ASUS
IN SEARCH OF INCREDIBLE

TS700-E9 Series
Server User Guide

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Safety information

Electrical Safety

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

Operation Safety

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

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

Lithium-Ion Battery Warning

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

Heavy System

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

About this guide

Audience

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

Contents

This guide contains the following parts:

1. **Chapter 1: Product Introduction**

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

2. **Chapter 2: Hardware Information**

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

3. **Chapter 3: Installation Options**

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

4. **Chapter 4: Motherboard Information**

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

5. **Chapter 5: BIOS Setup**

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

6. **Chapter 6: RAID Configuration**

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

7. **Chapter 7: Driver Installation**

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

Conventions

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

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

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

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

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

Typography

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

References

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

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

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

2. **ASUS websites**

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

1 Product Introduction

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	TS700-E9-PS4, TS700-E9-PS8, TS700-E9-RS4, TS700-E9-RS8
Chassis	ASUS T50A Pedestal / 5U Rackmount Chassis
Motherboard	ASUS WS C621E SAGE Board
Component	1 x 1200W 80PLUS Platinum Single Power Supply Module (TS700-E9-PS4/PS8; optional) 1 x 800W 80PLUS Platinum Redundant Power Supply Module (TS700-E9-RS4/RS8; optional) or 1 x 1300W 80PLUS Platinum Redundant Power Supply Module (TS700-E9-RS4/RS8; optional) 4 x Hot-swap 3.5-inch HDD Trays (Front panel, TS700-E9-PS4, TS700-E9-RS4) 8 x Hot-swap 3.5-inch HDD Trays (Front panel, TS700-E9-PS8, TS700-E9-RS8) 2 x Hot-swap 2.5-inch SSD Trays (Rear panel, TS700-E9-RS4/8 only)* 1 x SAS/SATA backplane (TS700-E9-PS4, TS700-E9-RS4) 2 x SAS/SATA backplanes (TS700-E9-PS8, TS700-E9-RS8) 1 x Front I/O Board 3 x System Fans (Front: 2 x 80mm x 38mm; Rear: 1 x 120mm x 38mm)
Accessories	1 x Support DVD (including the User Guide) 1 x ACC Instruction card** 1 x ASMB9 Instruction card 1 x AC Power Cable (TS700-E9-PS4/PS8) 2 x AC Power Cables (TS700-E9-RS4/RS8) 1 x VGA Cable (TS700-E9-RS8) 2 x CPU Carriers 2 x CPU Heatsinks
Optional Items	1 x Second 800W 80PLUS Platinum Redundant Power Supply Module (TS700-E9-RS4/RS8; optional) 1 x Second 1300W 80PLUS Platinum Redundant Power Supply Module (TS700-E9-RS4/RS8; optional) 1 x DVD-ROM / DVD-RW 1 x ASMB9 Card 1 x ASUS LAN Card 1 x ASUS TS700-E9-PS4/PS8, TS700-E9-RS4/RS8 Rackmount Rail Kit 1 x ASUS PIKE RAID Card

*** 2 x 2.5" Hot-swap storage bays when a PIKE card is installed.**

**** ASUS System Web-based Management**

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

1.2 Serial number label

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

1.3 System specifications

The ASUS TS700-E9-PS4/PS8, TS700-E9-RS4/RS8 is a Pedestal / 5U Rackmount barebone server system featuring the ASUS WS C621E SAGE Board. The server supports Intel® Socket-P / LGA-3647 square for Xeon® Processor Scalable Family (205W) plus other latest technologies through the chipsets onboard.

Model Name		TS700-E9-PS4/PS8 / TS700-E8-RS4/RS8
Processor Support / System Bus		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 * **Support of these CPU types depends on the configuration with other key parts, such as GPU, PIKE, or LAN card.**
Core Logic		Intel® PCH C621
Memory	Total Slots	12 (6-channel per CPU, 6 DIMM per CPU)
	Capacity	Maximum up to 1536GB
	Memory Type	DDR4 2933/2666/2400/2133 RDIMM/LR-DIMM/LR-DIMM 3DS * **2933MHz will drop to 2666MHz when using 2DPC configurations.** * **Refer to ASUS server AVL for the latest update** * **Maximum memory capacity support depends on CPU type**
	Memory Size	4GB, 8GB, 16GB, 32GB (RDIMM) 32GB, 64GB (LRDIMM) 64GB, 128GB (LRDIMM 3DS) **Refer to www.asus.com for the latest memory AVL update.**
Expansion Slots (follow SSI Location #)	Total PCI/PCI-E Slots	7
	Slot Type	2 x PCIe 3.0 x16 slots (Gen3 x16 link), FH, FL 2 x PCIe 3.0 x16 slots (single Gen3 x16 link, dual Gen3 x8/x8 link), FH, FL 2 x PCIe 3.0 x16 slots (Gen3 x8 link), FH, FL 1 x PCIe 3.0 x16 slot (Gen3 x16 link), FH, HL
	Micro SD Card Slot	1* * **This is only supported when the ASMB9 card is installed.**
Storage	SATA Controller	**Intel® Lewisburg PCH** - 8 x SATA 6Gb/s ports (gray) Intel® RSTe (for Windows only; Support software RAID 0, 1, 10 & 5) **ASMedia® SATA RAID Controller*** - 2 x SATA 6Gb/s ports
	SAS Controller	Optional kits: ASUS PIKE II 3008 8-port SAS HBA card ASUS PIKE II 3108 8-port SAS HW RAID card 12G SAS Support

(continued on the next page)

Model Name		TS700-E9-PS4/PS8	TS700-E9-RS4/RS8
HDD Bays	I = internal A or S = hot-swappable	4 x 3.5” Hot-swap Storage Bays (TS700-E9-PS4 only) 8 x 3.5” Hot-swap Storage Bays (TS700-E9-PS8 only) 1 x M.2 Socket 3, supporting type 22110 / 2280 / 2260 / 2242 (PCIe Gen3 x4 and SATA mode) * **Supports Intel® Virtual RAID on CPU (Intel® VROC)**	4 x 3.5” Hot-swap Storage Bays (TS700-E9-RS4 only) 8 x 3.5” Hot-swap Storage Bays (TS700-E9-RS8 only) 1 x M.2 Socket 3, supporting type 22110/2280/2260/2242 (PCIe Gen3 x4 and SATA mode) 2 x 2.5" Hot-swap Storage Bays (Rear panel)** * **Supports Intel® Virtual RAID on CPU (Intel® VROC)** ** **2 x 2.5” Hot-swap storage bays when a PIKE card is installed**
Networking	LAN	2 x Intel® i210-AT Gigabit LAN Controller	
Graphic	VGA	Aspeed AST2500 64MB* * **This is only supported when the ASMB9 is installed.**	
Auxiliary Storage Device Bay (Floppy / Optical Drive)		3 x 5.25” media bays (Options: No Device / DVD-RW or DVD-ROM)	
Front I/O Ports		1 x Headphone jack 1 x Microphone jack 2 x USB 2.0 ports 2 x USB 3.1 Gen 1 ports	
Rear I/O Ports		4 x USB 3.1 Gen 1 ports 2 x USB 3.1 Gen 2 ports (1 x Type-A and 1 x Type-C™) 2 x USB 2.0 ports (1 supports USB BIOS Flashback) 1 x USB BIOS Flashback button 1 x PS/2 KB port 2 x LAN (RJ45) ports (2 x Intel® LAN) 1 x Optical S/PDIF Out port 8-channel Audio I/O	
Switch/LED		**Front Switch/LED:** 1 x Power switch 1 x Location LED 1 x Reset switch 1 x HDD Access LED 1 x Message LED 1 x Power LED LAN 1-2 LED	
Security Options		Trusted Platform Module (TPM 2.0) Chassis Intusion Switch	

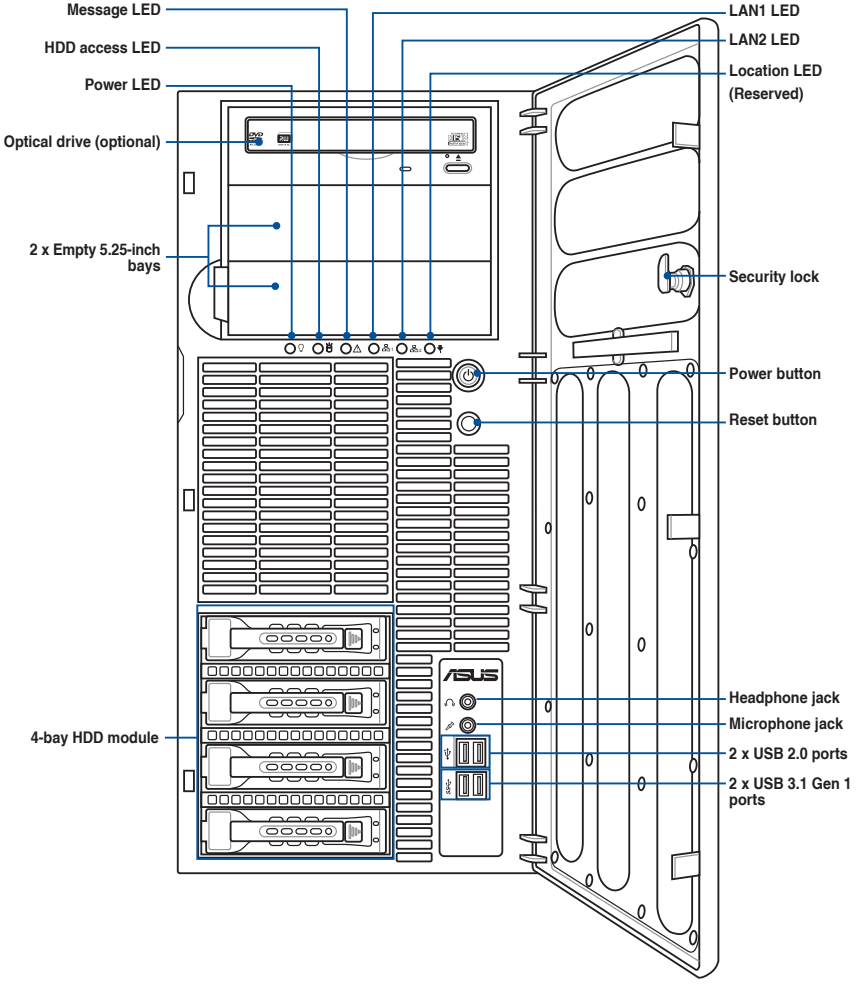
(continued on the next page)

Model Name		TS700-E9-PS4/PS8	TS700-E9-RS4/RS8
OS Support		Windows Server 2016 (64-bit) Windows Server 2012 (64-bit) Windows 10 64-bit RS3 RHEL 7.4 Server Edition RHEL 7.3 Server Edition RHEL 6.9 Server Edition CentOS 7.4 (1708) CentOS 7.3 (1611) CentOS 6.9 Ubuntu 17.10 Server 64-bit Ubuntu 17.10 Desktop 64-bit Red Hat Linux RHEL 7.4 Workstation Edition SUSE Linux SLED 12 SP3 SUSE Linux SLED 12 SP2 SUSE Linux Suse Linux Enterprise Server 11 SP4 64-bit SUSE Linux Suse Linux Enterprise Server 12 SP3 64-bit Fedora 26 Server 64-bit Fedora 26 Workstation 64-bit *** Support versions are subject to change without notice. Refer to www.asus.com for updates.**	
Management Solution	Software	ASUS Control Center (Classic)	
	Out of Band Remote Management	(optional) ASMB9-iKVM for KVM-over-IP	
Dimensions (HH x WW x DD)		455 mm x 217.50 mm x 545.00 mm	
Net Weight Kg (CPU, DRAM & HDD not included)		18.33kg	18.33kg
Power Supply and Rating		Single 1200W 80 PLUS Platinum Power Supply Rating: 100-240V, 12-8A, 50-60Hz, Class I	800W 80 PLUS Platinum Redundant Power Supply Module Rating: 100-127/200-240Vac, 9A / 4.5A, 50 / 60Hz, Class I 1300W 80 PLUS Platinum Redundant Power Supply Module Rating: 100-127/200-240Vac, 13.8A / 8.5A, 47Hz-63Hz, Class I; or DC 240V, 6.5A
Environment		Operating temperature: 10°C – 35°C Non operation temperature: -40°C – 70°C Non operation humidity: 20% – 90% (Non condensing)	

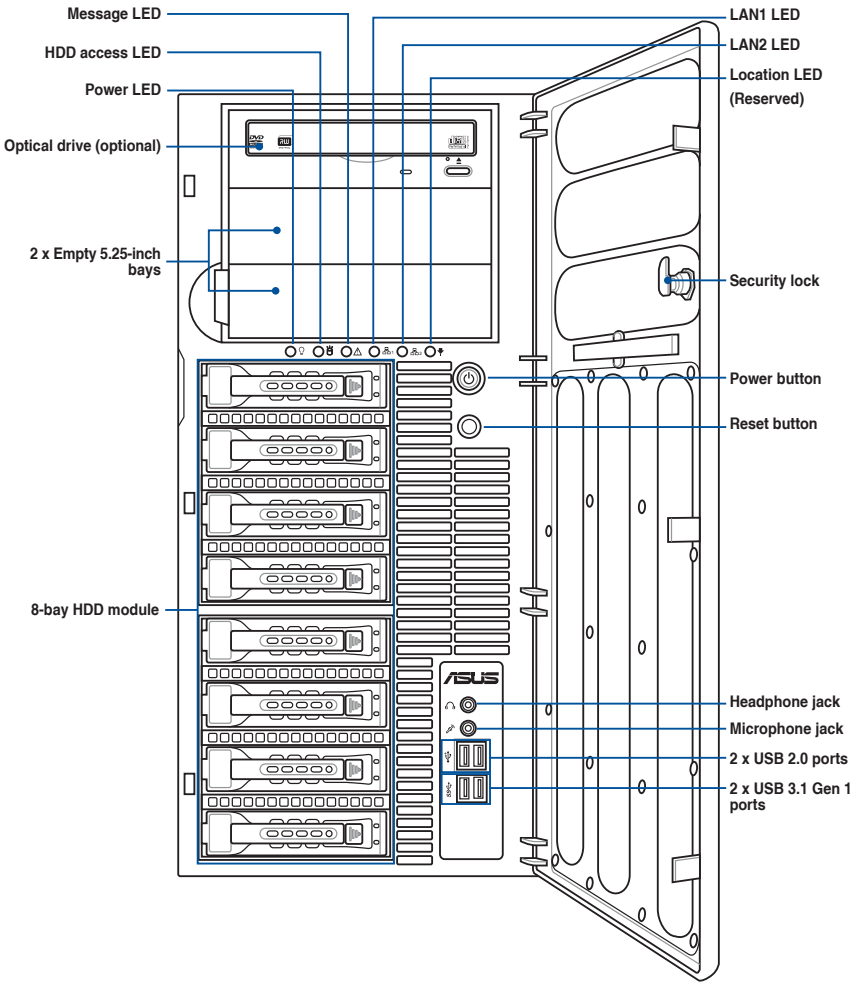
***Specifications are subject to change without notice.**

1.4 Front panel features

TS700-E9-PS4, TS700-E9-RS4



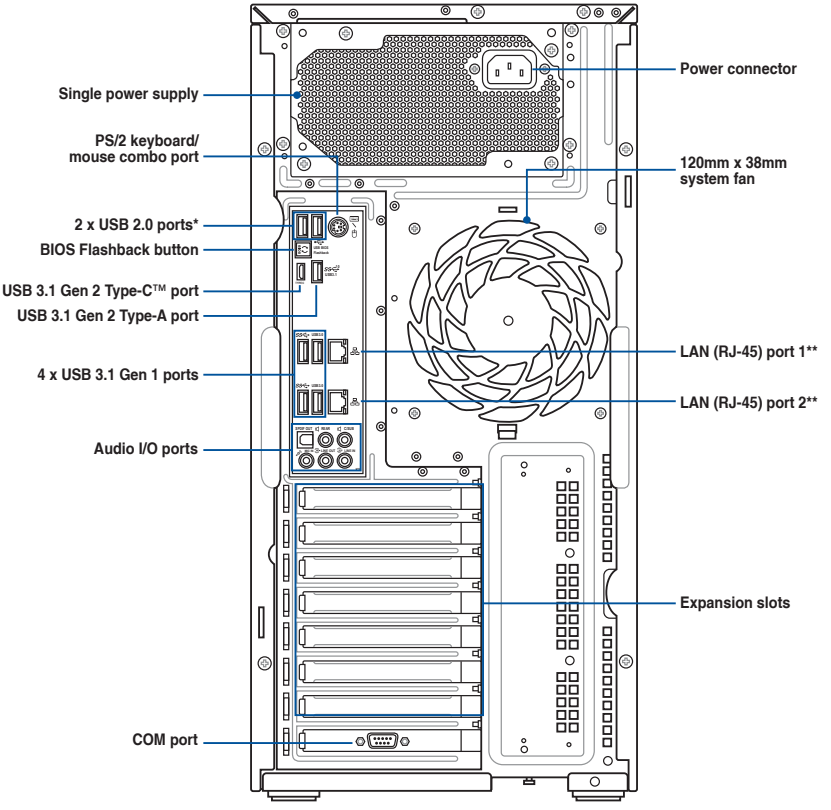
TS700-E9-PS8, TS700-E9-RS8



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

1.5 Rear panel features

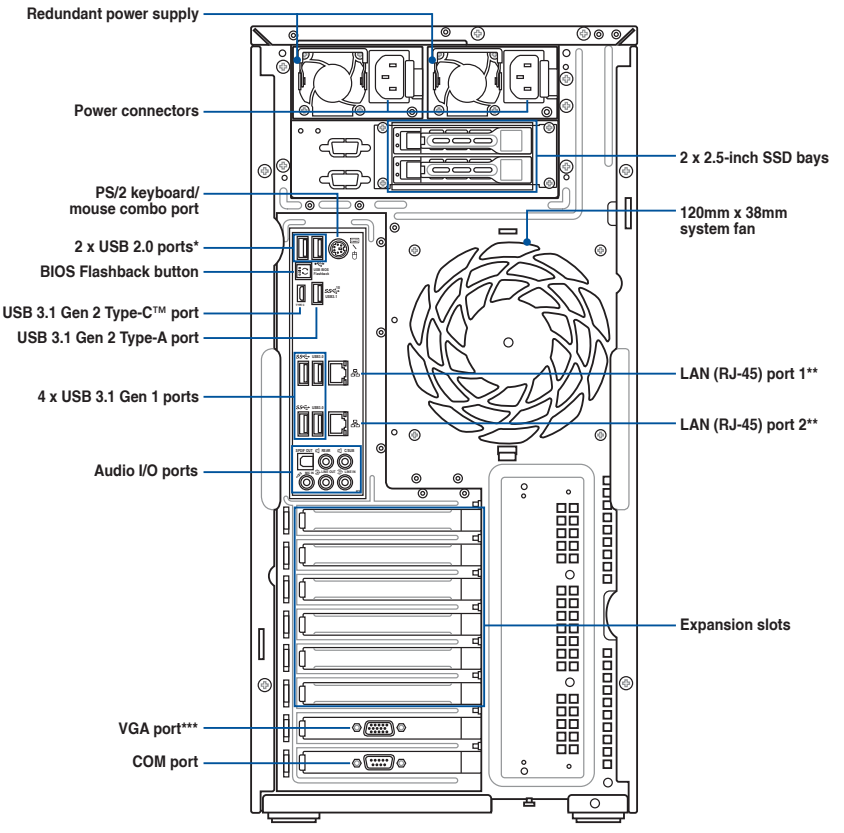
TS700-E9-PS4/PS8



* The lower port supports USB BIOS Flashback function.

** Shared LAN is only supported when ASMB9 Card is installed.

TS700-E9-RS4/RS8



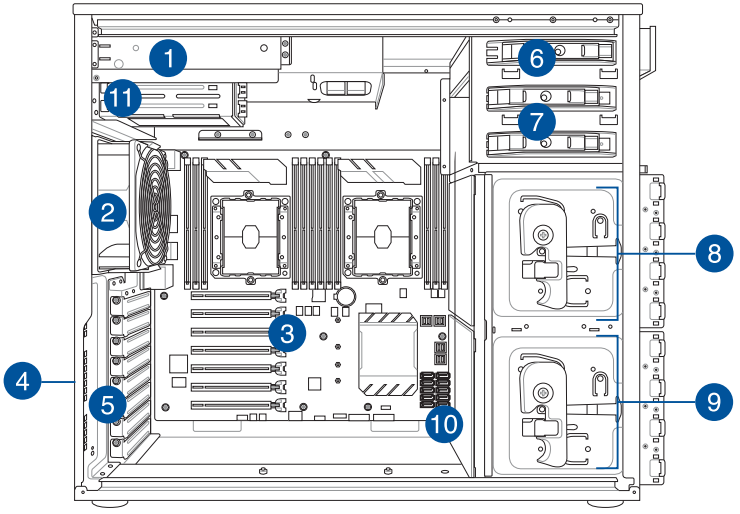
* The lower port supports USB BIOS Flashback function.

** Shared LAN is only supported when ASMB9 Card is installed.

*** VGA port is only supported when VGA cable is installed.

1.6 Internal features

The barebone server includes the basic components as shown.



1. 1200W 80PLUS Platinum Single Power Supply Module (TS700-E9-PS4/PS8) or 800W 80PLUS Platinum 1+1 Redundant Power Supply Module (TS700-E9-RS4/RS8)
2. 120mm x 38mm system fan
3. ASUS WS C621E SAGE Board
4. Chassis intrusion switch
5. Expansion card locks
6. Optical drive (optional)
7. 2 x 5.25-inch drive bays
8. 4-bay HDD module
   (Second set with backplane; TS700-E9-PS8 and TS700-E9-RS8 only)
9. 4-bay HDD module
   (First set with backplane, TS700-E9-PS4 and TS700-E9-RS4 only supports this set)
10. 2 x 80mm x 38mm system fans (hidden beside the backplane)
11. 2 x 2.5-inch SSD bays (TS700-E9-RS4/RS8 only)

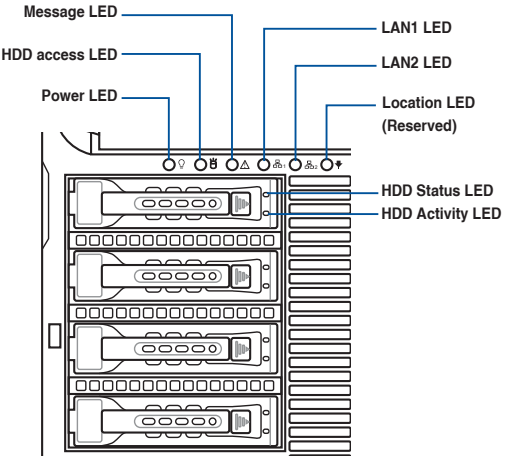
Turn off the system power and detach the power supply before removing or replacing any system component.

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

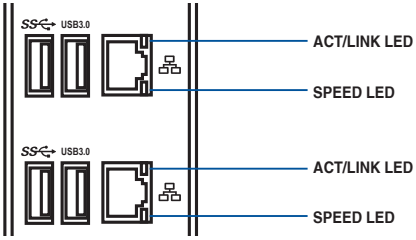
1.7.1 Front panel LEDs



LED	Icon	Display status	Description
Power LED		ON	System power ON
HDD Access LED		OFF	No activity
		Blinking	Read/write data into the HDD
Message LED		OFF	System is normal; no incoming event
		ON	A hardware temperature overheat is detected. Use ACC to check the abnormal status.
HDD Status LED		Green	Bridge board connected to backplane; Installed HDD is in good condition
		Red	HDD failure
		Green/Red Blinking	HDD rebuilding using the RAID card
LAN LEDs		OFF	No LAN connection
		Blinking	LAN is transmitting or receiving data
		ON	LAN connection is present

The Power LED, HDD Status LED and Message LED are visible even if the system front bezel is closed.

1.7.2 LAN (RJ-45) LEDs



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

2 Hardware Information

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

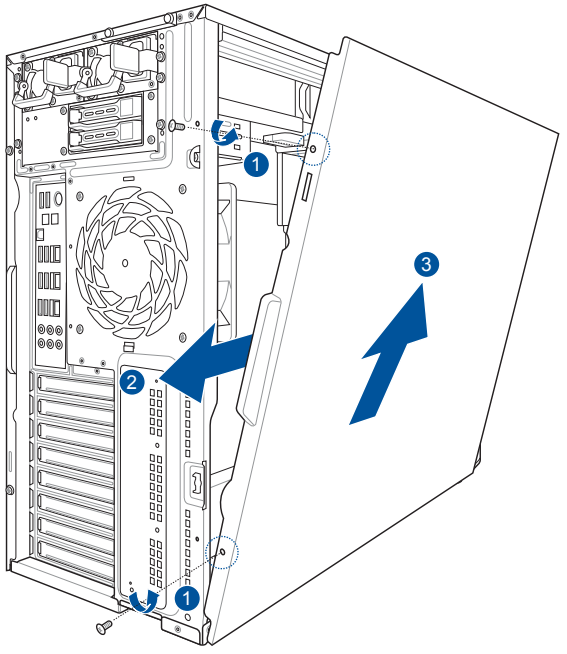
2.1 Chassis cover

2.1.1 Removing the side cover

- Ensure that you unplug the power cord before removing the side cover.
- The diagrams in this section are for reference only. The system may vary with models, but the installation steps are the same for all models.
- Take extra care when removing the side cover. Keep your fingers from components inside the chassis that can cause injury, such as the CPU fan, rear fan, and other sharp-edged parts.

