



RS520-E9 V2 Series

Server User Guide



Copyright © 2021 ASUSTeK COMPUTER INC. All Rights Reserved.

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

ASUS provides this manual "as is" without warranty of any kind, either express or implied, including but not limited to the implied warranties or conditions of merchantability or fitness for a particular purpose. In no event shall ASUS, its directors, officers, employees, or agents be liable for any indirect, special, incidental, or consequential damages (including damages for loss of profits, loss of business, loss of use or data, interruption of business and the like), even if ASUS has been advised of the possibility of such damages arising from any defect or error in this manual or product.

Specifications and information contained in this manual are furnished for informational use only, and are subject to change at any time without notice, and should not be construed as a commitment by ASUS. ASUS assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual, including the products and software described in it.

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

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

Contents

Safety information.....	viii
About this guide.....	x

Chapter 1: Product Introduction

1.1	System package contents	1-2
1.2	Serial number label.....	1-3
1.3	System specifications	1-4
1.4	Front panel features.....	1-7
1.5	Rear panel features.....	1-8
1.6	Internal features	1-10
1.7	LED information	1-12
1.7.1	Front panel LEDs	1-12
1.7.2	Bay status LED	1-13
1.7.3	LAN (RJ-45) LEDs	1-14
1.7.4	Rear panel LEDs.....	1-14
1.7.5	Q-Code table.....	1-15

Chapter 2: Hardware Information

2.1	Chassis cover.....	2-2
2.1.1	Removing the rear cover	2-2
2.2	Central Processing Unit (CPU)	2-3
2.2.1	Installing the CPU	2-3
2.3	System memory	2-5
2.3.1	Overview	2-5
2.3.2	Memory Configurations.....	2-6
2.3.3	Installing a DIMM on a single clip DIMM socket.....	2-7
2.4	Storage devices.....	2-8
2.5	Expansion slot.....	2-14
2.5.1	Installing an expansion card to the PCIE slot.....	2-14
2.5.2	Installing an ASUS PIKE II card.....	2-16
2.5.3	Replacing the ASUS PCIE-NVME4-OCuLink card	2-18
2.5.4	Configuring an expansion card	2-21
2.5.5	Installing an M.2 expansion card.....	2-22
2.5.6	Installing a Mezzanine card.....	2-23
2.6	Cable connections	2-25
2.7	Backplane cabling.....	2-26

Contents

- 2.8 Removable/optional components..... 2-31
 - 2.8.1 System fans 2-31
 - 2.8.2 Slim optical drive (optional for RS520-E9-RS8 V2)..... 2-32
 - 2.8.3 Redundant power supply module..... 2-34

Chapter 3: Installation Options

- 3.1 Tool-less Friction Rail Kit..... 3-2
- 3.2 Rail kit dimensions 3-5

Chapter 4: Motherboard Information

- 4.1 Motherboard layout..... 4-2
- 4.2 Jumpers 4-4
- 4.3 Internal LEDs 4-10
- 4.4 Internal connectors..... 4-13

Chapter 5: BIOS Setup

- 5.1 Managing and updating your BIOS 5-2
 - 5.1.1 ASUS CrashFree BIOS 3 utility..... 5-2
 - 5.1.2 ASUS EZ Flash Utility 5-3
 - 5.1.3 BUPDATER utility 5-4
- 5.2 BIOS setup program 5-6
 - 5.2.1 BIOS menu screen..... 5-7
 - 5.2.2 Menu bar 5-7
 - 5.2.3 Menu items..... 5-8
 - 5.2.4 Submenu items 5-8
 - 5.2.5 Navigation keys..... 5-8
 - 5.2.6 General help..... 5-8
 - 5.2.7 Configuration fields 5-8
 - 5.2.8 Pop-up window..... 5-8
 - 5.2.9 Scroll bar 5-8
- 5.3 Main menu 5-9
 - 5.3.1 System Date [Day xx/xx/xxxx]..... 5-9
 - 5.3.2 System Time [xx:xx:xx] 5-9
- 5.4 Performance Tuning menu..... 5-10

Contents

5.5	Advanced menu	5-11
5.5.1	Trusted Computing.....	5-12
5.5.2	ACPI Settings.....	5-12
5.5.3	Smart Settings.....	5-13
5.5.4	Super IO Configuration	5-13
5.5.5	Serial Port Console Redirection.....	5-14
5.5.6	Onboard LAN Configuration	5-17
5.5.7	APM	5-18
5.5.8	PCI Subsystem Settings	5-19
5.5.9	USB Configuration	5-22
5.5.10	CSM Configuration.....	5-23
5.5.11	NVMe Configuration.....	5-24
5.5.12	Offboard SATA Controller Configuration.....	5-24
5.5.13	Network Stack Configuration.....	5-25
5.5.14	iSCSI Configuration.....	5-26
5.6	Platform Configuration menu	5-26
5.6.1	PCH Configuration	5-27
5.6.2	Miscellaneous Configuration	5-29
5.6.3	Server ME Configuration.....	5-29
5.6.4	Runtime Error Logging.....	5-30
5.7	Socket Configuration menu	5-30
5.7.1	Processor Configuration.....	5-31
5.7.2	Common RefCode Configuration.....	5-32
5.7.3	UPI Configuration.....	5-33
5.7.4	Memory Configuration.....	5-34
5.7.5	IIO Configuration	5-36
5.7.6	Advanced Power Management Configuration.....	5-37
5.8	Event Logs menu	5-39
5.8.1	Change Smbios Event Log Settings	5-39
5.8.2	View Smbios Event Log	5-39
5.9	Server Mgmt menu	5-40

Contents

- 5.10 Security menu 5-41
- 5.11 Boot menu 5-44
- 5.12 Tool menu 5-45
- 5.13 Save & Exit menu 5-46

Chapter 6: RAID Configuration

- 6.1 Setting up RAID 6-2
 - 6.1.1 RAID definitions 6-2
 - 6.1.2 Installing hard disk drives 6-3
 - 6.1.3 Setting the RAID item in BIOS 6-3
 - 6.1.4 RAID configuration utilities 6-3
- 6.2 Intel® Rapid Storage Technology enterprise SATA/SSATA
Option ROM Utility 6-4
 - 6.2.1 Creating a RAID set 6-5
 - 6.2.2 Deleting a RAID set 6-7
 - 6.2.3 Resetting disks to Non-RAID 6-8
 - 6.2.4 Exiting the Intel® Rapid Storage Technology enterprise
SATA/SSATA Option ROM utility 6-9
 - 6.2.5 Rebuilding the RAID 6-9
 - 6.2.6 Setting the Boot array in the BIOS Setup Utility 6-11
- 6.3 Intel® Rapid Storage Technology enterprise (Windows) 6-12
 - 6.3.1 Creating a RAID set 6-13
 - 6.3.2 Changing a Volume Type 6-15
 - 6.3.3 Deleting a volume 6-16
 - 6.3.4 Preferences 6-17

Chapter 7: Driver Installation

7.1	RAID driver installation	7-2
7.1.1	Creating a USB flash drive with RAID drive	7-2
7.1.2	Installing the RAID controller driver.....	7-2
7.2	Management applications and utilities installation	7-5
7.3	Running the Support DVD.....	7-5
7.4	Intel® chipset device software installation.....	7-8
7.5	VGA driver installation	7-10
7.6	Installing the Intel® I350-AM2 Gigabit Adapters driver	7-12
7.7	Intel® Rapid Storage Technology enterprise installation	7-14

Appendix

Z11PR-D16/V2 block diagram	A-2
Notices	A-3
ASUS contact information.....	A-6

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.

Heavy System

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

Optical Drive Safety Information

Laser Safety Information



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

About this guide

Audience

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

Contents

This guide contains the following parts:

1. Chapter 1: Product Introduction

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

2. Chapter 2: Hardware Information

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

3. Chapter 3: Installation Options

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

4. Chapter 4: Motherboard Information

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

5. Chapter 5: BIOS Information

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>+

Command

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

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

References

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

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

This manual tells how to set up and use the proprietary ASUS server management utility. Visit asuscontrolcenter.asus.com for more information.

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 motherboard features and the new technologies it supports.

1.1 System package contents

Check your system package for the following items.

Model Name	RS520-E9-RS8 V2	RS520-E9-RS12UV2
Chassis	ASUS 2U Rackmount Chassis	
Motherboard	Z11PR-D16/V2 Server Board	
Component	2 x 800W Redundant Power Supply	2 x 800W Redundant Power Supply
	8 x Hot-swap 3.5-inch Storage Device Bays	12 x Hot-swap 3.5-inch Storage Device Bays
	2 x Hot-swap 2.5-inch Storage Device Bays	2 x Hot-swap 2.5-inch Storage Device Bays
	1 x SATA/SAS back panel	1 x SATA/SAS back panel
	1 x Front I/O Board	1 x Front I/O Board
	4 x System Fans (80 mm x 38 mm)	4 x System Fans (80 mm x 38 mm)
	1 x Power sharing Board	1 x Power sharing Board
	1 x Air duct	1 x Air duct
	Accessories	1 x RS520-E9 V2 Series DVD
1 x Bag of Screws		
2 x CPU Heatsink		
2 x AC Power Cable		
Optional Items	2 x LGA3647-P0 NRW-NF-CPU CARRIER	
	2 x CPU Heatsink (Quantity may vary depending on the request of each area/country)	
	1 x Tool-less Friction Rail Kit	

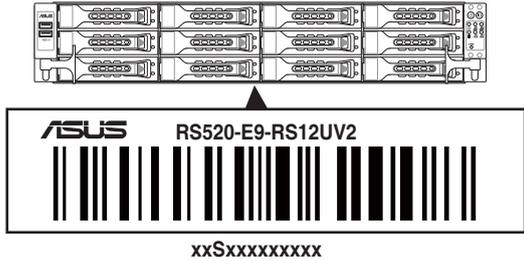
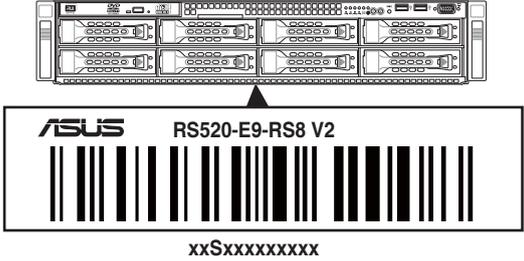


If any of the above items is damaged or missing, contact your retailer.

1.2 Serial number label

The product's serial number contains 12 characters such as xxS0xxxxxxx and printed on the sticker at the server's front cover.

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



1.3 System specifications

The ASUS RS520-E9 V2 Series is a 2U barebone server system featuring the ASUS Z11PR-D16/V2 Server Board. The server supports Intel® Xeon® Scalable Processor Family Series plus other latest technologies through the chipsets onboard.

Model Name	RS520-E9-RS8 V2	RS520-E9-RS12UV2
Motherboard	Z11PR-D16/V2	
Processor Support	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 * Refer to www.asus.com for Intel® CPU support list.	
Core Logic	Intel® C621 PCH	
Memory	Total Slots	16 (6-channel per CPU, 8 DIMM per CPU)
	Capacity	Maximum up to 4096GB
	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, 16GB, 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/PIKE Slots	6+1
	Slot Type	2 x PCI-E x16* (Gen3 x16 link), LP, HL (CPU1; CPU2) 4 x PCI-E x8** (Gen3 x8 link), LP, HL (CPU2) 1 x OCP 2.0 Mezzanine (Gen3 x16 link) (CPU1) * Optional for NVMe4-OCulink Card ** Optional for NVMe2-OCulink Card (for RS520-E9-RS12UV2 only)
	M.2	2 x M.2 (Up to 2280) (Support SATA/PCIe M.2, SATA/PCIe RAID)
	MicroSD Card Slot	1
Storage Controller	SATA Controller	Intel® Lewisburg PCH C621 - 11 x SATA 6Gb/s ports (8 by 2 mini-SAS Connector) - 2 x M.2 connectors (SATA 6Gb/s & PCI-E Gen3 x4 link) Intel® RSTe Supports software RAID 0, 1, 10 & 5 Intel® VROC Supports software RAID 0, 1, 10 & 5 (for Windows only)
	SAS Controller	Optional kits: ASUS PIKE II 3008 8-port SAS 12Gb/s HBA card ASUS PIKE II 3108 8-port SAS HW 12Gb/s RAID card

(continued on the next page)

Model Name		RS520-E9-RS8 V2	RS520-E9-RS12UV2
Storage	Storage Bay	8 x 3.5" Hot-swap Bays with optional NVMe supported. (up to 4 x SATA/SAS/NVMe + 4 x SATA/SAS) 2 x 2.5" Hot-swap storage device bays (Rear) (SATA HDD/SSD only) * NVMe support requires an optional NVMe upgrade kit. * SAS support requires an optional SAS HBA/RAID card.	12 x 3.5" Hot-swap Bays with optional NVMe supported. (up to 8 x SATA/SAS/ NVMe + 4 x SATA/SAS) 2 x 2.5" Hot-swap storage device bays (Rear) (SATA HDD/SSD only) * NVMe support requires an optional NVMe upgrade kit. * SAS support requires an optional SAS HBA/RAID card.
	Backplane Connectors	2 x Mini SAS HD + 4 x OCULink	2 x Mini SAS HD + 4/6/8 x OCULink
	MB On-board Connectors	2 x M.2 connectors 3 x SATA 7pin + 2 x Mini SAS HD	2 x M.2 connectors 3 x SATA 7pin + 2 x Mini SAS HD
	Default Cable	SATA 7P x 2 TO 7P x 2 x 1 Mini SAS HD Cable x 2	SATA 7P x 2 TO 7P x 2 x 1 Mini SAS HD Cable x 2
	NVMe Upgrade Option	Support 4 x NVMe: 1 x 4-port NVMe upgrade kit * Refer to ASUS server Upgrade Part List for the latest update	Support 8 x NVMe: 1 x 4-port NVMe upgrade kit 2 x 2-port NVMe upgrade kit * Refer to ASUS server Upgrade Part List for the latest update
Networking		1 x Dual Port Intel I350-AM2 Gigabit LAN controller 1 x Management Port Optional OCP Adapter: Up to 100Gb/s Ethernet / InfiniBand Adapter	
Graphic	VGA	Aspeed AST2500 64MB	
Auxiliary Storage Device Bay (Floppy / Optical Drive)		1 x slim-type Optical Drive Bay Optional: No Device/DVD-RW	Optional: 1 x External USB Optical Drive
Front I/O Ports		2 x USB 3.2 Gen1 ports 1 x VGA port	2 x USB 2.0 ports
Rear I/O Ports		2 x USB 3.2 Gen1 ports 1 x VGA port 2 x RJ-45 GbE LAN ports 1 x RJ-45 Mgmt LAN port	2 x USB 3.2 Gen1 ports 1 x VGA port 2 x RJ-45 GbE LAN ports 1 x RJ-45 Mgmt LAN port

(continued on the next page)

Model Name	RS520-E9-RS8 V2	RS520-E9-RS12UV2
Switches and LEDs	Front Switches/LEDs: 1 x Power switch/LED 1 x Location switch/LED 1 x Reset switch 1 x HDD Access LED 1 x Message LED LAN 1-4 LED * LAN3-4 for Mezzazine card use Rear Switches/LEDs: 1 x Q-Code/Port 80 LED 1 x Power switch 1 x Location LED (On Motherboard) 1 x HDD LED (On Motherboard) 1 x Message LED (On Motherboard)	
Security Options	TPM 2.0 Header	
OS Support	Windows® Server 2019 Windows® Server 2016 Windows® Server 2012 R2 RedHat® Enterprise Linux SuSE® Linux Enterprise Server CentOS Ubuntu VMware * Please find the latest OS support from http://www.asus.com/	
Management Solution	Software	ASUS Control Center (Classic)
	Out of Band Remote Management	On-Board ASMB9-iKVM for KVM-over-IP
Regulatory Compliance	BSMI, CE, C-TICK, FCC (Class A)	
Dimension (HH x WW x DD)	615mm x 444mm x 88mm (2U) 24.21" x 17.48" x 3.46"	
Net Weight Kg (CPU, DRAM & Storage device not included)	19.7 Kg	24.55 Kg
Gross Weight Kg (CPU, DRAM & Storage device not included, Packing include)	27.97 Kg	30.1 Kg
Power Supply (different configuration by region)	1+1 Redundant 800W 80 PLUS Platinum Power Supply Rating: 100-127Vac/200-240Vac, 9.4A/4.72A, 47-63 Hz, Class I	
Environment	Operating temperature: 10°C ~ 35°C Non operating temperature: -40°C ~ 60°C Non operating 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, and USB ports for each Node are located on the front panel.

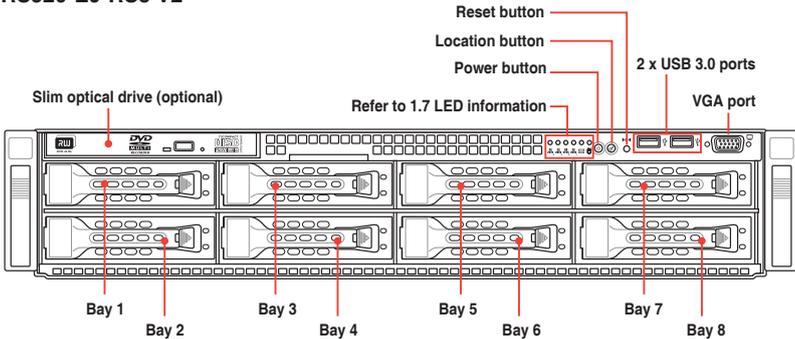


Refer to the **1.7.1 Front panel LEDs** section for the LED descriptions.



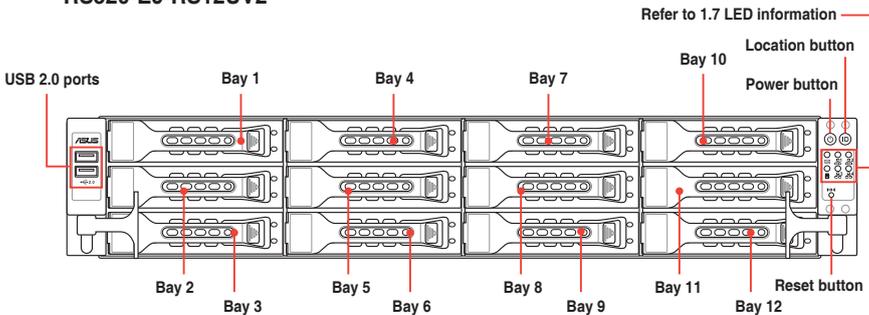
Turn off the system power and detach the power supply before removing or replacing any system component.

RS520-E9-RS8 V2



- Bay 1 to bay 4 supports hybrid NVMe/SAS/SATA (SAS support requires an optional ASUS PIKE II card).
- Bay 5 to bay 8 supports hybrid SAS/SATA (SAS support requires an optional ASUS PIKE II card).

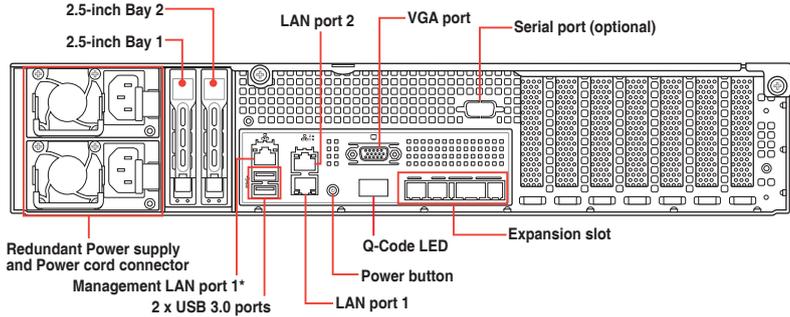
RS520-E9-RS12UV2



- Bay 1 to bay 8 supports hybrid NVMe/SAS/SATA (SAS/SATA support requires an optional ASUS PIKE II card).
- Bay 9 to bay 12 supports hybrid SAS/SATA (SAS/SATA support requires an optional ASUS PIKE II card).

1.5 Rear panel features

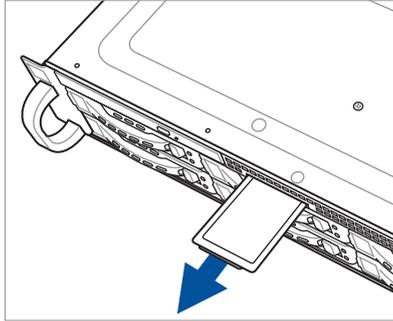
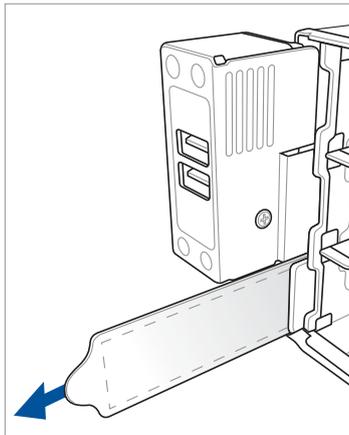
The rear panel includes the expansion slots, system power sockets, and rear fans. The I/O shields with openings for the rear panel connectors on the motherboard are also placed in the rear panel.



*This port is for ASUS ASMB9-iKVM only.

Asset tag

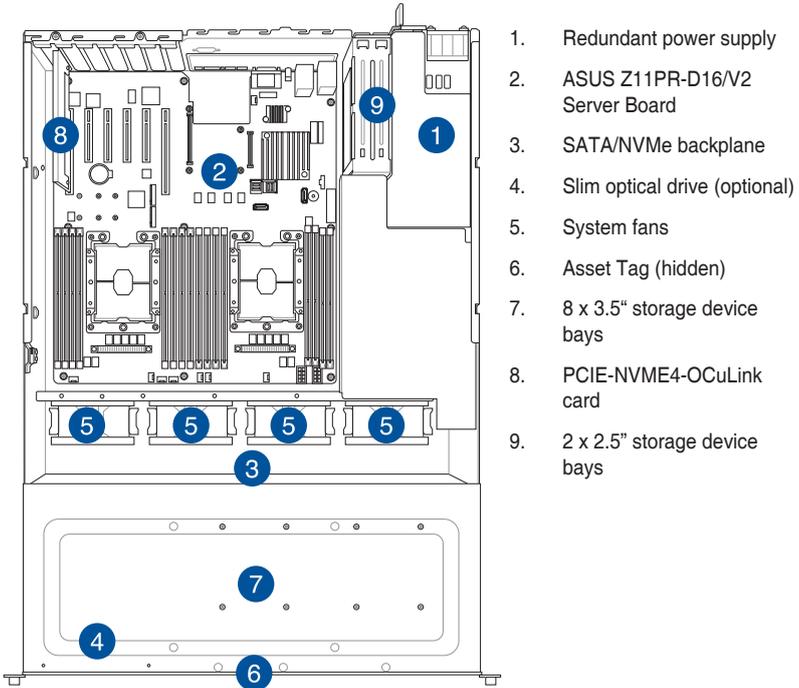
The Asset tag is a simple but useful device that is conveniently located on the front panel of the server that you can pull out or easily slide back in. It has a piece of paper that allows you to write down important information about the server.

RS520-E9-RS8 V2**RS520-E9-RS12UV2**

1.6 Internal features

The barebone server includes the basic components as shown.

RS520-E9-RS8 V2



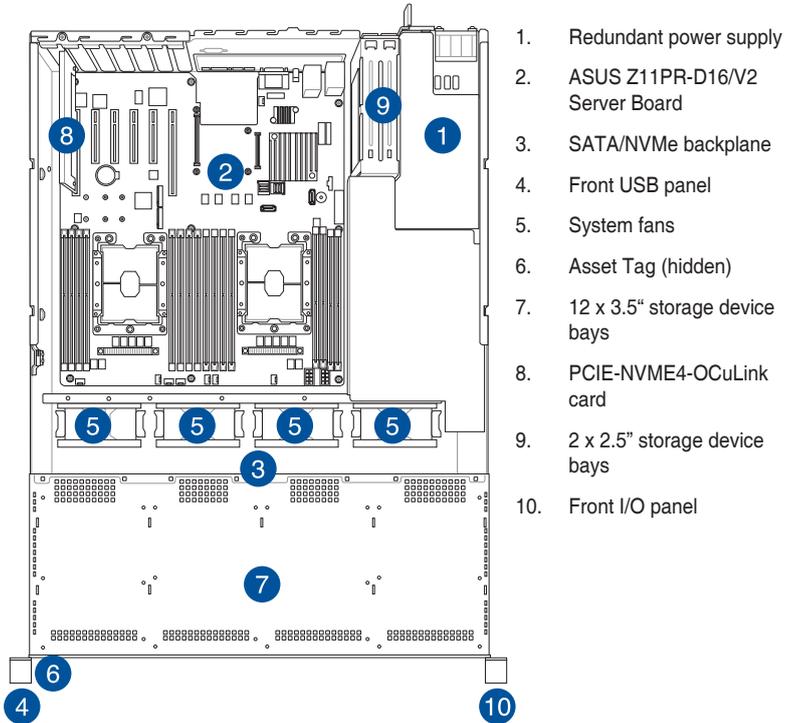
Turn off the system power and detach the power supply before removing or replacing any system component.



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

RS520-E9-RS12UV2



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



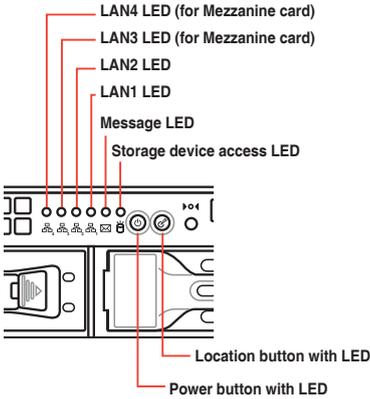
The barebone server does not include a floppy disk drive. Connect a USB floppy disk drive to any of the USB ports on the front or rear panel if you need to use a floppy disk.

