RS500-E9 Series

RS500-E9-PS4
RS500-E9-RS4
RS500-E9-RS4-U

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.

⚠️ 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.

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.

CLASS 1 LASER PRODUCT

Heavy System

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

About this guide

Audience

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

Contents

This guide contains the following parts:

1. **Chapter 1: Product Introduction**

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

2. **Chapter 2: Hardware 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: RAID Configuration**

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

7   **Chapter 7: Driver Installation**

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

Conventions

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

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

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

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

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

Typography

Bold text	Indicates a menu or an item to select.
Italics	Used to emphasize a word or a phrase.
<Key>	Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.
	Example: <Enter> means that you must press the Enter or Return key.
<Key1>+<Key2>+<Key3>	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).
	Example: <Ctrl>+<Alt>+<Del>
`Command`	Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets.
	Example: At the DOS prompt, type the command line: `format A:/S`

References

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

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

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

2. **ASUS websites**

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

Product Introduction

1

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

1.1   System package contents

Check your system package for the following items.

Model Name	RS500-E9-PS4, RS500-E9-RS4, RS500-E9-RS4-U
Chassis	ASUS R10E 1U Rackmount Chassis
Motherboard	ASUS Z11PR-D16-DC Server Board
Component	1 x 650W Single Power Supply (RS500-E9-PS4)
	1 x 770W Redundant Power Supply (RS500-E9-RS4, RS500-E9-RS4-U)
	4 x Hot-swap 3.5-inch HDD Trays
	1 x SAS/SATA Backplane (RS500-E9-PS4, RS500-E9-RS4)
	1 x SAS/SATA/NVMe Backplane (RS500-E9-RS4-U)
	1 x PCI-E Riser Card
	1 x Front I/O Board
	6 x System Fans (40 mm x 28 mm)
	1 x Redundant Power Supply Power Distribution Board (RS500-E9-RS4, RS500-E9-RS4-U)
Accessories	1 x Support DVD
	1 x Bag of Screws
	1 x AC Power Cable (RS500-E9-PS4)
	2 x AC Power Cable (RS500-E9-RS4, RS500-E9-RS4-U)
Optional Items	2 x CPU Heatsink
	1 x Tool-less Friction Rail Kit
	DVD-ROM/DVD-RW

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

1.2   Serial number label

Before requesting support from the ASUS Technical Support team, you must take note of the product's serial number containing 12 characters such as xxS0xxxxxxxx shown as the figure below. With the correct serial number of the product, ASUS Technical Support team members can then offer a quicker and satisfying solution to your problems.

1.3   System specifications

The ASUS RS500-E9 Series is a 1U barebone server system featuring the ASUS Z11PR-D16-DC Server Board. The server supports Intel® Xeon® Scalable Processor Family Series plus other latest technologies through the chipsets onboard.

Model Name		RS500-E9-PS4	RS500-E9-RS4	RS500-E9-RS4-U
Processor Support		2 x Socket P0 (LGA 3647) 1st Gen Intel® Xeon® Processor Scalable Family (up to 165W) 2nd Gen Intel® Xeon® Processor Scalable Family (up to 165W) UPI 10.4 GT/s	2 x Socket P0 (LGA 3647) 1st Gen Intel® Xeon® Processor Scalable Family (up to 205W) 2nd Gen Intel® Xeon® Processor Scalable Family (up to 205W) UPI 10.4 GT/s	
Core Logic		Intel® C621 PCH		
Memory	Total Slots	16 (6-channel per CPU, 8 DIMM per CPU)		
	Capacity	Maximum up to 4096 GB		
	Memory Type	DDR4 2933* (1 DIMM per Channel) DDR4 2666/2400/2133 RDIMM/LRDIMM/LRDIMM 3DS (2 DIMM per Channel) *** 2933MHz will drop to 2666MHz when using 2DPC configurations** **** Refer to ASUS server AVL for the latest update**		
	Memory Size	4GB, 8GB, 12GB, 32GB (RDIMM) 64GB,128GB (RDIMM 3DS) 32GB, 64GB,128GB (LRDIMM) 64GB,128GB ,256GB (LRDIMM 3DS) *** Refer to ASUS server AVL for the latest update**		
Expansion Slots	Total PCI/ PCI-X/PCI-E Slots	2+1		
	Slot Type	1 x PCI-E x16 (Gen3 x16 link), FH, HL 1 x PCI-E x8 (Gen3 x8 link), FH, HL 1 x OCP 2.0 Mezzanine (Gen3 x16 link)		
Disk Controller	SATA Controller	**Intel® C621 PCH** - 12 x SATA 6Gb/s ports (4 SATA connectors + 2 mini-SAS HD Connector) - 2 x M.2 connectors (SATA 6Gb/s & PCI-E Gen3 x4 link)		
	SAS Controller	**Optional kits:** - ASUS PIKE II 3008-8i HBA Card - ASUS PIKE II 3108-8i HW RAID Card		
	NVMe Controller	N/A		**Intel® VROC Feature (Support RAID 0, 1, 10, 5 with VROC H/W Key)** - 4 x NVMe ports

(continued on the next page)

Model Name		RS500-E9-PS4	RS500-E9-RS4	RS500-E9-RS4-U
Storage Bays	I = internal A or S = hot-swappable	4 x 3.5" or 2.5" Hot-swap Storage Bays (SATA/SAS Supported)		4 x 3.5" or 2.5" Hot-swap Storage Bays (SATA/SAS/ NVMe Supported)
Networking	LAN	1 x Dual Port Intel X722 Controller +Marvell 88E1514 PHY		
		1 x Management Port		
Infiniband		**Optional Kit:**		
		Mellanox MCX453A-FCAT Card		
Graphic	VGA	Aspeed AST2500 64MB		
Auxiliary Storage Device Bay (Optical Drive)		1 x Slim-type Optical Device Bay (DVD-RW)		
Front I/O Ports		2 x USB 3.0 ports		
		1 x VGA port		
Rear I/O Ports		2 x USB 3.0 ports		
		1 x VGA port		
		2 x RJ-45 GbE LAN ports		
		1 x RJ-45 Management port		
Switch/LED		**Rear:**		
		- 1 x Power Switch/LED		
		- 1 x Q-Code/Port 80 LED		
		Front:		
		- 1 x Power Switch/LED		
		- 1 x Location Switch/LED		
		- 1 x Reset Switch		
		- 1 x Message LED		
		- 4 x LAN LED (LED1~2 for on-board LAN, 3~4 for OCP LAN)		
OS Support		Please find the latest OS support from http://www.asus.com/		
Management Solution	Software	ASUS Control Center		
	Out of Band Remote Management	On-Board ASMB9-iKVM for KVM-over-IP		
Regulatory Compliance		BSMI, CE, FCC		
Dimension (HH x WW x DD)		615 x 444 x 44mm (1U)		
		24.21" x 17.48" x 1.73"		

(continued on the next page)

Model Name	RS500-E9-PS4	RS500-E9-RS4	RS500-E9-RS4-U
Net Weight Kg (CPU, DRAM & HDD not included)	10.0 kg	11.0 kg	
Gross Weight Kg (CPU, DRAM & HDD not included, Packing included)	16.0 kg	17.0 kg	
Power Supply (following different configuration by region)	Single 650W 80 PLUS Platinum Power Supply Rating: 100-240 Vac, 9A/5A, 50-60Hz, Class I	1+1 Redundant 770W 80 PLUS Platinum Power Supply Rating: 100-240 Vac, 10A/5A, 50-60Hz, Class I or 1+1 Redundant 450W 80 PLUS Gold Power Supply Rating: 100-240 Vac, 5.5A/3A, 50-60Hz, Class I	
Environment	Operating temperature: 10°C – 35°C Non operation temperature: -40°C – 70°C 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, slim type optical drive, and two USB ports are located on the front panel.

Refer to the **Front panel LEDs** section for the LED descriptions.

Rack screw

HDD 1   HDD 2   HDD 3   HDD 4

Rack screw

Optical drive (optional)

Asset tag (hidden)

LAN 4 LED
LAN 3 LED
LAN 2 LED
LAN 1 LED
Message LED
HDD LED

VGA port

USB 3.0 ports

Reset button
Location switch
Power button
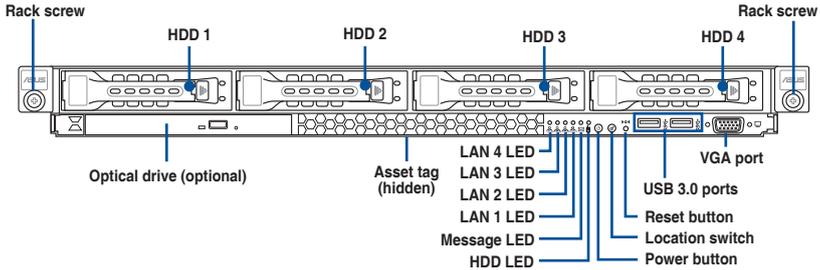
1.5 Rear panel features

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

RS500-E9-RS4 / RS500-E9-RS4-U

Power cord connector and Redundant power supply

Locate LED
LAN port for iKVM*

PCI-E slot

Q-Code LED

USB 3.0 ports
Gigabit LAN port 1 (bottom) and 2 (top)
VGA port

OCP 2.0 Mezzanine slot

Message LED
Power button

RS500-E9-PS4

Power cord connector and power supply

Locate LED
LAN port for iKVM*

PCI-E slot

Q-Code LED

USB 3.0 ports
Gigabit LAN port 1 (bottom) and 2 (top)
VGA port

OCP 2.0 Mezzanine slot

Message LED
Power button
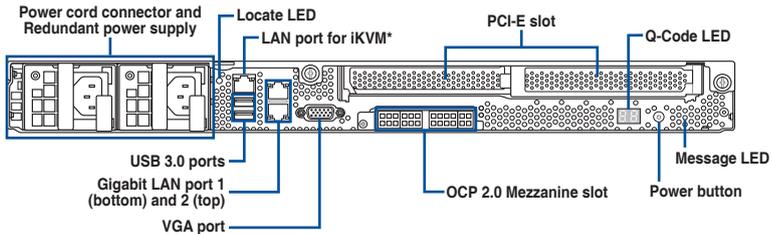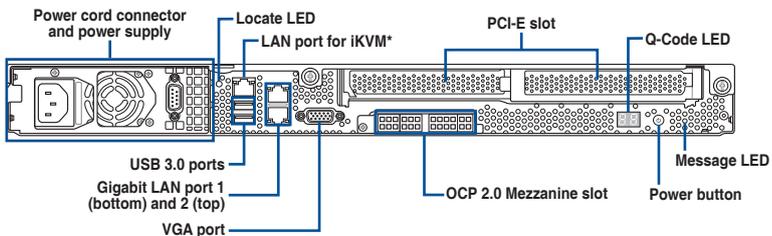
*This port is for ASUS ASMB9-iKVM controller card only.

1.6   Internal features

The barebone server includes the basic components as shown.
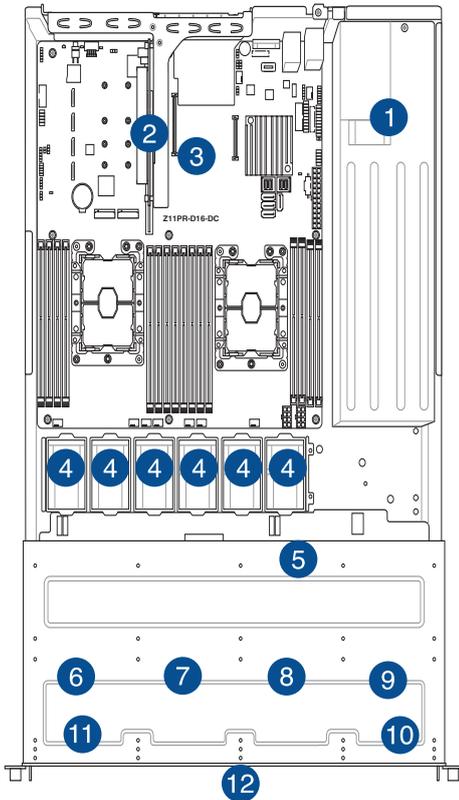
1.   Power supply and power fan

2.   PCI Express slot Riser Card

3.   ASUS Z11PR-D16-DC Server Board

4.   System fans

5.   SAS / SATA backplane (hidden)

6.   HDD tray 1 - Connects to SATA1 port

7.   HDD tray 2 - Connects to SATA2 port

8.   HDD tray 3 - Connects to SATA3 port

9.   HDD tray 4 - Connects to SATA4 port

10. Front I/O boards (hidden)

11. Slim-type optical drive

12. Asset Tag

Turn off the system power and detach the power supply before removing or replacing any system component.

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.

WARNING
HAZARDOUS MOVING PARTS
KEEP FINGERS AND OTHER BODY PARTS AWAY

1.7 LED information

1.7.1 Front panel LEDs

LAN 4 LED
LAN 3 LED
LAN 2 LED
LAN 1 LED

Location switch
Power button
HDD LED
Message LED
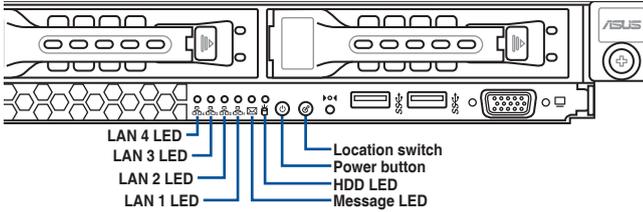
LED	Icon	Display status	Description
Power LED	⏻	ON	System power ON
HDD Access LED	🖱	OFF Blinking	No activity Read/write data into the HDD
Message LED	✉	OFF ON	System is normal; no incoming event A hardware monitor event is indicated
Location LED	✐	OFF ON	Normal status Location switch is pressed (Press the location switch again to turn off)
LAN LEDs	🖧	OFF Blinking ON	No LAN connection LAN is transmitting or receiving data LAN connection is present

1.7.2   LAN (RJ-45) LEDs

LAN port LED indications

Activity/Link LED		Speed LED	
Status	Description	Status	Description
OFF	No link		
GREEN	Linked	GREEN	1 Gbps connection
BLINKING	Data activity		

ACT/LINK   SPEED
   LED   LED
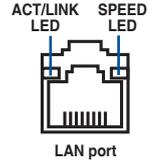
LAN port

Dedicated Management LAN port (DM_LAN1) LED indications

Activity/Link LED		Speed LED	
Status	Description	Status	Description
OFF	No link	OFF	10 Mbps connection
YELLOW	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection

ACT/LINK   SPEED
   LED   LED

DM LAN port

1.7.3   HDD status LED
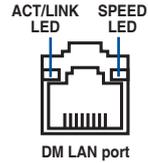
HDD status LED
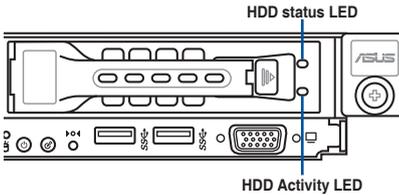
HDD Activity LED

SATA/SAS HDD LED Description			
HDD Status LED	GREEN	ON	SATA/SAS HDD power ON
	RED	ON	HDD has failed and should be swapped immediately
	GREEN/ RED	Blinking	RAID rebuilding
	GREEN/ RED	OFF	HDD not found
HDD Activity LED	GREEN	Blinking	Read/write data from/into the SATA/SAS HDD

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

Removing the rear cover

1.   Locate and remove the front side screws.

Front side screw
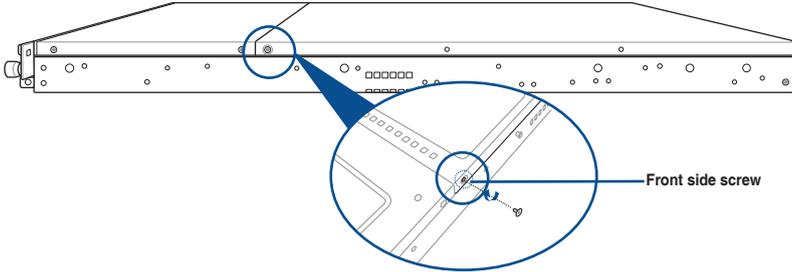
2.   Loosen the two thumbscrews on the rear panel to release the rear cover from the chassis.

Thumbscrews
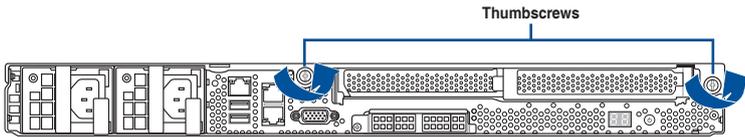
3.   Firmly hold the cover and slide it toward the rear panel for about half an inch until it is disengaged from the chassis.

4.   Lift the cover from the chassis.

5.   To reattach the rear cover, reverse step 1 to 4.
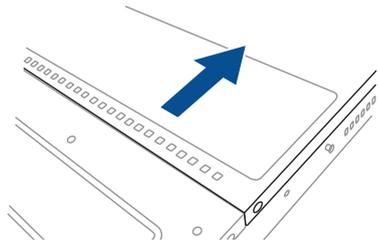
A protection film is pre-attached to the system cover before shipping. Please remove the protection film before turning on the system for proper heat dissipation.
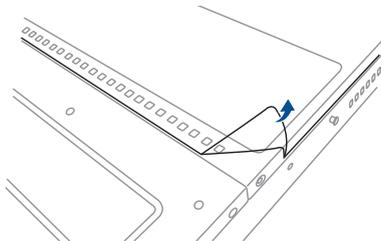
2.2 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA 3647 socket designed for the Intel® Xeon® Processors Scalable Family Series.

> ⚠ Ensure that you install the correct CPU designed for LGA3647 socket only. DO NOT install a CPU designed for other sockets on the LGA3647 socket.

> ⚡ • Ensure that all power cables are unplugged before installing the CPU.
>
> • Upon purchase of the server system, 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.
>
> • 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 a CPU:

1.   Remove the rear cover. For more information, see the section **Chassis cover**.

2.   Remove the air ducts, and then remove the PnP caps from the CPU sockets.

> ✎ Keep the PnP cap. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the PnP cap on the LGA 3647 socket.

CPU2
(CPU socket 2)

CPU1
(CPU socket 1)
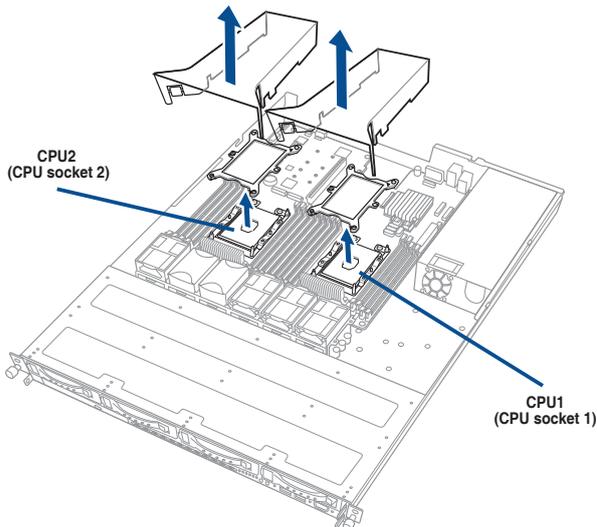
3.   Align the triangle mark on the CPU with the triangle mark on the CPU Carrier (A), then install the CPU into the CPU Carrier until it clicks firmly into place (B), and then install the CPU Carrier into the heatsink until it clicks firmly in place (C).

Ensure that the triangle mark on the CPU matches the triangle mark on the CPU Carrier.

CPU Carrier

C

A

Triangle mark

B

CPU
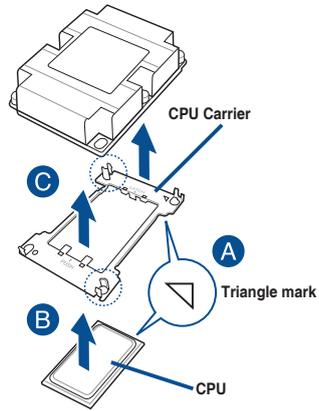
4.   Align the CPU and CPU Carrier in the correct orientation, and then place the heatsinks on top of the CPU sockets.

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

5.   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 a diagonal sequence to completely secure the heatsink.

The heatsink screws are T30 models. A torque value of 12 inch-lbf is recommended.

CPU2 (CPU socket 2)

CPU1 (CPU socket 1)

4

2

1

3
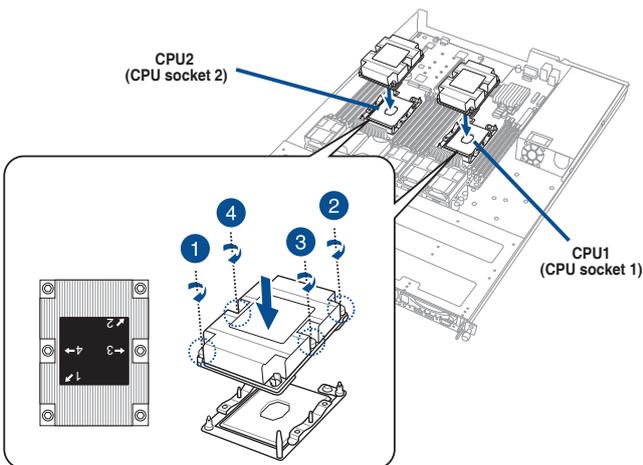
6. Reinstall the air ducts.

**CPU2
(CPU socket 2)**

**CPU1
(CPU socket 1)**
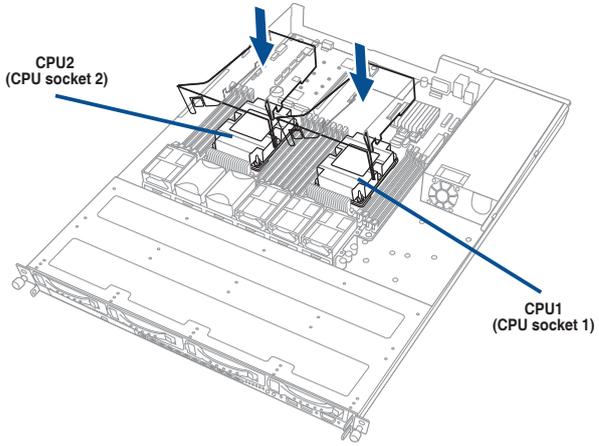
2.3 System memory

2.3.1 Overview

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

The figure illustrates the location of the DDR4 DIMM sockets:

Z11PR-D16-DC 288-pin DDR4 DIMM sockets
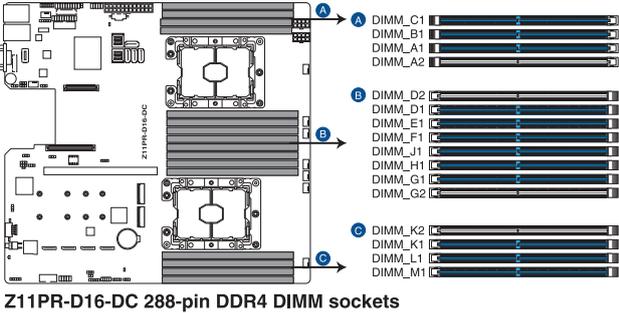
2.3.2 Memory Configurations

You may install 32GB, 16GB, 8GB, 4GB RDIMM, 64GB, 32GB LRDIMM, or 128GB, 64GB LRDIMM 3DS into the DIMM sockets using the memory configurations in this section.

- Always install DIMMs with the same CAS latency. For optimum compatibility, it is recommended that you obtain memory modules from the same vendor.
- Start installing the DIMMs in slots A1.

Single CPU configuration

You can refer to the following recommended memory population for a single CPU configuration.

Single CPU configuration (must be installed on CPU1)	DIMM							
	A2	A1	B1	C1	D2	D1	E1	F1
1 DIMM		✓						
2 DIMMs		✓				✓		
4 DIMMs		✓	✓			✓	✓	
6 DIMMs		✓	✓	✓		✓	✓	✓
8 DIMMs	✓	✓	✓	✓	✓	✓	✓	✓

Dual CPU configuration

You can refer to the following recommended memory population for a dual CPU configuration.

Dual CPU configuration	DIMM (CPU1)								DIMM (CPU2)							
	A2	A1	B1	C1	D2	D1	E1	F1	G2	G1	H1	J1	K2	K1	L1	M1
2 DIMMs		✓								✓						
4 DIMMs		✓	✓							✓	✓					
8 DIMMs		✓	✓			✓	✓			✓	✓			✓	✓	
12 DIMMs		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓
16 DIMMs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2.3.3   Installing a DIMM on a single clip DIMM socket

⚠️ 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 clip outward.