To remove the side cover:

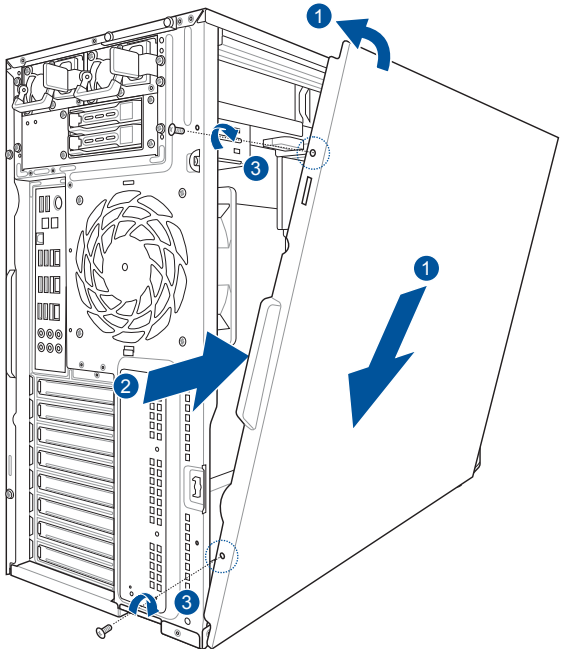
1. Remove the two screws that secure the side cover.
2. Slide the side cover for about half an inch toward the rear until it is disengaged from the chassis.
3. Carefully lift the side cover and set it aside.



2.1.2 Reinstalling the side cover

To reinstall the side cover:

1. Match and insert the lower sliding edge of the side cover to the corresponding chassis edge.
2. Slide the side cover toward the front panel until it snaps in place.
3. Drive in the two screws you removed earlier to secure the side cover.



2.2 Central Processing Unit (CPU)

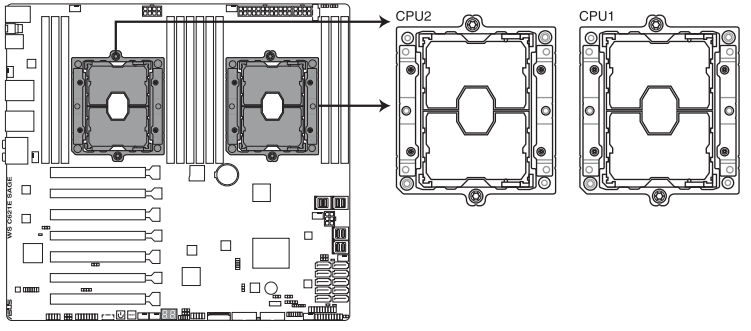
The motherboard comes with two surface mount LGA 3647 sockets designed for the Intel® Xeon® Skylake-SP product family series processors.

- Ensure that all power cables are unplugged before installing the CPU.
- Upon purchase of the server system, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

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

2.2.1 Installing the CPU and heatsink

1. Remove the chassis side cover. For more information, see the section **Chassis cover**.
2. Locate the CPU socket on the motherboard.

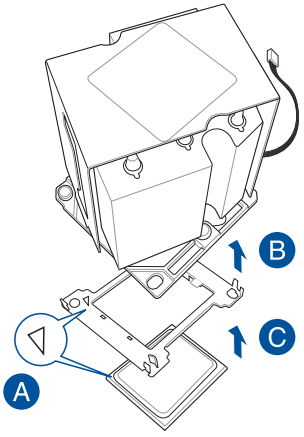


WS C621E SAGE CPU LGA3647 Socket

3. Remove the PnP cap from the sockets.

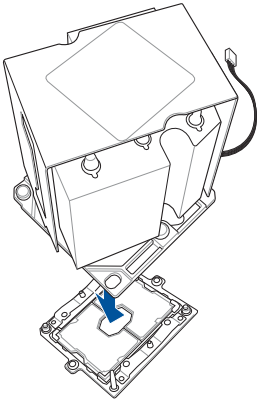
To prevent damage to the socket pins, do not remove the PnP cap unless you are installing a CPU.

4. Align the triangle mark on the CPU with the triangle mark on the CPU Carrier (A), 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).



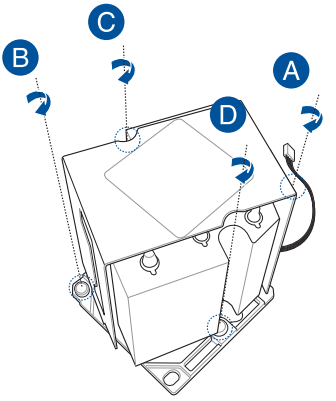
Ensure that the triangle mark on the CPU matches the triangle mark on the CPU Carrier.

5. 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.

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



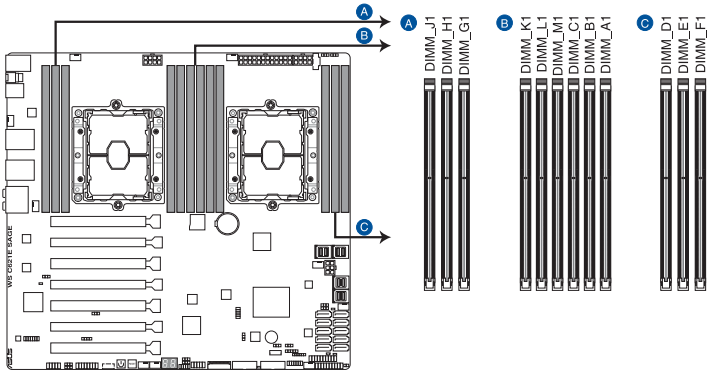
2.3 System memory

2.3.1 Overview

The motherboard comes with twelve (12) DDR 4 (Double Data Rate 4) Dual Inline Memory Modules (DIMM) slots.

A DDR4 module is notched differently from a DDR, DDR2 or DDR3 module. DO NOT install a DDR, DDR2 or DDR3 memory module to the DDR4 slot.

The figure illustrates the location of the DDR4 DIMM sockets:



WS C621E SAGE 288-pin DDR4 DIMM sockets

2.3.2 Memory Configurations

You may install 4 GB, 8 GB, 16 GB, and 32 GB RDIMMs; and 32 GB, and 64 GB LRDIMMs into the DIMM sockets.

- For system stability, use a more efficient memory cooling system to support a full memory load (12 DIMMs) or overclocking condition.
- Always install the DIMMS with the same CAS Latency. For an optimum compatibility, we recommend that you install memory modules of the same version or data code (D/C) from the same vendor. Check with the vendor to get the correct memory modules.
- Visit the ASUS website for the latest QVL.

Single CPU configuration

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

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

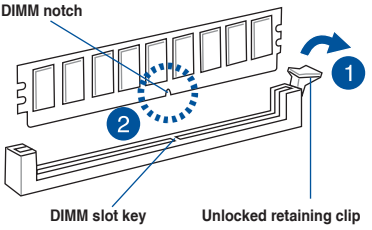
Dual CPU configuration

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

Dual CPU configuration												
	A1	B1	C1	D1	E1	F1	G1	H1	J1	K1	L1	M1
2 DIMMs	✓	-	-	-	-	-	✓	-	-	-	-	-
4 DIMMs	✓	✓	-	-	-	-	✓	✓	-	-	-	-
6 DIMMs	✓	✓	✓	-	-	-	✓	✓	✓	-	-	-
8 DIMMs	✓	✓	-	✓	✓	-	✓	✓	-	✓	✓	-
12 DIMMs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

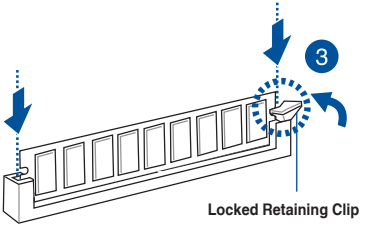
2.3.3 Installing a DIMM on a single clip DIMM socket

1. Press the retaining clip outward to unlock the DIMM socket.
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 at both ends then insert the DIMM into the socket. Apply force to both ends of the DIMM simultaneously until the retaining clip clicks into place and the DIMM is seated securely in place.

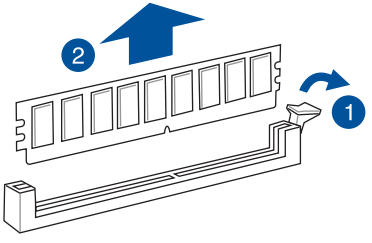


Always insert the DIMM into the socket VERTICALLY to prevent DIMM notch damage.

- To install two or more DIMMs, refer to the user guide bundled with the motherboard package.
- Refer to the user guide for qualified vendor lists of the memory modules.

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.

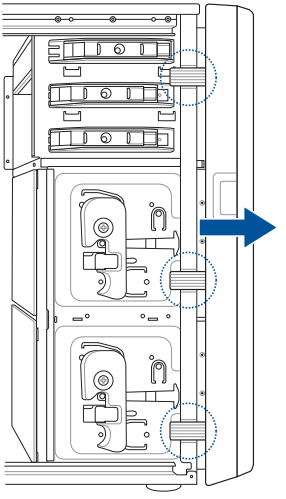
2.4 Front panel assembly

Before you can install a 5.25-inch drive, you should first remove the front panel assembly (front bezel and front panel cover).

2.4.1 Removing the front panel assembly

To remove the front panel assembly:

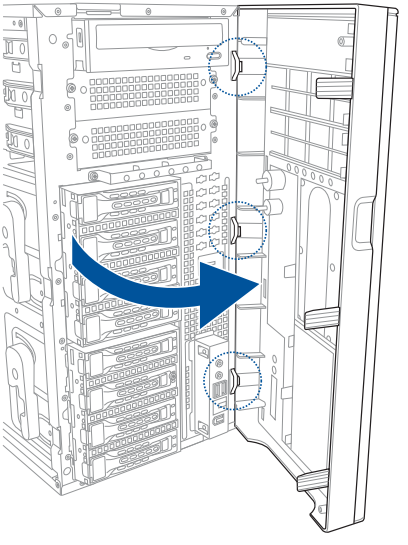
1. Locate the three hooked tabs on the chassis side rail.
2. Shift the hooked tabs and take off the front bezel.



2.4.2 Reinstalling the front panel assembly

To reinstall the front panel assembly:

1. Hook the other side of the front panel assembly to the chassis.
2. Swing the front panel assembly and snap it back into place.



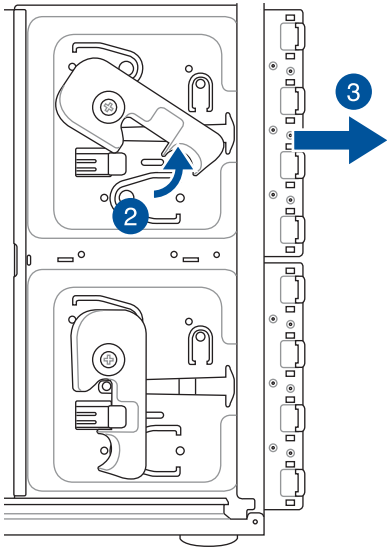
2.5 SATA/SAS hard disk drives

The system comes with two sets of hard disk drive modules. TS700-E9-PS4 and TS700-E9-RS4 supports the first set as default. TS700-E9-PS8 and TS700-E9-RS8 supports both sets. Each hard disk drive module, including externally removable trays for mounting four hot-swap SATA/SAS hard disk drives, allows you to access the drive trays by simply opening the front bezel.

An HDD module cage comes with a SATA or SAS backplane. Take note of the type of HDD module cage you purchase before buying hard disks.

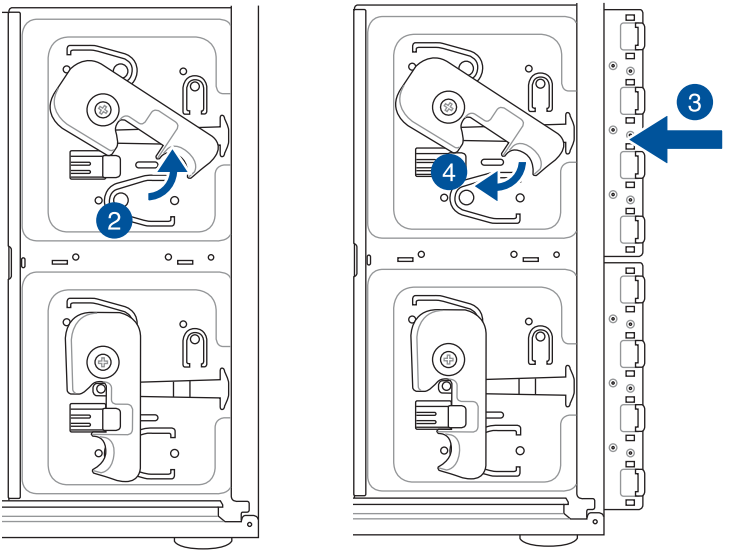
2.5.1 Removing the HDD module cage

1. Disconnect all the cables from the SATA/SAS backplane on the HDD module cage.
2. Level the HDD module cage latch counterclockwise. The HDD module cage will be pushed out of the chassis.
3. Remove the HDD module cage.



2.5.2 Installing the HDD module cage

1. Find a HDD tray. Locate an empty bay and insert the HDD tray into the bay.
2. Level the HDD module cage latch counterclockwise.
3. Insert the HDD module cage into the bay.
4. When the HDD module cage is completely inserted, the cage latch will be pushed back clockwise.
5. Lock the cage latch properly.
6. Connect the appropriate cables to the SATA/SAS backplane on the HDD module cage.

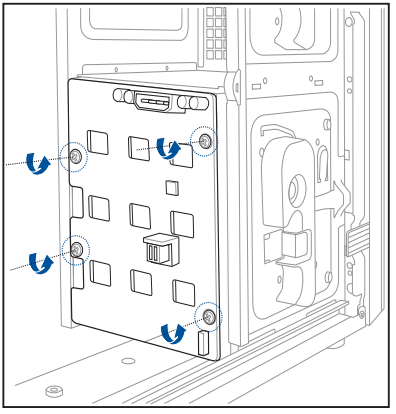


By default, only TS700-E9-PS8 and TS700-E9-RS8 supports the second set of HDD module.

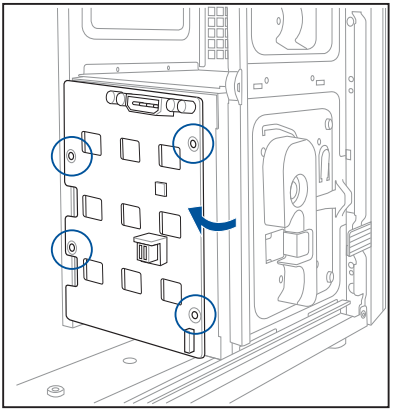
2.5.3 Removing the backplane

DO NOT remove the backplane unless necessary!

1. Remove all hot-swap HDD trays from the chassis.
2. Disconnect all cables from the SATA/ SAS backplane.
3. Loosen the four screws on the backplane.

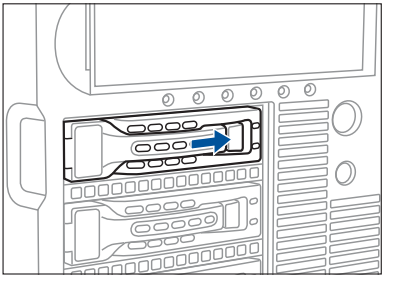


4. Firmly hold the backplane, and turn it in the direction of the arrow.
5. Remove the backplane from the module.

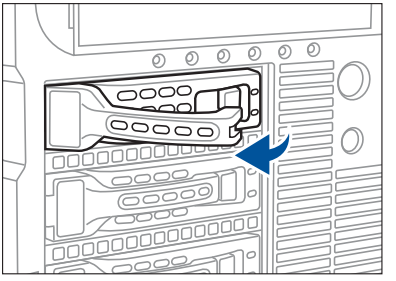


2.5.4 Installing a hot-swap SATA/SAS hard disk drive

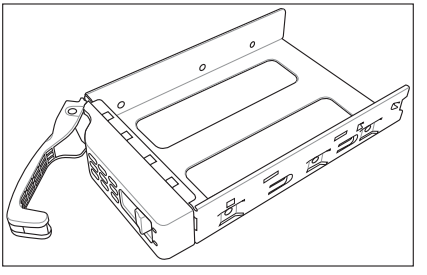
1. Release a drive tray by pushing the spring lock to the right, and then pulling the tray lever outward. The drive tray ejects slightly after you pull out the lever.



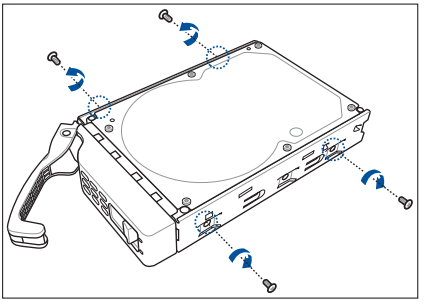
2. Firmly hold the tray lever and pull the drive tray out of the bay.



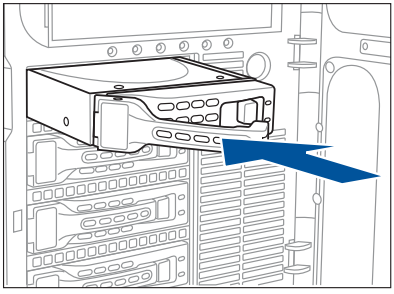
3. Take note of the drive tray holes. Each side has three holes to fit different types of hard disk drives. Use two screws on each side to secure the hard disk drive.



4. Place a SATA/SAS hard disk drive on the tray, and then secure it with four screws.



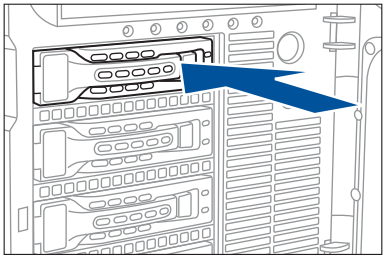
5. Carefully insert the drive tray and push it all the way to the depth of the bay until just a small fraction of the tray edge protrudes.



When installed, the SATA/SAS connector on the drive connects to the SATA/SAS interface on the backplane.

6. Push the tray lever until it clicks, and secures the drive tray in place. The drive tray is correctly placed when its front edge aligns with the bay edge.

7. Repeat steps 1 to 6 if you wish to install a second SATA/SAS drive.

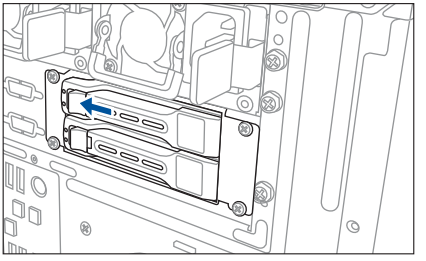


2.5.5 Installing a 2.5-inch hard disk drive (TS700-E9-RS4/RS8 only)

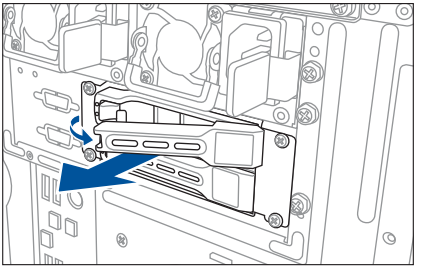
The system comes with two hot-swap 2.5-inch hard disk drives on the rear panel for mounting SATA/SAS or SSD hard disk drives.

To install a 2.5-inch hard disk drive:

1. Release a drive tray by pushing the spring lock to the right, and then pulling the tray lever outward. The drive tray ejects slightly after you pull out the lever.

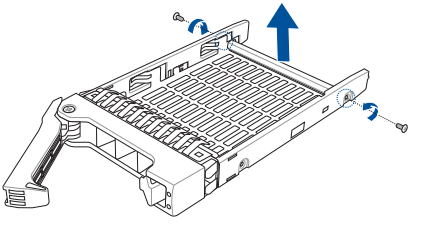


2. Firmly hold the tray lever and pull the drive tray out of the bay.



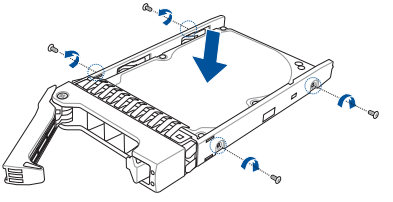
When the drive tray is out, its case is facing downwards.

3. Place the drive tray on a flat surface.
4. Release the screws on each side of the drive tray to release the drive tray metal beam.
5. Find the hard disk drive you want to install and its bundled screws.

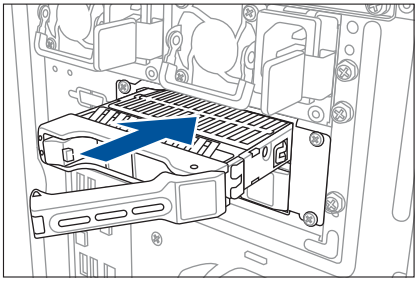


6. Orient and place the SSD into the tray.

   Ensure that the SSD is fitted firmly inside the drive tray and that the four screws of the SSD matches the four screws holes of the drive tray.

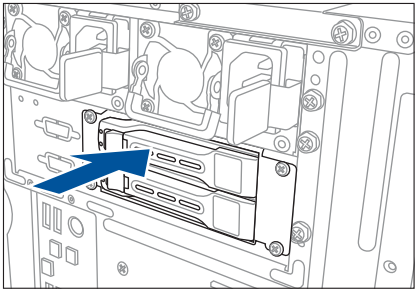


7. Carefully insert the drive tray with its case facing downwards and push it all the way to the drive bay.



When installed, the SATA/SAS connector on the drive connects to the SATA/SAS interface on the backplane.

8. Lock the secure tab to secure the drive tray in place.



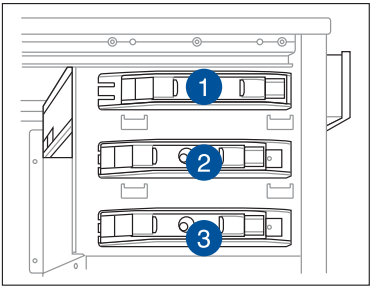
When the drive tray assembly is properly installed, you will see the edge of the drive tray is in align with the chassis cover.

9. Repeat steps 1 to 8 to install other 2.5-inch hard disk drives.

2.6 5.25-inch or 3.5-inch drives

Ensure to unplug the power cable before installing or removing any system components. Failure to do so may cause damage to the motherboard and other system components!

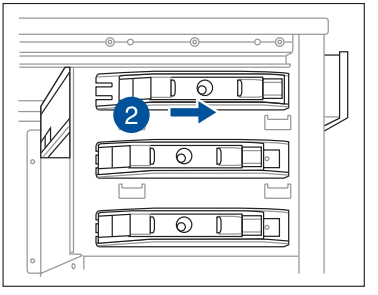
The system comes with three 5.25-inch drive bays located on the upper front part of the chassis. An optical drive that comes standard with the system package occupies the uppermost bay (labeled 1). The lower bays (labeled 2 and 3) are available for additional 5.25-inch drives or 5.25-inch to 3.5-inch hard drive adapter for installing 3.5-inch zip or floppy disk drives.



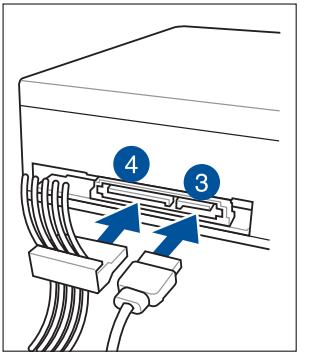
You must remove the front panel assembly before installing a 5.25-inch drive.

2.6.1 Installing a 5.25-inch drive

1. Unscrew and remove the metal cover of the bay where you want to install the 5.25-inch drive.
2. Insert the drive into the bay and slide the bay lock to the right until it clicks in place.



3. Connect the SATA cable to the SATA connector on the back of the drive.
4. Connect the 4-pin power connector from the power supply to the power connector on the back of the drive.



2.7 Expansion slots

Remove the metal slot cover before installing an expansion card.

Ensure to unplug the power cord before installing or removing expansion cards. Failure to do so may cause severe damage to the motherboard and other system components!

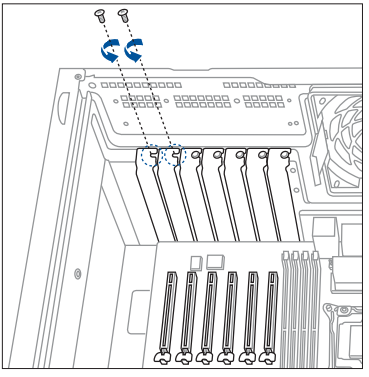
2.7.1 Installing an expansion card

1. Before installing the expansion card, read the documentation that came with it and make the necessary hardware settings for the card.

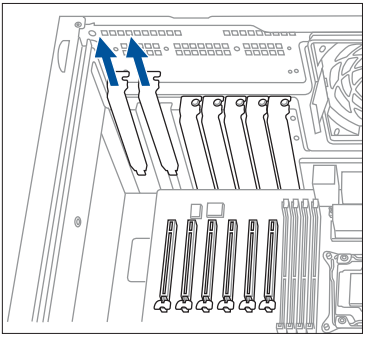
- Supports up to two double-decked GPU cards, depending on the configuration and other key parts, such as the CPU or PSU options.
- Ensure to check the power requirements of your expansion cards, as different voltage values (220V / 110V) may result in different power ratings (1200W / 1000W) and may influence the amount of expansion cards your system may support.

