend the pins of the socket.



6. Lift the load plate.



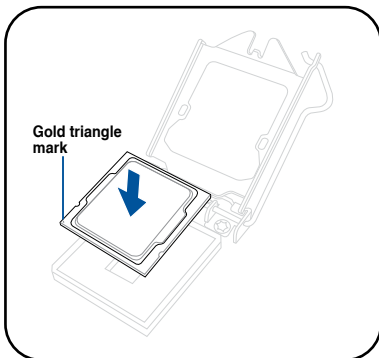
7. Remove the PnP cap from the CPU socket.



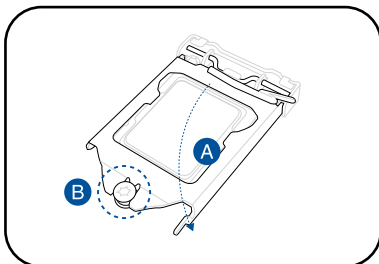
8. Position the CPU above the socket, ensuring that the gold triangle mark is on the bottom-left corner of the socket, then fit the CPU notches to the socket's alignment keys.



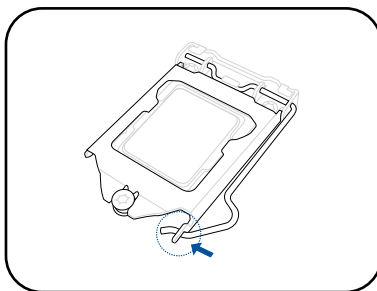
The CPU fits in only one orientation. DO NOT force the CPU into the socket to prevent bending the pins on the socket and damaging the CPU.



9. Close the load plate (A), ensuring that the front edge of the load plate slides under the retention lock (B).



10. Push the load lever down and insert it under the retention tab to secure the CPU in the socket.



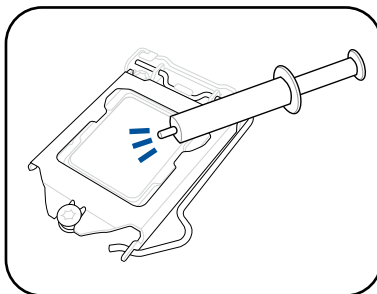
11. Apply some Thermal Interface Material to the exposed area of the CPU that the heatsink will be in contact with, ensuring that it is evenly spread in a thin layer.



Some heatsinks come with pre-applied Thermal Interface Material. If so, skip this step.



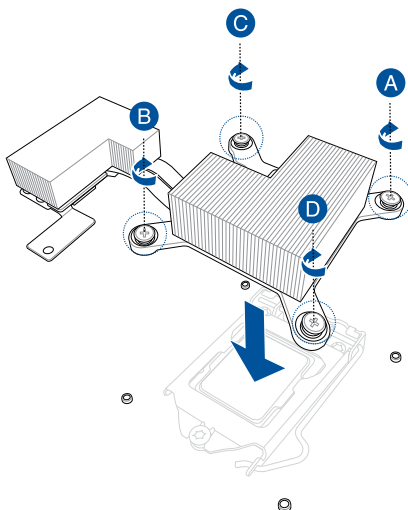
The Thermal Interface Material is toxic and inedible. DO NOT eat it. If it gets into your eyes or touches your skin, wash it off immediately and seek professional medical help.



12. Align the heatsink to the CPU socket, then 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.



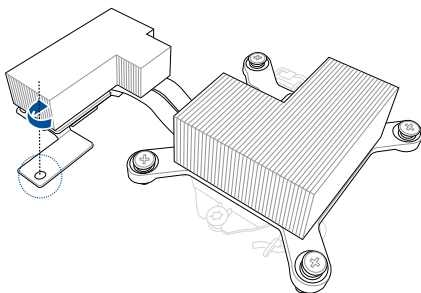
The heatsink screws are T20 models. A torque value of  $16.1 \pm 1.2$  kgf-cm ( $14.0 \pm 1.0$  lbf-in) is recommended.



13. Secure the remaining screwhole on the heatsink using the bundled screw.



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.

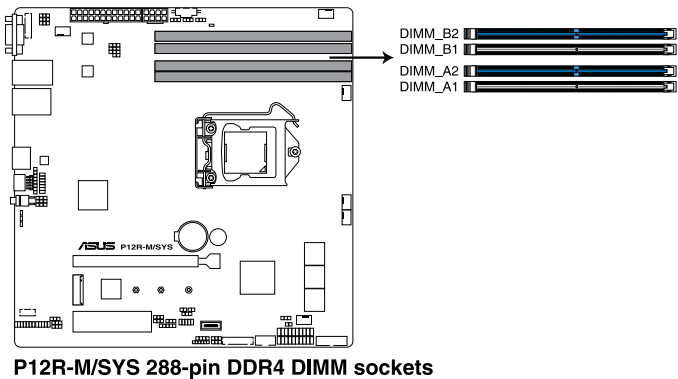


## 2.3 System memory

### 2.3.1 Overview

The motherboard comes with 16 Double Data Rate 4 (DDR4) Dual Inline Memory Modules (DIMM) sockets.

The figure illustrates the location of the DDR4 DIMM sockets:



### 2.3.2 Memory Configurations

You may install 4GB, 8GB, 16GB, or 32GB UDIMM 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.

| Memory configurations |      |    |    |    |
|-----------------------|------|----|----|----|
|                       | DIMM |    |    |    |
|                       | A1   | A2 | B1 | B2 |
| 1 DIMM                |      | ✓  |    |    |
| 2 DIMMs               |      | ✓  |    | ✓  |
| 4 DIMMs               | ✓    | ✓  | ✓  | ✓  |



Always install DIMMs with the same CAS latency. For optimum compatibility, it is recommended that you obtain memory modules from the same vendor.

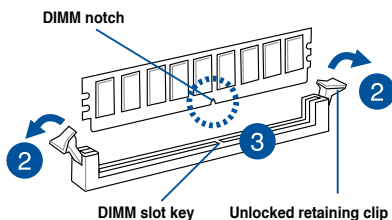


## 2.3.3 Installing a DIMM



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.

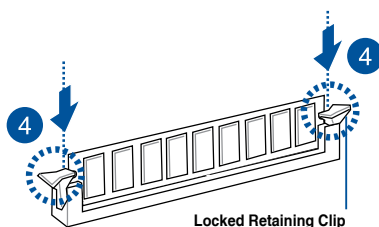
1. Unlock a DIMM socket by pressing the retaining clips outward.
2. Align a DIMM on the socket such that the notch on the DIMM matches the DIMM slot key on the socket.



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 snaps back into place.

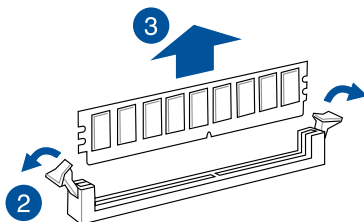
Ensure that the DIMM is sitting firmly on the DIMM slot.



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

## 2.3.4 Removing a DIMM

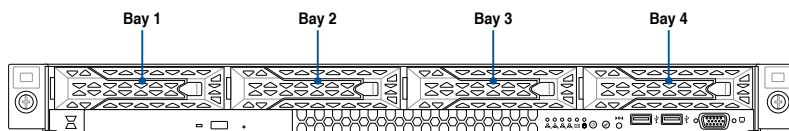
1. Remove the chassis cover. For more information, see the section **Chassis cover**.
2. Simultaneously press the retaining clips outward to unlock the DIMM.
3. Remove the DIMM from the socket.



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

## 2.4 Storage devices

The system supports four (4) 3.5"/2.5" hot-swap SATA/SAS/NVMe storage devices. The storage device installed on the storage device tray connects to the motherboard SATA/SAS/ NVMe ports via the SATA/SAS/NVMe backplane.



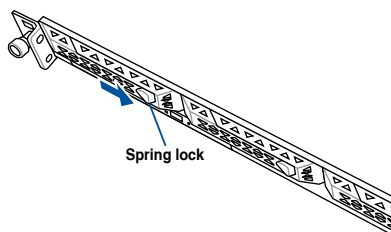
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Bay 1 to bay 4 supports NVMe/SATA/SAS. SAS support requires optional HBA/RAID card.

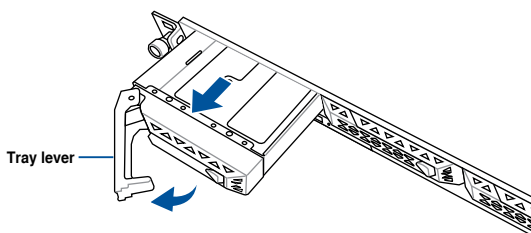
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### 2.4.1 Installing a 3.5" storage device

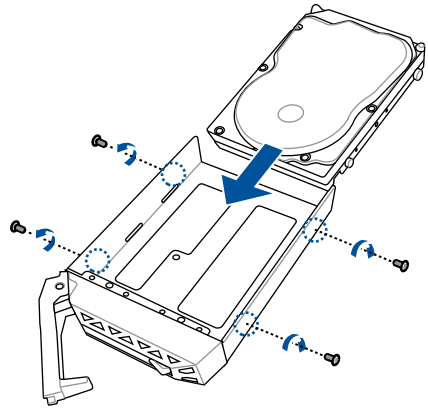
1. Press the spring lock to release the tray lever and to partially eject the tray from the bay.



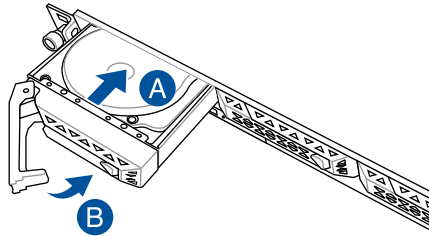
2. Firmly hold the tray lever and pull the storage device tray out of the bay.



3. Place the storage device tray on a flat and stable surface.
4. Prepare the 3.5" storage device and the bundled set of screws.
5. Place the 3.5" storage device into the tray then secure it with four screws.

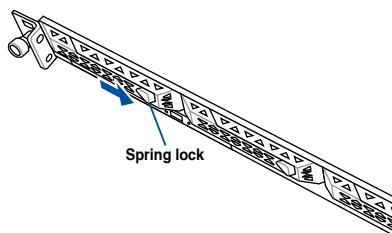


6. Carefully insert the tray and push it all the way to the depth of the bay (A). Lock the secure tab to secure the drive tray in place (B).
7. Repeat steps 1 to 6 to install the other 3.5" storage devices.

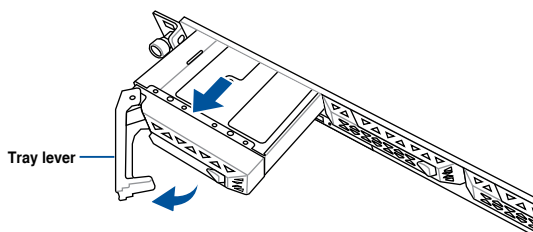


## 2.4.2 Installing a 2.5" storage device

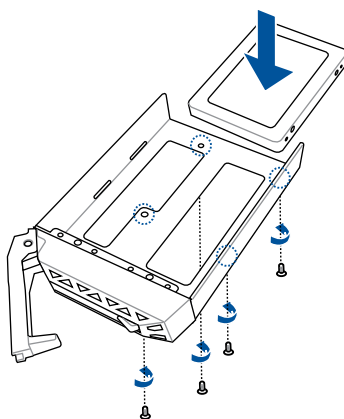
1. Press the spring lock to release the tray lever and to partially eject the tray from the bay.



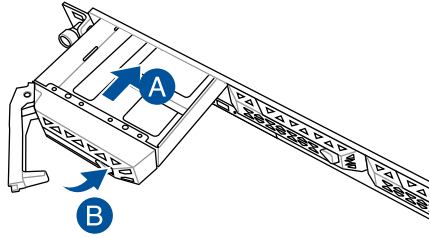
2. Firmly hold the tray lever and pull the storage device tray out of the bay.



3. Place the storage device tray on a flat and stable surface.
4. Prepare the 3.5" storage device and the bundled set of screws.
5. Place the 3.5" storage device into the tray then secure it with four screws.

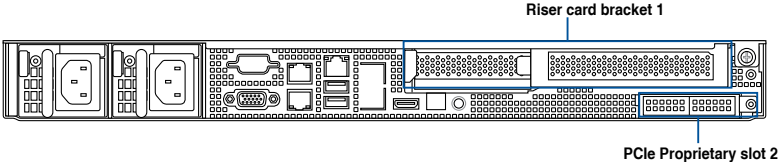


6. Carefully insert the tray and push it all the way to the depth of the bay (A). Lock the secure tab to secure the drive tray in place (B).
7. Repeat steps 1 to 6 to install the other 3.5" storage devices.



## 2.5 Expansion slot

The barebone server comes with a maximum of three (3) PCIe slots. One of the slots is pre-installed with a butterfly riser card bracket for installing PCIe expansion cards. You need to remove the butterfly expansion card bracket if you want to install PCIe expansion cards.



Riser card bracket 1

| PCIe slot | Operation mode |        |
|-----------|----------------|--------|
|           | Mode 1         | Mode 2 |
| Slot 1    | x16            | x8     |
| Slot 2    | -              | x8     |

PCIe Proprietary slot 2

| PCIe slot | Operation mode |        |
|-----------|----------------|--------|
|           | Mode 1         | Mode 2 |
| Slot 3    | -              | x8     |

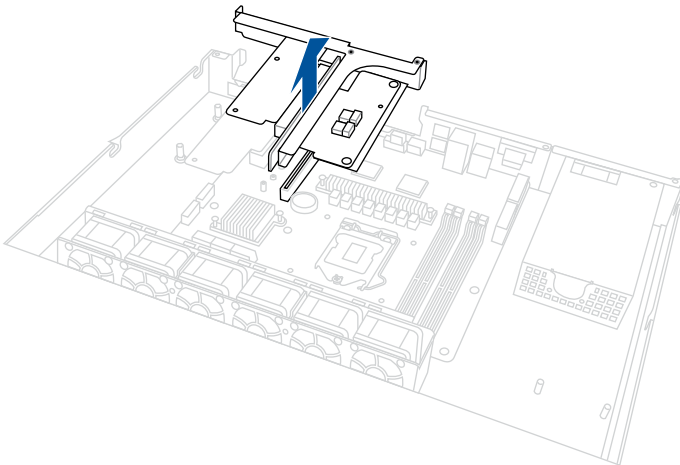
### 2.5.1 Installing an expansion card to the PCIe x16 slot on the butterfly riser card bracket

The pre-installed butterfly riser card bracket on the PCIEX16\_6 slot has a PCIe x16 slot and a PCIe x8 slot. The PCIe x16 slot provides x16 Gen4 link while the PCIe x8 slot provides x8 Gen4 link.

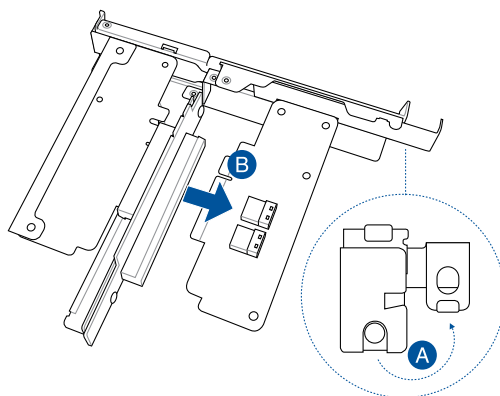
The pre-installed butterfly riser card bracket may come pre-installed with a NVMe expansion card in the PCIe x16 slot, if you wish to install a new expansion card to this slot, please remove the NVMe expansion card before installing new expansion cards.

To install PCIe x16 (Gen4 x16 link) proprietary cards, such as an HBA/RAID card to the PCIe x16 slot on the butterfly riser card bracket:

1. Lift and remove the butterfly riser card bracket from the chassis.



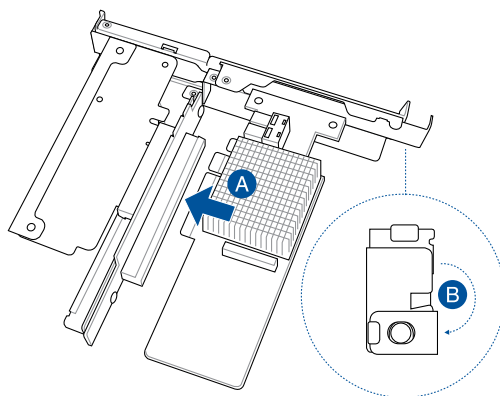
2. Push the metal bracket lock counter clockwise (A) until the metal bracket can be removed, then remove the metal bracket (B). If an NVMe card is installed, remove the NVMe card and metal bracket combo.



3. Install your expansion card to the PCIe x16 slot on the butterfly riser card bracket (A). Then push the metal bracket lock clockwise until it locks back and secures the expansion card to the butterfly riser card bracket (B).

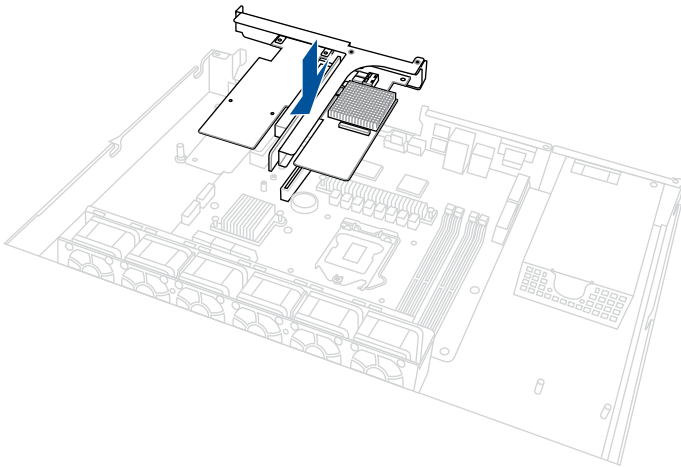


The amount of screws required may vary between expansion cards, only secure a bundled screw if a screw hole on the expansion card is aligned with the screw hole on the PCIe riser card.





4. Install the butterfly riser card bracket back into the PCIe slot on the motherboard. Ensure that the golden connectors of the butterfly riser card bracket is firmly seated in place.

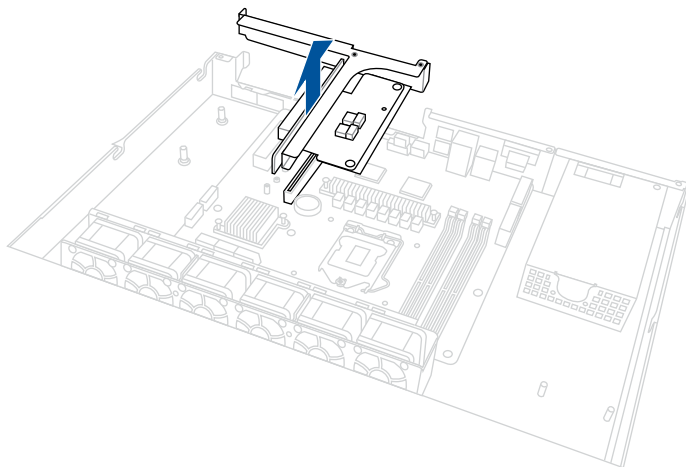


## 2.5.2 Installing an expansion card to the PCIe x8 slot on the butterfly riser card bracket

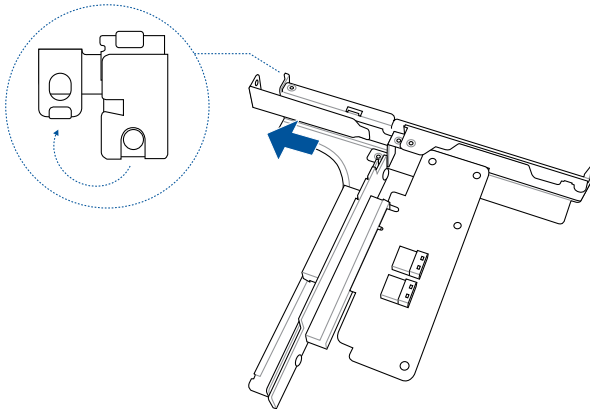
The pre-installed butterfly riser card bracket on the PCIEX16\_6 slot has a PCIe x16 slot and a PCIe x8 slot. The PCIe x16 slot provides x16 Gen4 link while the PCIe x8 slot provides x8 Gen4 link.

To install PCIe x8 (Gen4 x8 link) proprietary cards to the PCIe x8 slot on the butterfly riser card bracket:

1. Lift and remove the butterfly riser card bracket from the chassis.



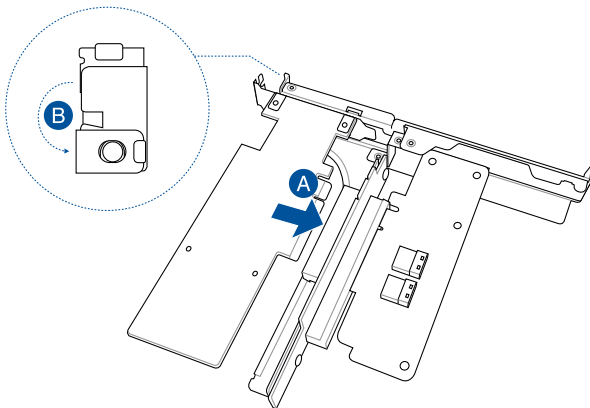
2. Push the metal bracket lock counter clockwise (A) until the metal bracket can be removed, then remove the metal bracket (B).



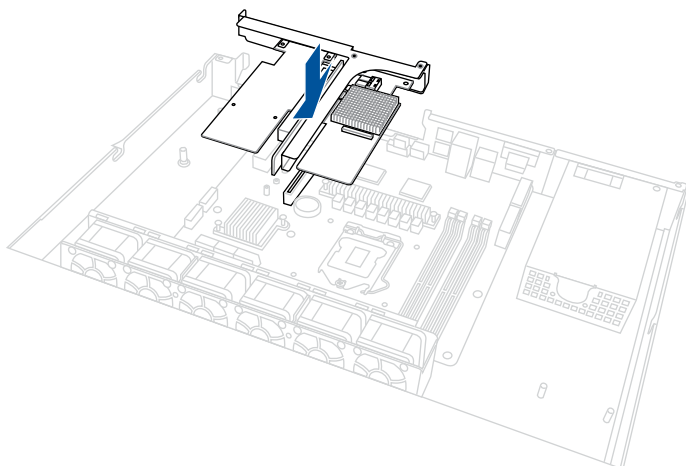
3. Install your expansion card to the PCIe x16 slot on the butterfly riser card bracket (A). Then push the metal bracket lock clockwise until it locks back and secure the expansion card to the butterfly riser card bracket (B).



The amount of screws required may vary between expansion cards, only secure a bundled screw if a screw hole on the expansion card is aligned with the screw hole on the PCIe riser card.



4. Install the butterfly riser card bracket back into the PCIe slot on the motherboard. Ensure that the golden connectors of the butterfly riser card bracket is firmly seated in place.

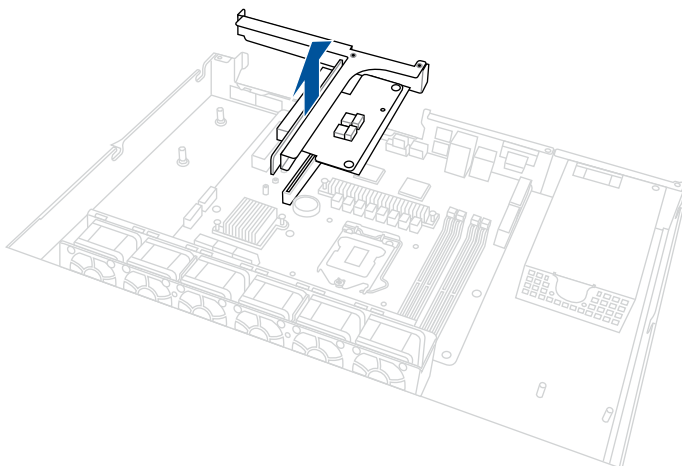


### 2.5.3 (optional) Installing an Intel® X710 10G LAN card to the onboard PCIe slot

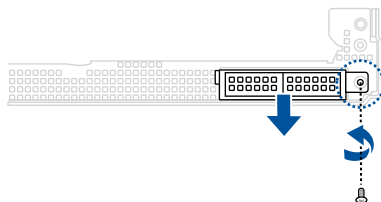
The onboard PCIEX8\_4 slot provides a x4 Gen3 link and allows you to install an Intel® X710 10G LAN card.