WARNING
HAZARDOUS MOVING PARTS
KEEP FINGERS AND OTHER BODY PARTS AWAY

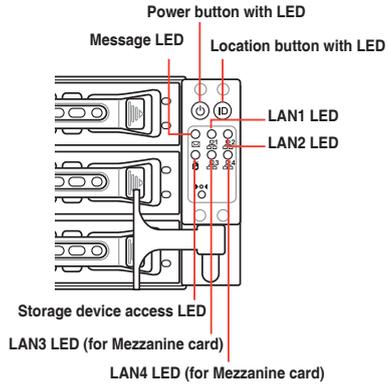
1.7 LED information

1.7.1 Front panel LEDs

RS520-E9-RS8 V2



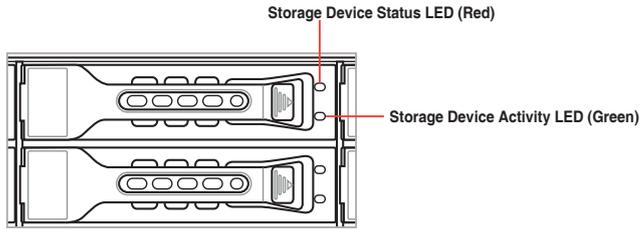
RS520-E9-RS12UV2



LED	Icon	Display status	Description
Power LED	⏻	GREEN ON	System power ON
		GREEN BLINKING	System sleep mode
		OFF	System power OFF
Storage Device Access LED	🗄️	OFF	No activity
		GREEN BLINKING	Read / Write data into the storage device
		AMBER ON	Storage device error
Message LED	✉️	GREEN ON	System is normal; no incoming event
		GREEN BLINKING	System ready but degraded some CPU fault and DIMM killed
		AMBER ON	Critical alarm
		AMBER BLINKING	Non-critical alarm
LAN LEDs	📶 ₁	GREEN OFF	No LAN connection
		GREEN BLINKING	LAN is transmitting or receiving data
	📶 ₂	GREEN ON	LAN connection is present
		📶 ₃	BLINKING
📶 ₄			
	Location LED	📍	ON
ID			OFF

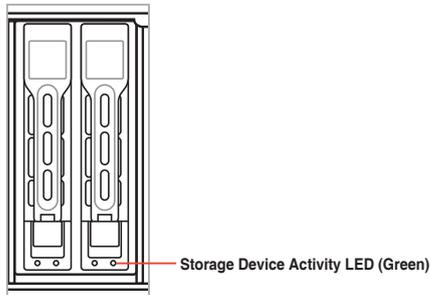
1.7.2 Bay status LED

Front panel



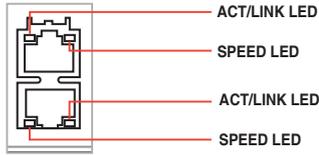
LED	Icon	Display status	Description
Storage Device Activity LED		OFF	Storage device not present
		GREEN ON	No activity
		GREEN BLINKING	<ol style="list-style-type: none"> 1. Read / Write data into the storage device 2. Locating
Storage Device Status LED		RED ON	Storage device has failed and should be swapped immediately
		RED BLINKING	<ol style="list-style-type: none"> 1. RAID rebuilding 2. Locating 3. Storage device hotspare

Rear panel



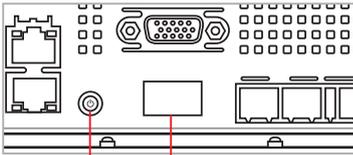
LED	Icon	Display status	Description
Storage Device Activity LED		OFF	Storage device not present
		GREEN ON	No activity
		GREEN BLINKING	<ol style="list-style-type: none"> 1. Read / Write data into the storage device 2. Locating

1.7.3 LAN (RJ-45) LEDs



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

1.7.4 Rear panel LEDs



Power button with LED

Q-Code LED*



- The Q-Code LED provides the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Refer to the Q-Code table on the next page for details.

1.7.5 Q-Code table

Action	PHASE	POST CODE	TYPE	DESCRIPTION
Security Phase		1	Progress	First post code(POWER_ON_POST_CODE)
		2	Progress	Load BSP microcode(MICROCODE_POST_CODE)
		3	Progress	Perform early platform initialization
		4	Progress	Set cache as ram for PEI phase(CACHE_ENABLED_POST_CODE)
		5	Progress	Establish Stack
		6	Progress	CPU Early init.(CPU_EARLY_INIT_POST_CODE)
Normal boot	PEI(Pre-EFI initialization) phase	10	Progress	PEI Core Entry
		11	Progress	PEI cache as ram CPU initial
		15	Progress	NB initialize before installed memory
		19	Progress	SB initialize before installed memory
		0	MRC Progress	MRC_INITIALIZATION_START
		10	MRC Progress	MRC_CMD_PLOT_2D
		1B	MRC Progress	MRC_FAST_BOOT_PERMITTED
		1C	MRC Progress	MRC_RESTORE_NON_TRAINING
		1D	MRC Progress	MRC_PRINT_INPUT_PARAMS
		1E	MRC Progress	MRC_SET_OVERRIDES_PSPD
		20	MRC Progress	MRC_SPD_PROCESSING
		21	MRC Progress	MRC_SET_OVERRIDES
		22	MRC Progress	MRC_MC_CAPABILITY
		23	MRC Progress	MRC_MC_CONFIG
		24	MRC Progress	MRC_MC_MEMORY_MAP
		25	MRC Progress	MRC_JEDEC_INIT_LPDDR3
		26	MRC Progress	MRC_RESET_SEQUENCE
		27	MRC Progress	MRC_PRE_TRAINING
		28	MRC Progress	MRC_EARLY_COMMAND
		29	MRC Progress	MRC_SENSE_AMP_OFFSET
		2A	MRC Progress	MRC_READ_MPR
		2B	MRC Progress	MRC_RECEIVE_ENABLE
		2C	MRC Progress	MRC_JEDEC_WRITE_LEVELING
		2D	MRC Progress	MRC_LPDDR_LATENCY_SET_B
		2E	MRC Progress	MRC_WRITE_TIMING_1D
		2F	MRC Progress	MRC_READ_TIMING_1D
		30	MRC Progress	MRC_DIMM_ODT
		31	MRC Progress	MRC_EARLY_WRITE_TIMING_2D
		32	MRC Progress	MRC_WRITE_DS
		33	MRC Progress	MRC_WRITE_EQ
		34	MRC Progress	MRC_EARLY_READ_TIMING_2D
		35	MRC Progress	MRC_READ_ODT
		36	MRC Progress	MRC_READ_EQ
		37	MRC Progress	MRC_READ_AMP_POWER
		38	MRC Progress	MRC_WRITE_TIMING_2D
		39	MRC Progress	MRC_READ_TIMING_2D
		3A	MRC Progress	MRC_CMD_VREF
		3B	MRC Progress	MRC_WRITE_VREF_2D
		3C	MRC Progress	MRC_READ_VREF_2D
		3D	MRC Progress	MRC_POST_TRAINING
		3E	MRC Progress	MRC_LATE_COMMAND
		3F	MRC Progress	MRC_ROUND_TRIP_LAT
		40	MRC Progress	MRC_TURN_AROUND
		41	MRC Progress	MRC_CMP_OPT
		42	MRC Progress	MRC_SAVE_MC_VALUES
		43	MRC Progress	MRC_RESTORE_TRAINING
		44	MRC Progress	MRC_RMT_TOOL
		45	MRC Progress	MRC_WRITE_SR
		46	MRC Progress	MRC_DIMM_RON
		47	MRC Progress	MRC_RCVEN_TIMING_1D
48	MRC Progress	MRC_MR_FILL		
49	MRC Progress	MRC_PWR_MTR		
4A	MRC Progress	MRC_DDR4_MAPPING		
4B	MRC Progress	MRC_WRITE_VOLTAGE_1D		
4C	MRC Progress	MRC_EARLY_RDMPR_TIMING_2D		
4D	MRC Progress	MRC_FORCE_OLTM		
50	MRC Progress	MRC_MC_ACTIVATE		

(continued on the next page)

Action	PHASE	POST CODE	TYPE	DESCRIPTION
Normal boot	PEI(Pre-EFI initialization) phase	51	MRC Progress	MRC_RH_PREVENTION
		52	MRC Progress	MRC_GET_MRC_DATA
		58	MRC Progress	MRC_RETRAIN_CHECK
		5A	MRC Progress	MRC_SA_GV_SWITCH
		5B	MRC Progress	MRC_ALIAS_CHECK
		5C	MRC Progress	MRC_ECC_CLEAN_START
		5D	MRC Progress	MRC_DONE
		5F	MRC Progress	MRC_CPGC_MEMORY_TEST
		60	MRC Progress	MRC_TXT_ALIAS_CHECK
		61	MRC Progress	MRC_ENG_PERF_GAIN
		68	MRC Progress	MRC_MEMORY_TEST
		69	MRC Progress	MRC_FILL_RMT_STRUCTURE
		70	MRC Progress	MRC_SELF_REFRESH_EXIT
		71	MRC Progress	MRC_NORMAL_MODE
		7D	MRC Progress	MRC_SSA_PRE_STOP_POINT
		7E	MRC Progress	MRC_NO_MEMORY_DETECTED
		7F	MRC Progress	MRC_SSA_STOP_POINT
		55	MRC Progress	MRC_MEM_INIT_DONE
		32	Progress	CPU Init.
		34	Progress	CPU Init.
	36	Progress	CPU Init.	
	4F	Progress	DXE Initial Program Load(IPL)	
	DXE(Driver Execution Environment) phase	60	Progress	DXE Core Started
		61	Progress	DXE NVRAM Init.
		62	Progress	SB run-time init.
		63	Progress	DXE CPU Init
		68	Progress	NB Init.
		69	Progress	NB Init.
		6A	Progress	NB Init.
		70	Progress	SB Init.
		71	Progress	SB Init.
		72	Progress	SB Init.
	BDS(Boot Device Selection) phase	78	Progress	ACPI Init.
		79	Progress	CSM Init.
		90	Progress	BDS started
		91	Progress	Connect device event
		92	Progress	PCI Bus Enumeration
		93	Progress	PCI Bus Enumeration
		94	Progress	PCI Bus Enumeration
		95	Progress	PCI Bus Enumeration
		96	Progress	PCI Bus Enumeration
		97	Progress	Console output connect event
		98	Progress	Console input connect event
		99	Progress	AMI Super IO start
		9A	Progress	AMI USB Driver Init.
		9B	Progress	AMI USB Driver Init.
		9C	Progress	AMI USB Driver Init.
		9D	Progress	AMI USB Driver Init.
		b2	Progress	Legacy Option ROM Init.
		b3	Progress	Reset system
		b4	Progress	USB hotplug
		b6	Progress	NVRAM clean up
		b7	Progress	NVRAM configuration reset
A0		Progress	IDE, AHCI Init.	
A1		Progress	IDE, AHCI Init.	
A2	Progress	IDE, AHCI Init.		
A3	Progress	IDE, AHCI Init.		
FF-00	Progress	Wait BMC ready(duration: 120 seconds).		
A8	Progress	BIOS Setup Utility password verify		
A9	Progress	BIOS Setup Utility start		
AB	Progress	BIOS Setup Utility input wait		
AD	Progress	Ready to boot event		
AE	Progress	Legacy boot event		
Operating system phase	AA	Progress	APIC mode	
	AC	Progress	PIC mode	

Hardware Information

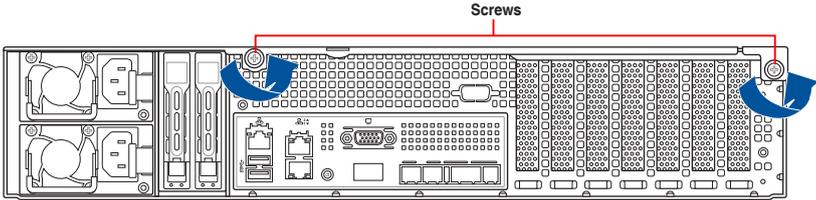
2

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

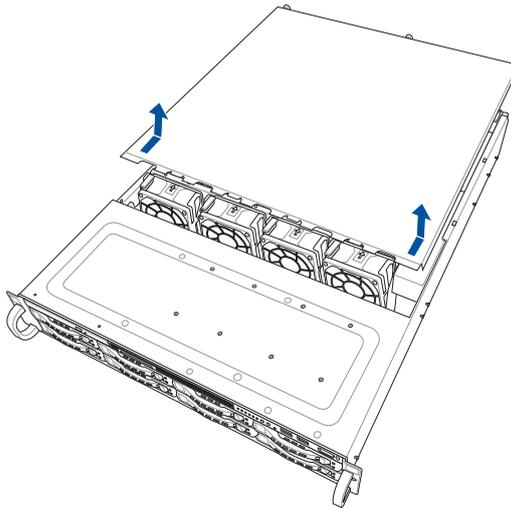
2.1 Chassis cover

2.1.1 Removing the rear cover

1. Loosen the two thumbscrews on the rear panel to release the rear cover from the chassis. There is no need to remove the thumbscrews, just loosen them.



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



The chassis is covered with a layer of film. Before starting up the system, remove the film to avoid overheating.

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 all power cables are unplugged before installing the CPU.



- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA 3647 socket.
- 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.

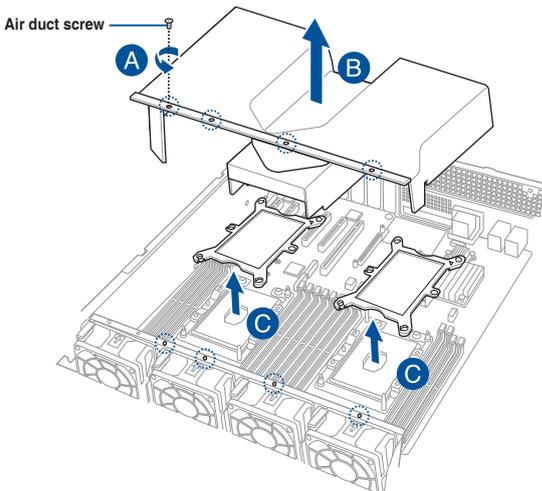
2.2.1 Installing the CPU

To install a CPU:

1. Remove the rear cover. For more information, see the section **Chassis cover**.
2. Remove the air duct screw at the left corner with a Phillips screw driver (A), remove the air duct (B), and then remove the PnP caps from the CPU sockets (C).



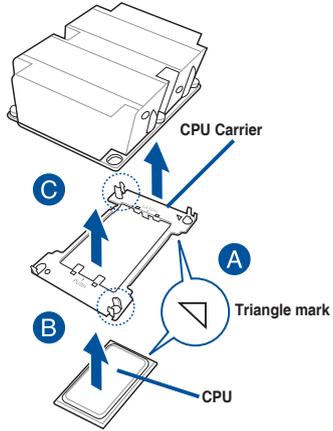
The three spots beside the air duct screw at the left corner are for positioning the air duct.



- 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.



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

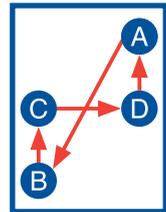
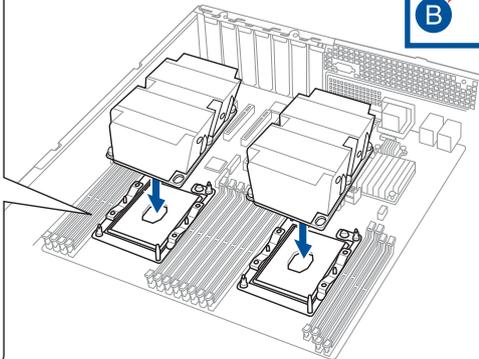
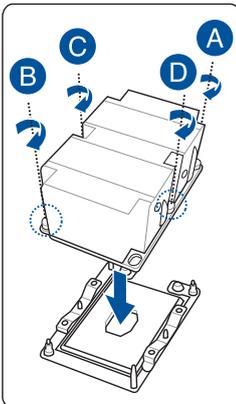


The CPU and CPU Carrier fits in only one correct orientation. DO NOT force the CPU and CPU Carrier into the socket to prevent damaging the CPU pins on the socket.

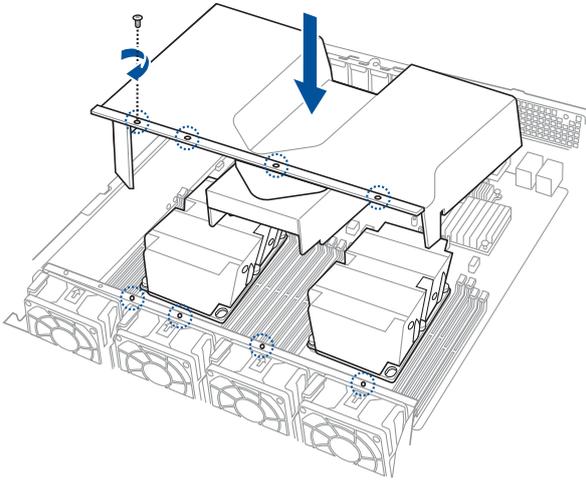
- Twist each of the four screws with a screwdriver just enough to attach the heatsink to the motherboard. When the four screws are attached, tighten them one by one in a diagonal sequence to completely secure the heatsink.



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



6. Reinstall the air duct and secure the air duct screw.

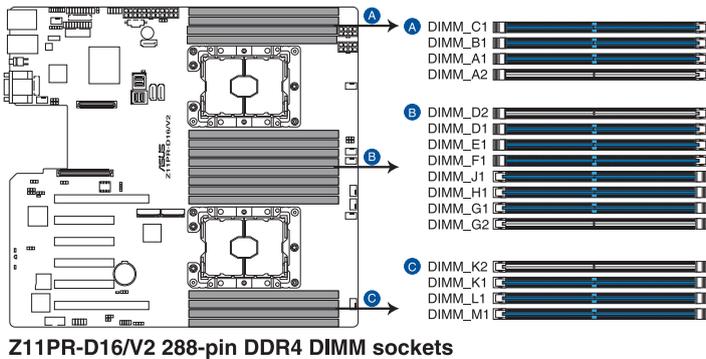


2.3 System memory

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:



2.3.2 Memory Configurations

You may install 4 GB, 8 GB, 16 GB, and 32 GB RDIMMs; 32 GB, and 64 GB LRDIMMs; and 64GB and 128GB LRDIMMs (3DS) into the DIMM sockets using the memory configurations in this section.



- Refer to ASUS Server AVL for the updated list of compatible DIMMs.
- Always install DIMMs with the same CAS latency. For optimum compatibility, it is recommended that you obtain memory modules from the same vendor.
- Start installing the DIMMs in slot A1.

Single CPU configuration (must be installed on CPU1)

	DIMM				
	1	2	4	6	8
DIMM_C1				•	•
DIMM_B1			•	•	•
DIMM_A1	•	•	•	•	•
DIMM_A2					•
DIMM_D2					•
DIMM_D1		•	•	•	•
DIMM_E1			•	•	•
DIMM_F1				•	•

Dual CPU configuration

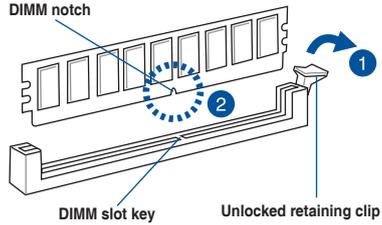
	DIMM						
	1	2	4	6	8	12	16
DIMM_C1				•		•	•
DIMM_B1			•	•	•	•	•
DIMM_A1	•	•	•	•	•	•	•
DIMM_A2							•
DIMM_D2							•
DIMM_D1					•	•	•
DIMM_E1					•	•	•
DIMM_F1						•	•
DIMM_J1				•		•	•
DIMM_H1			•	•	•	•	•
DIMM_G1		•	•	•	•	•	•
DIMM_G2							•
DIMM_K2							•
DIMM_K1					•	•	•
DIMM_L1					•	•	•
DIMM_M1						•	•

2.3.3 Installing a DIMM on a single clip DIMM socket



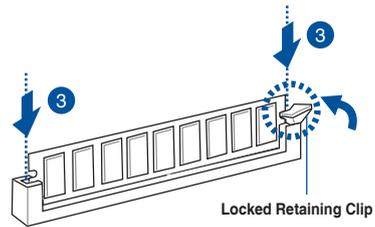
Ensure to unplug the power supply before adding or removing DIMMs or other system components. Failure to do so may cause severe damage to both the motherboard and the components.

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.



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.

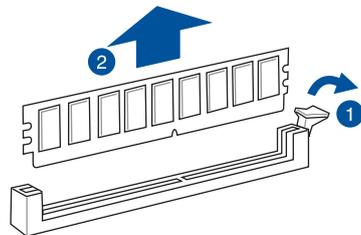
3. Hold the DIMM by both of its ends then insert the DIMM vertically into the socket. Apply force to both ends of the DIMM simultaneously until the retaining clip snaps back into place and the DIMM cannot be pushed in any further to ensure proper sitting of the DIMM.



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

2.3.4 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 Storage devices

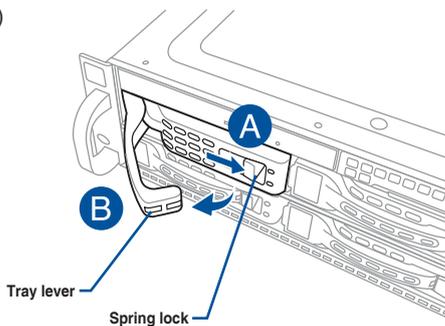
The RS520-E9-RS8 V2 system supports eight (8) 2.5" or 3.5" hot-swap storage devices, and the RS520-E9-RS12UV2 systems support twelve (12) storage devices, and both support two (2) additional hot-swap 2.5" storage devices on the rear panel. The storage device installed in the bay connects to the motherboard SATA/NVMe ports via the SATA/NVMe backplane (SAS drives require an optional ASUS PIKE II card).



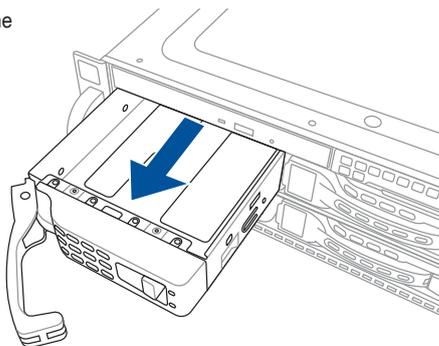
- On **RS520-E9-RS8 V2** models, the onboard controller only supports SATA storage devices by default, if you would like to use SAS storage devices, please install an ASUS PIKE II card (purchased separately).
- On **RS520-E9-RS12UV2** models, if you would like to use SATA or SAS storage devices on the backplane, please install an ASUS PIKE II card.

To install a 3.5" 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 tray. The tray ejects slightly after you pull out the lever.

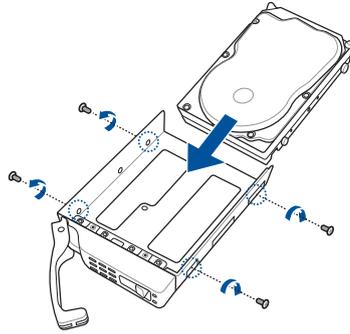


2. Firmly hold the tray lever and pull the tray out of the bay.

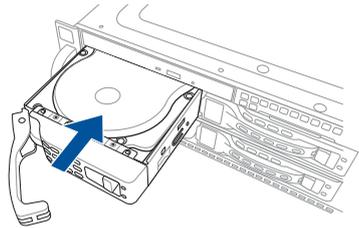


3. Place the tray on a flat and stable surface.
4. Prepare the 3.5" storage device and the bundled set of screws.

5. Place the 3.5" storage device into the tray then secure it with four screws.



6. 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.

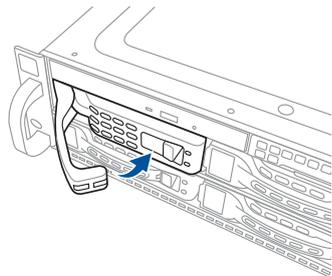


When installed, the SATA/NVMe connector on the storage device connects to the SATA/ NVMe interface on the backplane.

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



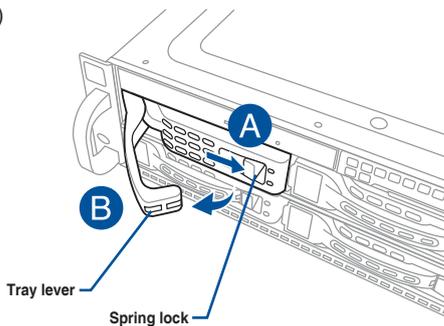
The tray is correctly placed when its front edge aligns with the bay edge.



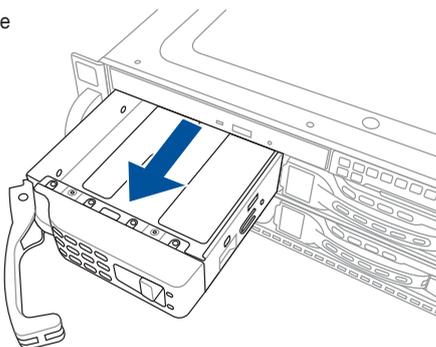
8. Repeat steps 1 to 7 to install the other storage devices.

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 tray. The tray ejects slightly after you pull out the lever.

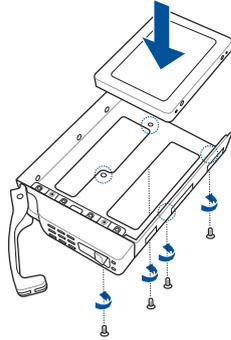


2. Firmly hold the tray lever and pull the tray out of the bay.

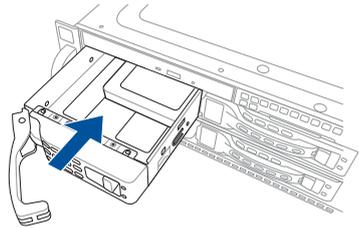


3. Place the tray on a flat and stable surface.
4. Prepare the 2.5" storage device and the bundled set of screws.

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.