2. Remove the side chassis cover. Lay the system on its side on a flat, stable surface.

3. Release the screws on the metal slot cover where you wish to install the expansion card.

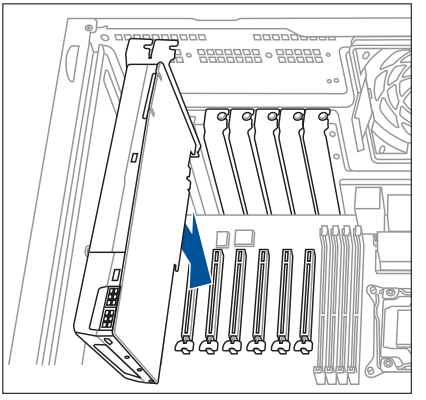


4. Remove the metal slot cover.

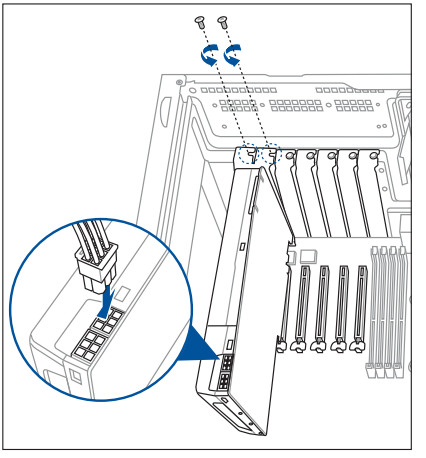


Refer to the following steps to install a double-deck GPU card.

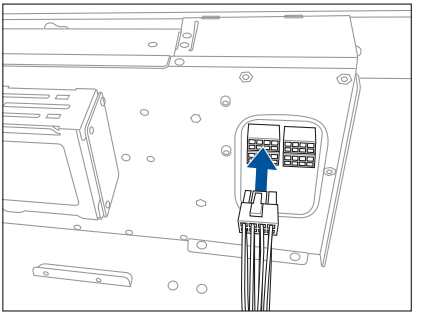
5. Align the card's golden fingers with the slot, and then press firmly until the card is completely seated on the slot.



6. Secure the expansion card with the screws that you removed earlier in step 3.
7. When installing a PCIe x16 graphics card that requires external power supply, connect the 6+2 pin connector of the bundled power cable to the graphics card.



8. Connect the 8-pin ATX power connector of the power cable to the power supply module to get external power supply.

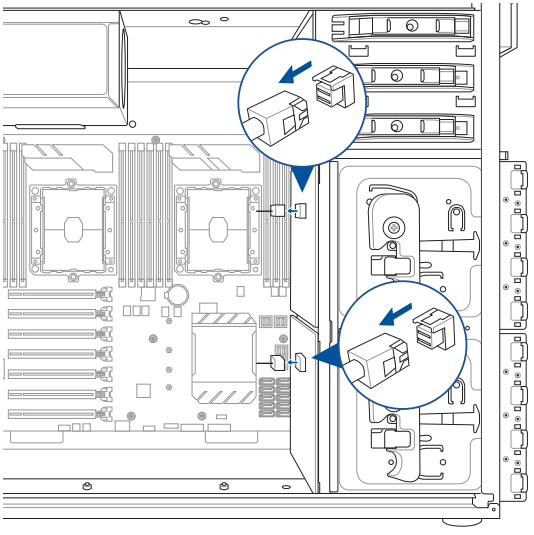


2.7.2 Installing an ASUS PIKE II card

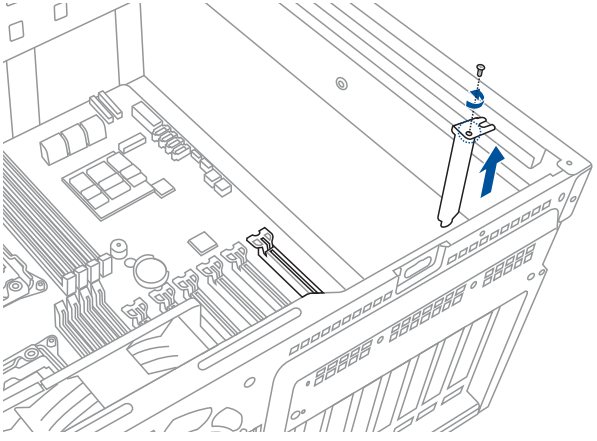
You can install an ASUS PIKE II card on the provided PCI-E slot onboard.

To install an ASUS PIKE II card:

1. Remove the default cable from the backplane.

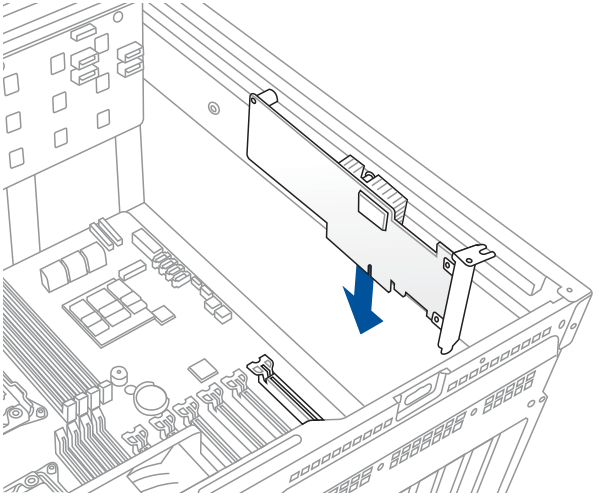


2. Remove the screw on the metal cover and then remove the metal cover, put them aside for future use.



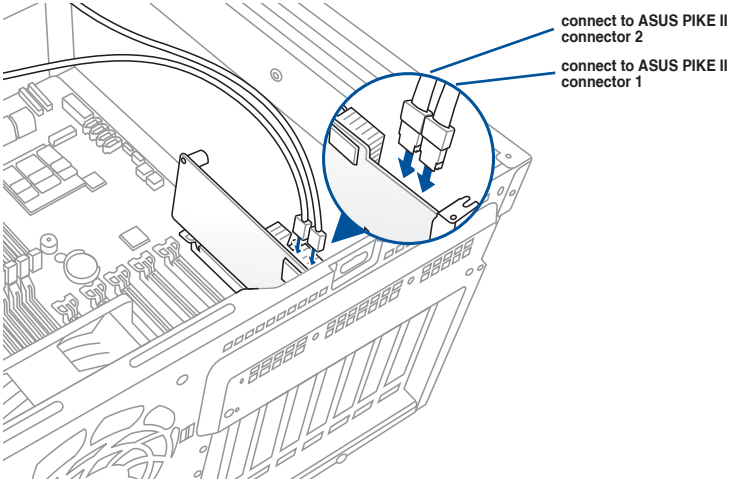
3. Prepare your ASUS PIKE II card.

4. Insert the expansion card into the PCI-E slot. Ensure that the golden fingers are totally inserted into the slot.



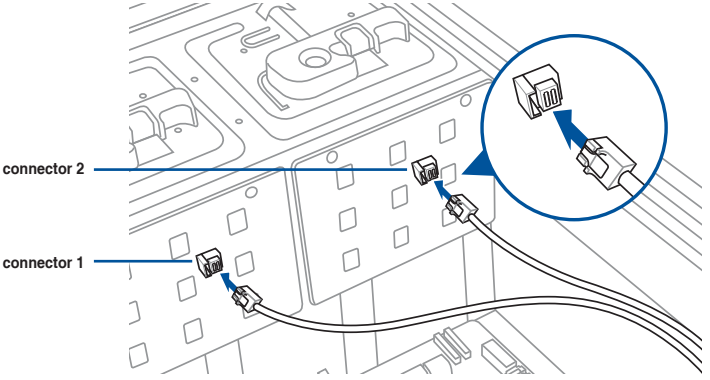
5. Connect the two mini-SAS HD cables to the ASUS PIKE II card.

Connect only one (1) mini-SAS HD cable to ASUS PIKE II connector 1 for TS700-E9-PS4 and TS700-E9-RS4.



6. Connect connector 1 on the ASUS PIKE II card to connector 1 on the backplane and connector 2 on the ASUS PIKE II card to connector 2 on the backplane using two mini-SAS HD cables.

Connect only one (1) mini-SAS HD cable to backplane connector 1 for TS700-E9-PS4 and TS700-E9-RS4.



Only up to four SAS is supported when using the PIKE II card.

2.7.3 Configuring an expansion card

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

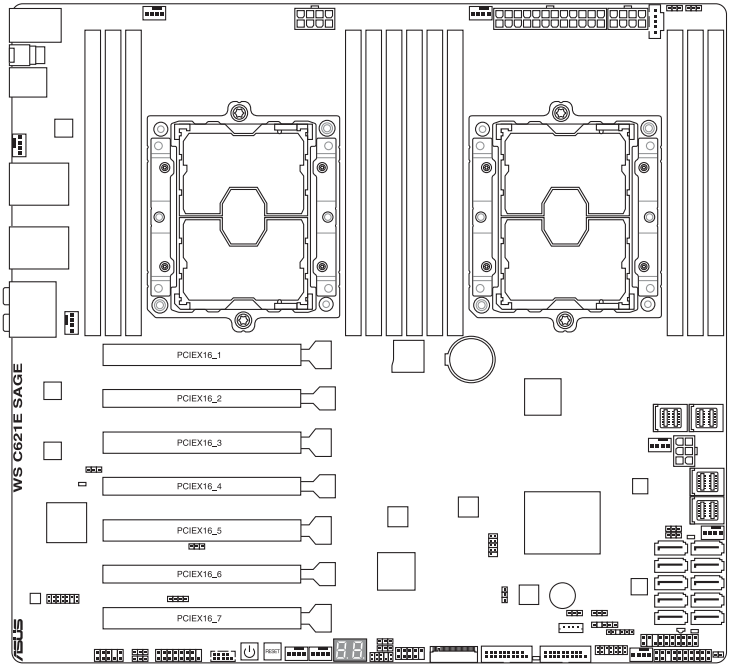
1. Turn on the system and change the necessary BIOS settings, if any. See Chapter 5 for information on BIOS setup.
2. Assign an IRQ to the card. Refer to the following tables.
3. Install the software drivers for the expansion card.

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 PCI devices.

Expansion slots



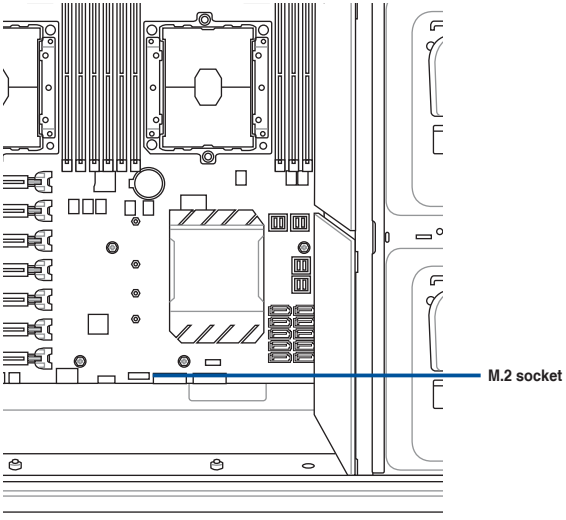
PCIEX16_1	1 x PCIE x16 (x16 Gen3 Link)
PCIEX16_2	1 x PCIE X16 (x8 Gen3 Link)
PCIEX16_3	1 x PCIE x16 (x16/x8 Gen3 Link)
PCIEX16_4	1 x PCIE X16 (x0/x8 Gen3 Link)
PCIEX16_5	1 x PCIE x16 (x16 Gen3 Link)
PCIEX16_6	1 x PCIE x16 (x8 Gen3 Link)
PCIEX16_7	1 x PCIE x16 (x16 Gen3 Link)

2.7.4 Installing an M.2 expansion card

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

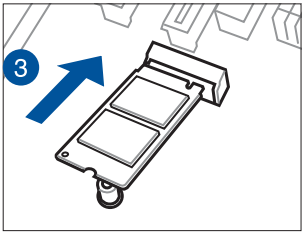
To install an M.2 expansion card:

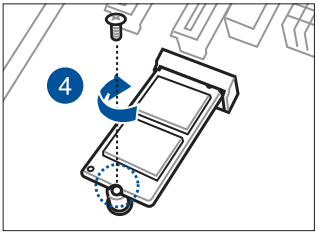
1. Remove the screw on the M.2 socket and set it aside.



The illustrations below vary with models. The installation steps are the same.

2. Find 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 that you removed earlier in step 1.

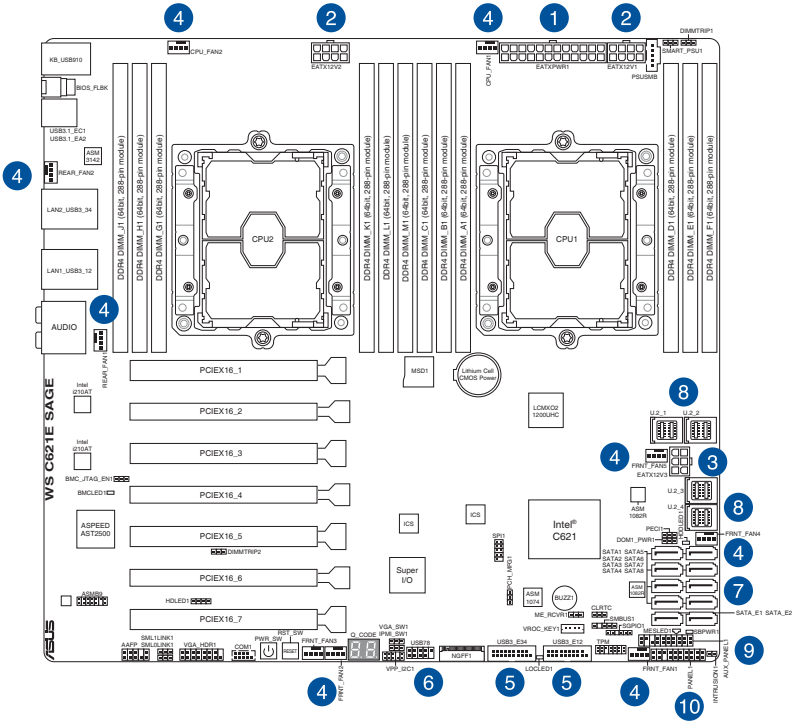




2.8 Cable connections

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

2.8.1 Motherboard connections



Standard cables connected to the motherboard

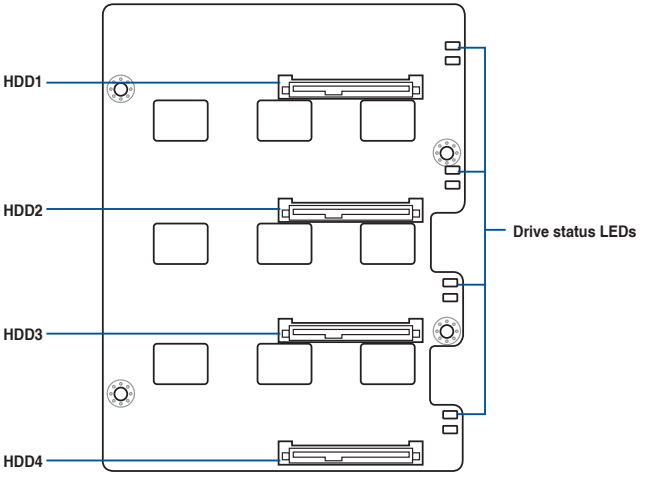
1. 24-pin ATX power connector (from power supply to motherboard)
2. 8-pin 12V power connectors (from power supply to motherboard)
3. 6-pin 12V power connector (from power supply to motherboard)
4. System fan connectors (from motherboard to system fans)
5. USB 3.1 Gen 1 connector (from motherboard to front I/O board)
6. USB 2.0 connector (from motherboard to front I/O board)
7. SATA connector (system default; from motherboard to optical drive or front 3.5-inch SATA/SAS backplane)
8. U.2 connector (system default; from motherboard to rear 2.5-inch SATA/SAS backplane)
9. System auxiliary panel connector (from motherboard to front I/O board)
10. System panel connector (from motherboard to front I/O board)

2.8.2 SATA/SAS backplane cabling

The system comes with a pre-installed SATA/SAS backplane. The SATA/SAS backplane has four 22-pin SATA/SAS connectors to support Serial ATA hard disk drives and SAS hard disk drives. The backplane design incorporates a hot-swap feature to allow easy connection or removal of SATA/SAS hard disks. The LEDs on the backplane connect to the front panel LEDs to indicate HDD status. See section **1.7 LED information** for details.

Front side

The front side of the SATA/SAS backplane faces the front panel when installed. This side includes four SATA/SAS connectors for the hot-swap drive trays.

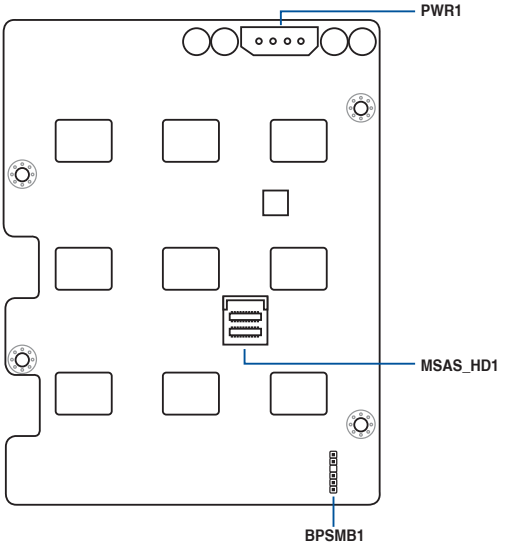


Each SATA/SAS connector is labeled (HDD1, HDD2, HDD3, HDD4) so you can easily determine their counterpart connectors at the back side of the backplane. Refer to the table for reference.

HDD Device	Front side connector	Back side connector
HDD 1	HDD1	CON1
HDD 2	HDD2	CON2
HDD 3	HDD3	CON3
HDD 4	HDD4	CON4

Back side

The back side of the SATA/SAS backplane faces the rear panel when installed. This side includes the power connectors and SATA/SAS interfaces for the motherboard Serial ATA connectors or the SAS card.



Connectors	Description
MSAS_HD1	Connects to SATA SGPIO1 connector on the motherboard or connects to SATA/SAS connectors on the ASUS PIKE II card.
BPSMB1	Connects to AUX_PANEL1 connector on the motherboard
PWR1	Connects to 4-pin plug of the power supply

2.9 Removable components

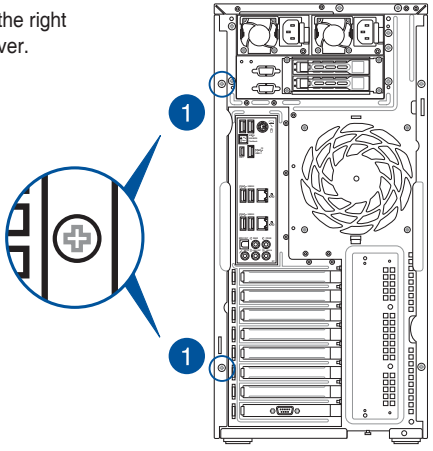
You may need to remove previously installed system components when installing or removing system devices, or when you need to replace defective components. This section tells how to remove the following components:

1. System fans (front and rear)
2. Redundant power supply module
3. Chassis footpads

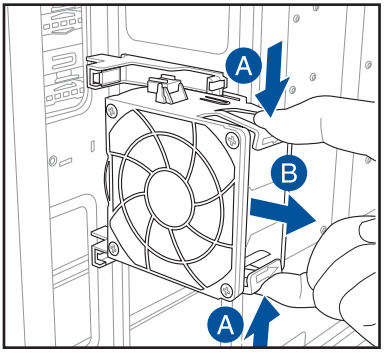
2.9.1 System fans

Removing the front system fan

1. Remove the two screws that secure the right side cover. Then remove the side cover.

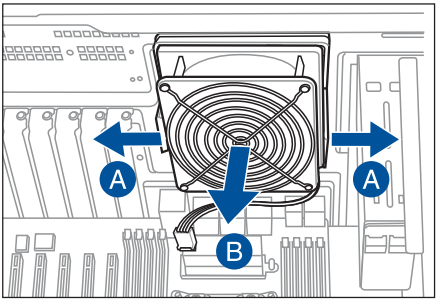


2. Locate the front system fan near the 5.25-inch drive bays.
3. Squeeze the front system fan latches (step A) and pull out the front system fan (step B), as shown in the right figure.
4. Follow the previous instructions in reverse to reinstall the front system fan.

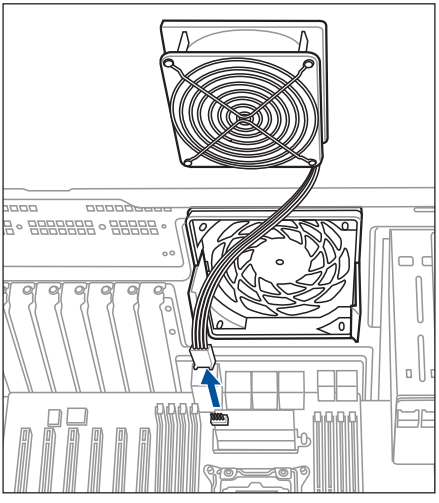


Removing the rear system fan

1. Pull the rear system fan latches outwards (A) to release the rear system fan (B), as shown in the figure below.



2. Unplug the system fan cable from the **REAR_FAN1** connector on the motherboard, then remove the rear system fan from the server system.

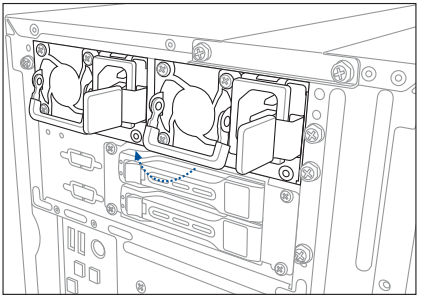


Follow the previous instructions in reverse to reinstall the rear system fan.

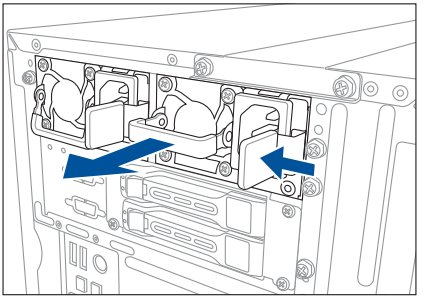
2.9.2 Redundant power supply module (TS700-E9-RS4/RS8 only)

To install the redundant power supply module:

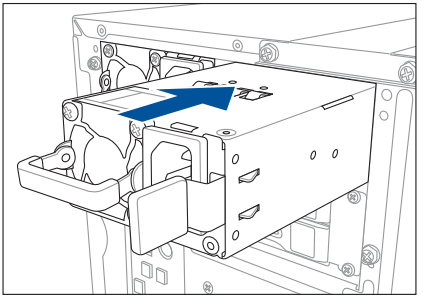
1. Locate the redundant power supply you want to remove on the rear panel of your chassis. Move the handle on it upward.



2. Press the latch to the left and pull the power supply module out of the system chassis.



3. Insert the replacement power supply module into the chassis. You will hear a sound when the power supply module is secured in place.

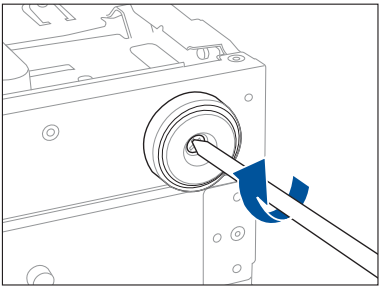


2.9.3 Chassis footpads

The barebone server system is shipped with four footpads attached to the bottom of the chassis for stability. You need to remove these footpads if you wish to install the system to a rack. Refer to Chapter 3: Installation Options of this user guide, and to the “Rackmount Kit” user guide for instructions.

To remove the footpads:

1. Lay the system chassis on its side.
2. Remove the footpad by rotating it counterclockwise with a Phillips (cross) screwdriver.
3. Repeat steps 1 and 2 to remove the other three footpads.



3 Installation Options

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

3.1 Preparing the system for rack mounting

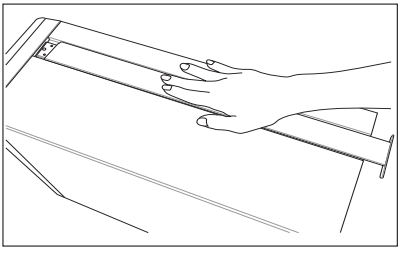
- The items required for the optional configurations described in this chapter are not included in the standard barebone system package. These items are purchased separately.
- We recommend that you allot at least 1U space above the server system to ensure optimal thermal performance.

Removing the footpads

Refer to section 2.9.3 Chassis footpads for instructions on removing the footpads.

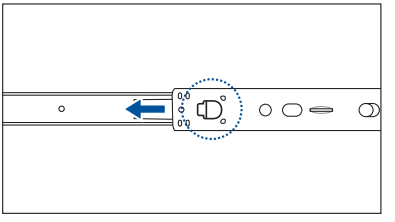
Removing the top cover

Unscrew and slide the top cover toward the rear panel, and then lift it up from the chassis.