To install an Intel® X710 10G LAN card to the onboard PCIe x8 slot:

1. Lift and remove the butterfly riser card bracket from the chassis.



2. Remove the screw from the metal bracket on the rear of the chassis, then remove the metal bracket.



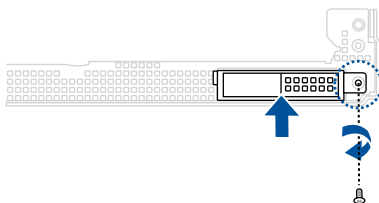
3. Remove the metal cover from the metal bracket.



Take extra care when removing the metal cover. Use tools such as a screw driver to bend and remove the metal cover to avoid physical injury.



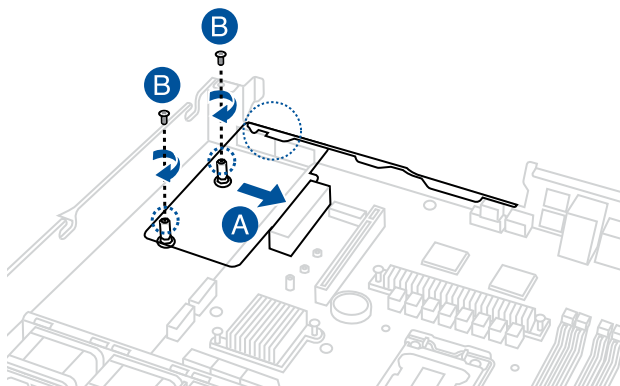
4. Replace the metal bracket and secure it to the chassis using the screw removed previously.



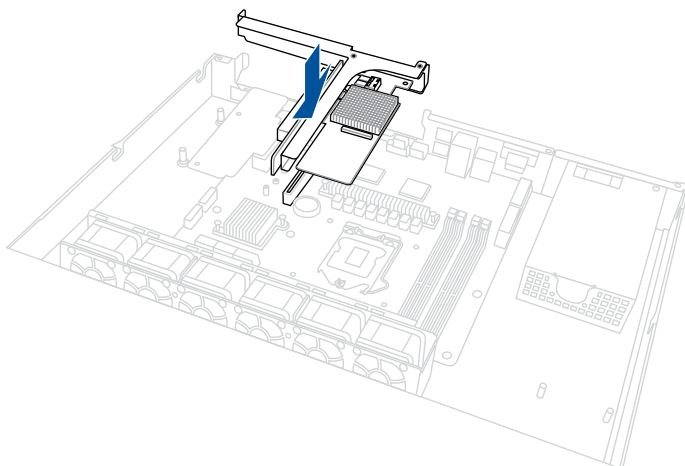
5. Install the Intel® X710 10G LAN card to the onboard PCIe slot (A), then secure it using two (2) screws (B).



Ensure to watch out for the metal bracket of the rear IO when installing the expansion card.



6. Install the butterfly riser card bracket back into the PCIe slot on the motherboard. Ensure that the golden connectors of the butterfly riser card bracket is firmly seated in place.



## 2.5.4 Installing an M.2 module

You may install an M.2 card (supports up to 2280) to the onboard M.2 slot on the motherboard.

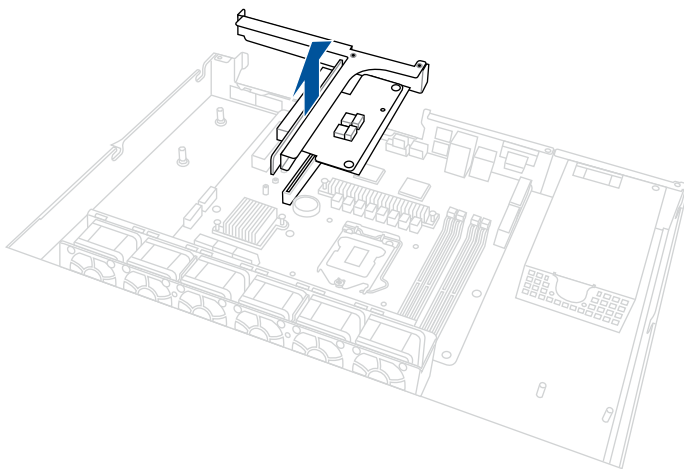


This connector supports type 2242 / 2260 / 2280 devices on both PCIe x2 and SATA interface.

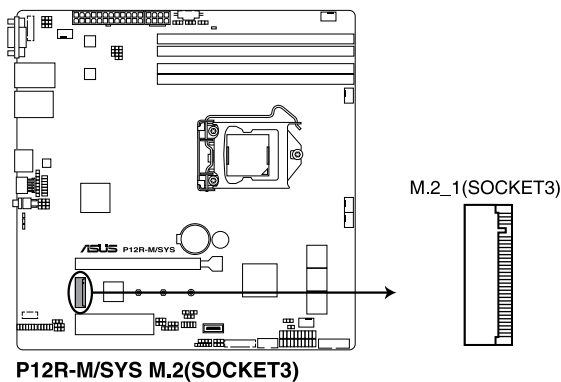


The M.2 (NGFF) device is purchased separately.

1. Lift and remove the butterfly riser card bracket from the chassis.

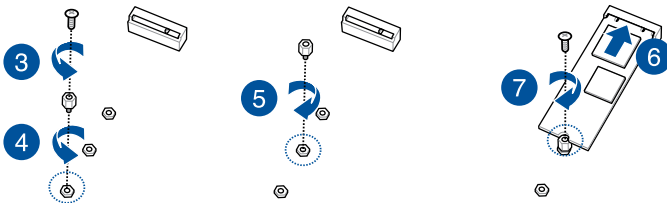


2. Locate the M.2 slot (M.2\_1(SOCKET3)) on the motherboard.

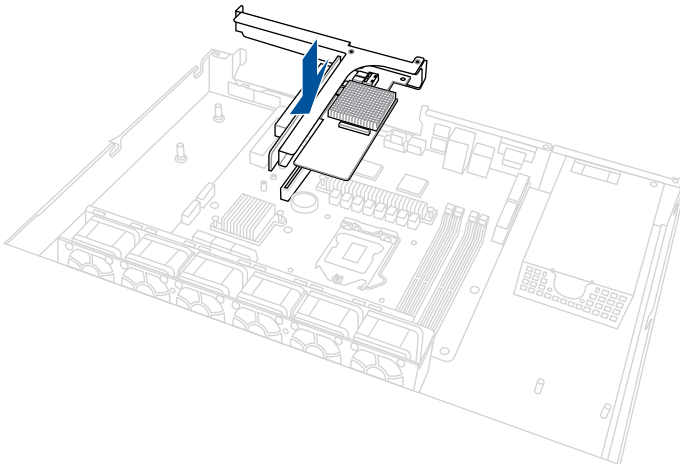




3. Remove the screw on the stand screw.
4. (optional) Remove the stand screw if you wish to install an 2242 or 2260 length M.2 module.
5. (optional) Install the stand screw to the length hole corresponding to the M.2 module you wish to install.
6. Prepare the M.2 module, then align and insert the M.2 module into the M.2 slot (M.2\_1(SOCKET3)).
7. Secure the M.2 module with the screw you removed in step 2.



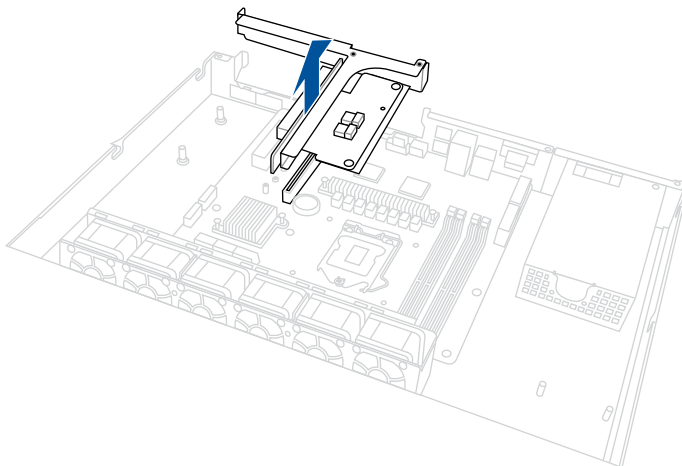
8. Install the butterfly riser card bracket back into the PCIe slot on the motherboard. Ensure that the golden connectors of the butterfly riser card bracket is firmly seated in place.



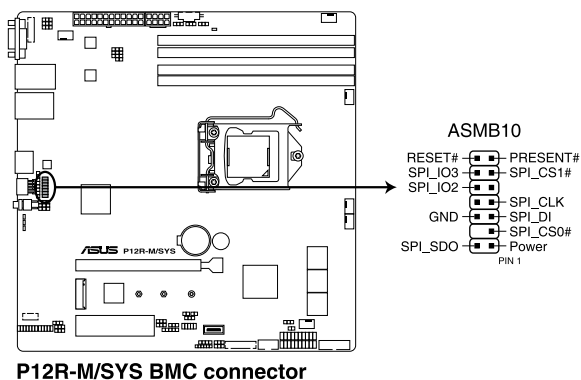
## 2.5.5 Installing the Baseboard Management Card

Follow the steps below to install an optional ASMB10 Management Card on your motherboard.

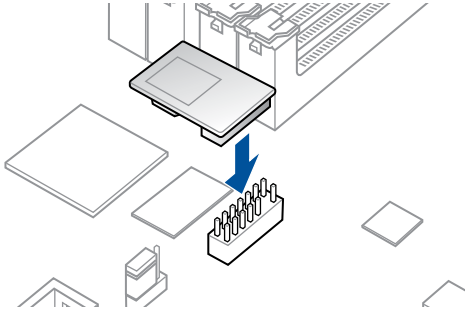
1. Lift and remove the butterfly riser card bracket from the chassis.



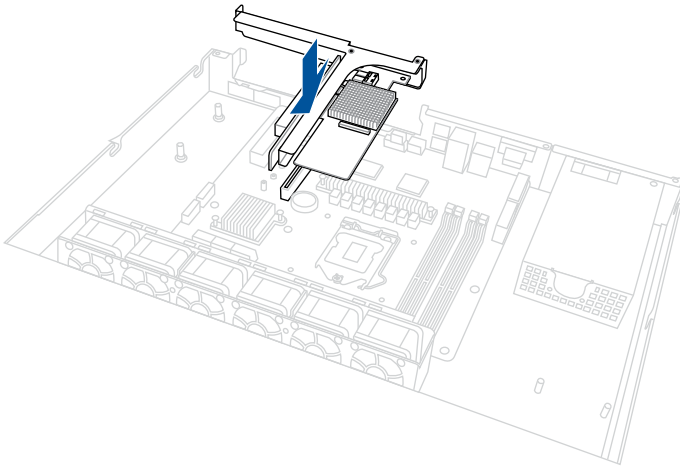
2. Locate the Baseboard Management Card header on the motherboard.



3. Orient and press the Management Card in place.



4. Install the butterfly riser card bracket back into the PCIe slot on the motherboard. Ensure that the golden connectors of the butterfly riser card bracket is firmly seated in place.



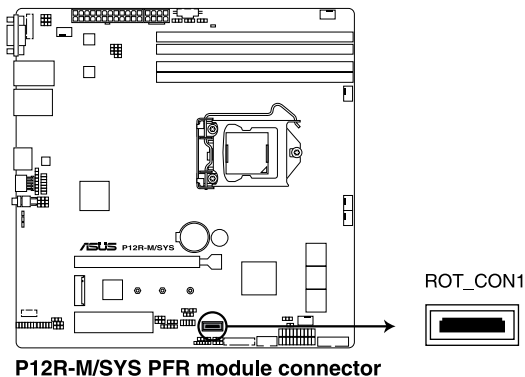
## 2.5.6 (optional) Installing the PFR module

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

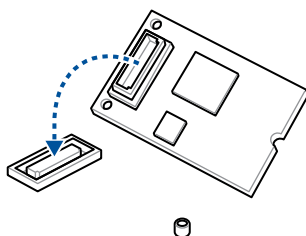


- The illustration below is for reference only.
- For more information or assistance, please refer to [www.asus.com](http://www.asus.com).

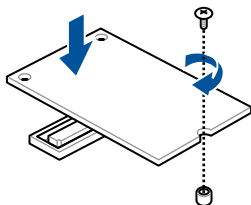
1. Locate the PFR module connector on your motherboard.



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.



## 2.5.7 Configuring an expansion card

After installing the expansion card, configure it by adjusting the software settings.

1. Turn on the system and change the necessary BIOS settings, if any. See Chapter 5 for information on BIOS setup.
2. Assign an IRQ to the card. Refer to the following tables.
3. Install the software drivers for the expansion card.

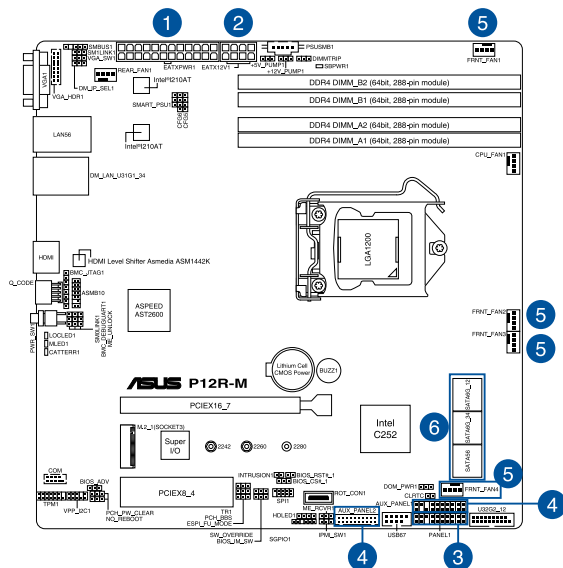
### Standard Interrupt assignments

| 0  | 1 | System Timer               |
|----|---|----------------------------|
| 1  | - | -                          |
| 2  | - | Programmable Interrupt     |
| 3  | 4 | Communications Port (COM2) |
| 4  | 5 | Communications Port (COM1) |
| 5  | - | -                          |
| 6  | - | -                          |
| 7  | - | -                          |
| 8  | - | -                          |
| 9  | - | -                          |
| 10 | - | -                          |
| 11 | - | -                          |
| 12 | - | -                          |
| 13 | 2 | Numeric Data Processor     |
| 14 | 3 | Intel® GPIO Controller     |
| 15 | - | -                          |

## 2.6 Cable connections



- The bundled system cables are pre-connected before shipment. You do not need to disconnect these cables unless you are going to remove pre-installed components to install additional devices.
- Refer to Chapter 4 for detailed information on the connectors.



### Pre-connected system cables

1. 24-pin EATXPWR1 power connector (connected to power supply)
2. 8-pin EATX12V1 power connector (connected to power supply)
3. Panel connector (connected to front I/O board)
4. Auxiliary panel connectors (connected to front I/O board)
5. System fan connectors (from motherboard to system fans)
6. SATA connectors (connected to backplane)

## 2.7 Removable/optional components

This section explains how to install optional components into the system and covers the following components:

1. Redundant power supply module (on selected models)



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

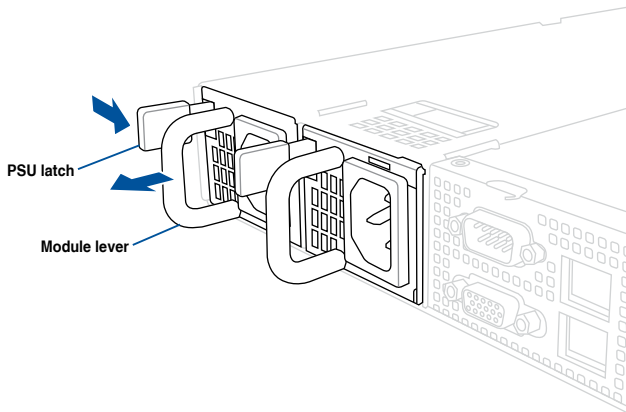


You may need to remove previously installed component or factory shipped components when installing optional components.

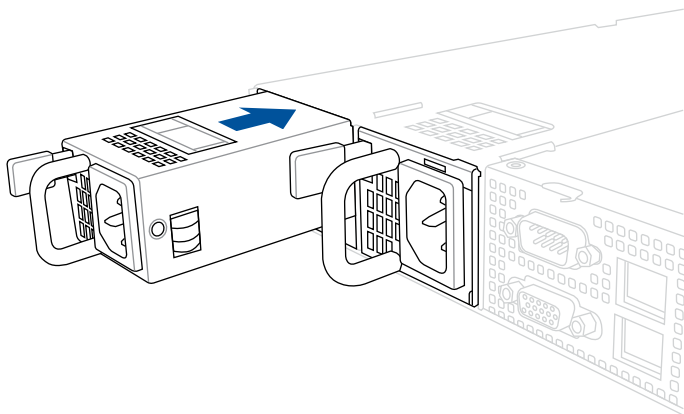
### 2.7.1 Redundant power supply module (on selected models)

To replace a failed redundant power supply module:

1. Lift up the power supply module lever.
2. Hold the power supply module lever and press the PSU latch, then pull the power supply module out of the system chassis.



3. Prepare the replacement power supply module.
4. Insert the replacement power supply module into the chassis then push it inwards until the latch locks into place.





# 3

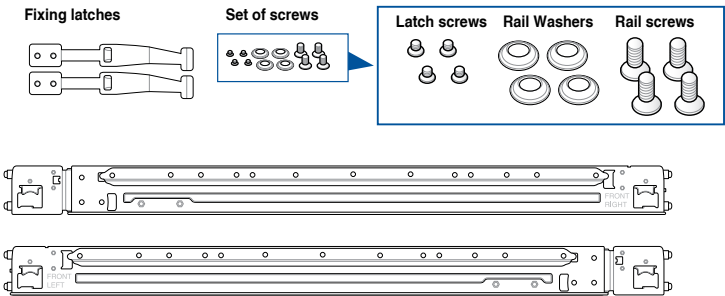
## **Installation Options**

This chapter describes how to install the optional components and devices into the barebone server.

### 3.1 Tool-less Friction Rail Kit

The tool less design of the rail kit allows you to easily install the rack rails into the server rack without the need for additional tools. The kit also comes with a metal stopping bracket that can be installed to provide additional support and stability to the server.

The tool-less rail kit package includes:



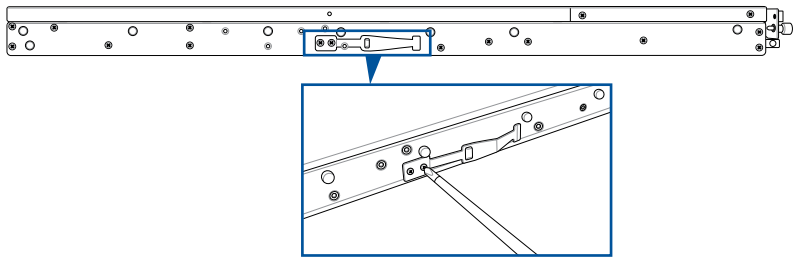
#### 3.1.1 Installing the tool-less rack rail

To install the tool-less rack rails into the rack:

1. Secure the two fixing latches to the two sides of the server using the set of latch screws.



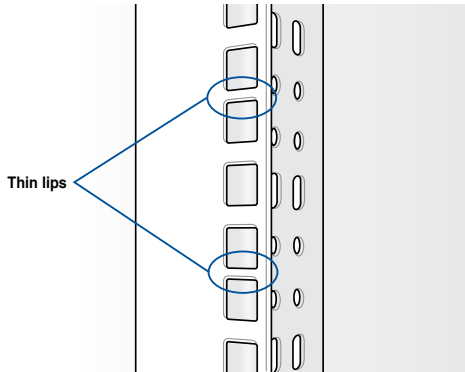
The locations of the screw holes vary with different server models. Refer to your server user manual for details.



2. Select a desired space and place the appropriate rack rail (left and right) on opposite positions on the rack.



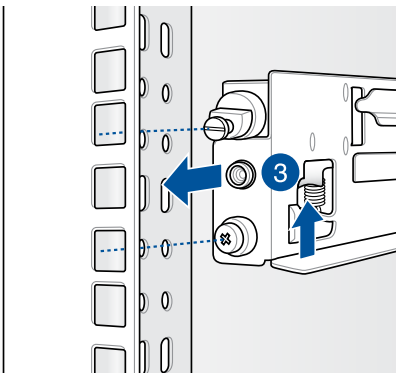
A 1U space consists of three square mounting holes with two thin lips on the top and the bottom.



3. Press the spring lock, then insert the studs into the selected square mounting holes on the rack post.
4. Press the spring lock on the other end of rail then insert the stud into the mounting hole on the rack post. Extend the rack rail, if necessary.
5. Perform steps 3 to 4 for the other rack rail.



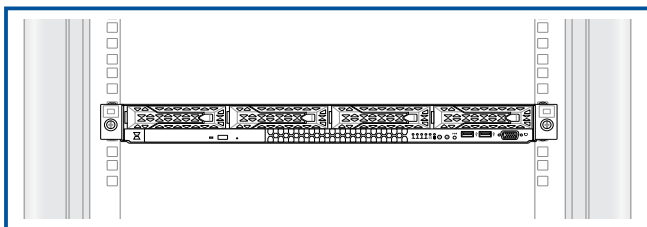
Ensure that the installed rack rails (left and right) are aligned, secured, and stable in place.



6. Lift the server chassis and insert it into the rack rail.



- Ensure that the rack rail cabinet and the rack posts are stable and standing firmly on a level surface.
- We strongly recommend that at least two able-bodied persons perform the steps described in this guide.
- We recommend the use of an appropriate lifting tool or device, if necessary.

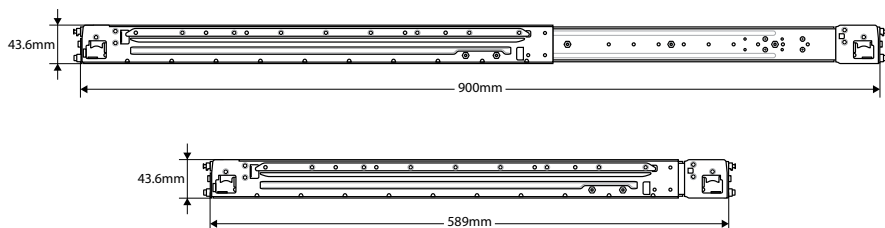


Ensure to include the side knots on the two sides of the server in the rack rail holders.



The illustrations shown above are for reference only.

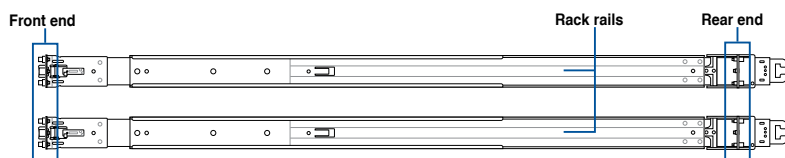
### 3.1.2 Rail kit dimensions



## 3.2 Ball bearing Rail Kit

The rail kit package includes:

2 x 1200 mm rack rails (or 2 x 1000 mm rack rails)



4 x #6-32X4L screws



4 x M4X4L screws



8 x ø17.1 screws



8 x #10-32 screws  
(or 10 x #10-32 screws for 1000 mm rack rails)



2 x M5X20L screws



- The bundled screw package includes different types of screws for you to choose from, not all screws are required for the installation.
- Package content and specifications are subject to change without notice.

## 3.2.1 Attaching the rack rails



- Ensure that the rack rail cabinet and the rack posts are stable and standing firmly on a level surface.
- We strongly recommend that at least two able-bodied persons perform the steps described in this guide.
- We recommend the use of an appropriate lifting tool or device, if necessary.



- The installation steps in this section uses a **1200 mm rack rail** as an example, the installation steps for a **1000 mm rack rail** is exactly the same.
- The illustrations in this section are for reference only.