2.   Align a DIMM on the socket such that the notch on the DIMM matches the DIMM slot key on the socket.

DIMM notch

DIMM slot key   **Unlocked retaining clip**
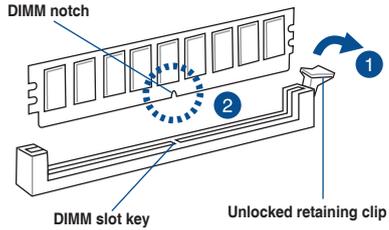
👆 A DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket in the wrong direction to avoid damaging the DIMM.

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 clip snaps back into place and the DIMM cannot be pushed in any further to ensure proper sitting of the DIMM.

Locked Retaining Clip
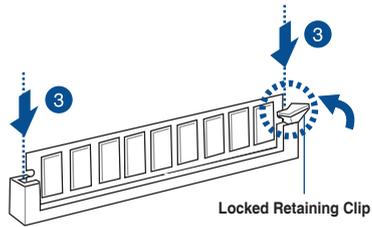
⚠️ Always insert the DIMM into the socket vertically to prevent DIMM notch damage.

Removing a DIMM from a single clip DIMM socket

1.   Press the retaining clip outward to unlock the DIMM.

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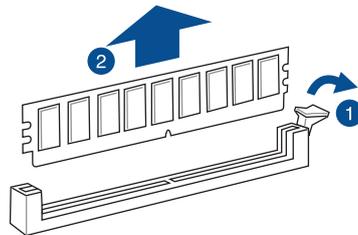
✏️ Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it flips out with extra force.

2.4 Hard disk drives

The system supports four hot-swap SATA/SAS hard disk drives. The hard disk drive installed on the drive tray connects to the motherboard SATA/SAS ports via the SATA/SAS backplane.

To install a 3.5" hot-swap SATA/SAS HDD:

1. Push the spring lock to the right (A) then pull the tray lever outward (B) to release the drive tray. The drive tray ejects slightly after you pull out the lever.

tray lever   spring lock
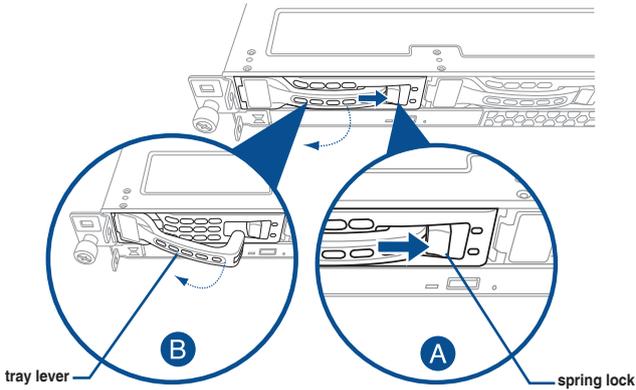
2. Firmly hold the tray lever and pull the drive tray out of the bay.
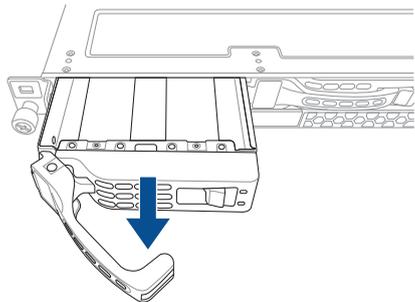
3. Place the drive tray on a flat and stable surface.

4. Prepare the SATA/SAS HDD and the bundled set of screws.
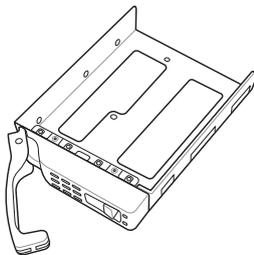
5. Place the 3.5" SATA/SAS HDD into the tray then secure it with four screws.
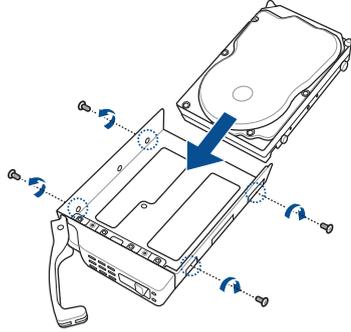
6. Insert the drive tray and HDD assembly all the way into the depth of the bay until just a small fraction of the tray edge protrudes.
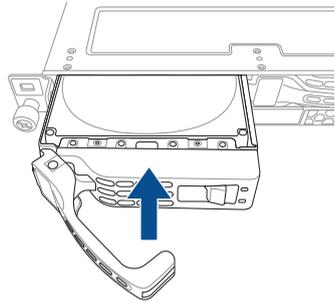
> When installed, the SATA/SAS connector on the drive connects to the SATA/SAS interface on the backplane.

7. Push the tray lever until it clicks and secures the drive tray in place.

> The drive tray is correctly placed when its front edge aligns with the bay edge.
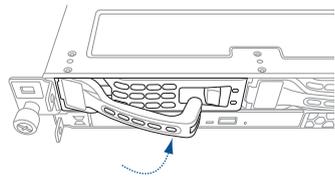
8. Repeat steps 1 to 7 to install the other SATA/SAS HDDs.

To install a 2.5" storage device to the front panel:

1.   Push the spring lock to the right (A) then pull the tray lever outward (B) to release the drive tray. The drive tray ejects slightly after you pull out the lever.

tray lever   **spring lock**
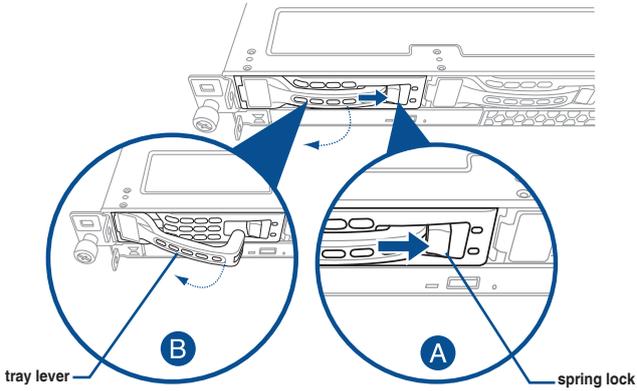
2.   Firmly hold the tray lever and pull the tray out of the bay.
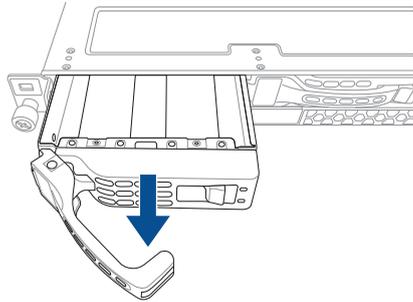
3.   Place the tray on a flat and stable surface.

4.   Prepare the 2.5" storage device and the bundled set of screws.
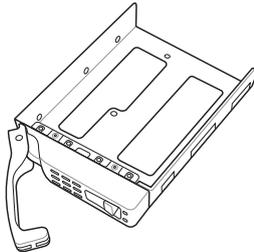
5.	Place the 2.5" storage device into the tray then secure it with four screws.
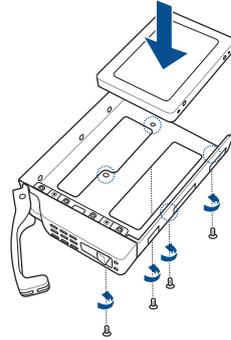
6.	Insert the tray and storage device assembly all the way into the depth of the bay until just a small fraction of the tray edge protrudes.
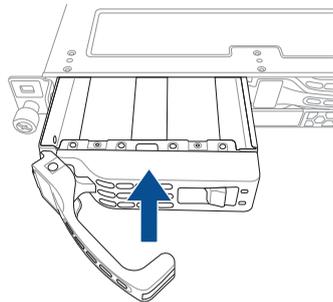
When installed, the SATA/NVMe connector on the storage device connects to the SATA/NVMe interface on the backplane.

7.	Push the tray lever until it clicks and secures the tray in place.

The tray is correctly placed when its front edge aligns with the bay edge.
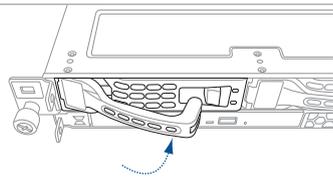
8.	Repeat steps 1 to 7 to install the other storage devices.

2.5 Expansion slot

2.5.1 Installing an expansion card to the riser card bracket

The barebone server comes with a riser card bracket. You need to remove the bracket if you want to install PCI Express x8 or x16 expansion cards.

To install a PCI Express x8 or x16 card:

1. Firmly hold the riser card bracket, then pull it up to detach it from the PCI Express x24 slot on the motherboard.

2. Place the riser card bracket on a flat and stable surface, then remove the screw from the slot bay.

3. Install a PCI Express x8 or x16 card to the bracket as shown.

4. Secure the card with a screw.
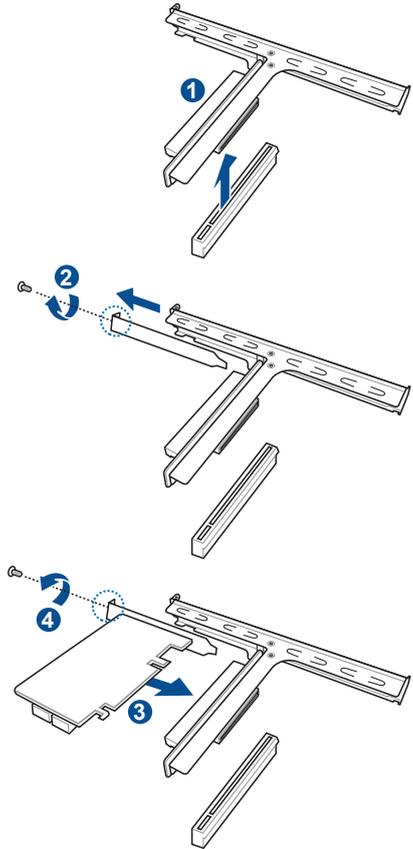
5.	Install the riser card bracket and PCI Express card assembly back into the PCI Express x24 slot on the motherboard. Ensure that the golden connectors of the riser card bracket is firmly seated in place.
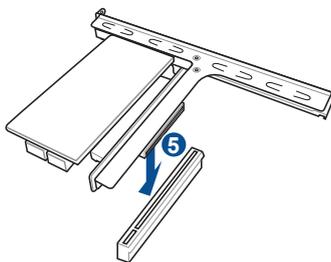
## 2.5.2	Installing an ASUS PIKE II card

You can install an ASUS PIKE II card on the provided PCI-E slot onboard.

To install an ASUS PIKE II card:

1.	Firmly hold the riser card bracket, then pull it up to detach it from the PCI Express x24 slot on the motherboard.
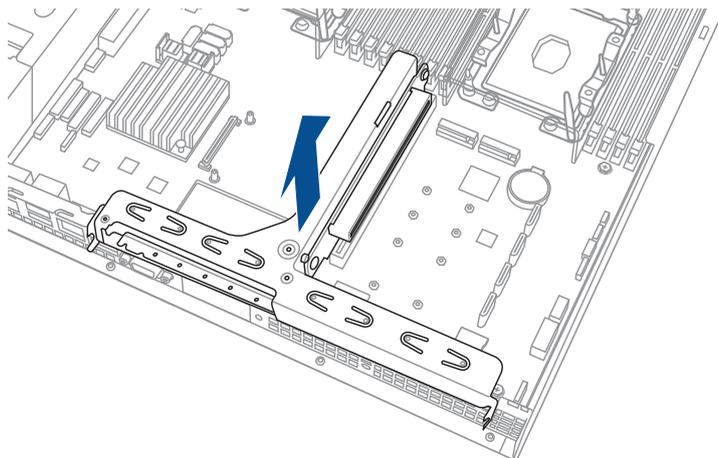
2.   Remove the screw that secures the metal cover to the riser card bracket, then remove the metal cover.
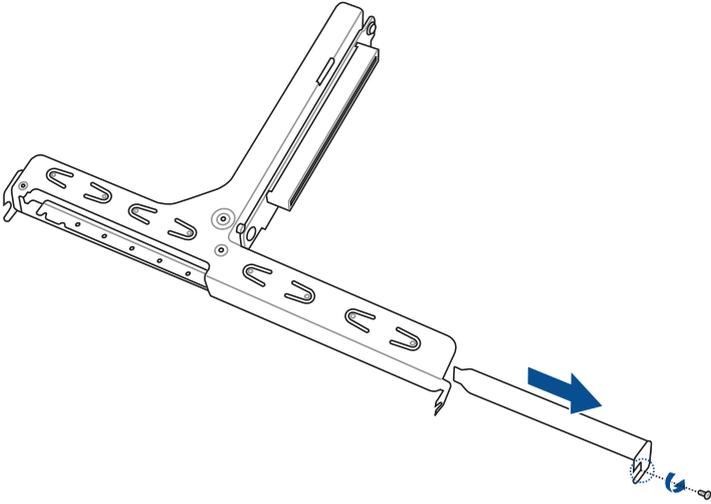
3.   Prepare your ASUS PIKE II card.

4.   Insert the expansion card into the PCI-E slot. Ensure that the golden fingers are totally inserted into the slot, then secure the ASUS PIKE II card with the screw removed before.
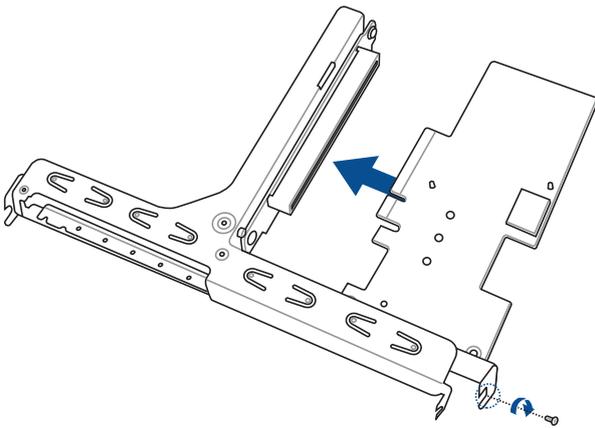
5.	Remove the default mini-SAS HD cable from the motherboard.
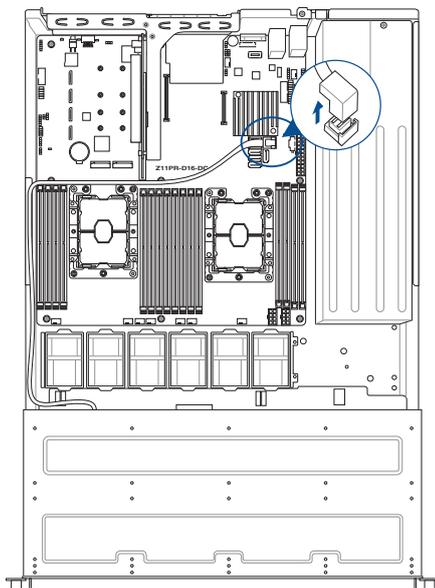
6.	Connect the mini-SAS HD cable to connector 1 of the ASUS PIKE II card.

Connect to PIKE II connector 1
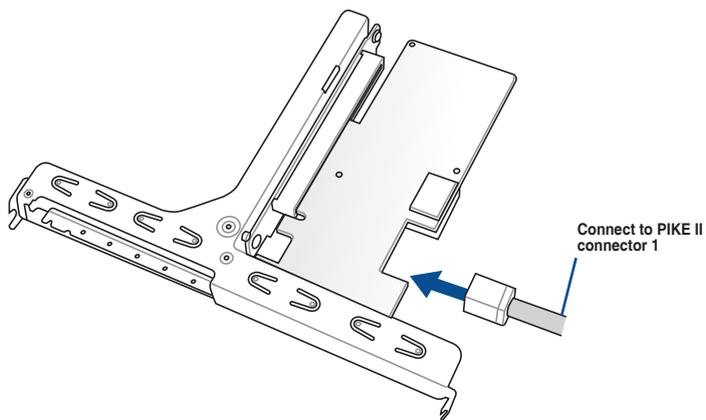
7. Reinstall the riser card bracket into the PCI Express x24 slot on the motherboard. Ensure that the golden connectors of the riser card bracket is firmly seated in place.
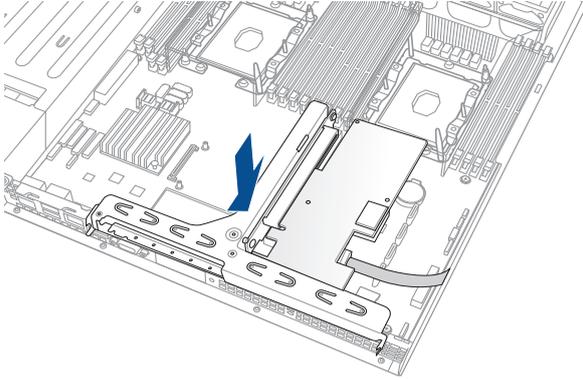
2.5.3   Installing M.2 (NGFF) cards

To install an M.2 (NGFF) card:

1.   Locate the M.2 (NGFF) connectors on your motherboard.

NGFF2

NGFF1

Z11PR-D16-DC NGFF connectors
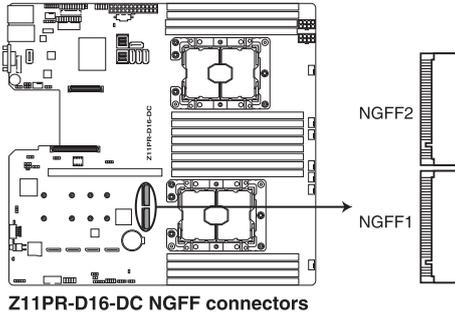
2.   Remove the top screw and the
     stand from the motherboard.

Top screw   Stand screw
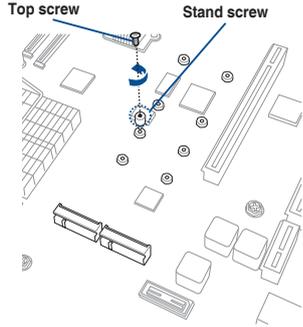
3.   Select an appropriate screw hole
     on the motherboard for your M.2
     card, then secure the stand to the
     motherboard.
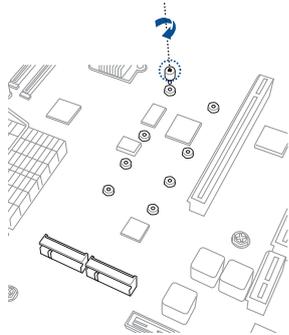
4.   Prepare the M.2 card.

5.   Align and insert the M.2 card into the
      M.2 connector on the motherboard.

      Ensure that the golden connector
      of the M.2 card is inserted firmly in
      place and that the screw hole on the
      M.2 card matches the stand screw
      on the motherboard.
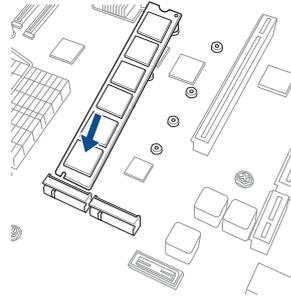
6.   Secure the M.2 card with the top
      screw.

      Ensure that the M.2 card is
      positioned between the top screw
      and the stand screw before
      securing it.
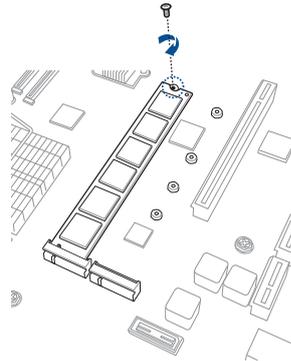
2.5.4   Installing Mezzanine cards

To install a Mezzanine card:

1.   Locate the Mezzanine card connector on your motherboard.

Z11PR-D16-DC MEZZPCIE connectors
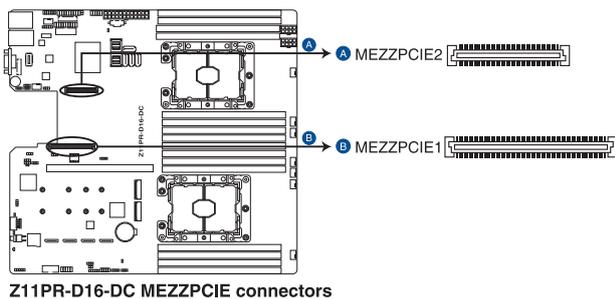
2.   Firmly hold the riser card bracket, then pull it up to detach it from the PCI Express x24 slot on the motherboard.
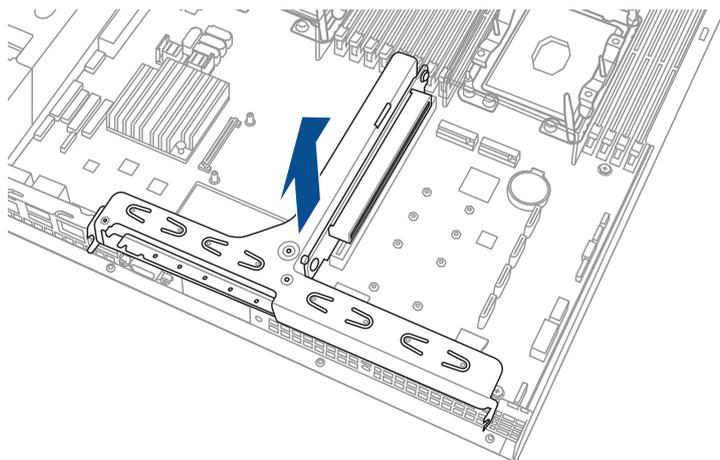
3. Select the slots that are going to be used for your Mezzanine card, then use a screwdriver and pry the corresponding slots until it pops off.
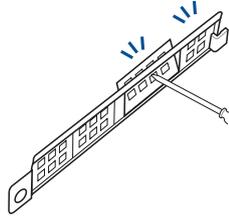
4. Prepare your Mezzannine card and the signal cable. Connect the signal transmission end (white) to the AUXLED_CON header on the card.

AUXLED_CON1
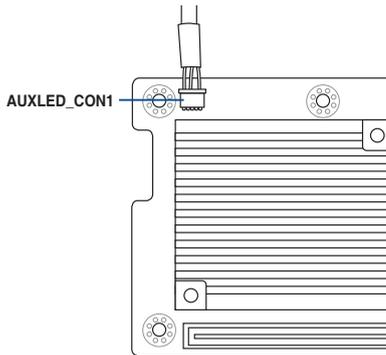
5. Insert the ports of the Mezzanine card into the mounting hole on the chassis, then insert the golden connector of the Mezzanine card into the **MEZZPCIE1** (OCP) connector on the motherboard.

    Ensure that the stand screws on the motherboard is aligned and matched to the screw holes of the Mezzanine card.

Screw holes

LAN ports

LAN port slots

Stand screws
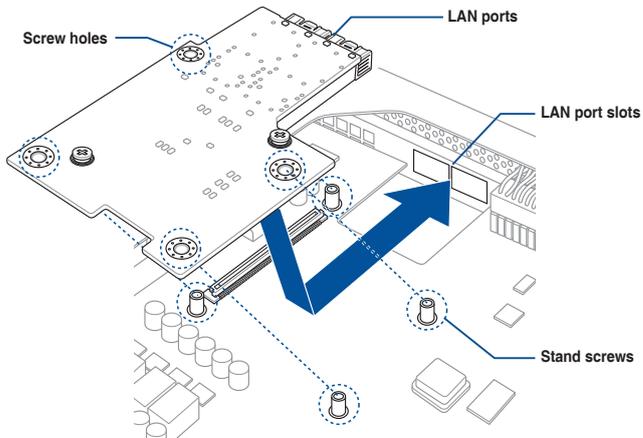
6. Secure the Mezzanine card with the four (4) bundled screws.
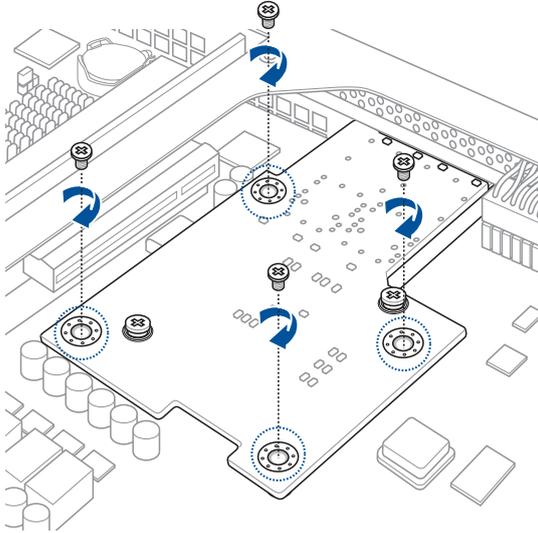
7. Connect the signal end (black) to the OCP_LED1 header on the motherboard.

