Pro E800 G4

WORKSTATION SYSTEM

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, contact a qualified service technician or your dealer. 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 service.

- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your dealer.

Operation Safety

- Servicing of this product or units is to be performed by trained service personnel only.

- Before operating the server, carefully read all the manuals included with the server package.

- Before using the server, make sure 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.

- The product is suitable for mounting on concrete or other non-combustible surfaces only.

> 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.

Restricted Access Location

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

- Access can only be gained by SERVICE PERSONS or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken.

- Access is through the use of a TOOL, or other means of security, and is controlled by the authority responsible for the location.

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.

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CLASS 1 LASER PRODUCT
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Heavy System ---

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

About this guide

Audience

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

Contents

This guide contains the following parts:

1. **Chapter 1: Product Introduction**

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

2. **Chapter 2: Hardware Setup**

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

3. **Chapter 3: Motherboard Information**

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

4. **Chapter 4: BIOS Setup**

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

5. **Chapter 5: RAID Configuration**

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

Conventions used in this guide

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

References

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

ASUS websites

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

Product Introduction

1

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

1.1   System package contents

Check your system package for the following items.

Model Name	ASUS Pro E800 G4
Accessories	1 x CPU heatsink 1 x ASUS Pro E800 G4 support DVD 1 x AC power cord
Optional Items	DVD-ROM / DVD-RW

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

1.2   Serial number label

Before requesting support from the ASUS Technical Support team, you must take note of the product's serial number containing 12 characters such as xxSxxxxxxxxx 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 ASUS Pro E800 G4 specifications summary

The ASUS Pro E800 G4 is a workstation featuring the ASUS Pro WS C621-64L SAGE/10G motherboard.

Processor / System Bus		1 x Socket-P (LGA 3647)
		Intel® Xeon® W-3200 Processor Family (up to 205W)*
		Intel® Xeon Processor Scalable Family (up to 205W)*
		* **Refer to www.asus.com for Intel® CPU support list.**
Core Logic		Intel® C621 PCH
Memory	**Total Slots**	12 (6-channel, 2 DIMM per channel)
	Capacity	Maximum up to 1536GB
	Memory Type	DDR4 2933/2666 RDIMM/LR-DIMM/LR-DIMM 3DS
	Memory Size	32GB, 16GB (RDIMM)
		64GB, 32GB (LRDIMM)
		128GB, 64GB (LRDIMM 3DS)
		* **Refer to www.asus.com/support for more information**
Expansion Slots	**Total PCI/PCI-E Slots**	5
	Slot Type	**Intel Xeon W-3200 Processor:**
		PCIe x16_1 Slot (Gen3 x16 link)
		PCIe x16_2 Slot (Gen3 x16 link)
		PCIe x4_1 Slot (Gen3 x4 link)
		PCIe x16_3 Slot (Gen3 x16 link)
		PCIe x16_4 Slot (Gen3 x16 link)
		Intel Xeon Scalable Processor:
		PCIe x16_1 Slot (Gen3 x16 link)
		PCIe x16_2 Slot (Gen3 x16/x8 link)
		PCIe x4_1 Slot (Gen3 x4 link)
		PCIe x16_3 Slot (Gen3 x16 link)
		PCIe x16_4 Slot (Gen3 x0/x8 link)

(continued on the next page)

ASUS Pro E800 G4 specifications summary

Disk Controller	**SATA Controller**	**ASMedia® ASM1062R**
		- 2 x SATA 6Gb/s ports
		Intel® C621 PCH with Intel® RSTe (for windows only, support software RAID 0,1,5,10)
		- 8 x SATA 6Gb/s ports
		- 1 x M.2 Connector, up to 22110 (PCIe 3.0 x4 or SATA mode)*
		* The M.2 socket shares bandwidth with PCIEX4_1 when using M.2 PCIe mode device.
	SAS Controller	Optional Kits: (One PCIe slot will be occupied)
		- ASUS PIKE II 3008 8-port SAS HBA Card
		- ASUS PIKE II 3108 8-port SAS HW RAID Card
		Support SAS 12Gbps
	NVMe Controller	Optional Kits: (One PCIe slot will be occupied)
		- ASUS NVMe Riser Card
		Supports 4 x NVMe SSD, Intel® VROC Feature with VROC H/W Key
Storage Bays		8 x 3.5" or 2.5" Internal Storage Bays
		(Backplane supports 4 x SATA/SAS + 4 x SATA/SAS/NVME devices)
Networking	**LAN**	1 x Dual Port Intel® X550 10GbE LAN Controller
Graphic	**VGA (from BMC)**	Aspeed AST2500 64MB
Audio		7.1-Channel High Definition Audio
Auxiliary Storage Device Bay (Floppy / Optical Drive)		2 x 5.25" media bays
		(Optional DVD-ROM/DVD-RW)
Front I/O		4 x USB 3.2 Gen 1 ports
		2 x Audio Jacks (Mic in / Speaker out)
Rear I/O		2 x USB 3.2 Gen 2 ports (1 x Type-A & 1 x Type-C™)
		4 x USB 3.2 Gen 1 ports
		2 x 10GbE LAN ports (RJ45)
		5 x Audio Jack
		1 x Optical S/PDIF output
		1 x COM port (optional)
		1 x VGA port (optional, from BMC)
Switch/LED		**Front:**
		- 1 x Power Switch/LED
		- 1 x Reset Switch
		- 1 x HDD Access LED
		Rear:
		- 1 x BIOS Flash-back Button