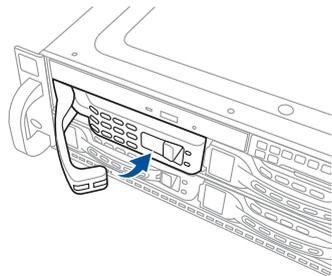


When installed, the SATA/NVMe connector on the storage device connects to the SATA/NVMe interface on the backplane.

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



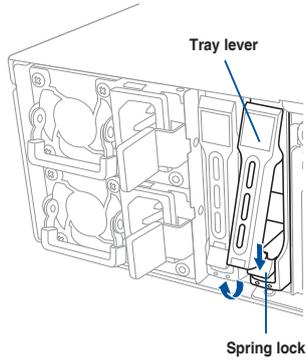
The tray is correctly placed when its front edge aligns with the bay edge.



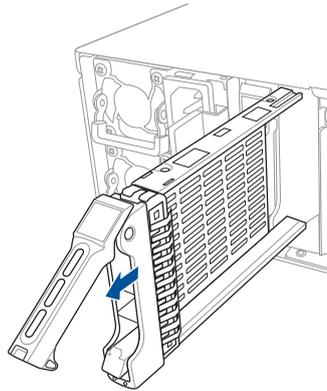
8. Repeat steps 1 to 7 to install the other storage devices.

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

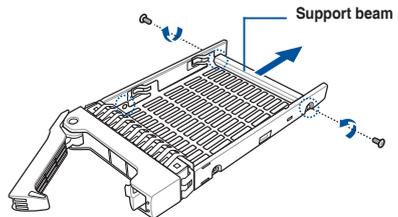
1. Press the spring lock to release the tray lever.



2. Firmly hold the tray lever then pull the tray out of the bay.

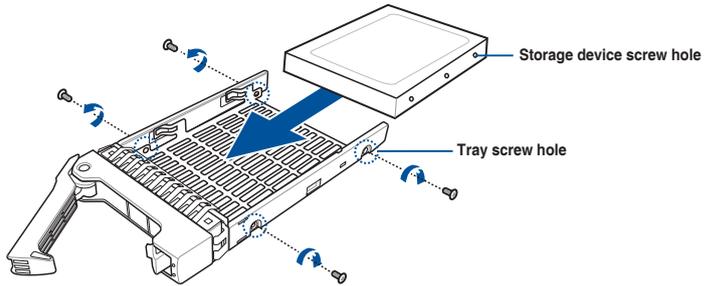


3. Release the screws on each side of the tray to release the tray metal beam.

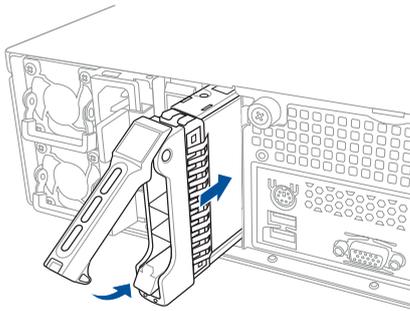


4. Orient and place the 2.5" storage device into the tray.

Ensure that the storage device is fitted firmly inside the tray and that the four screws of the storage device matches the four screws holes of the tray.



5. Carefully insert the tray and push it all the way to the depth of the bay. Lock the secure tab to secure the tray in place.



When installed, the connector on the storage device connects to the connector on the backplane.

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

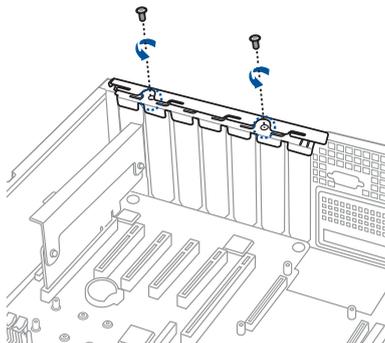
2.5 Expansion slot

The barebone server comes with six (6) PCIe slots. PCIe slot 1 is pre-installed with a PCIe-NVME4-OCuLink card for installing NVME storage devices on Bay 1 to Bay 4. You need to remove these expansion card brackets if you want to install PCIe expansion cards.

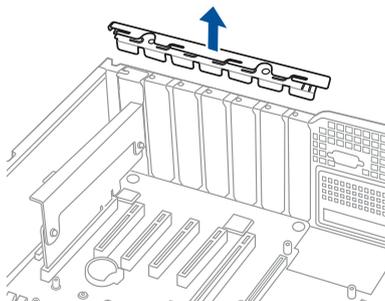
2.5.1 Installing an expansion card to the PCIe slot

To install an expansion card:

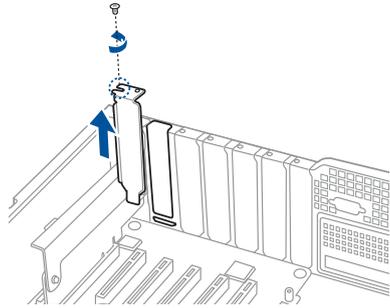
1. Remove the two screws on the bracket and put it aside.



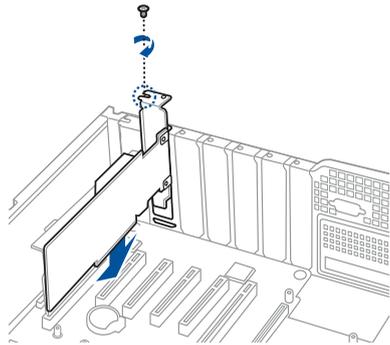
2. Remove the bracket and put it aside.



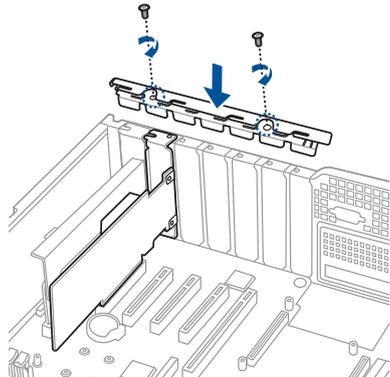
3. Remove the screw that secures the metal cover to the chassis, then remove the metal cover then set it aside for future use.



4. Insert the expansion card into the PCIe slot. Ensure that the golden fingers are totally inserted into the slot. Secure it with the screw removed earlier.



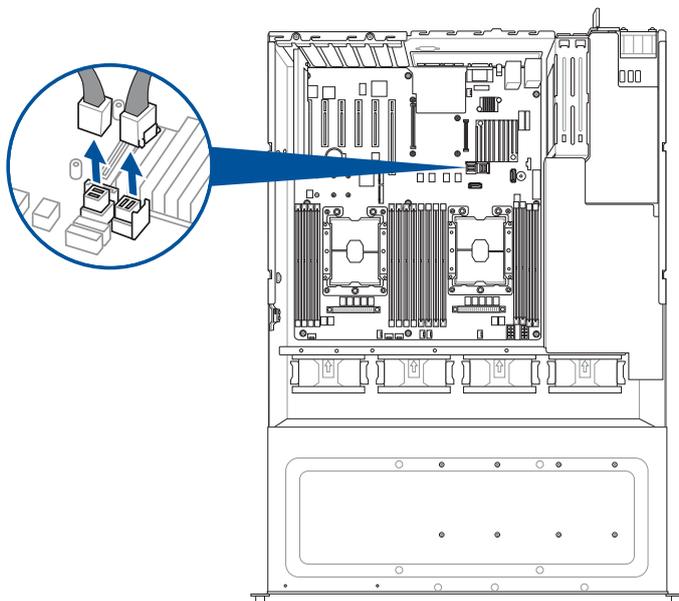
5. Reinstall the bracket. Secure it with the two screws to complete the installation.



2.5.2 Installing an ASUS PIKE II card

You can install an ASUS PIKE II card into PCIe slot 6 to allow your server system to support SAS drives on the front panel.

1. Remove the default cable from the motherboard.



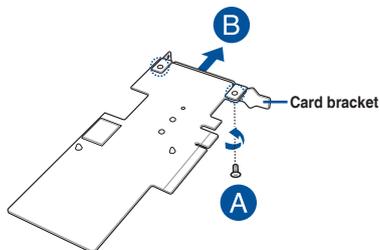
The illustrations shown above are for reference only.

2. Prepare the ASUS PIKE II card.

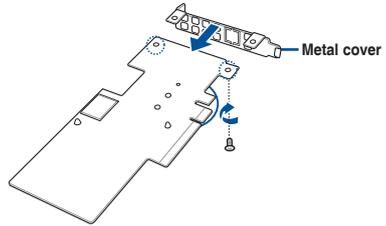


If your expansion card is pre-installed with a proprietary card bracket, proceed to step 5.

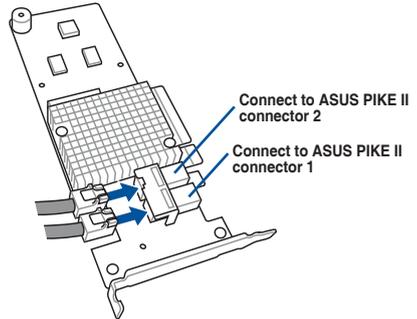
3. Remove the two screws on the ASUS PIKE II card (A), then remove the card bracket (B).



- Secure the ASUS PIKE II card and the metal cover (proprietary card bracket) with the two screws.



- Connect the mini-SAS HD cable to the ASUS PIKE II card.



- Install the ASUS PIKE II card and the metal cover assembly into PCIe slot 6. Ensure that the golden connectors of the ASUS PIKE II card is firmly seated in place.



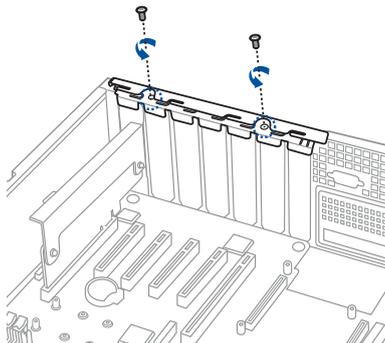
Refer to section **2.5.1 Installing an expansion card to the PCIe slot** for the steps on installing an expansion card to the PCIe slot.

2.5.3 Replacing the ASUS PCIE-NVME4-OCuLink card

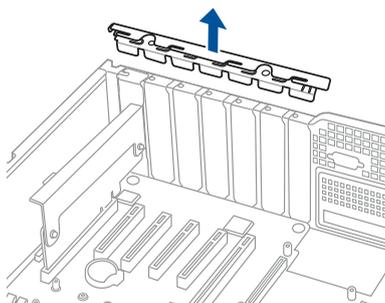
The ASUS PCIE-NVME4-OCuLink card pre-installed on the PCIE slot 1 allows your server system to support NVME storage devices on Bay 1 to Bay 4.

To replace an ASUS PCIE-NVME4-OCuLink card:

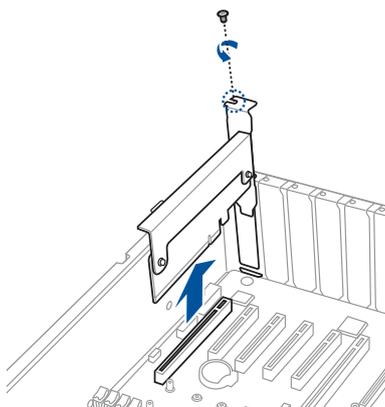
1. Remove the two screws on the bracket and put it aside.



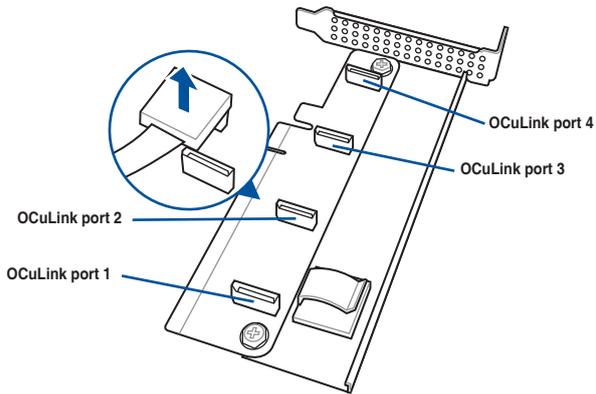
2. Remove the bracket and put it aside.



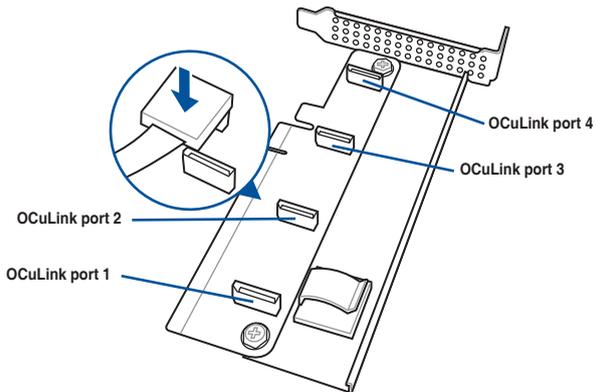
3. Remove the screw that secures the metal cover of the ASUS PCIE-NVME4-OCuLink card to the chassis, then remove the ASUS PCIE-NVME4-OCuLink card.



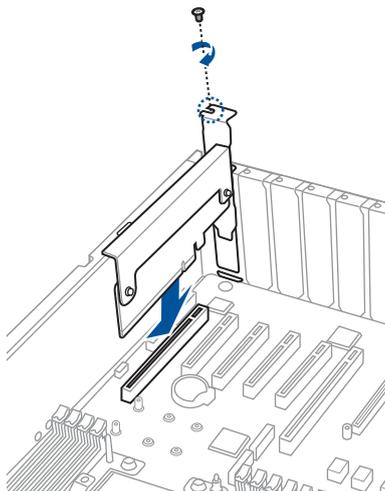
4. Remove the OCuLink cables from its corresponding slots.



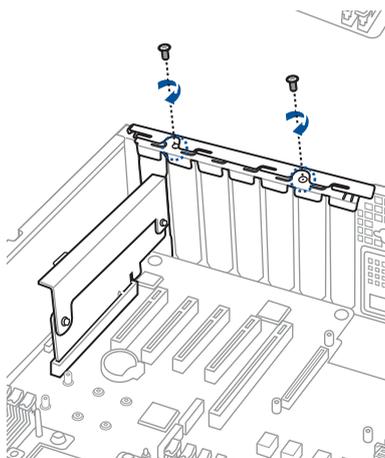
5. Prepare the replacement ASUS PCIe-NVME4-OCuLink card.
6. Reconnect the OCuLink cables to its corresponding slots.



7. Insert the ASUS PCIE-NVME4-OCuLink card into the PCIE slot. Ensure that the golden fingers are totally inserted into the slot. Secure it with the screw removed earlier.



8. Reinstall the bracket. Secure it with the two screws to complete the installation.



2.5.4 Configuring an expansion card

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

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

Standard Interrupt assignments

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

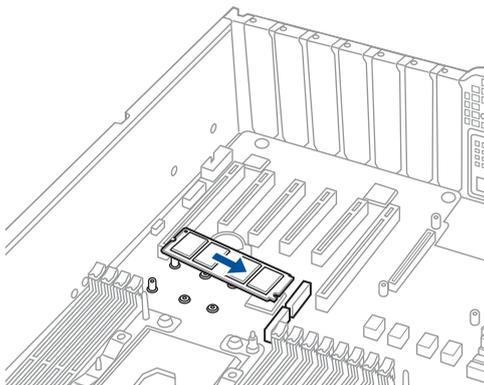
* These IRQs are usually available for ISA or PCI devices.

2.5.5 Installing an M.2 expansion card

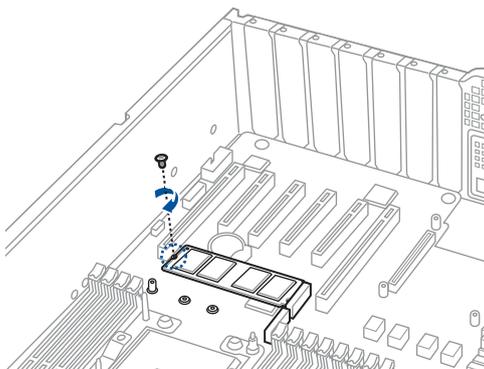
You can install an M.2 expansion card on the provided M.2 slot onboard.

To install an M.2 expansion card:

1. Remove the screw on the M.2 socket and put it aside.
2. Prepare your M.2 expansion card.
3. Align and insert the M.2 card into the M.2 slot onboard as shown.



4. Secure the M.2 card with a screw to complete the installation.

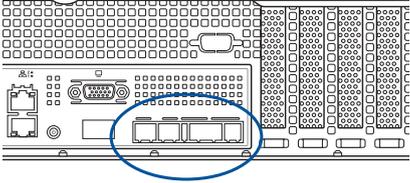


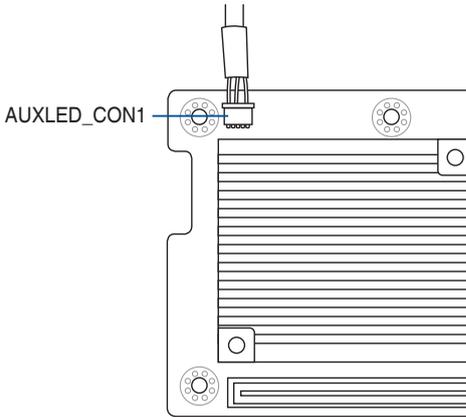
- Please pay attention when removing the screw, the stand screw might be removed together with it.
- Ensure that the M.2 card is positioned between the screw and the stand screw before securing it.

2.5.6 Installing a Mezzanine card

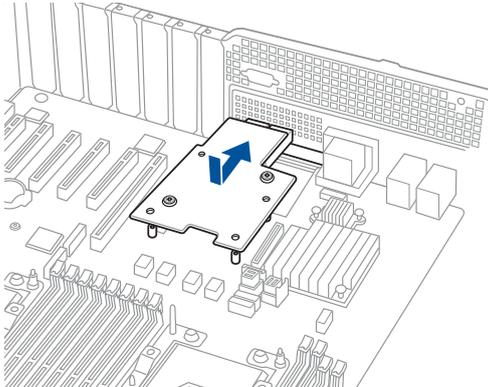
You can install a supported Mezzanine card on the onboard slot.

To install a Mezzanine card:

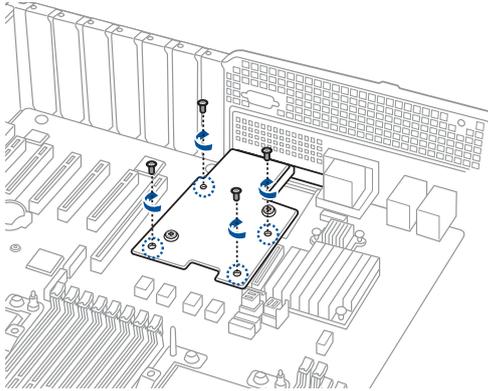
1. Remove the slot bay from the Mezzanine card expansion slot.
- 
2. Prepare your Mezzanine card and the signal cable. Connect the signal transmission end (white) to the AUXLED_CON header on the card.



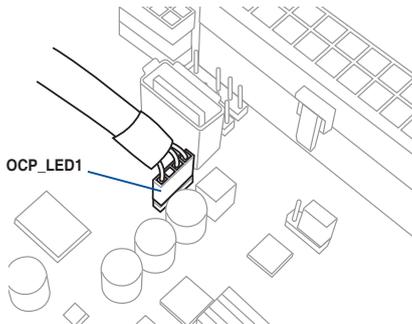
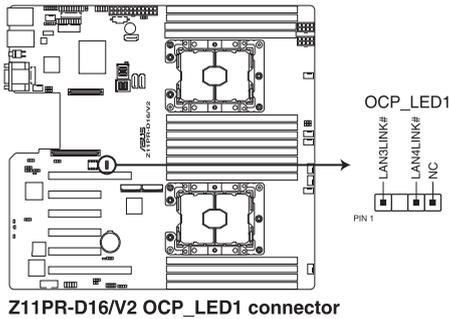
3. Match and insert the four (4) screw holes on the Mezzanine card into the four (4) stand screws on the chassis, then insert the Mezzanine card to the slot on the motherboard.



4. Secure the Mezzanine card with the four (4) bundled screws.



5. Connect the signal end (black) to the OCP_LED1 header on the motherboard.

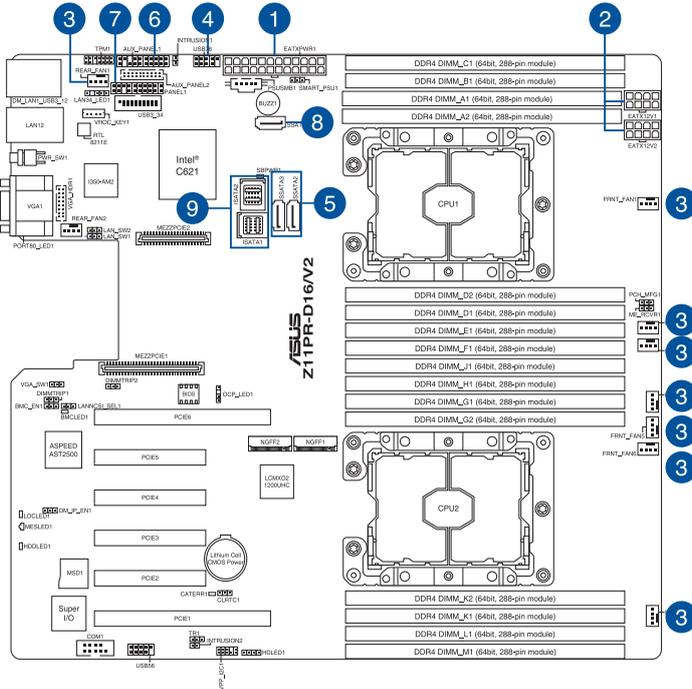


The two ends of the signal cable are different in size and color for easy recognition. Please refer to your exact cable.