Z11PR-D16-DC OCP_LED1 connector
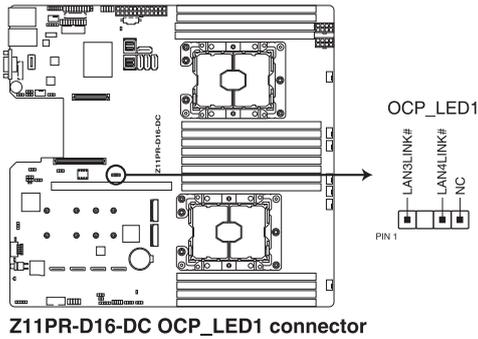
The two ends of the signal cable are different in size and color for easy recognition. Please refer to your exact cable.

8. Reinstall the riser card bracket into the PCI Express x24 slot on the motherboard. Ensure that the golden connectors of the riser card bracket is firmly seated in place.

2.5.5   Configuring an expansion card

After installing the expansion card, configure the 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

IRQ	Priority	Standard function
0	1	System Timer
1	2	Keyboard Controller
2	-	Programmable Interrupt
3*	11	Communications Port (COM2)
4*	12	Communications Port (COM1)
5*	13	--
6	14	Floppy Disk Controller
7*	15	--
8	3	System CMOS/Real Time Clock
9*	4	ACPI Mode when used
10*	5	IRQ Holder for PCI Steering
11*	6	IRQ Holder for PCI Steering
12*	7	PS/2 Compatible Mouse Port
13	8	Numeric Data Processor
14*	9	Primary IDE Channel
15*	10	Secondary IDE Channel

* These IRQs are usually available for ISA or PCI devices.

2.6 Cable connections
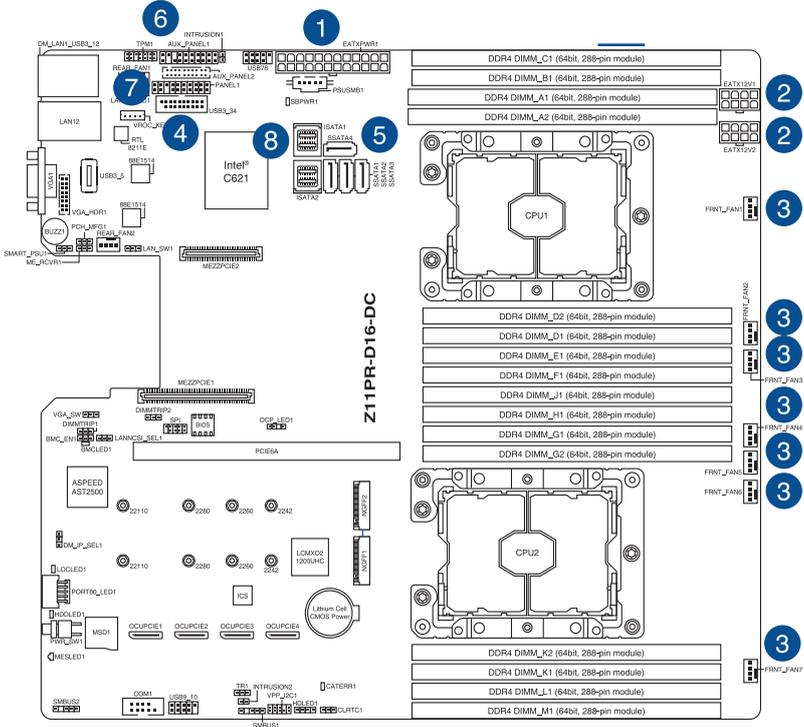
Standard cables connected to the motherboard

1. 24-pin ATX power connector (from power supply to motherboard)
2. 8-pin 12V power connector (from power supply to motherboard)
3. System fan connector (from system fan to motherboard)
4. USB connector (from motherboard to front I/O board)
5. SATA connector (system default; from motherboard to backplane)
6. System auxiliary panel connector (from motherboard to front I/O board)
7. System panel connector (from motherboard to front I/O board)
8. Mini-SAS HD connector (from motherboard to backplane)

2.7 SATA/SAS backplane cabling

RS500-E9-RS4 / RS500-E9-PS4

**Connects an 8-pin plug
from power supply**

Connects the data cables connected to the motherboard

Connect the SATA/SAS storage device

RS500-E9-RS4-U

Connects the data cables connected to the motherboard

**Connects an 8-pin plug
from power supply**

Connects the data cables connected to the motherboard

Connects to the SATA/SAS/NMVE storage device
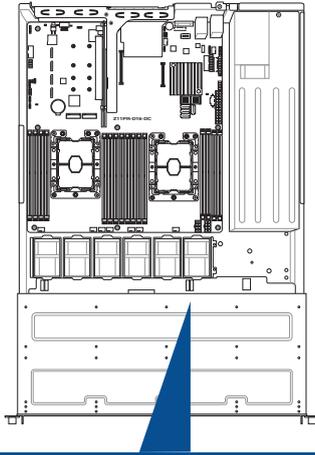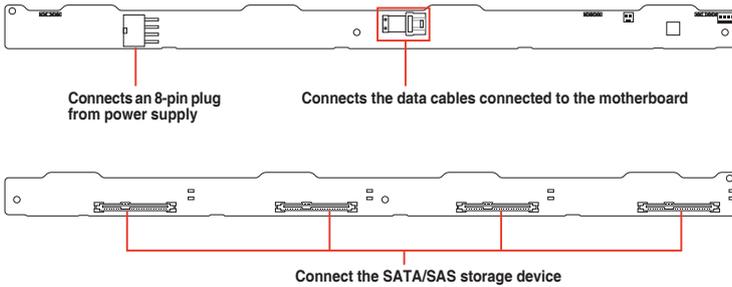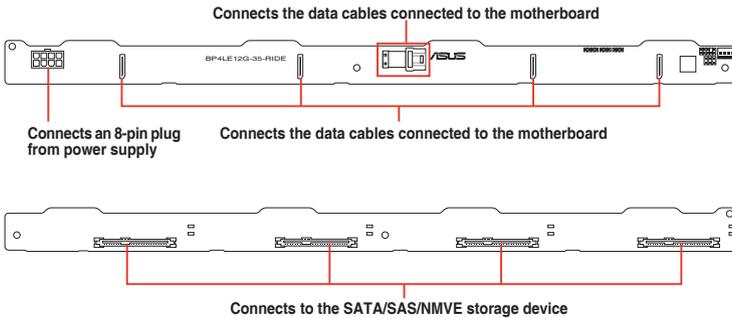
2.8 Removable/optional components

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

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

2.8.1 System fans

To uninstall the system fans:

1. Disconnect the system fan cable from the fan connector on the motherboard.

2. Lift the fan, then set aside.

3. Repeat steps 1 to 2 to uninstall the other system fans.

To reinstall the system fans

1. Insert the fan to the fan cage. The airflow directional arrow on the fan side should point towards the system rear panel.

2. Connect the system fan cable to the fan connector on the motherboard.

Installation Options

3

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

3.1 Rail kit installation

3.1.1 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:

Set of screws

Fixing latches   **Rail components (screws included)**

Latch screws   Rail Washers   Rail screws
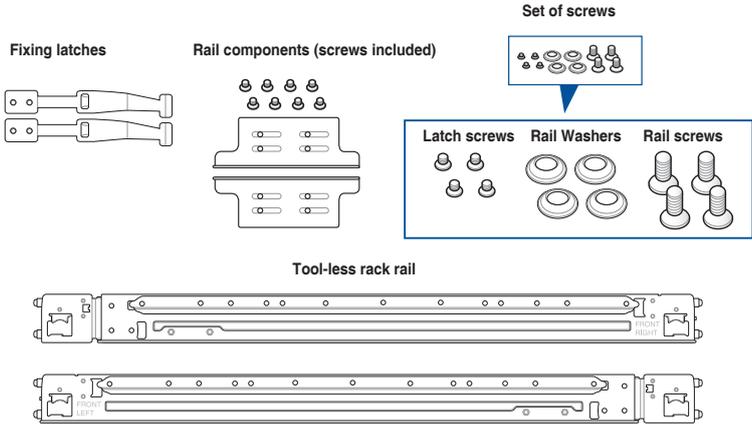
Tool-less rack rail

3.1.2 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.

Front end of system
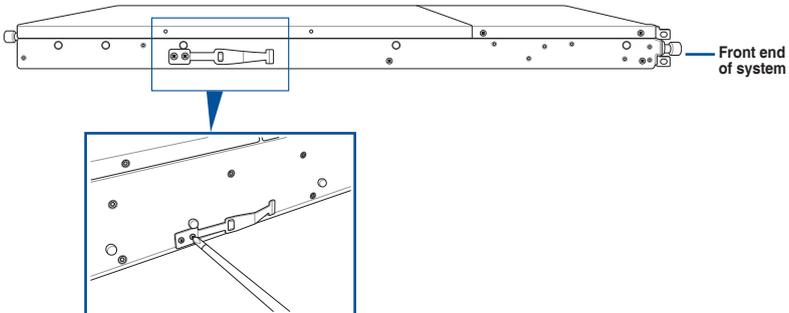
> Follow steps 2 to 4 if the depth of your server rack exceeds 850mm, if the depth of your server rack is less than 850mm, please skip steps 2 to 4 and proceed with step 5.

2.   Slightly slide out and extend the right rack rail, then prepare one of the bundled rail components.
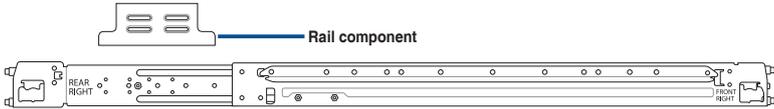
Rail component

3.   Align the rail component with the right rack rail and secure it using four (4) bundled screws.
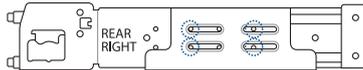
4.   Follow steps 2 and 3 to secure the rail component to the left rail rack.

5.   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.

1U
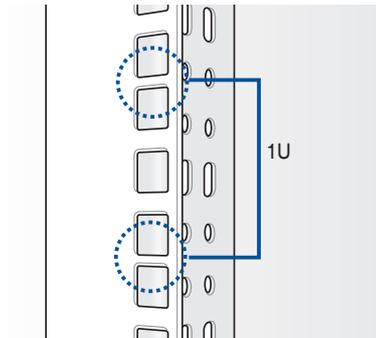
6. Secure the rail components to the rail using the bundled screws.

7 Press the spring lock (A) then insert the studs into the selected square mounting holes on the rack post.

8. 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.

9. (Optional) Use the rail screw and rail washer (B) that comes with the kit to secure the rack rail to the rack post.

10. Perform steps 3 to 5 for the other rack rail.

Ensure that the installed rack rails (left and right) are aligned, secured, and stable in place.
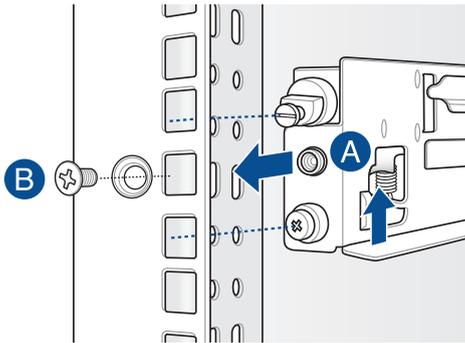
11. Lift the server chassis and insert into the rack rail.

Ensure that the rack rail cabinet and the rack posts are stable and standing firmly on a level surface.

3.2 Rail kit dimensions
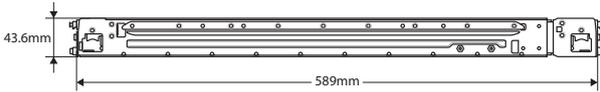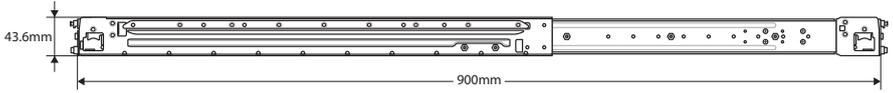
Motherboard Information

4

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

4.1 Motherboard layout

Layout contents

4.2 Jumpers

1. **Clear RTC RAM (3-pin CLRTC1)**

   This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS which include system setup information such as system passwords.
   To erase the RTC RAM:

   1. Turn OFF the computer and unplug the power cord.

   2. Move the jumper cap from the default pins 1–2 to pins 2–3. Keep the cap on pins 2–3 for about 5 to 10 seconds, then move the cap back to pins 1–2.

   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 remove the cap on CLRTC jumper default position except when clearing the RTC RAM. Removing the cap will cause system boot failure!

   📝 If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.

CLRTC1

1 2   2 3

Normal   Clear CMOS
(Default)

Z11PR-D16-DC Clear RTC RAM
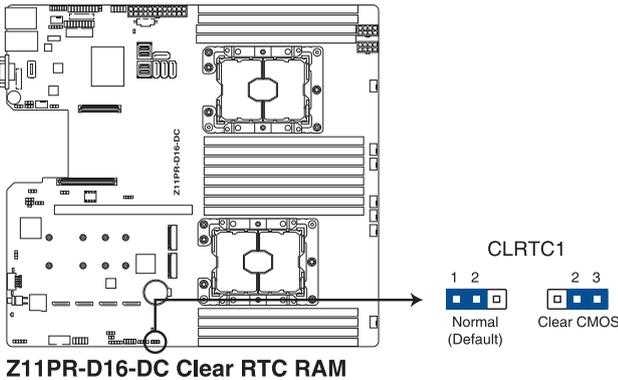
2. **VGA controller setting (3-pin VGA_SW1)**

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

VGA_SW1

1 2   2 3
Enable   Disable
(Default)
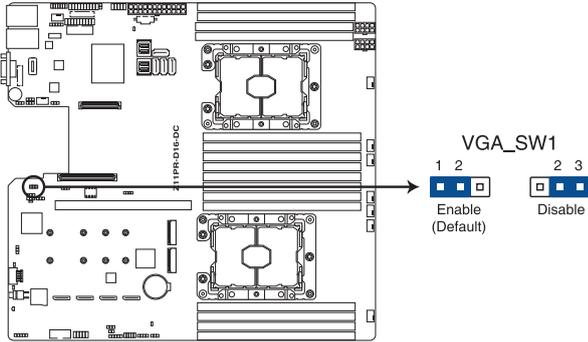
Z11PR-D16-DC VGA setting

3. **LAN controller setting (3-pin LAN_SW1)**

This jumper allows you to enable or disable the onboard LAN_SW1. Set to pins 1-2 to activate the Gigabit LAN feature.

LAN_SW1

1 2   2 3
Enable   Disable
(Default)
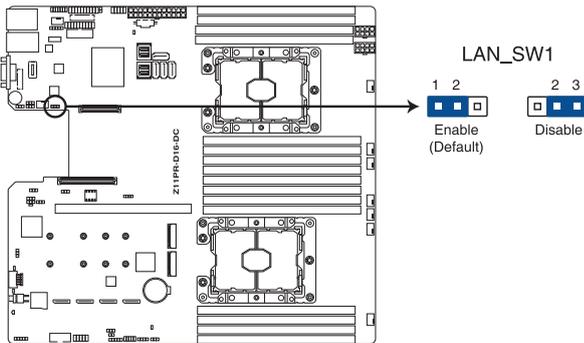
Z11PR-D16-DC LAN setting

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 becomes corrupted.

Z11PR-D16-DC ME recovery setting
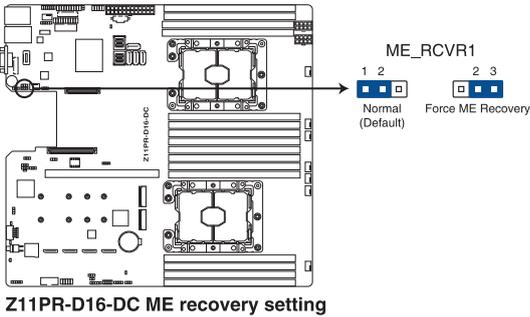
5. **DDR4 thermal event setting (3-pin DIMMTRIP1-2)**

   These jumpers allow you to enable or disable DDR4 DIMM thermal sensing event pin.

Z11PR-D16-DC Thermaltrip setting
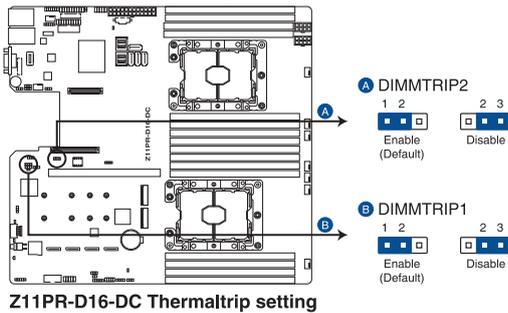
6. BMC Setting (3-pin BMC_EN1)

This jumper allows you to enable or disable the Baseboard Management Controller (ASMB9).

BMC_EN1

1 2   2 3
Enable   Disable
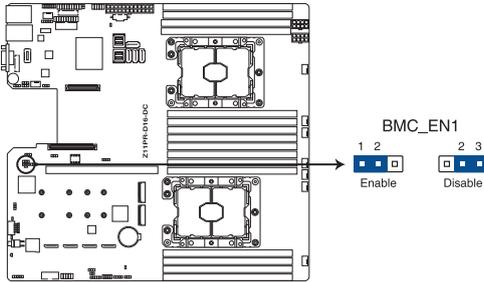
Z11PR-D16-DC BMC_EN1 setting

7. 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).

DM_IP_EN1

2   3
1   2
          1
Normal   Force DMLAN IP
(Default) to static mode
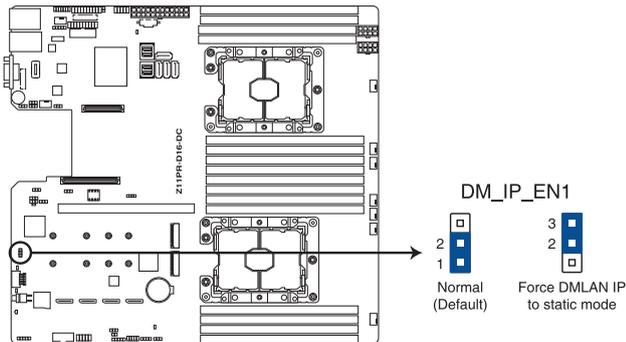
Z11PR-D16-DC DM_IP_EN1 setting

8. **PCH_MFG1 setting (3-pin PCH_MFG1)**

This jumper allows you to update the BIOS ME block.
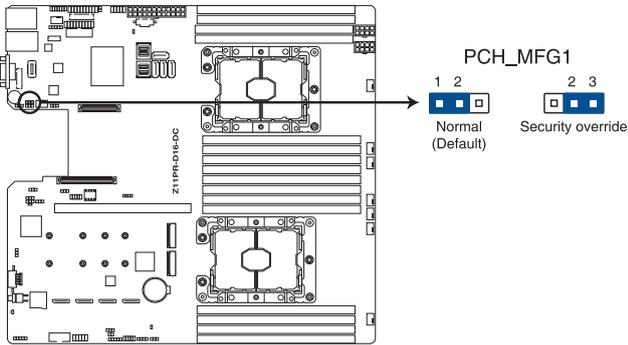
Z11PR-D16-DC PCH_MFG setting

9. **LANNCSI setting (3-pin LANNCSI_SEL1)**

This jumper allows you to select which LAN NCSI to function.
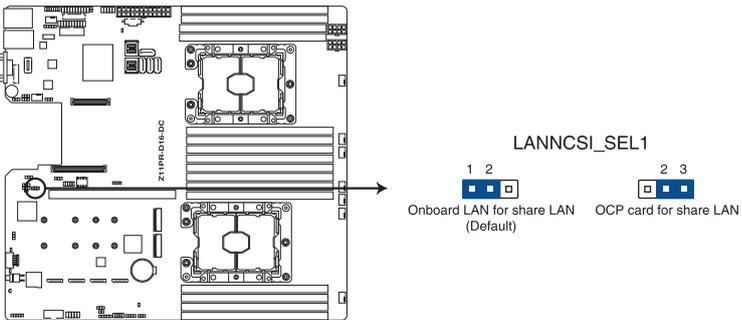
Z11PR-D16-DC LANNCSI setting

10. **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 enabled by default. Set to pins 2-3 to disable it. When enabled, SmaRT allows uninterrupted operation of the system during an AC loss event.
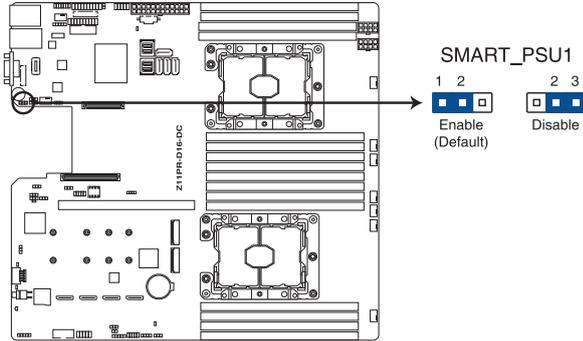
Z11PR-D16-DC Smart Ride Through setting

4.3 Onboard LEDs

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 sleep mode, or in soft-off 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.

   SBPWR1

   ON
   Standby Power

   OFF
   Powered Off
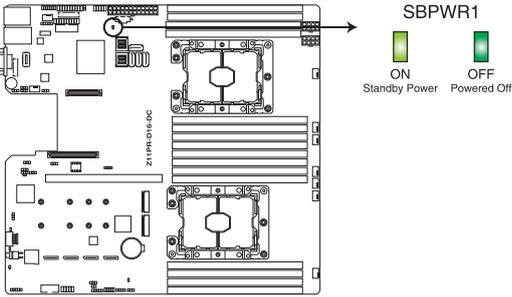
   Z11PR-D16-DC Standby Power LED

2. **BMC LED (BMCLED1)**

   The BMC LED lights up to indicate that the on-board BMC is functional.
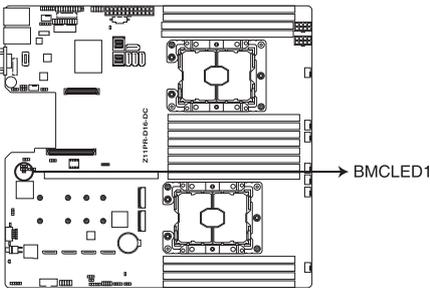
   BMCLED1

   Z11PR-D16-DC BMC LED

   This LED functions only when you enable ASUS ASMB9.

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.
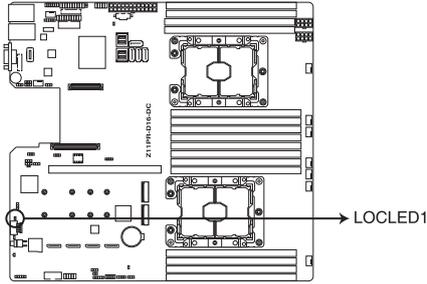
Z11PR-D16-DC Location LED

4. **CATT LED (CATTERR_LED1)**

   The CATT LED indicates that the system has experienced a fatal or catastrophic error and cannot continue to operate.
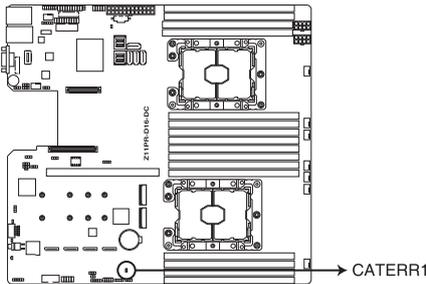
Z11PR-D16-DC CATERR LED

5. **Message LED (MESLED1)**

This onboard LED lights up to red when there is a BMC event log is generated.
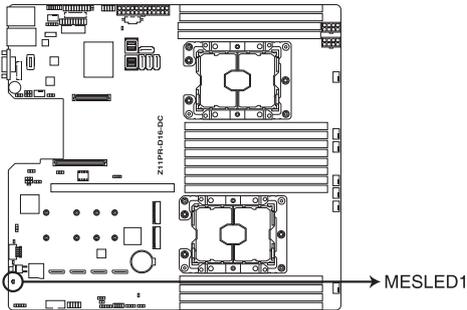
Z11PR-D16-DC MESLED

6. **Hard disk activity LED (HDDLED1)**

This LED is for the storage devices connected to the onboard SATA, or SATA/SAS add-on card. The read or write activities of any device connected to the onboard SATA, or SATA/SAS add-on card causes the rear panel LED to light up.
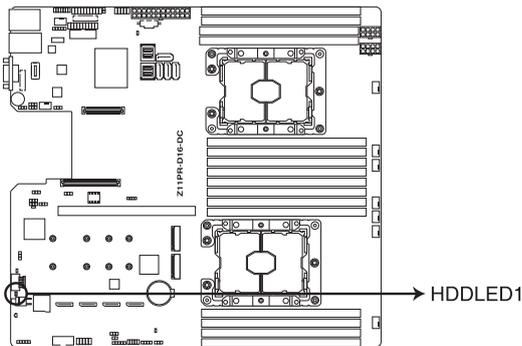
Z11PR-D16-DC Storage device activity LED

4.4 Internal connectors

1. Serial ATA 6.0Gb/s connectors (7-pin SSATA1-4)

Supported by the Intel® C621 chipset, these connectors are for the Serial ATA signal cables for Serial ATA hard disk drives (SATA 1 connector is used for the optical drive by default).