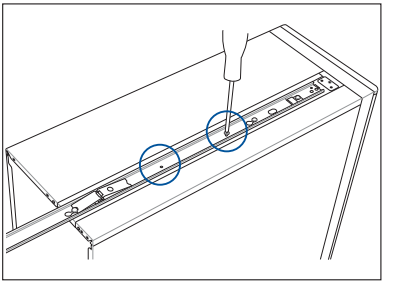


3.2 Attaching the inner rail to the server

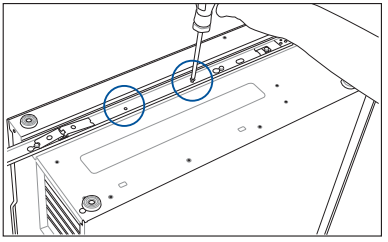
1. Press the lock on side of the rail and slide the inner rail out from the rackmount rail kit.



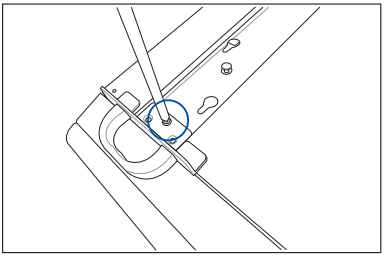
2. Slide the inner rail into the rail on top of the chassis.
3. Align the screw holes on the inner rail and the chassis top, and then secure the inner rail to the chassis top with screws.



4. Repeat the previous steps to secure the other inner rail to the bottom of the chassis with screws.



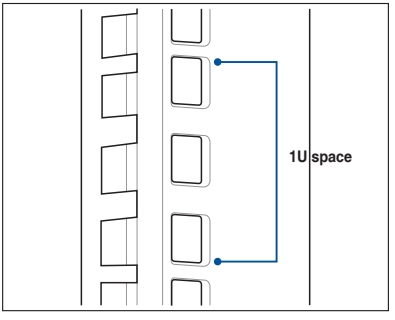
5. Use three screws to secure the side hooks to both rails.



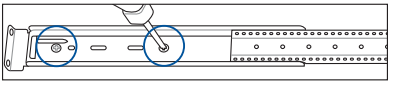
3.3 Attaching the rails to the rack

To attach the rails to the rack:

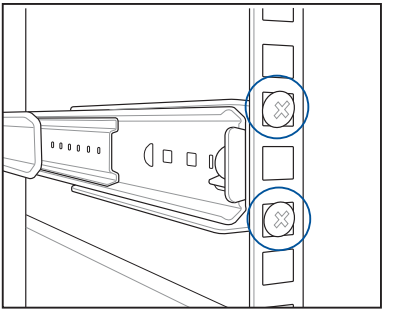
1. Select one unit of space (1U) on the rack where you wish to install the server.



2. Drive in two screws on the rack rails.



3. Align the front end holes of a rack rail pair to the 1U space.
4. Drive in two screws on the outer holes to secure the front end.

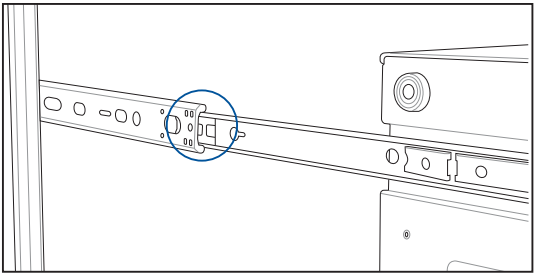


5. Find the rear 1U space that corresponds to the front 1U space where you attached the rail. Drive in two screws on the outer holes to secure the rear end.
6. From the rack front, find the corresponding 1U space for the second rail pair.
7. Repeat steps 3–6 to attach the second rail pair.

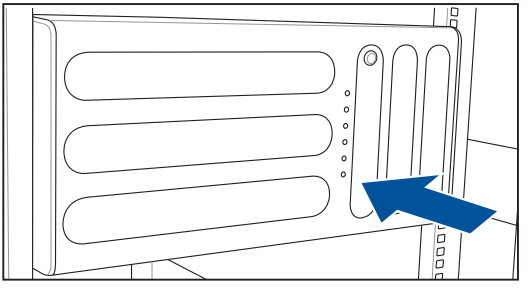
3.4 Mounting the server to the rack

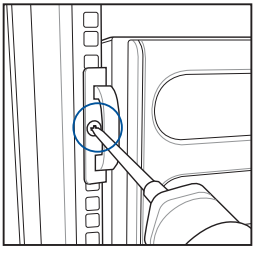
To mount the server to the rack:

1. Align the server rails with the rack rails.
2. Press the lock on side of the rail and slide the server into the rack.



3. When the server is fully slide into the rack, secure both sides using screws.

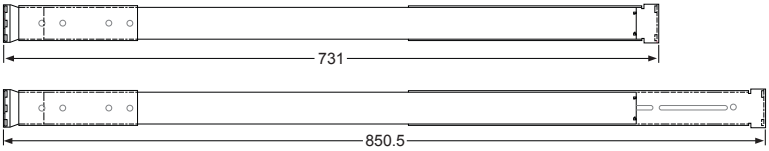




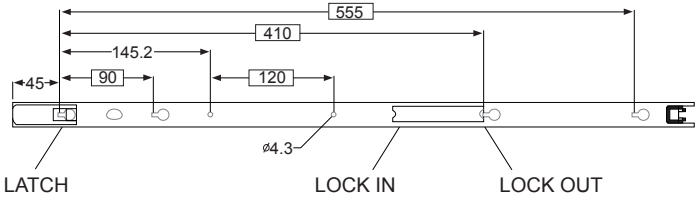
3.5 Rail kit dimensions

Outer rail length (unit: mm; installed to the rack)

Minimum length when closed: 731 mm; maximum length: 850.5 mm

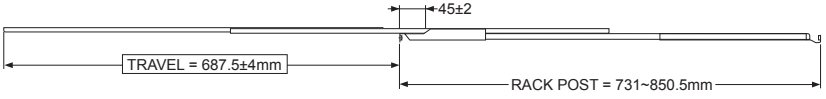


Inner rail length (unit: mm; installed to the chassis)



Inner and outer rail assembly maximum length (unit: mm)

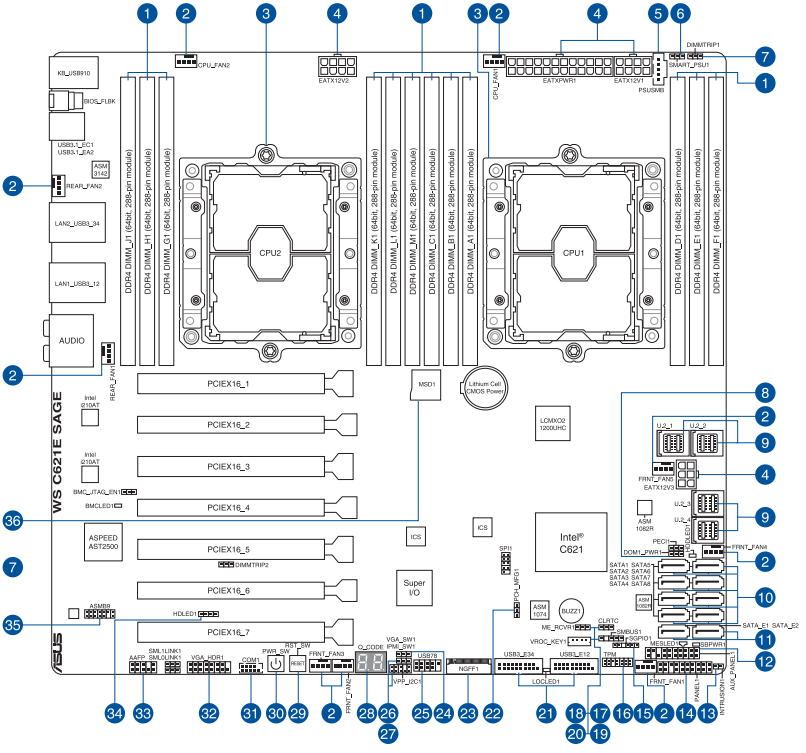
Total length: 687.5 + 850.5 = 1538 mm



4 Motherboard Information

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

4.1 Motherboard layout



Refer to **4.5 Internal connectors** and **1.5 Rear panel features** for more information about rear panel connectors and internal connectors.

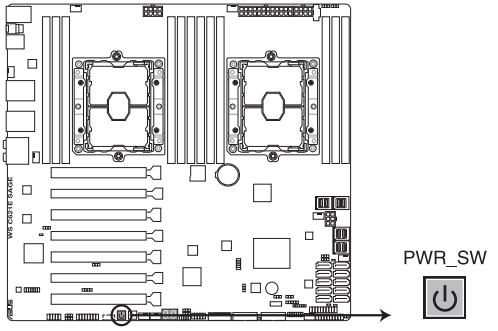
Layout contents

4.2 Onboard buttons and switches

Onboard buttons and switches allow you to fine-tune performance when working on a bare or open-case system. This is ideal for overclockers and gamers who continually change settings to enhance system performance.

1. Power-on button

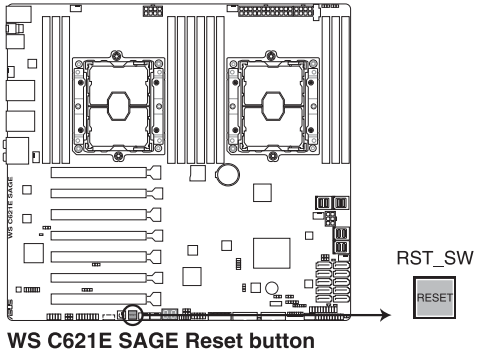
The motherboard comes with a power-on button that allows you to power up or wake up the system. The button also lights up when the system is plugged to a power source indicating that you should shut down the system and unplug the power cable before removing or installing any motherboard component.



WS C621E SAGE Power on button

2. Reset button

Press the reset button to reboot the system.



WS C621E SAGE Reset button

4.3 Jumpers

1. Clear RTC RAM (3-pin CLRTC1)

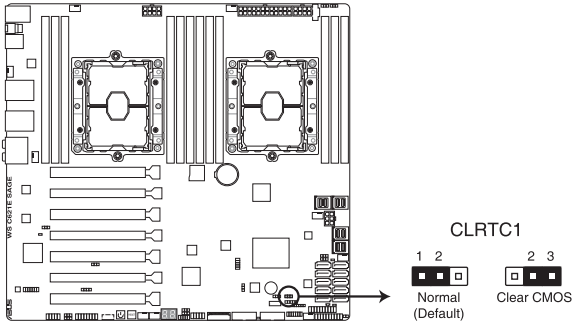
This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.

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 <Del> key during the boot process and enter BIOS setup to reenter data.

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

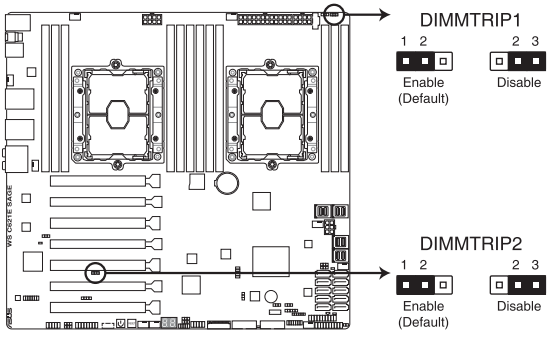
If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.



WS C621E SAGE Clear RTC RAM

2. DDR4 thermal event setting (3-pin DIMMTRIP1-2)

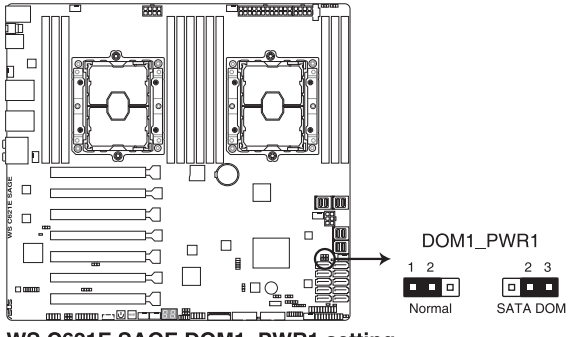
These jumpers allow you to enable or disable DDR4 DIMM thermal sensing event pin.



WS C621E SAGE Thermaltrip setting

3. SATADOM power setting (3-pin DOM1_PWR1)

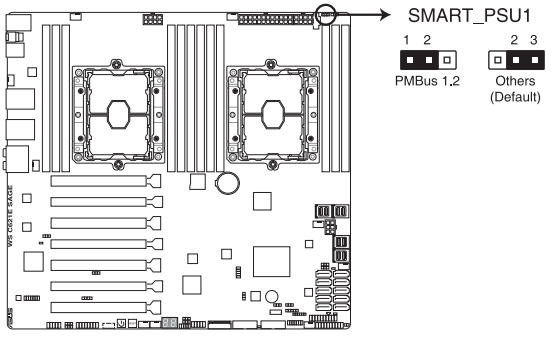
This jumper allows SATA8 to support SATADOM which do not need external power connections. Set to pins 2-3 to activate the SATA8 support feature.



WS C621E SAGE DOM1_PWR1 setting

4. PMBus 1.2 PSU select jumper (3-pin SMART_PSU1)

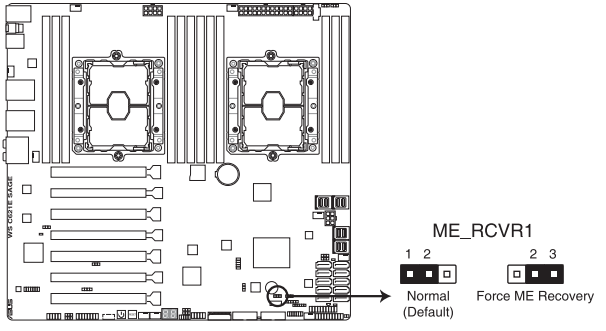
This jumper allows you to select PSU PMBus version. Set to pins 1–2 for PMBus, set to pins 2–3 for others.



WS C621E SAGE PMBus 1.2 PSU setting

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

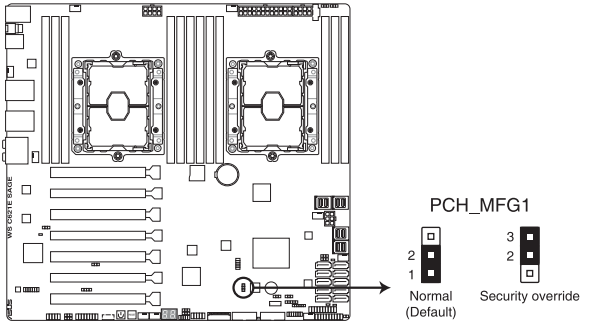
This jumper allows you to quickly recover the Intel Management Engine (ME) firmware when it becomes corrupted.



WS C621E SAGE ME recovery setting

6. PCH_MFG1 setting (3-pin PCH_MFG1)

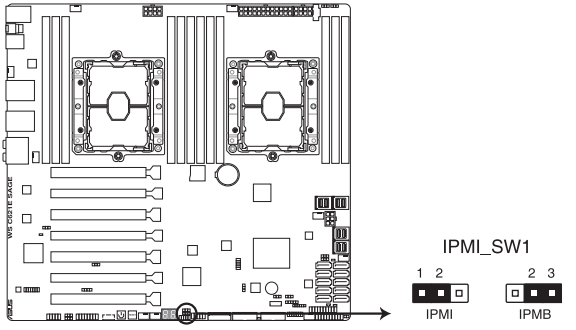
This jumper allows you to update the BIOS ME block.



WS C621E SAGE PCH_MFG setting

7. IPMI SW setting (3-pin IPMI_SW1)

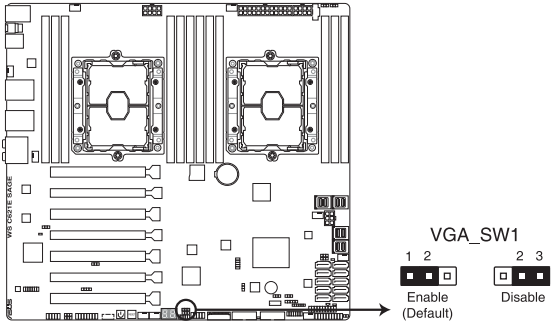
This jumper allows you to select which protocol in the GPU sensor to function.



WS C621E SAGE IPMI_SW1 setting

8. 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.



WS C621E SAGE VGA setting

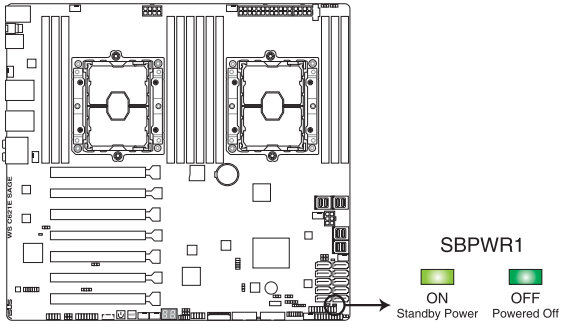
Ensure the ATX power supply is switched off or the power cord is detached from the power supply when enabling or disabling the VGA controller settings using this jumper.

- If a VGA Card is installed into a PCI Express x16 Slot, the onboard VGA function will still be enabled.
- BMC Remote Management Function will still be available when VGA controller settings is set to disabled, but the display will be disabled on the client device.

4.4 Onboard LEDs

1. Standby Power LED (SBPWR1)

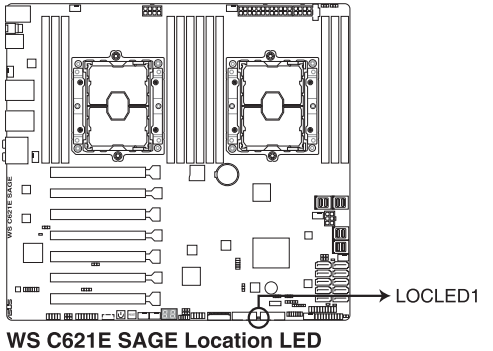
The motherboard comes with a standby power LED. The green LED lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration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



WS C621E SAGE Standby Power LED

2. Location LED (LOCLED1)

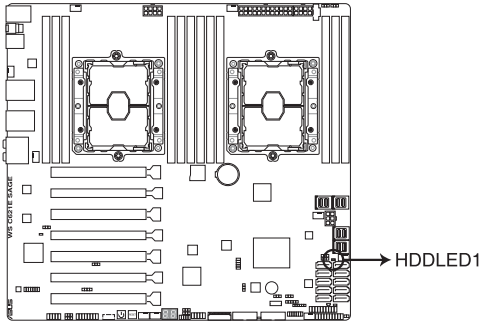
This onboard LED lights up when the Location button on the server is pressed or when triggered by a system management software. The Location LED helps visually locate and quickly identify the server in error on a server rack.



WS C621E SAGE Location LED

3. Hard disk activity LED (HDDLED1)

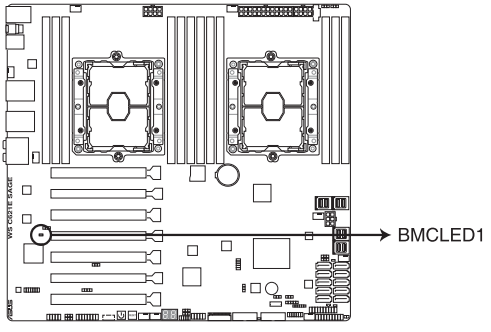
This LED is for the storage devices connected to the onboard SATA, or SATA/SAS add-on card. The read or write activities of any device connected to the onboard SATA, or SATA/SAS add-on card causes the rear panel LED to light up.



WS C621E SAGE HDD LED

4. Baseboard Management Controller LED (BMCLED1)

The BMC LED works with the ASUS ASMB management device and indicates its initiation status. When the PSU is plugged and the system is OFF, ASUS ASMB management device starts system initiation for about one (1) minute. The BMC LED blinks after system initiation finishes.

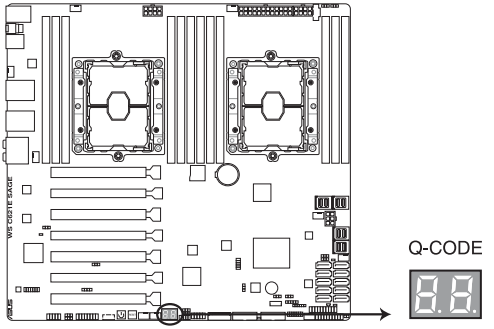


WS C621E SAGE BMC LED

This LED is only enabled for the WS C621E SAGE (BMC) model.

5. Q-Code LEDs

The Q-Code LED design provides you with a 2-digit error code that displays the system status. Refer to the Q-Code table on the next page for details.



WS C621E SAGE Q-CODE LED

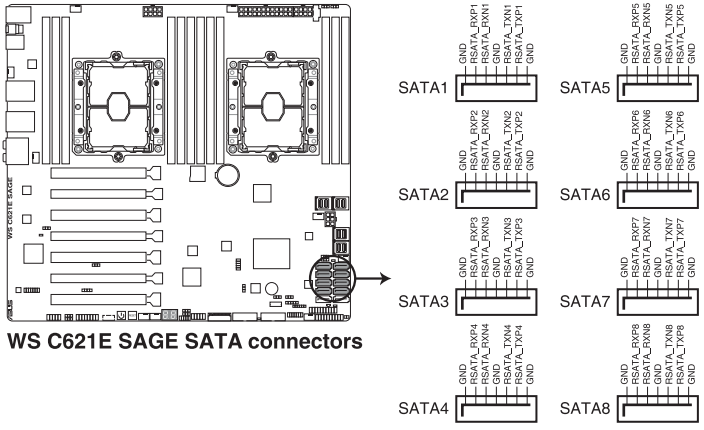
- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Please refer to the Q-Code table in the **Appendix** section for more details.

4.5 Internal connectors

1. Intel® C621 Serial ATA 6 Gb/s connectors (7-pin SATA1-8)

These connectors connect to Serial ATA 6 Gb/s hard disk drives via Serial ATA 6 Gb/s signal cables.

If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology enterprise (Intel® RSTe) through the onboard Intel® C621 chipset.

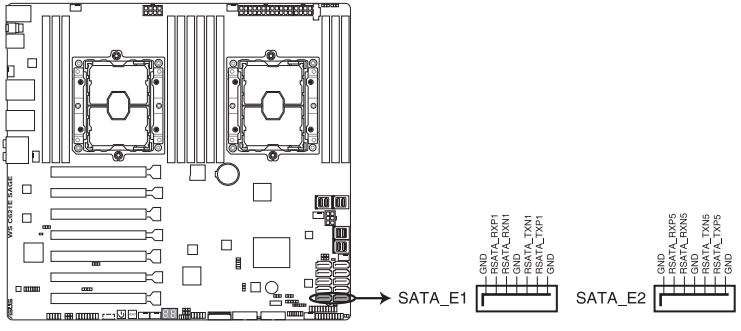


WS C621E SAGE SATA connectors

These connectors are set to **[AHCI]** by default. If you intend to create a Serial ATA RAID set using these connectors, set the SATA Mode item in the BIOS to **[RAID]**.

2. ASMedia® Serial ATA 6 Gb/s connectors (7-pin SATA_E1-2)

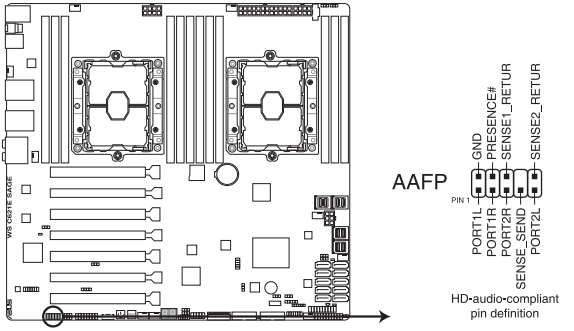
These connectors connect to Serial ATA 6 Gb/s hard disk drives via Serial ATA 6 Gb/s signal cables.



WS C621E SAGE ASMedia® SATA 6 Gb/s connectors

3. Front panel audio connector (10-1 pin AAFP)

This connector is for a chassis-mounted front panel audio I/O module that supports HD Audio. Connect one end of the front panel audio I/O module cable to this connector.

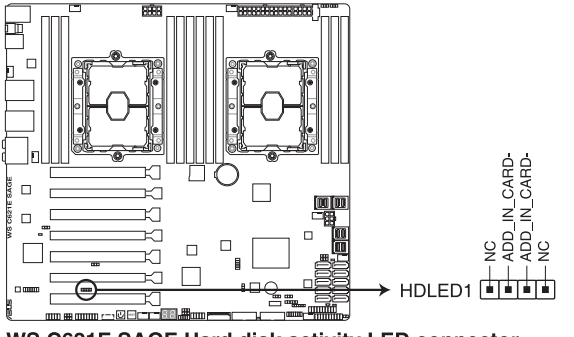


WS C621E SAGE Front panel audio connector

We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

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

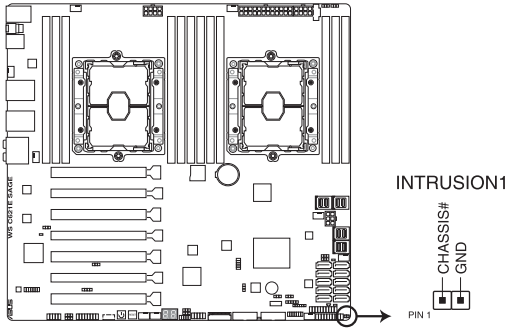
This LED connector is for the storage add-on card cable connected to the SATA or SAS add-on card. The read or write activities of any device connected to the SATA or SAS add-on card causes the front panel LED to light up.