2.6 Cable connections



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

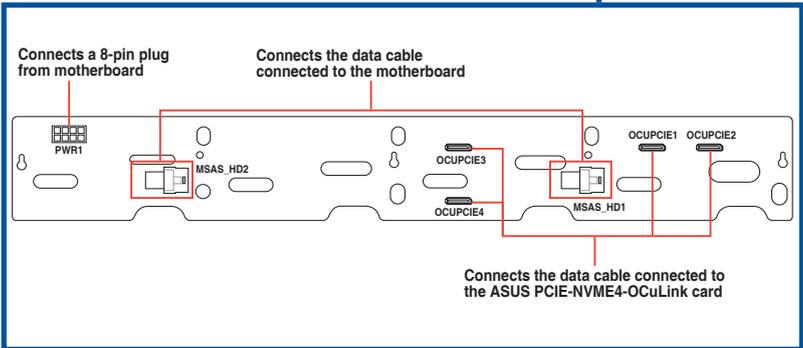
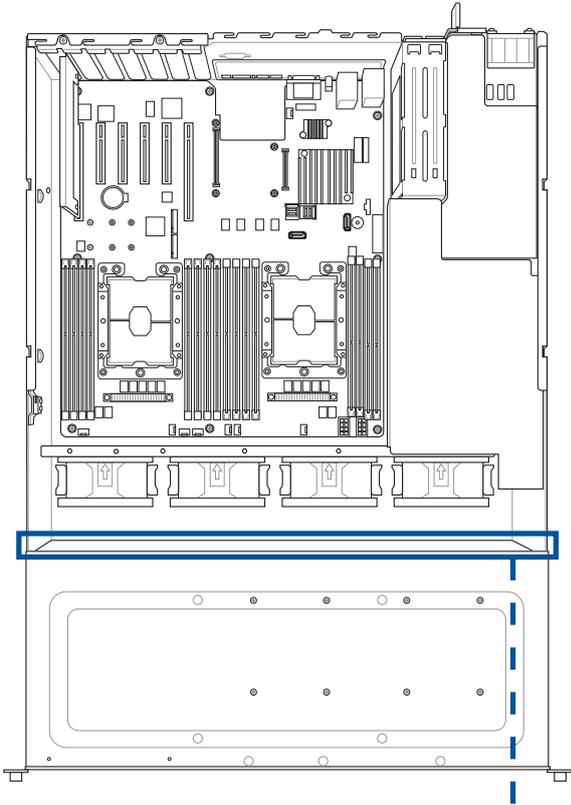


Pre-connected system cables

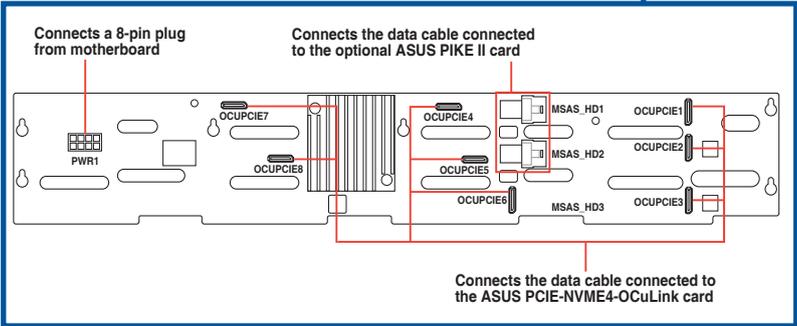
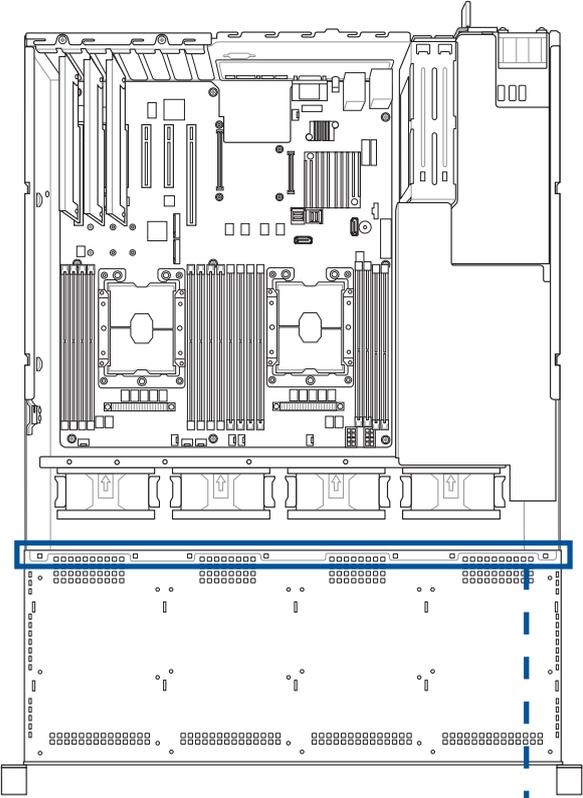
1. 24-pin ATX power connector (from power supply to motherboard)
2. 8-pin 12V power connector (from power supply to motherboard)
3. System fan connector (from motherboard to system fans)
4. USB connector (from motherboard to front I/O board)
5. SATA ports connectors (from motherboard to rear backplane board)
6. System auxiliary panel connector (from motherboard to front I/O board)
7. System panel connector (from motherboard to front I/O board)
8. SATA ports connectors (from motherboard to front backplane board)
9. ISATA connectors (from motherboard to SATA/SAS front backplane board)

2.7 Backplane cabling

RS520-E9-RS8 V2

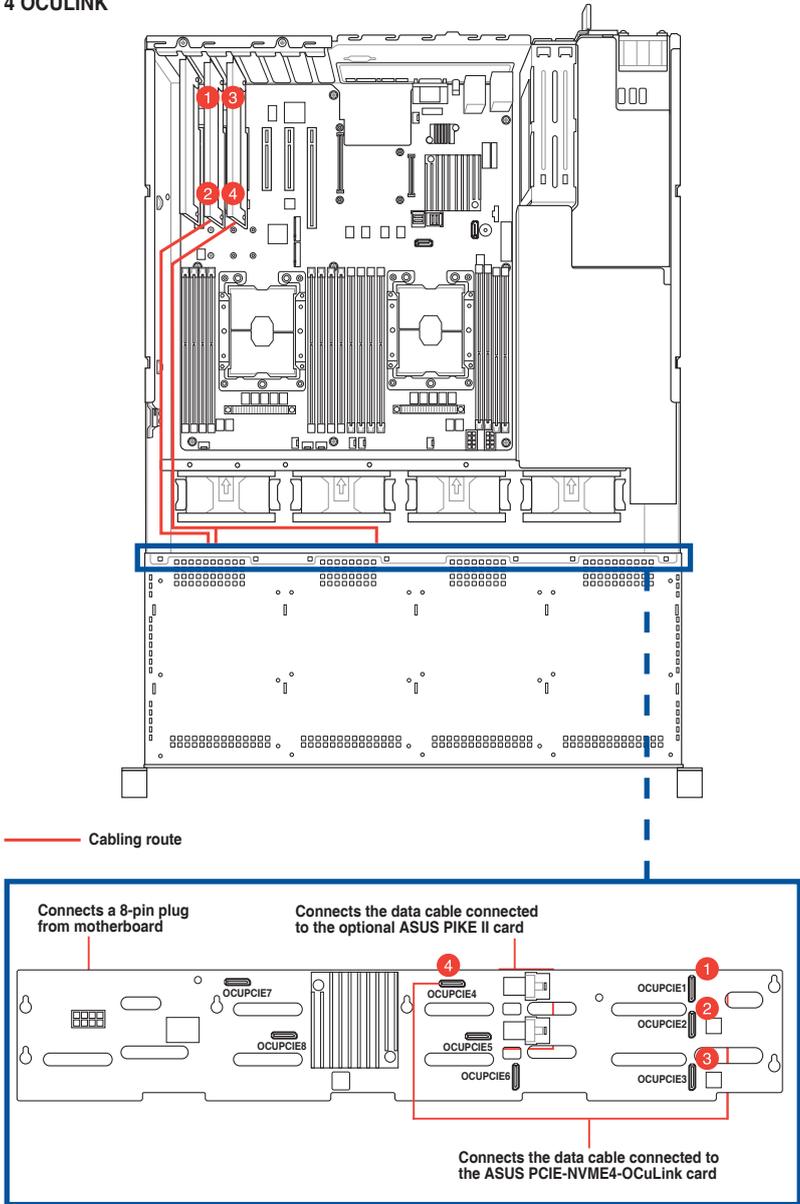


RS520-E9-RS12UV2

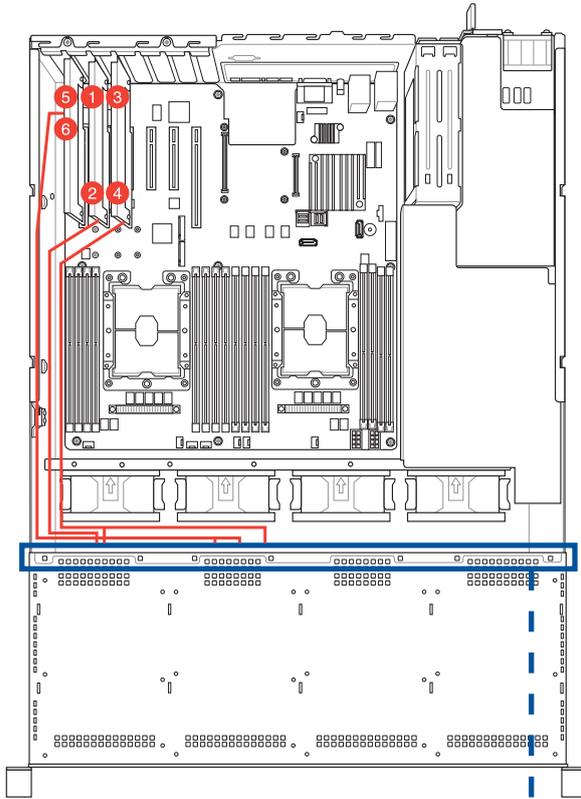


Please refer to the following illustrations for different OCULINK configurations and cabling routes.

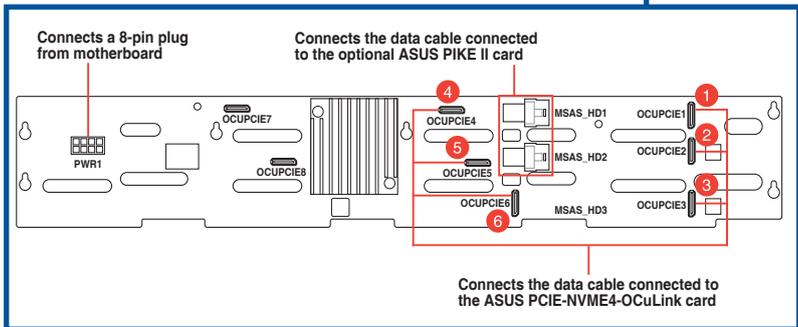
4 OCULINK



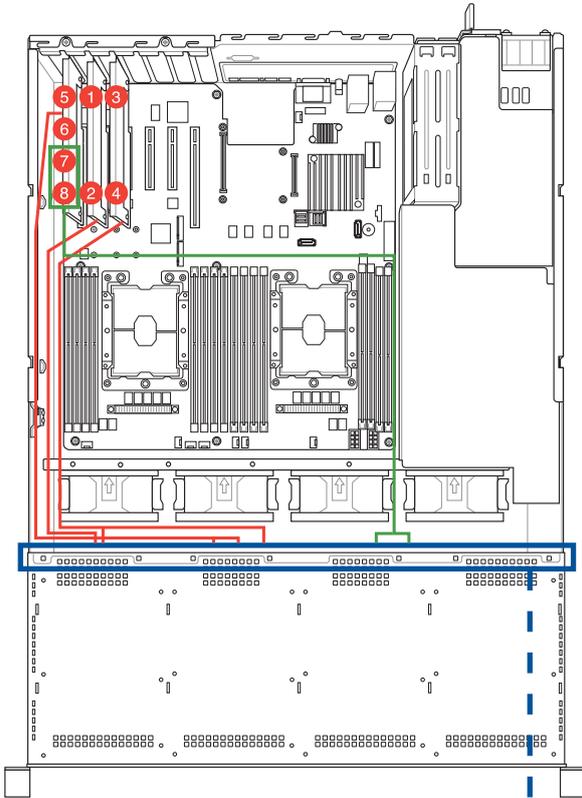
6 OCULINK



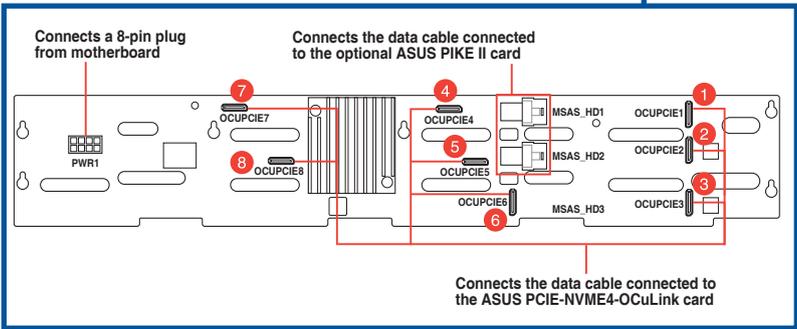
 Cabling route



8 OCU LINK



Cabling route



2.8 Removable/optional components

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

1. System fans
2. Slim type optical drive (optional)
3. Redundant power supply module (optional)

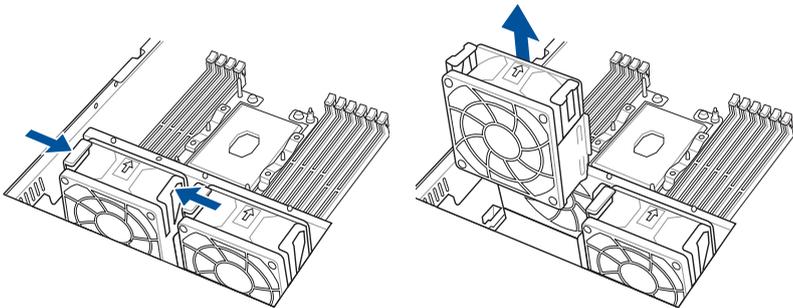


Ensure that the system is turned off before removing any components.

2.8.1 System fans

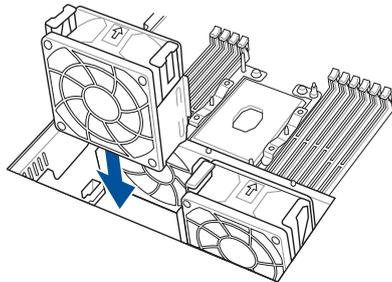
To uninstall the system fans:

1. Hold two levers on both sides of the fan, then lift the fan to remove.
2. Repeat steps 1 to uninstall the other system fans.



To reinstall the system fans

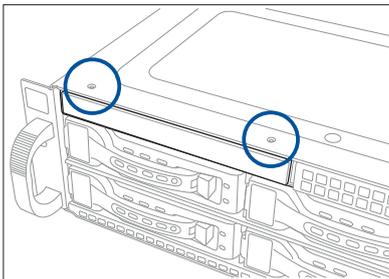
1. Insert the fan into the fan cage. The airflow directional arrow on the fan side should point towards the CPU heatsink.



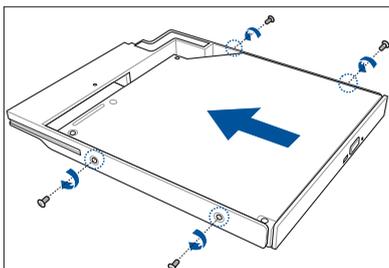
2.8.2 Slim optical drive (optional for RS520-E9-RS8 V2)

To install the optional optical drive:

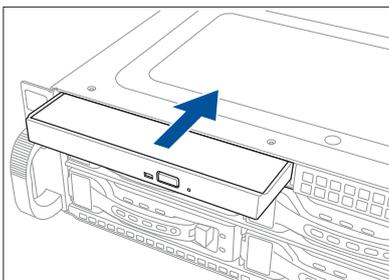
1. Remove 2 screws that secure the slim optical drive cover to the chassis.



2. Secure two screws on each side of the optical drive to secure it into the expansion bracket.

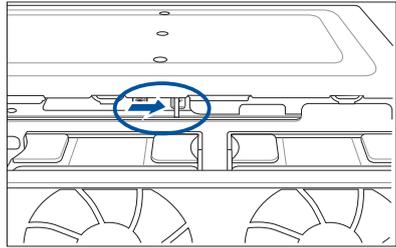


3. Place the slim optical drive into the expansion bay.
4. Ensure the expansion tray is completely inserted into the bay. (The drive tray is correctly placed when its front edge aligns with the bay edge.)

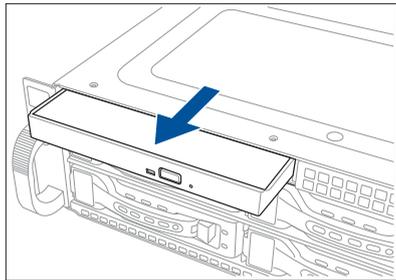


To remove or uninstall the slim type optical disk drive:

1. Locate the optical drive eject latch at the back of the optical drive bay.



2. Press the optical drive eject latch to the right then push the slim type optical drive towards the front panel.



2.8.3 Redundant power supply module

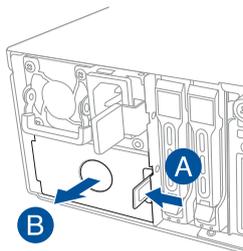
To replace a failed redundant power supply module:



-
- Ensure that the system is turned off before removing any components.
 - Touch any metal surface to release static electricity.
 - Use power supply module with the same model and style.
-

To install the second redundant power supply module:

1. Press the latch to the left (A).
2. Remove the metal cover from the chassis (B).

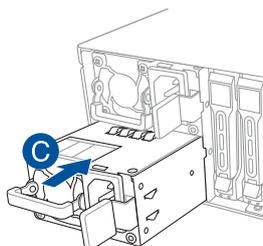


3. Prepare the second redundant power supply module.



Ensure to remove the protection cap before installation.

4. Carefully insert the replacement power supply module into the chassis.
5. Push the power supply module in place (C).



Installation Options

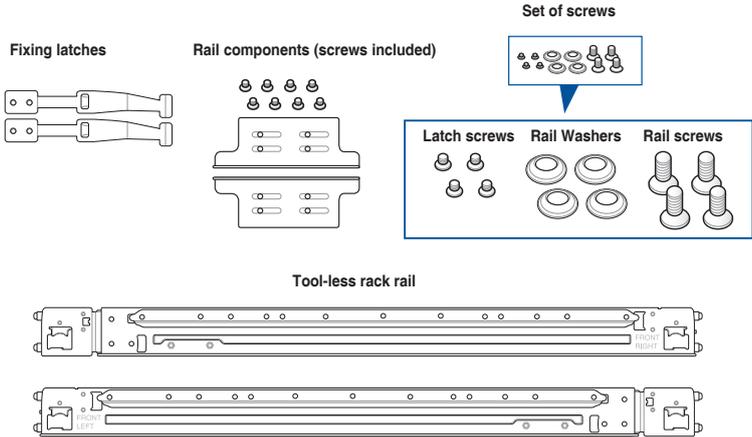
3

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

3.1 Tool-less Friction Rail Kit

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

The tool-less rail kit package includes:



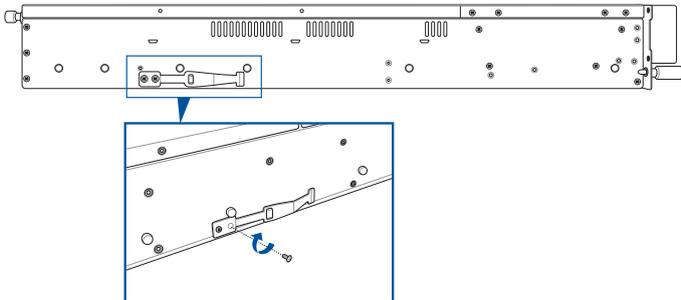
Installing the tool-less rack rail

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

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



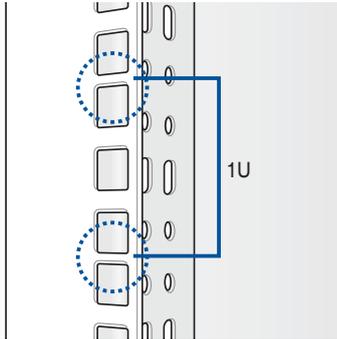
The locations of the screw holes vary with different server models. Refer to your server user manual for details.



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



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



3. Secure the rail components to the rail using the bundled screws.
4. Press the spring lock (A) then insert the studs into the selected square mounting holes on the rack post.
5. 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.
6. (Optional) Use the rail screw and rail washer (B) that comes with the kit to secure the rack rail to the rack post.

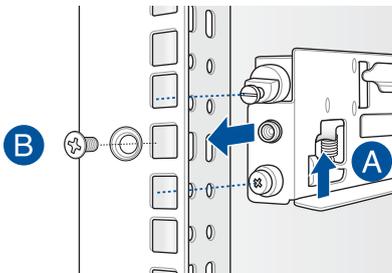


A torque value of 14 kgf.cm is recommended for the rail screw.

7. 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.

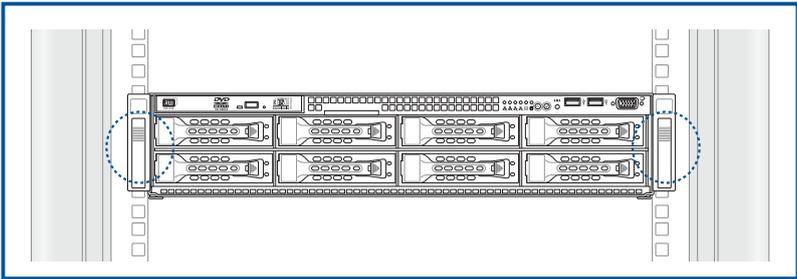


8. Lift the server chassis and insert it into the rack rail.

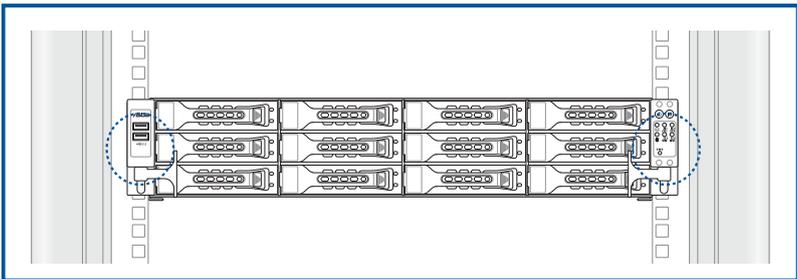


- Ensure that the rack rail cabinet and the rack posts are stable and standing firmly on a level surface.
- We strongly recommend that at least two able-bodied persons perform the steps described in this guide.
- We recommend the use of an appropriate lifting tool or device, if necessary.

RS520-E9-RS8 V2 Front View



RS520-E9-RS12UV2 Front View

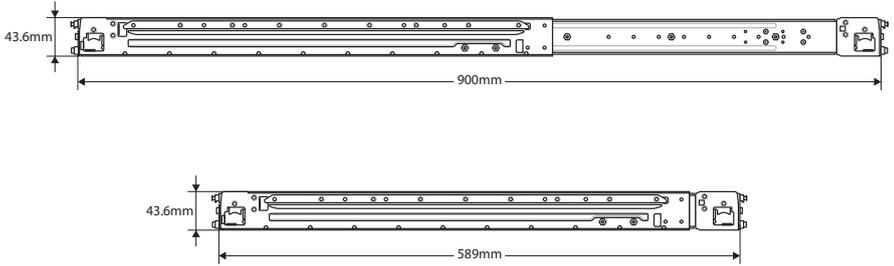


Ensure to include the side knots on the two sides of the server in the rack rail holders.



The illustrations shown above are for reference only.

3.2 Rail kit dimensions

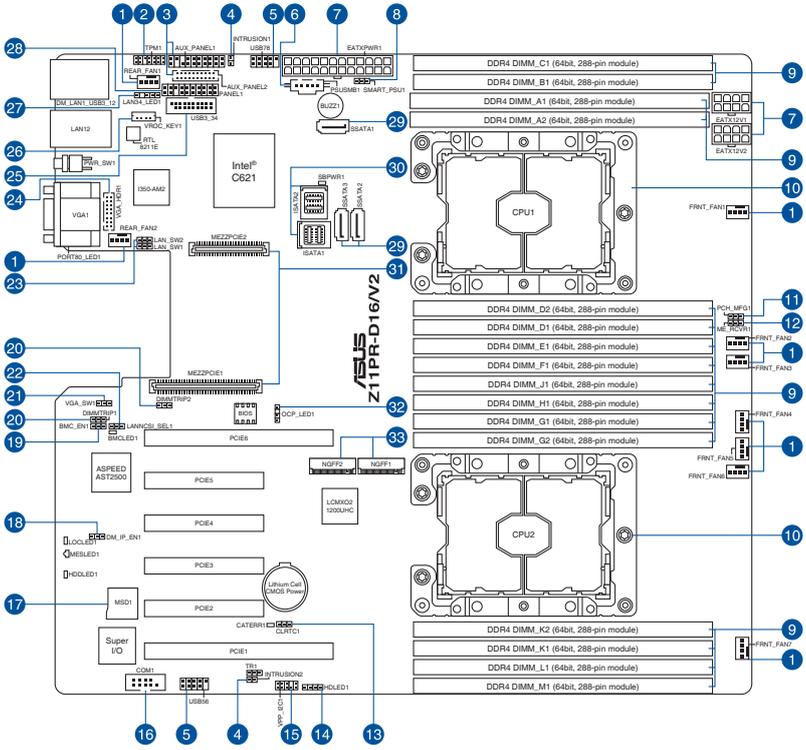


Motherboard Information

4

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

4.1 Motherboard layout



Layout contents

Internal connectors / Sockets / Jumpers / LEDs	Page
1. CPU, front, and rear fan connectors (4-pin FRNT_FAN1-7; REAR_FAN1-2)	4-15
2. TPM connector (14-1 pin TPM1)	4-16
3. Auxiliary panel connector (20-2 pin AUX_PANEL1, 20-pin AUX_PANEL2)	4-19
4. Chassis Intrusion (2-pin INTRUSION1-2)	4-21
5. USB 2.0 connector (10-1 pin USB78; USB56)	4-14
6. Power Supply SMBus connector (5-pin PSUSMB1)	4-24
7. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V1; 8-pin EATX12V2)	4-17
8. Smart Ride Through (SmaRT) setting (3-pin SMART_PSU1)	4-8
9. DDR4 DIMM sockets	2-5
10. CPU socket	2-3
11. PCH_MFG1 setting (3-pin PCH_MFG1)	4-7
12. ME firmware force recovery setting (3-pin ME_RCVR1)	4-6
13. Clear RTC RAM (3-pin CLRTC1)	4-4
14. Storage device activity LED connector (4-pin HDLED1)	4-20
15. VPP_I2C1 connector (10-1 pin VPP_I2C1)	4-21
16. Serial port connector (10-1 pin COM1)	4-16
17. Micro SD card slot (MSD1)	4-22
18. DMLAN setting (3-pin DM_IP_SEL1)	4-9
19. Baseboard Management Controller setting (3-pin BMC_EN1)	4-6
20. DDR4 thermal event setting (3-pin DIMMTRIP1; DIMMTRIP2)	4-7
21. VGA controller setting (3-pin VGA_SW1)	4-5
22. LANNCSI setting (3-pin LANNCSI_SEL1)	4-8
23. LAN controller setting (3-pin LAN_SW1, LAN_SW2)	4-5
24. VGA connector (16-pin VGA_HDR1)	4-20
25. USB 3.0 connector (20-1 pin USB3_34)	4-14
26. VROC KEY connector (4-pin VROC_KEY)	4-23
27. LAN Activity LED connector (5-1 pin LAN34_LED1)	4-15
28. System panel connector (20-1 pin PANEL1)	4-18
29. Serial ATA connectors (7-pin SSATA1-3)	4-13
30. Mini-SAS HD connector (ISATA1-2)	4-13
31. Mezzanine PCIe card connectors (MEZZPCIE1-2)	4-22
32. OCP LAN Activity LED connector (4-1 pin OCP_LED1)	4-24
33. M.2 (NGFF) card connectors (NGFF1-2)	4-23

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:

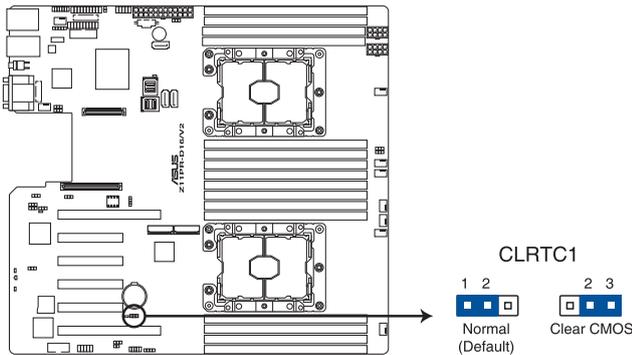
1. Turn OFF the computer and unplug the power cord.
2. Move the jumper cap from pins 1–2 (default) to pins 2–3. Keep the cap on pins 2–3 for about 5–10 seconds, then move the cap back to pins 1–2.
3. Plug the power cord and turn ON the computer.
4. Hold down the key during the boot process and enter BIOS setup to re-enter data.



Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!



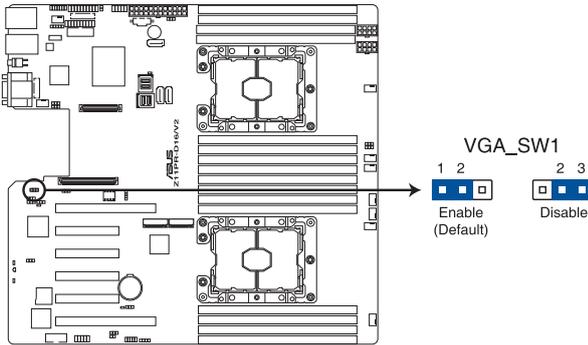
If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.



Z11PR-D16/V2 Clear RTC RAM

2. VGA controller setting (3-pin VGA_SW1)

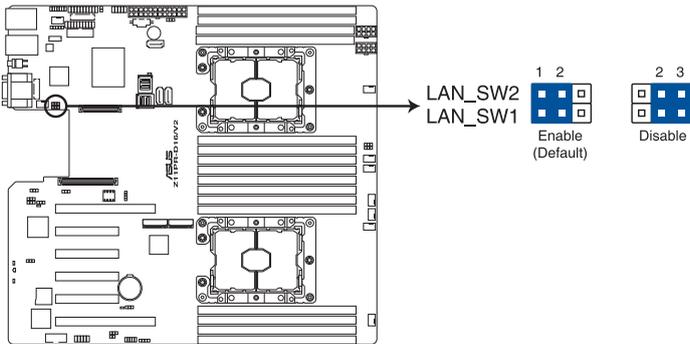
This jumper allows you to enable or disable the onboard VGA controller. Set to pins 1–2 to activate the VGA feature.



Z11PR-D16/V2 VGA setting

3. LAN controller setting (3-pin LAN_SW1, LAN_SW2)

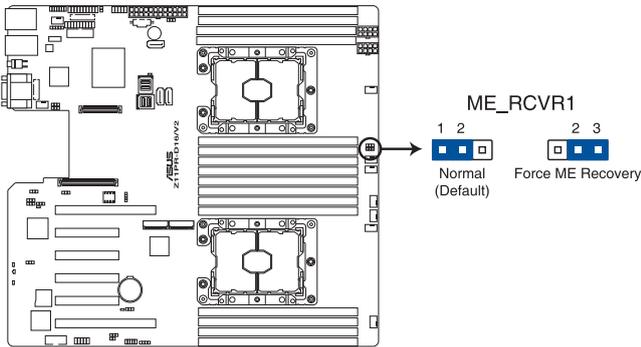
These jumpers allow you to enable or disable the onboard Intel® I350-AM2 Gigabit LAN1/2 controller. Set to pins 1–2 to activate the Gigabit LAN feature.



Z11PR-D16/V2 LAN setting

4. ME firmware force recovery setting (3-pin ME_RCVR1)

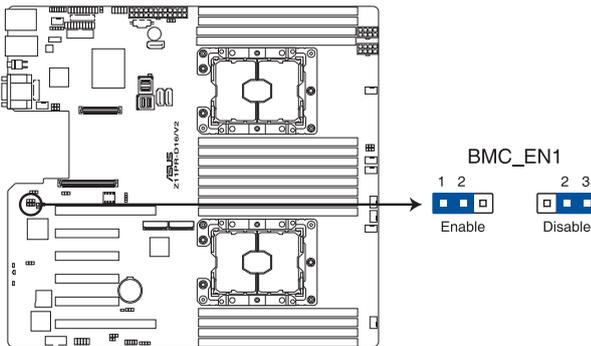
This jumper allows you to force Intel® Management Engine (ME) boot from recovery mode when ME becomes corrupted.



Z11PR-D16/V2 ME recovery setting

5. Baseboard Management Controller setting (3-pin BMC_EN1)

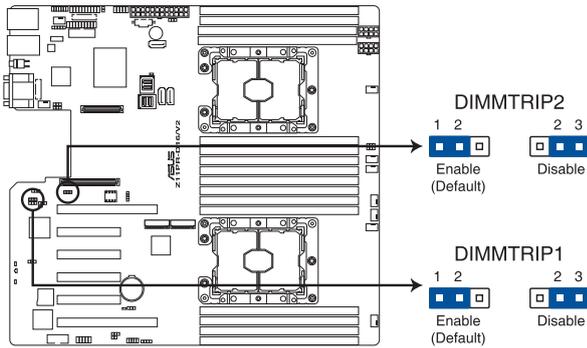
This jumper allows you to enable (default) or disable on-board BMC. Ensure to set this BMC jumper to enabled to avoid system fan control and hardware monitor error.



Z11PR-D16/V2 BMC_EN1 setting

6. DDR4 thermal event setting (3-pin DIMMTRIP1; DIMMTRIP2)

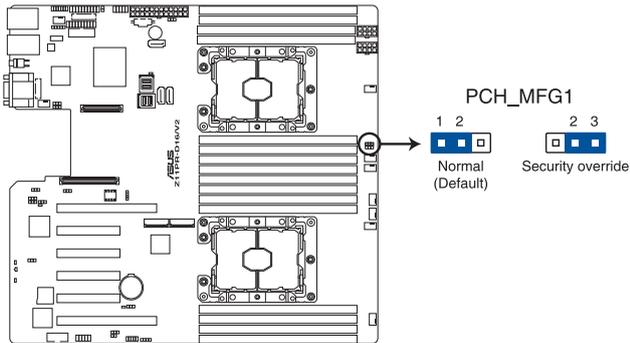
This jumper allows you to enable or disable DDR4 DIMM thermal sensing event pin.



Z11PR-D16/V2 Thermaltrip setting

7. PCH_MFG1 setting (3-pin PCH_MFG1)

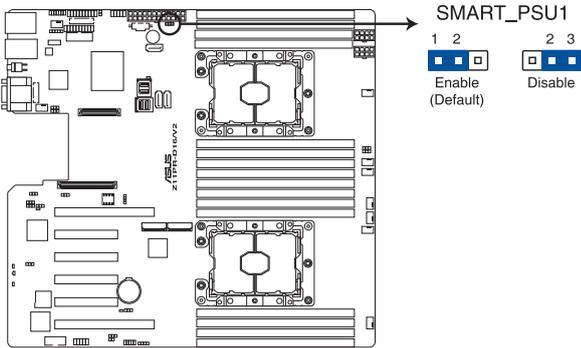
This jumper allows you to update the BIOS ME block.



Z11PR-D16/V2 PCH_MFG setting

8. Smart Ride Through (Smart) setting (3-pin SMART_PSU1)

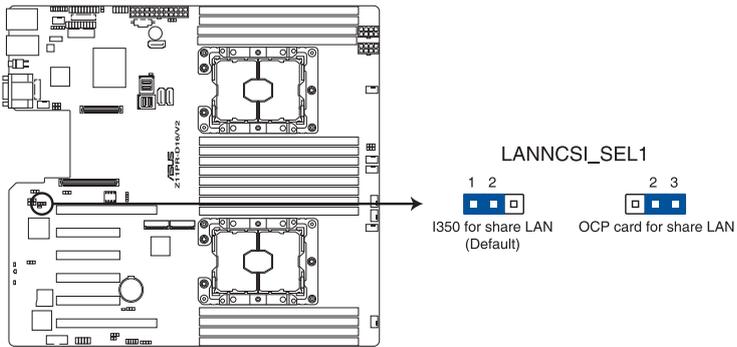
This jumper allows you to enable or disable the Smart Ride Through (SmaRT) function. This feature is enabled by default. Set to pins 2-3 to disable it. When enabled, SmaRT allows uninterrupted operation of the system during an AC loss event.



Z11PR-D16/V2 Smart Ride Through setting

9. LANNCISI setting (3-pin LANNCISI_SEL1)

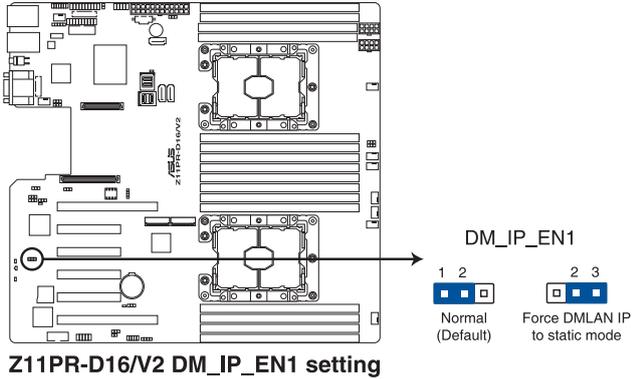
This jumper allows you to select which LAN NCSI to function.



Z11PR-D16/V2 LANNCISI setting

10. DMLAN setting (3-pin DM_IP_SEL1)

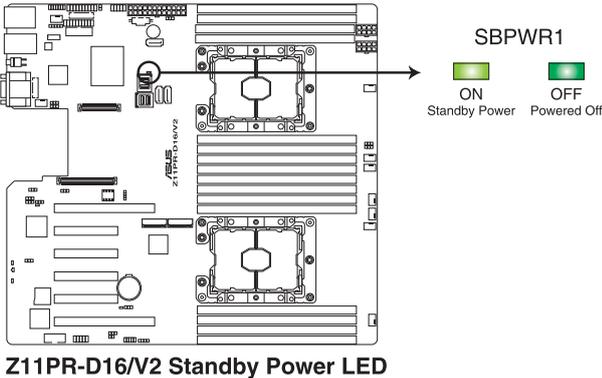
This jumper allows you to select the DMLAN setting. Set to pins 2-3 to force the DMLAN IP to static mode (IP=10.10.10.10, submask=255.255.255.0).



4.3 Internal LEDs

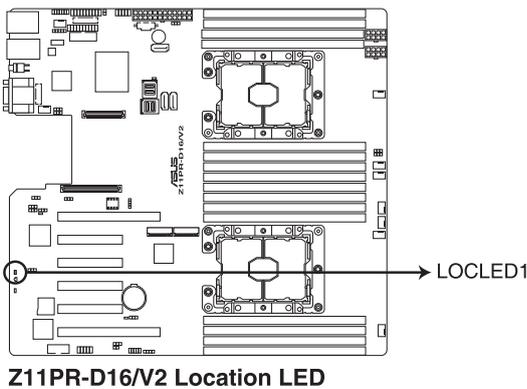
1. Standby Power LED (SBPWR1)

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.



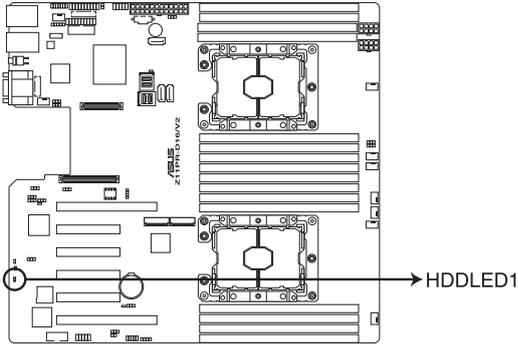
2. Location LED (LOCLED1)

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.



3. Storage device activity LED (HDDLED1)

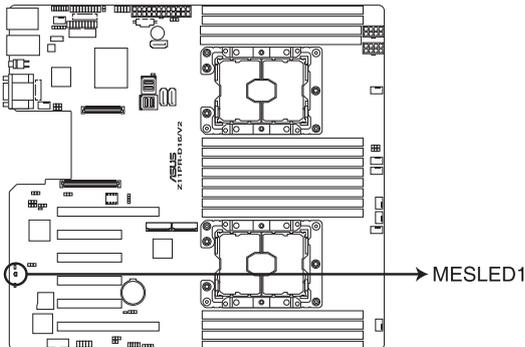
This LED is for the storage devices connected to the onboard SATA, or SATA/SAS add-on card. The read or write activities of any device connected to the onboard SATA, or SATA/SAS add-on card causes the rear panel LED to light up.



Z11PR-D16/V2 Storage device activity LED

4. Message LED (MESLED1)

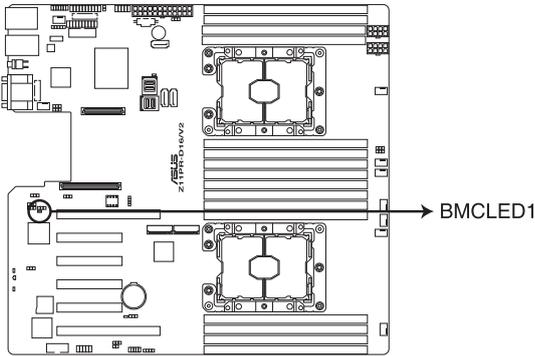
This onboard LED lights up to orange when there is a BMC event log is generated.



Z11PR-D16/V2 MESLED

5. BMC LED (BMCLED1)

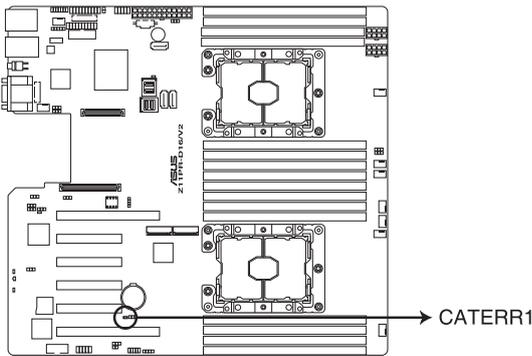
The BMC LED blinks to indicate that the on-board BMC is functional.



Z11PR-D16/V2 BMC LED

6. CATERR1 LED (CATERR1)

The CATERR1 LED indicates that the system has experienced a fatal or catastrophic error and cannot continue to operate.

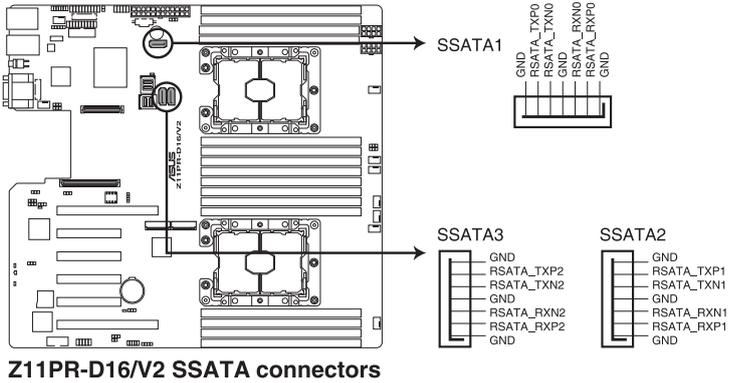


Z11PR-D16/V2 CATERR LED

4.4 Internal connectors

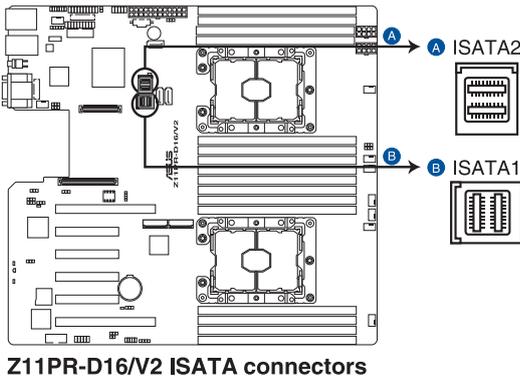
1. Serial ATA connectors (7-pin SSATA1-3)

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



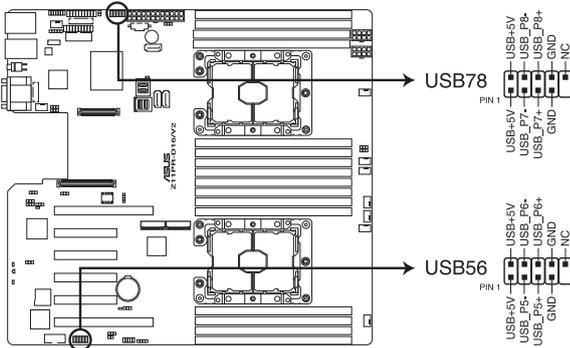
2. Mini-SAS HD connector (ISATA1-2)

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.



3. USB 2.0 connector (10-1 pin USB78; USB56)

This connector is for USB 2.0 ports. Connect the USB module cable to the connector, and then install the module to a slot opening at the back of the system chassis. The USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.



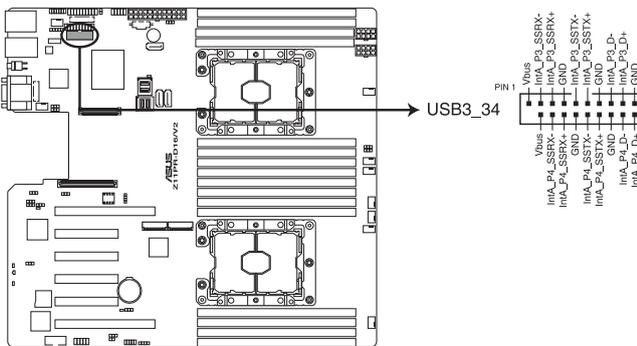
Z11PR-D16/V2 USB 2.0 connectors



The USB port module is purchased separately.

4. USB 3.0 connector (20-1 pin USB3_34)

This connector allows you to connect a USB 3.0 module for additional USB 3.0 front or rear panel ports. With an installed USB 3.0 module, you can enjoy all the benefits of USB 3.0 including faster data transfer speeds of up to 5Gbps, faster charging time for USB-chargable devices, optimized power efficiency, and backward compatibility with USB 2.0.



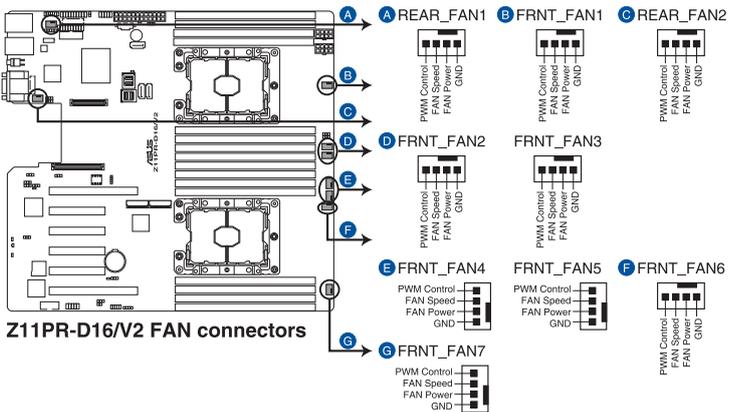
Z11PR-D16/V2 USB 3.0 connector

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

The fan connectors support cooling fans of 0.8A–1.0A (12 W max.) or a total of 6.4 A–8.0 A (96 W max.) at +12V. Connect the fan cables to the fan connectors on the motherboard, making sure that the black wire of each cable matches the ground pin of the connector.

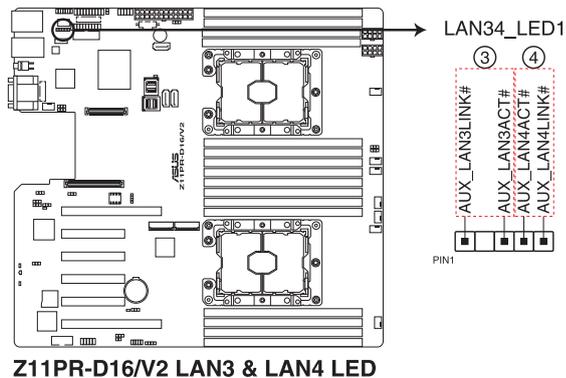


DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! DO NOT place jumper caps on the fan connectors!



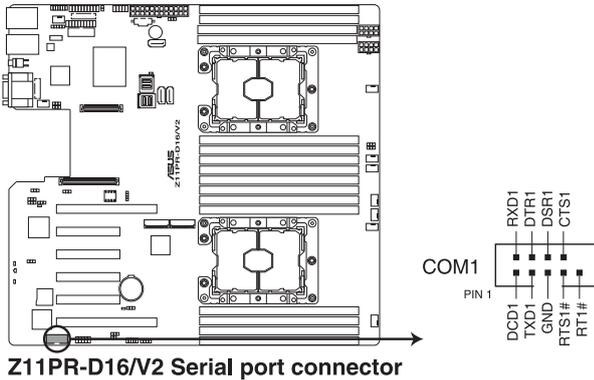
6. LAN Activity LED connector (5-1 pin LAN34_LED1)

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



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

This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



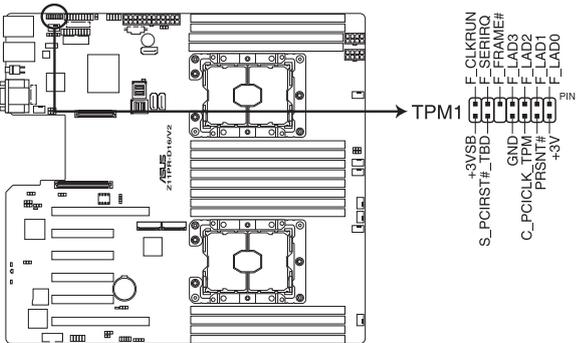
Z11PR-D16/V2 Serial port connector



The COM module is purchased separately.

8. TPM 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.



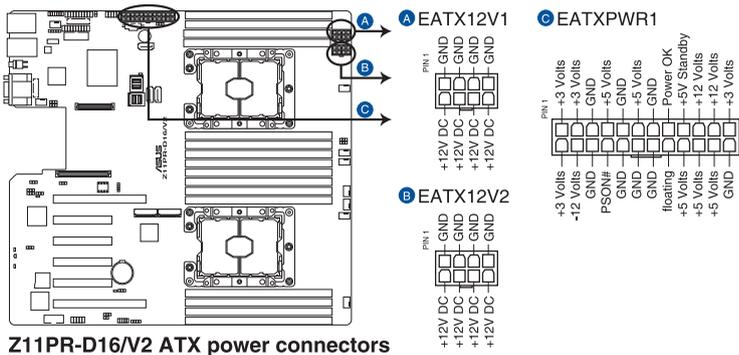
Z11PR-D16/V2 TPM connector

9. ATX power connectors (24-pin EATXPWR1; 8-pin EATX12V1; 8-pin EATX12V2)

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.

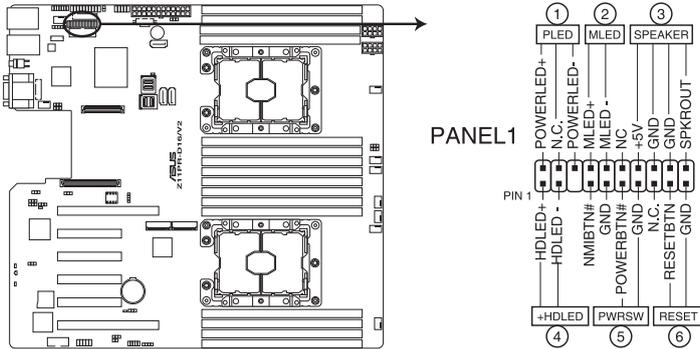


- DO NOT forget to connect the 24-pin and the 8-pin power plugs; otherwise, the system will not boot up.
- Use of a power supply unit (PSU) with a higher power output is recommended when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power 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.



10. System panel connector (20-1 pin PANEL1)

This connector supports several chassis-mounted functions.



Z11PR-D16/V2 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. Power button/soft-off button (2-pin PWRSW)

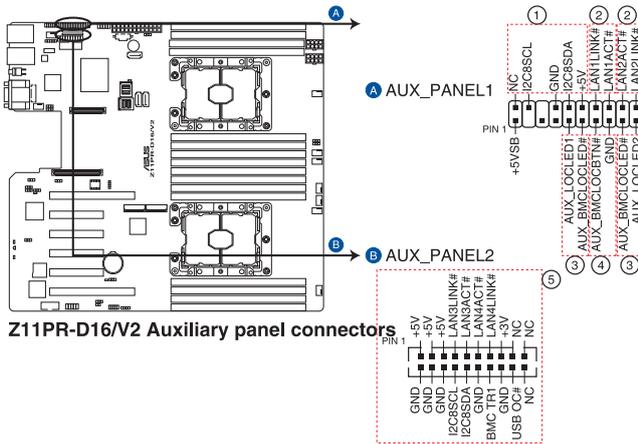
This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the BIOS settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

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.

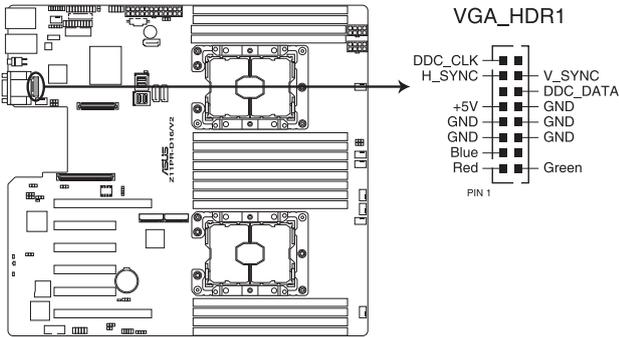
11. Auxiliary panel connector (20-2 pin AUX_PANEL1, 20-pin AUX_PANEL2)

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



12. VGA connector (16-pin VGA_HDR1)

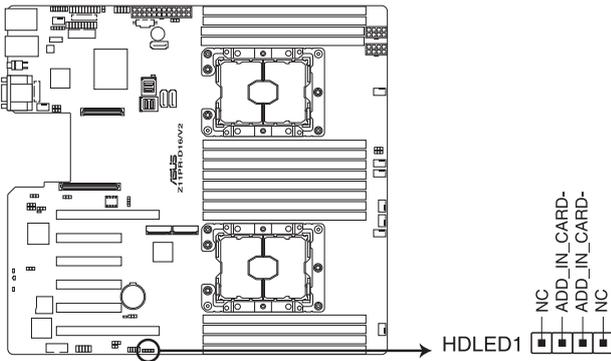
This connector supports the VGA High Dynamic-Range interface.