SSATA4

GND
RSATA_TXP4
RSATA_TXN4
GND
RSATA_RXN4
RSATA_RXP4
GND

SSATA1	SSATA2	SSATA3
GND	GND	GND
RSATA_TXP3	RSATA_TXP2	RSATA_TXP1
RSATA_TXN3	RSATA_TXN2	RSATA_TXN1
GND	GND	GND
RSATA_RXN3	RSATA_RXN2	RSATA_RXN1
RSATA_RXP3	RSATA_RXP2	RSATA_RXP1
GND	GND	GND

Z11PR-D16-DC SSATA connectors
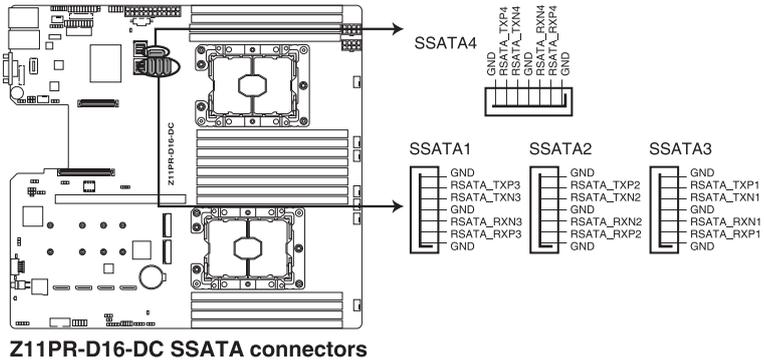
The actual data transfer rate depends on the speed of Serial ATA hard disks installed.

2. 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.

PSUSMB1

I2C1SCL
I2C1SDA
I2C1ALT
GND
+3.3V

Z11PR-D16-DC Power supply SMBus connector
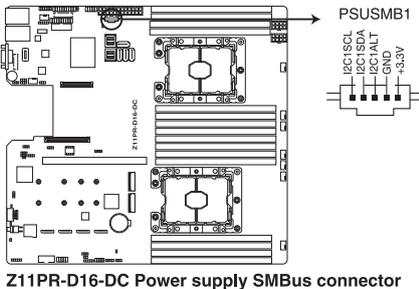
This connector functions only when you enable ASUS ASMB9.

3. **USB 2.0 connector (10-1 pin USB9_10; USB78)**

The 10-1 pin connector allows you to connect a USB 2.0 module for additional USB 2.0 front or rear panel ports. The 4-pin USB (Universal Serial Bus) Type-A port is available for connecting USB 2.0 devices. These USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.
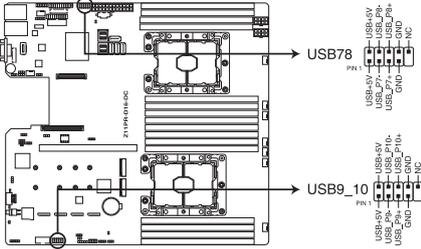
Z11PR-D16-DC USB 2.0 connectors

4. **USB 3.0 connector (20-1 pin USB3_34; 4-pin Type-A USB3_5)**

The 20-1 pin connector allows you to connect a USB 3.0 module for additional USB 3.0 front or rear panel ports. The 4-pin USB (Universal Serial Bus) Type-A port is available for connecting USB 3.0 devices.
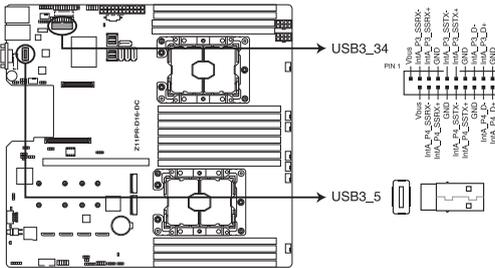
Z11PR-D16-DC USB 3.0 connector

5. CPU, front, and rear fan connectors (4-pin FRNT_FAN1-7, REAR_FAN1-2)

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.

Z11PR-D16-DC FAN connectors
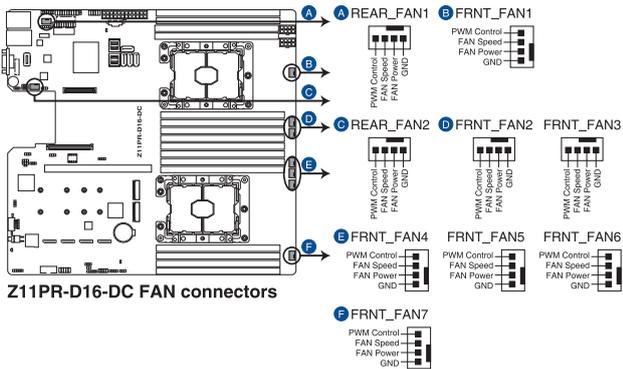
6. LAN Activity LED connector (5-1 pin LAN34_LED1)

These leads are for 10G LAN activity LEDs on the front panel. Connect the LAN LED cable to the backplane for LAN activity indication.

Z11PR-D16-DC LAN3 & LAN4 LED
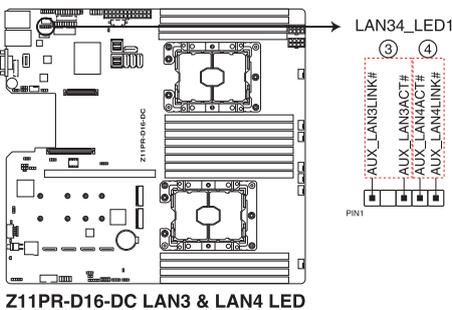
7. **Serial port connector (10-1 pin COM1)**

    This connector is for the serial COM port. Connect the serial port module cable to one of these connectors, then install the module to a slot opening at the back of the system chassis.
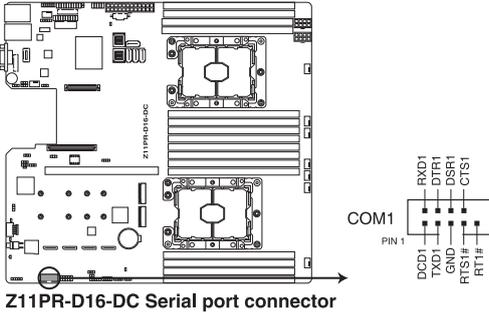
Z11PR-D16-DC Serial port connector

8. **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.
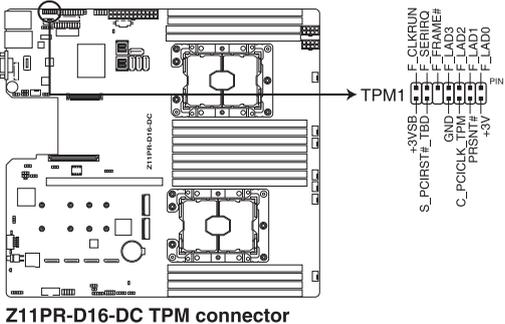
Z11PR-D16-DC TPM connector

9. **ATX power connectors (24-pin EATXPWR1, 8-pin EATX12V1-2)**

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.

- 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.

Z11PR-D16-DC ATX power connectors
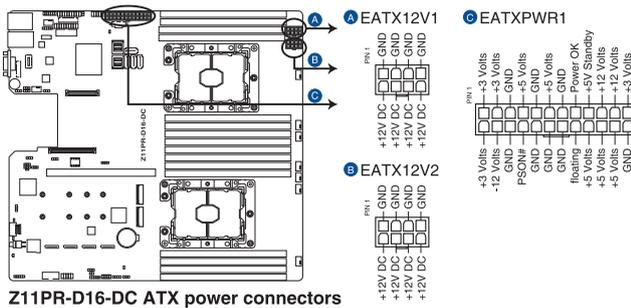
10. **System panel connector (20-1 pin PANEL1)**

This connector supports several chassis-mounted functions.
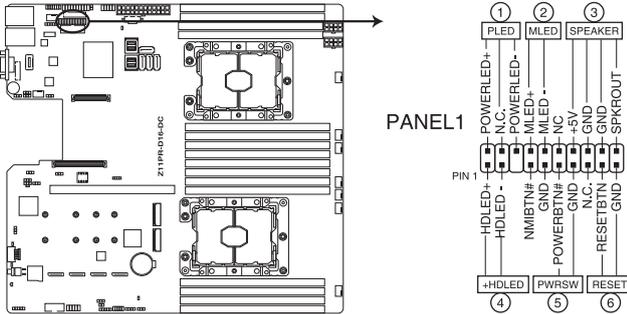
Z11PR-D16-DC System panel connector

1. **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.

2. **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 the BMC to indicate an abnormal event occurrence.

3. **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.

4. **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 LED lights up or flashes when data is read from or written to the HDD.

5. **ATX 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 seconds while the system is ON turns the system OFF.

6. **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.

11. **Auxiliary panel connector (20-2 pin AUX_PANEL1, 20-pin AUX_PANEL2)**

This connector is for additional front panel features including front panel SMB, locator LED and switch, chassis intrusion, and LAN LEDs.

Z11PR-D16-DC
Auxiliary panel connectors

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

   These leads connect the front panel SMBus cable.

2. **LAN activity LED (2-pin LAN1_LED, LAN2_LED)**

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

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

   These leads are 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.

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

   These leads are for the locator button on the front panel. This button queries the state of the system locator.

5. **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.

12. **VGA connector (10-1 pin VGA_HDR1)**

   This connector supports the VGA High Dynamic-Range interface.

VGA_HDR1

DDC_CLK
H_SYNC —— ■ ■ —— V_SYNC
            ■ ■ —— DDC_DATA
+5V ——   ■ ■ —— GND
GND ——   ■ ■ —— GND
GND ——   ■ ■ —— GND
Blue ——
Red ——   ■ ■ —— Green

PIN 1
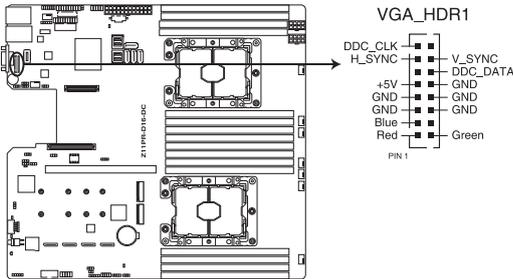
Z11PR-D16-DC Internal VGA connector

13. **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.

NC
ADD_IN_CARD-
ADD_IN_CARD-
NC

HDLED1 ▪ ▪ ▪ ▪
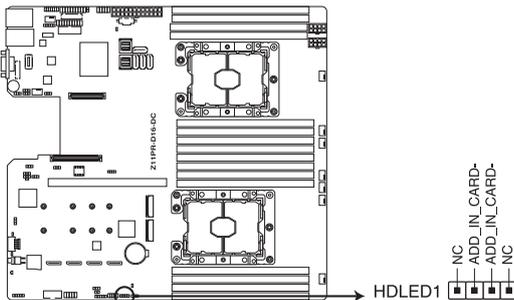
Z11PR-D16-DC Storage device activity LED connector

14. **Chassis Intrusion connectors (2-pin INTRUSION1-2)**

These leads are for the intrusion detection feature for chassis with intrusion sensor or microswitch. When you remove any chassis component, the sensor triggers and sends a high level signal to these leads to record a chassis intrusion event. The default setting is short CASEOPEN and GND pin by jumper cap to disable the function.
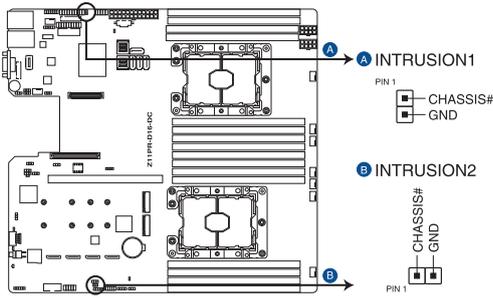
Z11PR-D16-DC Chassis Intrusion connectors

15. **OCUPCIE connectors (OCUPCIE1-4)**

Connects the PCIE signal to the NVME port on the backplane.
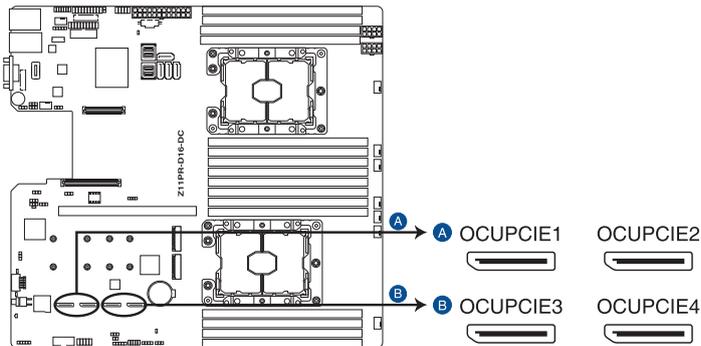
Z11PR-D16-DC OCUPCIE connectors

16. M.2 (NGFF) connectors (NGFF1-2)

These connectors allow you to install M.2 devices.

Z11PR-D16-DC NGFF connectors

NGFF2

NGFF1
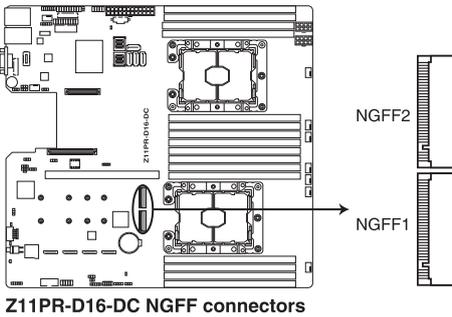
> This connector supports type 2242/2260/2280/22110 devices on both PCI-E and SATA interface.

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

17. Mezzanine PCIE card connectors (MEZZPCIE1-2)

The MEZZPCIE1-2 connector supports Open Compute Project (OCP) cards.

A MEZZPCIE2

B MEZZPCIE1

Z11PR-D16-DC MEZZPCIE connectors
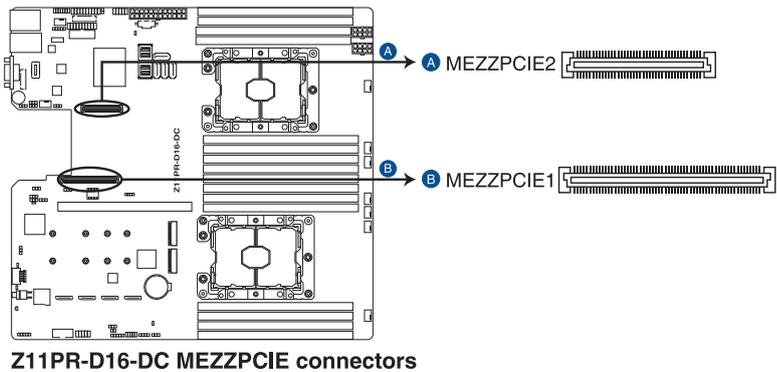
18. OCP LAN Activity LED connector (4-1 pin OCP_LED1)

OCP LAN LED connector supports OCP LAN card Active LED.
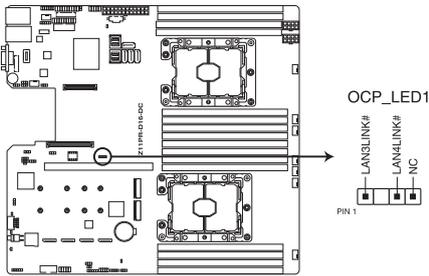
Z11PR-D16-DC OCP_LED1 connector

19. Micro SD card slot (MSD1)

Your motherboard supports SD Memory Card v2.00 (SDHC) / v3.00 (SDXC).
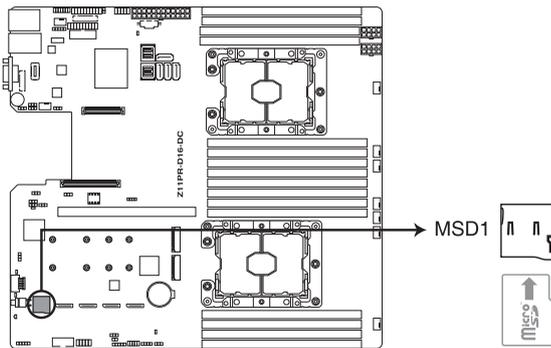
Z11PR-D16-DC MSD1

Disconnect all power (including redundant PSUs) from the existing system before you add or remove a Memory Card, then reboot the system to access the Memory Card.

• This Micro SD card slot functions only when you enable ASUS ASMB9.

• Some memory cards may not be compatible with your motherboard. Ensure that you use only compatible memory cards to prevent loss of data, damage to your device, or memory card, or both.

20. 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.
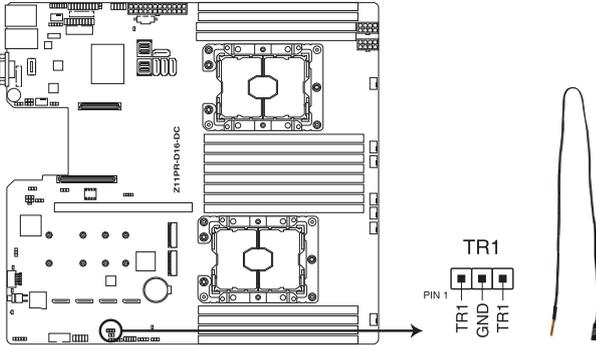
Z11PR-D16-DC Thermal sensor cable connector

21. Mini-SAS HD connectors (ISATA1-2)

This motherboard comes with mini Serial Attached SCSI (SAS) HD connectors, the storage technology that supports Serial ATA. Each connector supports up to four devices.
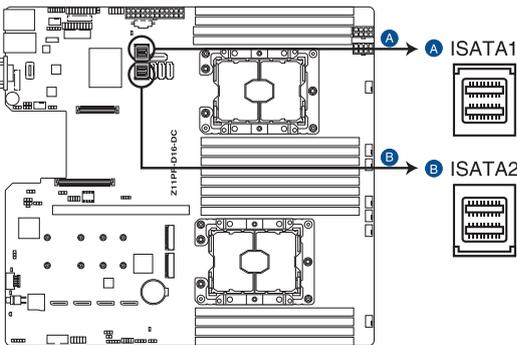
Z11PR-D16-DC ISATA connectors

22. VPP_I2C1 connector (10-1 pin VPP_I2C1)

This connector is used for the Intel VMD function and sensor readings.

Z11PR-D16-DC VPP_I2C1 connector
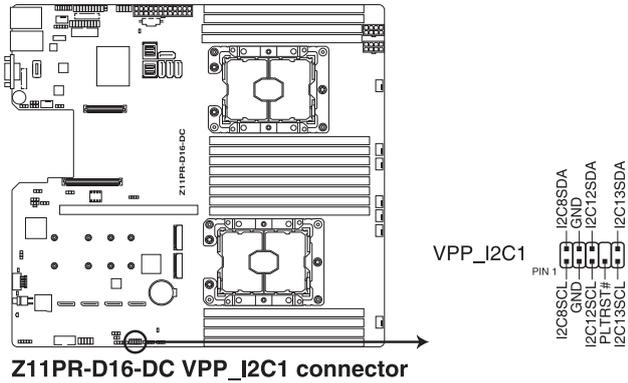
23. VROC_KEY connector (4-pin VROC_KEY1)

This connector allows you to connect a KEY module to support Intel VMD RAID function.

Z11PR-D16-DC VROC_KEY1
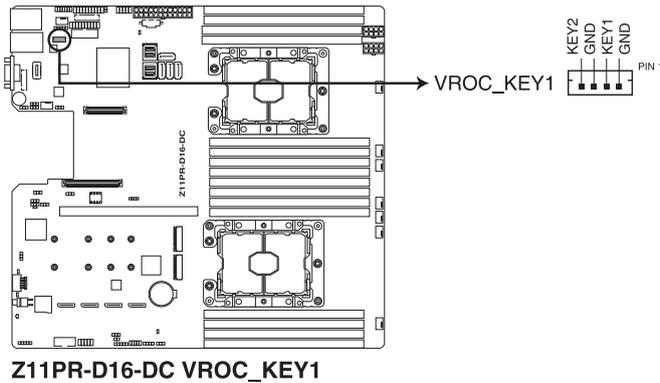
24. **System Management Bus (SMBUS) connector (5-1 pin SMBUS1)**

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

Z11PR-D16-DC SMBUS connector
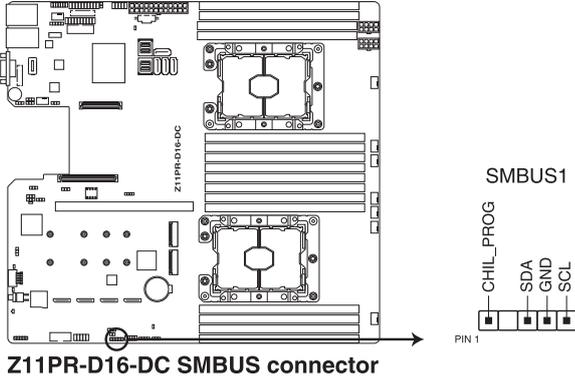
BIOS Setup

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.

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 to download the latest BIOS file.

5.1.2 ASUS EZ Flash Utility

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

Before you start using this utility, download the latest BIOS from the ASUS website at www.asus.com.

To update the BIOS using EZ Flash Utility:

1. Insert the USB flash disk that contains the latest BIOS file into the USB port.

2. Enter the BIOS setup program. Go to the **Tool** menu then select **ASUS EZ Flash Utility**. Press <Enter>.

```
                    ASUS Tek. EzFlash Utility

/SYS Current Platform              New Platform
Platform : Z11PR-D16-DC     Platform : Z11PR-D16-DC
Version :   0201            Version :   0207
Build Date :12/04/2018      Build Date :01/05/2018

FS0         System Volume Information          <DIR>
            Z11PR-D16-DC BIOS                  <DIR>
            Windows                            <DIR>




[Up/Down/Left/Right]:Switch [Enter]:Choose [q]:Exit
```
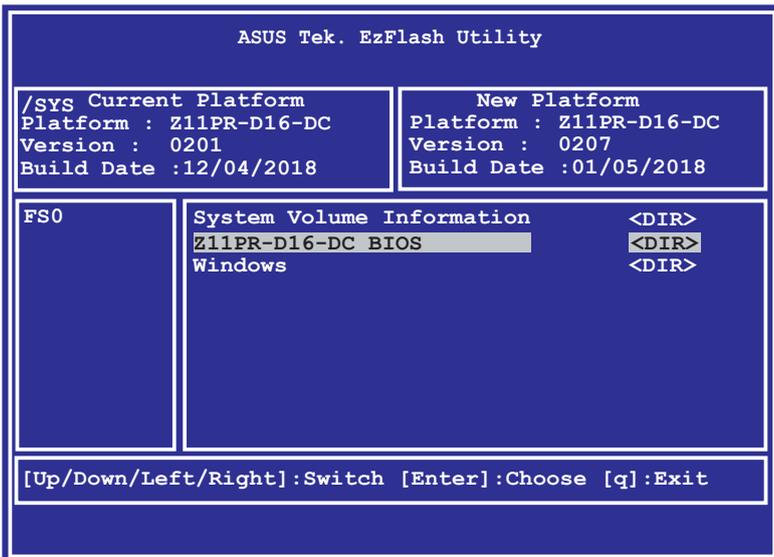
3. Press <Tab> to switch to the **Drive** field.

4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, then press <Enter>.

5. Press <Tab> to switch to the **Folder Info** field.

6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.

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

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

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 the DOS environment using a bootable USB flash disk drive with the updated BIOS file.

Updating the BIOS file

To update the BIOS file using the BUPDATER utility:

1. Visit the ASUS website at www.asus.com and download the latest BIOS file for the motherboard. Save the BIOS file to a bootable USB flash disk drive.