ASUS Pro E800 G4 specifications summary

OS Support		Windows® 10 Pro for Workstation
		* Refer to http://www.asus.com/ for the latest OS support.
Management Solution	**Software**	ASUS Control Center
	Out of Band Remote Management	ASMB9-iKVM (on-board)
Dimension (HH x WW x DD)		532 mm x 243 mm x 582 mm (21.0" x 9.5" x 22.9")
Net Weight Kg (CPU, DRAM & HDD not inclu ded)		18 Kg
Power Supply and Rating		2000W Platinum ATX Power Supply (100-240Vac, 15-12A, 60-50Hz) or
		750W Gold ATX Power Supply (100-240Vac, 9-4.5A, 60/50Hz)
Environment		Operating temperature: 10°C ~ 35°C
		Non operating temperature: -40°C ~ 70°C
		Non operating humidity: 20% ~ 90% (Non condensing)

Specifications are subject to change without notice.

1.4 Front panel features

The ASUS Pro E800 G4 workstation features a simple yet stylish front panel design. The power and reset buttons, LED indicators, optical drive, and USB ports are all conveniently located at the front panel for easy access.
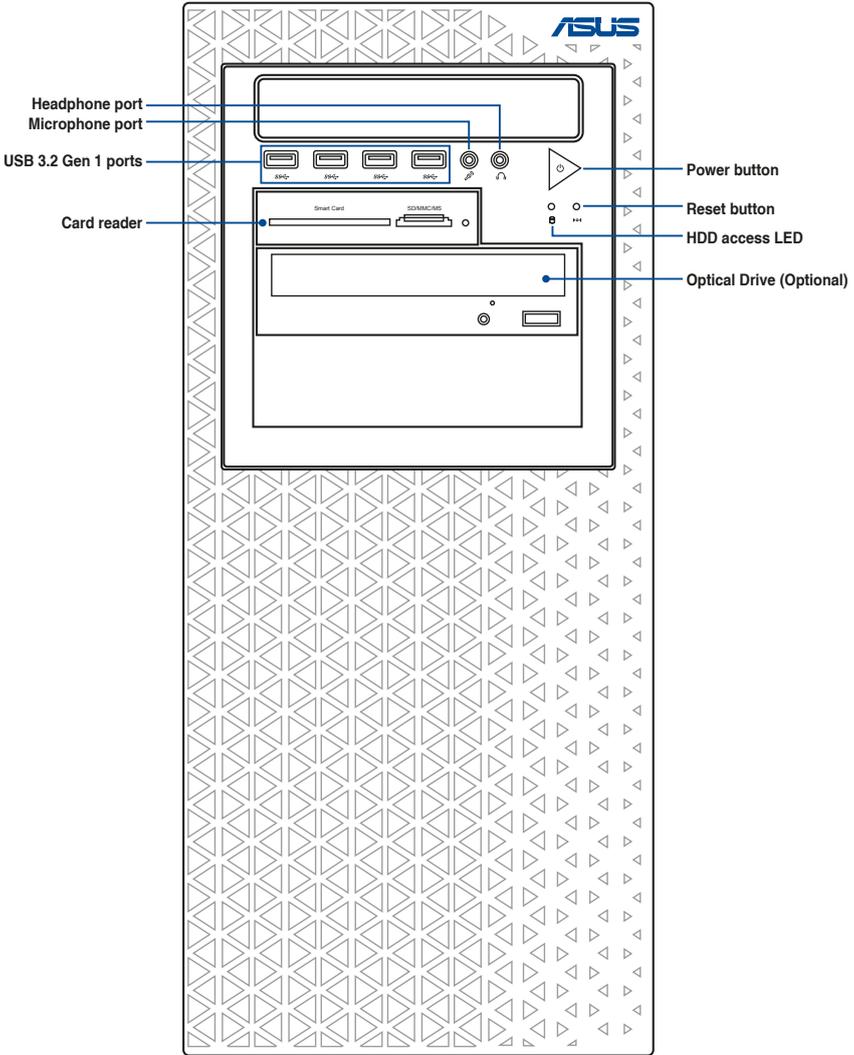
Refer to the Front panel LEDs section for the LED descriptions.

1.5   Rear panel features

The rear panel includes a slot for the motherboard rear I/O ports, expansion slots, a vent for the system fan, and the power supply module.