WS C621E SAGE Hard disk activity LED connector

5. Chassis intrusion connector (2-pin INTRUSION1)

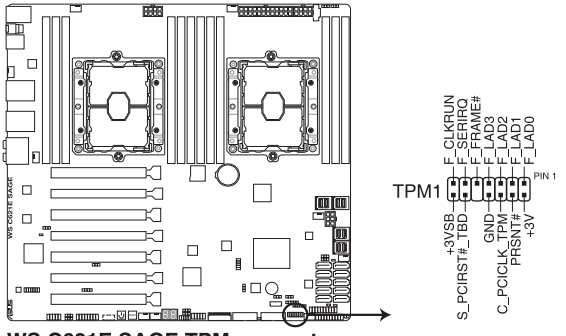
These leads are for the intrusion detection feature for chassis with intrusion sensor or microswitch. When you remove any chassis component, the sensor triggers and sends a high level signal to these leads to record a chassis intrusion event. The default setting is to short the CHASSIS# and the GND pin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



WS C621E SAGE Chassis Intrusion connector

6. TPM connector (14-1 pin TPM1)

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

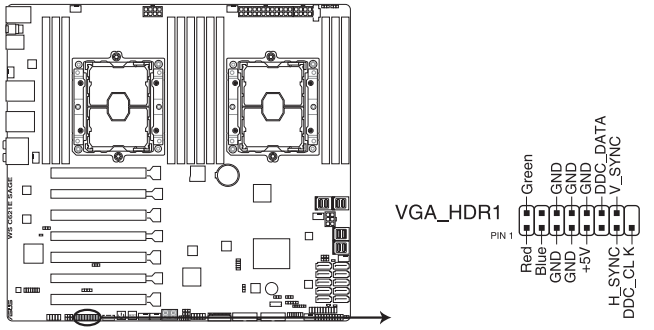


WS C621E SAGE TPM connector

The TPM module is purchased separately.

7. VGA connector (16-1 pin VGA_HDR1)

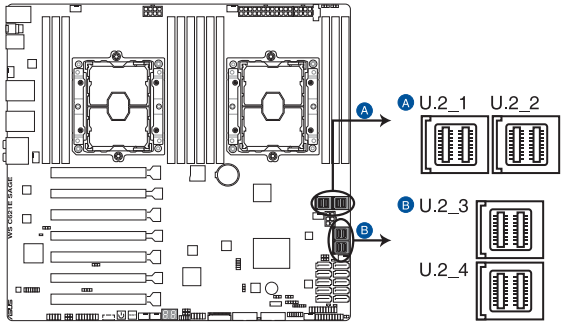
This connector supports the VGA High Dynamic-Range interface.



WS C621E SAGE Internal VGA connector

8. U.2 connectors (U.2_1; U.2_2; U.2_3; U.2_4)

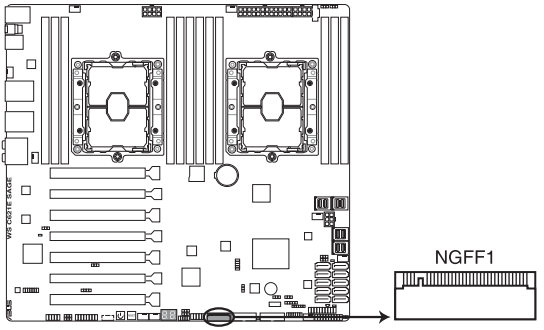
This motherboard comes with U.2 connectors which support PCIe 3.0 x4 NVM Express storage.



WS C621E SAGE U.2 connectors

9. M.2 (NGFF) connectors (NGFF1)

This socket allows you to install an M.2 (NGFF) SSD module.

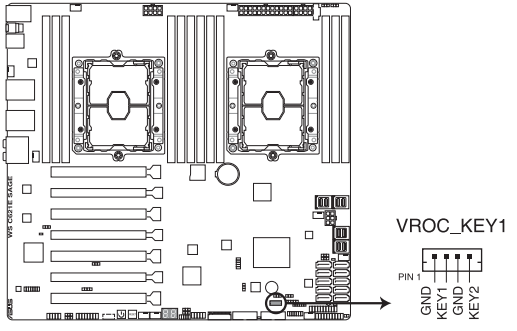


WS C621E SAGE NGFF1 connector

- This socket supports M Key and type 22110/2280/2260/2242 storage devices.
- This socket supports PCIe and SATA modes.
- The M.2 (NGFF) device is purchased separately.

10. VROC_KEY connector (4-pin VROC_KEY1)

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

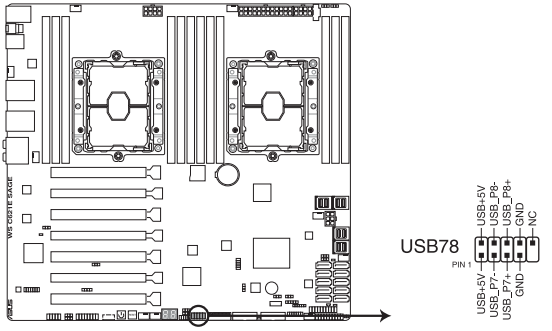


WS C621E SAGE VROC_KEY1

The KEY module is purchased separately.

11. USB 2.0 connector (10-1 pin USB78)

These connectors are for USB 2.0 ports. Connect the USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.

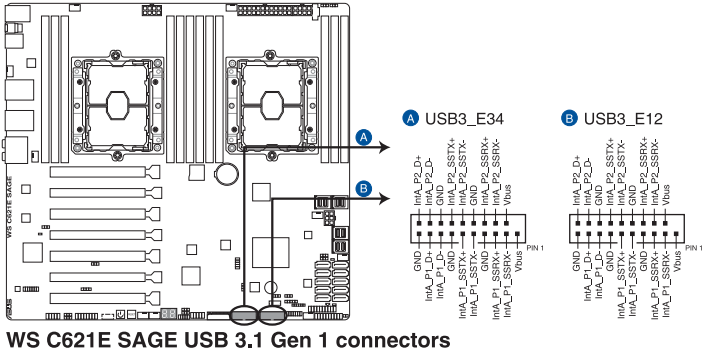


WS C621E SAGE USB 2.0 connector

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

12. USB 3.1 Gen 1 connectors (20-1 pin USB3_E12; 20-1 pin USB3_E34)

These connectors allow you to connect a USB 3.1 Gen 1 module for additional USB 3.1 Gen 1 front or rear panel ports. With an installed USB 3.1 Gen 1 module, you can enjoy all the benefits of USB 3.1 Gen 1 including faster data transfer speeds of up to 5 Gb/s, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.0.



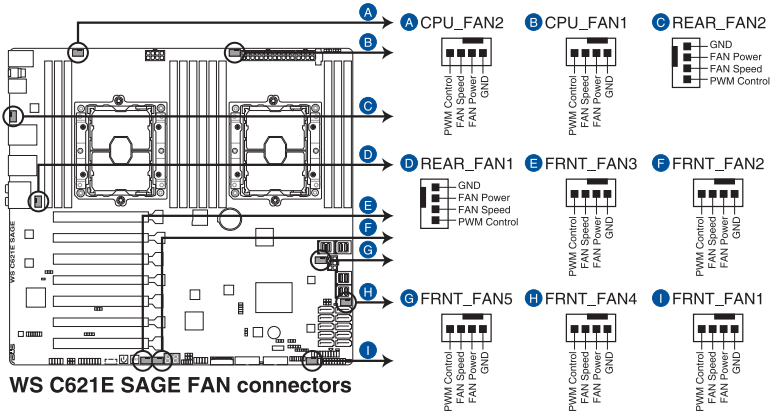
WS C621E SAGE USB 3.1 Gen 1 connectors

The USB 3.1 Gen 1 module is purchased separately.

The plugged USB 3.1 Gen 1 device may run on xHCI or EHCI mode depending on the operating system's setting.

13. Fan connectors (4-pin CPU_FAN1-2; 4-pin FRNT_FAN1-5; 4-pin REAR_FAN1-2)

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



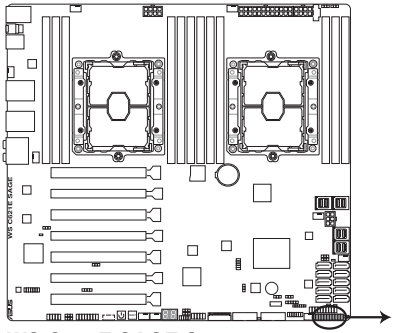
WS C621E SAGE FAN connectors

- 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!
- Ensure that the CPU fan cable is securely installed to the CPU fan connector.

The CPU_FAN connector supports the CPU fan of maximum 1A (12 W) fan power.

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

This connector supports several chassis-mounted functions.



WS C621E SAGE 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.

This connector may be disabled depending on the model.

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

5. ATX power button/soft-off button (2-pin PWRSW)

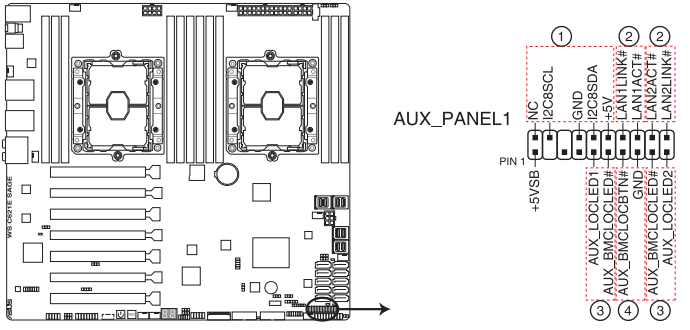
This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the operating system settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

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.

15. Auxiliary panel connector (20-2 pin AUX_PANEL1)

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



WS C621E SAGE Auxiliary panel connector

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

This connector connects the front panel SMBus cable.

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

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

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

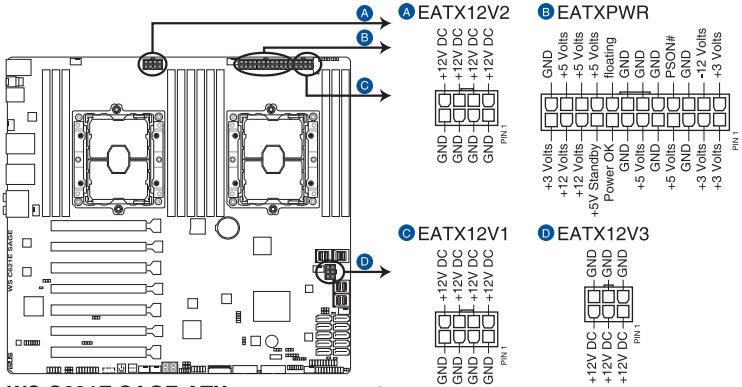
These connectors are for the locator LED1 and LED2 on the front panel. Connect the Locator LED cables to these 2-pin connector. The LEDs will light up when the Locator button is pressed.

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

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

16. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V1; 8-pin EATX12V2; 6-pin EATX12V3)

These connectors are for 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.



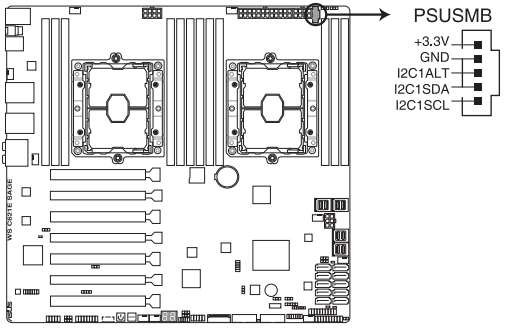
WS C621E SAGE ATX power connectors

Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.

- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 350 W.
- DO NOT forget to connect the 8-pin EATX12V1/EATX12V2 power plugs. Otherwise, the system will not boot.
- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you want to use two or more high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability, and recommend connecting the 6-pin EATX12V3 power plug.

17. Power Supply SMBus connector (5-pin PSUSMB)

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.



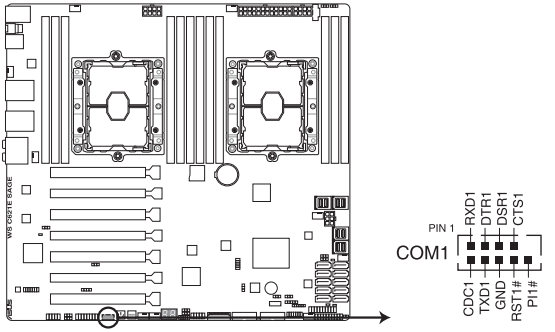
WS C621E SAGE Power supply SMBus connector

This connector functions only when you enable the ASUS ASMB card.

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

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

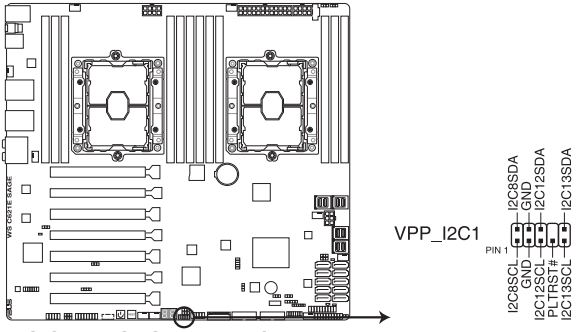
This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



WS C621E SAGE Serial port connector

19. VPP_I2C1 connector (10-1 pin VPP_I2C1)

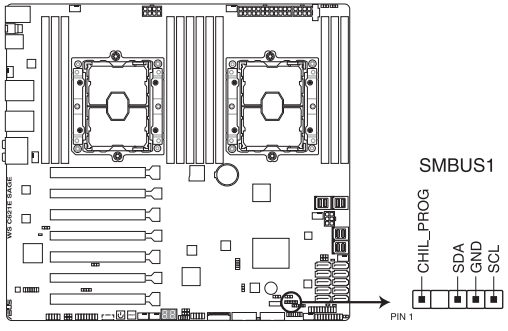
This connector is used for the Intel VMD function and sensor readings.



WS C621E SAGE VPP_I2C1 connector

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

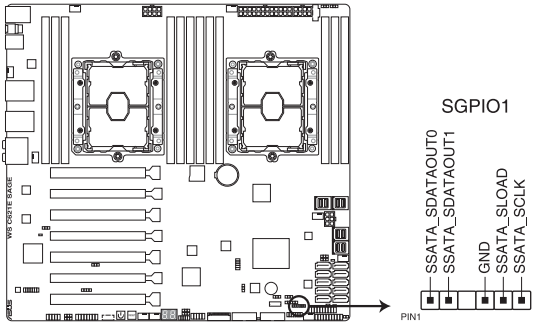
This connector controls the system and power management-related tasks. This connector processes the messages to and from devices rather than tripping the individual control lines.



WS C621E SAGE SMBUS connector

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

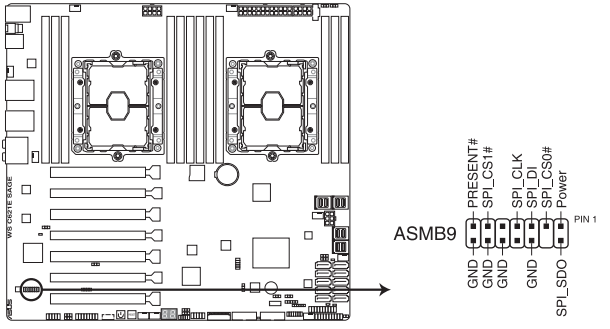
The SGPIO 1 connector is used for the Intel Rapid Storage Technology Enterprise SGPIO interface that controls the LED pattern generation, device information, and general purpose data.



WS C621E SAGE SGPIO1 connector

22. BMC connector (14-1 pin ASMB9)

The BMC connector on the motherboard supports an ASUS® Server Management Board card.

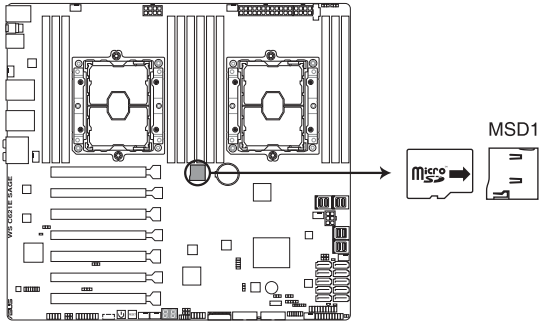


WS C621E SAGE BMC connector

- This connector is only enabled when ASMB9 Card is installed.
- The Baseboard Management Card is only available with the WS C621E SAGE (BMC) model.

23. Micro SD card slot (MSD1)

Your motherboard supports SD Memory Card v2.00 (SDHC) / v3.00 (SDXC) when an ASMB9 Card is installed.



WS C621E SAGE MSD1

- 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.
- The MicroSD Slot is only supported with BMC Function and not supported for normal use under the OS.

5

BIOS Setup

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 EzFlash Utility

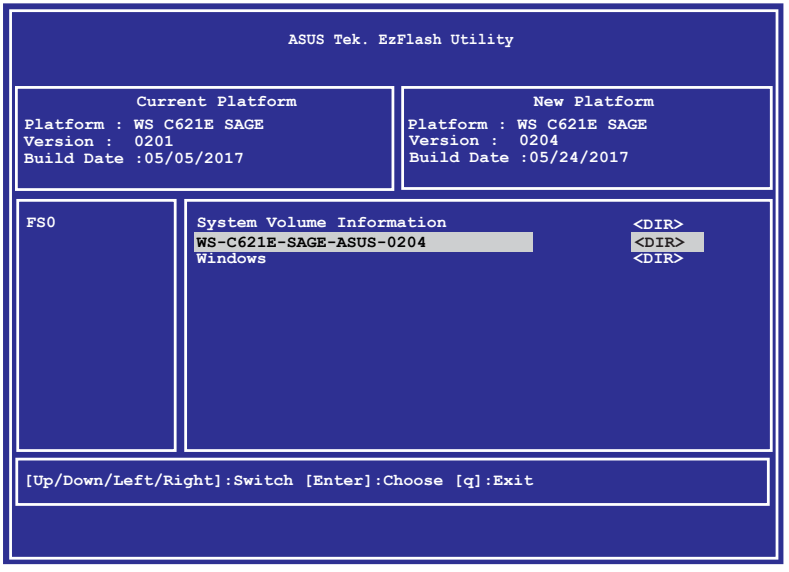
The ASUS EzFlash Utility feature allows you to update the BIOS using a USB flash disk without having to use a DOS-based utility.

Download the latest BIOS from the ASUS website at www.asus.com before using this utility.

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

To update the BIOS using EzFlash Utility:

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



3. Press <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 then press <Enter>.
7. Reboot the system when the update process is done.

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

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

5.1.3 BUPDATER utility

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

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

Updating the BIOS file

To update the BIOS file using the BUPDATER utility:

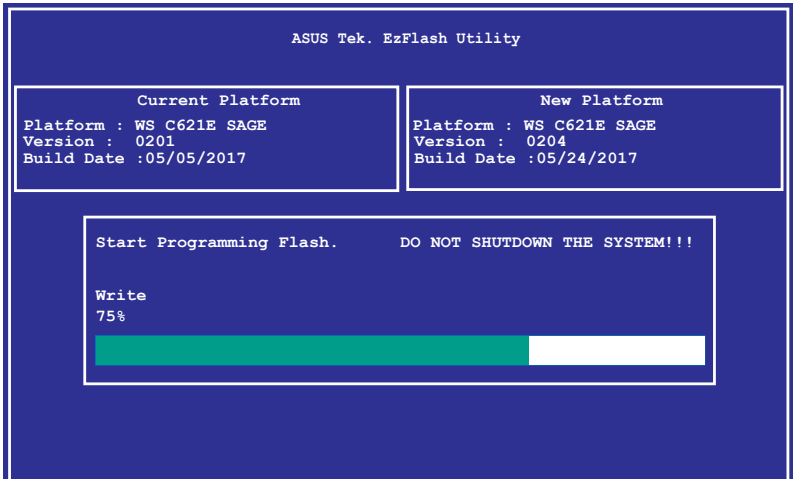
1. Visit the ASUS website at www.asus.com and download the latest BIOS file for the motherboard. Save the BIOS file to a bootable USB flash disk drive.
2. Download the BUPDATER utility (BUPDATER.exe) from the ASUS support website at support.asus.com to the bootable USB flash disk drive you created earlier.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

   BUPDATER /i[filename].CAP

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

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

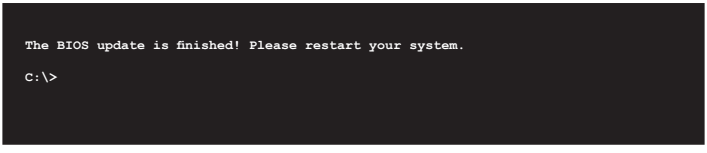
The utility verifies the file, then starts updating the BIOS file.



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

The utility returns to the DOS prompt after the BIOS update process is completed.

4. Reboot the system from the hard disk drive.



5.2 BIOS setup program

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

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

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

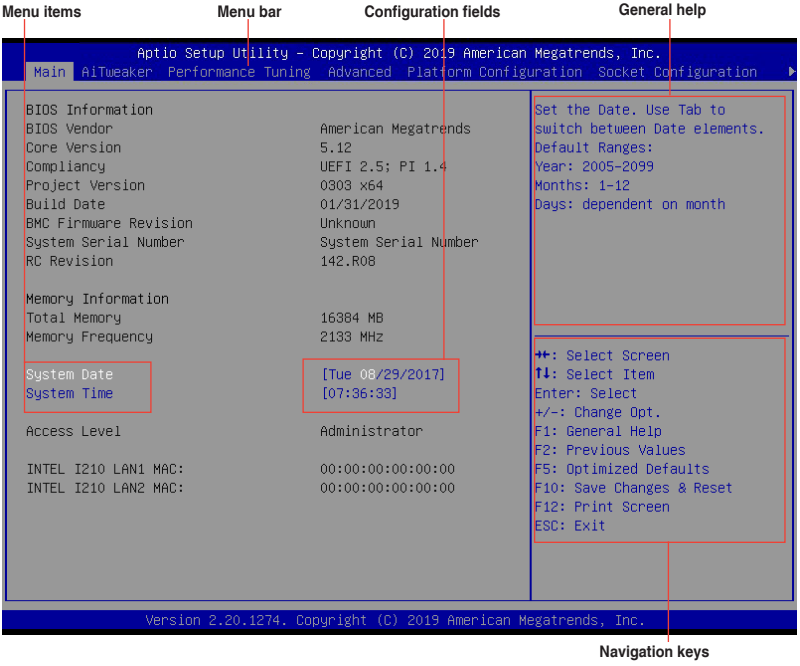
The firmware chip on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press <Del> during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

If you wish to enter Setup after POST, restart the system by pressing <Ctrl>+<Alt>+<Del>, or by pressing the reset button on the system chassis. You can also restart by turning the system off 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
Ai Tweaker	For changing the overclocking settings
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
Monitor	For displaying the system temperature, power status, and changing the fan 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 save & exit options

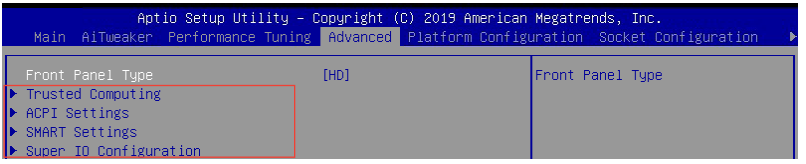
To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

5.2.3 Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting Main shows the Main menu items. The other items (Advanced, Platform Configuration, Socket Configuration, Event Logs, Server Mgmt, Monitor, Security, Boot, Tool, and Save & Exit) on the menu bar have their respective menu items.

5.2.4 Submenu items

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

5.4 Ai Tweaker menu

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

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

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

Ai Overclock Tuner

Allows you to select the CPU overclocking options to achieve the desired CPU internal frequency.
Configuration options: [Auto] [Manual] [OC Tune]

The following item appears only when you set the **Ai Overclocking Tuner** to **[Manual]**.

BCLK Frequency

This item allows you to set the BCLK (base clock) frequency to enhance the system performance. Use the <+> or <-> to adjust the value. The values range from 80.0 MHz to 300.0 MHz.

We recommend you to set the value based on the CPU specification, as high BCLK frequencies may damage the CPU permanently.

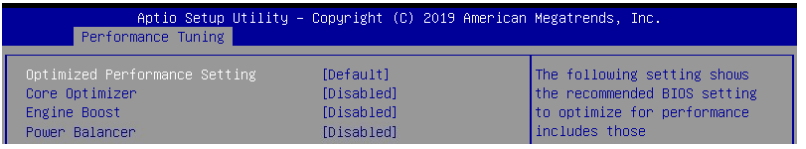
The following item appears only when you set the **Ai Overclocking Tuner** to **[OC Tune]**.

OC Tune Level

Allows you to select the OC Tune Level.
Configuration options: [Level 1] [Level 2] [Level 3]

5.5 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]

5.6 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.

5.6.1 Trusted Computing

The items in this menu allow you configure BIOS support for security device.

5.6.2 ACPI Settings

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

Enable ACPI Auto Configuration

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

Enable Hibernation

Allows you to enable or disable the ability of the system to hibernate (OS/S4 Sleep State).
Configuration options: [Disabled] [Enabled]

This option may be not be effective with some OS.

ACPI Sleep State

Allows you to select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.
Configuration options: [Suspend Disabled] [S3 (Suspend to RAM)]

5.6.3 SMART Self Test

The items in this menu allow you to configure the SMART Self Test settings.