2. Copy the BUPDATER utility (BUPDATER.exe) from the ASUS support website at https://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
   ```

4.   The utility verifies the file, then starts updating the BIOS file.
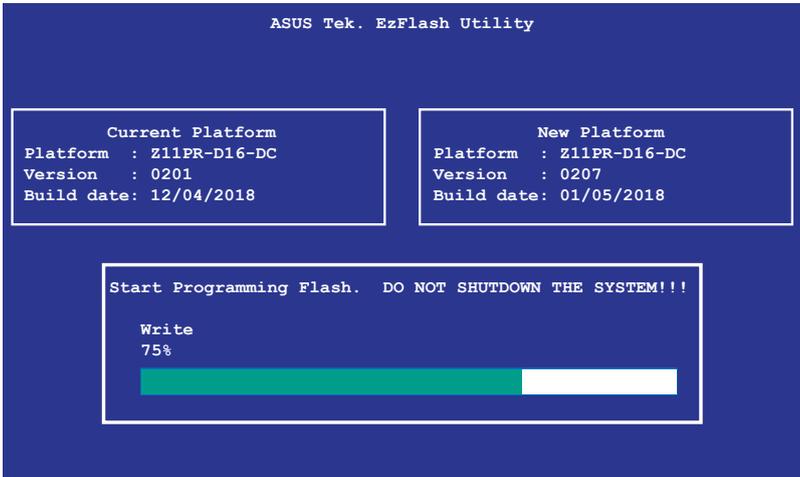
```
                     ASUS Tek. EzFlash Utility



          Current Platform                          New Platform
 Platform  : Z11PR-D16-DC             Platform  : Z11PR-D16-DC
 Version   : 0201                     Version   : 0207
 Build date: 12/04/2018               Build date: 01/05/2018



      Start Programming Flash.  DO NOT SHUTDOWN THE SYSTEM!!!

         Write
         75%
```

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

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

```
 The BIOS update is finished! Please restart your system.

 C:\>
```
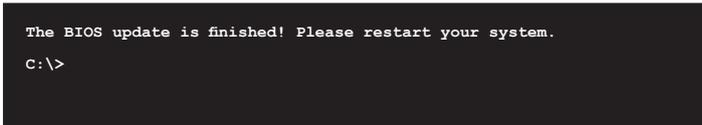
5.2 BIOS setup program

This motherboard supports a programmable firmware chip that you can update using the provided utility described in section **5.1 Managing and updating your BIOS**.

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

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

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

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

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

- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Press <F5> and select **Yes** to load the BIOS default settings.

- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.

- Visit the ASUS website (www.asus.com) to download the latest BIOS file for this motherboard.

5.2.1   BIOS menu screen

Menu items   **Menu bar**   **Configuration fields**   **General help**

```
                  Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
      Main  Performance Tuning  Advanced  Platform Configuration  Socket Configuration  Event Logs  ▶

      BIOS Information                                              Set the Date. Use Tab to
      BIOS Vendor                     American Megatrends           switch between Date elements.
      Core Version                    5.14                          Default Ranges:
      Compliancy                      UEFI 2.7; PI 1.6              Year: 1998-9999
      Project Version                 5101 x64                      Months: 1-12
      Build Date                      01/31/2019                    Days: Dependent on month
      BMC Firmware Revision           1.11                          Range of Years may vary.
      System Serial Number            System Serial Number
      RC Revision                     0561.D09

      Memory Information
      Total Memory                    32768 MB
      Memory Frequency                2400 MHz
                                                                   ►◄: Select Screen
      BIOS Sub Version                S19013101                    ▲▼: Select Item
                                                                   Enter: Select
      System Date                     [Tue 02/12/2019]             +/-: Change Opt.
      System Time                     [15:43:57]                   F1: General Help
                                                                   F2: Previous Values
      Access Level                    Administrator                F5: Optimized Defaults
                                                                   F10: Save Changes & Reset
      INTEL I350 LAN1 MAC:            18:31:BF:D0:5F:99            F12: Print Screen
      INTEL I350 LAN2 MAC:            18:31:BF:D0:5F:9A            ESC: Exit

                  Version 2.20.1274. Copyright (C) 2019 American Megatrends, Inc.
```

Navigation keys

5.2.2   Menu bar

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

Main	For changing the basic system configuration
Performance Tuning	For changing the performance settings
Advanced	For changing the advanced system settings
Platform Configuration	For changing the platform settings
Socket Configuration	For changing the socket settings
Event Logs	For changing the event log settings
Server Mgmt	For changing the Server Mgmt settings
Security	For changing the security settings
Boot	For changing the system boot configuration
Tool	For configuring options for special functions
Save & Exit	For selecting the exit options

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

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 (such as Advanced) 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, language, and security settings.

```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
  Main  Performance Tuning  Advanced  Platform Configuration  Socket Configuration  Event Logs ▶

  BIOS Information                                          Set the Date. Use Tab to
  BIOS Vendor                    American Megatrends        switch between Date elements.
  Core Version                   5.14                       Default Ranges:
  Compliancy                     UEFI 2.7; PI 1.6           Year: 1998-9999
  Project Version                5101 x64                   Months: 1-12
  Build Date                     01/31/2019                 Days: Dependent on month
  BMC Firmware Revision          1.11                       Range of Years may vary.
  System Serial Number           System Serial Number
  RC Revision                    0561.D09

  Memory Information
  Total Memory                   32768 MB
  Memory Frequency               2400 MHz

  BIOS Sub Version               S19013101                  ➔←: Select Screen
                                                            ↑↓: Select Item
  System Date                    [Tue 02/12/2019]           Enter: Select
  System Time                    [15:43:57]                 +/-: Change Opt.
                                                            F1: General Help
  Access Level                   Administrator              F2: Previous Values
                                                            F5: Optimized Defaults
  INTEL I350 LAN1 MAC:           18:31:BF:D0:5F:99          F10: Save Changes & Reset
  INTEL I350 LAN2 MAC:           18:31:BF:D0:5F:9A          F12: Print Screen
                                                            ESC: Exit


                Version 2.20.1274. Copyright (C) 2019 American Megatrends, Inc.
```

5.3.1 System Date [Day xx/xx/xxxx]

Allows you to set the system date.

5.3.2 System Time [xx:xx:xx]

Allows you to set the system time.

5.4   Performance Tuning menu

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

```
                  Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
        Main   Performance Tuning  Advanced  Platform Configuration  Socket Configuration  Event Logs   ►

    Optimized Performance Setting        [Default]              The following setting shows
    Core Optimizer                       [Disabled]             the recommended BIOS setting
    Engine Boost                         [Disabled]             to optimize for performance
    Power Balancer                       [Disabled]             includes those
```
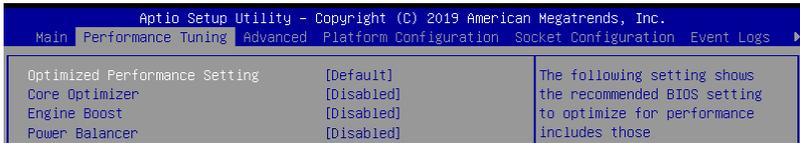
Optimized Performance Setting [Default]

Allows you to select performance settings for different scenarios.

[Default]   Default settings.

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

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

Configuration options:

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

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

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

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

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

Core Optimizer [Disabled]

Enable this item to keep the processor operating at the turbo frequency.
Configuration options: [Disabled] [Enabled]

> Linux support may vary by version of the OS.

Engine Boost [Disabled]

Enable this item to boost the CPU's frequency.
Configuration options: [Disabled] [Level1] [Level2] [Level3(Max)]

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

Power Balancer [Disabled]

Select [Enable Auto] to dynamically adjust the frequency of all CPU cores based on the current utilization, delivering better performance per watt for improved system energy efficiency.
Configuration options: [Disabled] [Enable Auto] [Enable Manual]

5.5   Advanced menu

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

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

```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
     Main  Performance Tuning  Advanced  Platform Configuration  Socket Configuration  Event Logs  ▶

 ▶ Trusted Computing                                    Trusted Computing Settings
 ▶ ACPI Settings
 ▶ SMART Settings
 ▶ Super IO Configuration
 ▶ Serial Port Console Redirection
 ▶ Onboard LAN Configuration
 ▶ APM
 ▶ PCI Subsystem Settings
 ▶ USB Configuration
 ▶ CSM Configuration
 ▶ NVMe Configuration

 ▶ Network Stack Configuration
 ▶ iSCSI Configuration                                  ↔: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F5: Optimized Defaults
                                                        F10: Save Changes & Reset
                                                        F12: Print Screen
                                                        ESC: Exit


                Version 2.20.1274. Copyright (C) 2019 American Megatrends, Inc.
```

5.5.1 Trusted Computing

```
                    Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                       Advanced

  Configuration                                               Enables or Disables BIOS
    Security Device Support            [Enable]               support for security device.
    NO Security Device Found                                 O.S. will not show Security
                                                             Device. TCG EFI protocol and
                                                             INT1A interface will not be
                                                             available.
```

Configuration

Security Device Support [Disabled]

Allows you to enable or disable the BIOS support for security device.
Configuration options: [Disabled] [Enabled]

5.5.2 ACPI Settings

```
                    Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                       Advanced

  ACPI Settings                                               Enables or Disables BIOS ACPI
                                                              Auto Configuration.
    Enable ACPI Auto Configuration     [Disabled]

    Enable Hibernation                 [Enabled]
```

Enable ACPI Auto Configuration [Disabled]

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

Enable Hibernation [Enabled]

Allows you to enable or disable the ability of the system to hibernate (OS/Sleep State).
Configuration options: [Disabled] [Enabled]

This option may be not effective with some OS.

5.5.3   Smart Settings

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                          Advanced

 SMART Settings                                       Run SMART Self Test on all
                                                      HDDs during POST.
 SMART Self Test                    [Enabled]
```

SMART Self Test [Enabled]

Allows you to run SMART Self Test on all HDDs during POST.
Configuration options: [Disabled] [Enabled]

5.5.4   Super IO Configuration

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                          Advanced

 Super IO Configuration                               Set Parameters of Serial Port
                                                      1 (COMA)
 Super IO Chip                      NCT6793D
▶ Serial Port 1 Configuration
```
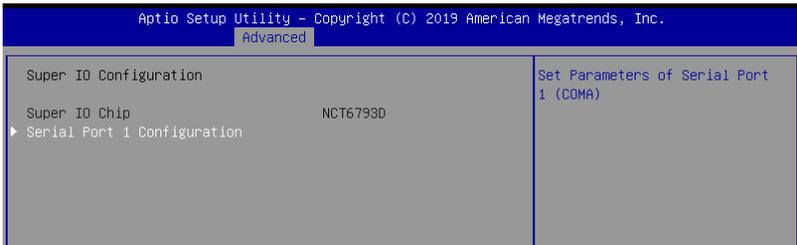
Serial Port 1 Configuration
Allows you to set the parameters of Serial Port 1.

Serial Port [Enabled]
Allows you to enable or disable Serial Port.
Configuration options: [Disabled] [Enabled]

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

Change Settings [Auto]

Allows you to choose the setting for Super IO device.
Configuration options: [Auto] [IO=3F8h; IRQ=4;]
                      [IO=3F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;]
                      [IO=2F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;]
                      [IO=3E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;]
                      [IO=2E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;]

5.5.5   Serial Port Console Redirection

```
           Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                       Advanced

                                                            Console Redirection Enable or
    COM1                                                    Disable.
    Console Redirection                 [Disabled]
  ▶ Console Redirection Settings

    COM2
    Console Redirection                 [Disabled]
  ▶ Console Redirection Settings

    Legacy Console Redirection
  ▶ Legacy Console Redirection Settings

    Serial Port for Out-of-Band Management/
    Windows Emergency Management Services (EMS)            ↔: Select Screen
    Console Redirection                 [Disabled]         ↑↓: Select Item
  ▶ Console Redirection Settings                           Enter: Select
                                                           +/-: Change Opt.
```

COM1/COM2

Console Redirection [Disabled]

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

> The following item appears only when you set **Console Redirection** 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 [VT-UTF8]

Allows you to set the terminal type.

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

Bits per second [57600]

Selects serial port transmission speed. The speed must be matched on the other side.
Long or noisy lines may require lower speeds.
Configuration options: [9600] [19200] [38400] [57600] [115200]

Data Bits [8]

Configuration options: [7] [8]

Parity [None]
A parity bit can be sent with the data bits to detect some transmission errors. [Mark] and [Space] parity do not allow for error detection.

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

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

Flow Control [Hardware RTS/CTS]
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]

Legacy OS Redirection Resolution [80x24]
This allows you to set the number of rows and columns supported on the Legacy OS.
Configuration options: [80x24] [80x25]

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

Redirection After BIOS POST [Always Enable]
This setting allows you to specify if Bootloader is selected than Legacy console redirection.
Configuration options: [Always Enable] [Bootloader]

Legacy Console Redirection Settings

Legacy Console Redirection Port [COM1]
Allows you to select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.
Configuration options: [COM1] [COM2]

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 you set **Console Redirection** to **[Enabled]**.

Console Redirection Settings

Out-of-Band Mgmt Port [COM1]
Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.
Configuration options: [COM1] [COM2]

Terminal Type [VT-UTF8]
Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.
Configuration options: [VT100] [VT100+] [VT-UTF8] [ANSI]

Bits per second [115200]
Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.
Configuration options: [9600] [19200] [57600] [115200]

Flow Control [None]
Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.
Configuration options: [None] [Hardware RTS/CTS] [Software Xon/Xoff]

5.5.6　Onboard LAN Configuration

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                        Advanced

   Onboard I350 LAN Configuration                                    Intel LAN Enable/Disable

   INTEL I350 LAN1 MAC:             18:31:BF:D0:5F:99
   INTEL I350 LAN2 MAC:             18:31:BF:D0:5F:9A
   Intel LAN1 Enable                [Enabled]
   Intel LAN1 ROM Type              [PXE]
   Intel LAN2 Enable                [Enabled]
   Intel LAN2 ROM Type              [Disabled]
```

Onboard I350 LAN Configuration

Intel LAN1 Enable [Enabled]
Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

> The following items appear only when **Intel LAN1 Enable** is set to **[Enabled]**.

Intel LAN 1 ROM Type [PXE]
Allows you to select the Intel LAN ROM type.
Configuration options: [PXE] [iSCSI] [Disabled]

Intel LAN2 Enable [Enabled]
Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

> The following items appear only when **Intel LAN2 Enable** is set to **[Enabled]**.

Intel LAN 2 ROM Type [Disabled]
Allows you to select the Intel LAN ROM type.
Configuration options: [PXE] [iSCSI] [Disabled]

5.5.7   APM

Allows you to configure the Advance Power Management (APM) settings.

```
                 Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                          Advanced

    Restore On AC Power Loss            [Last State]        Specify what state to go to
    Power On By PCIE                    [Disabled]          when power is re-applied after
    Power On By RTC                     [Disabled]          a power failure (G3 state).
```
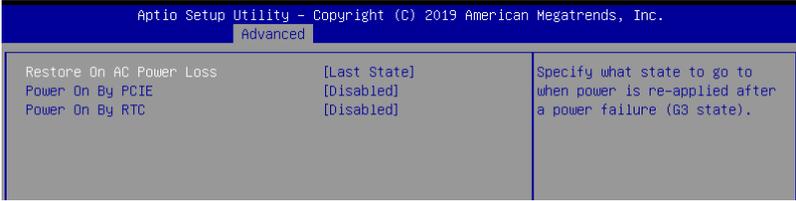
Restore AC Power Loss [Last State]
When set to [Power Off], the system goes into off state after an AC power loss. When set to [Power On], the system will reboot after an AC power loss. When set to [Last State], the system goes into either off or on state, whatever the system state was before the AC power loss.
Configuration options: [Power Off] [Power On] [Last State]

Power On By PCIE [Disabled]
[Disabled]   Disables the PCIE devices to generate a wake event.

[Enabled]   Enables the PCIE devices to generate a wake event.

Power On By RTC [Disabled]
[Disabled]   Disables RTC to generate a wake event.

[Enabled]   When set to [Enabled], the items **RTC Alarm Date (Days)** and **Hour/Minute/Second** will become user-configurable with set values.

5.5.8 PCI Subsystem Settings

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

```
              Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                      Advanced

    PCI Devices Common Settings:                              Enables or Disables RT32 Image
    Load RT32 Image                     [Enabled]             Loading.
    Above 4G Decoding                   [Disabled]
    SR-IOV Support                      [Enabled]
    BME DMA Mitigation                  [Disabled]

  ▶ PCI Express Settings
```
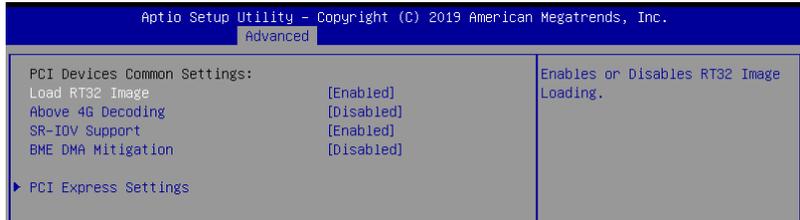
Load RT32 Image [Enabled]
This option allows you to enable or disable RT32 Image Loading.
Configuration options: [Disabled] [Enabled]

Above 4G Decoding [Disabled]
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]

SR-IOV Support [Enabled]
This option enables or disables SIngle Root IO Virtualization Support if the system has SR-IOV capable PCIe devices.
Configuration options: [Disabled] [Enabled]

BME DMA Mitigation [Disabled]
This allows you to enable or disable re-enabling Bus Master Attribute disabled during PCI enumeration for PCI Bridges after SMM locked.
Configuration options: [Disabled] [Enabled]

PCIE Express Settings

PCI Express Device Register Settings

Relaxed Ordering [Enabled]
Enables or disables PCI Express device relaxed ordering.
Configuration options: [Disabled] [Enabled]

Extended Tag [Disabled]
If Enable allows device is use 8-bit tag field as a requester.
Configuration options: [Disabled] [Enabled]

No Snoop [Enabled]
Enables or disables PCI Express device No snoop option.
Configuration options: [Disabled] [Enabled]

PCI Express Link Register Settings

ASPM Support [Disabled]
Allows to set the ASPM level. Configuration options: [Disabled] [Auot] [Force L0s]
[Force L0s]   Force all links to L0s state.
[Auto]   BIOS auto configure.
[Disabled]   Disabled ASPM.

Unpopulated Links [Keep Link ON]
In order to save power, software will disable unpopulated PCI Express links, if this
option set to Disabled.
Configuration options: [Keep Link ON] [Disabled]

PCIE OPROM Slot Options

PCIE1-3 Slot OPROM [Enabled]
This option allows you to enable or disable the OPROM of the PCIe slots.
Configuration options: [Disabled] [Enabled]

MEZZ1 Slot OPROM [Enabled]
This option allows you to enable or disable the OPROM of the MEZZ slot.
Configuration options: [Disabled] [Enabled]

5.5.9 USB Configuration

```
             Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                     Advanced

    USB Configuration                                    Enables Legacy USB support.
                                                         AUTO option disables legacy
    USB Module Version            21                     support if no USB devices are
                                                         connected. DISABLE option will
    USB Controllers:                                     keep USB devices available
        1 XHCI                                           only for EFI applications.
    USB Devices:
        5 Drives, 2 Keyboards, 1 Mouse, 1 Hub

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


    Mass Storage Devices:
    JetFlashTranscend 4GB 8.07    [Auto]             ↔: Select Screen
    AMI Virtual CDROM0 1.00       [Auto]             ↑↓: Select Item
    AMI Virtual Floppy0 1.00      [Auto]             Enter: Select
    AMI Virtual HDisk0 1.00       [Auto]             +/-: Change Opt.
    AMI Virtual HDisk1 1.00       [Auto]             F1: General Help
                                                     F2: Previous Values
                                                     F5: Optimized Defaults
                                                     F10: Save Changes & Reset
```

Legacy USB Support [Enabled]

Allows you to enable or disable Legacy USB device support.
Configuration options: [Enabled] [Disabled] [Auto]

USB Mass Storage Driver Support [Enabled]

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

Mass Storage Devices

AMI Virtual CDROM0-2 / Floppy / HDisk0 1.00 [Auto]

Allows you to select the mass storage device emulation type.
Configuration options: [Auto] [Floppy] [Forced FDD] [Hard Disk] [CD-ROM]

5.5.10   CSM Configuration

```
              Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                     Advanced

     Compatibility Support Module Configuration            Enable/Disable CSM Support.

     CSM Support                        [Enabled]

     CSM16 Module Version               07.82

     GateA20 Active                     [Upon Request]
     Option ROM Messages                [Force BIOS]
     INT19 Trap Response                [Immediate]

     Boot option filter                 [Legacy only]

     Option ROM execution
                                                          ++: Select Screen
     Network                            [Legacy]          ↑↓: Select Item
     Storage                            [Legacy]          Enter: Select
     Video                              [Legacy]          +/-: Change Opt.
     Other PCI devices                  [Legacy]          F1: General Help
                                                          F2: Previous Values
```

CSM Support [Enabled]
This option allows you to enable or disable CSM Support.
Configuration options: [Disabled] [Enabled]

> The following item appears only when **CSM Support** is set to **[Enabled]**.

GateA20 Active [Upon Request]
This allows you to set the GA20 option.
Configuration options: [Upon Request] [Always]

Option ROM Messages [Force BIOS]
This allows you to set the display mode for option ROM.
Configuration options: [Force BIOS] [Keep Current]

INT19 Trap Response [Immediate]

[Immediate]	Execute the trap right away.
[Postponed]	Execute the trap during legacy boot.

Boot Option filter [Legacy only]
This option allows you to control the Legacy/UEFI ROMs priority.
Configuration options: [UEFI and Legacy] [Legacy only] [UEFI only]

Network / Storage / Video [Legacy]
This option allows you to control the execution of UEFI and Legacy PXE / Storage / Video OpROM.
Configuration options: [UEFI] [Legacy]

Other PCI devices [Legacy]
This item determines the OpROM execution policy for devices other than Network, Storage, or Video.
Configuration options: [UEFI] [Legacy]

5.5.11 NVMe Configuration

This page will display the NVMe controller and drive information.

```
        Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                     Advanced

 NVMe controller and Drive information

 No NVME Device Found
```

5.5.12 Network Stack Configuration

```
        Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                     Advanced

 Network Stack                    [Disabled]           Enable/Disable UEFI Network
                                                        Stack
```

Network stack [Disabled]
Enables or disables the network stack feature.
Configuration options: [Disable] [Enable]

The following item appears only when **Network stack** is set to **[Enabled]**.

Ipv4 PXE Support [Disabled]
Enables or disables the Ipv4 PXE Boot Support. If disabled, Ipv4 PXE boot option will
not be created.
Configuration options: [Disabled] [Enabled]

Ipv4 HTTP Support [Disabled]
Enables or disables the Ipv4 HTTP Boot Support. If disabled, Ipv4 HTTP boot option
will not be created.
Configuration options: [Disabled] [Enabled]

Ipv6 PXE Support [Disabled]
Enables or disables the Ipv6 PXE Boot Support. If disabled, Ipv6 PXE boot option will
not be created.
Configuration options: [Disabled] [Enabled]

Ipv6 HTTP Support [Disabled]
Enables or disables the Ipv6 HTTP Boot Support. If disabled, Ipv6 HTTP boot option
will not be created.
Configuration options: [Disabled] [Enabled]

PXE boot wait time [0]
Wait time to press ESC key to abort the PXE boot.

Media detect time [1]
Wait time (in seconds) to detect media.