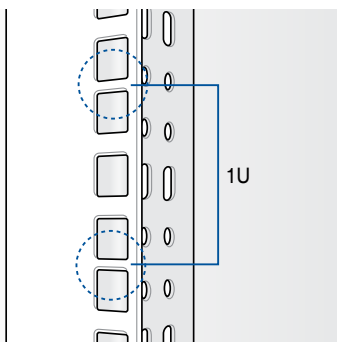
### Installing the rack rail

To install the rack rails into the rack:

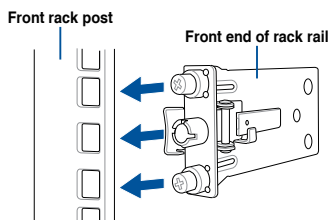
1. Select a desired space on the rack.



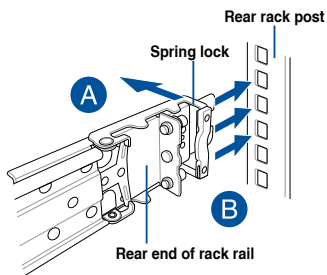
A 1U space consists of three square mounting holes with two thin lips on the top and the bottom.



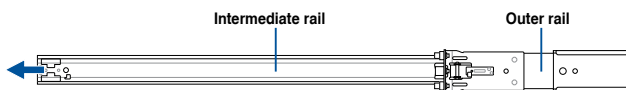
2. Align and insert the front end of the appropriate rack rail (left and right) into the front rack post.



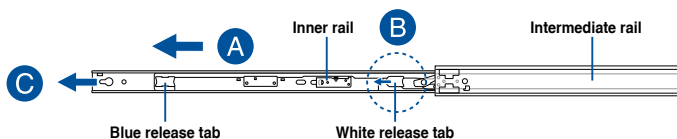
3. Press the spring lock on the rear end of the rack rail and insert the studs into the selected mounting holes on the rear rack post.



4. Slide the intermediate rail out of the outer rail until it clicks to a stop.



5. Slide the inner rail out of the intermediate rail until it clicks to a stop. Slide the white release tab outwards and remove the inner rail completely from the intermediate rail.



The blue release tab is available on 1200 mm rack rails. This blue release tab is used to further extend or retract the inner rail.

6. Repeat steps 2 to 5 for the other rack rail.

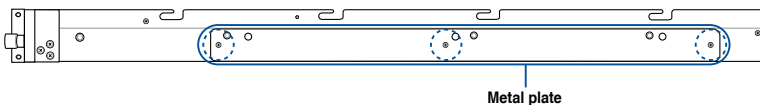


Ensure that the installed rack rails (left and right) are aligned, secured, and stable in place.

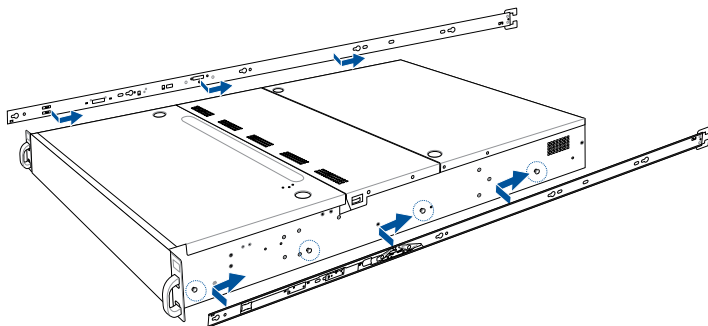
7. Remove the three (3) screws from both left and right sides of the server system chassis, then remove the metal plate.



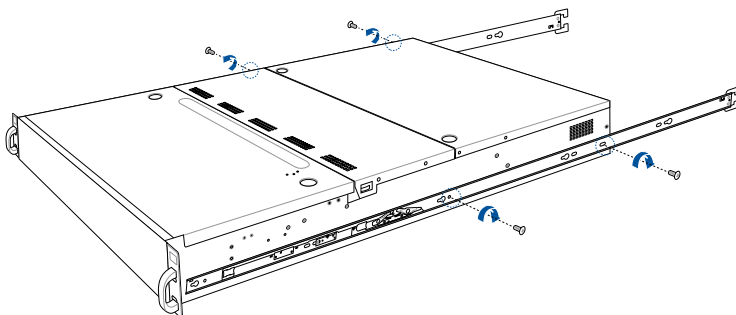
The illustration below only shows one side of the server system chassis, but the screws on the other side should be at the same place.



8. Align the inner rails with the studs on both sides of the server system, install the inner rails to the server system, then slide the inner rails toward the rear of the server system until it locks in place.

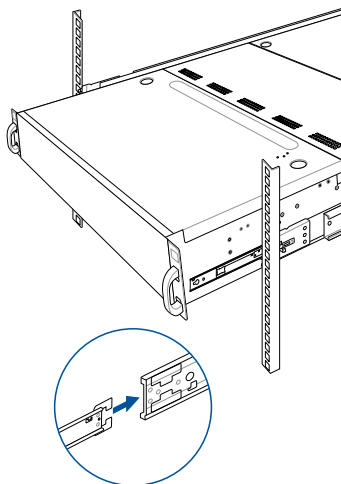


9. Secure the inner rails on both sides of the server system using the #6-32X4L screws.

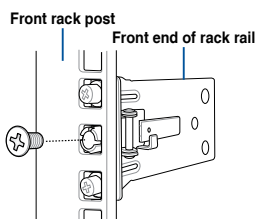




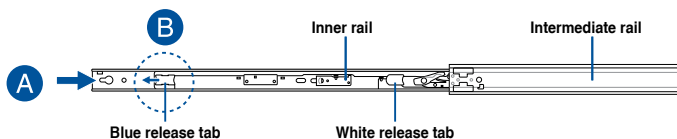
10. Align the server system and gently insert it into the rack rails.



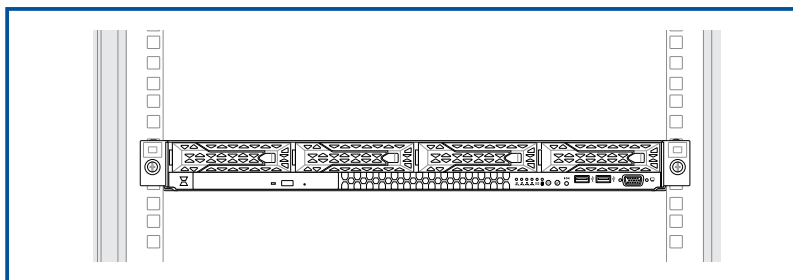
11. (optional) Use the M5X20L screws to secure the rack rails to the rack post.



12. Gently push the server system until it is completely installed into the rack rail.
- (optional) For 1200 mm rack rails, if the inner rail clicks to a stop while you are installing the server system into the rack rails, slide the blue release tab outwards and gently push the server system until it is completely installed into the rack rail.

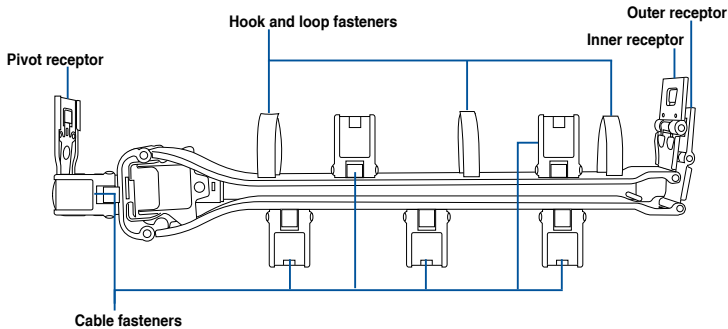


The blue release tab is available on 1200 mm rack rails. This blue release tab is used to further extend or retract the inner rail.



### 3.3 Cable management arm (optional for 1200 mm rack rails)

You can install an additional cable management arm (CMA) to the rack rails to help you manage the cables from your server system. The CMA is designed with movable parts that allow you to move the server system along the rack rail without the need to remove the CMA.



#### 3.3.1 Attaching the cable management arm

##### Installing the cable management arm

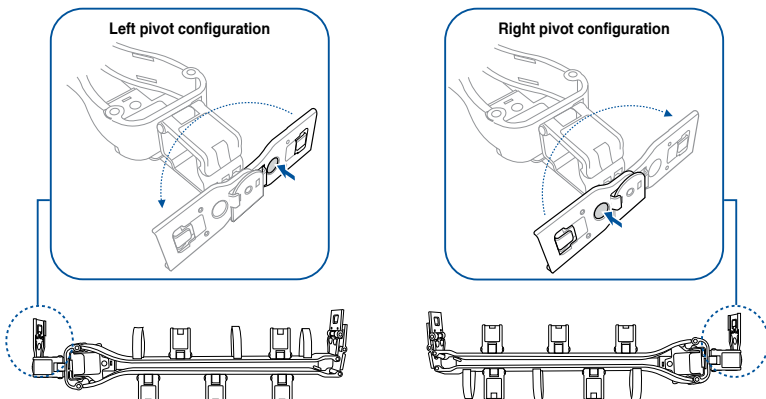
To install the cable management arm:

1. Install the rack rails into the rack.

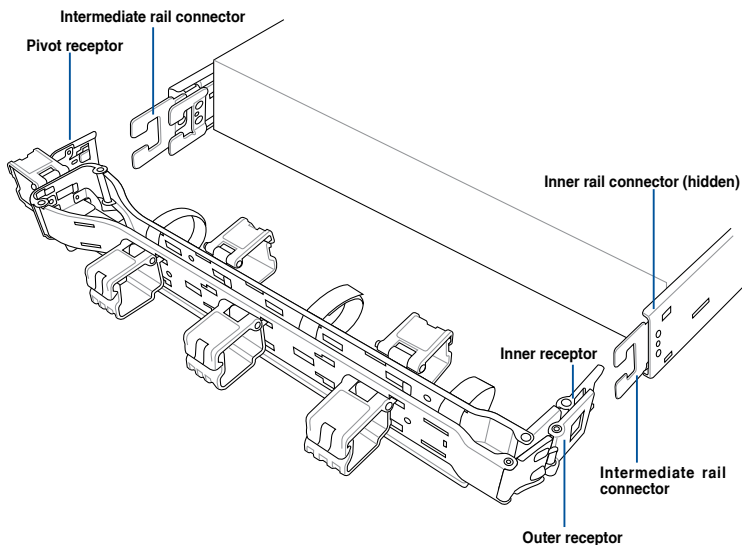


Refer to section **Rail Kit** for the steps on installing the rack rails into the rack.

2. Press the round button on the pivot receptor, then rotate the pivot receptor to the left or right for a left pivot configuration or right pivot configuration.

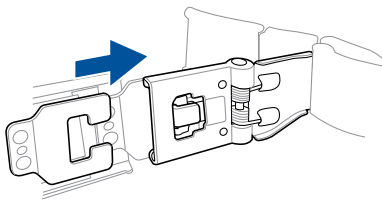


3. Align the three receptors on the CMA with the connectors on the rack rails.

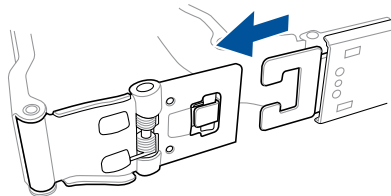


The installation steps in this section uses a **Left pivot configuration** as an example, the installation steps for a **Right pivot configuration** is similar.

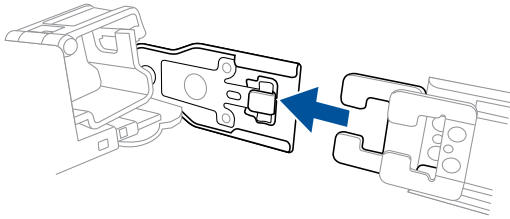
4. Align and connect the inner receptor on the CMA with the connector on the inner rail.



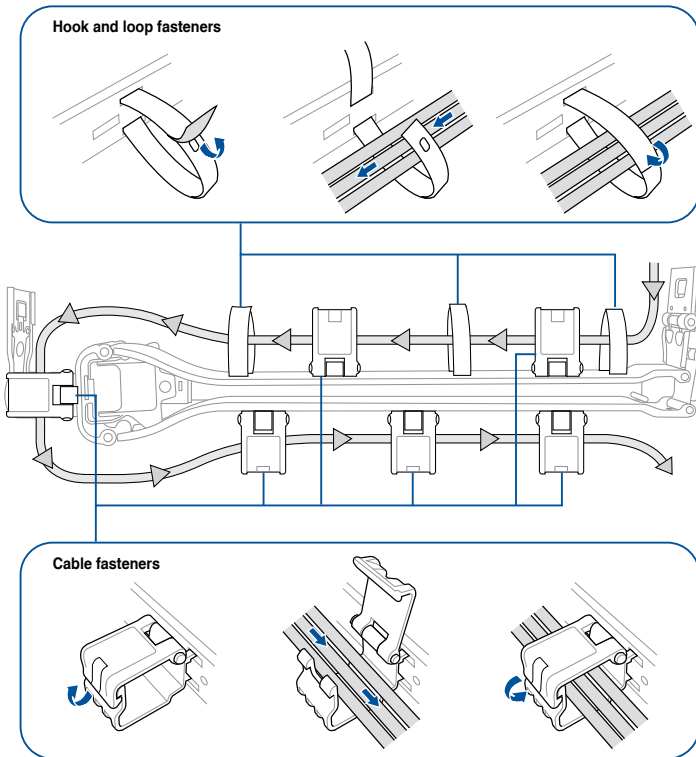
5. Align and connect the outer receptor on the CMA with the connector on the intermediate rail.



6. Align and connect the pivot receptor on the CMA with the connector on the other intermediate rail.



7. Pass the cables from the server system through the hook and loop fasteners and the cable fasteners on the CMA to complete.



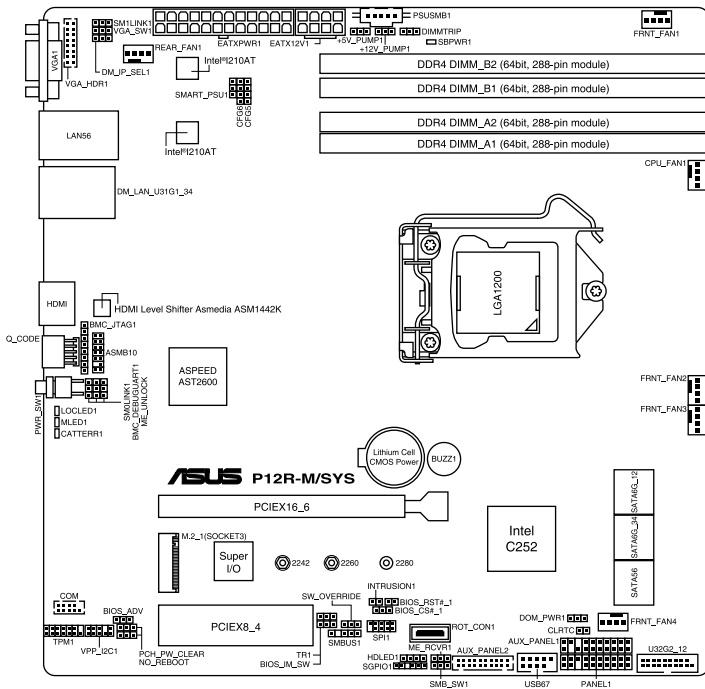
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Motherboard Information

# 4

This chapter includes the motherboard layout and brief descriptions of the jumpers and internal connectors.

## 4.1 Motherboard layout





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## 4.2 Jumpers



The motherboard illustration is for reference only. The motherboard layout and appearance may vary depending on the model, but the locations for these jumpers/LEDs/connectors remain the same.

### 1. Clear RTC RAM (2-pin CLRTC)

This jumper allows you to clear the CMOS memory system setup parameters by erasing the CMOS Real Time Clock (RTC) RAM data. The onboard button cell battery powers the RAM data in CMOS.

#### To erase the RTC RAM:

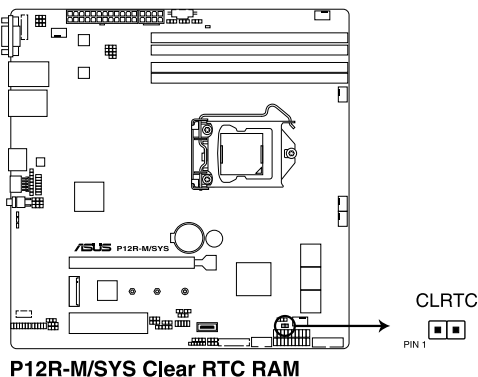
1. Turn OFF the computer and unplug the power cord.
2. Short-circuit pin 1-2 with a metal object or jumper cap for about 5-10 seconds.
3. Plug the power cord and turn ON the computer.
4. Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.



DO NOT short-circuit the pins except when clearing the RTC RAM. Short-circuiting or placing a jumper cap will cause system boot failure!

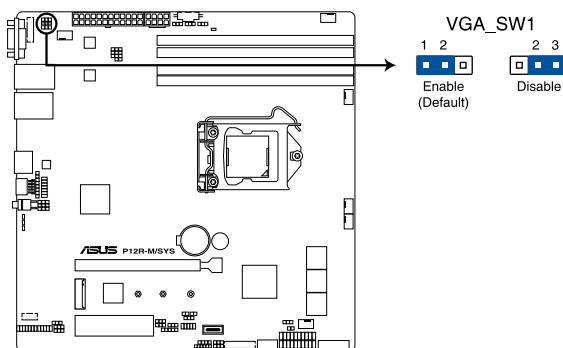


- If the steps above do not help, remove the onboard battery and short the two pins again to clear the CMOS RTC RAM data. After clearing the CMOS, reinstall the battery.
- Due to chipset behavior, AC power off is required to enable C.P.R. function. You must turn off and on the power supply or unplug and plug the power cord before rebooting the system.



## 2. VGA controller setting (3-pin VGA\_SW1)

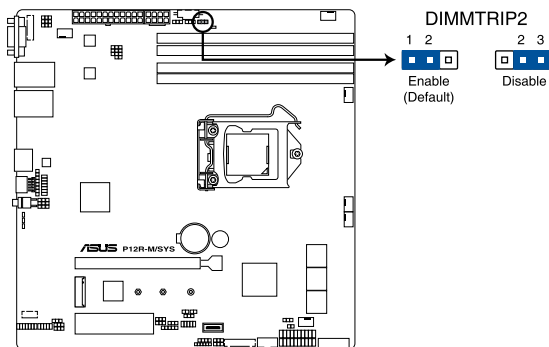
This jumper allows you to enable or disable the onboard VGA controller. Set to pins 1–2 to activate the VGA feature.



**P12R-M/SYS VGA setting**

## 3. DDR4 Thermal Event jumper (3-pin DIMMTRIP2)

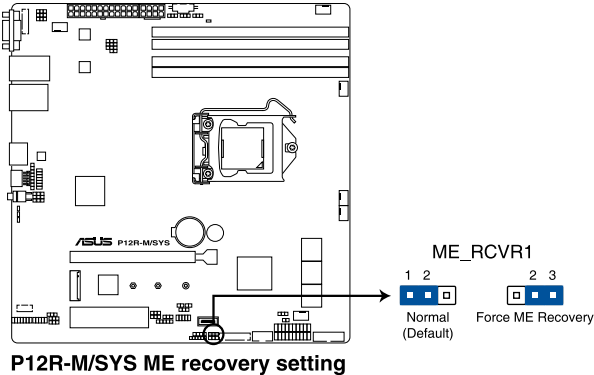
Set to pins 1-2 to enable DDR4 DIMM thermal sensing event.



**P12R-M/SYS Thermaltrip setting**

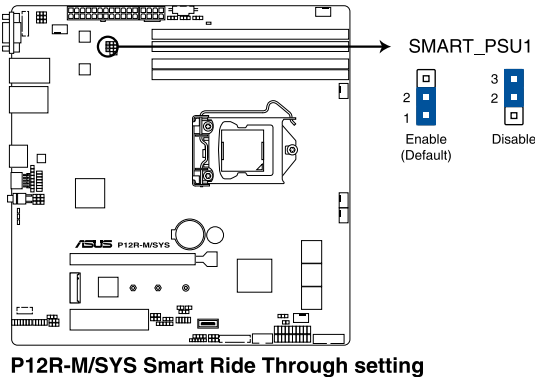
**4. ME firmware force recovery setting (3-pin ME\_RCVR1)**

This jumper allows you to force Intel Management Engine (ME) boot from recovery mode when ME become corrupted.



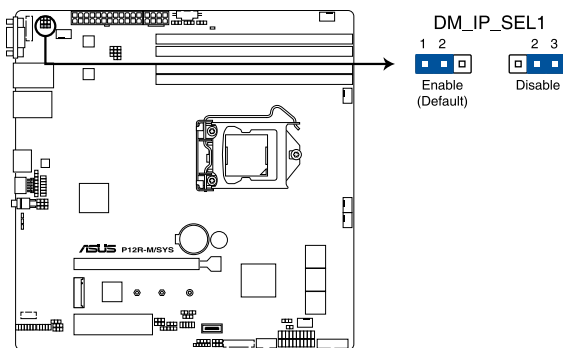
**5. Smart Ride Through (SmaRT) setting (3-pin SMART\_PSU1)**

This jumper allows you to enable or disable the Smart Ride Through (SmaRT) function. This feature is disabled by default. Set to pins 1-2 to enable it. When enabled, SmaRT allows uninterrupted operation of the system during an AC loss event.



## 6. DMLAN setting (3-pin DM\_IP\_SEL1)

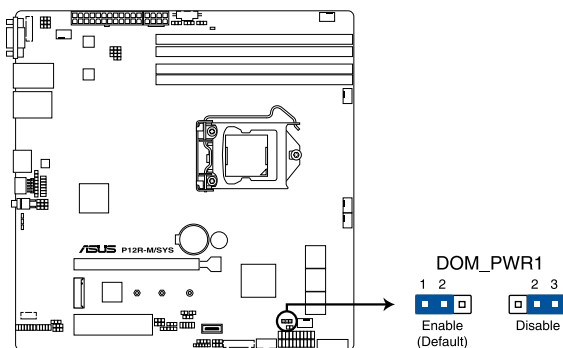
This jumper allows you to select the DMLAN setting. Set to pins 2-3 to force the DMLAN IP to static mode (IP=10.10.10.10, submask=255.255.255.0).



**P12R-M/SYS DM\_IP\_SEL1 setting**

## 7. SATADOM power setting (3-pin DOM\_PWR1)

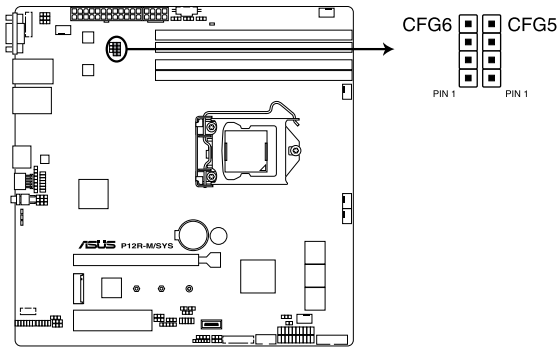
This jumper allows SATA56 to support SATADOM which do not need external power connections. Set to pins 2-3 to activate the SATA56 support feature.



**P12R-M/SYS DOM\_PWR1 setting**

8. CPU PCIE configuration setting (4-pin CFG5-6)

These jumpers allow you to configure the speed at which PCIEX16\_6 will run at. Refer to the table below for the different jumper configurations.

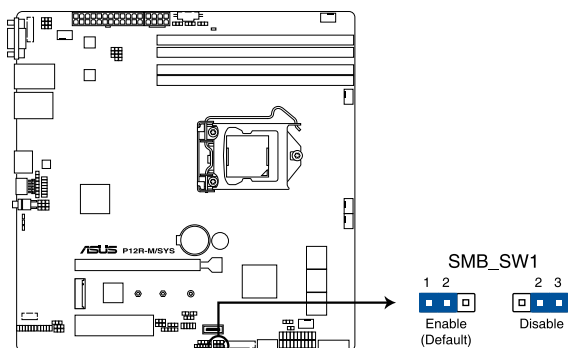


P12R-M/SYS CFG6 & CFG5 connectors

| Jumper Setting   |  |                              |
|--|--|------------------------------|
| CFG6   | CFG5   | PCIEX16_6 slot configuration |
| <div>1 2</div> <div><div></div><div></div><div></div><div></div></div> | <div>1 2</div> <div><div></div><div></div><div></div><div></div></div> | Auto (default)               |
| <div>2 3</div> <div><div></div><div></div><div></div><div></div></div> | <div>2 3</div> <div><div></div><div></div><div></div><div></div></div> | x16                          |
| <div>2 3</div> <div><div></div><div></div><div></div><div></div></div> | <div>3 4</div> <div><div></div><div></div><div></div><div></div></div> | x8, x8                       |
| <div>3 4</div> <div><div></div><div></div><div></div><div></div></div> | <div>3 4</div> <div><div></div><div></div><div></div><div></div></div> | x8, x4, x4                   |

## 9. PCIe SMBus Switcher setting (3-pin SMB\_SW1)

This jumper allows toggle whether the SMBUS signal comes from BMC or PCH.