5.6.4 Super IO Configuration

The items in this menu allow you to configure the system Super IO Chip parameters.

Serial Port 1 Configuration

Allows you to set the parameters of Serial Port 1.

Serial Port

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

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;]

5.6.5 Serial Port Console Redirection

The items in this menu allow you to configure the Serial Port Console Redirection settings.

5.6.6 Onboard LAN Configuration

The items in this menu allow you to configure tne onboard LAN parameters.

Onboard I210 LAN Configuration

Intel LAN1 Enable

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

The following item appears only when you set **Intel LAN1 Enable** to **[Enabled]**.

Intel LAN ROM Type

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

Intel LAN2 Enable

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

The following item appears only when you set **Intel LAN2 Enable** to **[Enabled]**.

Intel LAN ROM Type

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

5.6.7 APM

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

Restore AC Power Loss

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

Power On By RTC

[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.

5.6.8 PCI Subsystem Settings

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

Load RT32 Image

Allows you to enable or disable RT32 Image Loading.
Configuration options: [Disabled] [Enabled]

Above 4G Decoding

Allows you to enable or disable 64-bit capable devices to be decoded in above 4G address space. It only works if the system supports 64-bit PCI decoding.
Configuration options: [Disabled] [Enabled]

SR-IOV Support

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

PCIE OPROM Slot Options

PCIE1-7 Slot OPROM

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

5.6.9 Network Stack Configuration

The items in this menu allow you to configure Ipv4 / Ipv6 PXE support.

5.6.10 CSM Configuration

This item allows you to configure the CSM (Compatibility Support Module) items to fully support the various VGA, bootable devices and add-on devices for better compatibility.

CSM Support

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

The following items appear only when you set the **CSM Support** to **[Enabled]**.

GateA20 Active

This allows you to set the GA20 option.

[Upon Request]	GA20 can be disabled using BIOS services.
[Always]	Do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

Option ROM Messages

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

INT19 Trap Response

This option allows you to control the BIOS reaction on INT19 trapping by Option ROM.

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

Boot Option filter

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

Network / Storage / Video

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

Other PCI devices

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

5.6.11 NVMe Configuration

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

5.6.12 USB Configuration

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

5.6.13 iSCSI Configuration

Allows you to configure the iSCSi parameters.

5.6.14 Intel(R) Virtual RAID on CPU

Allows you to configure the view the RAID volumes and VMD controllers on the system.

5.7 Platform Configuration menu

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

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

5.7.1 PCH Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show **Not Present** if no SATA device is installed to the corresponding SATA port.

PCH SATA Configuration

SATA Controller

Allows you to enable or disable the SATA Controller.

Configuration options: [Disabled] [Enabled]

The following item appears only when you set **SATA Controller** to **[Enabled]**.

Configure SATA as

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

Allows you to enable or disable the Support Aggressive Link Power (SALP) Management.

Configuration options: [Disabled] [Enabled]

SATA Port 0-7

Port 0-7

Allows you to enable or disable the SATA port.

Configuration options: [Disabled] [Enabled]

5.7.2 Miscellaneous Configuration

Active Video

Allows you to select the video type.

Configuration options: [Onboard Device] [Offboard Device]

5.7.3 Server ME Configuration

Displays the Server ME Technology parameters on your system.

5.7.4 Runtime Error Logging

Displays the system errors and also allows you to configure the WHEA settings on your system.

5.8 Socket Configuration menu

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

5.8.1 Processor Configuration

The items in this menu show the processor-related information that the BIOS automatically detects.

Hyper-threading [ALL]

This item allows a hyper-threading processor to appear as two logical processors, allowing the operating system to schedule two threads or processors simultaneously.
Configuration options: [Disabled] [Enabled]

5.8.2 Common RefCode Configuration

This menu displays and provides options to change the Common RefCode Settings.

5.8.3 UPI Configuration

This menu displays and provides options to change the UPI Settings.

5.8.4 Memory Configuration

This menu displays and provides options to change the Memory Settings.

Memory Topology

Displays memory topology with DIMM population information.

5.8.5 IIO Configuration

This menu displays and provides options to change the IIO Settings.

5.8.6 Advanced Power Management Configuration

This menu displays and provides options to change the Power Management Settings.

CPU P State Control

Boot performance mode

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

Energy Efficient Turbo

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

Turbo Mode

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

Hardware PM State Control

Hardware P-States

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

CPU C6 Report

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

OS ACPI Cx

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

Package C State Control

Package C State

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

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

CPU - Advanced PM Tuning

Energy Perf BIAS

Power Performance Tuning

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

5.9 Event Logs menu

The Event Logs menu allows to veiw and configure Smbios Event log settings.

5.9.1 Change Smbios Event Log Settings

Press <Enter> to change the Smbios Event Log configuration.

5.9.2 View Smbios Event Log

Press <Enter> to view all smbios event logs.

5.10 Server Mgmt menu

The Server Mgmt menu items allow you to set BMC and SEL configurations.

The items in this menu is only enabled for the WS C621E SAGE (BMC) model. WS C621E SAGE does not support the items in this menu.

5.10.1 System Event Log

Allows you to change the SEL event log configuration.

5.10.2 BMC network configuration

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

5.10.3 View System Event Log

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

5.11 Monitor menu

The Monitor menu displays the system temperature/power status, and allows you to change the fan settings.

5.12 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.

5.13 Boot menu

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

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.

Network Device BBS Priorities

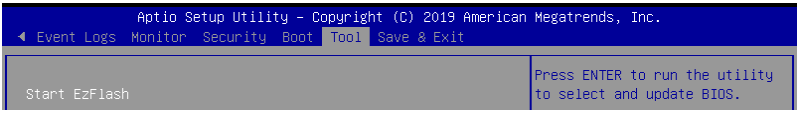
This item allows you to set the booting from network.

Hard Drive BBS Priorities

These items appear only when you connect SATA ODD or hard drive to the SATA ports and allow you to set the booting order of the SATA devices.

5.14 Tool menu

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

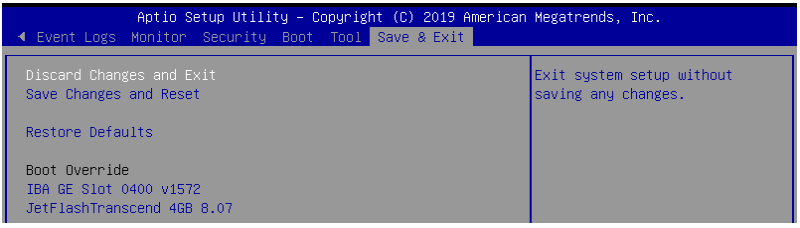


Start EzFlash

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

5.15 Save & Exit menu

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



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

Discard Changes and Exit

Exit System setup without saving any changes.

Save Changes and Reset

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.

6 RAID Configuration

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

6.1 RAID configurations

The motherboard supports Intel® Rapid Storage Technology enterprise Option ROM Utility with RAID 0, RAID 1, RAID 10, and RAID 5 support.

If you want to install a Windows® operating system to a hard disk drive included in a RAID set, you have to create a RAID driver disk and load the RAID driver during OS installation. Refer to section **4.2 Creating a RAID driver disk** for details.

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 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.

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.

6.1.2 Installing Serial ATA hard disks

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

To install the SATA hard disks for a RAID configuration:

1. Install the SATA hard disks into the drive bays.
2. Connect the SATA signal cables to the ASMedia® SATA ports for for ASMedia RAID or Intel® SATA ports for Intel® Rapid Storage Technology.

Refer to Chapter 4 for details on the location of the ASMedia® and Intel® SATA ports.

3. Connect a SATA power cable to the power connector on each drive.

6.1.3 Setting the RAID item in BIOS

Follow this section only when you wish to use the Intel® Rapid Storage Technology enterprise SATA/SSATA Option ROM Utility.

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

To do this:

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

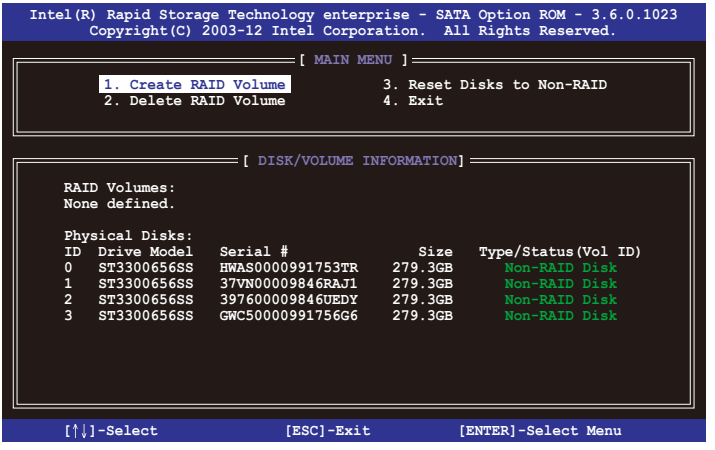
6.2 Intel® Rapid Storage Technology enterprise SATA/SSATA Option ROM Utility

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, and have set the correct SATA mode in the BIOS setup. You can refer to the **Installing hard disk drives**, and **Setting the RAID mode** sections in this manual 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.



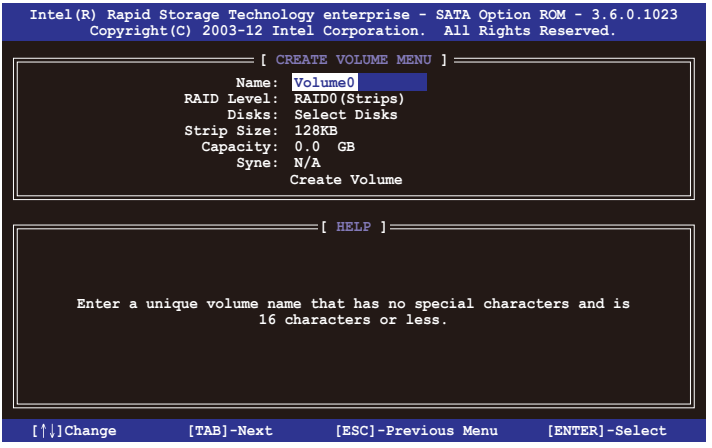
The navigation keys at the bottom of the screen allow you to move through the menus and select the menu options.

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

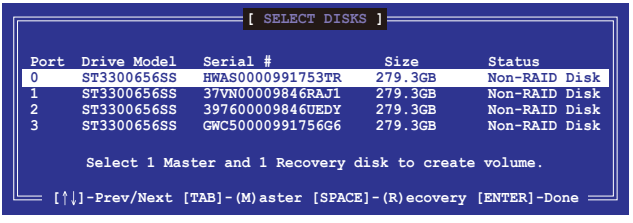
6.2.1 Creating a RAID set

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.

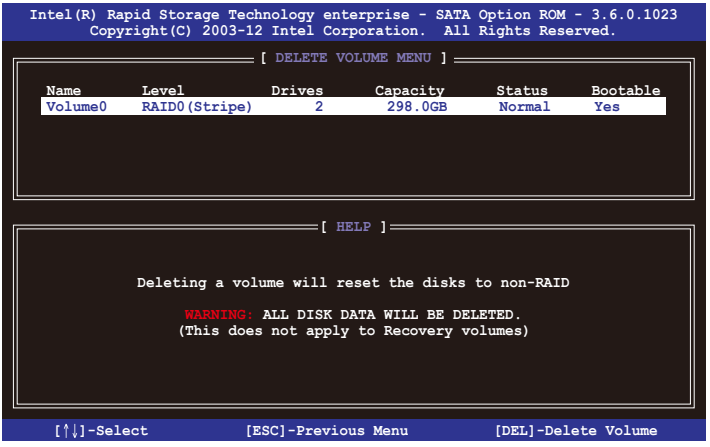
9. From the following warning message, press <Y> to create the RAID volume and return to the main menu, or press <N> to go back to the **CREATE VOLUME** menu.

6.2.2 Deleting a RAID set

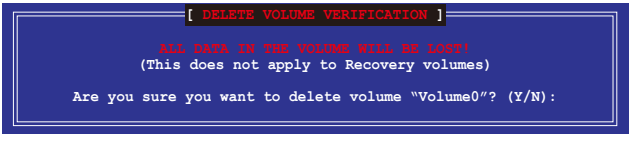
Take caution when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

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 <Del>.



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.

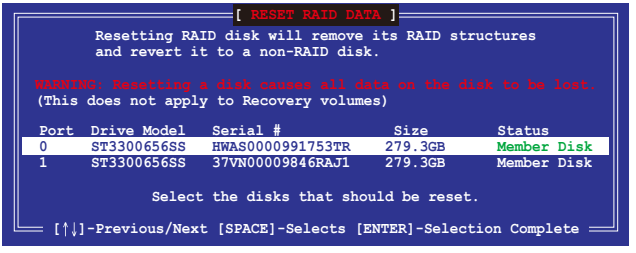


6.2.3 Resetting disks to Non-RAID

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.



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

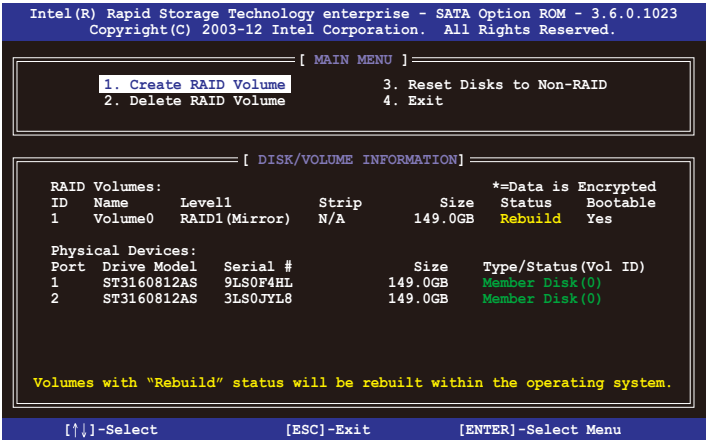
If any of the SATA hard disk drives included in the RAID 1 array failed, the system displays the status of the RAID volume as "**Degraded**" during POST. You can rebuild the RAID array with other installed non-RAID disks.

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.

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



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

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

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

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

Rebuilding the RAID with a new hard disk

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

To rebuild the RAID with a new hard disk:

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

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

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

6.2.6 Setting the Boot array in the BIOS Setup Utility

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

To set the boot array in the BIOS:

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

1. Reboot the system and press <Del> to enter the BIOS setup utility during POST.
2. Go to the **Boot** menu and select the boot option priority.
3. Use up/down arrow keys to select the boot priority and press <Enter>. See the **Boot menu** section of Chapter 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.

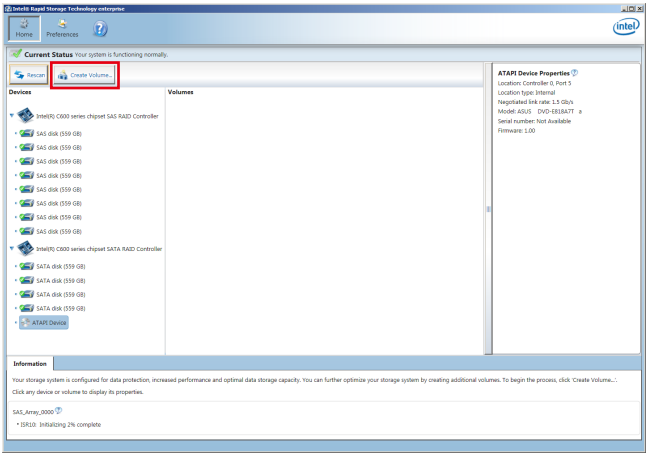
You need to manually install the Intel® Rapid Storage Technology enterprise utility on a Windows® operating system.

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

1. Turn on the system and go to the windows desktop.

2. Click the **Intel® Rapid Storage Technology enterprise** icon to display the main menu.

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

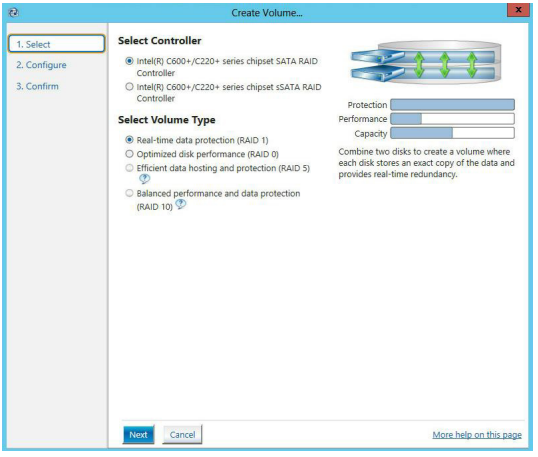


You can click **Rescan** to re-scan any attached hard disks.

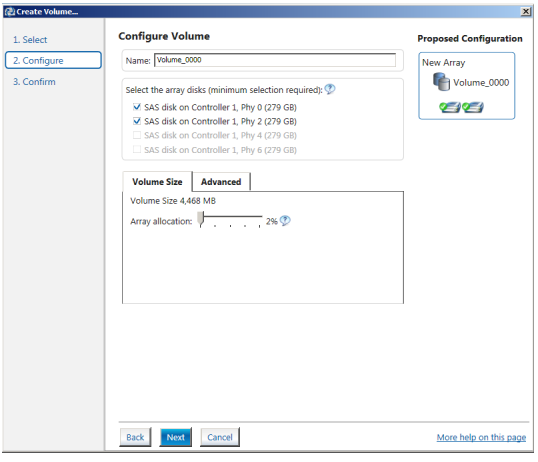
6.3.1 Creating a RAID set

To create a RAID set:

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



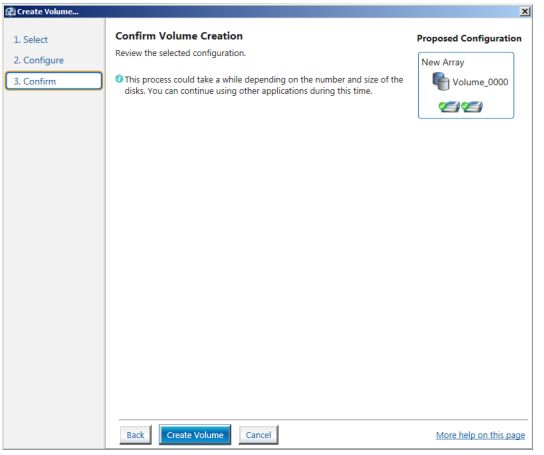
3. Enter a name for the RAID set, then select the array disks.
4. Select **Volume Size** tab, you can drag the bar to decide the volume size.
5. Click **Next**.



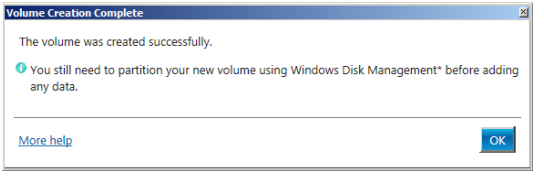
- If you do not want to keep the data on one of the selected disks, select NO when prompted.
- If you want to **Enable volume write-back cache** or **Initialize volume**, click **Advanced**.

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

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

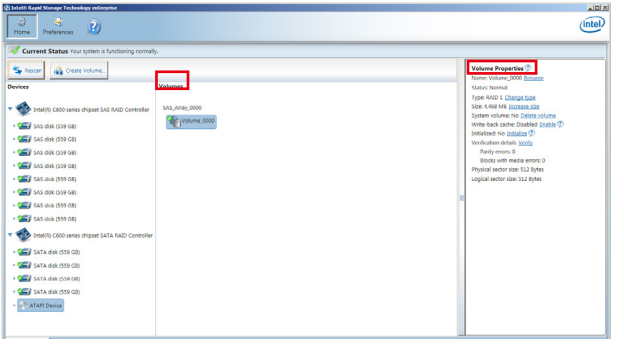


7. Wait until the process is completed, then click **OK** when prompted.



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

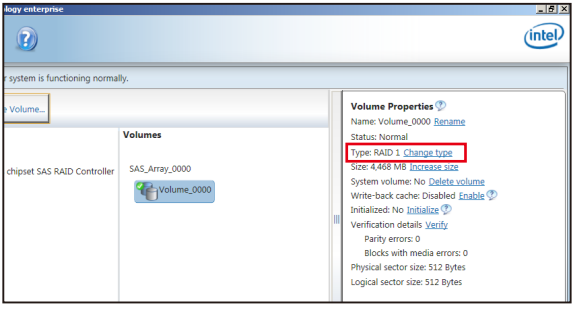
The RAID set is displayed in the **Volumes** list and you can change the settings in **Volume Properties**.



6.3.2 Changing a Volume Type

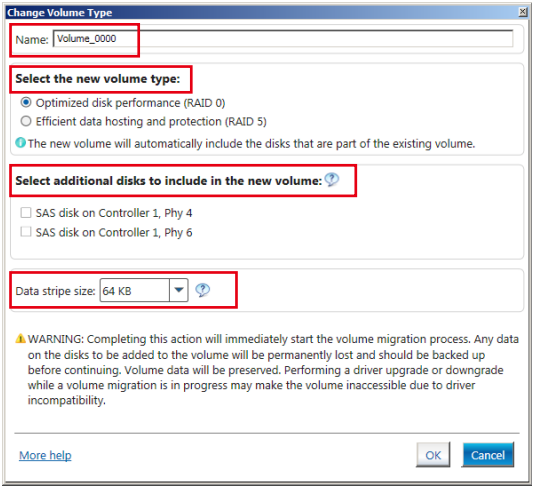
To change the volume type in **Volume Properties**:

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



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

RAID 0:	128KB
RAID 10:	64KB
RAID 5:	64KB



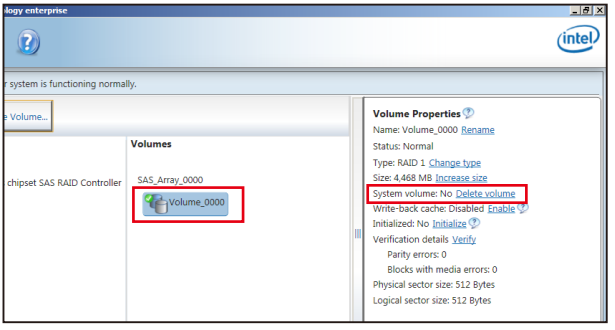
We recommend a lower stripe size for server systems, and a higher stripe size for multimedia computer systems used mainly for audio and video editing.

6.3.3 Deleting a volume

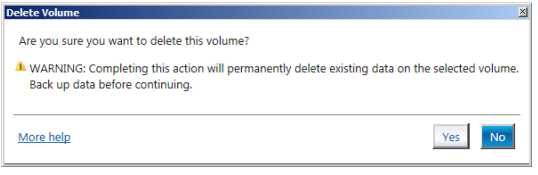
Be cautious when deleting a volume. You will lose all data on the hard disk drives. Before you proceed, ensure that you back up all your important data from your hard drives.

To delete a volume:

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



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

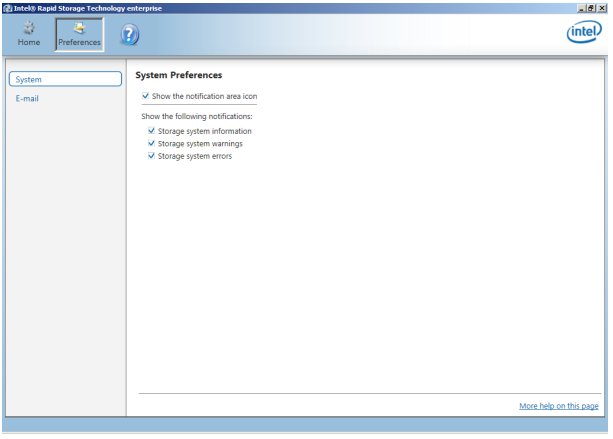


3. Click **Yes** to delete the volume and return to the utility main menu, or click **No** to return to the main menu.

6.3.4 Preferences

System Preferences

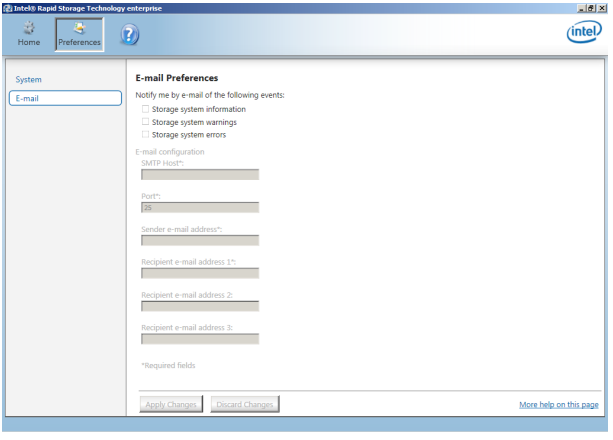
Allow you to set to show the notification area icon and show system information, warning, or errors here.