5.5.13 iSCSI Configuration

Allows you to configure the iSCSi parameters.

```
             Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                         Advanced

   iSCSI Initiator Name                              The worldwide unique name of
                                                     iSCSI Initiator. Only IQN
 ▶ Add an Attempt                                    format is accepted. Range is
                                                     from 4 to 223
 ▶ Delete Attempts

 ▶ Change Attempt Order
```
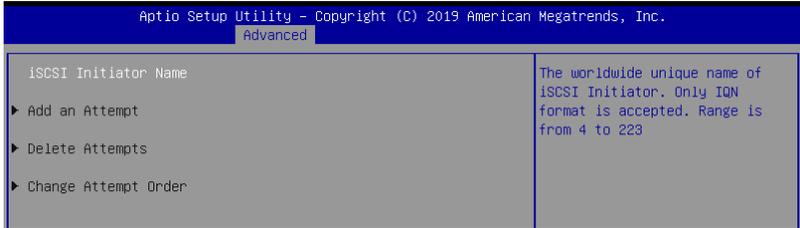
5.6 Platform Configuration menu

The IntelRCSetup menu items allow you to change the platform settings.

```
             Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
       Main  Performance Tuning  Advanced  Platform Configuration  Socket Configuration  Event Logs  ▶

 ▶ PCH Configuration                                 Displays and provides option
 ▶ Miscellaneous Configuration                       to change the PCH Settings
 ▶ Server ME Configuration
 ▶ Runtime Error Logging

   ------------------------------------------------
   Setup Warning:
   Setting items on this Screen to incorrect values
   may cause system to malfunction!
```

5.6.1 PCH Configuration

```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                       Platform Configuration
┌────────────────────────────────────────────────┬──────────────────────────┐
│ PCH Configuration                               │ Enable/Disable Intel(R) IO│
│ -----------------------------------------------  │ Controller Hub devices    │
│                                                 │                           │
│▶ PCH Devices                                    │                           │
│▶ PCI Express Configuration                      │                           │
│▶ PCH SATA Configuration                         │                           │
│▶ PCH sSATA Configuration                        │                           │
│▶ USB Configuration                              │                           │
│                                                 │                           │
└────────────────────────────────────────────────┴──────────────────────────┘
```

PCH Devices

DeepSx Power Policies [Disabled]
Allows you to configure the DeepSx Mode configuration.
Configuration options: [Disabled] [Enabled in S5] [Enabled in S4 and S5]

GP27 Wake From DeepSx [Disabled]
Allows you to enable or disable GP27 Wake From DeepSx.
Configuration options: [Disabled] [Enabled]

PCI Express Configuration

PCI-E ASPM Support (Global) [L1 Only]
Allows you to select ASPM support for all downstream devices.
Configuration options: [Per individual port] [L1 Only]

PCH DMI ASPM [Platform-POR]
Allows you to configure the PCH DMI ASPM.
Configuration options: [Platform-POR] [ASPM L1] [Disabled]

PCH SATA Configuration

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

Configure sSATA as [AHCI]
Allows you to identify the SATA port connected to Solid State Drive or Hard Disk Drive.
Configuration options: [IDE] [AHCI] [RAID]

Support Aggressive Link Power Management [Enabled]
Allows you to enable or disable the Support Aggressive Link Power (SALP) Management.
Configuration options: [Disabled] [Enabled]

SATA Port 1-8

> ***Port 1-8***
> Allows you to enable or disable the SATA port.
> Configuration options: [Disabled] [Enabled]

PCH sSATA Configuration

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

Configure sSATA as [AHCI]
Allows you to identify the SATA port connected to Solid State Drive or Hard Disk Drive.
Configuration options: [IDE] [AHCI] [RAID]

Support Aggressive Link Power Management [Enabled]
Allows you to enable or disable the Support Aggressive Link Power (SALP)
Management.
Configuration options: [Disabled] [Enabled]

sSATA Port 1-3

> ***Port 1-3***
> Allows you to enable or disable the SATA port.
> Configuration options: [Disabled] [Enabled]

USB Configuration

USB Precondition [Disabled]
Allows you to enable or disable precondition work on USB host controller and root ports
for faster enumeration.
Configuration options: [Disabled] [Enabled]

XHCI Manual Mode [Disabled]
This option is used by validation.
Configuration options: [Disabled] [Enabled]

> The following items appears only when the **XHCI Manual Mode** is set to **[Enabled]**.

> ***Trunk Clock Gating (BTCG) [Enabled]***
> Allows you to enable or disable BTCG.
> Configuration options: [Disabled] [Enabled]

> ***Enable USB 3.0 pins [Disable all pins]***
> Allows you to enable or disable USB 3.0 pins or on a per pin basis.
> Configuration options: [Select Per-Pin] [Disable all pins] [Enable all pins]

USB Per-Connector Disable [Disabled]
Allows you to enable or disable each of the USB physical connectors. Once a
connector is disabled, any USB devices plugged into the connector will not be detected
by BIOS or OS.
Configuration options: [Disabled] [Enabled]

The following items appears only when the **USB Per-Connector Disable** is set to **[Enabled]**.

> ***USB_1-8 [Enabled]***
> Configuration options: [Disabled] [Enabled]
>
> ***USB3_1-5 [Enabled]***
> Configuration options: [Disabled] [Enabled]

Security Configuration

> **SMM BIOS Write Protect [Enabled]**
> Allows you to enable or disable SMM BIOS Write Protect.
> Configuration options: [Disabled] [Enabled]

5.6.2   Miscellaneous Configuration

```
             Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                    Platform Configuration

Miscellaneous Configuration                                    Select active Video type
------------------------------------------------

Active Video                        [Offboard Device]
```

Active Video [Offboard Device]
Allows you to select the video type.
Configuration options: [Auto] [Onboard Device] [Offboard Device]

5.6.3   Server ME Configuration

Displays the Server ME Technology parameters on your system.

```
             Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                    Platform Configuration

General ME Configuration
Oper. Firmware Version              0A:4.1.3.237
Backup Firmware Version             0A:4.1.3.237
Recovery Firmware Version           0A:4.1.3.237
ME Firmware Status #1               0x000F0245
ME Firmware Status #2               0x8811C026
  Current State                     Operational
PTT Support                         [Disable]
ME Firmware Features
  SiEn                              Support
  NM                               Support
```

5.6.4 Runtime Error Logging Support

```
                    Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                                    Platform Configuration
─────────────────────────────────────────────────────────────────────────────────
  Runtime Error Logging                                          System Error Enable/Disable
  ─────────────────────────────────────────────────             setup options.
  System Errors                         [Enable]
▶ WHEA Settings
```
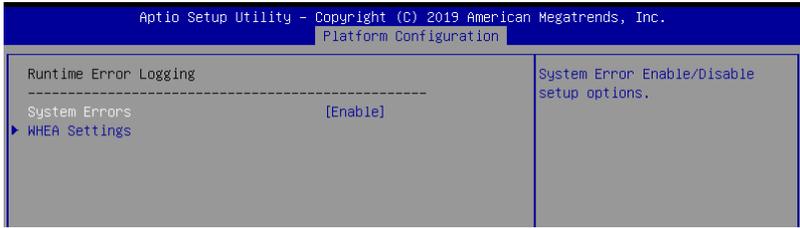
Runtime Error Logging

System Errors [Enabled]
This item allows you to enable or disable System Errors.
Configuration options: [Disabled] [Enabled]

Whea Settings

Whea Support [Disabled]
This item allows you to enable or disable the WHEA support.
Configuration options: [Disabled] [Enabled]

5.7 Socket Configuration menu

The IntelRCSetup menu items allow you to change the socket settings.

```
                    Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
       Main  Performance Tuning  Advanced  Platform Configuration  Socket Configuration  Event Logs  ▶
─────────────────────────────────────────────────────────────────────────────────
▶ Processor Configuration                                       Displays and provides option
▶ Common RefCode Configuration                                  to change the Processor
▶ UPI Configuration                                             Settings
▶ Memory Configuration
▶ IIO Configuration
▶ Advanced Power Management Configuration
```

5.7.1 Processor Configuration

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                                      Socket Configuration

  Processor Configuration                            ▲  Change Per-Socket Settings
  ----------------------------------------------
▶ Per-Socket Configuration
  Processor BSP Revision          50654 - SKX U0
  Processor Socket                Socket 1    Socket 2
  Processor ID                    00050654* |    N/A
  Processor Frequency             2.100GHz  |    N/A
  Processor Max Ratio                  15H  |    N/A
  Processor Min Ratio                  08H  |    N/A
  Microcode Revision              02000057  |    N/A
  L1 Cache RAM                         64KB |    N/A
  L2 Cache RAM                       1024KB |    N/A
  L3 Cache RAM                      11264KB |    N/A
  Processor 1 Version             Intel(R) Xeon(R) Silv...  ←→: Select Screen
  Processor 2 Version             Not Present               ↑↓: Select Item
                                                            Enter: Select
  Hyper-Threading [ALL]           [Enable]                  +/-: Change Opt.
  Enable Intel(R) TXT             [Disable]                 F1: General Help
  VMX                             [Enable]                  F2: Previous Values
  Enable SMX                      [Disable]                 F5: Optimized Defaults
  Hardware Prefetcher             [Enable]                  F10: Save Changes & Reset
  L2 RFO Prefetch Disable         [Disable]                 F12: Print Screen
  Adjacent Cache Prefetch         [Enable]                  ESC: Exit
  DCU Streamer Prefetcher         [Enable]
  DCU IP Prefetcher               [Enable]               ▼

          Version 2.20.1274. Copyright (C) 2019 American Megatrends, Inc.
```

Hyper Threading [ALL] [Enabled]
Allows you to enable or disable the Hyper-Threading Technology function. When disabled, only one thread per activated core is enabled.
Configuration options: [Disabled] [Enabled]

Enable Intel(R) TXT Support [Disabled]
Forces the XD feature log to always return 0 when disabled.
Configuration options: [Disabled] [Enabled]

VMX [Enabled]
Enables the Vanderpool Technology. Takes effect after reboot.
Configuration options: [Disabled] [Enabled]

Enable SMX [Disabled]
Enables the Safer Mode Extensions.
Configuration options: [Disabled] [Enabled]

Hardware Prefetcher [Enabled]
This Item allows you to turn on/off the mid level cache(L2) streamer prefetcher.
Configuration options: [Disabled] [Enabled]

L2 RFO Prefetch Disable [Disabled]
This Item allows you to turn on/off L2 RFO prefetcher.
Configuration options: [Disabled] [Enabled]

Adjacent Cache Prefetch [Enabled]
This Item allows you to turn on/off prefetching of adjacent cache lines.
Configuration options: [Disabled] [Enabled]

DCU Streamer Prefetcher [Enabled]
This Item allows you to enable or disable prefetcher of next L1 data line.
Configuration options: [Disabled] [Enabled]

DCU IP Prefetcher [Enabled]
This Item allows you to enable or disable prefetch of next L1 line based upon sequential load history.
Configuration options: [Disabled] [Enabled]

LLC Prefetch [Disabled]
This Item allows you to enable or disable LLC Prefetch on all threads.
Configuration options: [Disabled] [Enabled]

DCU Mode [32K 8Way Without ECC]
Configuration options: [32K 8Way Without ECC] [16K 4Way With ECC]

Extended APIC [Disabled]
This Item allows you to enable or disable the extended APIC support.
Configuration options: [Disabled] [Enabled]

AES-NI [Enabled]
This Item allows you to enable or disable the AES-NI support.
Configuration options: [Disabled] [Enabled]

5.7.2   Common RefCode Configuration

```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                                          Socket Configuration

  Common RefCode Configuration                            Select MMIO High Base
  --------------------------------------------------
  MMIO High Base                    [56T]
  MMIO High Granularity Size        [256G]
  Numa                              [Enable]
```
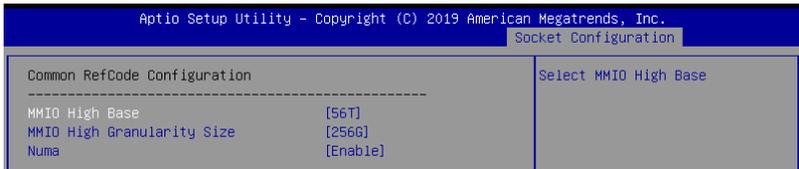
MMIO High Base [56T]
This item allows you to select the MMIO High Base.
Configuration options: [56T] [40T] [24T] [16T] [4T] [1T]

MMIO High Granularity Size [256G]
This item allows you to select the allocation size used to assign MMIOH resources.
Configuration options: [1G] [4G] [16G] [64G] [256G] [1024G]

Numa [Enabled]
This item enables or disables the Non uniform Memory Access (NUMA).
Configuration options: [Disabled] [Enabled]

5.7.3 UPI Configuration

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                                    Socket Configuration
  UPI General Configuration                        UPI Status Help
  ------------------------------------------------
▶ UPI Status
  Link Speed Mode                    [Fast]
  Link Frequency Select              [Auto]
  Link L0p Enable                    [Auto]
  Link L1 Enable                     [Auto]
  Directory Mode Enable              [Enable]
  SNC                                [Disable]
  KTI Prefetch                       [Enable]
  Local/Remote Threshold             [Auto]
  Stale AtoS                         [Auto]
  LLC dead line alloc                [Enable]
```
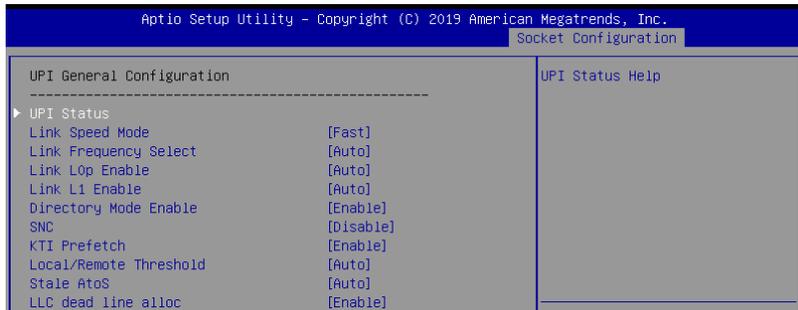
UPI General Configuration

UPI Status
This item displays information about the UPI status.

Link Speed Mode [Fast]
This item allows you to select the UPI link speed as either the fast mode or slow mode.
Configuration options: [Slow] [Fast]

Link Frequency Select [Auto]
This item allows for selecting the UPI link frequency.
Configuration options: [Auto] [9.6 GB/s] [10.4 GB/s] [Use Per Link Setting]

UPI Link0p Enable [Enabled]
Configuration options: [Disabled] [Enabled] [Auto]

UPI Link1 Enable [Enabled]
Configuration options: [Disabled] [Enabled] [Auto]

Directory Mode Enable [Enabled]
Configuration options: [Disabled] [Enabled]

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

KTI Prefetch [Enabled]
Configuration options: [Disabled] [Enabled]

Local/Remote Threshold [Auto]
Configuration options: [Disabled] [Auto] [Low] [Medium] [High]

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

LLC dead line alloc [Enabled]
Configuration options: [Disabled] [Enabled] [Auto]

5.7.4 Memory Configuration

```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                                         Socket Configuration

    ---------------------------------------------      Enable - Enforces Plan Of
     Integrated Memory Controller (iMC)                Record restrictions for DDR4
    ---------------------------------------------      frequency and voltage
                                                       programming. Disable -
     Enforce POR                        [Auto]         Disables this feature. Auto -
     Memory Frequency                   [Auto]         Sets it to the MRC default
     Data Scrambling for DDR4           [Auto]         setting; current default is
    ▶ Memory Topology                                  Enable.
    ▶ Page Policy
    ▶ Memory Map
    ▶ Memory RAS Configuration
    ▶ NGN Configuration
                                                       ↔: Select Screen
```

Enforce POR [Auto]
Allows you to enforce POR restrictions for DDR4 frequency and voltage programming.
Configuration options: [Auto] [POR] [Disabled]

Memory Frequency [Auto]
Allows you to select the memory frequency setting.
Configuration options: [Auto] [1800] - [3000-OvrClk]

Data Scrambling for DDR4 [Auto]
Allows you to enable or disable data scrambling.
Configuration options: [Auto] [Disabled] [Enabled]

Memory Topology
Displays memory topology with DIMM population information.

Page Policy
Allows you to configure Page Policy settings.

> #### Page Policy [Disabled]
> Configuration options: [Auto] [Closed] [Adaptive]

Memory Map

> #### IMC Interleaving [Auto]
> Select different IMC interleaving setting.
> Configuration options: [Auto] [1-way Interleave] [2-way Interleave]

> #### Channel Interleaving [Auto]
> Select different channel interleaving setting.
> Configuration options: [Auto] [1-way Interleave] [2-way Interleave]
> [3-way Interleave]

Rank Interleaving [Auto]
Select different rank interleaving setting.
Configuration options: [Auto] [1-way Interleave] [2-way Interleave]
[4-way Interleave] [8-way Interleave]

Memory RAS Configuration

Mirror Mode [Disabled]
Allows you to select Mirror Modes. Mirror Mode will set entire 1LM/2LM memory in system to be mirrored, consequently reducing the memory capacity by half. Enabling Mirror Mode will disable XPT Prefetch.
Configuration options: [Disabled] [Mirror Mode 1LM] [Mirror Mode 2LM]

UEFI ARM Mirror [Disabled]
Allows you to enable or disable UEFI ARM Mirror.
Configuration options: [Disabled] [Enabled]

Memory Rank Sparing [Disabled]
Allows you to enable or disable Memory Rank Sparing
Configuration options: [Disabled] [Enabled]

Patrol Scrub [Enabled]
Allows you to enable or disable Patrol Scrub.
Configuration options: [Disabled] [Enabled]

NGN Configuration

Average Power Budget (in mW) [18000]
Allows you to set the power management policy for average power in 250 mW increments.
Configuration options: [10000] - [18000]

5.7.5   IIO Configuration

```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                                      Socket Configuration

      IIO Configuration
      -------------------------------------------------

    ▶ Socket1 Configuration
    ▶ Intel® VT for Directed I/O (VT-d)

      IIO-PCIE Express Global Options
      =======================================
      PCI-E ASPM Support (Global)           [Per-Port]
      Pcie Relaxed Ordering                 [Enable]
```
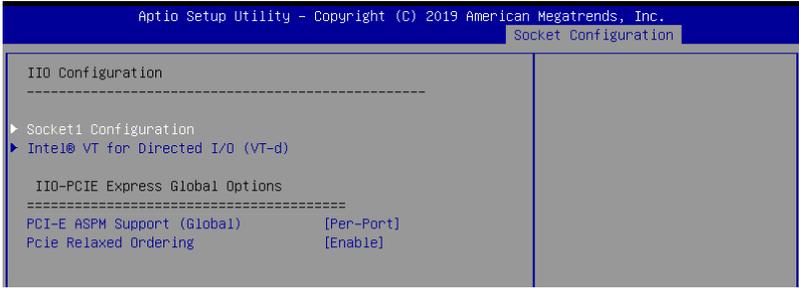
Socket1 Configuration
> This item allows you to configure settings related to the corresponding PCIE port.

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

Intel(R) VT for Directed I/O (VT-d) [Disabled]
Allows you to enable or disable the Intel Virtualization Technology for Directed I/O.
Configuration options: [Disabled] [Enabled]

PCI Express Global Options

PCI-E ASPM Support (Global) [Per-Port]
Allows you to enable or disable ASPM support for all downstream devices.
Configuration options: [Disabled] [Per-Port] [L1 Only]

PCIE relaxed Ordering [Enabled]
Allows you to enable or disable PCIE relaxed Ordering.
Configuration options: [Disabled] [Enabled]

5.7.6 Advanced Power Management Configuration

```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                                          Socket Configuration

   Advanced Power Management Configuration              P State Control Configuration
   ------------------------------------------------     Sub Menu, include Turbo, XE
 ▶ CPU P State Control                                  and etc.
 ▶ Hardware PM State Control
 ▶ CPU C State Control
 ▶ Package C State Control
 ▶ CPU Thermal Management
 ▶ CPU - Advanced PM Tuning
```
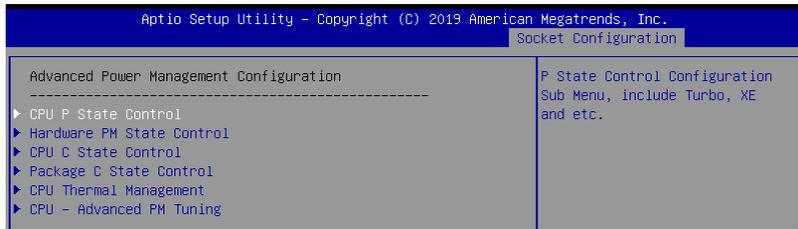
CPU P State Control

Boot performance mode [Max Performance]
Allows you to switch between Boot performance mode.
Configuration options: [Max Performance] [Max Efficient] [Set by Intel Node Manager]

Energy Efficient Turbo [Enabled]
Allows you to enable or disable Energy Efficient Turbo.
Configuration options: [Disabled] [Enabled]

Turbo Mode [Enabled]
Allows you to enable or disable Turbo Mode.
Configuration options: [Disabled] [Enabled]

Hardware PM State Control

Hardware P-States [Native Mode]
Allows you to switch between Hardware P-States mode.
Configuration options: [Disabled] [Native Mode] [Out of Band Mode] [Native Mode with no Legacy Support]

CPU C State Control

Autonomous Core C-State [Disabled]
Allows you to enable or disable Autonomous Core C-State Report.
Configuration options: [Disabled] [Enabled]

CPU C6 Report [Auto]
Allows you to select CPU C6 Report.
Configuration options: [Disabled] [Enabled] [Auto]

OS ACPI Cx [ACPI C2]
Allows you to select OS ACPI Cx Report.
Configuration options: [ACPI C2] [ACPI C3]

Package C State Control

Package C State [Auto]
Allows you to select Package C State.
Configuration options: [C0/C1 state] [C2 state] [C6(non Retention state] [C6(Retention state] [No Limit] [Auto]

CPU Thermal Control

CPU T-State Control

Software Controlled T-States [Disabled]
Allows you to enable or disable Software Controlled T-States.
Configuration options: [Disabled] [Enabled]

CPU - Advanced PM Tuning

Energy Perf BIAS

Power Performance Tuning [OS Controls EPB]

Configuration options: [OS Controls EPB] [BIOS Controls EPB]

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

PECI PCS EPB [OS Controls EPB]

This option controls whether PECI has control over EPB.
Configuration options: [OS Controls EPB] [PECI Controls EPB using PCS]

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

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

Dynamic Loadline Switch [Enabled]
Configuration options: [Disabled] [Enabled]

Workload Configuration [UMA]
This option allows optimization for the workload characterization.
Configuration options: [UMA] [NUMA]

Averaging Time Window [17]
This option is used to control the effective window of the average C0 an P0 time.
Configuration options: [0] - [FF]

P0 TotalTimeThreshold Low [23]
The HW switching mechanism DISABLES the performance setting (0) when the total P0 time is less than the threshold set.
Configuration options: [0] - [3F]

P0 TotalTimeThreshold High [3a]
The HW switching mechanism Enables the performance setting (0) when the total P0 time is greater than the threshold set.
Configuration options: [0] - [3F]

5.8   Event Logs menu

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

```
             Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
    Main   Performance Tuning   Advanced   Platform Configuration   Socket Configuration   Event Logs   ▶

▶ Change Smbios Event Log Settings                              Press <Enter> to change the
▶ View Smbios Event Log                                         Smbios Event Log configuration.
```

5.8.1   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]

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]

5.8.2   View Smbios Event Log

Press <Enter> to view all smbios event logs.

5.9 Server Mgmt menu

The Server Management menu displays the server management status and allows you to change the settings.

```
                 Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
     ◄ Server Mgmt  Security  Boot  Tool  Save & Exit

        BMC Self Test Status            PASSED              If enabled, starts a BIOS
        BMC Device ID                   32                  timer which can only be shut
        BMC Device Revision             1                   off by Management Software
        BMC Firmware Revision           1.11                after the OS loads.  Helps
        IPMI Version                    2.0                 determine that the OS
        BMC Interface(s)                KCS                 successfully loaded or follows
                                                            the OS Boot Watchdog Timer
        Current Time Zone               -05:00              policy.
        OS Watchdog Timer               [Disabled]
        OS Wtd Timer Timeout            [10 minutes]
        OS Wtd Timer Policy             [Reset]
     ► System Event Log
     ► BMC network configuration
     ► View System Event Log                                ►←: Select Screen
                                                            ↑↓: Select Item
```

OS Watchdog Timer [Disabled]
This item allows you to start a BIOS timer which can only be shut off by Intel Management Software after the OS loads.
Configuration options: [Disabled] [Enabled]

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

OS Wtd Timer Timeout [10 minutes]
Allows you to configure the length fo 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]

System Event Log
Allows you to change the SEL event log configuration.

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

When SEL is Full [Do Nothing]
Allows you to choose options for reactions to a full SEL.
Configuration options: [Do Nothing] [Erase Immediately]

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

View System Event Log
This item allows you to view the system event log records.

5.10   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.

```
            Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
  ◄ Server Mgmt  Security  Boot  Tool  Save & Exit

   Password Description                              Set Administrator Password

   If ONLY the Administrator's password is set,
   then this only limits access to Setup and is
   only asked for when entering Setup.
   If ONLY the User's password is set, then this
   is a power on password and must be entered to
   boot or enter Setup. In Setup the User will
   have Administrator rights.
   The password length must be
   in the following range:
   Minimum length                      3
   Maximum length                      20
                                                     ◄►: Select Screen
                                                     ↑↓: Select Item
   Administrator Password                            Enter: Select
   User Password                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
  ► Secure Boot                                      F5: Optimized Defaults
                                                     F10: Save Changes & Reset
                                                     F12: Print Screen
                                                     ESC: Exit
```

Administrator Password

To set an administrator password:

1.   Select the Administrator Password item and press <Enter>.

2.   From the Create New Password box, key in a password, then press <Enter>.

3.   Confirm the password when prompted.

To change an administrator password:

1.   Select the Administrator Password item and press <Enter>.

2.   From the Enter Current Password box, key in the current password, then press <Enter>.

3.   From the Create New Password box, key in a new password, then press <Enter>.

4.   Confirm the password when prompted.

To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password.