Z11PR-D16/V2 Internal VGA connector

13. Storage device activity LED connector (4-pin HDLED1)

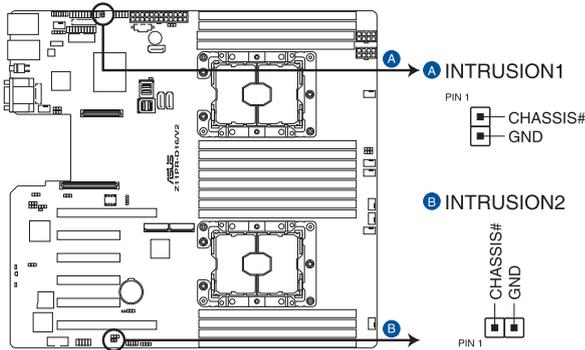
This LED connector is for the storage add-on card cable connected to the SATA or SAS add-on card. The read or write activities of any device connected to the SATA or SAS add-on card causes the front panel LED to light up.



Z11PR-D16/V2 Storage device activity LED connector

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

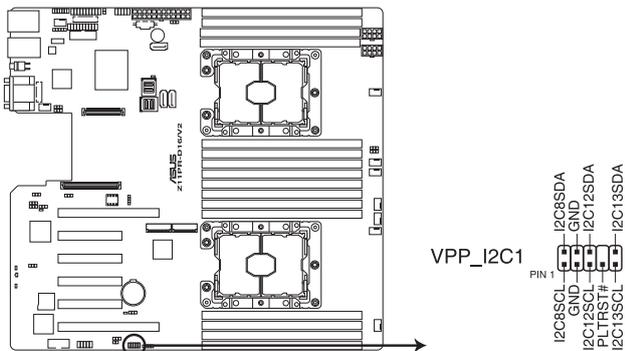
These leads are for the intrusion detection feature for chassis with intrusion sensor or microswitch. When you remove any chassis component, the sensor triggers and sends a high level signal to these leads to record a chassis intrusion event. The default setting is to short the CHASSIS# and the GND pin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



Z11PR-D16/V2 Chassis Intrusion connectors

15. VPP_I2C1 connector (10-1 pin VPP_I2C1)

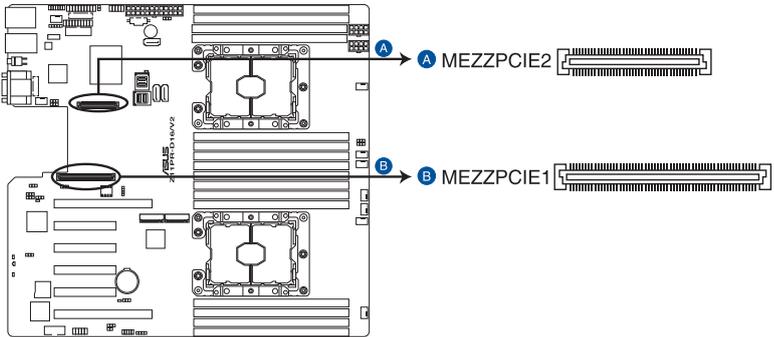
This connector is used for the Intel VMD function and sensor readings.



Z11PR-D16/V2 VPP_I2C1 connector

16. Mezzanine PCIe card connectors (MEZZPCIE1-2)

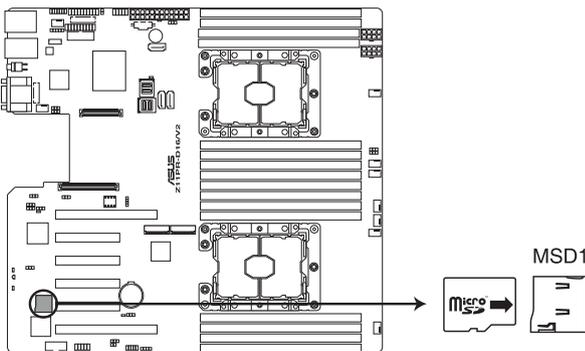
The MEZZPCIE1-2 connector supports Open Compute Project (OCP) cards.



Z11PR-D16/V2 MEZZPCIE connectors

17. Micro SD card slot (MSD1)

Your motherboard supports SD Memory Card v2.00 (SDHC) / v3.00 (SDXC).



Z11PR-D16/V2 MSD1



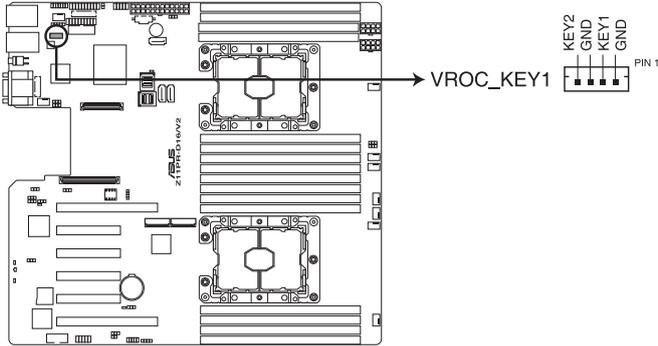
Disconnect all power (including redundant PSUs) from the existing system before you add or remove a Memory Card, then reboot the system to access the Memory Card.



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.

18. VROC KEY connector (4-pin VROC_KEY)

This connector allows you to connect a KEY module to enable additional CPU RAID functions with Intel® CPU RSTe.



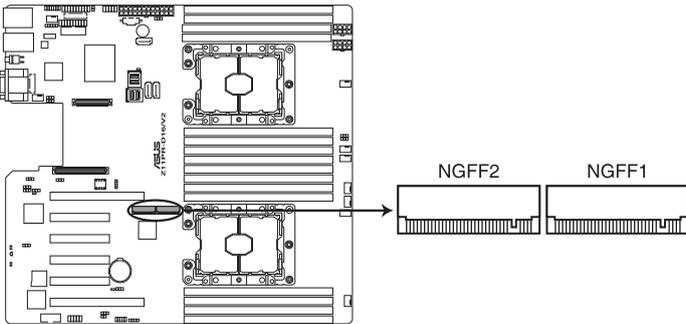
Z11PR-D16/V2 VROC_KEY1



The KEY module is purchased separately.

19. M.2 (NGFF) card connectors (NGFF1-2)

These connectors allow you to install M.2 devices.



Z11PR-D16/V2 NGFF connectors



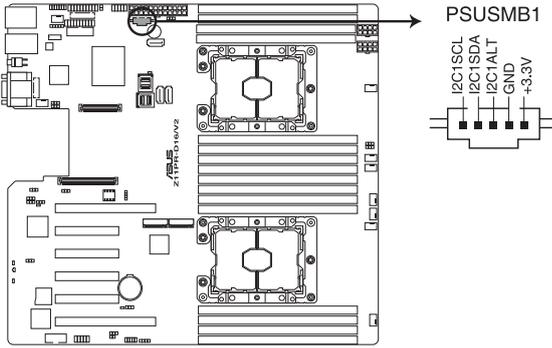
This connector supports type 2242 / 2260 / 2280 devices on both PCI-E and SATA interface.



The M.2 (NGFF) device is purchased separately

20. 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.



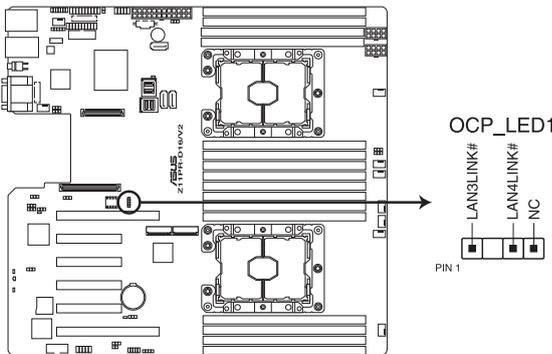
Z11PR-D16/V2 Power supply SMBus connector



This connector functions only when you enable BMC_EN1.

21. OCP LAN Activity LED connector (4-1 pin OCP_LED1)

OCP LAN LED connector supports OCP LAN card Active LED.



Z11PR-D16/V2 OCP_LED1 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

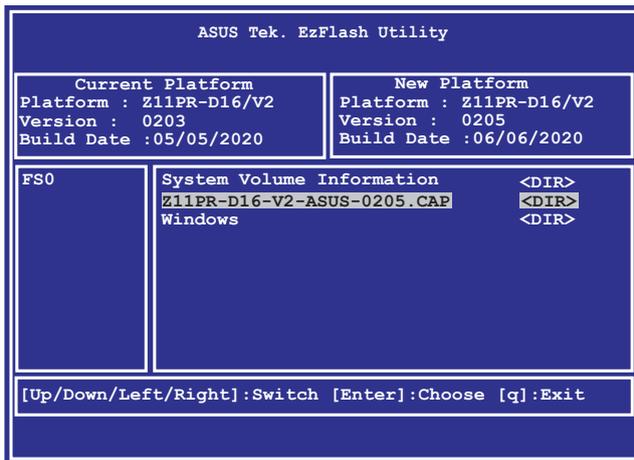
The ASUS EZ Flash Utility feature allows you to update the BIOS without having to use a DOS-based utility.



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>.



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.

4.1.3 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:

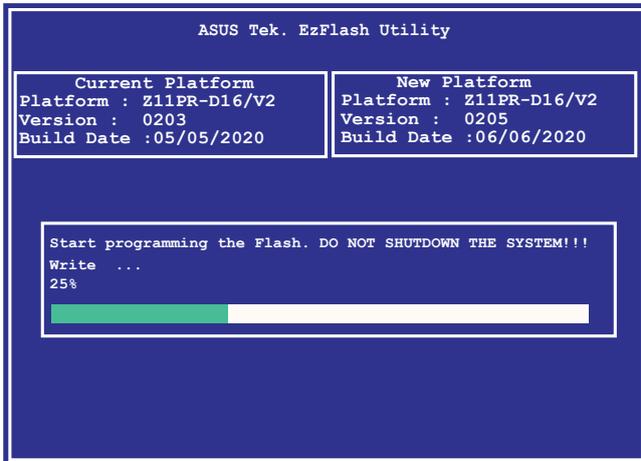
1. Visit the ASUS website at www.asus.com and download the latest BIOS file for the motherboard. Save the BIOS file to a bootable USB flash disk drive.
2. Copy the BUPDATER utility (BUPDATER.exe) from the ASUS support website at www.asus.com/support to the bootable USB flash disk drive you created earlier.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

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

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

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

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



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

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

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

5.2 BIOS setup program

This motherboard supports a programmable firmware chip that you can update using the provided utility described in section **4.1 Managing and updating your BIOS**.

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

Even if you are not prompted to use the Setup program, you can change the configuration of your computer in the future. For example, you can enable the security password feature or change the power management settings. This requires you to reconfigure your system using the BIOS Setup program so that the computer can recognize these changes and record them in the 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 during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

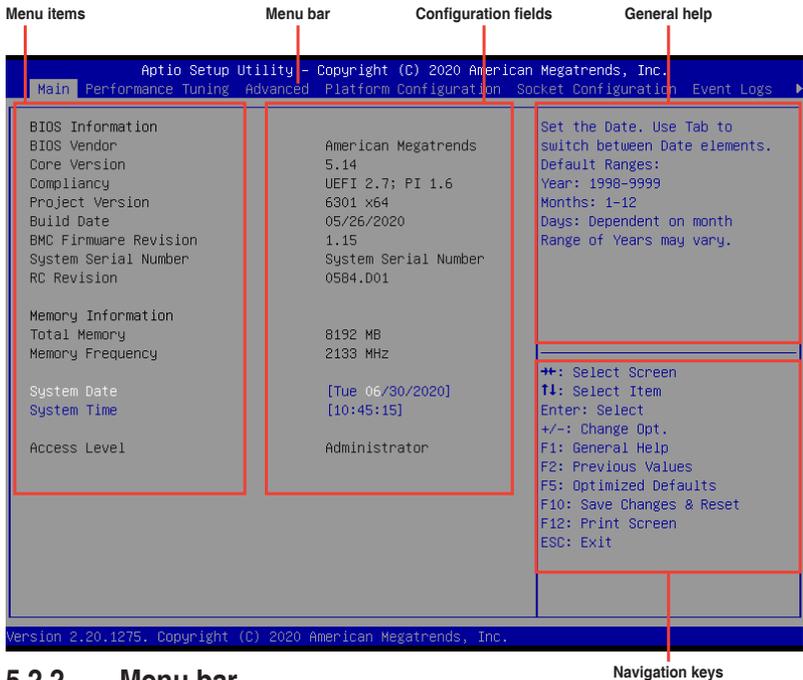
If you wish to enter Setup after POST, restart the system by pressing <Ctrl>+<Alt>+<Delete>, or by pressing the reset button on the system chassis. You can also restart by turning the system off and then back on. Do this last option only if the first two failed.

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



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

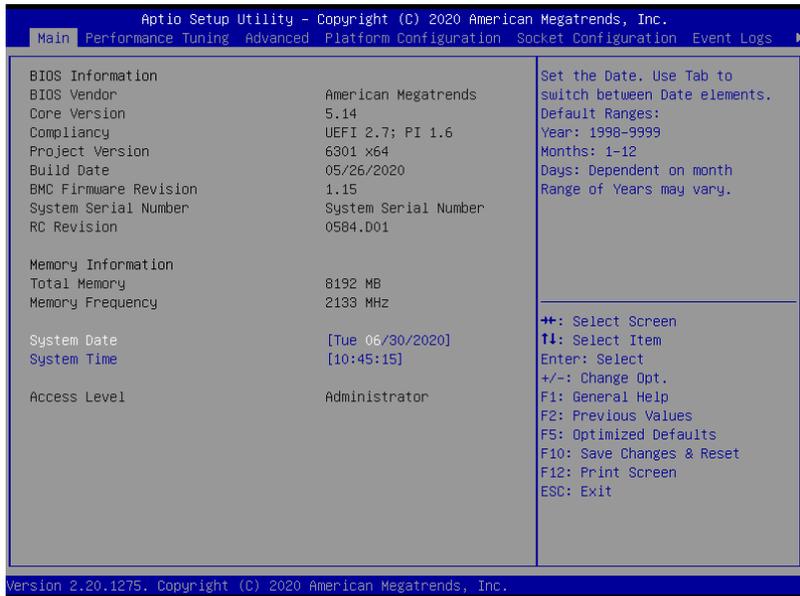
Select a menu item and press <Enter> to display a pop-up window with the configuration options for that item.

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.



5.3.1 System Date [Day xx/xx/xxxx]

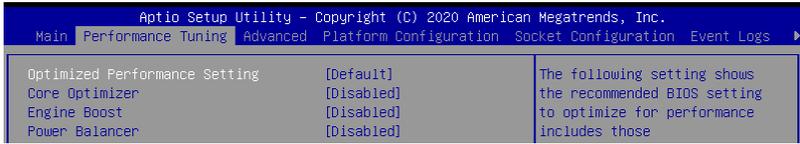
Allows you to set the system date.

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.



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.

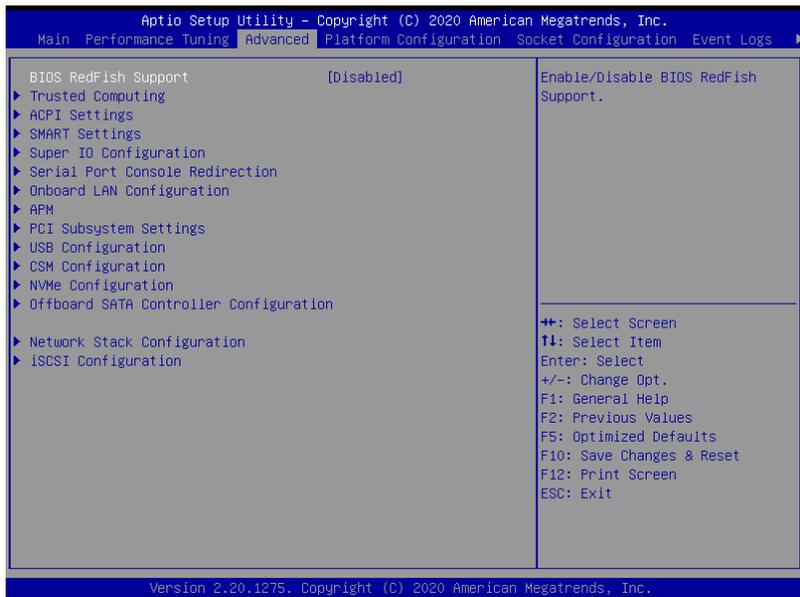
Configuration options: [Disabled] [Enable Auto] [Enable Manual]

5.5 Advanced menu

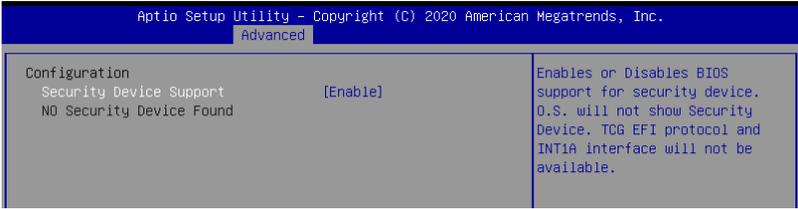
The Advanced menu items allow you to change the settings for the CPU and other system devices.



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



5.5.1 Trusted Computing



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



Enable ACPI Auto Configuration [Disabled]

Allows you to enable or disable the BIOS ACPI Auto Configuration.

Configuration options: [Disabled] [Enabled]

Enable Hibernation [Enabled]

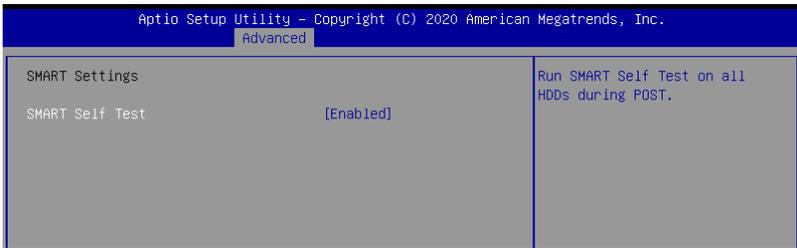
Allows you to enable or disable the ability of the system to hibernate (OS/Sleep State).

Configuration options: [Disabled] [Enabled]



This option may be not effective with some OS.

5.5.3 Smart Settings



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



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;]

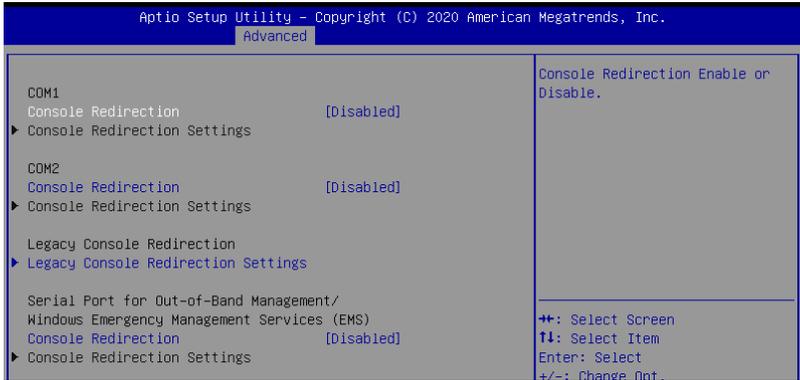
[IO=3F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;]

[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



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]

Putty Keypad [VT100]

This allows you to select the FunctionKey and Keypad on Putty.

Configuration options: [VT100] [LINUX] [XTERMR6] [SCO] [ESCN] [VT400]

Legacy Console Redirection Settings

Redirection COM Port [COM1]

Allows you to select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.

Configuration options: [COM1] [COM2]

Resolution [80x24]

This allows you to set the number of rows and columns supported on the Legacy OS.

Configuration options: [80x24] [80x25]

Redirection After POST [Always Enable]

This setting allows you to specify if Bootloader is selected than Legacy console redirection.

Configuration options: [Always Enable] [Bootloader]

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

Console Redirection [Disabled]

Allows you to enable or disable the console redirection feature.

Configuration options: [Disabled] [Enabled]



The following item appears only when 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] [38400] [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



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]**.

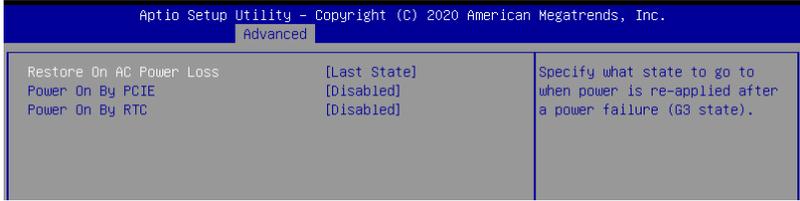
Intel LAN 2 ROM Type [Disabled]

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.



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.

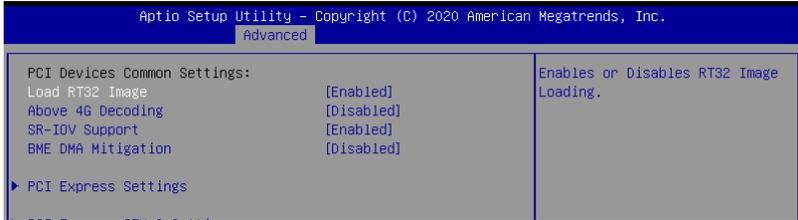
Power On By RTC [Disabled]

[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.



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]

PCI 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] [Autot] [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]

PCI Express GEN 2 Settings

PCI Express GEN 2 Device Register Settings

Completion Timeout [Default]

This option allows system software to modify the Completion Timeout value.

Configuration options: [Default] [Shorter] [Longer] [Disabled]

ARI Forwarding [Enabled]

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

Configuration options: [Disabled] [Enabled]

AtomicOp Requester Enable [Disabled]

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

Configuration options: [Disabled] [Enabled]

AtomicOp Egress Blocking [Disabled]

If supported by hardware and set to [Enabled], outbound AtomicOp Request via Egress Ports will be blocked.

Configuration options: [Disabled] [Enabled]

IDO Request Enable [Disabled]

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

Configuration options: [Disabled] [Enabled]

IDO Completion Enable [Disabled]

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

Configuration options: [Disabled] [Enabled]

LTR Mechanism Enable [Disabled]

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

Configuration options: [Disabled] [Enabled]

End-End TLP Prefix Blocking [Disabled]

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

Configuration options: [Disabled] [Enabled]

PCI Express GEN 2 Link Register Settings

Target Link Speed [Auto]

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

Configuration options: [Auto] [Force to 2.5 GT/s] [Force to 5.0 GT/s]
[Force to 8.0 GT/s] [Force to 16.0 GT/s]

Clock Power Management [Disabled]

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

Configuration options: [Disabled] [Enabled]

Compliance SOS [Disabled]

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

Configuration options: [Disabled] [Enabled]

Hardware Autonomous Width [Enabled]

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

Configuration options: [Enabled] [Disabled]

Hardware Autonomous Speed [Enabled]

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

Configuration options: [Enabled] [Disabled]

PCIe OPROM Slot Options

PCIe1-6 Slot OPROM [Enabled]

This option allows you to enable or disable the OPROM of the PCIe slots.

Configuration options: [Disabled] [Enabled]

MEZZPCIe1 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) 2020 American Megatrends, Inc.	
Advanced	
USB Configuration	Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
USB Module Version	21
USB Controllers:	
1 XHCI	
USB Devices:	
1 Drive, 2 Keyboards, 1 Mouse	
Legacy USB Support	[Enabled]
USB Mass Storage Driver Support	[Enabled]
Mass Storage Devices:	
JetFlashTranscend 4GB 8.07	[Auto]

Legacy USB Support [Enabled]

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

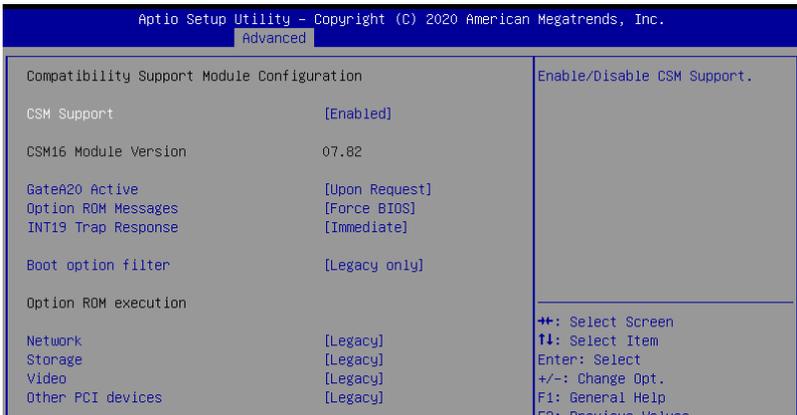
USB Mass Storage Driver Support [Enabled]

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

Mass Storage Devices

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



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]

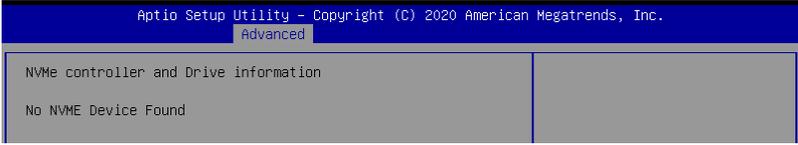
This option allows you to control the execution of UEFI and Legacy PXE / Storage / Video OpROM.
Configuration options: [UEFI] [Legacy]

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.



5.5.12 Offboard SATA Controller Configuration

This page will display the offboard SATA controller information.