E-Mail Preferences

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

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



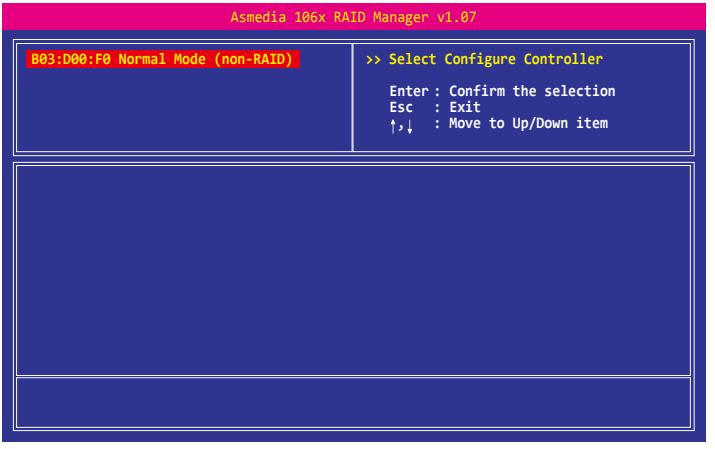
6.4 ASMedia 106x RAID Manager

The ASMedia® 106x RAID Manager allows you to create RAID 0, and RAID 1 set(s) 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. You can refer to the **Installing hard disk drives** section in this manual for more information.

To launch the ASMedia® 106x RAID Manager:

1. Turn on the system.
2. During POST, press <Ctrl>+<r> to display the RAID Manager main menu.



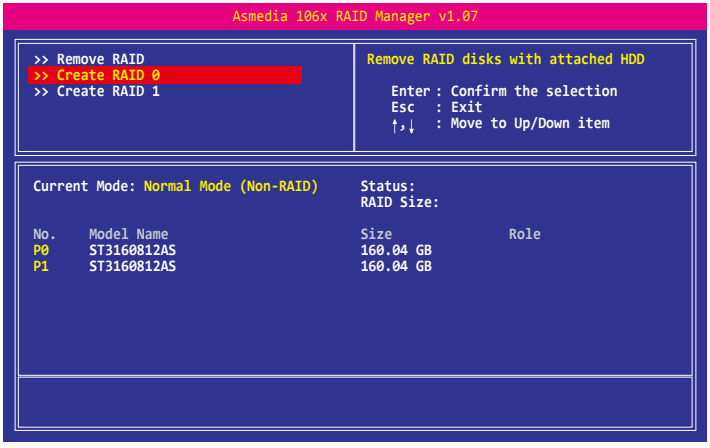
The navigation keys at the right of the screen allow you to move through the menus and select the menu options.

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

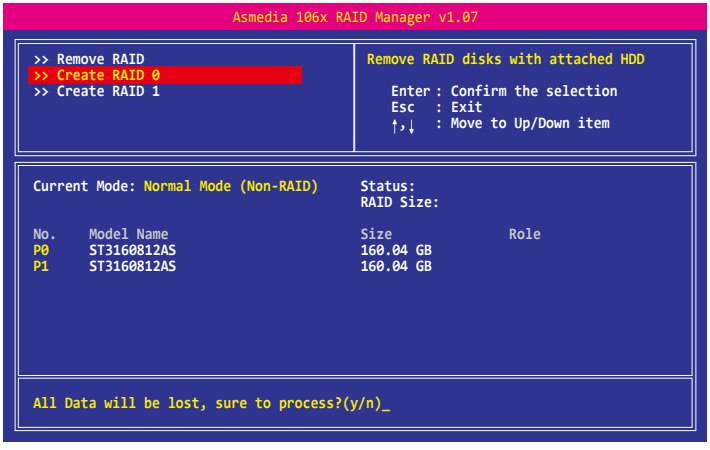
6.4.1 Creating a RAID set

To create a RAID set:

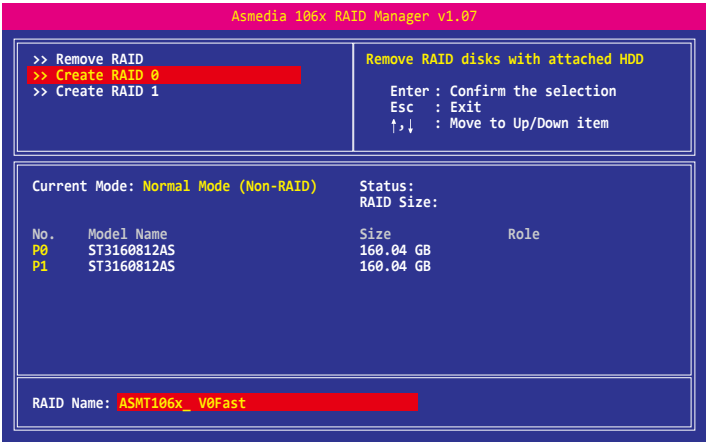
1. From the RAID manager main menu, select the controller you wish to configure and press <Enter>.
2. Press the up/down arrow keys to select a RAID Level that you wish to create then press <Enter>.



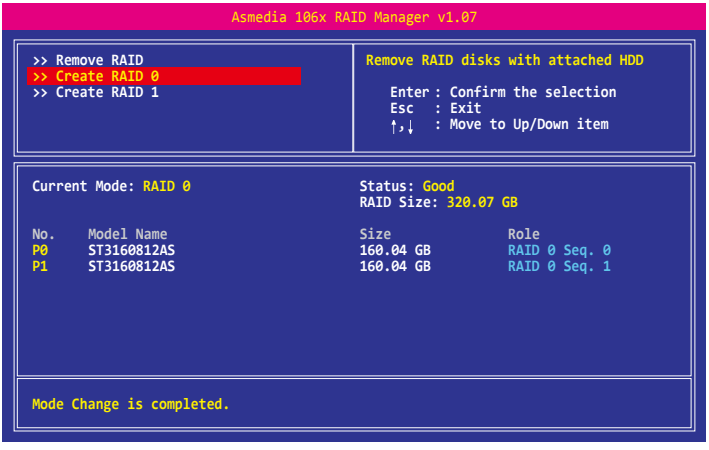
3. Press <Y> to continue the RAID process, or press <N> to select another RAID level.



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



5. Once the RAID set has been created, the Current Mode, Status, RAID Size, and HDD roles should display the RAID information.

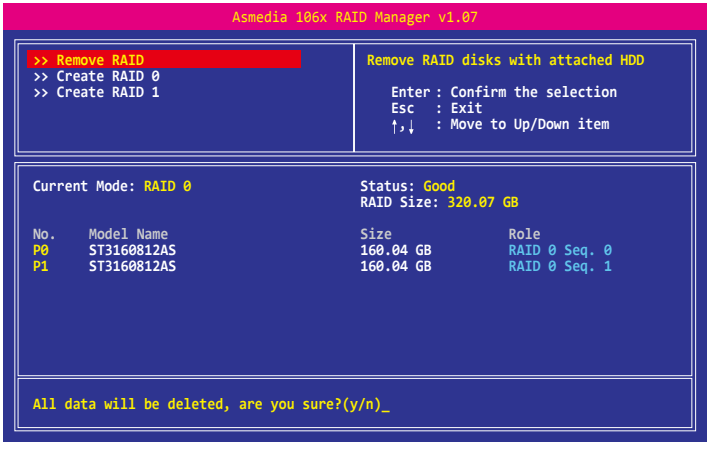


6.4.2 Deleting a RAID set

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 RAID Manager main menu, select the controller you wish to configure and press <Enter>.
2. From the Configure Controller menu, select **Remove RAID** and press <Enter>.
3. Press <Y> to confirm deletion of the selected RAID set, or press <N> to return to the Configure Controller menu.

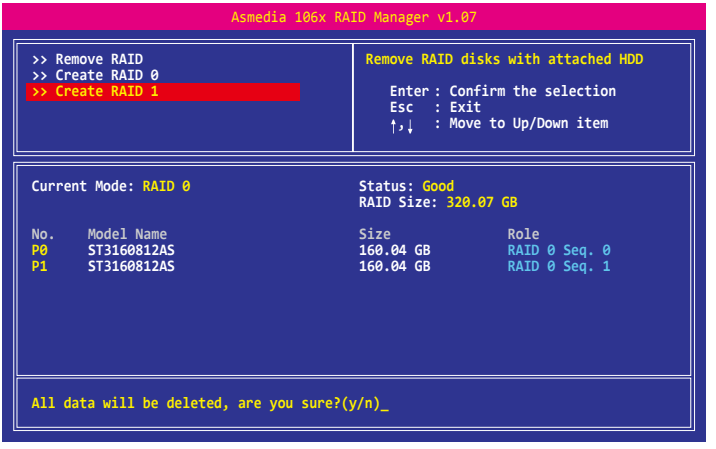


6.4.3 Changing the RAID level

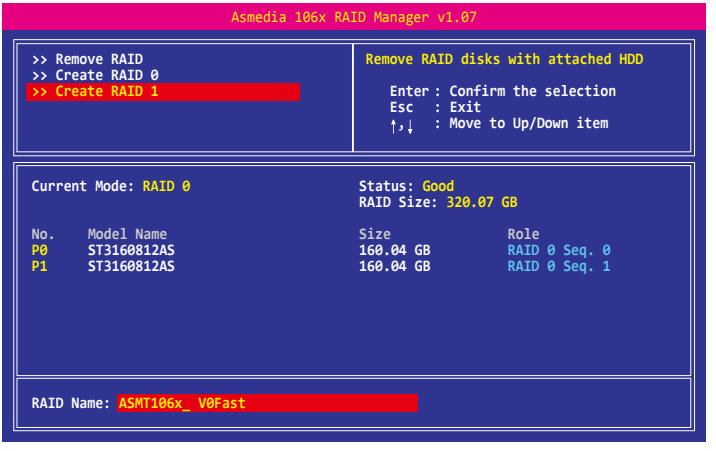
Take caution when changing the RAID level. You will lose all data on the hard disk drives when you change to a different RAID level.

To change the RAID level:

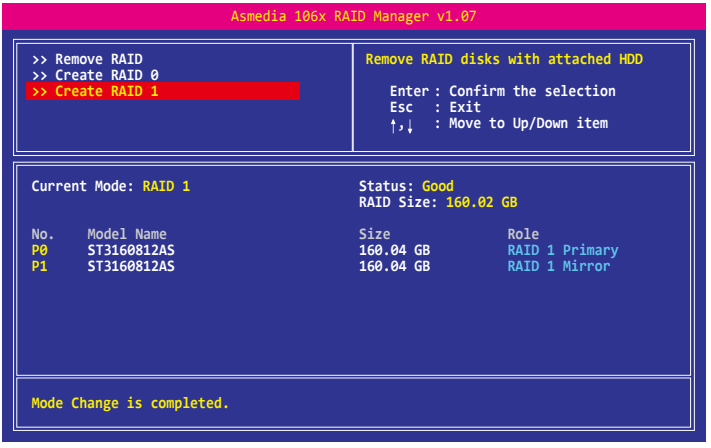
1. From the RAID Manager main menu, select the controller you wish to configure and press <Enter>.
2. From the Configure Controller menu, select a new RAID level you wish to change to and press <Enter>.
3. Press <Y> to continue the RAID process, or press <N> to select another RAID level.



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



5. Once the RAID set has been created, the Current Mode, Status, RAID Size, and HDD roles should display the RAID information.



6.4.4 Exiting the ASMedia 106x RAID Manager

To exit the RAID Manager:

1. From the RAID Manager menu, press <Esc>.
2. Press <Y> to exit or press <N> to return to the RAID Manager main menu.

6.5 ASMedia 106x RAID Manager (Windows)

The ASMedia 106x RAID Manager allows you to create RAID 0, and RAID 1 set(s) from Serial ATA hard disk drives that are connected to the Serial ATA connectors supported by the Southbridge.

You do not need to manually install the ASMedia 106x RAID Manager on a Windows® operating system.

To enter the ASMedia® 106x RAID Manager under Windows operating system:

1. 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.

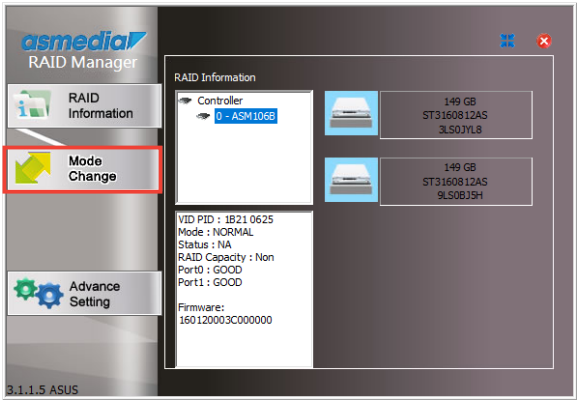
If Autorun is NOT enabled in your computer, browse the contents of the support DVD to locate the file **Setup.exe**. Double-click the **Setup.exe** to run the support DVD.

2. Click on the **Utilities** tab, then click on **Asmedia 106x RAID Manager** to launch the RAID Manager.

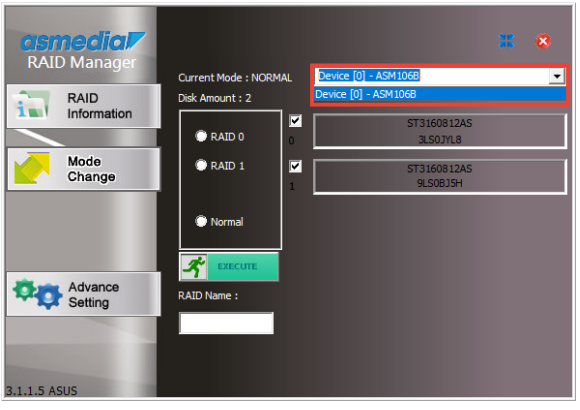
6.5.1 Creating a RAID set

To create a RAID set:

1. From the RAID Manager main menu, select **Mode Change** from the left menu.



2. Select the device set you wish to RAID from the drop-down menu to the top right.



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

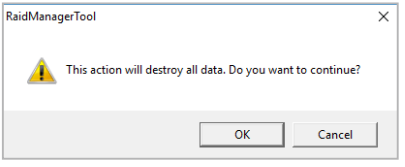
At least two (2) array disks must be checked to be able to RAID.

4. Select your RAID level from the check box to the right.

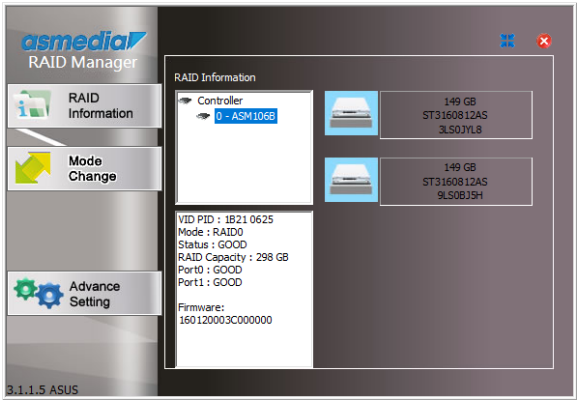
Selecting **Normal** will delete the RAID set.

5. Click on **EXECUTE** to start the RAID process.

6. The following message will appear, press **OK** to continue the RAID process, or press **Cancel** to select another RAID level.



6. Once the RAID set has been created, the RAID information should be displayed on the **RAID Information** menu.

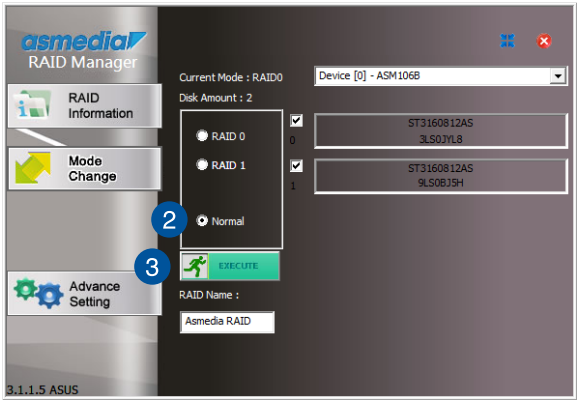


6.5.2 Deleting a RAID set

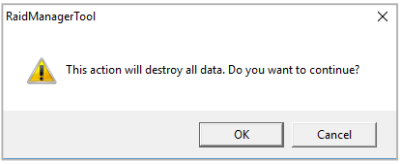
Take caution when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. Select **Mode Change** from the left menu.
2. Select **Normal** from the check box to the right.
3. Click on **EXECUTE** to start the RAID process.



6. The following message will appear, press **OK** to delete the RAID set, or press **Cancel** to return to the RAID Manager menul.



6.5.3 Changing the RAID level

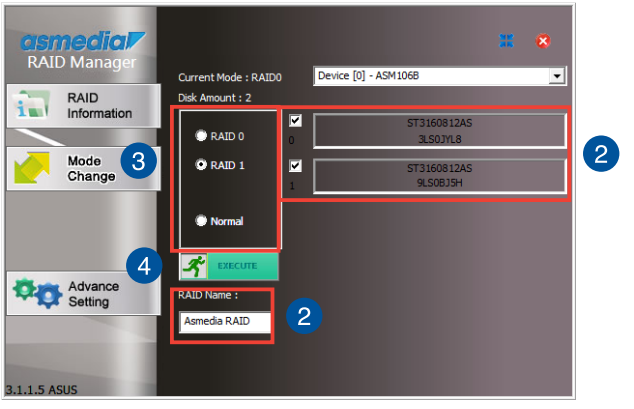
Take caution when changing the RAID level. You will lose all data on the hard disk drives when you change to a different RAID level.

To change the RAID level:

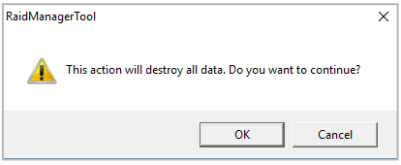
1. Select **Mode Change** from the left menu.
2. (optional) Enter a name for the RAID set, then select the disks or additional disks to include in the new RAID set.
3. Select your new RAID level from the check box to the right.

Selecting **Normal** will delete the RAID set.

4. Click on **EXECUTE** to start the RAID process.



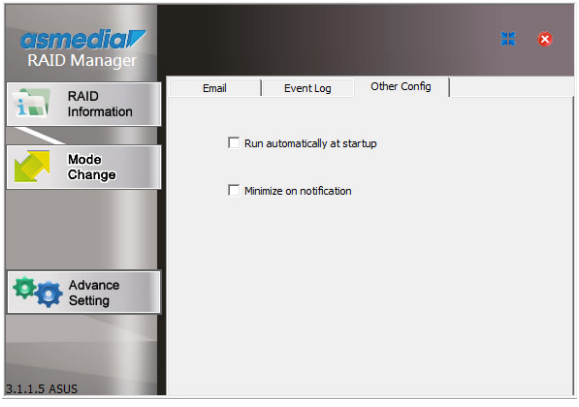
5. The following message will appear, press **OK** to continue the RAID process, or press **Cancel** to select another RAID level.



6.5.4 Preferences

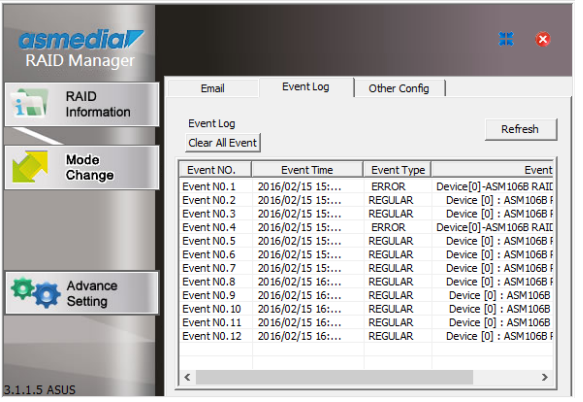
System Preferences

Allows you to set automatic run on system startup or minimize on notification.



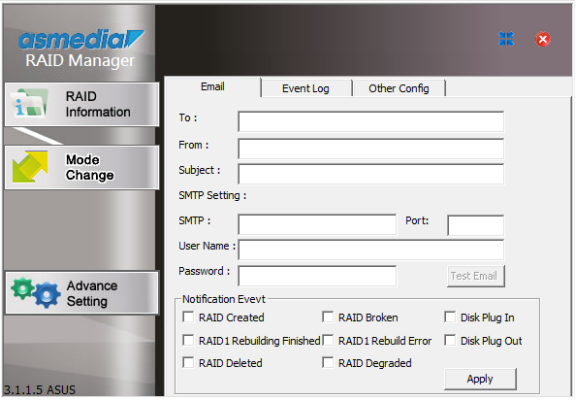
Event Log

Allows you to view the event log of the RAID set, you may also choose to clear all events.



E-Mail Preferences

Allow you to configure the email details, as well as the notification events to send an email when they happen.



6.6 Intel® Virtual Raid on CPU in BIOS

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

- The KEY module is purchased separately.
- Due to chipset behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® SSD modules.
- Refer to section **1.1.9 Internal connectors** for the location of the VROC_HW_KEY connector.

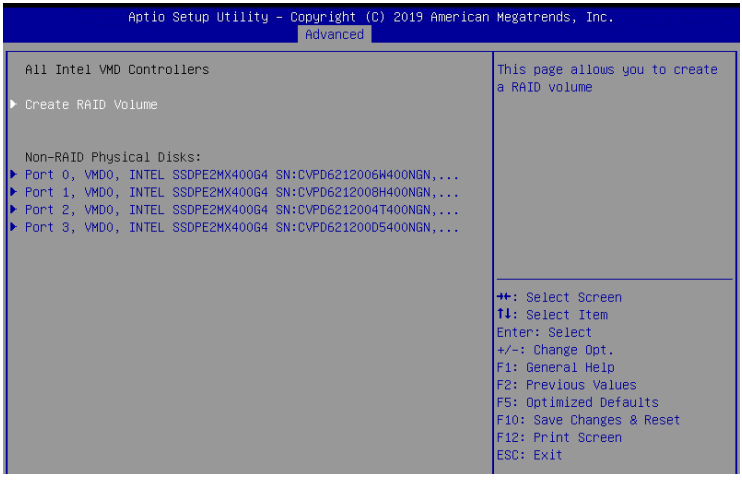
- Due to hardware design, [U.2_1 to U.2_4], or [PCIEX16_1], or [PCIEX16_2], or [PCIEX16_3], or [PCIEX16_5], or [PCIEX16_6], or [PCIEX16_7], or [PCIEX16_2 and PCIEX16_6] can support CPU RAID configuration as OS drives, but OS RAID may not be built across the different [items] mentioned above.
- [PCIEX16_1], or [PCIEX16_2], or [PCIEX16_3], or [PCIEX16_5], or [PCIEX16_6], or [PCIEX16_7], or [PCIEX16_2 and PCIEX16_6] can support OS RAID on Hyper M.2 cards installed on the [items] mentioned above.
- [PCIEX16_2 and PCIEX16_6] can support OS RAID on installed Intel® P3500 or P3600 SSD.

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

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

Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.

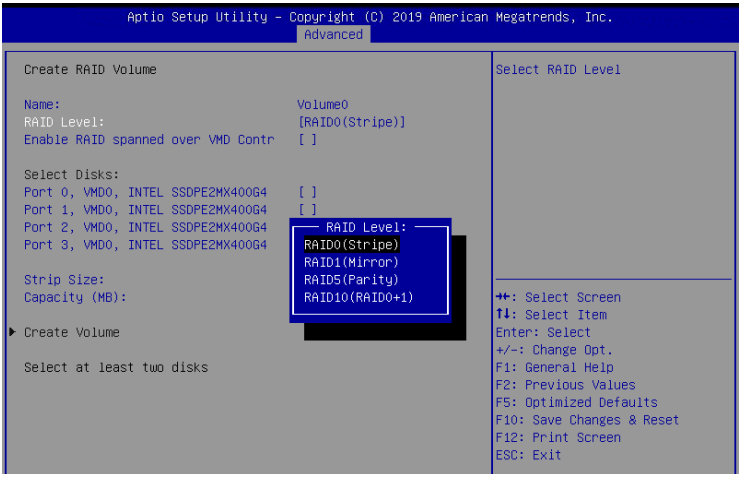
Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.



6.6.1 Creating a RAID set

To create a RAID set:

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

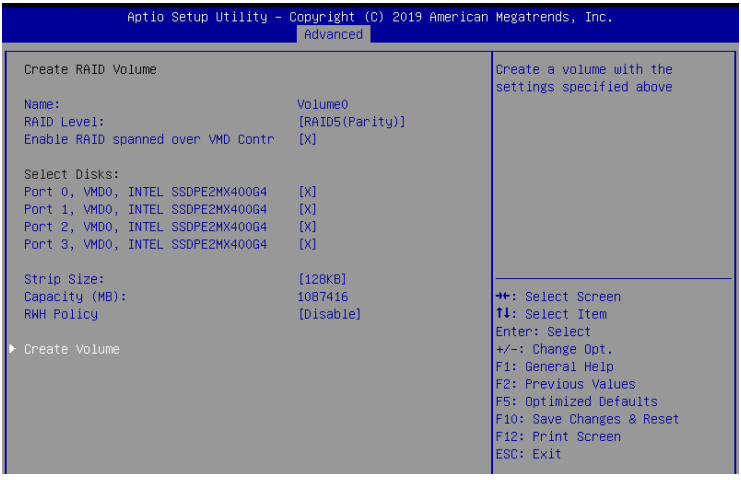


2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. When the **Enable RAID spanned over VMD Controllers** item is selected, press <Enter> and select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

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

7. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

8. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.