User Password

To set a user password:

1.   Select the User Password item and press <Enter>.

2.   From the Create New Password box, key in a password, then press <Enter>.

3.   Confirm the password when prompted.

To change a user password:

1.   Select the User Password item and press <Enter>.

2.   From the Enter Current Password box, key in the current password, then press <Enter>.

3.   From the Create New Password box, key in a new password, then press <Enter>.

4.   Confirm the password when prompted.

To clear a user password:

1.   Select the Clear User Password item and press <Enter>.

2.   Select **Yes** from the Warning message window then press <Enter>.

Secure Boot

This item allows you to customize the Secure Boot settings.

```
       Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
       Security

                                                  Secure Boot feature is Active
Secure Boot                       [Disabled]      if Secure Boot is Enabled,
                                  Not Active       Platform Key(PK) is enrolled
                                                  and the System is in User mode.
```

Secure Boot
Allows you to enable or disable Secure Boot.
Configuration options: [Disabled] [Enabled]

5.11 Boot menu

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

```
              Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
      ◀ Server Mgmt   Security   Boot   Tool   Save & Exit

       Boot Configuration                                            Set the order of the legacy
       Bootup NumLock State            [On]                          devices in this group
       Boot Logo Display               [Disabled]
         POST Report                   [5 sec]


       Boot Option Priorities
       Boot Option #1                  [AMI Virtual CDROM0...]
       Boot Option #2                  [JetFlashTranscend ...]
       Boot Option #3                  [IBA GE Slot 1700 v...]

       Hard Drive BBS Priorities
       CD/DVD ROM Drive BBS Priorities
       Network Device BBS Priorities
                                                                     ↔: Select Screen
                                                                     ↑↓: Select Item
                                                                     Enter: Select
```

Bootup NumLock State [On]
Allows you to select the power-on state for the NumLock.
Configuration options: [Off] [On]

Boot Logo Display [Auto]
Allows you to enable or disable the full screen logo display feature.
Configuration options: [Auto] [Full Screen] [Disabled]

POST Report [5 sec]
Allows you to set the desired POST Report waiting time from 1 to 10 seconds.
Configuration options: [1 sec] ~ [10 sec] [Until Press ESC]

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.

Hard Drive / CD/DVD ROM Drive / Network Device BBS Priorities
These items appear allow you to set the order of the legacy devices in this group.

5.12 Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.

```
            Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
◀ Server Mgmt  Security  Boot  Tool  Save & Exit

                                                        Press ENTER to run the utility.

   IPMI Hardware Monitor
   Start EzFlash
```

IPMI Hardware Monitor
Allows you to run the IPMI hardware monitor.

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

5.13 Save & Exit menu

The Save & Exit menu items allow you to save or discard your changes to the BIOS items.

```
            Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
◀ Server Mgmt  Security  Boot  Tool  Save & Exit

   Discard Changes and Exit                             Exit system setup without
   Save Changes and Reset                               saving any changes.

   Restore Defaults

   Boot Override
   JetFlashTranscend 4GB 8.07
   AMI Virtual CDROM0 1.00
   IBA GE Slot 1700 v1578

   Launch EFI Shell from filesystem device
```
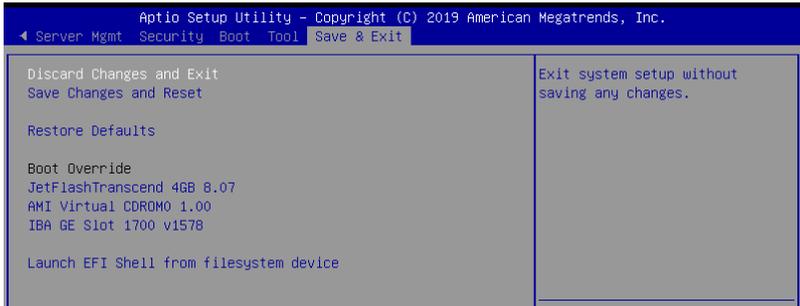
Pressing <Esc> does not immediately exit this menu. Select one of the options from this menu or <F10> from the legend bar to exit.

Discard Changes & Exit
Exit System setup without saving any changes.

Save Changes & Reset
Exit System setup after saving the changes.

Restore Defaults
Restore/load default values for all the setup options.

Boot Override
These items displays the available devices. The device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

RAID Configuration

6

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.

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.

- Please refer to chapter 2 for how to select the RAID configuration utility. Move the jumper to choose between LSI MegaRAID and Intel® Rapid RAID.

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® C621 chipset.

To do this:

1.   Enter the BIOS Setup during POST.

2.   Go to the **Platform Configuration** Menu > **PCH Configuration**, then press <Enter>.

3.   Set **Configure SATA as** to [RAID Mode].

4.   Press <F10> to save your changes and exit the BIOS Setup.

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

6.2 Intel® Rapid Storage Technology enterprise SATA Option ROM Utility

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

Before you proceed, ensure that you have installed the Serial ATA hard disk drives, and have set the correct SATA mode in the BIOS setup.

To launch the Intel® Rapid Storage Technology enterprise SATA Option ROM utility:

1. Turn on the system.

2. During POST, press <Ctrl>+<I> to display the utility main menu.

```
  Intel(R) Rapid Storage Technology enterprise - SATA Option ROM - 3.6.0.1023
        Copyright(C) 2003-12 Intel Corporation.  All Rights Reserved.
 ═══════════════════════════[ MAIN MENU ]═══════════════════════════
       1. Create RAID Volume          3. Reset Disks to Non-RAID
       2. Delete RAID Volume          4. Exit


 ═════════════════════[ DISK/VOLUME INFORMATION]═════════════════════
     RAID Volumes:
     None defined.

     Physical Disks:
     ID   Drive Model    Serial #           Size      Type/Status(Vol ID)
     0    ST3300656SS    HWAS0000991753TR   279.3GB   Non-RAID Disk
     1    ST3300656SS    37VN00009846RAJ1   279.3GB   Non-RAID Disk
     2    ST3300656SS    397600009846UEDY   279.3GB   Non-RAID Disk
     3    ST3300656SS    GWC50000991756G6   279.3GB   Non-RAID Disk




     [↑↓]-Select            [ESC]-Exit         [ENTER]-Select Menu
```

The navigation keys at the bottom of the screen allow you to move through the menus and select the menu options.

The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.

6.2.1 Creating a RAID set

To create a RAID set:

1. From the utility main menu, select **1. Create RAID Volume** and press <Enter>.

2. Key in a name for the RAID set and press <Enter>.

```
   Intel(R) Rapid Storage Technology enterprise - SATA Option ROM - 3.6.0.1023
          Copyright(C) 2003-12 Intel Corporation.   All Rights Reserved.
   ================= [ CREATE VOLUME MENU ] =================
                       Name:   Volume0
                 RAID Level:   RAID0(Strips)
                      Disks:   Select Disks
                 Strip Size:   128KB
                   Capacity:   0.0  GB
                       Syne:   N/A
                              Create Volume


   ======================= [ HELP ] =======================


         Enter a unique volume name that has no special characters and is
                          16 characters or less.




    [↑↓]Change        [TAB]-Next        [ESC]-Previous Menu        [ENTER]-Select
```

3. Press the up/down arrow keys to select a RAID Level that you wish to create then press <Enter>.

4. From the **Disks** item field, press <Enter> to select the hard disk drives that you want to include in the RAID set.

```
   ==================== [ SELECT DISKS ] ====================

   Port   Drive Model   Serial #            Size        Status
   0      ST3300656SS   HWAS0000991753TR    279.3GB     Non-RAID Disk
   1      ST3300656SS   37VN00009846RAJ1    279.3GB     Non-RAID Disk
   2      ST3300656SS   397600009846UEDY    279.3GB     Non-RAID Disk
   3      ST3300656SS   GWC50000991756G6    279.3GB     Non-RAID Disk

       Select 1 Master and 1 Recovery disk to create volume.

   == [↑↓]-Prev/Next [TAB]-(M)aster [SPACE]-(R)ecovery [ENTER]-Done ==
```
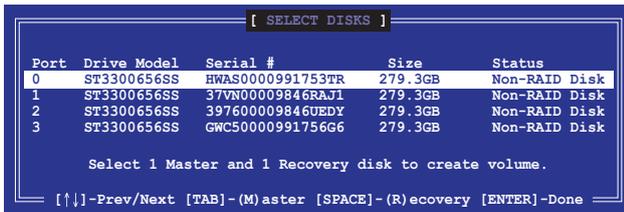
5. Use the up/down arrow keys to move the selection bar then press <Space> to select a disk. A small triangle before the Port number marks the selected drive. Press <Enter> when you are done.

6. Use the up/down arrow keys to select the stripe size for the RAID array (for RAID 0, 10 and 5 only) then press <Enter>. 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.

7. In the **Capacity** field item, key in the RAID volume capacity that you want to use and press <Enter>. The default value field indicates the maximum allowed capacity.

8. Press <Enter> to start creating the RAID volume.

9. From the following warning message, press <Y> to create the RAID volume and return to the main menu, or press <N> to go back to the **CREATE VOLUME** menu.

```
            WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

        Are you sure you want to create this volume? (Y/N):
```

6.2.2 Deleting a RAID set

⚠️ Take caution 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 utility main menu, select **2. Delete RAID Volume** and press <Enter>.

2.   From the Delete Volume Menu, press the up/down arrow keys to select the RAID set you want to delete then press <Del>.

```
     Intel(R) Rapid Storage Technology enterprise - SATA Option ROM - 3.6.0.1023
              Copyright(C) 2003-12 Intel Corporation.  All Rights Reserved.
     ════════════════════════[ DELETE VOLUME MENU ]════════════════════════

       Name          Level        Drives      Capacity      Status     Bootable
       Volume0       RAID0(Stripe)    2         298.0GB       Normal       Yes




     ═══════════════════════════════[ HELP ]═══════════════════════════════



              Deleting a volume will reset the disks to non-RAID

                     WARNING: ALL DISK DATA WILL BE DELETED.
                     (This does not apply to Recovery volumes)



         [↑↓]-Select            [ESC]-Previous Menu        [DEL]-Delete Volume
```

3.   Press <Y> to confirm deletion of the selected RAID set and return to the utility main menu, or press <N> to return to the **DELETE VOLUME** menu.

```
     ═══════════════════[ DELETE VOLUME VERIFICATION ]═══════════════════

                     ALL DATA IN THE VOLUME WILL BE LOST!
                     (This does not apply to Recovery volumes)

          Are you sure you want to delete volume "Volume0"? (Y/N):
```

6.2.3   Resetting disks to Non-RAID

⚠ Take caution before you reset a RAID volume hard disk drive to non-RAID. Resetting a RAID volume hard disk drive deletes all internal RAID structure on the drive.

To reset a RAID set:

1.   From the utility main menu, select **3. Reset Disks to Non-RAID** and press <Enter>.

2.   Press the up/down arrow keys to select the drive(s) or disks of the RAID set you want to reset, then press <Space>. A small triangle before the Port number marks the selected drive. Press <Enter> when you are done.

```
========================[ RESET RAID DATA ]========================
          Resetting RAID disk will remove its RAID structures
          and revert it to a non-RAID disk.

     WARNING: Resetting a disk causes all data on the disk to be lost.
     (This does not apply to Recovery volumes)

     Port  Drive Model    Serial #            Size       Status
     0     ST3300656SS    HWAS0000991753TR    279.3GB    Member Disk
     1     ST3300656SS    37VN00009846RAJ1    279.3GB    Member Disk

               Select the disks that should be reset.

===== [↑↓]-Previous/Next [SPACE]-Selects [ENTER]-Selection Complete =====
```

3.   Press <Y> in the confirmation window to reset the drive(s) or press <N> to return to the utility main menu.

6.2.4   Exiting the Intel® Rapid Storage Technology enterprise SATA Option ROM utility

To exit the utility:

1.   From the utility main menu, select **4. Exit** then press <Enter>.

2.   Press <Y> to exit or press <N> to return to the utility main menu.

```
                          [ CONFIRM EXIT ]
               Are you sure you want to exit? (Y/N):
```

6.2.5   Rebuilding the RAID

This option is only for the RAID 1 set.

Rebuilding the RAID with other non-RAID disk

If any of the SATA hard disk drives included in the RAID 1 array failed, the system displays the status of the RAID volume as "**Degraded**" during POST. You can rebuild the RAID array with other installed non-RAID disks.

To rebuild the RAID with other non-RAID disk:

1.   During POST, press <Ctrl>+<I> at the prompt to enter the Intel Rapid Storage Technology option ROM utility.

2.   If there is a non-RAID SATA Hard Disk available, the utility will prompt you to rebuild the RAID. Press the up/down arrow keys to select the destination disk then Press <Enter> to start the rebuilding process, or press <ESC> to exit.

```
                   [ DEGRADED VOLUME DETECTED ]
  "Degraded" volume and disk available for rebuilding detected. Selectign
  a disk initiates a rebuild. Rebuild completes in the operating system.

    Select the port of destination disk for rebuilding (ESC to exit):
    Port  Drive Model    Serial #            Size
    X     XXXXXXXXXXX    XXXXXXXX            XXX.GB

             [↑↓]-Previous/Next [ENTER]-Select [ESC]-Exit
```
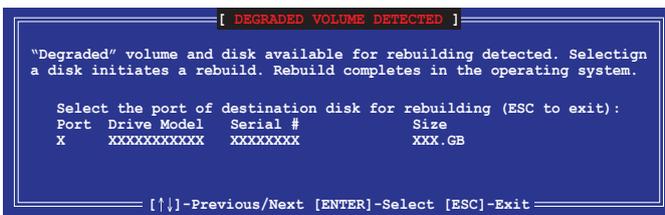
Select a destination disk with the same size as the original hard disk.

3. The utility immediately starts rebuilding after the disk is selected. When done, the status of the degraded RAID volume is changed to **"Rebuild"**.

```
Intel(R) Rapid Storage Technology enterprise - SATA Option ROM - 3.6.0.1023
        Copyright(C) 2003-12 Intel Corporation.  All Rights Reserved.
================================[ MAIN MENU ]================================
          1. Create RAID Volume             3. Reset Disks to Non-RAID
          2. Delete RAID Volume             4. Exit



==========================[ DISK/VOLUME INFORMATION]========================
    RAID Volumes:                                    *=Data is Encrypted
    ID    Name       Level1         Strip        Size    Status     Bootable
    1     Volume0    RAID1(Mirror)  N/A          149.0GB  Rebuild    Yes

    Physical Devices:
    Port  Drive Model   Serial #          Size     Type/Status(Vol ID)
    1     ST3160812AS   9LS0F4HL          149.0GB  Member Disk(0)
    2     ST3160812AS   3LS0JYL8          149.0GB  Member Disk(0)



  Volumes with "Rebuild" status will be rebuilt within the operating system.

     [↑↓]-Select              [ESC]-Exit           [ENTER]-Select Menu
```

4. Press <Esc> to exit Intel Rapid Storage Technology and reboot the system.

5. Select **Start > Programs > Intel Rapid Storage > Intel Rapid Storage Console** or click the **Intel Rapid Storage Technology** tray icon to load the Intel Rapid Storage Manager utility.

6. From the **View** menu, select **Advanced Mode** to display the details of the Intel Rapid Storage Console.

7. From the **Volumes view** option, select **RAID volume** to view the rebuilding status. When finished, the status is changed to "**Normal**".

Rebuilding the RAID with a new hard disk

If any of the SATA hard disk drives included in the RAID array failed, the system displays the status of the RAID volume as "**Degraded**" during POST. You may replace the disk drive and rebuild the RAID array.

To rebuild the RAID with a new hard disk:

1. Remove the failed SATA hard disk and install a new SATA hard disk of the same specification into the same SATA Port.

    Select a destination disk with the same size as the original hard disk.

2. Reboot the system then follow the steps in section **Rebuilding the RAID with other non-RAID disk**.

6.2.6   Setting the Boot array in the BIOS Setup Utility

You can set the boot priority sequence in the BIOS for your RAID arrays when creating multi-RAID using the Intel® Rapid Storage Technology enterprise SATA Option ROM utility.

To set the boot array in the BIOS:

> Set at least one of the arrays bootable to boot from the hard disk.

1.   Reboot the system and press <Del> to enter the BIOS setup utility during POST.

2.   Go to the **Boot** menu and select the boot option priority.

3.   Use up/down arrow keys to select the boot priority and press <Enter>. See the **Boot menu** section of Chapter 4 for more details.

4.   From the **Exit** menu, select **Save Changes & Exit**, then press <Enter>.

5.   When the confirmation window appears, select **Yes**, then press <Enter>.

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 7.

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® Rapid Storage Technology enterprise** 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.
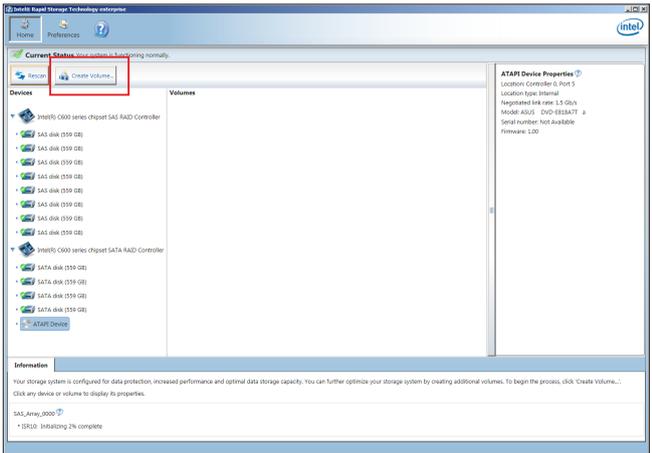
You can click **Rescan** to re-scan any attached hard disks.

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**.
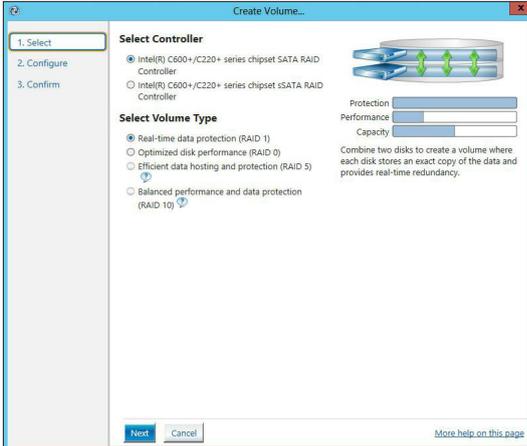
3. Enter a name for the RAID set, then select the array disks.

4. Select **Volume Size** tab, you can drag the bar to decide the volume size.

5. Click **Next**.
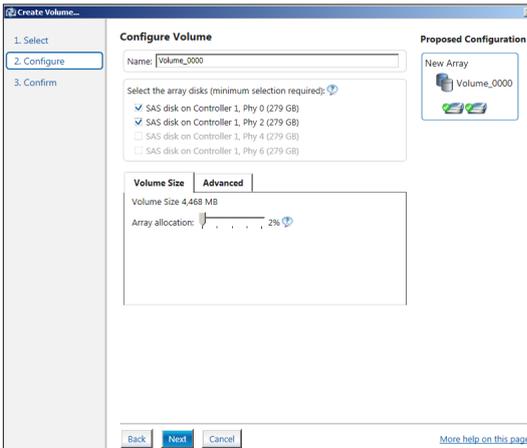
• If you do not want to keep the data on one of the selected disks, select **NO** when prompted.

• If you want to **Enable volume write-back cache** or **Initialize volume**, click **Advanced**.

6.   Confirm the volume creation, than 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.
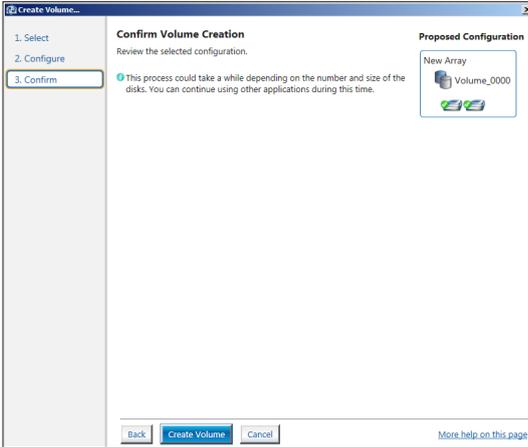
7.   Wait until the process is completed, then click **OK** when prompted.
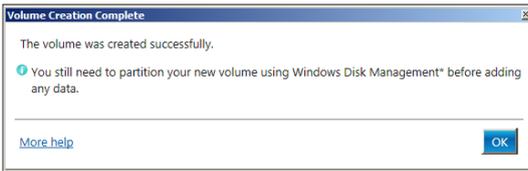
> You still need to partition your new volume using Windows Disk Management before adding any data.

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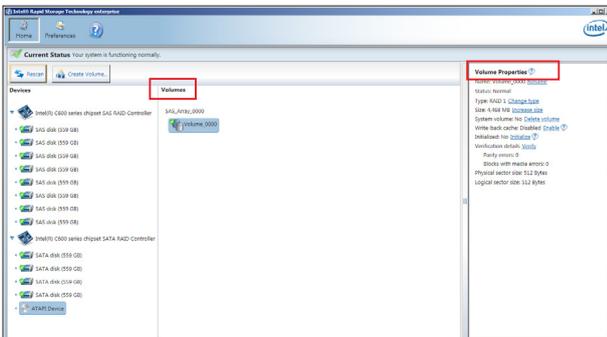
6.3.2 Changing a Volume Type

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**.
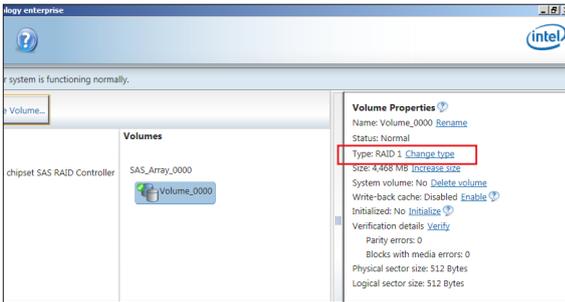
3. You can change the **Name**, **Select the new volume type**, and **Select additional disks to include in the new volume** if needed.

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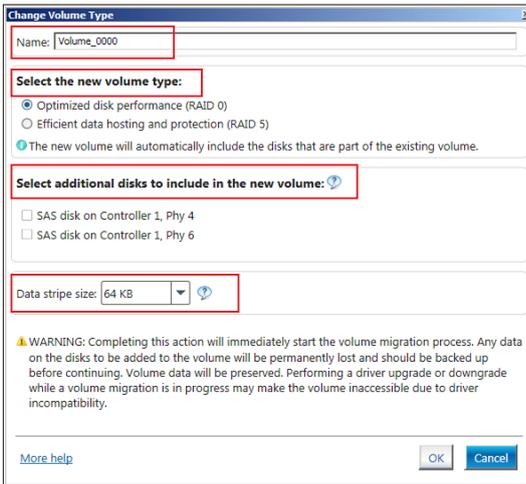
We recommend a lower stripe size for server systems, and a higher stripe size for multimedia computer systems used mainly for audio and video editing.

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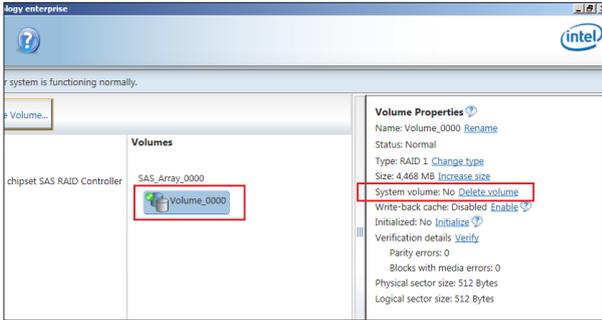
2.　Select **Delete volume** in **Volume Properties** field. The following screen appears.