5.5.13 Network Stack Configuration

Aptio Setup Utility - Copyright (C) 2020 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]

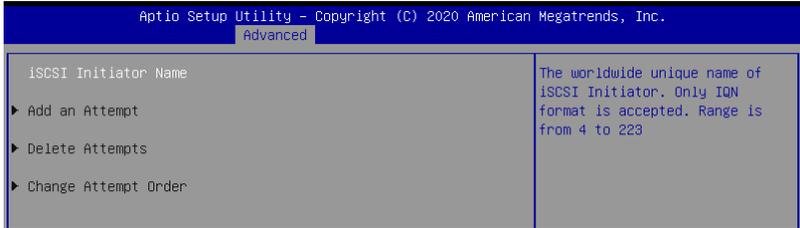
Wait time to press ESC key to abort the PXE boot.

Media detect count [1]

Wait time (in seconds) to detect media.

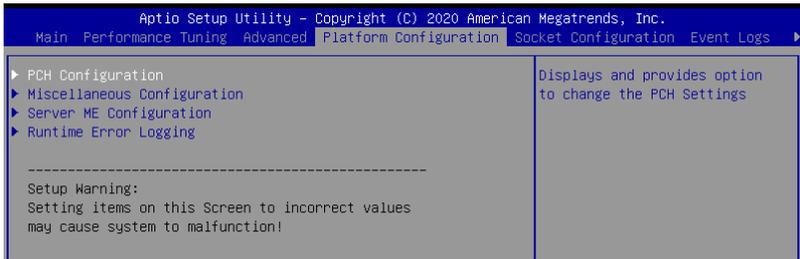
5.5.14 iSCSI Configuration

Allows you to configure the iSCSI parameters.



5.6 Platform Configuration menu

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



5.6.1 PCH 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 SATA as [AHCI]

Allows you to identify the SATA port connected to Solid State Drive or Hard Disk Drive.

Configuration options: [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: [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 1-6

Port 1-6

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]**.

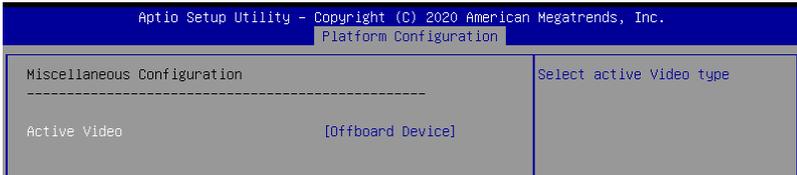
USB_1-8 [Enabled]

Configuration options: [Disabled] [Enabled]

USB3_1-4 [Enabled]

Configuration options: [Disabled] [Enabled]

5.6.2 Miscellaneous Configuration



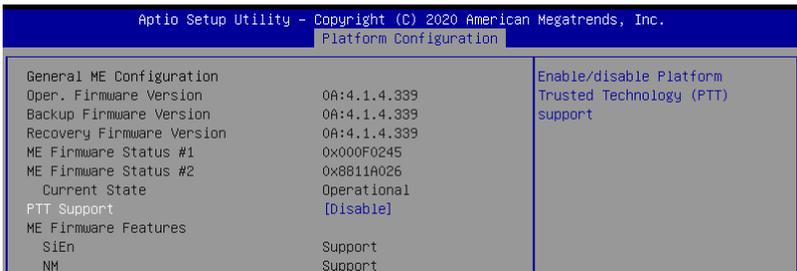
Active Video [Offboard Device]

Allows you to select the video type.

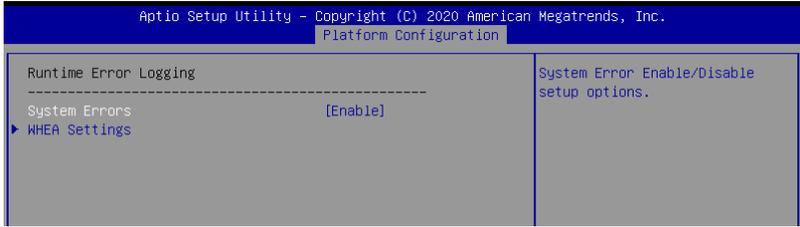
Configuration options: [Onboard Device] [Offboard Device]

5.6.3 Server ME Configuration

Displays the Server ME Technology parameters on your system.



5.6.4 Runtime Error Logging



Runtime Error Logging

System Errors [Enabled]

This item allows you to enable or disable System Errors.

Configuration options: [Disabled] [Enabled]

WHEA Settings

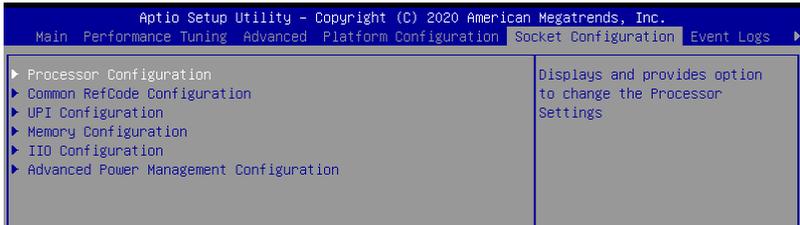
WHEA Support [Disabled]

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.



5.7.1 Processor Configuration



Enable Intel(R) TXT Support [Disable]

Forces the XD feature log to always return 0 when disabled.

Configuration options: [Disable] [Enable]

VMX [Enable]

Enables the Vanderpool Technology. Takes effect after reboot.

Configuration options: [Disable] [Enable]

Enable SMX [Disable]

Enables the Safer Mode Extensions.

Configuration options: [Disable] [Enable]

Hardware Prefetcher [Enable]

This Item allows you to turn on/off the mid level cache(L2) streamer prefetcher.

Configuration options: [Disable] [Enable]

L2 RFO Prefetch Disable [Disable]

This Item allows you to turn on/off L2 RFO prefetcher.

Configuration options: [Disable] [Enable]

Adjacent Cache Prefetch [Enable]

This Item allows you to turn on/off prefetching of adjacent cache lines.
Configuration options: [Disable] [Enable]

DCU Streamer Prefetcher [Enable]

This Item allows you to enable or disable prefetcher of next L1 data line.
Configuration options: [Disable] [Enable]

DCU IP Prefetcher [Enable]

This Item allows you to enable or disable prefetch of next L1 line based upon sequential load history.
Configuration options: [Disable] [Enable]

LLC Prefetch [Disable]

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

DCU Mode [32K 8Way Without ECC]

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

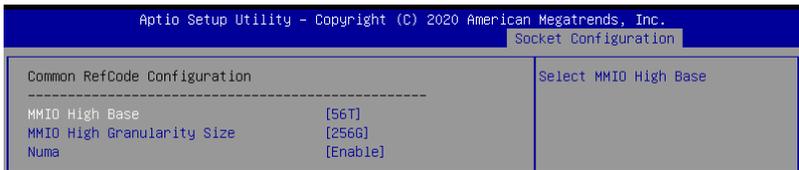
Extended APIC [Disable]

This Item allows you to enable or disable the extended APIC support.
Configuration options: [Disable] [Enable]

AES-NI [Enable]

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

5.7.2 Common RefCode Configuration



MMIO High Base [56T]

This item allows you to select the MMIO High Base.
Configuration options: [56T] [40T] [24T] [16T] [4T] [1T]

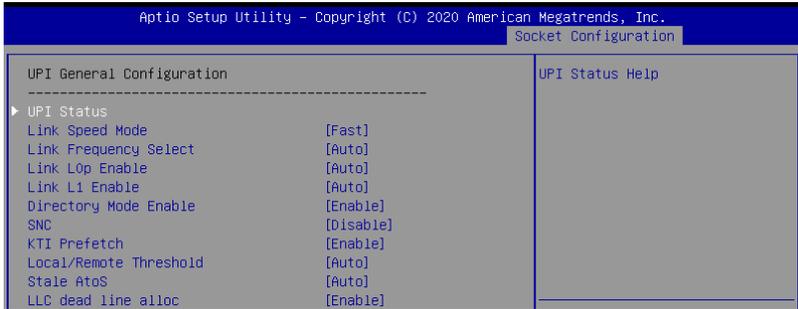
MMIO High Granularity Size [256G]

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

Numa [Enable]

This item enables or disables the Non uniform Memory Access (NUMA).
Configuration options: [Disable] [Enable]

5.7.3 UPI Configuration



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]

Link L0p Enable [Enable]

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

Link L1 Enable [Enable]

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

Directory Mode Enable [Enable]

Configuration options: [Disable] [Enable]

SNC [Disable]

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

KTI Prefetch [Enable]

Configuration options: [Disable] [Enable]

Local/Remote Threshold [Auto]

Configuration options: [Disable] [Auto] [Low] [Medium] [High]

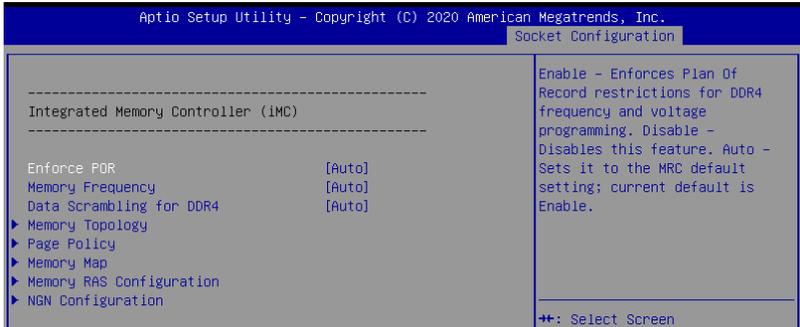
Stale AtoS [Disable]

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

LLC dead line alloc [Enable]

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

5.7.4 Memory Configuration



Enforce POR [Auto]

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

Memory Frequency [Auto]

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

Data Scrambling for DDR4 [Auto]

Allows you to enable or disable data scrambling.
Configuration options: [Auto] [Disable] [Enable]

Memory Topology

Displays memory topology with DIMM population information.

Page Policy

Allows you to configure Page Policy settings.

Page Policy [Auto]

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 [Disable]

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: [Disable] [Enable Mirror Mode (1LM)]

UEFI ARM Mirror [Disable]

Allows you to enable or disable UEFI ARM Mirror.

Configuration options: [Disable] [Enable]

Memory Rank Sparing [Disable]

Allows you to enable or disable Memory Rank Sparing

Configuration options: [Disable] [Enable]

Patrol Scrub [Enable]

Allows you to enable or disable Patrol Scrub.

Configuration options: [Disable] [Enable]

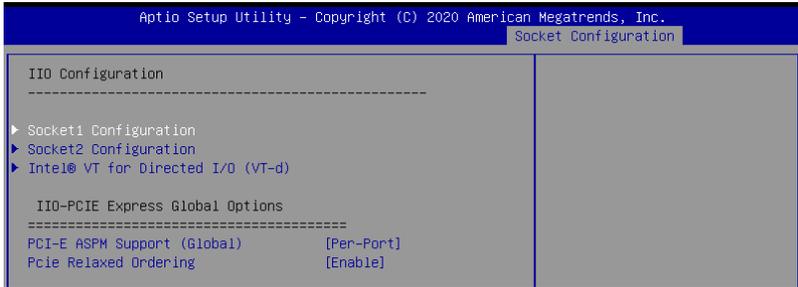
NGN Configuration

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



Socket1 Configuration

This item allows you to configure settings related to the corresponding PCIE port.

Socket2 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) [Enable]

Allows you to enable or disable the Intel Virtualization Technology for Directed I/O.
Configuration options: [Disable] [Enable]

IIO-PCIE Express Global Options

PCI-E ASPM Support (Global) [Per-Port]

Allows you to enable or disable ASPM support for all downstream devices.
Configuration options: [Disable] [Per-Port] [L1 Only]

PCI-E relaxed Ordering [Enable]

Allows you to enable or disable PCI-E relaxed Ordering.
Configuration options: [Disable] [Enable]

5.7.6 Advanced Power Management Configuration



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 [Enable]

Allows you to enable or disable Energy Efficient Turbo.

Configuration options: [Disable] [Enable]

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 [Disable]

Allows you to enable or disable Autonomous Core C-State Report.

Configuration options: [Disable] [Enable]

CPU C6 Report [Auto]

Allows you to select CPU C6 Report.

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

Enhanced Halt State (C1E) [Enable]

Core C1E auto promotion control. Takes effect after reboot.

Configuration options: [Disable] [Enable]

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 Management

CPU T-State Control

Software Controlled T-States [Disable]

Allows you to enable or disable Software Controlled T-States.

Configuration options: [Disable] [Enable]

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 [Enable]

Configuration options: [Disable] [Enable]

Workload Configuration [Balanced]

This option allows optimization for the workload characterization.

Configuration options: [Balanced] [I/O Sensitive]

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]

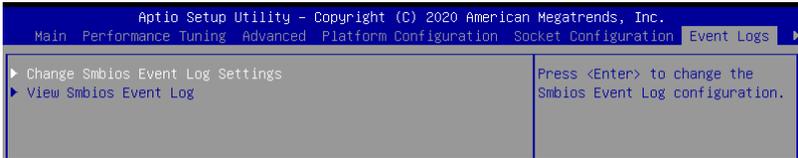
P0 TotalTimeThreshold High [3a]

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.



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]

Smbios Event Log Standard Settings

Log System Boot Event [Disabled]

Choose options to enable or disable logging of System boot event.

Configuration options: [Enables] [Disabled]

MECI [1]

Multiple Event Count Increment: the number of occurrences of a duplicate event that must pass before the multiple-event counter of log entry is updated. The value ranges from 1 to 255.

Configuration options: [1-255]

METW [60]

Multiple Event Time Window: the number of minutes which must pass between duplicate log entries which utilize a multiple-event counter. The value ranges from 0 to 99.

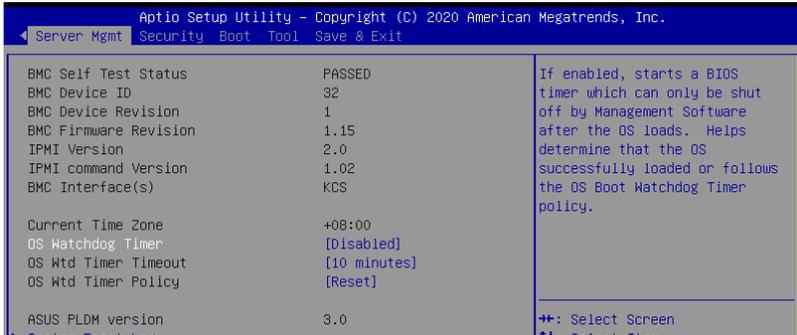
Configuration options: [0-99]

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.



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 for the OS Boot Watchdog Timer.

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

OS Wtd Timer Policy [Reset]

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

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

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]

BMC network configuration

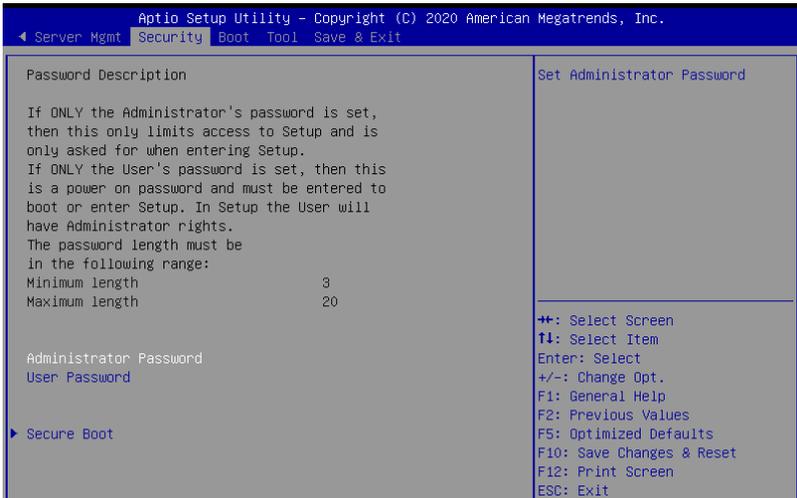
The sub-items in this configuration allow you to configure the BMC network parameters.

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.



Administrator Password

To set an administrator password:

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

To change an administrator password:

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



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

User Password

To set a user password:

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

To change a user password:

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

To clear a user password:

1. Select the Clear User Password item and press <Enter>.
2. Select **Yes** from the Warning message window then press <Enter>.

Secure Boot

This item allows you to customize the Secure Boot settings.



Secure Boot

Allows you to enable or disable Secure Boot.

Configuration options: [Disabled] [Enabled]

Key Management

This item only appears when the item Secure Boot Mode is set to [Custom]. The Key Management item allows you to modify Secure Boot variables and set Key Management page.



Factory Key Provision [Disabled]

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

Configuration options: [Disabled] [Enabled]

Restore Factory keys

This item will install all Factory Default keys.

Reset to Setup Mode

This item appears only when you load the default Secure Boot keys. This item allows you to clear all default Secure Boot keys.

Export Secure Boot Variables

This item will ask you if you want to save all secure boot variables. Select Yes if you want to save all secure boot variables, otherwise select No.

Enroll Efi Image

This item will allow the image to run in Secure Boot mode.

Configuration options: [Set New] [Append]

Device Guard Ready

Remove 'UEFI CA' from DB

Remove Microsoft UEFI CA from Secure Boot DB.

Restore DB defaults

Restore DB variable to factory defaults.

Platform Key (PK)

Configuration options: [Details] [Export] [Update] [Delete]

Key Exchange Keys (KEK) / Authorized Signatures (DB) / Forbidden Signatures (DBX)

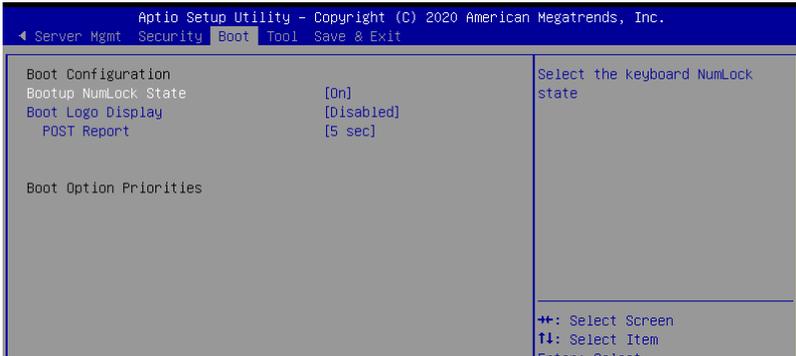
Configuration options: [Details] [Export] [Update] [Append] [Delete]

Authorized TimeStamps (DBT) / OsRecovery Signatures

Configuration options: [Update] [Append]

5.11 Boot menu

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



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.



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.



Pressing <Esc> does not immediately exit this menu. Select one of the options from this menu or <F10> from the legend bar to exit.

Discard Changes and Exit

Exit System setup without saving any changes.

Save Changes and Reset

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.

Launch EFI Shell from filesystem device

This item allows you to attempt to launch the EFI Shell application (shellx64.efi) from one of the available filesystem devices.

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 (for Windows OS and Linux).

6.1.1 RAID definitions

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

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

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

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



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

6.1.2 Installing hard disk drives

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

To install the SATA hard disks for RAID configuration:

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

6.1.3 Setting the RAID item in BIOS

You must set the RAID item in the BIOS Setup before you can create a RAID set from SATA hard disk drives attached to the SATA connectors supported by Intel® C621 chipset.

To do this:

1. Enter the BIOS Setup during POST.
2. Go to the **Platform Configuration menu** Menu > **PCH Configuration Menu** > **PCH SATA Configuration**, then press <Enter>.
3. Set **Configure sSATA as** to [RAID Mode]
4. Press <F10> to save your changes and exit the BIOS Setup.



Refer to Chapter 5 for details on entering and navigating through the BIOS Setup.

6.1.4 RAID configuration utilities

Depending on the RAID connectors that you use, you can create a RAID set using the utilities embedded in each RAID controller. For example, use the **Intel® Rapid Storage Technology** if you installed Serial ATA hard disk drives on the Serial ATA connectors supported by the Intel® C621 chipset.

Refer to the succeeding section for details on how to use the RAID configuration utility.

6.2 Intel® Rapid Storage Technology enterprise SATA/SSATA Option ROM Utility

The Intel® Rapid Storage Technology enterprise SATA/SSATA 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, have set the correct jumper settings of the motherboard, and have set the correct SATA mode in the BIOS setup. You can refer to the **Installing hard disk drives**, **Setting Jumpers**, and **Setting the RAID mode sections in BIOS** for more information.

To launch the Intel® Rapid Storage Technology enterprise SATA/SSATA 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      HWA50000991753TR 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.

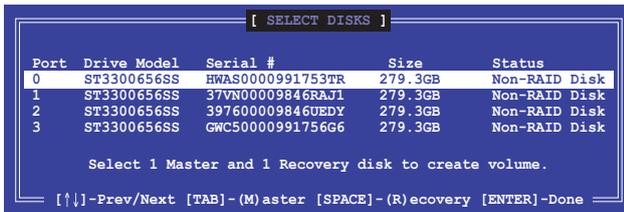
6.2.1 Creating a RAID set

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>.



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.



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.



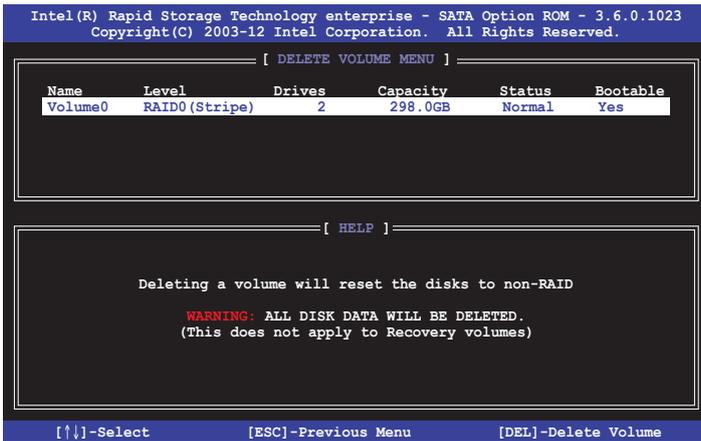
6.2.2 Deleting a RAID set



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 .



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.



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.

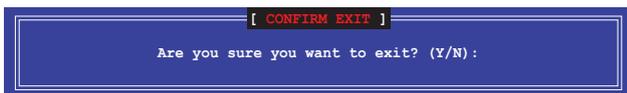
```
[ RESET RAID DATA ]
Resetting RAID disk will remove its RAID structures
and revert it to a non-RAID disk.
WARNING: Resetting a disk causes all data on the disk to be lost.
(This does not apply to Recovery volumes)
Port  Drive Model  Serial #      Size      Status
---  -
0     ST3300656SS   HWAS000991753TR  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/SSATA 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.



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.



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

- 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
2. Delete RAID Volume
3. Reset Disks to Non-RAID
4. Exit

[ DISK/VOLUME INFORMATION ]

RAID Volumes:
ID Name Level Strip Size Status Bootable
1 Volume0 RAID1(Mirror) N/A 149.0GB Rebuild Yes
*=Data is Encrypted

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

```

- Press <Esc> to exit Intel Rapid Storage Technology and reboot the system.
- 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.
- From the **View** menu, select **Advanced Mode** to display the details of the Intel Rapid Storage Console.
- 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:

- 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.

- 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 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 5 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.

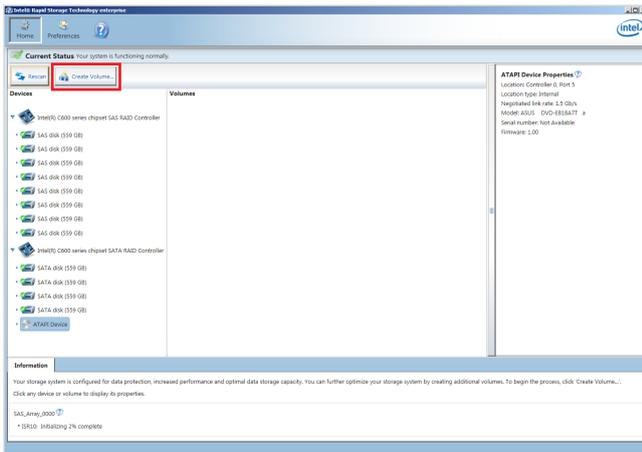


You need to manually install the Intel® Rapid Storage Technology enterprise utility on a Windows® operating system. Please refer to the installation instructions in Chapter 7.

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.

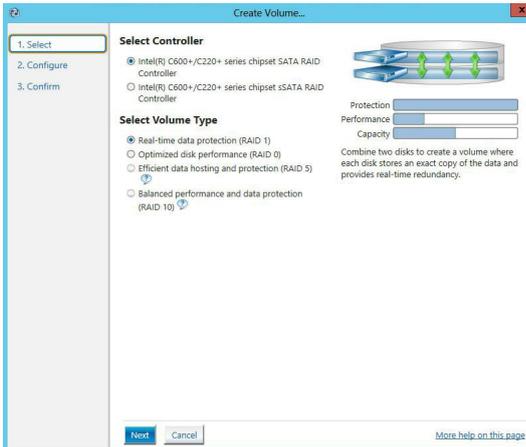


You can click **Rescan** to re-scan any attached hard disks.

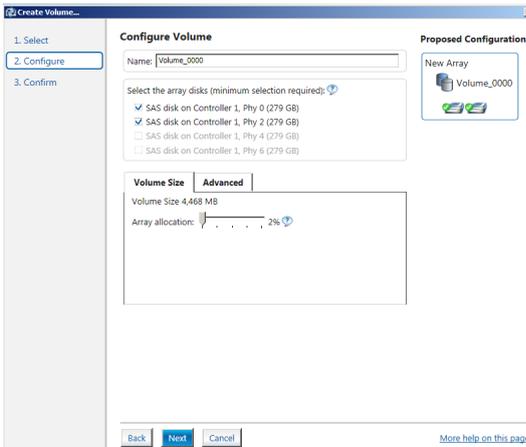
6.3.1 Creating a RAID set

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**.