**P12R-M/SYS SMBus Switcher setting**



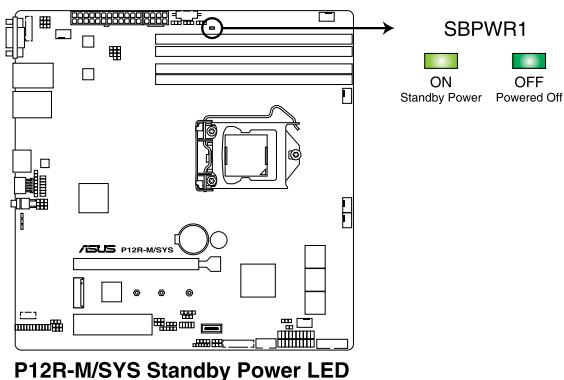
## 4.3 Onboard LEDs



The motherboard illustration is for reference only. The motherboard layout and appearance may vary depending on the model, but the locations for these jumpers/LEDs/connectors remain the same.

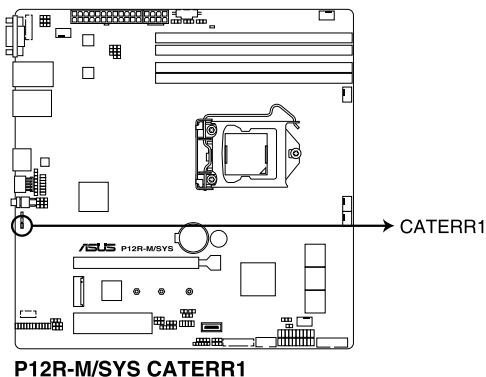
### 1. Standby Power LED (SBPWR1)

The motherboard comes with a standby power LED. The green LED lights up to indicate that the system is ON, in S5 mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows the location of the onboard LED.



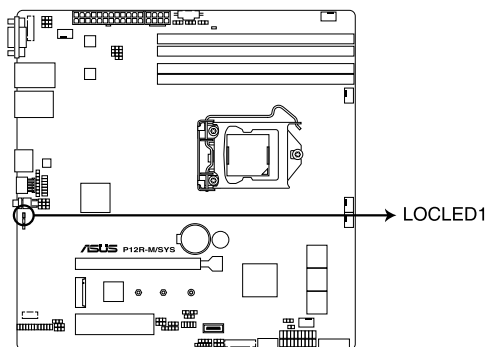
### 2. CATT ERR LED (CATTERR1)

The CATT ERR LED indicates that the system has experienced a fatal or catastrophic error and cannot continue to operate.



### 3. Location LED (LOCLED1)

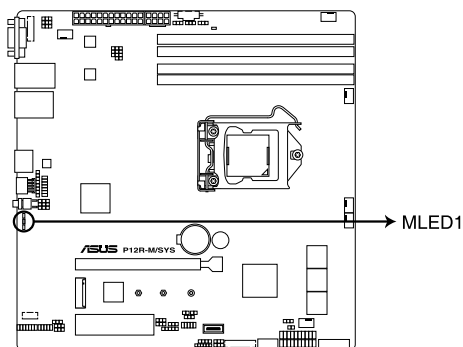
This onboard LED lights up when the Location button on the server is pressed or when triggered by a system management software. The Location LED helps visually locate and quickly identify the server in error on a server rack.



**P12R-M/SYS Location LED**

### 4. Message LED (MLED1)

This onboard LED lights up to indicate that there is a temperature warning or a BMC event log is generated.

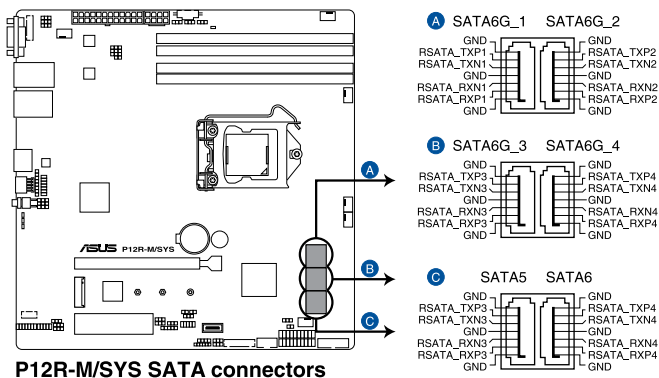


**P12R-M/SYS MLED**

## 4.4 Internal connectors

### 1. Serial ATA 6.0 Gbp/s connectors (7-pin SATA6G\_1-4; SATA5-6)

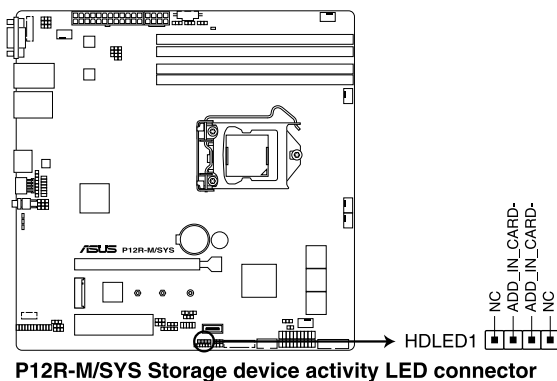
Supported by the Intel® C252 chipset, these connectors are for the Serial ATA signal cables for Serial ATA hard disk drives that allows up to 6Gb/s of data transfer rate. If you installed Serial ATA hard disk drives, you can create a RAID 0, RAID 1, RAID 10, or RAID 5 configuration.



The actual data transfer rate depends on the speed of Serial ATA hard disks installed.

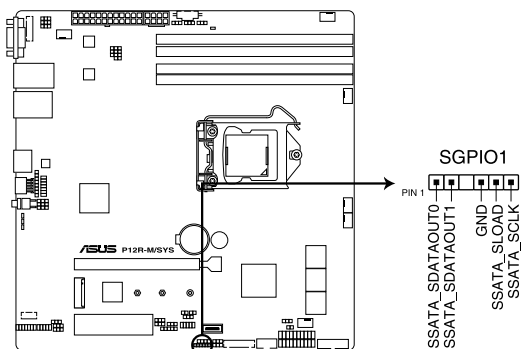
### 2. Hard disk activity LED connector (4-pin HDLED1)

This LED connector is for the storage add-on card cable connected to the SATA or SAS add-on card. The read or write activities of any device connected to the SATA or SAS add-on card causes the front panel LED to light up.



### 3. Serial General Purpose Input/Output connector (6-1 pin SGPIO1)

The SGPIO 1 connector is used for the Intel Rapid Storage Technology Enterprise SGPIO interface that controls the LED pattern generation, device information, and general purpose data.



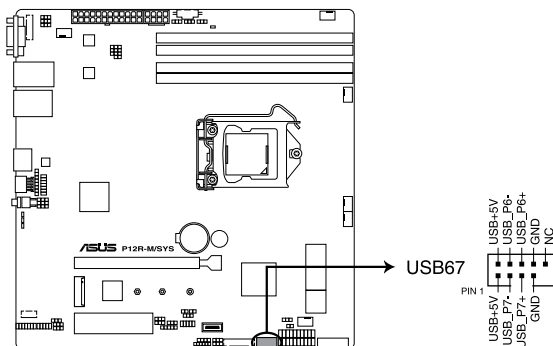
**P12R-M/SYS Serial General Purpose Input/Output connector**



DO NOT connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

### 4. USB 2.0 connectors (10-1 pin USB67)

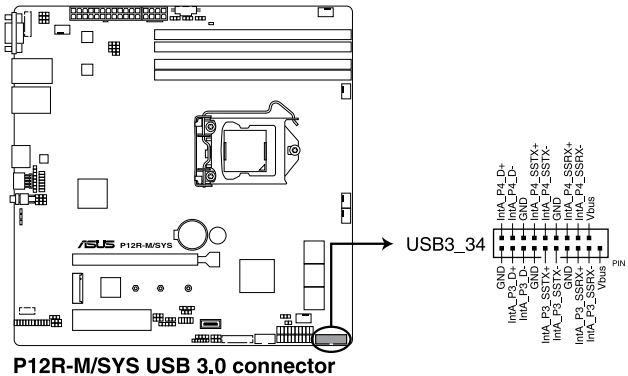
This connector allows you to connect a USB 2.0 module for additional USB 2.0 front or rear panel ports. This USB connector provides data transfer speeds of up to 480 Mb/s connection speed.



**P12R-M/SYS USB 2.0 connector**

5. **USB 3.2 Gen 2 connector (20-pin USB3\_34)**

This connector allows you to connect a USB 3.2 Gen 2 module for additional USB 3.2 Gen 2 front or rear panel ports. The USB 3.2 Gen 2 connector provides data transfer speeds of up to 10 Gb/s.



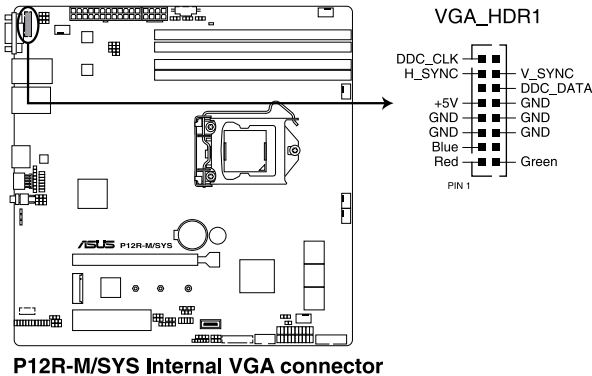
The USB 3.2 Gen 2 module is purchased separately.



The plugged USB 3.2 Gen 2 device may run on xHCI or EHCI mode depending on the operating system's setting.

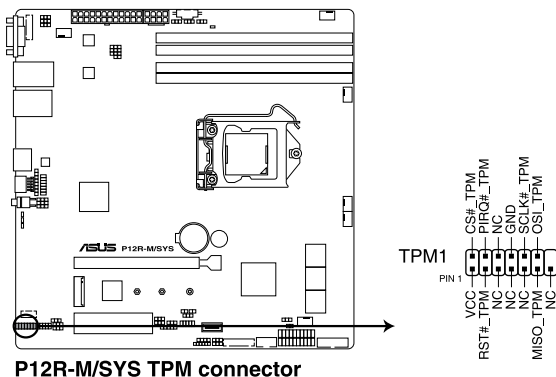
6. **VGA connector (16-pin VGA\_HDR1)**

This connector supports the VGA High Dynamic-Range interface.



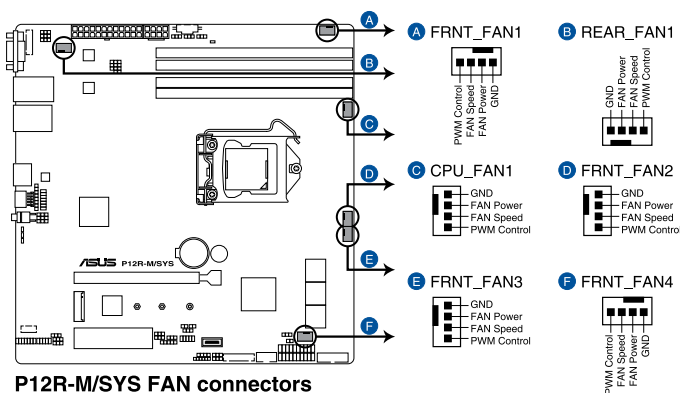
## 7. Trusted Platform Module connector (14-1 pin TPM1)

This connector supports a Trusted Platform Module (TPM) system, which can securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity.



## 8. Fan connectors (4-pin CPU\_FAN1, FRNT\_FAN1-4, REAR\_FAN1)

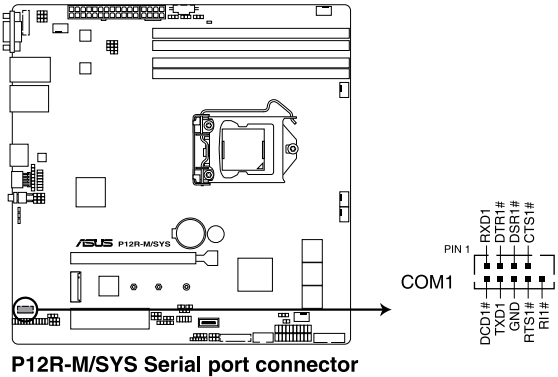
The fan connectors support cooling fans. Connect the fan cables to the fan connectors on the motherboard, ensuring that the black wire of each cable matches the ground pin of the connector.



- DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components.
- These are not jumpers! DO NOT place jumper caps on the fan connectors!
- All fans feature the ASUS Smart Fan technology.

9. Serial port connector (10-1 pin COM1)

These connectors are for the serial (COM) ports. Connect the serial port module cable to the connector, then install the module to a slot opening at the back of the system chassis.



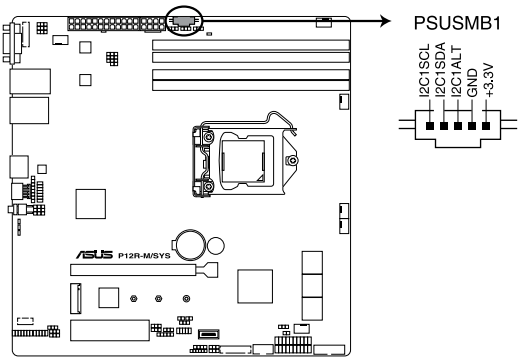
P12R-M/SYS Serial port connector



The COM module is purchased separately.

10. Power Supply SMBus connector (5-pin PSUSMB1)

This connector allows you to connect SMBus (System Management Bus) to the PSU (power supply unit) to read PSU information. Devices communicate with an SMBus host and/or other SMBus devices using the SMBus interface.



P12R-M/SYS Power supply SMBus connector



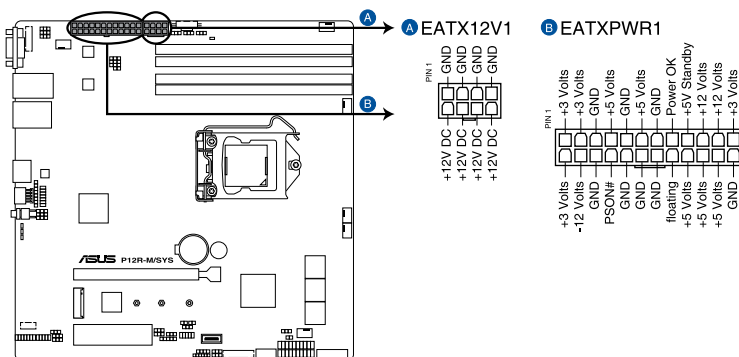
This connector functions only when you enable the ASUS ASMB10.



Power supply is required to meet PMBus specification and customized BMC FW may be needed. Please contact ASUS if you need further support.

## 11. ATX power connectors (24-pin EATXPWR1, 8-pin EATX12V1)

These connectors are for the ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.



**P12R-M/SYS ATX power connectors**

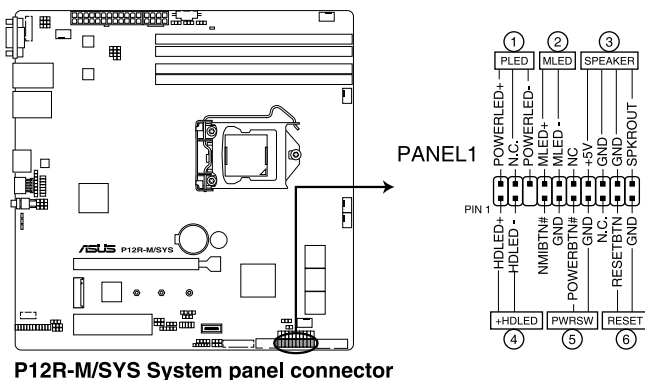


- DO NOT forget to connect the 24-pin and the 8-pin power plugs; otherwise, the system will not boot up.
- Use of a power supply unit (PSU) with a higher power output is recommended when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- This motherboard supports ATX2.0 PSU or later version.
- Ensure that your PSU can provide at least the minimum power required by your system.



## 12. System panel connector (20-1 pin PANEL1)

This connector supports several chassis-mounted functions.



**P12R-M/SYS System panel connector**

- **System power LED (3-pin PLED)**

This 3-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

- **Message LED (2-pin MLED)**

This 2-pin connector is for the message LED cable that connects to the front message LED. The message LED is controlled by Hardware monitor to indicate an abnormal event occurrence.

- **System warning speaker (4-pin SPEAKER)**

This 4-pin connector is for the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

- **Hard disk drive activity LED (2-pin +HDLED)**

This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector. The IDE LED lights up or flashes when data is read from or written to the HDD.

- **Power button/soft-off button (2-pin PWRSW)**

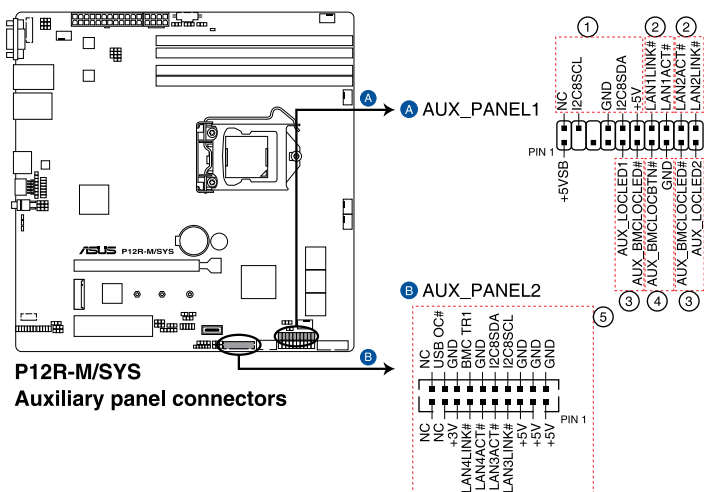
This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the BIOS settings. Pressing the power switch for more than four (4) seconds while the system is ON turns the system OFF.

- **Reset button (2-pin RESET)**

This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.

### 13. Auxiliary panel connectors (20-2 pin AUX\_PANEL1; 20-pin AUX\_PANEL2)

These connectors are for additional front panel features including front panel SMB, locator LED and switch, chassis intrusion, and LAN LEDs.



- **Front panel SMB (6-1 pin FPSMB)**

This 6-1 pin connector is for the front panel SMBus cable.

- **LAN activity LED (2-pin LAN1\_LED, LAN2\_LED)**

This 2-pin connector is for the Gigabit LAN activity LEDs on the front panel.

- **Locator LED (2-pin LOCATORLED1, 2-pin LOCATORLED2)**

This 2-pin connector is for the locator LED1 and LED2 on the front panel. Connect the Locator LED cables to these 2-pin connector. The LEDs will light up when the Locator button is pressed.

- **Locator Button/Switch (2-pin LOCATORBTN)**

This 2-pin connector is for the locator button on the front panel. This button queries the state of the system locator.

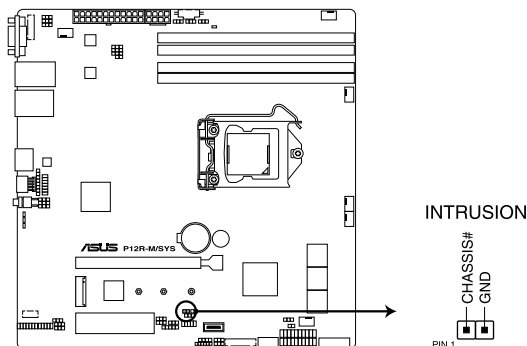
- **LAN activity LED and USB port (2-pin LAN3\_LED, LAN4\_LED, USB ports)**

These leads are for the Gigabit LAN activity LEDs and USB ports on the front panel.

#### 14. Chassis intrusion connector (2-pin INTRUSION)

This connector is for a chassis-mounted intrusion detection sensor or switch. Connect one end of the chassis intrusion sensor or switch cable to this connector. The chassis intrusion sensor or switch sends a high-level signal to this connector when a chassis component is removed or replaced. The signal is then generated as a chassis intrusion event.

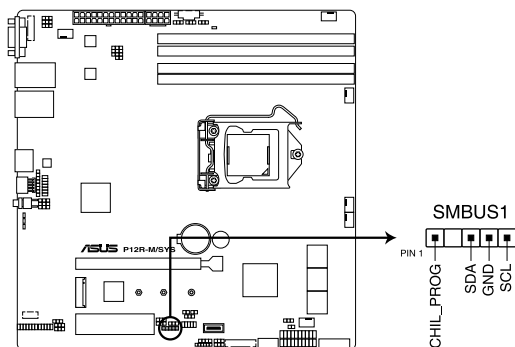
By default, the pin labeled “Chassis Signal” and “Ground” are shorted with a jumper cap. Remove the jumper caps only when you intend to use the chassis intrusion detection feature.



**P12R-M/SYS Chassis Intrusion connector**

#### 15. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)

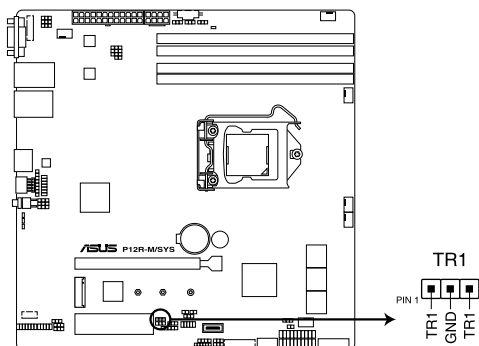
This connector controls the system and power management-related tasks. This connector processes the messages to and from devices rather than tripping the individual control lines.



**P12R-M/SYS SMBUS connector**

## 16. Thermal sensor cable connector (3-pin TR1)

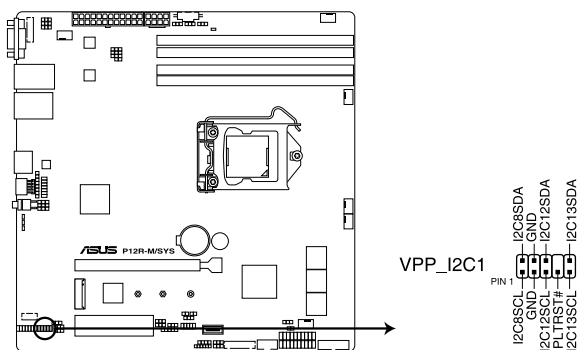
This connector allows you to connect a thermal sensor cable that is used for monitoring temperature. Connect the thermal sensor cable to the connector and place its probe to the device that you want to monitor.



**P12R-M/SYS Thermal sensor cable connector**

## 17. VPP\_I2C connector (10-1 pin VPP\_I2C1)

The VPP\_I2C connector is used for the storage backplane with sensor readings.



**P12R-M/SYS VPP\_I2C1 connector**

# BIOS Setup

# 5

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

## 5.1 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.

---

### 5.1.1 **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.

---



---

When downloading or updating the BIOS file, rename it as **P11CM4L.CAP** for this motherboard.