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.
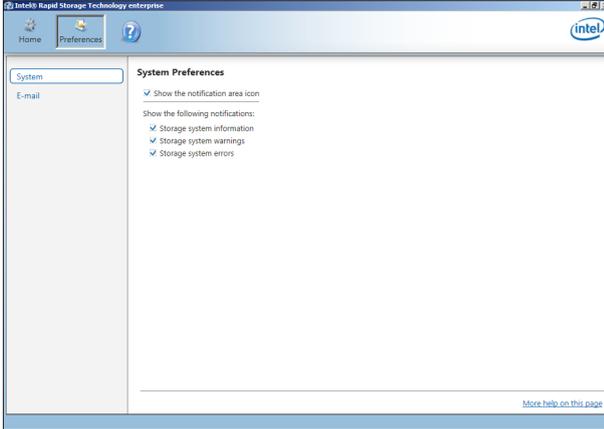
E-Mail Preferences

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

- Storage system information

- Storage system warnings

- Storage system errors
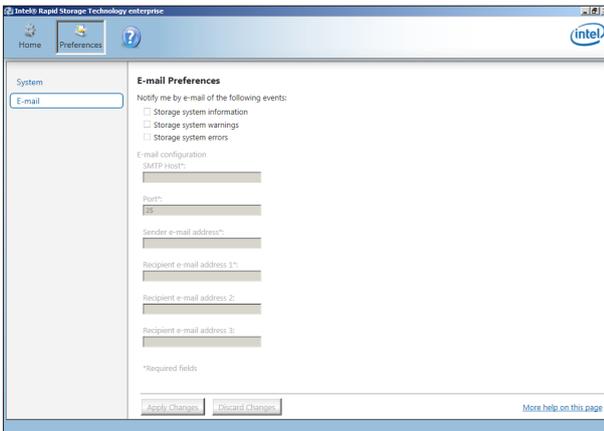
6.4   Intel® Virtual Raid on CPU in BIOS

This feature requires a KEY module to enable CPU RAID functions with Intel® CPU RSTe.

> • The KEY module is purchased separately.
>
> • Refer to section **4.4 Internal connectors** for the location of the VROC_KEY1 connector.

To enter the Intel® Virtual Raid on CPU in BIOS:

1.   Enter the BIOS Setup during POST.

2.   Go to the **Advanced** menu **> Intel(R) Virtual Raid on CPU** > **All Intel VMD Controllers** 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.

> Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.

```
                 Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
         Advanced

    All Intel VMD Controllers                          This page allows you to create
                                                       a RAID volume
  ▶ Create RAID Volume


    Non-RAID Physical Disks:
  ▶ Port 0, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212006W400NGN,...
  ▶ Port 1, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212008H400NGN,...
  ▶ Port 2, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212004T400NGN,...
  ▶ Port 3, VMD0, INTEL SSDPE2MX400G4 SN:CVPD621200D5400NGN,...



                                                       →←: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F5: Optimized Defaults
                                                       F10: Save Changes & Reset
                                                       F12: Print Screen
                                                       ESC: Exit
```

6.4.1   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 Utility - Copyright (C) 2017 American Megatrends, Inc.
         Advanced

  Create RAID Volume                                           Select RAID Level

  Name:                            Volume0
  RAID Level:                      [RAID0(Stripe)]
  Enable RAID spanned over VMD Contr    [ ]

  Select Disks:
  Port 0, VMD0, INTEL SSDPE2MX400G4    [ ]
  Port 1, VMD0, INTEL SSDPE2MX400G4    [ ]
  Port 2, VMD0, INTEL SSDPE2MX400G4 ┌──── RAID Level: ────┐
  Port 3, VMD0, INTEL SSDPE2MX400G4 │ RAID0(Stripe)       │
                                    │ RAID1(Mirror)       │
  Strip Size:                       │ RAID5(Parity)       │
  Capacity (MB):                    │ RAID10(RAID0+1)     │
                                    └─────────────────────┘  →←: Select Screen
  ▶ Create Volume                                            ↑↓: Select Item
                                                             Enter: Select
  Select at least two disks                                  +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F5: Optimized Defaults
                                                             F10: Save Changes & Reset
                                                             F12: Print Screen
                                                             ESC: Exit
```

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.   When the **Enable RAID spanned over VMD Controllers** item is selected, press <Enter> and select **X** to enable this function.

5.   Under Select Disks, press <Enter> and select **X** for the disks you want to include in the RAID set.

6.   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 (MB)** 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.

```
                   Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
        Advanced

    Create RAID Volume                                        Create a volume with the
                                                              settings specified above
    Name:                              Volume0
    RAID Level:                        [RAID5(Parity)]
    Enable RAID spanned over VMD Contr   [X]

    Select Disks:
    Port 0, VMD0, INTEL SSDPE2MX400G4    [X]
    Port 1, VMD0, INTEL SSDPE2MX400G4    [X]
    Port 2, VMD0, INTEL SSDPE2MX400G4    [X]
    Port 3, VMD0, INTEL SSDPE2MX400G4    [X]

    Strip Size:                        [128KB]
    Capacity (MB):                     1087416             →←: Select Screen
    RWH Policy                         [Disable]           ↑↓: Select Item
                                                           Enter: Select
  ▶ Create Volume                                          +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F5: Optimized Defaults
                                                           F10: Save Changes & Reset
                                                           F12: Print Screen
                                                           ESC: Exit
```

6.4.2 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:
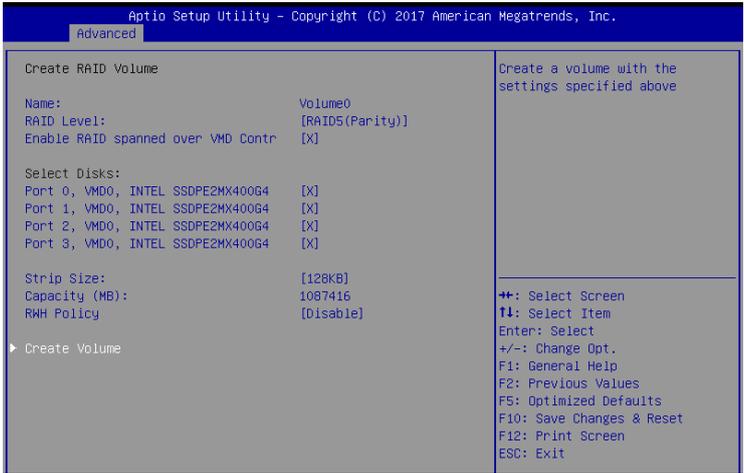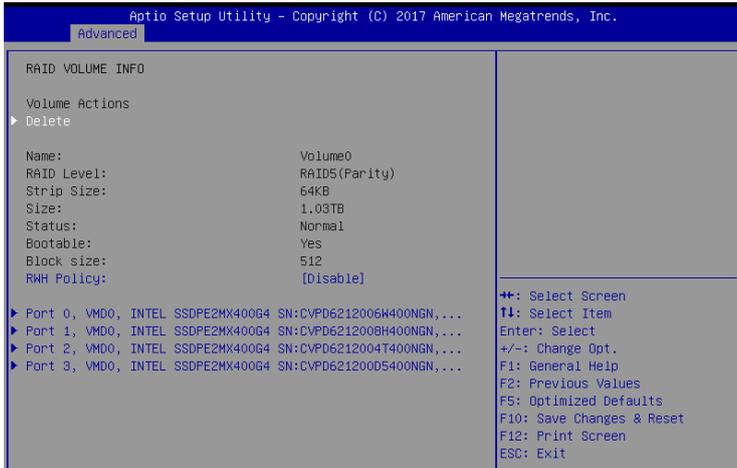
```
            Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
    Advanced

    RAID VOLUME INFO

    Volume Actions
  ▶ Delete

    Name:                           Volume0
    RAID Level:                     RAID5(Parity)
    Strip Size:                     64KB
    Size:                           1.03TB
    Status:                         Normal
    Bootable:                       Yes
    Block size:                     512
    RWH Policy:                     [Disable]
                                                      ➜←: Select Screen
  ▶ Port 0, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212006W400NGN,...    ↑↓: Select Item
  ▶ Port 1, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212008H400NGN,...    Enter: Select
  ▶ Port 2, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212004T400NGN,...    +/-: Change Opt.
  ▶ Port 3, VMD0, INTEL SSDPE2MX400G4 SN:CVPD621200D5400NGN,...    F1: General Help
                                                      F2: Previous Values
                                                      F5: Optimized Defaults
                                                      F10: Save Changes & Reset
                                                      F12: Print Screen
                                                      ESC: Exit
```

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.

```
            Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
    Advanced

    Delete                                          Deleting a volume will reset
                                                    the disks to non-RAID.
    Delete the RAID volume?
    ALL DATA ON VOLUME WILL BE LOST!

  ▶ Yes
  ▶ No
```
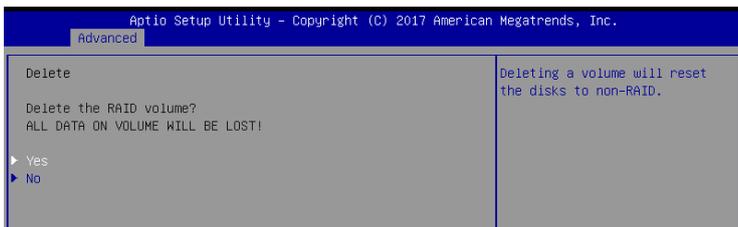
Driver Installation

7

This chapter provides the instructions for installing the necessary drivers for different system components in both Linux® and Windows® Operating Systems.

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** > **C620 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 or 2016 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)**.
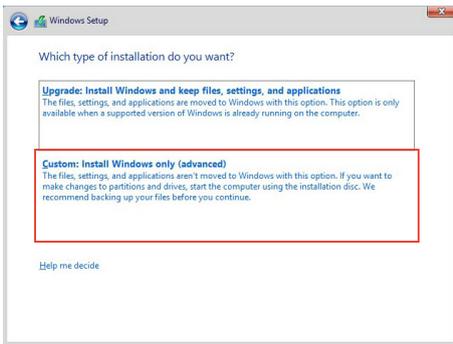
3. Click **Load Driver**.
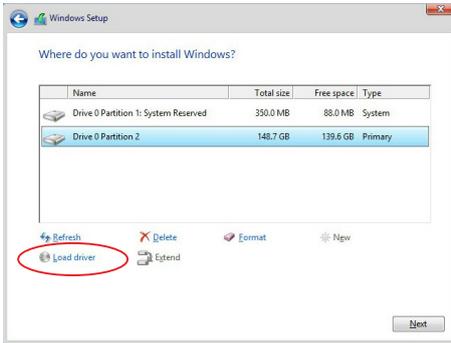
4. A message appears reminding you to insert the installation media containing the driver of the RAID controller driver (the installation media can be a CD, DVD, or USB flash drive).

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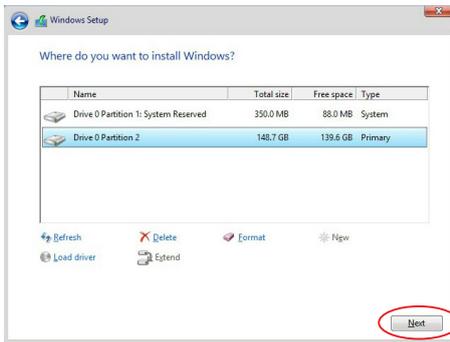
8.	Setup then proceeds with the OS installation. Follow the onscreen instructions to continue.

7.2 Management applications and utilities installation

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.

> • The contents of the support DVD are subject to change at any time without notice. Visit the ASUS website (www.asus.com) for the latest updates on software and utilities.
>
> • The support DVD is supported on Windows® Server 2012 R2 and Windows® Server 2016.

7.3 Running the Support DVD

When you place the support DVD into the optical drive, the DVD automatically displays the main screen if Autorun is enabled in your computer. By default, the Drivers tab is displayed.

> If Autorun is NOT enabled in your computer, browse the contents of the support DVD to locate the file **Setup.exe**. Double-click the **Setup.exe** to run the support DVD.
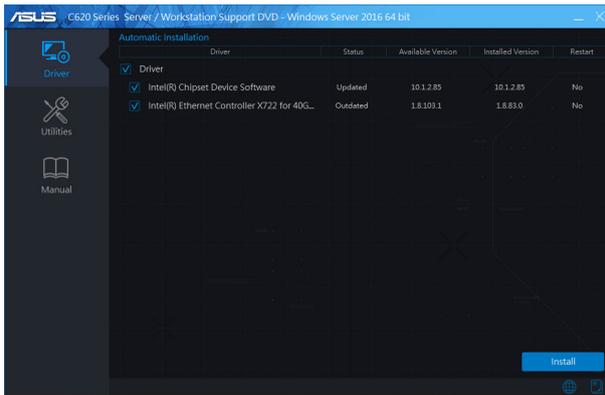
> Onscreen display and content vary depending on the motherboard and chipset. The screenshots are provided for reference only.

7.4 Installing the system drivers

This section provides the instructions on how to install the system drivers. You will need to manually install the system drivers on a Windows® operating system.

To install the system drivers:

1. Restart the computer, and then log on with **Administrator** privileges.

2. Insert the support DVD into the optical drive. The support DVD automatically displays the **Driver** menu if Autorun is enabled in your computer.

> If Autorun is NOT enabled in your computer, browse the contents of the support DVD to locate the file **Setup.exe**. Double-click the **Setup.exe** to run the support DVD.

3. Check the drivers that you would like to install, then select **Install**.
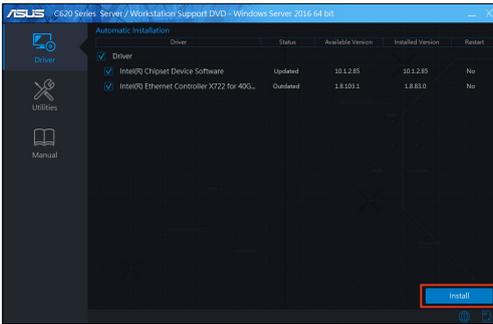
4. The installation window appears.
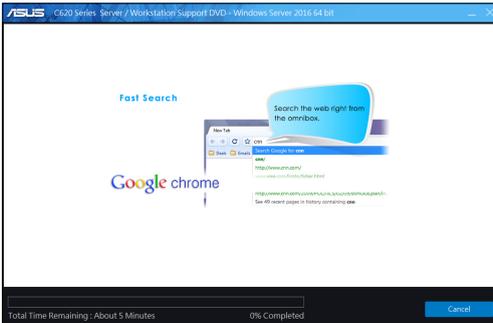
5.   Follow the onscreen instructions to complete the installation.
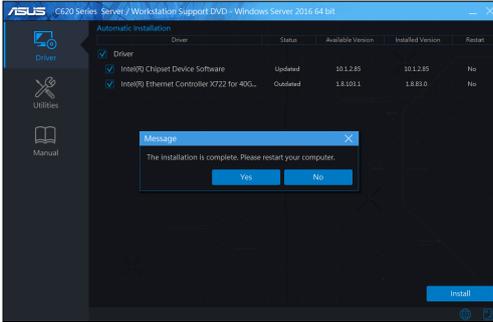
Appendix

Z11PR-D16-DC block diagram

DDR4 AEP DIMM/RDIMM * 2 — Channel G — DDR4 1866/2133/2400/2667
DDR4 AEP DIMM/RDIMM * 1 — Channel H — DDR4 1866/2133/2400/2667
DDR4 AEP DIMM/RDIMM * 1 — Channel J — DDR4 1866/2133/2400/2667
DDR4 AEP DIMM/RDIMM * 2 — Channel K — DDR4 1866/2133/2400/2667
DDR4 AEP DIMM/RDIMM * 1 — Channel L — DDR4 1866/2133/2400/2667
DDR4 AEP DIMM/RDIMM * 1 — Channel M — DDR4 1866/2133/2400/2667

CPU2
Skylake-EP Processor
150W
Socket P0 (LGA3647)

UPI 10.4GT/s
UPI 10.4GT/s

Channel A — DDR4 1866/2133/2400/2667 — DDR4 AEP DIMM/RDIMM * 2
Channel B — DDR4 1866/2133/2400/2667 — DDR4 AEP DIMM/RDIMM * 1
Channel C — DDR4 1866/2133/2400/2667 — DDR4 AEP DIMM/RDIMM * 1
Channel D — DDR4 1866/2133/2400/2667 — DDR4 AEP DIMM/RDIMM * 2
Channel E — DDR4 1866/2133/2400/2667 — DDR4 AEP DIMM/RDIMM * 1
Channel F — DDR4 1866/2133/2400/2667 — DDR4 AEP DIMM/RDIMM * 1

CPU1
Skylake-EP Processor
150W
Socket P0 (LGA3647)

PCI-E x4 OCULINK1 — PCI EXPRESS GEN3 x4
PCI-E x4 OCULINK2 — PCI EXPRESS GEN3 x4
PCI-E x4 OCULINK3 — PCI EXPRESS GEN3 x4
PCI-E x4 OCULINK4 — PCI EXPRESS GEN3 x4
PCI-E x24 Slot6 — PCI EXPRESS GEN3 x8

PCI EXPRESS GEN3 x16 — PCI-E x24 Slot6
PCI EXPRESS GEN3 x8 — PCI-E x8 MezzPCIE1
PCI EXPRESS GEN3 x8 — PCI-E x8 MezzPCIE2

NCSI

DMI3
UPLINK (GEN3 x4)

PCI EXPRESS GEN3 x4 — M2_NGFF1 up to 2280
PCI EXPRESS GEN3 x4 — M2_NGFF1 up to 2280

88E1514 — 1G LAN
88E1514 — 1G LAN

SATA III — Quick Switch
SATA III — Quick Switch

NCSI

SATA III 8 ports — SATA III
sSATA III 4 ports — SATA III
High-Speed USB 9 ports — USB 2.0

Lewisburg

USB 3.0 — Super Speed USB 5 ports

PCI EXPRESS GEN3 x1

BMC
ASPEED AST2500
4Gb/8Gb DDR4 SDRAM

FAN Control
Rear Fan *2
Front Fan *7

LPC BUS
RGMII

SPI Flash 256Mbits
Nuvoton NCT6793D Super IO
COM
TPM
Realtek RTL8211E

Q-Code table

Code	Description
00	Not used
02	microcode
03	CACHE_ENABLED
04	PCH initialization
06	CPU_EARLY_INIT
10	PEI Core is started
11 – 14	Pre-memory CPU initialization is started
15 – 18	Pre-memory System Agent initialization is started
19 – 1C	Pre-memory PCH initialization is started
2B – 2F	Memory initialization
30	Reserved for ASL (see ASL Status Codes section below)
31	Memory Installed
32 – 36	CPU post-memory initialization
37 – 3A	Post-Memory System Agent initialization is started
3B – 3E	Post-Memory PCH initialization is started
4F	DXE IPL is started
50 – 53	Memory initialization error. Invalid memory type or incompatible memory speed
4F	DXE IPL is started
54	Unspecified memory initialization error
55	Memory not installed
56	Invalid CPU type or Speed
57	CPU mismatch
58	CPU self test failed or possible CPU cache error
59	CPU micro-code is not found or micro-code update is failed
5A	Internal CPU error
5B	Reset PPI is not available
5C – 5F	Reserved for future AMI error codes
E0	S3 Resume is stared (S3 Resume PPI is called by the DXE IPL)
E1	S3 Boot Script execution
E2	Video repost
E3	OS S3 wake vector call
E4 – E7	Reserved for future AMI progress codes
E8	S3 Resume Failed
E9	S3 Resume PPI not Found
EA	S3 Resume Boot Script Error
EB	S3 OS Wake Error
EC – EF	Reserved for future AMI error codes
F0	Recovery condition triggered by firmware (Auto recovery)
F1	Recovery condition triggered by user (Forced recovery)
F2	Recovery process started
F3	Recovery firmware image is found
F4	Recovery firmware image is loaded
F5 – F7	Reserved for future AMI progress codes
F8	Recovery PPI is not available
F9	Recovery capsule is not found

Code	Description
FA	Invalid recovery capsule
FB – FF	Reserved for future AMI error codes
60	DXE Core is started
61	NVRAM initialization
62	Installation of the PCH Runtime Services
63 – 67	CPU DXE initialization is started
68	PCI host bridge initialization
69	System Agent DXE initialization is started
6A	System Agent DXE SMM initialization is started
6B – 6F	System Agent DXE initialization (System Agent module specific)
70	PCH DXE initialization is started
71	PCH DXE SMM initialization is started
72	PCH devices initialization
73 – 77	PCH DXE Initialization (PCH module specific)
78	ACPI module initialization
79	CSM initialization
7A – 7F	Reserved for future AMI DXE codes
90	Boot Device Selection (BDS) phase is started
91	Driver connecting is started
92	PCI Bus initialization is started
93	PCI Bus Hot Plug Controller Initialization
94	PCI Bus Enumeration
95	PCI Bus Request Resources
96	PCI Bus Assign Resources
97	Console Output devices connect
98	Console input devices connect
99	Super IO Initialization
9A	USB initialization is started
9B	USB Reset
9C	USB Detect
9D	USB Enable
9E – 9F	Reserved for future AMI codes
A0	IDE initialization is started
A1	IDE Reset
A2	IDE Detect
A3	IDE Enable
A4	SCSI initialization is started
A5	SCSI Reset
A6	SCSI Detect
A7	SCSI Enable
A8	Setup Verifying Password
A9	Start of Setup
AA	Reserved for ASL (see ASL Status Codes section below)
AB	Setup Input Wait

Code	Description
AC	Reserved for ASL (see ASL Status Codes section below)
AD	Ready To Boot event
AE	Legacy Boot event
AF	Exit Boot Services event
B0	Runtime Set Virtual Address MAP Begin
B1	Runtime Set Virtual Address MAP End
B2	Legacy Option ROM Initialization
B3	System Reset
B4	USB hot plug
B5	PCI bus hot plug
B6	Clean-up of NVRAM
B7	Configuration Reset (reset of NVRAM settings)
B8– BF	Reserved for future AMI codes
D0	CPU initialization error
D1	System Agent initialization error
D2	PCH initialization error
D3	Some of the Architectural Protocols are not available
D4	PCI resource allocation error. Out of Resources
D5	No Space for Legacy Option ROM
D6	No Console Output Devices are found
D7	No Console Input Devices are found
D8	Invalid password
D9	Error loading Boot Option (LoadImage returned error)
DA	Boot Option is failed (StartImage returned error)
DB	Flash update is failed
DC	Reset protocol is not available

ACPI/ASL Checkpoints (under OS)

Code	Description
03	System is entering S3 sleep state
04	System is entering S4 sleep state
05	System is entering S5 sleep state
30	System is waking up from the S3 sleep state
40	System is waking up from the S4 sleep state
AC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.
AA	System has transitioned into ACPI mode. Interrupt controller is in APIC mode.

Notices

Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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This device complies with Innovation, Science and Economic Development Canada licence exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

CAN ICES-3(A)/NMB-3(A)

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CAN ICES-3(A)/NMB-3(A)

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Complying with the REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) regulatory framework, we published the chemical substances in our products at ASUS website at http://csr.asus.com/english/REACH.htm.

ASUS Recycling/Takeback Services

ASUS recycling and takeback programs come from our commitment to the highest standards for protecting our environment. We believe in providing solutions for you to be able to responsibly recycle our products, batteries, other components as well as the packaging materials. Please go to http://csr.asus.com/english/Takeback.htm for detailed recycling information in different regions.

DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.

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If you require assistance please call ASUS Customer Service 1300 2787 88 or visit us at https://www.asus.com/support/.

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General support   +1-812-282-2787
Online support   https://www.asus.com/support/Product/ContactUs/Services/
                               questionform/?lang=en-us

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Web site   https://www.asus.com/de/

Technical Support

Telephone   +49-1805-010923
Support Fax   +49-2102-959911
Online support   https://www.asus.com/support/Product/ContactUs/Services/
                               questionform/?lang=de-de

ASUS Czech Service s.r.o. (Europe)

Address   Na Rovince 887, 720 00 Ostrava – Hrabová,
                               Czech Republic
Telephone   +420-596766888
Web site   https://www.asus.com/cz/

Technical Support

Telephone   +420-596-766-891
Fax   +420-596-766-329
E-mail   advance.rma.eu@asus.com
Online Support   https://www.asus.com/support/Product/ContactUs/Services/
                               questionform/?lang=cs-cz

ASUS contact information

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Web site   https://www.asus.com/nl/

Technical Support

Telephone   +31-(0)591-5-70292
Fax   +31-(0)591-666853
E-mail   advance.rma.eu@asus.com
Online Support   https://www.asus.com/support/Product/ContactUs/Services/
                           questionform/?lang=nl-nl

ASUS Polska Sp. z o.o. (Poland)

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Web site   https://www.asus.com/pl/

Technical Support

Telephone   +48-225718033
Online Support   https://www.asus.com/support/Product/ContactUs/Services/
                           questionform/?lang=pl-pl

ASK-Service (Russia and CIS)

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Telephone   (495) 640-32-75
Web site   https://www.asus.com/ru/

Technical Support

Telephone   008-800-100-ASUS (008-800-100-2787)
Online Support   https://www.asus.com/support/Product/ContactUs/Services/
                           questionform/?lang=ru-ru