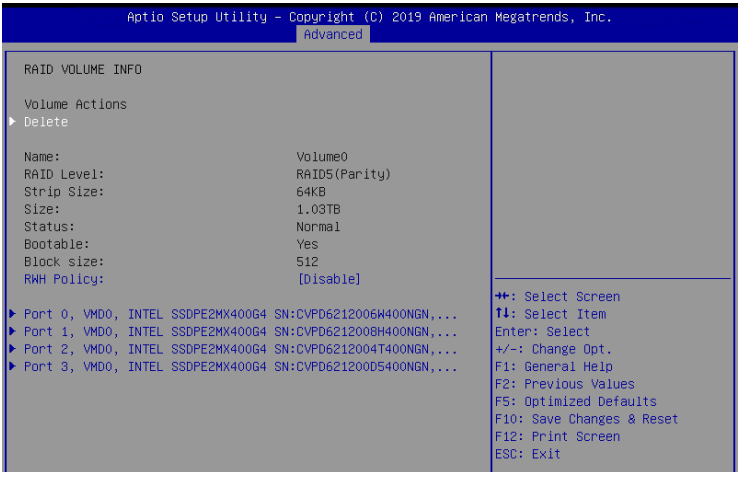


6.6.2 Deleting a RAID set

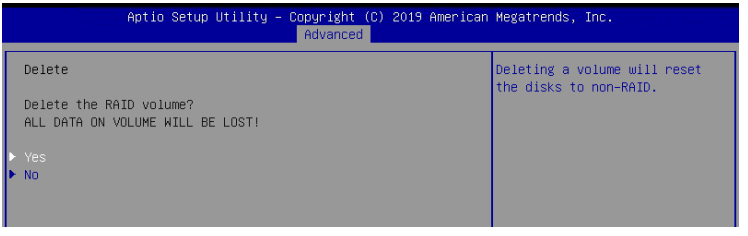
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

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



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



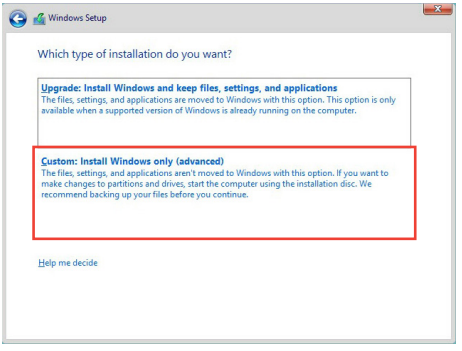
6.6.3 Installing the RAID controller driver during Windows® 10 OS installation

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

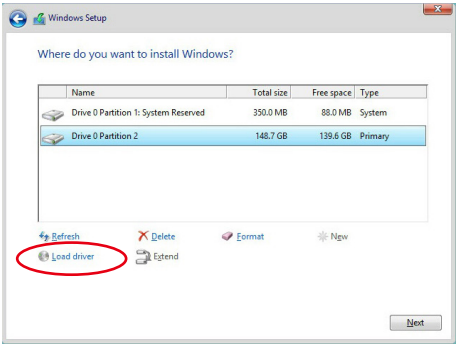
To install the RAID controller driver when installing Windows® 10 OS:

1. Boot the computer using the Windows® 10 OS installation disc. Follow the screen instructions to start installing Windows® 10.

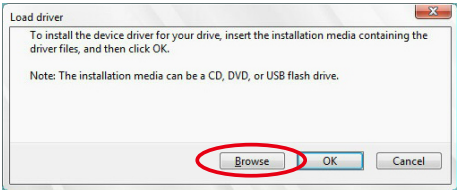
2. When prompted to choose a type of installation, click **Custom: Install Windows only (advanced)**.



3. Click **Load Driver**.



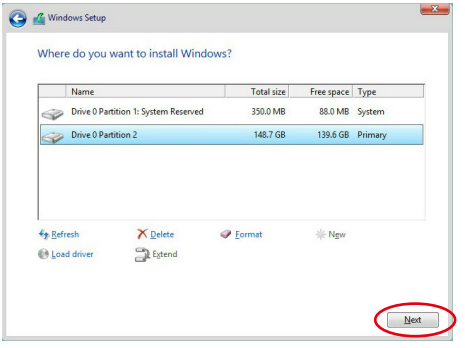
4. A message appears, reminding you to insert the installation media containing the driver of the RAID controller driver. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive. Click **Browse** to continue.



5. Locate the driver in the corresponding folder of the support DVD 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. Select the drive to install Windows and click **Next**.



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

7 Driver Installation

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

7.1 RAID driver installation

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

7.1.1 Creating a USB flash drive with RAID drive

When installing Window®® 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:

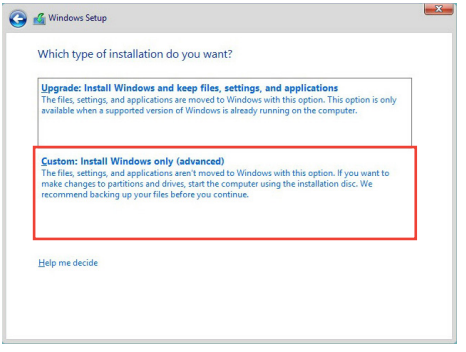
1. Place the motherboard support DVD in the optical drive.
2. Connect a USB flash drive to your system.
3. Click on the optical drive to browse the contents of the support DVD.
4. Click **Drivers** > **C620 INTEL RAID** > **Windows** > **Driver** and then copy the RAID driver folder to the USB flash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

7.1.2 Installing the RAID controller driver

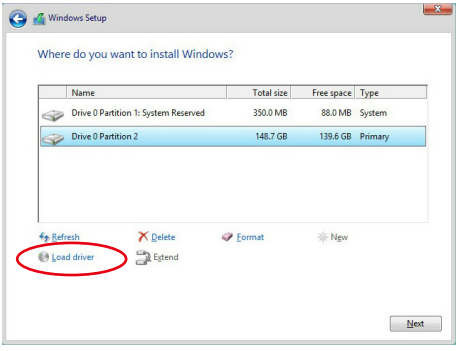
During Windows® Server 2012 R2 OS installation

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)**.

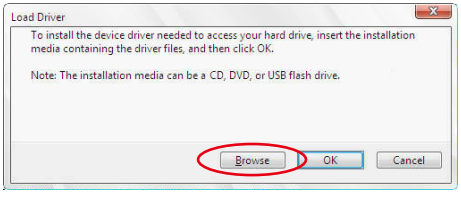


3. Click **Load Driver**.



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.

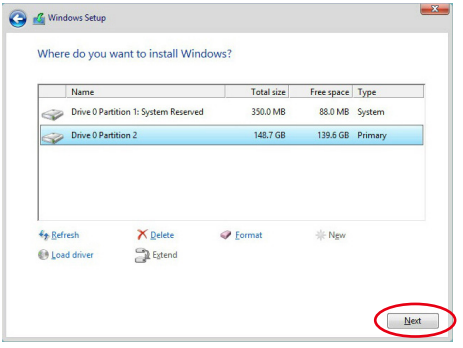
   Click **Browse** to continue.



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.

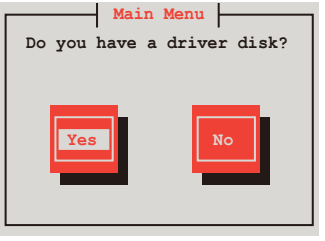
Red Hat® Enterprise Linux OS 6.x

To install the LSI MegaRAID controller driver when installing Red Hat® Enterprise OS:

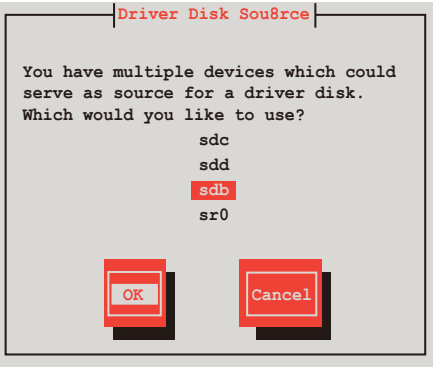
1. Boot the system from the Red Hat® OS installation CD.
2. Press <Tab> to edit options.

3. While booting from DVD, press <ESC> to give the third party driver. Enter the following command at the boot: **`Linux dd blacklist=isci blacklist=ahci nodmraid`**, then press <ENTER>.

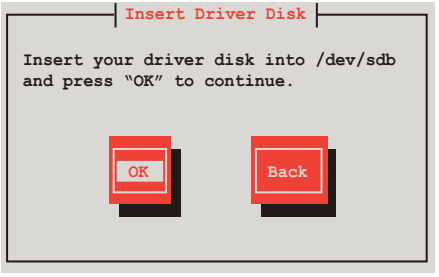
4. Select Yes using the <Tab> key when asked if you have the driver disk, then press <Enter>.



5. You have multiple devices which could serve as source for a driver disk. Choose one you like to use and select **OK**, then press <Enter>.

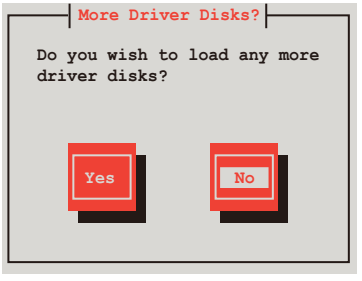


6. Insert the Red Hat® Enterprise RAID driver disk to the USB floppy disk drive, select **OK**, then press <Enter>.



The drivers for the RAID card are installed to the system.

7. When asked if you will load additional RAID controller drivers, select **No**, then press <Enter>.



8. Follow the onscreen instructions to finish the OS installation.

Preparing the Linux Driver

Ensure that there is another computer with a Linux-based OS to create the RAID driver. When creating the RAID driver, you may refer to the examples below which uses a 64bit SUSE Linux system to create a 64bit RAID driver for SUSE11 sp1.

1. Copy the image file into the Linux system.

   Example: **megasr-15.00.0120.2012-1-sles11-ga-x86_64.img**

2. Create a folder.

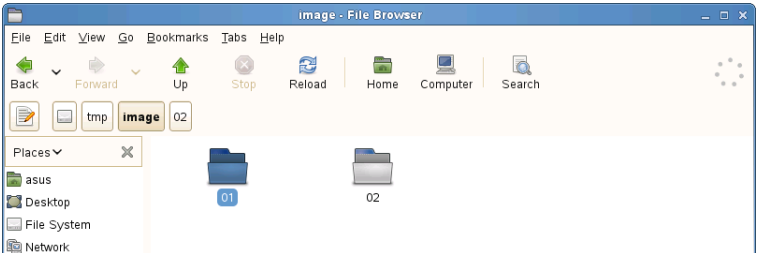
   Example: **image**

3. Mount the image file into the image folder using this command format:

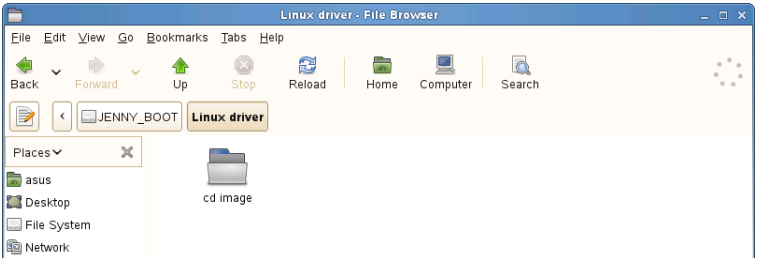
   mount -oloop [image file name] image

   Example: **mount -oloop megasr-15-15.00.0120.2012-1-sles11-ga-x86__64.img image**

4. Copy the contents of the image directory, labeled as **01**, into a FAT32 USB drive.



5. Rename the **01** folder to **CD Image**.

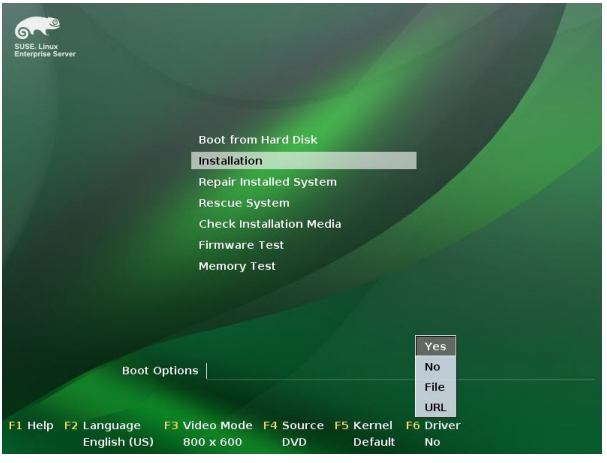


Installing SUSE 11 Linux OS

To install the LSI MegaRAID controller driver when installing SUSE Linux Enterprise Server OS:

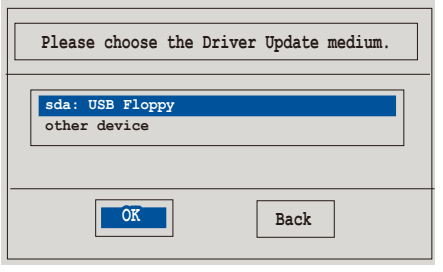
1. Boot the system from the SUSE OS installation CD.
2. Use the arrow keys to select **Installation** from the **Boot Options** menu.

3. Press <F6>, then select **Yes** from the menu. Press <Enter>.



4. Use the USB drive to provide the third-party driver during the OS installation. Type the command **brokenmodules=ahci** in **Boot Options** field, and press <Enter>.

5. When below screen appears, select the USB floppy disk drive (sda) as the driver update medium. Select **OK**, then press <Enter>.



6. Select **Back** and follow the onscreen instructions to finish the installation.

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.

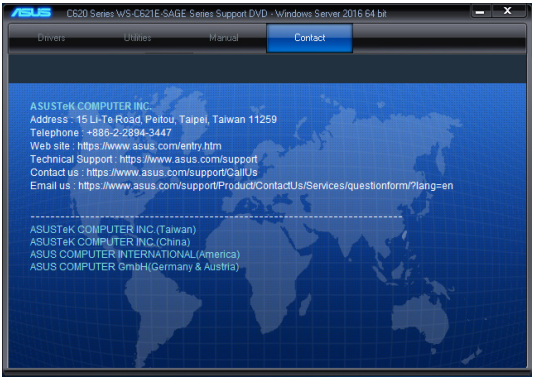
7.3.3 Manual menu

The Manual menu provides a list of supplementary user guides.

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.

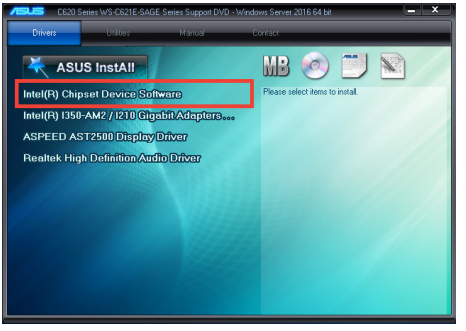
You need to manually install the Intel® chipset device software on a Windows operating system.

To install the Intel® chipset device software:

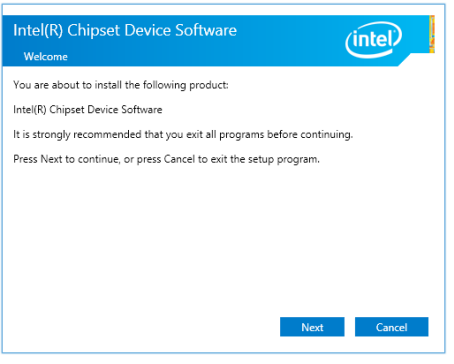
1. Restart the computer, and then log on with **Administrator** privileges.
2. Insert the motherboard/system support DVD into the optical drive. The support DVD automatically displays the **Drivers** menu if Autorun is enabled in your computer.

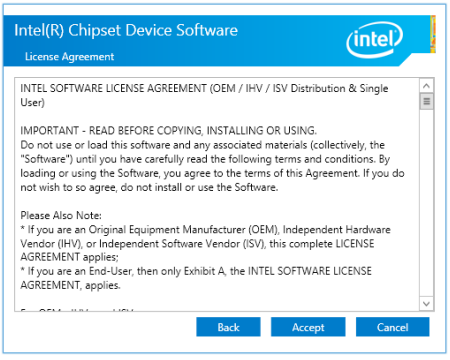
If Autorun is NOT enabled in your computer, browse the contents of the support DVD to locate the file **Setup.exe**. Double-click the **Setup.exe** to run the support DVD.

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

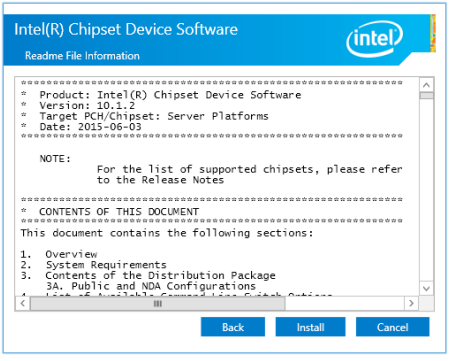


4. The **Intel® Chipset Device Software** window appears. Click **Next** to start the installation.





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 Installing the Intel® I210 Gigabit Adapters driver

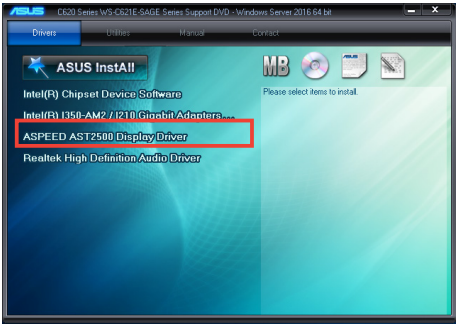
This section provides the instructions on how to install the **Intel® I210 Gigabits Adapter Driver** on the system.

To install the **Intel® I210 Gigabit Adapters Driver** on the Windows® operating system:

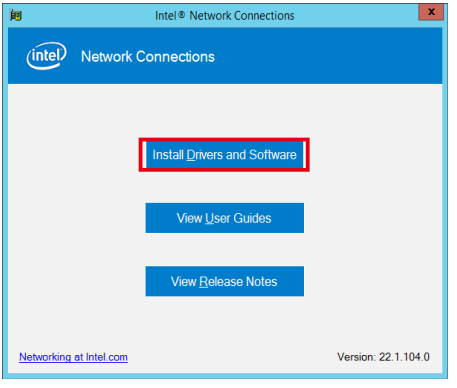
1. Restart the computer.
2. Log on with **Administrator** privileges.
3. Insert the motherboard/system support DVD to the optical drive.

If 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.

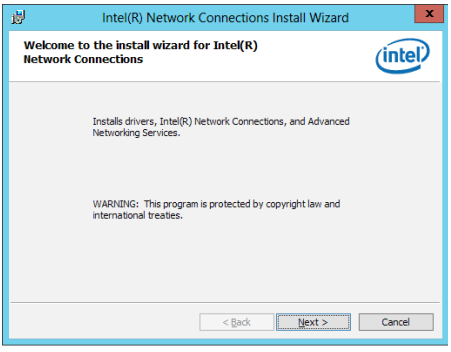
4. Click **Intel® I350-AM2/I210 Gigabit Adapters Driver** in the **Drivers** menu of the main screen to start the installation.



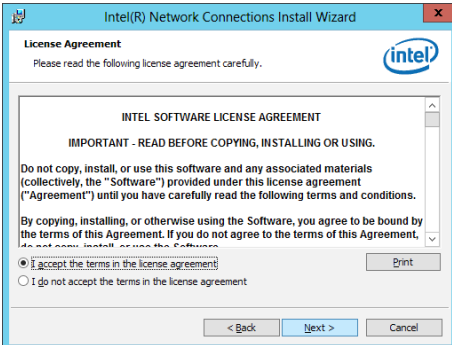
5. Click **Install Drivers and Software** option to begin installation.



6. Click **Next** when the **Intel(R) Network Connections Install Wizard** window appears.

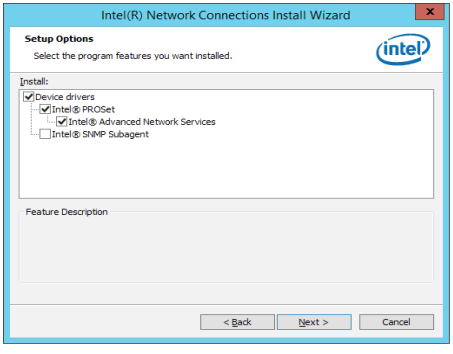


7. Tick **I accept the terms in the license agreement** and click **Next** to continue.

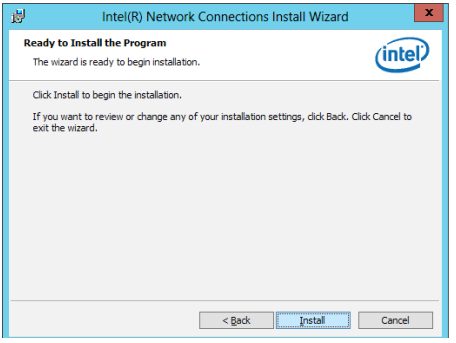


8. From the **Setup Options** window, click **Next** to start the installation.

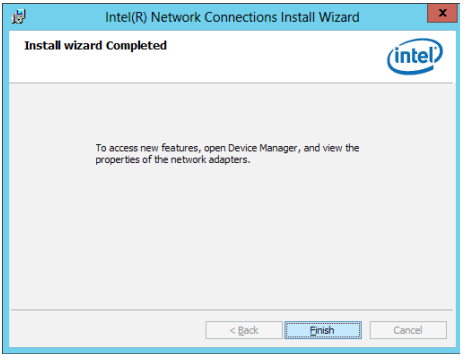
By default, **Intel(R) PROSet for Windows Device Manager** and Windows PowerShell Module are ticked.



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



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



7.6 VGA driver installation

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

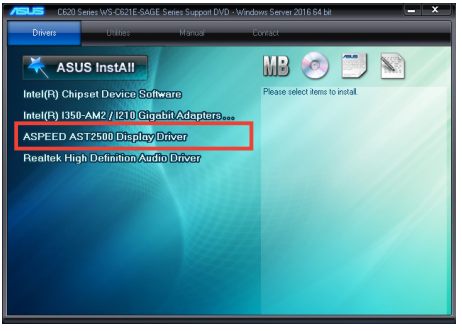
You need to manually install the ASPEED VGA driver on a Windows® operating system.

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.

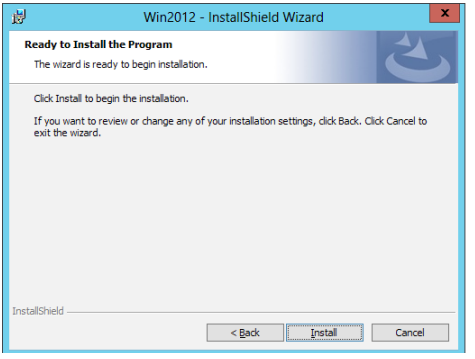
If Autorun is NOT enabled in your computer, browse the contents of the support DVD to locate the file **Setup.exe**. Double-click the **Setup.exe** to run the support DVD.

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

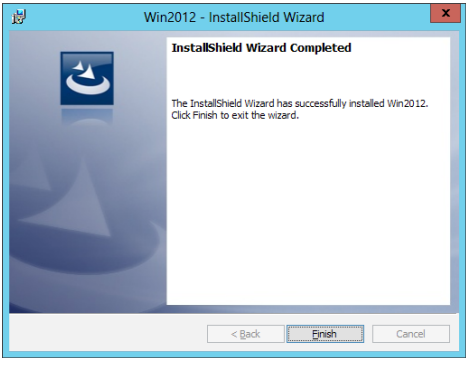


4. From the installation window, click **Next** to start the installation.

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



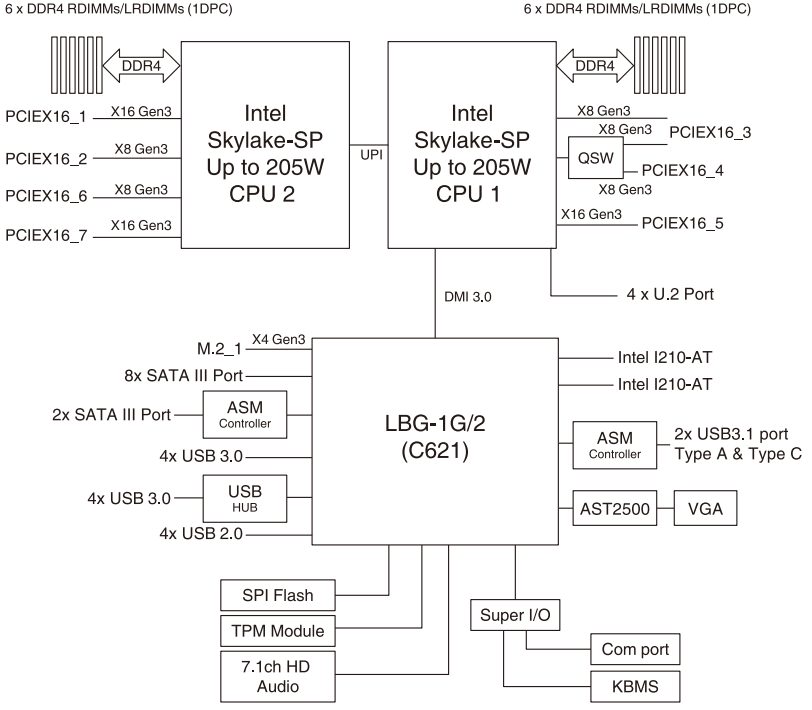
6. Click **Finish** to complete the installation.



Appendix

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

WS C621E SAGE block diagram



Q-Code table

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

(continued on the next page)

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

(continued on the next page)

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

ACPI/ASL Checkpoints (under OS)

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

Notices

Federal Communications Commission Statement

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

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

> 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-3(B)/NMB-3(B)

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-3(B)/NMB-3(B)

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.

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 năm2011 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.

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