---

### **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.

---

## 5.1.2 ASUS EzFlash Utility

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



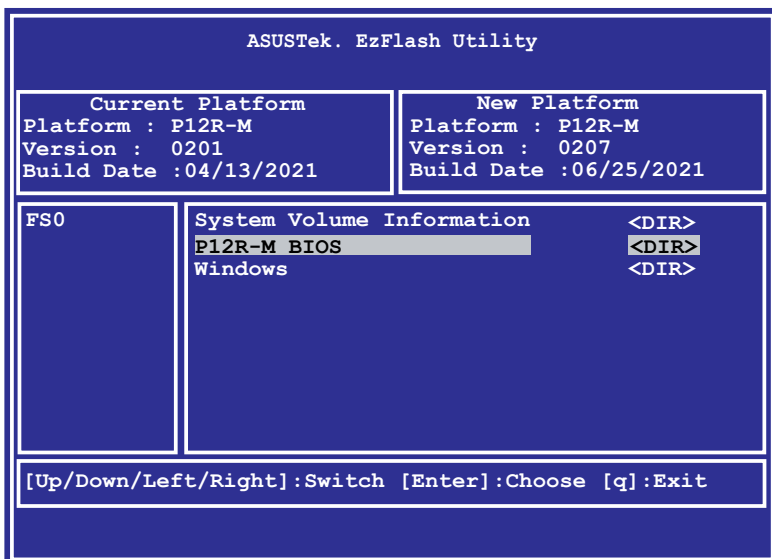
Download the latest BIOS from the ASUS website at [www.asus.com](http://www.asus.com) before using this utility.



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

To update the BIOS using EzFlash Utility:

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



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



- 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.

### 5.1.3 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 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. Download 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:

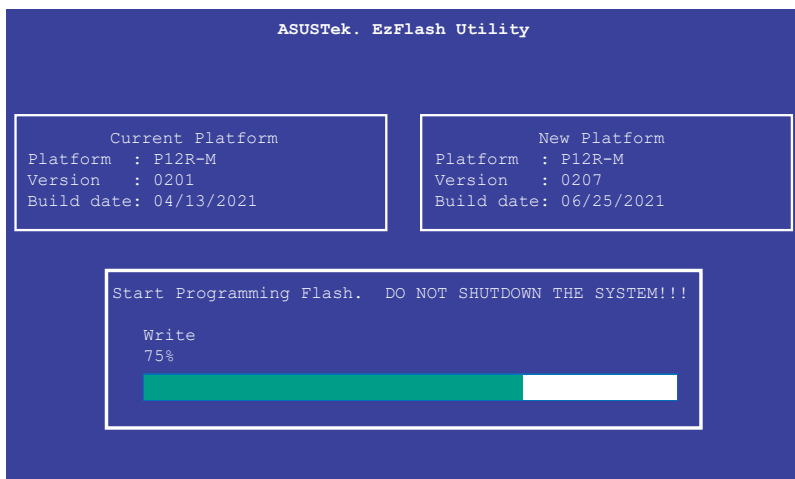
```
BUPDATER /i[filename].CAP
```

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.

4. Reboot the system from the hard disk drive.

The BIOS update is finished! Please restart your system.  
C:\>

## 5.2 BIOS setup program

This motherboard supports a programmable firmware chip that you can update using the provided utility described in section **4.1 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 NVRAM 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.

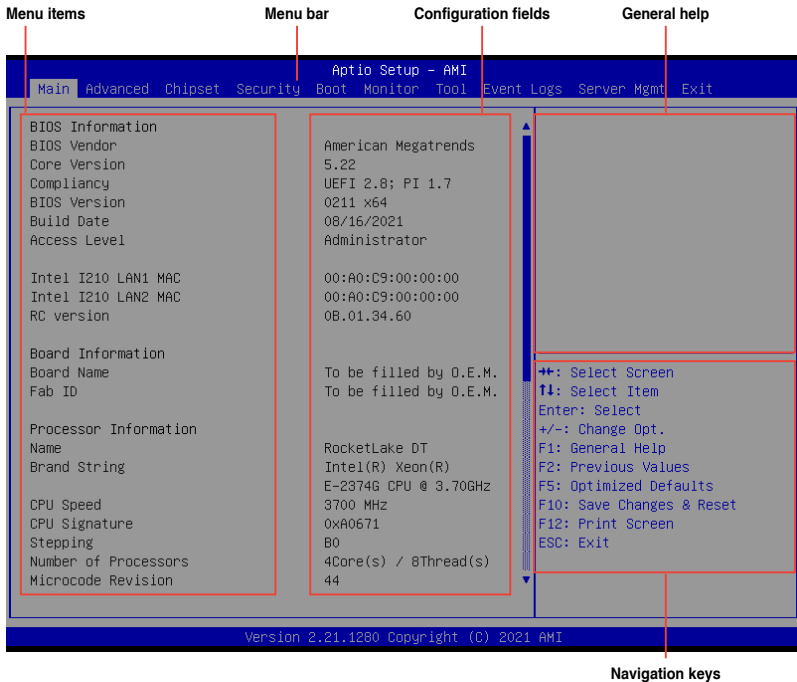
If you wish to enter Setup after POST, restart the system by pressing <Ctrl+Alt+Delete>, or by pressing the reset button on the system chassis. You can also restart by turning the system off and then back on. Do this last option only if the first two failed.

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.
-

## 5.2.1 BIOS menu screen



Navigation keys

## 5.2.2 Menu bar

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

- |                    |  |
|--------------------|--|
| <b>Main</b>        | For changing the basic system configuration  |
| <b>Advanced</b>    | For changing the advanced system settings  |
| <b>Chipset</b>     | For changing the chipset settings  |
| <b>Security</b>    | For changing the security settings   |
| <b>Boot</b>        | For changing the system boot configuration   |
| <b>Monitor</b>     | For displaying the system temperature, power status, and changing the fan settings |
| <b>Tool</b>        | For configuring options for special functions                                      |
| <b>Event Logs</b>  | For changing the event log settings  |
| <b>Server Mgmt</b> | For changing the server mgmt settings  |
| <b>Exit</b>        | For selecting the save & exit options  |

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

### **5.2.3 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 (Advanced, Chipset, Security, Boot, Monitor, Tool, Event Logs, Server Mgmt, and Exit) on the menu bar have their respective menu items.

### **5.2.4 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>.

### **5.2.5 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.

### **5.2.6 General help**

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

### **5.2.7 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.

### **5.2.8 Pop-up window**

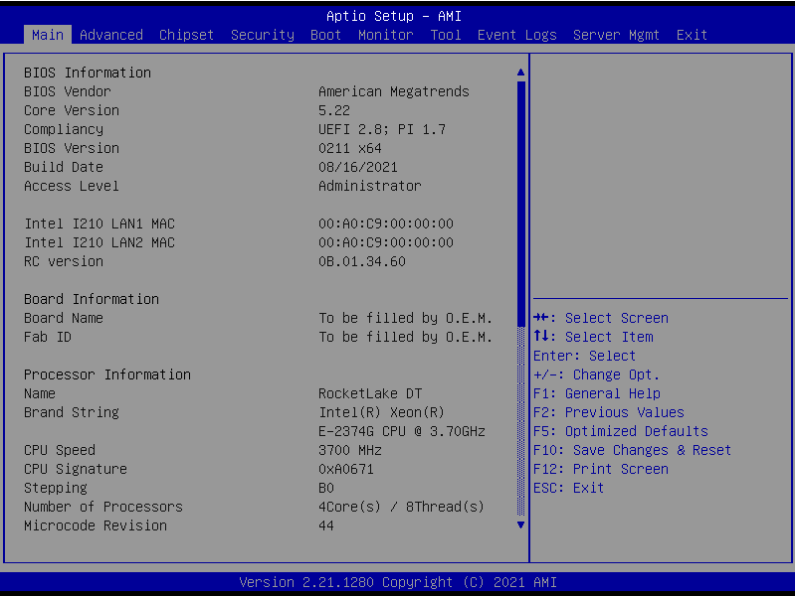
Select a menu item and press <Enter> to display a pop-up window with the configuration options for that item.

### **5.2.9 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.

### 5.3 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.



Navigate to the second page of the screen to see the rest of items in this menu by pressing the Up or Down arrow keys.

 To quickly go to the last item of the second page, press the **Page Down** button. Press the **Page Up** button to go back to the first item in the first page.

#### 5.3.1 System Language [English]

Allows you to select the system default language.

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

Allows you to set the system date.

#### 5.3.3 System Time [xx:xx:xx]

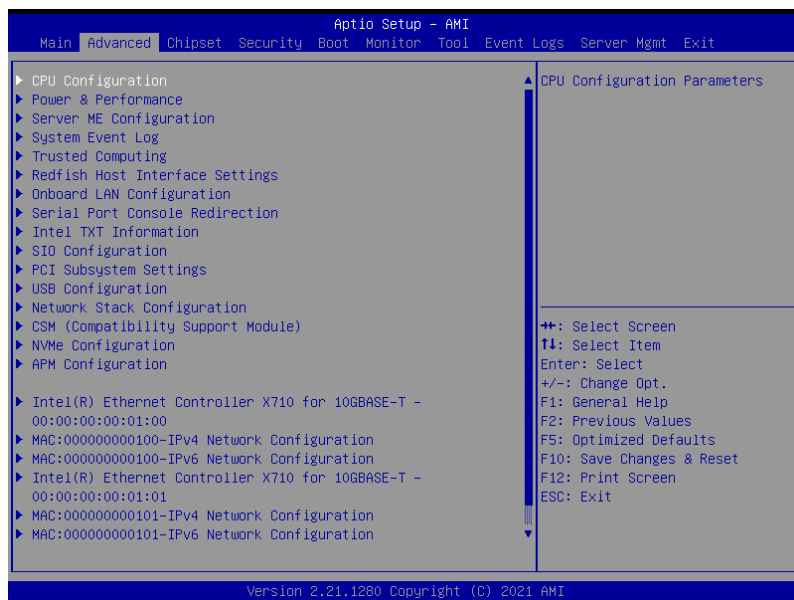
Allows you to set the system time.

## 5.4 Advanced menu

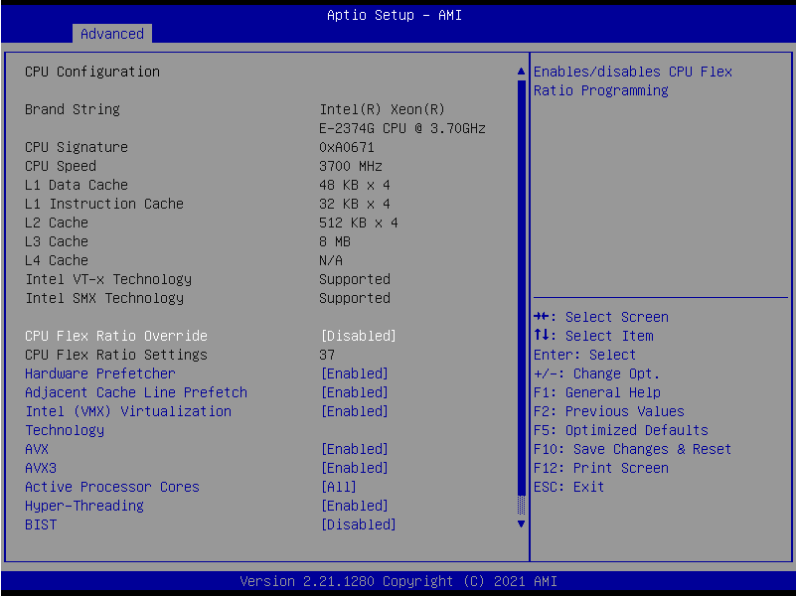
The Advanced menu items allow you to change the settings for the CPU and other system devices.



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



# 5.4.1 CPU Configuration



## CPU Flex Ratio Override [Disabled]

Allows you to enable or disable CPU Flex Ratio Override.

Configuration options: [Disabled] [Enabled]



The following item appears only when **CPU Flex Ratio Override** is set to **[Enabled]**.

## CPU Flex Ratio Settings [37]

Allows you to set the CPU Flex Ratio. This value must be between the Max Efficiency Ratio (LFM) and the Maximum non-turbo ratio set by the Hardware (HFW).

## Hardware Prefetcher [Enabled]

Allows you to turn on/off the MLC streamer prefetcher.

Configuration options: [Disabled] [Enabled]

## Adjacent Cache Prefetch [Enabled]

Allows you to turn on/off prefetching of adjacent cache lines.

Configuration options: [Disabled] [Enabled]

## Intel (VMX) Virtualization Technology [Enabled]

Enable this item to allow a VMM to utilize the additional hardware capabilities provided by Vanderpool Technology.

Configuration options: [Disabled] [Enabled]

### **AVX [Enabled]**

Allows you to enable or disable the AVX 2/3 Instructions. This is applicable for Big Core only.  
Configuration options: [Disabled] [Enabled]

### **AVX3 [Enabled]**

Allows you to enable or disable the AVX 3 Instructions. This is applicable for Big Core only.  
Configuration options: [Disabled] [Enabled]

### **Active Processor Cores [All]**

Allows you to set the number of cores to enable in each processor package.  
Configuration options: [All] [1] [2] [3]

### **Hyper-Threading [Enabled]**

Allows a hyper-threading processor to appear as two logical processors, allowing the operating system to schedule two threads or processes simultaneously.

[Enabled]            For two threads per activated core.

[Disabled]          For only one thread per activated core.

### **BIST [Disabled]**

Allows you to enable or disable BIST (Built-In Self Test) on reset.  
Configuration options: [Disabled] [Enabled]

### **AES [Enabled]**

Allows you to enable or disable AES (Advanced Encryption Standard).  
Configuration options: [Disabled] [Enabled]

### **Intel Trusted Execution Technology [Disabled]**

Allows you to enable or disable utilization of additional hardware capabilities provided by Intel(R) Trusted Execution Technology. Changes require a full power cycle to take effect.  
Configuration options: [Disabled] [Enabled]

## **5.4.2 Power & Performance**



### **CPU - Power Management Control**

#### **Boot performance mode [Turbo Performance]**

This item allows you to select the performance state that the BIOS will set starting from reset vector.  
Configuration options: [Max Battery] [Max Non-Turbo Performance] [Turbo Performance]

#### **Intel(R) SpeedStep(tm) [Enabled]**

Allows more than two frequency ranges to be supported.  
Configuration options: [Disabled] [Enabled]



### **Race To Halt (RTH) [Enabled]**

Allows you to enable or disable Race To Halt feature. RTH dynamically increases the CPU frequency to quickly enter the package C-State and reduce the overall power. RTH is controlled through MSR 1FC bit 20.

Configuration options: [Disabled] [Enabled]

### **Intel(R) Speed Shift Technology [Native Mode]**

Allows you to enable or disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

Configuration options: [Disabled] [Native Mode] [Out of Band Mode]

### **Per Core P State OS control mode [Enabled]**

Allows you to enable or disable Per Core P state OS control mode. Disabling will set Bit 31 = 1 command 0x06. When set the highest core request is used for all other core requests.

Configuration options: [Disabled] [Enabled]

### **HwP Autonomous Per Core P State [Enabled]**

[Disabled]      Disable Autonomous PCPS (Bit 30 = 1, command 0x11). Autonomous will request the same value for all cores all the time.

[Enabled]      Enable PCPS (default Bit 30 = 0, command 0x11).

### **HwP Autonomous EPP Grouping [Enabled]**

[Disabled]      Disable EPP grouping (default Bit 29 = 1, command 0x11). Autonomous will not necessarily request same values for all cores with same EPP.

[Enabled]      Enable EPP grouping (default Bit 29 = 1, command 0x11). Autonomous will request the same value for all cores with same EPP.

### **HwP Fast MSR Support [Enabled]**

Allows you to enable or disable HwP Fast MSR Support for IA32\_HWP\_REQUEST MSR.

Configuration options: [Disabled] [Enabled]

### **HDC Control [Enabled]**

[Disabled]      Disable HDC.

[Enabled]      Can be enable by OS if OS native support available.

### **Turbo Mode [Enabled]**

Allows you to enable or disable processor turbo mode if EMTTM is also enabled.

Configuration options: [Disabled] [Enabled]

### **C-States [Enabled]**

Allows you to enable or disable CPU power management, this allows the CPU to enter C-state when not it is not 100 % utilized.

Configuration options: [Disabled] [Enabled]



---

The following items appears only when **C-States** is set to **[Enabled]**.

---

### **Enhanced C-States [Enabled]**

Allows you to enable or disable C11E. Enable this item to allow the CPU to switch to minimum speed when all cores enter C-State.

Configuration options: [Disabled] [Enabled]

### **C-State Auto Demotion [C1]**

This item allows you to configure the C-state auto demotion.

Configuration options: [Disabled] [C1]

### **C-State Un-demotion [C1]**

This item allows you to configure the C-state Un-demotion.

Configuration options: [Disabled] [C1]

### **Package C-State Demotion [Enabled]**

This item allows you to configure the Package C-State Demotion.

Configuration options: [Disabled] [Enabled]

### **Package C-State Un-demotion [Enabled]**

This item allows you to configure the Package C-state Un-demotion.

Configuration options: [Disabled] [Enabled]

### **Package C-state Limit [Auto]**

This item allows you to select the maximum package C-state limit setting. Setting this item to CPU Default will leave it to Factory default value. Setting this item to Auto will initialize to deepest available Package C State Limit.

Configuration options: [C0/C1] [C2] [C3] [C6] [C7] [C7S] [C8] [C9] [C10] [CPU Default] [Auto]

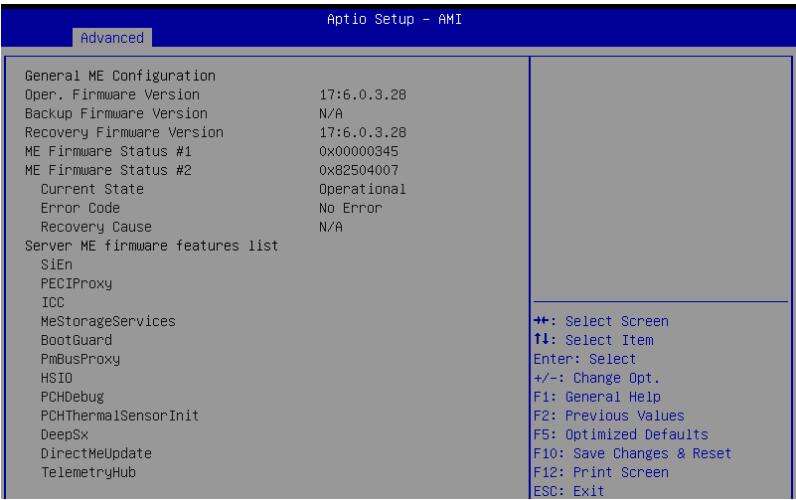
### **Thermal Monitor [Enabled]**

Allows you to enable or disable Thermal Monitoring.

Configuration options: [Disabled] [Enabled]

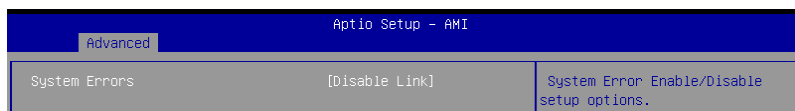
### 5.4.3 Server ME Configuration

Displays the Server ME Technology parameters on your system. Scroll using <Page Up> / <Page Down> keys to see more items.



## 5.4.4 System Event Log

Allows you to view the System Event Main Screen and RAS features enabling.



### System Errors [Disabled]

Allows you to enable or disable system error setup options.

Configuration options: [Disabled] [Enabled]



---

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

---

### Whea Driver Support [Disabled]

Allows you to enable or disable Whea Driver Support. This option may not be effective with some OS.

Configuration options: [Disabled] [Enabled]



---

The following items appear only when **Whea Driver Support** is set to **[Enabled]**.

---

### Whea FFM Logging [Disable Link]

Allows you to enable or disable Whea FFM logging of errors.

Configuration options: [Disable Link] [Enabled]

### WHEA/UEFI Record Format [UEFI 2.2]

Allows you to set WHEA/UEFI FFM Error record format.

Configuration options: [UEFI 2.2] [UEFI 2.3.1]

### Memory Error Enabling:

Press <Enter> to view or change Memory errors enabling options.

#### Memory corrected Error enabling [Disable Link]

Allows you to enable or disable Memory corrected Errors.

Configuration options: [Disable Link] [Enabled]

#### Memory uncorrected Error enabling [Disable Link]

Allows you to enable or disable Memory uncorrected Errors.

Configuration options: [Disable Link] [Enabled]

### PCH Error Enable [No]

Allows you to enable or disable Whea Driver Support. This option may not be effective with some OS.

Configuration options: [No] [Yes]



The following item appears only when **PCH Error Enable** is set to **[Yes]**.

### PCI/PCI Error Enabling:

Press <Enter> to view or change PCH errors enabling options.

#### **PCI-Ex Error Enable [No]**

Configuration options: [No] [Yes]

#### **Fatal Error Enable [Enabled]**

Allows you to enable and escalate fatal errors to error pins.

Configuration options: [Disable Link] [Enabled]

#### **Uncorrected Error Enable [Enabled]**

Allows you to enable and escalate Uncorrectable/Recoverable errors to error pins.

Configuration options: [Disable Link] [Enabled]

#### **Corrected Error Enable [Enabled]**

Allows you to enable and escalate Correctable Errors to error pins.

Configuration options: [Disable Link] [Enabled]

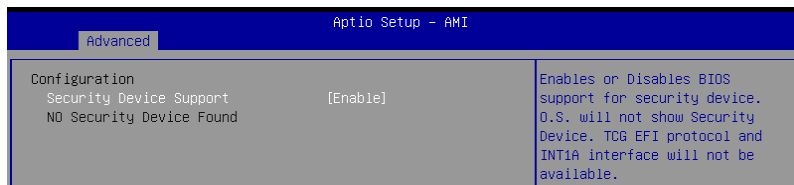
#### **Enable SERR propagation [No]**

Configuration options: [No] [Yes]

#### **Enable PERR propagation [No]**

Configuration options: [No] [Yes]

## 5.4.5 Trusted Computing

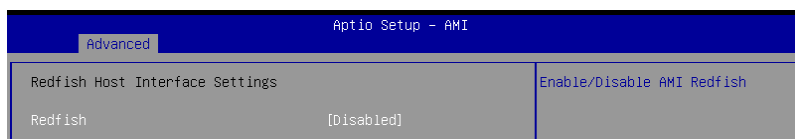


### **Security Device Support [Enabled]**

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

Configuration options: [Disabled] [Enabled]

## 5.4.6 Redfish Host Interface Settings



### Redfish [Disabled]

Allows you to enable or disable Redfish.

Configuration options: [Disabled] [Enabled]



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

### Authentication mode [Basic Authentication]

Allows you to select the authentication mode.

Configuration options: [Basic Authentication] [Session Authentication]

### Redfish BMC Settings

#### IP address

Enter the IP address.

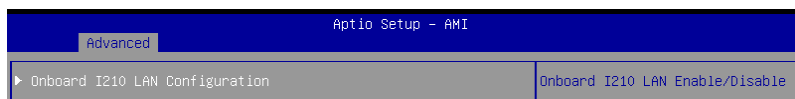
#### IP Mask address

Enter the IP Mask address.

#### IP Port

Enter the IP Port.

## 5.4.7 Onboard LAN Configuration



### Onboard I210 LAN Configuration

#### Intel I210 LAN1-2

#### LAN Enable [Enabled]

Allows you to enable or disable the Intel LAN.

Configuration options: [Disabled] [Enabled]



The following item appears only when an Intel® X710 10G LAN card is installed.

## Onboard X710 LAN Configuration

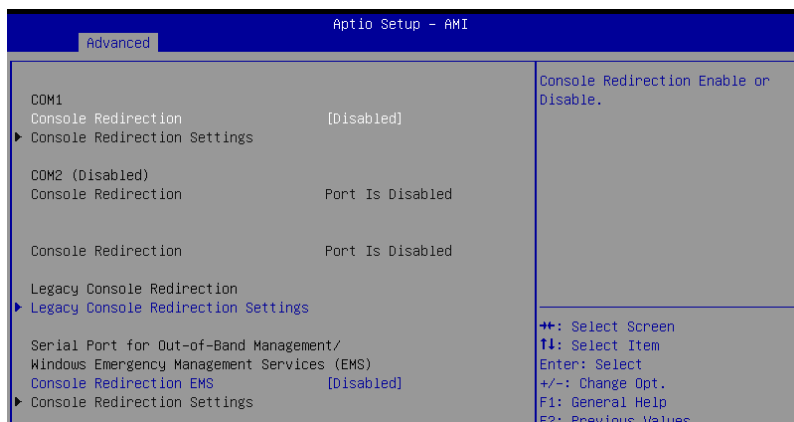
### Intel X710 LAN1-2

#### LAN Enable [Enabled]

Allows you to enable or disable the Intel LAN.