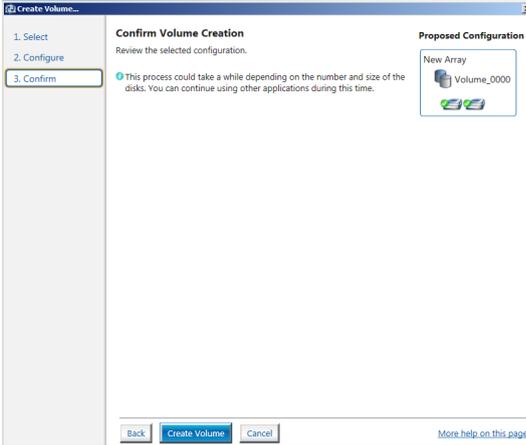


- If you do not want to keep the data on one of the selected disks, select **NO** when prompted.
- If you want to **Enable volume write-back cache** or **Initialize volume**, click **Advanced**.

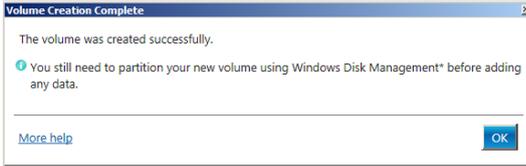
6. Confirm the volume creation, then click **Create Volume** to continue.



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

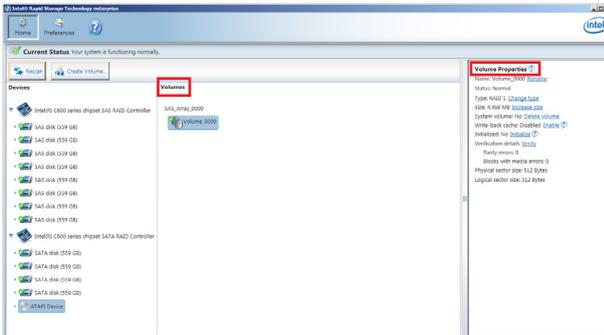


7. Wait until the process is completed, then click **OK** when prompted.



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

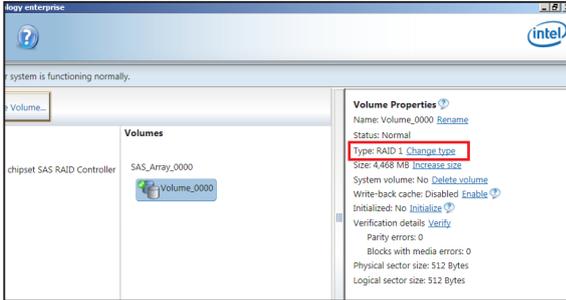
The RAID set is displayed in the **Volumes** list and you can change the settings in **Volume Properties**.



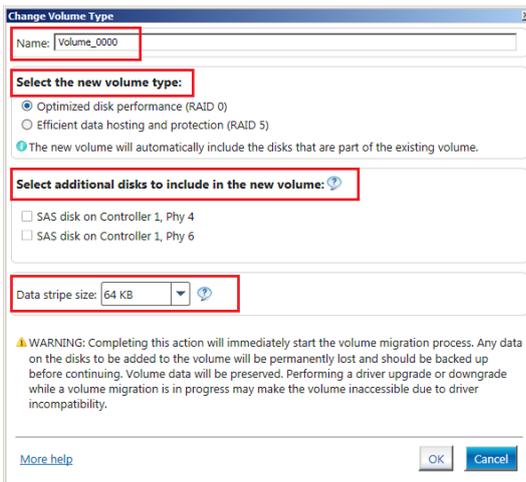
6.3.2 Changing a Volume Type

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

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



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



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

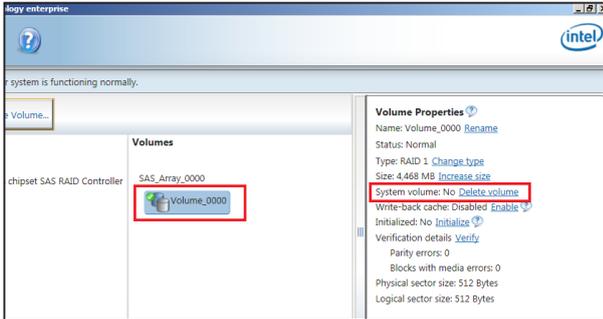
6.3.3 Deleting a volume



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

To delete a volume:

1. From the utility main menu, select the volume (ex. Volume_0000) in **Volumes** field you want to delete.



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

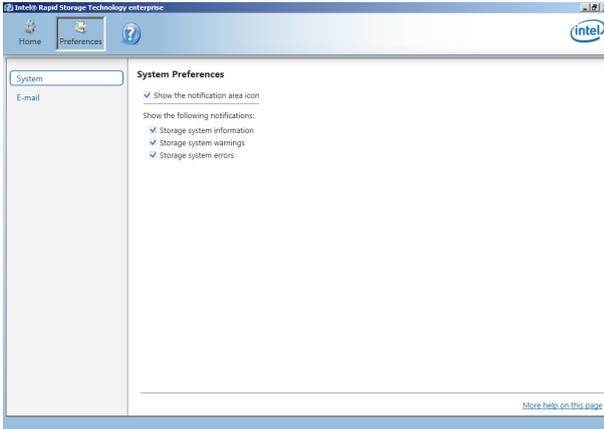


3. Click **Yes** to delete the volume and return to the utility main menu, or click **No** to return to the main menu.

6.3.4 Preferences

System Preferences

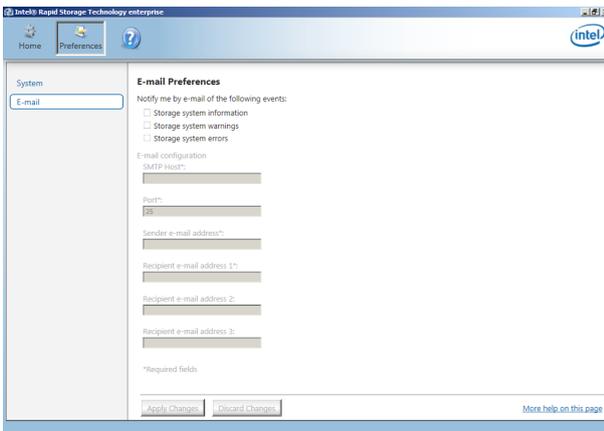
Allow you to set to show the notification area icon and show system information, warning, or errors here.



E-Mail Preferences

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

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



Driver Installation

7

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

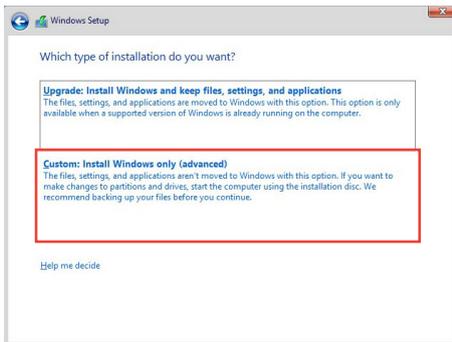
1. Place the motherboard support DVD in the optical drive.
2. Connect a USB flash drive to your system.
3. Click on the optical drive to browse the contents of the support DVD.
4. Click **Drivers > C620 INTEL RAID > Windows > Driver** and then copy the RAID driver folder to the USB flash drive.

7.1.2 Installing the RAID controller driver

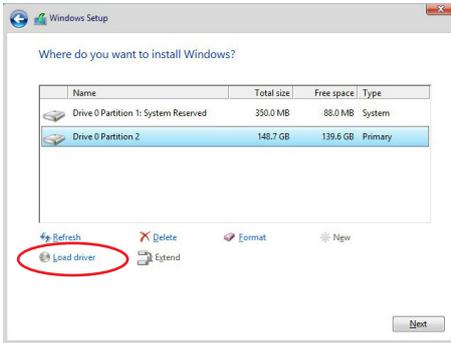
During Windows® Server 2012 R2 OS installation

To install the RAID controller driver when installing Windows® Server 2012 R2 OS:

1. Boot the computer using the Windows® Server 2012 R2 OS installation disc. Follow the screen instructions to start installing Windows Server 2012 R2.
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.

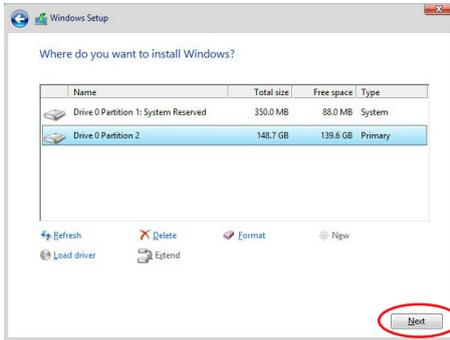
Click **Browse** to continue.



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 screen 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.



1. 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.
2. 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.

The main screen of the Support DVD contains the following tabs:

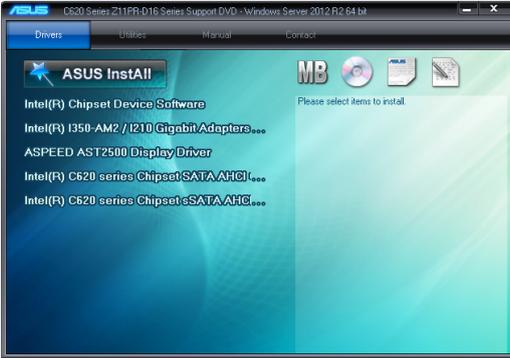
1. Drivers
2. Utilities
3. Manual
4. Contact



The main screen of the Support DVD looks exactly the same on the Windows® Server 2012 R2 and on the Windows® Server 2016 Operating System (OS).

7.3.1 Drivers menu tab

The Drivers Menu shows the available device drivers if the system detects installed devices. Install the necessary drivers to activate the devices.



7.3.2 Utilities menu tab

The Utilities menu displays the software applications and utilities that the motherboard supports.



7.3.3 Manual menu

The Manual menu provides the link to the Broadcom NetXtreme II Network Adapter user guide.

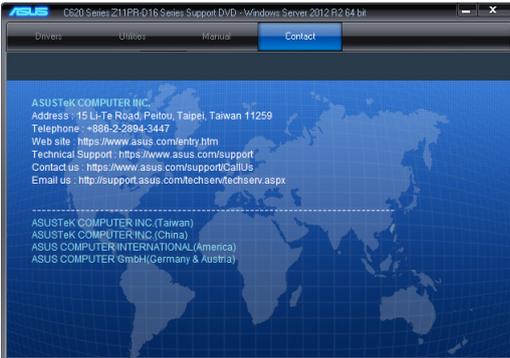


You need an internet browser installed in your OS to view the User Guide.



7.3.4 Contact information menu

The Contact menu displays the ASUS contact information, e-mail addresses, and useful links if you need more information or technical support for your motherboard.



7.4 Intel® chipset device software installation

This section provides the instructions on how to install the Intel® chipset device software on the system.

You need to manually install the Intel® chipset device software on a Windows operating system.

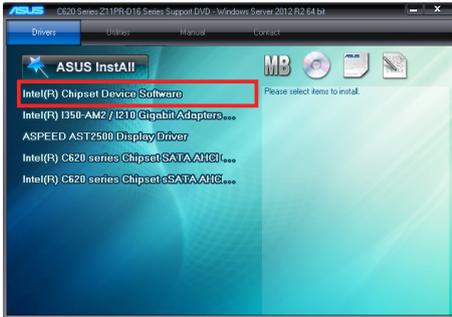
To install the Intel® chipset device software:

1. Restart the computer, and then log on with **Administrator** privileges.
2. Insert the motherboard/system support DVD into the optical drive. The support DVD automatically displays the **Drivers** 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.

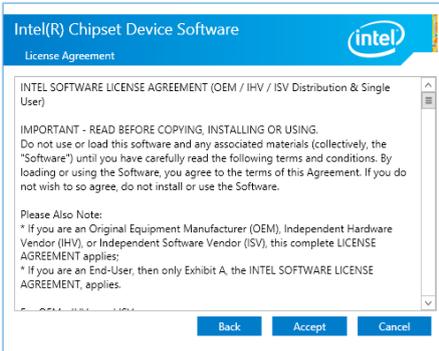
3. Click the item **Intel® Chipset Device Software** from the menu.



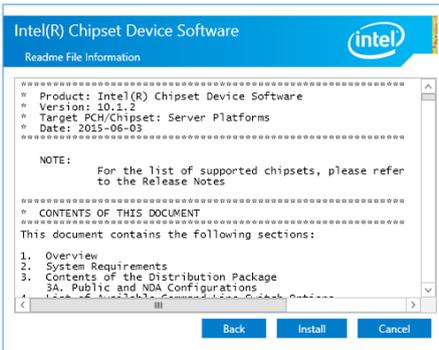
4. The **Intel® Chipset Device Software** window appears. Click **Next** to start the installation.



5. Read the **License Agreement** and click **Accept** to continue the process.



6. Read the **Readme File Information** and click **Install** to start the installation process.



7. Click **Restart Now** to complete the setup process.



7.5 VGA driver installation

This section provides the instructions on how to install the ASPEED Video Graphics Adapter (VGA) driver.

You need to manually install the ASPEED VGA driver on a Windows® operating system.

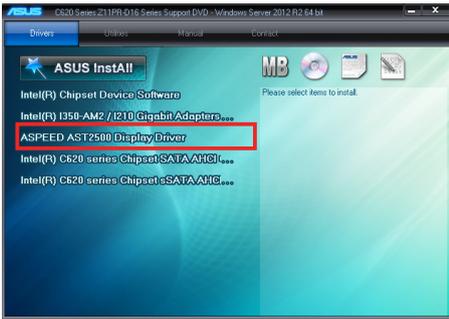
To install the ASPEED VGA driver:

1. Restart the computer, and then log on with **Administrator** privileges.
2. Insert the motherboard/system support DVD into the optical drive. The support DVD automatically displays the **Drivers** 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.

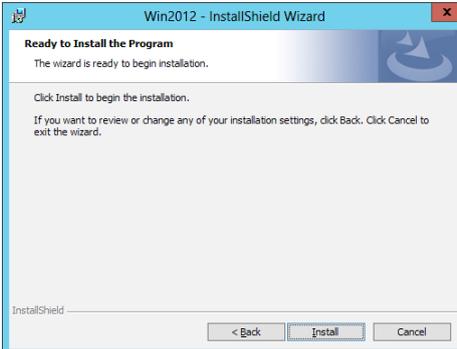
3. Click the **ASPEED AST2500 Display Driver** to begin installation.



4. From the installation window, click **Next** to start the installation.



5. Click **Install** to start the installation process.



6. Click **Finish** to complete the installation.



7.6 Installing the Intel® I350-AM2 Gigabit Adapters driver

This section provides the instructions on how to install the **Intel® I350-AM2 Gigabits Adapter Driver** on the system.

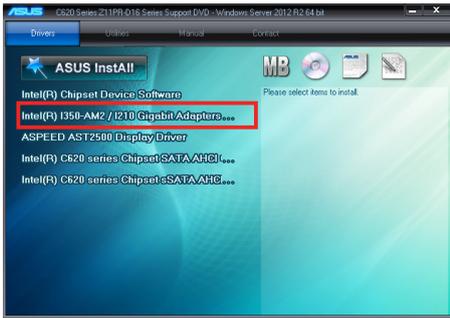
To install the **Intel® I350-AM2 Gigabit Adapters Driver** on the Windows® operating system:

1. Restart the computer.
2. Log on with **Administrator** privileges.
3. Insert the motherboard/system support DVD to the optical drive.

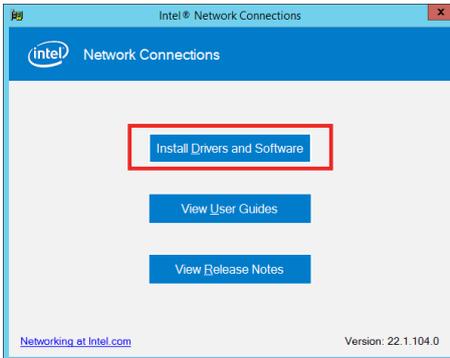


If Aurun is NOT enabled in your computer, browse the contents of the support DVD to locate the file **Setup.exe**. Double-click the **Setup.exe** to run the support DVD.

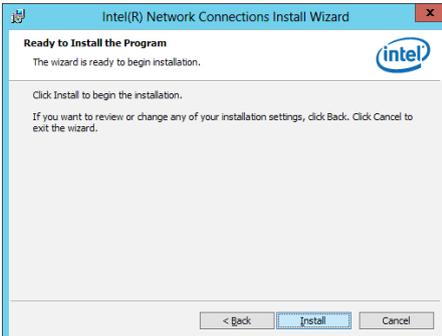
4. Click **Intel® I350-AM2 Gigabit Adapters Drivers** in the **Drivers** menu of the main screen to start the installation.



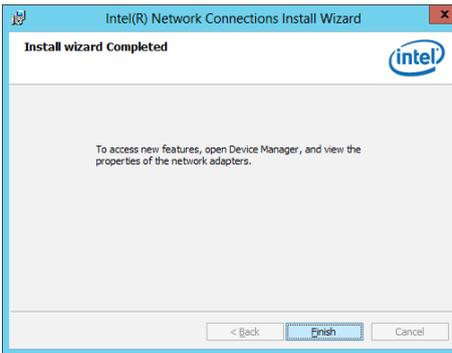
5. Click **Install Drivers and Software** option to begin installation.



6. Click **Install** to start the installation.



7. When the installation is done, press **Finish** to complete the installation.



7.7 Intel® Rapid Storage Technology enterprise installation

This section provides the instructions on how to install the Intel® Rapid Storage Technology enterprise on the system.

You need to manually install the Intel® Rapid Storage Technology enterprise utility on a Windows® operating system.

To install the Intel® Rapid Storage Technology enterprise utility:

1. Restart the computer, and then log on with **Administrator** privileges.
2. Insert the motherboard/system support DVD into the optical drive, and navigate to the **Utilities** menu.
3. Click the **Intel® Rapid Storage Technology enterprise** to begin installation.



4. The **Intel® Rapid Storage Technology enterprise** window appears. Click **Next** to start the installation.



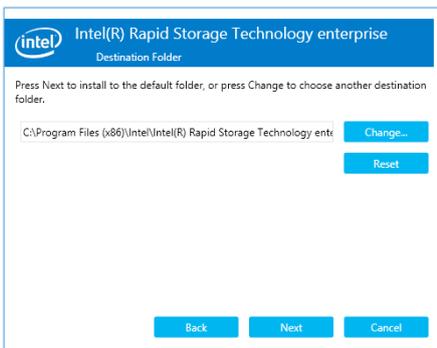
5. Read the **Warning** message and click **Next** to continue.



6. Read the **License Agreement** and click **Accept** to continue the process.



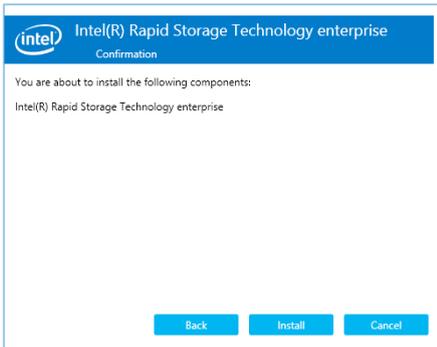
7. Select the destination folder and click **Next** to continue.



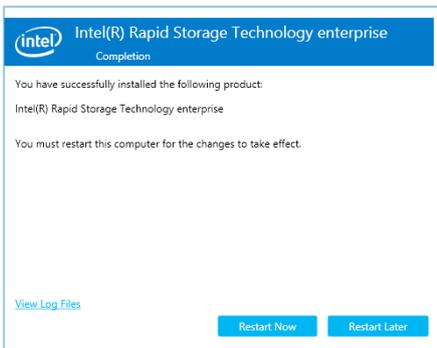
8. Tick the features that you would like to install and click **Next** to continue.



9. Click **Install** to start the installation process.



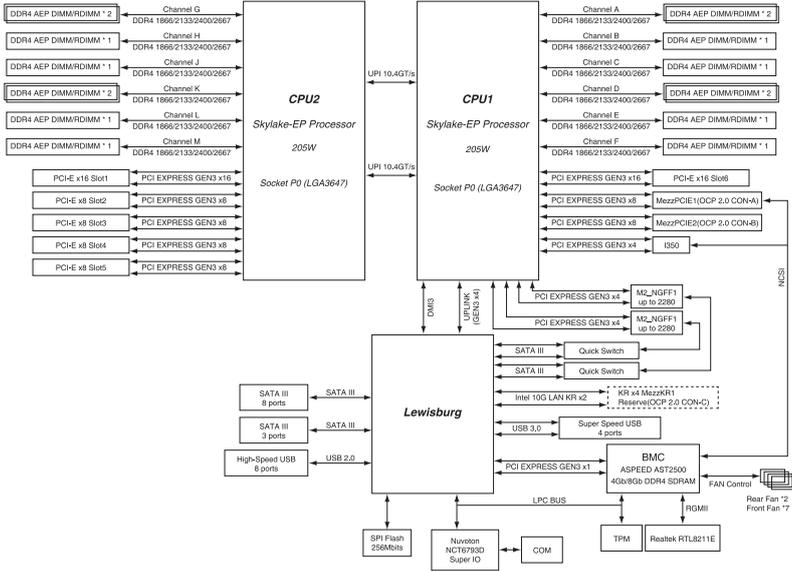
10. Click **Restart Now** to complete the setup process.



Appendix

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

Z11PR-D16/V2 block diagram



Notices

Federal Communications Commission Statement

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

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

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.

Compliance Statement of Innovation, Science and Economic Development Canada (ISED)

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

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

Déclaration de conformité de Innovation, Sciences et Développement économique Canada (ISED)

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

Australia statement notice

From 1 January 2012 updated warranties apply to all ASUS products, consistent with the Australian Consumer Law. For the latest product warranty details please visit <https://www.asus.com/support/>. Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

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



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.

Japan statement notice

This product cannot be directly connected to the Internet (including public wireless LAN) of a telecom carrier (mobile network companies, landline network companies, Internet providers, etc.). When connecting this product to the Internet, be sure to connect it through a router or switch.

Declaration of compliance for product environmental regulation

ASUS follows the green design concept to design and manufacture our products, and makes sure that each stage of the product life cycle of ASUS product is in line with global environmental regulations. In addition, ASUS disclose the relevant information based on regulation requirements.

Please refer to <http://csr.asus.com/Compliance.htm> for information disclosure based on regulation requirements ASUS is complied with:

EU REACH and Article 33

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

EU RoHS

This product complies with the EU RoHS Directive. For more details, see <http://csr.asus.com/english/article.aspx?id=35>

Japan JIS-C-0950 Material Declarations

Information on Japan RoHS (JIS-C-0950) chemical disclosures is available on <http://csr.asus.com/english/article.aspx?id=19>

India RoHS

This product complies with the “India E-Waste (Management) Rules, 2016” and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in concentrations exceeding 0.1% by weight in homogenous materials and 0.01% by weight in homogenous materials for cadmium, except for the exemptions listed in Schedule II of the Rule.

Vietnam RoHS

ASUS products sold in Vietnam, on or after September 23, 2011, meet the requirements of the Vietnam Circular 30/2011/TT-BCT.

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 năm 2011 trở về sau, đều phải đáp ứng các yêu cầu của Thông tư 30/2011/TT-BCT của Việt Nam.

Turkey RoHS

AEEE Yönetmeliğine Uygundur

ASUS Recycling/Takeback Services

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

Ecodesign Directive

European Union announced a framework for the setting of ecodesign requirements for energy-related products (2009/125/EC). Specific Implementing Measures are aimed at improving environmental performance of specific products or across multiple product types. ASUS provides product information on the CSR website. The further information could be found at <https://csr.asus.com/english/article.aspx?id=1555>.

ASUS contact information

ASUSTeK COMPUTER INC.

Address 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Telephone +886-2-2894-3447
Fax +886-2-2890-7798
Web site <https://www.asus.com>

Technical Support

Telephone +86-21-38429911
Online support <https://qr.asus.com/techserv>

ASUSTeK COMPUTER INC. (Taiwan)

Address 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Telephone +886-2-2894-3447
Fax +886-2-2890-7798
Web site <https://www.asus.com/tw/>

Technical Support

Telephone +886-2-2894-3447 (0800-093-456)
Online support <https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=zh-tw>

ASUSTeK COMPUTER INC. (China)

Address No. 5077, Jindu Road, Minhang District, Shanghai, China
Telephone +86-21-5442-1616
Fax +86-21-5442-0099
Web site <https://www.asus.com.cn>

Technical Support

Telephone +86-20-2804-7506 (400-620-6655)
Online support <https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=zh-cn>

ASUS contact information

ASUS COMPUTER INTERNATIONAL (America)

Address 48720 Kato Rd., Fremont, CA 94538, USA
Fax +1-510-608-4555
Web site <https://www.asus.com/us/>

Technical Support

Support fax +1-812-284-0883
General support +1-812-282-2787
Online support <https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=en-us>

ASUS COMPUTER GmbH (Germany and Austria)

Address Harkortstrasse 21-23, 40880 Ratingen, Germany
Web site <https://www.asus.com/de/>
Online contact <https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=de-de>

Technical Support

Telephone (DE) +49-2102-5789557
Telephone (AT) +43-1360-2775461
Online support <https://www.asus.com/de/support>

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

ASUS Holland BV (The Netherlands)

Address Marconistraat 2, 7825GD EMMEN, The Netherlands
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)

Address Ul. Postępu 6, 02-676 Warszawa, Poland
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)

Address г.Москва, ул. Орджоникидзе, д.10, Россия
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>