Configuration options: [Disabled] [Enabled]

## 5.4.8 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 to 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] [XTERM6] [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 OPRM Messages.

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

### Resolution [80x24]

Allows you to select a the number of rows and columns in supported redirection.

Configuration options: [80x24] [80x25]

### Redirect After POST [Always Enable]

Allows you to select the redirection after POST.

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 (Disabled)]

#### 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]

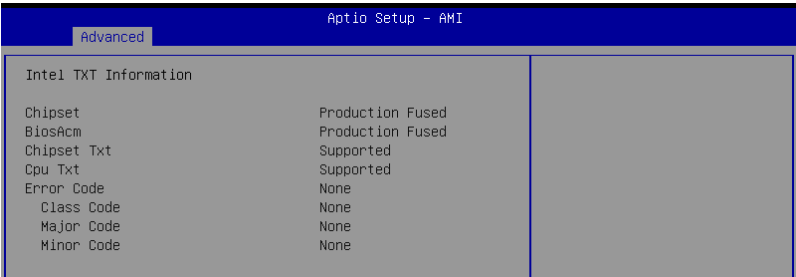
#### Flow Control [None]

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

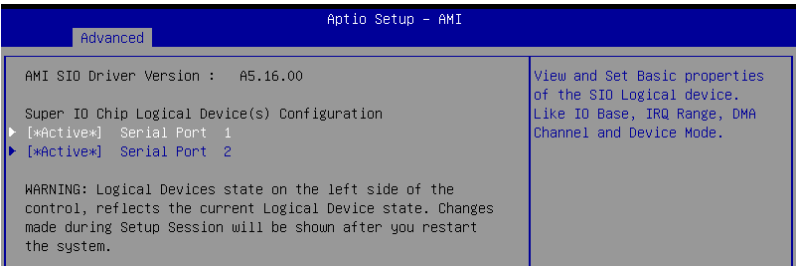
Configuration options: [None] [Hardware RTS/CTS] [Software Xon/Xoff]


### 5.4.9 Intel TXT Information

You may view the Intel TXT information in this menu.



### 5.4.10 SIO Configuration





Logical Devices state on the left side of the control, reflects the current Logical Device state. Changes made during Setup Session will be shown after you restart the system.

#### [\*Active\*] Serial Port 1 / [\*Active\*] Serial Port 2

Allows you to view and set basic properties of the SIO Logical device. Like IO Base, IRQ Range, DMA Channel, and Device Mode.

##### Use This Device [Enabled]

Allows you to enable or disable this Logical Device.  
Configuration options: [Disabled] [Enabled]



The following item appears only when **Use This Device** is set to **[Enabled]**.



Disabling SIO Logical Devices may have unwanted side effects. **PROCEED WITH CAUTION.**

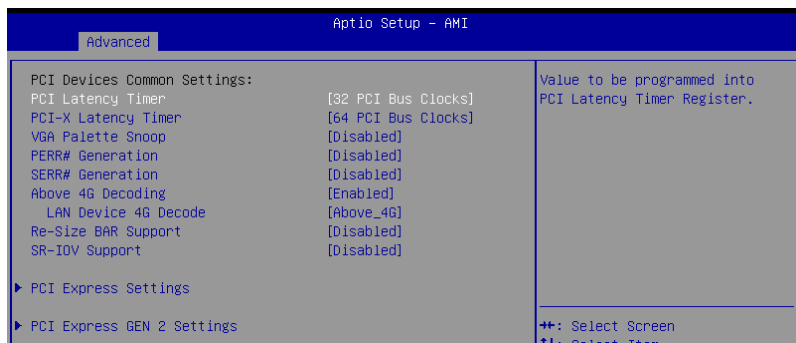
#### **Possible: [Use Automatic Settings]**

Allows the user to change the device resource settings. New settings will be reflected no this setup page after system restarts.

Configuration options: [Use Automatic Settings] [IO=3F8h; IRQ=4; DMA;] [IO=3F8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;] [IO=2F8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;] [IO=3E8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;] [IO=2E8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;]

## **5.4.11 PCI Subsystem Settings**

Allows you to configure PCI, PCI-X, and PCI Express Settings.



### **PCI Latency Timer [32 PCI Bus Clocks]**

Allows you to set the value to be programmed into PCI Latency Timer Register.

Configuration options: [32 PCI Bus Clocks] [64 PCI Bus Clocks] [96 PCI Bus Clocks] [128 PCI Bus Clocks] [160 PCI Bus Clocks] [192 PCI Bus Clocks] [224 PCI Bus Clocks] [248 PCI Bus Clocks]

### **PCI-X Latency Timer [64 PCI Bus Clocks]**

Allows you to set the value to be programmed into PCI Latency Timer Register.

Configuration options: [32 PCI Bus Clocks] [64 PCI Bus Clocks] [96 PCI Bus Clocks] [128 PCI Bus Clocks] [160 PCI Bus Clocks] [192 PCI Bus Clocks] [224 PCI Bus Clocks] [248 PCI Bus Clocks]

### **VGA Palette Snoop [Disabled]**

Allows you to enable or disable VGA Palette Registers Snooping.

Configuration options: [Disabled] [Enabled]

### **PERR# Generation [Disabled]**

Allows you to enable or disable PCI Device to Generate PERR#.  
Configuration options: [Disabled] [Enabled]

### **SERR# Generation [Disabled]**

Allows you to enable or disable PCI Device to Generate SERR#.  
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]**.

---

### **LAN Device 4G Decode [Above\_4G]**

Configuration options: [Auto] [Above\_4G]

### **Re-Size BAR Support [Disabled]**

If system has Resizable BAR capable PCIe Devices, this option enables or disables Resizable BAR Support. (Only if system supports 64-bit PCI Decoding).  
Configuration options: [Disabled] [Auto]



---

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

---

### **SR-IOV Support [Disabled]**

Allows you to enable or disable Single Root IO Virtualization Support, if your system has SR-IOV capable PCIe Devices.  
Configuration options: [Disabled] [Enabled]

### **PCI Express Settings**

The items in this submenu allow you change PCI Express Devices Settings.

#### **PCI Express Device Register Settings**

##### **Relaxed Ordering [Enabled]**

Allows you to enable or disable PCI Express Device Relaxed Ordering.  
Configuration options: [Disabled] [Enabled]

##### **Extended Tag [Disabled]**

If this item is set to Enabled, it will allow Device to use 8-bit Tag field as a requester.  
Configuration options: [Disabled] [Enabled]

##### **No Snoop [Enabled]**

Allows you to enable or disable PCI Express Device No Snoop option.  
Configuration options: [Disabled] [Enabled]

### **Maximum Payload [Auto]**

Allows you to set Maximum Payload of PCI Express Device or allow System BIOS to select the value.

Configuration options: [Auto] [128 Bytes] [256 Bytes] [512 Bytes] [1024 Bytes] [2048 Bytes] [4096 Bytes]

### **Maximum Read Request [Auto]**

Allows you to set Maximum Read Request Size of PCI Express Device or allow System BIOS to select the value.

Configuration options: [Auto] [128 Bytes] [256 Bytes] [512 Bytes] [1024 Bytes] [2048 Bytes] [4096 Bytes]

### **PCI Express Link Register Settings**

#### **ASPM Support [Disabled]**

Allows you to set the ASPM level.

[Disabled] Disables ASPM.

[Auto] BIOS auto configure.

[Force L0s] Force all links to L0 State.



---

Enabling ASPM may cause some PCI-E devices to fail.

---

#### **Extended Synch [Disabled]**

If this item is enabled, it will allow generation of Extended Synchronization patterns.

Configuration options: [Disabled] [Enabled]

#### **Link Training Retry [5]**

Allows you to define the number of Retry Attempts software will take to retrain the link if previous training attempt was unsuccessful.

Configuration options: [Disabled] [2] [3] [5]

#### **Link Training Timeout (uS) [1000]**

Allows you to define the number of Microseconds software will wait before polling 'link Training' bit in Link Status register.

Configuration options: [10] - [10000]

#### **Unpopulated Links [Keep Link ON]**

If this option is set to **[Disable Link]**, in order to save power, software will disable unpopulated PCI Express Links.

Configuration options: [Keep Link ON] [Disabled Link]

### **PCI Express GEN 2 Settings**

The items in this submenu allow you change PCI Express GEN Devices Settings.

#### **PCI Express GEN2 Device Register Settings**

##### **Completion Timeout [Default]**

In device Functions that support Completion Timeout programmability, allows system software to modify the Completion Timeout value.

[Default] 50us to 50ms.

[Shorter] Software will use shorter timeout ranges supported by hardware.

[Longer] Software will use longer timeout ranges.

[Disabled] Disable completion timeout.

### **ARI Forwarding [Disabled]**

If supported by hardware and set to **[Enabled]**, the Downstream Port disables its traditional Device Number field being 0 enforcement when turning a Type1 Configuration Request into a Type0 Configuration Request, permitting access to Extended Functions in an ARI Device immediately below the Port.  
Configuration options: [Disabled] [Enabled]

### **AtomicOp Requester Enable [Disabled]**

If supported by hardware and set to **[Enabled]**, this function initiates AtomicOp Requests only if Bus Master Enable bit is in the Command Register Set.  
Configuration options: [Disabled] [Enabled]

### **AtomicOp Egress Blocking [Disabled]**

If supported by hardware and set to **[Enabled]**, outbound AtomicOp Requests via Egress Ports will be blocked.  
Configuration options: [Disabled] [Enabled]

### **IDO Request Enable [Disabled]**

If supported by hardware and set to **[Enabled]**, this permits setting the number of ID-Based Ordering (IDO) bit (Attribute[2]) requests to be initiated.  
Configuration options: [Disabled] [Enabled]

### **IDO Completion Enable [Disabled]**

If supported by hardware and set to **[Enabled]**, this permits setting the number of ID-Based Ordering (IDO) bit (Attribute[2]) requests to be initiated.  
Configuration options: [Disabled] [Enabled]

### **LTR Mechanism Enable [Disabled]**

If supported by hardware and set to **[Enabled]**, this enables the Latency Tolerance Reporting (LTR) Mechanism.  
Configuration options: [Disabled] [Enabled]

### **End-End TLP Prefix Blocking [Disabled]**

If supported by hardware and set to **[Enabled]**, this function will block forwarding of TLPs containing End-End TLP Prefixes.  
Configuration options: [Disabled] [Enabled]

## **PCI Express GEN2 Link Register Settings**

### **Target Link Speed [Auto]**

If supported by hardware and set to **[Force to X.X GT/s]**, for Downstream Ports, this sets an upper limit on Link operational speed by restricting the values advertised by the Upstream component in its training sequences. When **[Auto]** is selected HW initialized data will be used.  
Configuration options: [Disabled] [Force to 2.5 GT/s] [Force to 5.0 GT/s] [Force to 8.0 GT/s] [Force to 16.0 GT/s] [Force to 32.0 GT/s]

### **Clock Power Management [Disabled]**

If supported by hardware and set to **[Enabled]**, the device is permitted to use CLKREQ# signal for power management of Link clock in accordance to protocol defined in appropriate form factor specification.  
Configuration options: [Disabled] [Enabled]

### Compliance SOS [Disabled]

If supported by hardware and set to **[Enabled]**, this will force LTSSM to send SKP Ordered Sets between sequences when sending Compliance Pattern or Modified Compliance Pattern.

Configuration options: [Disabled] [Enabled]

### Hardware Autonomous Width [Enabled]

If supported by hardware and set to **[Disabled]**, this will disable the hardware's ability to change link width except width size reduction for the purpose of correcting unstable link operation.

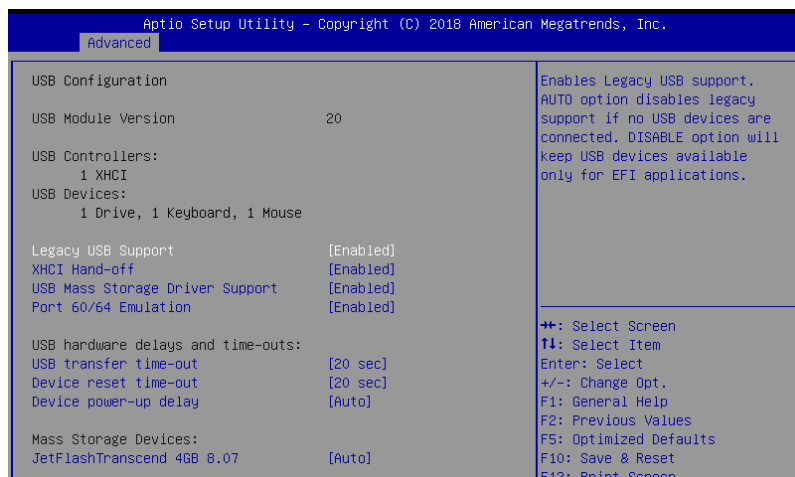
Configuration options: [Disabled] [Enabled]

### Hardware Autonomous Speed [Enabled]

If supported by hardware and set to **[Disabled]**, this will disable the hardware's ability to change link speed except speed rate reduction for the purpose of correcting unstable link operation.

Configuration options: [Disabled] [Enabled]

## 5.4.12 USB Configuration



### Legacy USB Support [Enabled]

[Disabled] USB devices are available only for EFI applications.

[Enabled] Enables the support for USB devices on legacy operating systems (OS).

[Auto] Automatically disables the Legacy USB support if USB devices are not connected.

### 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: [Disabled] [Enabled]

**USB Mass Storage Driver Support [Enabled]**

Allows you to enable or disable USB Mass Storage driver support.  
Configuration options: [Disabled] [Enabled]

**Port 60/64 Emulation [Enabled]**

Allows you to enable or disable Port 60/64 Emulation.  
Configuration options: [Disabled] [Enabled]

**USB hardware delays and time-outs**

**USB transfer time-out [20 sec]**

Allows you to set the time-out value for Control, Bulk, and Interrupt transfers.  
Configuration options: [1 sec] [5 sec] [10 sec] [20 sec]

**Device reset time-out [20 sec]**

Allows you to set the device reset time-out value.  
Configuration options: [10 sec] 20 sec] [30 sec] [40 sec]

**Device power-up delay [Auto]**

Allows you to set the maximum time the device takes before the device reports itself to the host controller properly. **[Auto]** uses default value; for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.  
Configuration options: [Auto] [Manual]



The following item appears only when **Device power-up delay** is set to **[Manual]**.

**Device power-up delay in seconds [5]**

Allows you to set the device power-up delay in seconds. Use the <+> or <-> to adjust the value. The values range from 1 to 40.

**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]

**5.4.13 Network Stack Configuration**

Allows you to configure the network stack configuration.

| Aptio Setup - AMI  |            |                                   |
|--------------------|------------|-----------------------------------|
| Advanced           |            |                                   |
| Network Stack      | [Enabled]  | Enable/Disable UEFI Network Stack |
| IPv4 PXE Support   | [Disabled] |                                   |
| IPv4 HTTP Support  | [Disabled] |                                   |
| IPv6 PXE Support   | [Disabled] |                                   |
| IPv6 HTTP Support  | [Disabled] |                                   |
| PXE boot wait time | 0          |                                   |
| Media detect count | 1          |                                   |

**Network Stack [Enabled]**

Allows you to enable or disable UEFI Network Stack.  
Configuration options: [Disabled] [Enabled]





The following items appear 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 PXE 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 PXE boot option will not be created.

Configuration options: [Disabled] [Enabled]

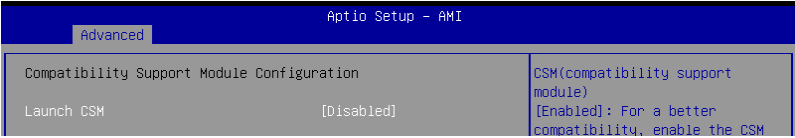
**PXE boot wait time [0]**

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.

**5.4.14 CSM (Compatibility Support Module)**



**Launch CSM [Disabled]**

This option allows you to enable or disable CSM Support.

[Disabled]      Disable the CSM to fully support the Windows secure update and secure boot.

[Enabled]      For a better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows UEFI mode.



---

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

---

### **GateA20 Active [Upon Request]**

This allows you to set the GA20 option.

[Upon Request] GA20 can be disabled using BIOS services.

[Always] Do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

### **Interrupt 19 Capture [Immediate]**

Allows you to select the BIOS reaction on INT19 trapping by Option ROM.

[Immediate] Execute the trap right away.

[Postponed] Execute the trap during legacy boot.

[Auto] Auto

### **Boot Device Control [UEFI only]**

Allows you to select the devices boot-up mode according to the devices specification.

Devices with the selected mode will in the boot priority list.

Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

#### **Boot from Network Devices [Ignore]**

Allows you to select the type of onboard LAN controller and installed LAN cards.

Network devices will run the selected type during the system boot. Selecting **[Ignore]** will accelerate the boot up time without running network devices during POST (Power-On Self-Test).

Configuration options: [Ignore] [UEFI only] [Legacy only]

#### **Boot from Storage Devices [UEFI only]**

Allows you to select the type of storage devices to run first during the system boot. It is recommended to select either **[Legacy only]** or **[UEFI only]** according to devices specification for better stability. Selecting **[Ignore]** will accelerate the boot up time without running network devices during POST (Power-On Self-Test).

Configuration options: [Ignore] [UEFI only] [Legacy only]

#### **Launch Video OPROM policy [UEFI only]**

This option controls the execution of UEFI and Legacy Video OPROM.

Configuration options: [Ignore] [UEFI only] [Legacy only]

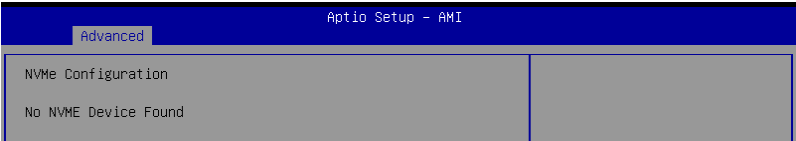
#### **Boot from PCI-E/PCI Expansion Devices [UEFI only]**

Allows you to select the type of PCI-E/PCI Expansion devices to run first during the system boot.

Configuration options: [Ignore] [UEFI only] [Legacy only]

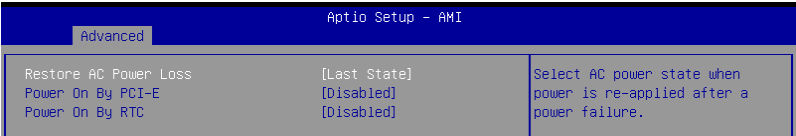
### 5.4.15 NVMe Configuration

You may view the NVMe controller and Drive information if an NVMe device is connected.



### 5.4.16 APM Configuration

This page will allow you to configure the Advance Power Management (APM) settings.



#### Restore AC Power Loss [Last State]

When set to **[Power Off]**, the system goes into off state after an AC power loss. When set to **[Power On]**, the system will reboot after an AC power loss. When set to **[Last State]**, the system goes into either off or on state, whatever the system state was before the AC power loss.

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

#### Power On By PCI-E/PCI [Disabled]

[Disabled] Disables the PCI/PCIe devices to generate a wake event.

[Enabled] Enables the PCI/PCIe devices to generate a wake event.

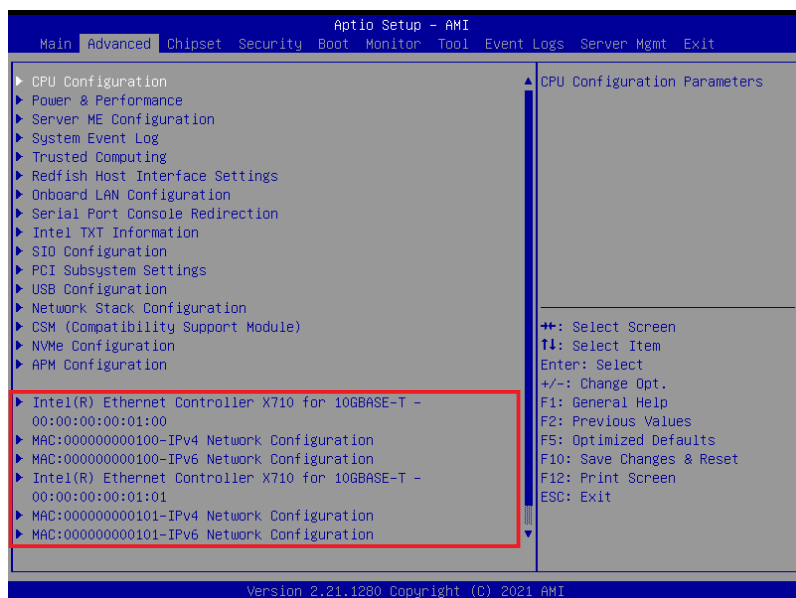
#### Power On By RTC [Disabled]

[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.

## 5.4.17 Third-party UEFI driver configurations

Additional configuration options for third-party UEFI drivers installed to the system will appear in the section marked in red in the screenshot below.



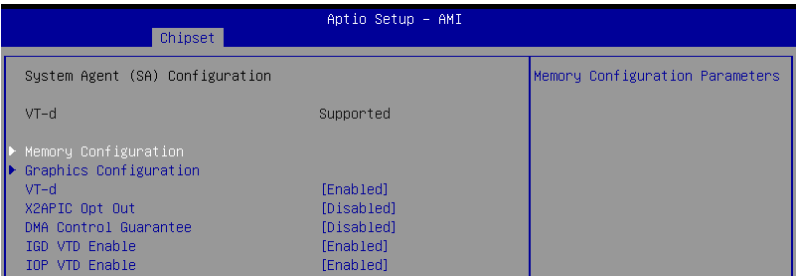
# 5.5 Chipset menu

The Chipset menu allows you to change the platform settings.



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

## 5.5.1 System Agent (SA) Configuration



### Memory Configuration

#### Maximum Memory Frequency [Auto]

Allows you to select the maximum memory frequency setting.  
Configuration options: [Auto] [2133] [2400] [2666] [2933] [3200]

**ECC Support [Enabled]**

Allows you to enable or disable the DDR Ecc support.

Configuration options: [Disabled] [Enabled]

**DDR Speed Control [Auto]**

Allows you to set DDR Frequency and Gear1 / Gear2 control for all SAGV points.

Configuration options: [Auto] [Manual]

**Memory Scrambler [Enabled]**

Allows you to enable or disable Memory Scrambler support.

Configuration options: [Disabled] [Enabled]

**Fast Boot [Disabled]**

Allows you to enable or disable fast path thru the MRC.

Configuration options: [Disabled] [Enabled]

**Graphics Configuration****Primary Display [Auto]**

Allows you to select which of CPU Graphics / PEG Graphics / PCIe Graphics device should be Primary Display.

Configuration options: [Auto] [CPU Graphics] [PCI] [HG]

**Select PCIe Card [Auto]**

Allows you to select the card used on the platform.

[Auto] Skip GPIO based Power Enable to dGPU.

[Elk Creek 4] DGPU Power Enable = ActiveLow.

[PEG Eval] DGPU Power Enable = ActiveHigh.

**HG Delay After Power Enable [300]**

The delay in milli-seconds after power enable.

**HG Delay After Hold Reset [100]**

The delay in milli-seconds after hold reset.

**Internal Graphics [Auto]**

Keep IGFX enabled based on the setup options.

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

**VT-d [Enabled]**

Allows you to enable or disable VT-d capability.

Configuration options: [Disabled] [Enabled]

**X2APIC OPT Out [Disabled]**

Allows you to enable or disable X2APIC\_OPT\_OUT bit.

Configuration options: [Disabled] [Enabled]

**DMA Control Guarantee [Disabled]**

Allows you to enable or disable DMA\_CONTROL\_GUARANTEE bit.

Configuration options: [Disabled] [Enabled]

**IGD VTD Enable [Enabled]**

Allows you to enable or disable IGD VTD.

Configuration options: [Disabled] [Enabled]

### IOP VTD Enable [Enabled]

Allows you to enable or disable IOP VTD.  
Configuration options: [Disabled] [Enabled]

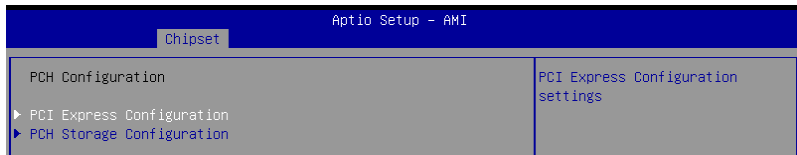
### CRID Support [Disabled]

Allows you to enable or disable SA CRID and TCSS CRID control for Intel SIPP.  
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]

## 5.5.2 PCH Configuration



### PCI Express Configuration

#### DMI Link ASPM Control [Disabled]

Allows you to enable or disable control of active state power management of DMI link.  
Configuration options: [Disabled] [L0s] [L1] [L0sL1] [Auto]

#### Port8xh Decode [Disabled]

Allows you to enable or PCI express port 8xh decode.  
Configuration options: [Disabled] [Enabled]



The following item appears only when **Port8xh Decode** is set to **[Enabled]**.

#### Port8xh Decode Port# [0]

Select PCI Express Port8xh Decode Root Port. User to ensure port availability.  
Configuration options: [0] - [23]

### PCH Storage Configuration

#### SATA Controller(s) [Enabled]

Allows you to enable or disable the SATA Controller.  
Configuration options: [Disabled] [Enabled]



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

#### SATA Mode Selection [AHCI]

Allows you to select the SATA controllers operation.  
Configuration options: [AHCI] [Intel RSTe Premium With Intel Optane System Acceleration]

## **SATA 1**

### **Port 1 [Enabled]**

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

### **SATA6G\_1 Hot Plug [Disabled]**

Allows you to enable or disable this port as hot pluggable.

Configuration options: [Disabled] [Enabled]

### **Spin Up Device [Disabled]**

Allows you to enable or disable Spin Up Device. If enabled for any of the ports, Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]

### **SATA Device Type [Hard Disk Drive]**

Allows you to identify the SATA port is connected to a solid state drive or a hard disk drive

Configuration options: [Hard Disk Drive] [Solid State Drive]

## **SATA 2**

### **Port 2 [Enabled]**

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

### **SATA6G\_2 Hot Plug [Disabled]**

Allows you to enable or disable this port as hot pluggable.

Configuration options: [Disabled] [Enabled]

### **Spin Up Device [Disabled]**

Allows you to enable or disable Spin Up Device. If enabled for any of the ports, Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]

### **SATA Device Type [Hard Disk Drive]**

Allows you to identify the SATA port is connected to a solid state drive or a hard disk drive

Configuration options: [Hard Disk Drive] [Solid State Drive]

## **SATA 3**

### **Port 3 [Enabled]**

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

### **SATA6G\_3 Hot Plug [Disabled]**

Allows you to enable or disable this port as hot pluggable.

Configuration options: [Disabled] [Enabled]

### **Spin Up Device [Disabled]**

Allows you to enable or disable Spin Up Device. If enabled for any of the ports, Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]



### **SATA Device Type [Hard Disk Drive]**

Allows you to identify the SATA port is connected to a solid state drive or a hard disk drive

Configuration options: [Hard Disk Drive] [Solid State Drive]

### **SATA 4**

#### **Port 1 [Enabled]**

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

#### **SATA6G\_4 Hot Plug [Disabled]**

Allows you to enable or disable this port as hot pluggable.

Configuration options: [Disabled] [Enabled]

#### **Spin Up Device [Disabled]**

Allows you to enable or disable Spin Up Device. If enabled for any of the ports, Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]

### **SATA Device Type [Hard Disk Drive]**

Allows you to identify the SATA port is connected to a solid state drive or a hard disk drive

Configuration options: [Hard Disk Drive] [Solid State Drive]

### **SATA 5**

#### **Port 5 [Enabled]**

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

#### **SATA6G\_5 Hot Plug [Disabled]**

Allows you to enable or disable this port as hot pluggable.

Configuration options: [Disabled] [Enabled]

#### **Spin Up Device [Disabled]**

Allows you to enable or disable Spin Up Device. If enabled for any of the ports, Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]

### **SATA Device Type [Hard Disk Drive]**

Allows you to identify the SATA port is connected to a solid state drive or a hard disk drive

Configuration options: [Hard Disk Drive] [Solid State Drive]

### **SATA 6**

#### **Port 6 [Enabled]**

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

#### **SATA6G\_6 Hot Plug [Disabled]**

Allows you to enable or disable this port as hot pluggable.

Configuration options: [Disabled] [Enabled]

**Spin Up Device [Disabled]**

Allows you to enable or disable Spin Up Device. If enabled for any of the ports, Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

Configuration options: [Disabled] [Enabled]

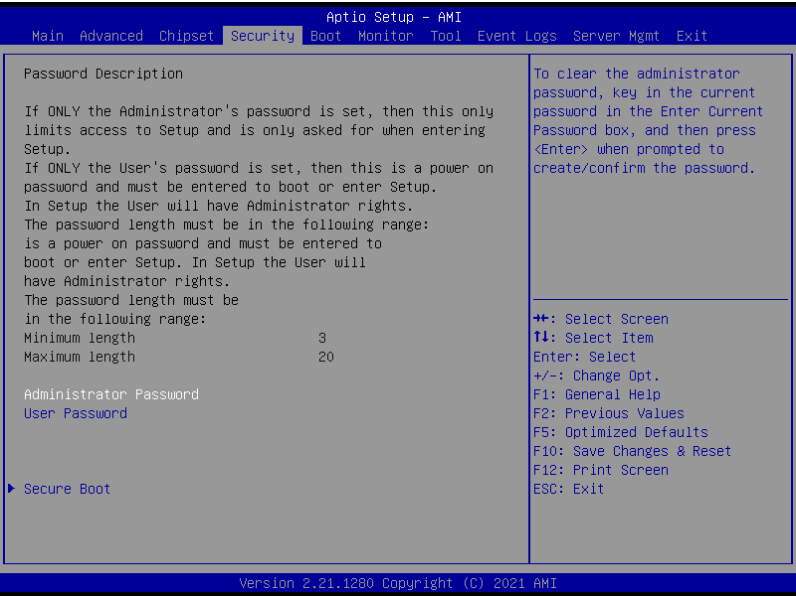
**SATA Device Type [Hard Disk Drive]**

Allows you to identify the SATA port is connected to a solid state drive or a hard disk drive

Configuration options: [Hard Disk Drive] [Solid State Drive]

## 5.6 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:

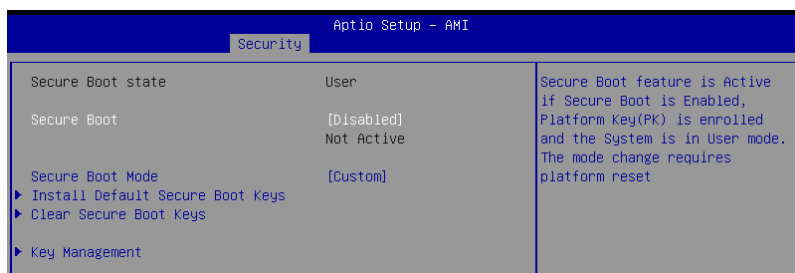
1. Select the User Password item and press <Enter>.
2. From the Enter Current Password box, key in the current password, then press <Enter>.
3. From the Create New Password box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

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.



### Secure Boot [Disabled]

Secure Boot feature is Active if Secure Boot is set to **[Enabled]**, Platform Key (PK) is enrolled and the System is in User mode. Mode change requires a platform reset.  
Configuration options: [Disabled] [Enabled]

### Secure Boot Mode [Custom]

Allows you to set the Secure Boot selector.  
Configuration options: [Custom] [Standard]



The following items are available only when **Secure Boot Mode** is set to **[Custom]**.

## Install Default Secure Boot Keys

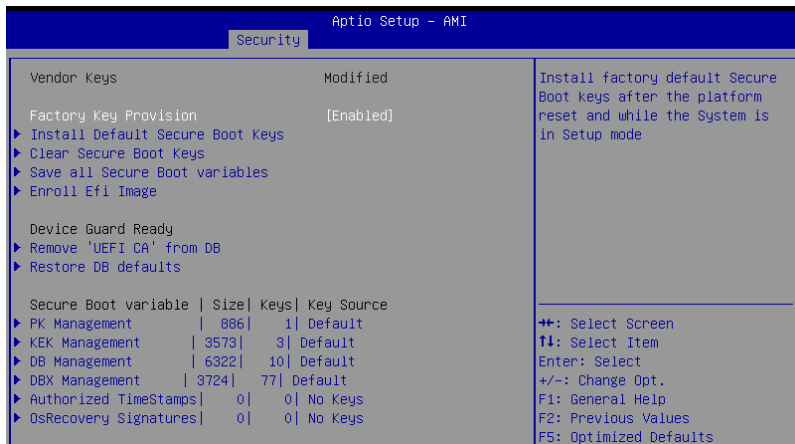
This option will load the default secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

## Clear Secure Boot Keys

This option will delete all previously applied secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

## 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 [Enabled]

Allows you to provision factory default Secure Boot keys when the system is in Setup Mode.

Configuration options: [Disabled] [Enabled]

### Install Default Secure Boot Keys

This option will load the default secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

### **Clear Secure Boot Keys**

This option will delete all previously applied secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

### **Save all Secure Boot Variables**

This option will save NVRAM content of Secure Boot policy variables to the file (EFI\_SIGNATURE\_LIST data format) in root folder on a target file system device.

### **Enroll Efi Image**

This item will allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db).

### **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.

### **PK Management**

Configuration options: [Details] [Save To File] [Set New Key] [Delete key]

### **KEK Management / DB Management / DBX Management**

Configuration options: [Details] [Save To File] [Set New Key] [Append Key] [Delete key]

### **Authorized TimeStamps / OsRecovery Signatures**

Configuration options: [Set New Key] [Append Key]



## 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.

## Fast Boot [Disable Link]

Allows you to enable or disable boot with initialization of a minimal set of devices required to launch active boot option. This has no effect for BBS boot options.

Configuration options: [Disable Link] [Enabled]



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

## SATA Support [Last Boot SATA Devices Only]

[Last Boot SATA Devices Only] Only last booted SATA device will be available in POST.

[All SATA Devices]

All SATA devices will be available in OS and POST.

## NVMe Support [Enabled]

If this option is disabled, NVMe device will be skipped.

Configuration options: [Disable Link] [Enabled]

## VGA Support [EFI Driver]

[Auto] Only legacy OpRom with Legacy OS, and logo will NOT be shown during POST.

[EFI Driver] Efi driver will still be installed with EFI OS.

## USB Support [Full Initial]

[Disable Link] All USB devices will NOT be available until after OS boot.

[Full Initial] All USB devices will be available in OS and POST.

[Partial Initial] USB Mass Storage and specific USB port/device will NOT be available before OS boot.

## PS2 Devices Support [Enabled]

If this option is disabled, PS2 devices will be skipped.

Configuration options: [Disable Link] [Enabled]

## Network Stack Driver Support [Disable Link]

If this option is disabled, Network Stack Driver will be skipped.

Configuration options: [Disable Link] [Enabled]

## Redirection Support [Disable Link]

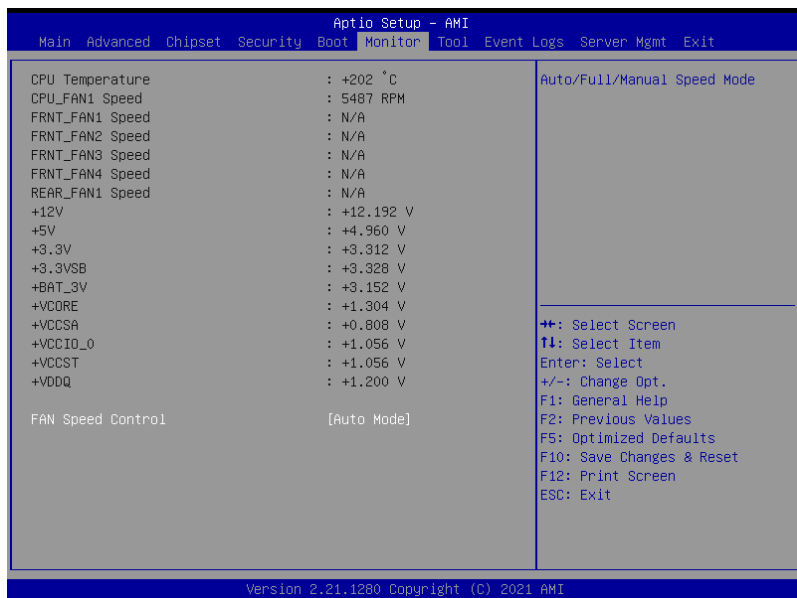
If this option is disabled, Redirection function will be disabled.

Configuration options: [Disable Link] [Enabled]



## 5.8 Monitor menu

This menu displays the system temperature, fan speed, and power status. You can also change the fan settings in this menu.



### Fan Speed Control [Auto Mode]

Allows you to select the power-on state for the NumLock.

Configuration options: [Auto Mode] [Full Speed Mode] [Manual Speed Mode]



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

#### REAR\_FAN1 / CPU\_FAN1 / FRNT\_FAN1-4 Duty% [50]

Allows you to set the desired POST Report waiting time from 1 to 10 seconds. Use the <+> or <-> to adjust the value. The values range from 10 to 100.

## 5.9 Tool menu



### Start ASUS EzFlash

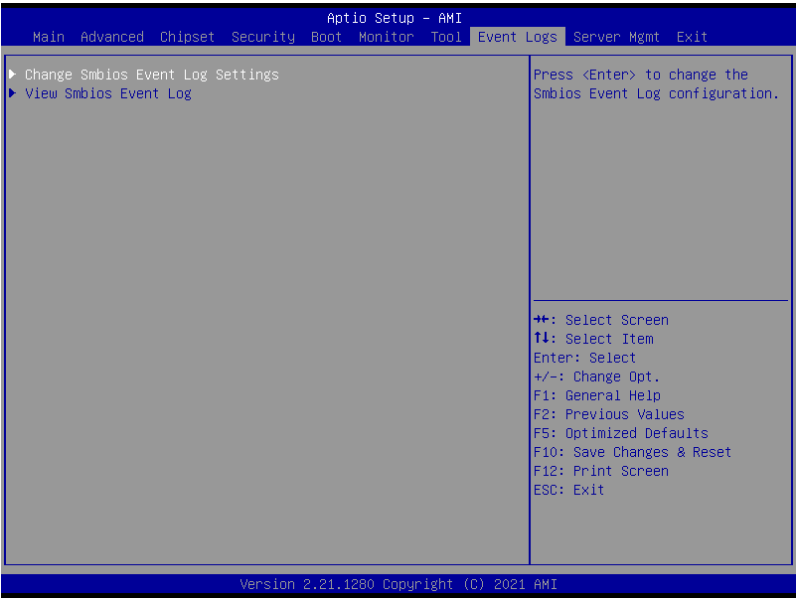
Allows you to run ASUS EzFlash BIOS ROM Utility when you press <Enter>. Refer to the ASUS EzFlash Utility section for details.

### ASUS SMBIOS Viewer

Allows you to start ASUS SMBIOS Viewer when you press <Enter>.

# 5.10 Event Logs menu

The Event Logs menu items allow you to change the event log settings and view the system event logs.

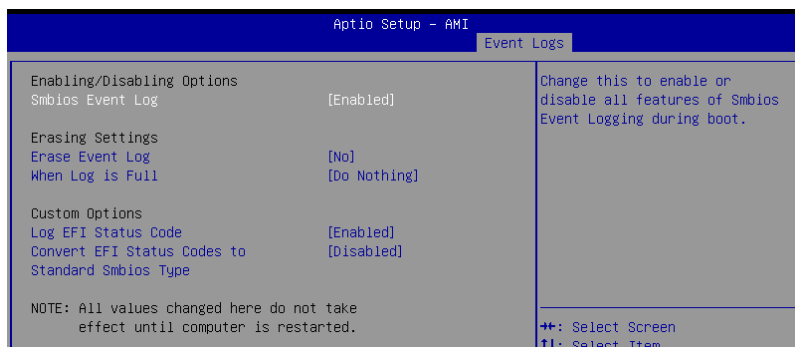


## 5.10.1 Change Smbios Event Log Settings

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]

#### When Log is Full [Do Nothing]

Choose options for reacting to a full Smbios Event Log.  
Configuration options: [Do Nothing] [Erase Immediately]

### 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]

## 5.10.2 View Smbios Event Log

Press <Enter> to view all smbios event logs.

| Aptio Setup - AMI |          |              |              |       |  |
|-------------------|----------|--------------|--------------|-------|--|
|                   |          |              |              |       | Event Logs   |
| DATE              | TIME     | ERROR CODE   | SEVERITY     | COUNT | DESCRIPTION  |
| 03/04/21          | 00:27:00 | Event 0x16   | N/A          |       | Log Area Reset and Count is applicable only for Multi-Events |
| 03/04/21          | 00:27:01 | EFI 03008407 | Unrecognized | 04    |  |
| 03/22/21          | 22:09:11 | EFI 03008407 | Unrecognized | 01    |  |

## 5.11 Server Mgmt menu



### BMC Support [Enabled]

This item allows you to enable or disable interfaces to communicate with BMC.

Configuration options: [Disabled] [Enabled]



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

### 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 minutes]

Allows you to configure the length for the OS Boot Watchdog Timer.

Configuration options: [5 minutes] [10 minutes] [15 minutes] [20 minutes]

### OS Wtd Timer Policy [Reset]

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

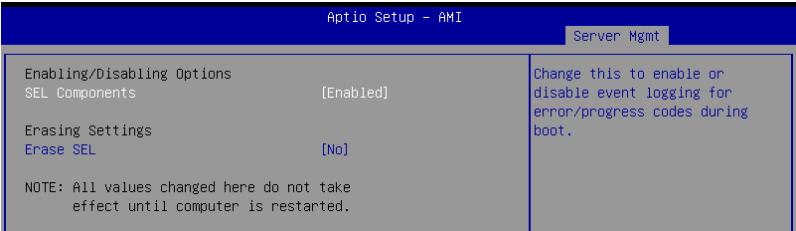
Configuration options: [Do Nothing] [Reset] [Power Down] [Power Cycle]

**BMC init phase [PEI phase]**

Allows you to set BMC init phase.  
Configuration options: [PEI phase] [BDS phase]

**5.11.1 System Event Log**

Allows you to change the SEL event log configuration.



**Enabling/Disabling Options**

**SEL Components [Enabled]**

Allows you to enable or disable event logging for error/progress codes during boot.  
Configuration options: [Disabled] [Enabled]



- The following items are configurable only when **SEL Components** is set to **[Enabled]**.
- All values changed here do not take effect until computer is restarted.

**Erasing Settings**

**Erase SEL [No]**

Allows you to choose options for erasing SEL.  
Configuration options: [No] [Yes, On next reset] [Yes, On every reset]

## 5.11.2 View FRU information

Press <Enter> to view FRU information.

Aptio Setup - AMI

Server Mgmt

FRU Information

|                       |                        |
|-----------------------|------------------------|
| System Manufacturer   | To be filled by O.E.M. |
| System Product Name   | To be filled by O.E.M. |
| System Version        | To be filled by O.E.M. |
| System Serial Number  | To be filled by O.E.M. |
| Board Manufacturer    | To be filled by O.E.M. |
| Board Product Name    | To be filled by O.E.M. |
| Board Part Number     | To be filled by O.E.M. |
| Board Serial Number   | To be filled by O.E.M. |
| Chassis Manufacturer  | To be filled by O.E.M. |
| Chassis Part Number   | To be filled by O.E.M. |
| Chassis Serial Number | To be filled by O.E.M. |
| SDR Version           | To be filled by O.E.M. |
| System UUID           | To be filled by O.E.M. |

NOTE: No FRU information for fields indicate information needs to be filled by O.E.M.

++: Select Screen  
tl: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values

## 5.11.3 Bmc self test log

Allows you to change the SEL event log configuration.

Aptio Setup - AMI

Server Mgmt

Log area usage = 00 out of 20 logs

Erase Log [Yes, On every reset]  
When log is full [Clear Log]

Log Empty

Erase Log Options

### Erase Log [Yes, On every reset]

Choose options for erasing Smbios Event Log. Erasing is done prior to any logging activation during reset.

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

### When Log is Full [Clear Log]

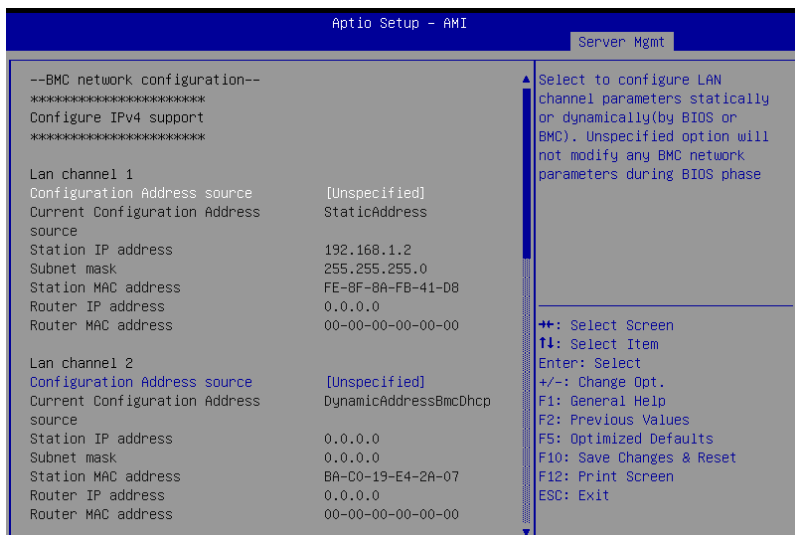
Allows you to choose options for reactions to a full Smbios Event Log.

Configuration options: [Clear Log] [Do not log any more]



## 5.11.4 BMC network configuration

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



Navigate to the second page of the screen to see the rest of items in this menu by pressing the Up or Down arrow keys.



To quickly go to the last item of the second page, press the **Page Down** button. Press the **Page Up** button to go back to the first item in the first page.

### Configure IPV4 support

#### Lan channel 1 / Lan channel 2

#### Configuration Address source [Unspecified]

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

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



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

#### Station IP address

Allows you to set the station IP address.

#### Subnet mask

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

#### Router IP Address

Allows you to set the router IP address.

## Router MAC Address

Allows you to set the router MAC address.

## Configure IPv6 support

### Lan channel 1 / Lan channel 2

#### IPv6 support [Enabled]

Allows you to enable or disable IPv6 support.

Configuration options: [Enabled] [Disabled]



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

#### Configuration Address source [Unspecified]

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

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



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

#### Station IPv6 address

Allows you to set the station IPv6 address.

#### Prefix Length

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

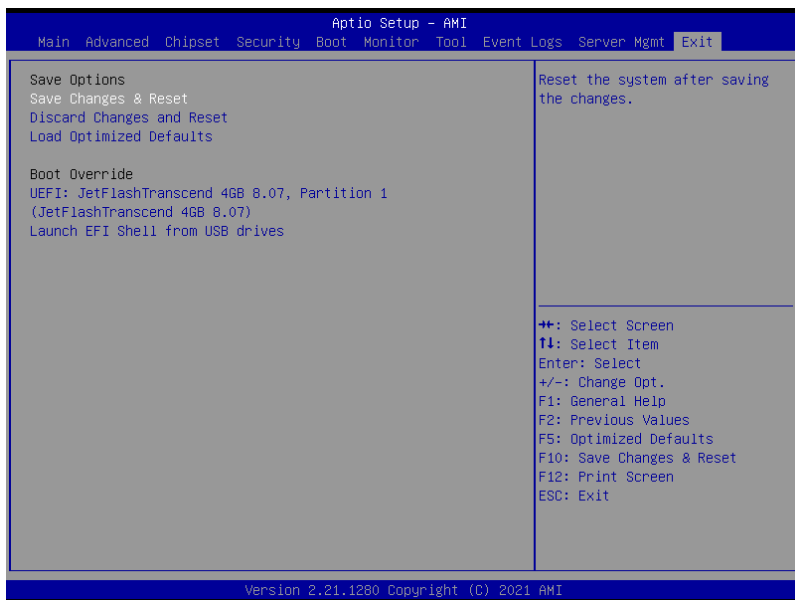
## 5.11.5 View System Event Log

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

| Aptio Setup - AMI             |          |             |  | Server Mgmt                |  |
|-------------------------------|----------|-------------|--|----------------------------|--|
| No. of log entries in SEL : 4 |          |             |  | HEX:                       |  |
| DATE                          | TIME     | SENSOR TYPE |  | 01 00 02 79 80 91          |  |
| 05/04/21                      | 17:12:25 | Temperature |  | 60 20 00 04 01 01          |  |
| 05/04/21                      | 17:12:25 | Temperature |  | 01 57 61 5E                |  |
| 05/04/21                      | 17:12:37 | Temperature |  | Generator ID: BMC - LUN #0 |  |
| 05/04/21                      | 17:12:37 | Temperature |  | (Channel #0)               |  |
|                               |          |             |  | Sensor Number: 0x01 Other  |  |
|                               |          |             |  | Event Description:         |  |
|                               |          |             |  | Record Type-0x02.          |  |
|                               |          |             |  | Assertion Event.           |  |

## 5.12 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.

### Save Changes and Reset

Reset system after saving the changes.

### Discard Changes and Reset

Reset system setup without saving any changes.

### Load Optimized 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.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# 6

## **RAID Configuration**

This chapter provides instructions for setting up, creating, and configuring RAID sets using the available utilities.

## 6.1 Setting up RAID

The motherboard supports the **Intel® Rapid Storage Technology enterprise Option ROM Utility** with RAID 0, RAID 1, RAID 10, and RAID 5 support (for Windows OS and Linux).

### 6.1.1 RAID definitions

**RAID 0** (*Data striping*) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

**RAID 1** (*Data mirroring*) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

**RAID 10** is data striping and data mirroring combined without parity (redundancy data) having to be calculated and written. With the RAID 10 configuration you get all the benefits of both RAID 0 and RAID 1 configurations. Use four new hard disk drives or use an existing drive and three new drives for this setup.

**RAID 5** stripes both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.



---

If you want to boot the system from a hard disk drive included in a created RAID set, copy first the RAID driver from the support DVD to a floppy disk before you install an operating system to the selected hard disk drive.

---

### 6.1.2 Installing hard disk drives

The motherboard supports Serial ATA for RAID set configuration. For optimal performance, install identical drives of the same model and capacity when creating a disk array.

To install the SATA hard disks for RAID configuration:

1. Install the SATA hard disks into the drive bays following the instructions in the system user guide.
2. Connect a SATA signal cable to the signal connector at the back of each drive and to the SATA connector on the motherboard.
3. Connect a SATA power cable to the power connector on each drive.

### 6.1.3 Setting the RAID item in BIOS

You must set the RAID item in the BIOS Setup before you can create a RAID set from SATA hard disk drives attached to the SATA connectors supported by Intel® C242 chipset.

To do this:

1. Enter the BIOS Setup during POST.
2. Go to the **Chipset Menu > PCH Configuration > PCH Storage Configuration**, then press <Enter>.
3. Set **SATA Mode Selection** to **[Intel RSTe Premium With Intel Optane System Acceleration]**.
4. Press <F10> to save your changes and exit the BIOS Setup.



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Refer to Chapter 4 for details on entering and navigating through the BIOS Setup.

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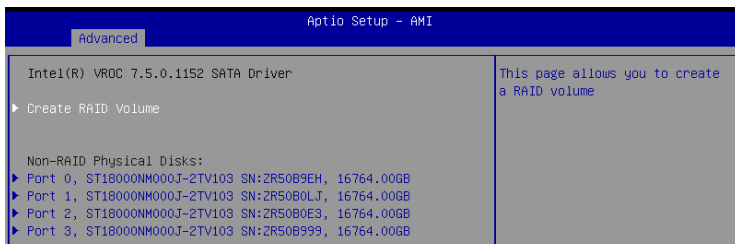
## 6.2 Intel® Virtual Raid on CPU in BIOS

This feature allows you to do CPU RAID functions with Intel® CPU RSTe.

1. Enter the BIOS Setup during POST.
2. Go to the **Advanced** menu > **Intel(R) VROC SATA Controller** then press <Enter> to display the Intel® Virtual Raid on CPU menu.



Refer to Chapter 4 for details on entering and navigating through the BIOS Setup.





## 6.2.1 Creating a RAID set

To create a RAID set:

1. From the Intel® Virtual RAID on CPU menu, select **Create RAID Volume** and press <Enter>. The following screen appears:

Aptio Setup - AMI

Advanced

Create RAID Volume

Name: Volume1

RAID Level: [RAID0(Stripe)]

Select Disks:

Port 0, ST18000NM000J-2TV103 [X]  
SN:ZR50B0LJ, 16764.00GB

Port 1, ST18000NM000J-2TV103 [X]  
SN:ZR50B9EH, 16764.00GB

Port 2, ST18000NM000J-2TV103 [X]  
SN:ZR50B0E3, 16764.00GB

Port 3, ST18000NM000J-2TV103 [X]  
SN:ZR50B999, 16764.00GB

Strip Size: [128KB]

Capacity (GB): 3185.15

X - to Select Disk

++: Select Screen  
14: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F5: Optimized Defaults  
F10: Save Changes & Reset

Create Volume

2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. Under Select Disks, press <Enter> and select **X** for the disks you want to include in the RAID set.
5. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:
  - RAID 0: 128 KB
  - RAID 10: 64 KB
  - RAID 5: 64 KB



We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.

7. When the **Capacity (GB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.
8. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.

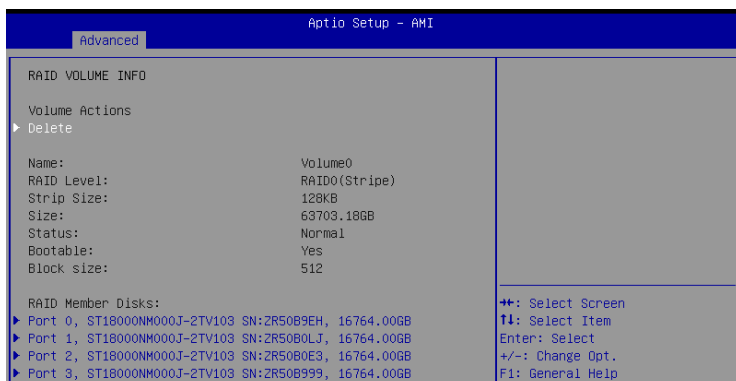
## 6.2.2 Deleting a RAID set



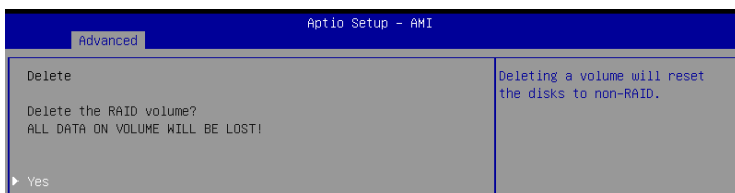
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Virtual Raid on CPU menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:



2. When the **Delete** item is selected, press <Enter>, then select **Yes** to delete the RAID volume and return to the Intel® Virtual Raid on CPU menu, or select **No** to cancel.



# 6.3 Intel® Rapid Storage Technology enterprise (Windows)

The Intel® Rapid Storage Technology enterprise allows you to create RAID 0, RAID 1, RAID 10 (RAID 1+0), and RAID 5 set(s) from Serial ATA hard disk drives that are connected to the Serial ATA connectors supported by the Southbridge.

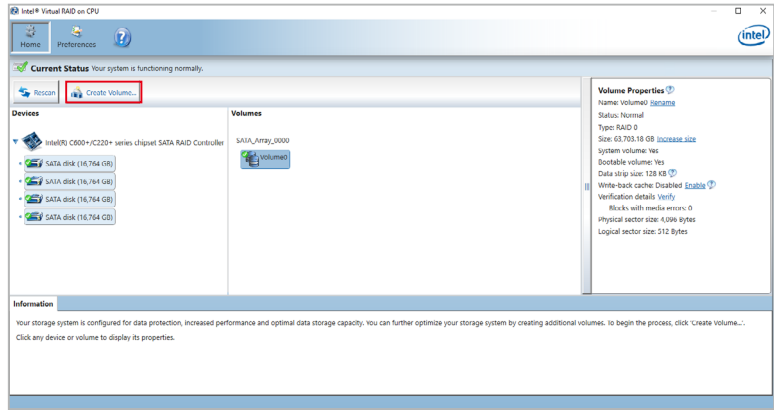


You need to manually install the Intel® Rapid Storage Technology enterprise utility on a Windows® operating system. Please refer to the installation instructions in Chapter 6.

To enter the Intel® Rapid Storage Technology enterprise utility under Windows operating system:

1. Turn on the system and go to the windows desktop.
2. Click the **Intel(R) Virtual RAID on CPU** icon to display the main menu.

Your storage system is configured for data protection, increased performance and optimal data storage capacity. You can create additional volumes to further optimize your storage system.

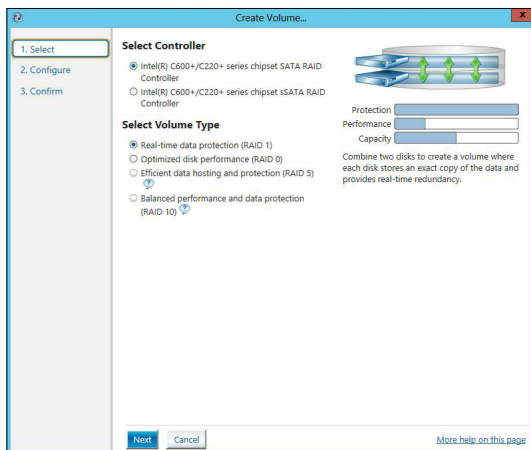


You can click **Rescan** to re-scan any attached hard disks.

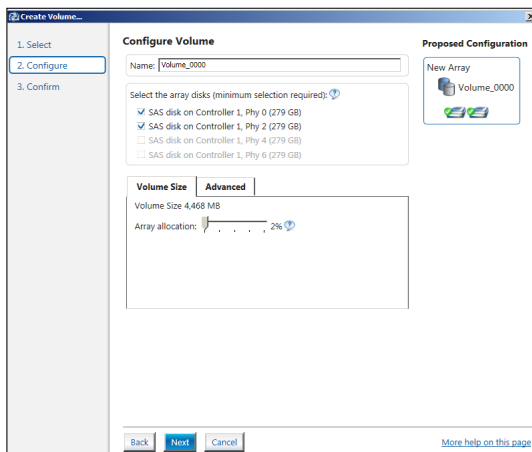
## 6.3.1 Creating a RAID set

To create a RAID set:

1. From the utility main menu, select **Create Volume** and select volume type.
2. Click **Next**.



3. Enter a name for the RAID set, then select the array disks.
4. Select **Volume Size** tab, you can drag the bar to decide the volume size.
5. Click **Next**.

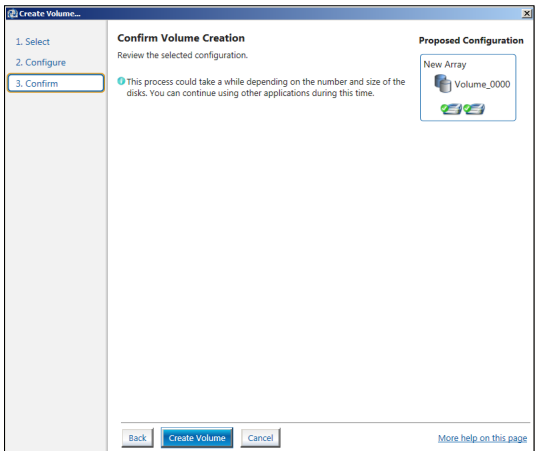


- If you do not want to keep the data on one of the selected disks, select **NO** when prompted.
- If you want to **Enable volume write-back cache** or **Initialize volume**, click **Advanced**.

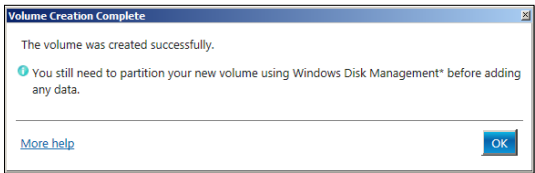
6. Confirm the volume creation, then click **Create Volume** to continue.



This process could take a while depending on the number and size of the disks. You can continue using other applications during this time.

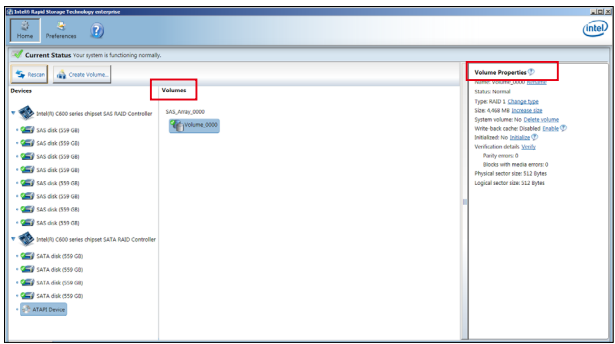


7. Wait until the process is completed, then click **OK** when prompted.



You still need to partition your new volume using Windows Disk Management before adding any data.

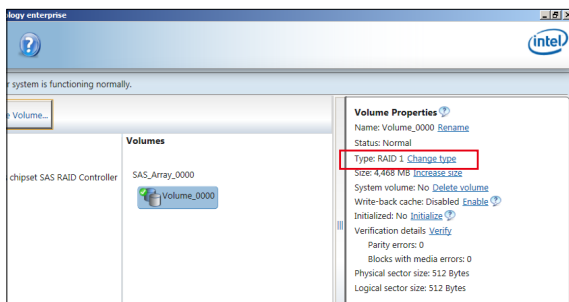
The RAID set is displayed in the **Volumes** list and you can change the settings in **Volume Properties**.



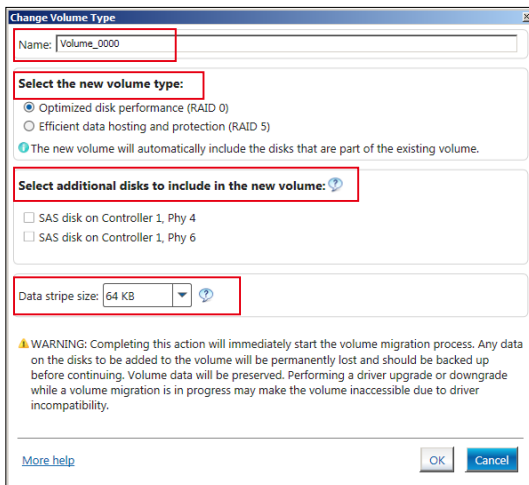
## 6.3.2 Changing a Volume Type

To change the volume type in **Volume Properties**:

1. Click the SATA Array items you want to change in **Volumes** field.
2. From the **Volume Properties** field, select **Type:RAID 1 Change type**.



3. You can change the **Name**, **Select the new volume type**, and **Select additional disks to include in the new volume** if needed.
4. Select the **Data stripe size** for the RAID array (for RAID 0, 10 and 5 only), and click **OK**. The available stripe size values range from 4 KB to 128 KB. The following are typical values:  
RAID 0: 128KB  
RAID 10: 64KB  
RAID 5: 64KB



We recommend a lower stripe size for server systems, and a higher stripe size for multimedia computer systems used mainly for audio and video editing.

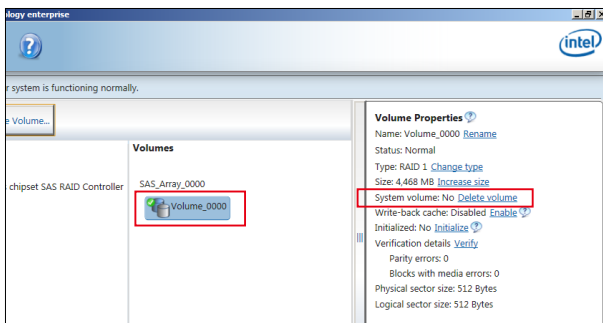
### 6.3.3 Deleting a volume



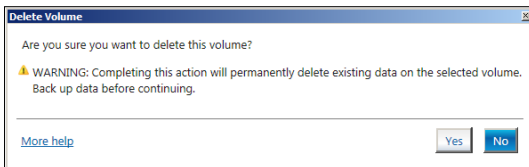
Be cautious when deleting a volume. You will lose all data on the hard disk drives. Before you proceed, ensure that you back up all your important data from your hard drives.

To delete a volume:

1. From the utility main menu, select the volume (exp. Volume\_0000) in **Volumes** field you want to delete.



2. Select **Delete volume** in **Volume Properties** field. The following screen appears.

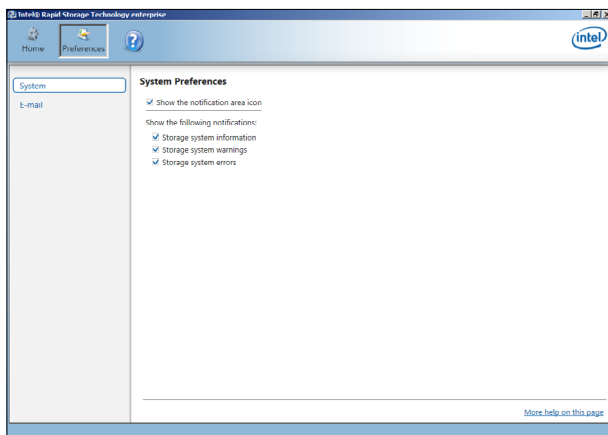


3. Click **Yes** to delete the volume and return to the utility main menu, or click **No** to return to the main menu.

## 6.3.4 Preferences

### System Preferences

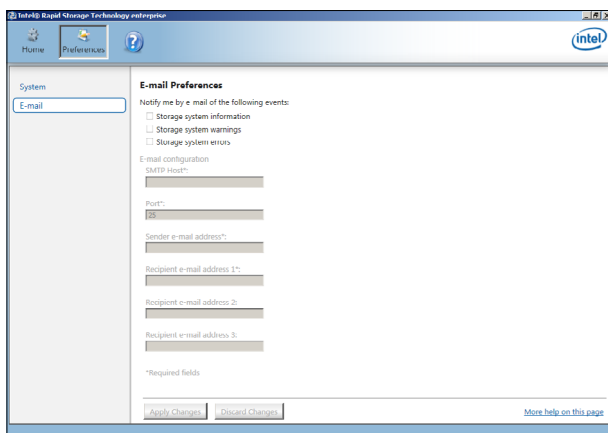
Allow you to set to show the notification area icon and show system information, warning, or errors here.



### E-Mail Preferences

Allow you to set to sent e-mail of the following events:

- Storage system information
- Storage system warnings
- Storage system errors





# Driver Installation

# 7

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

## 7.1 RAID driver installation

After creating the RAID sets for your server system, you are now ready to install an operating system to the independent hard disk drive or bootable array. This part provides the instructions on how to install the RAID controller drivers during OS installation.

### 7.1.1 Creating a USB flash drive with RAID drive

When installing Windows® Server OS, you can load the RAID driver from a USB flash drive. You can create a USB flash drive with RAID driver in Windows by copying the files from the support DVD to the USB flash drive.

To copy the RAID driver to a USB flash drive in Windows environment:

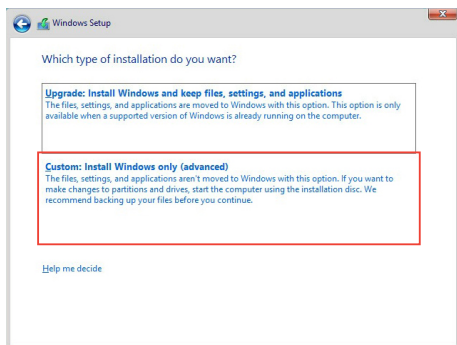
1. Place the motherboard support DVD in the optical drive.
2. Connect a USB flash drive to your system.
3. Click on the optical drive to browse the contents of the support DVD.
4. Click **Drivers > C25x INTEL RAID > Windows> Driver** and then copy the RAID driver folder to the USB flash drive.

### 7.1.2 Installing the RAID controller driver

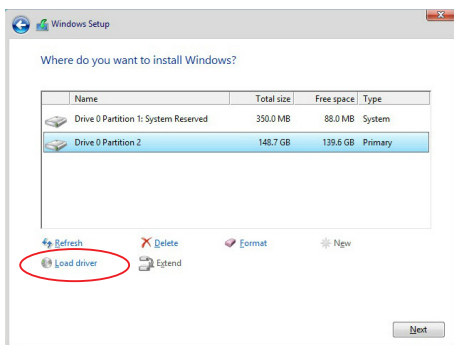
**During Windows® Server 2012 R2, 2016, or 2019 OS installation**

To install the RAID controller driver when installing Windows® Server OS:

1. Boot the computer using the Windows® Server installation disc. Follow the onscreen instructions to start installing Windows® Server.
2. When prompted to choose a type of installation, click **Custom: Install Windows only (advanced)**.

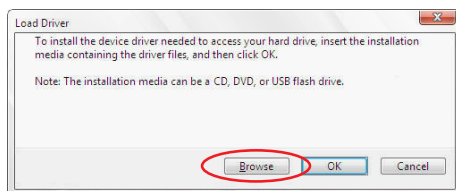


3. Click **Load Driver**.



4. A message appears reminding you to insert the installation media containing the driver of the RAID controller driver (the installation media can be a CD, DVD, or USB flash drive).
  - If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive.
  - Or you may connect a USB flash drive containing the RAID controller driver.

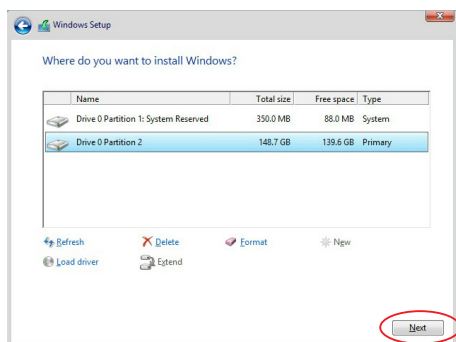
Click **Browse** to continue.



5. Locate the driver in the corresponding folder of the Support DVD or USB flash drive and then click **OK** to continue.
6. Select the RAID controller driver you need from the list and click **Next**.

7. When the system finishes loading the RAID driver,
  - Replace the motherboard Support DVD with the Windows Server installation disc.
  - Remove the USB flash drive.

Select the drive to install Windows and click **Next**.



8. Setup then proceeds with the OS installation. Follow the onscreen instructions to continue.

## 7.2 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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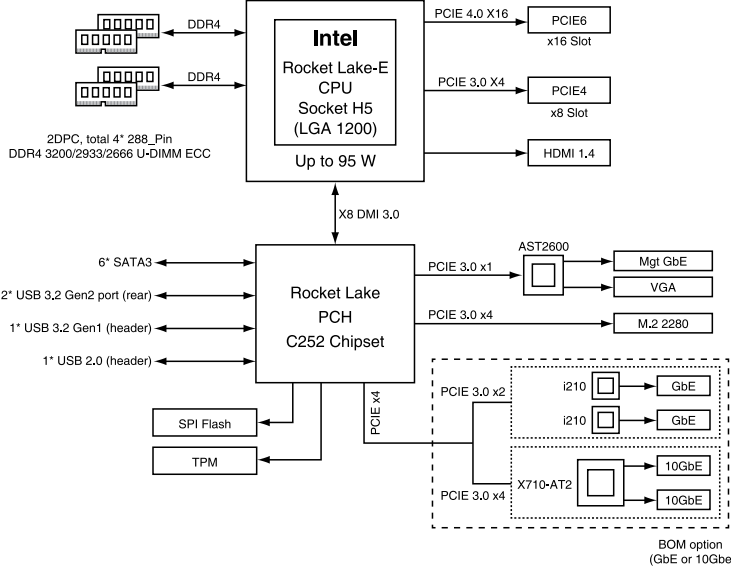
4. Contact - Displays the ASUS contact information, e-mail addresses, and useful links if you need more information or technical support for your motherboard.

[illegible]

# Appendix

This appendix includes additional information that you may refer to when configuring the motherboard.

# P12R-M/SYS block diagram





## 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.

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CAN ICES-003(A)/NMB-003(A)

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AEEE Yönetmeliğine Uygundur

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.