USB 3.2 Gen 2 Type-A port

USB 3.2 Gen 2 Type-C™ port

10G Lan ports

BIOS Flashback button

USB 3.2 Gen 1 ports

Audio ports

Expansion slots

Single power supply

120 mm x 120 mm system fan vents

Optional COM port

Optional VGA port (from BMC)
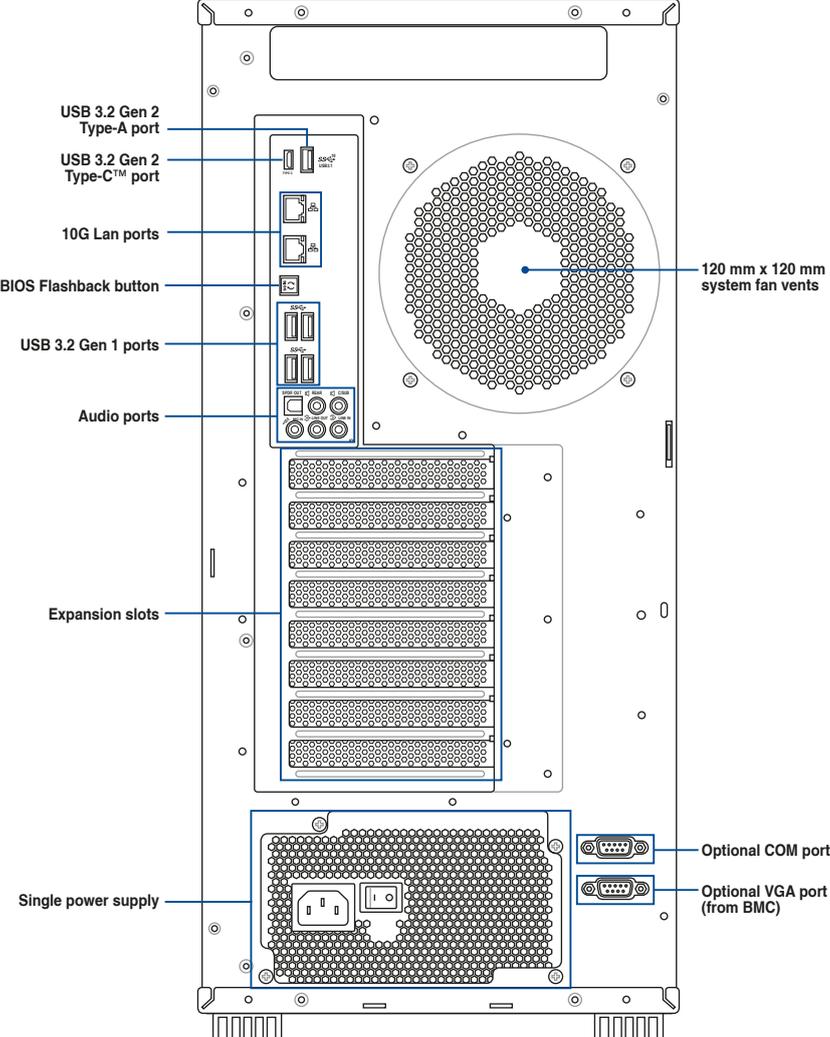
1.6   Internal features

The ASUS Pro E800 G4 workstation system includes the basic components as shown:
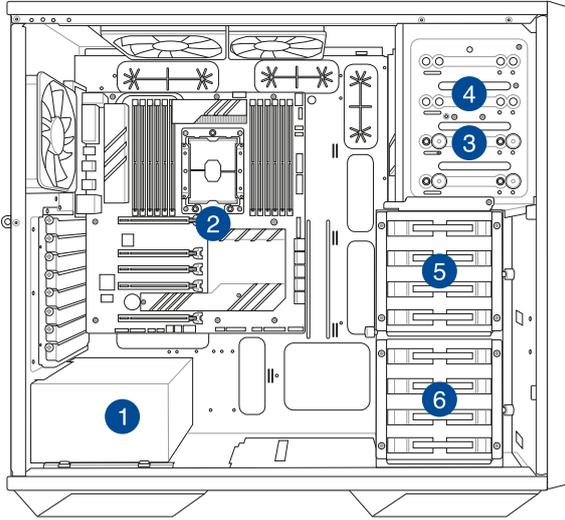
1.   Power supply unit

2.   ASUS Pro WS C621-64L SAGE/10G motherboard

3.   Optical drive (Optional)

4.   Front I/O board (hidden)

5.   Storage device bay (Top)

6.   Storage device bay (Bottom)

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. If you need to use a floppy disk, connect the USB floppy disk drive to any of the USB ports on the front or rear panel.

WARNING

HAZARDOUS MOVING PARTS
KEEP FINGERS AND OTHER BODY PARTS AWAY

1.7 LED information

1.7.1 Front panel LEDs
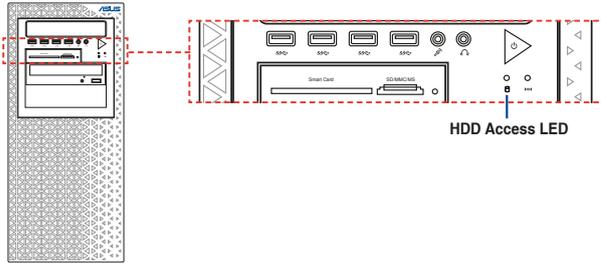
HDD Access LED

LED	Icon	Display status	Description
HDD Access LED	🖴	OFF	No activity
		Blinking	Read/write data into the HDD

1.7.2 Rear panel LEDs
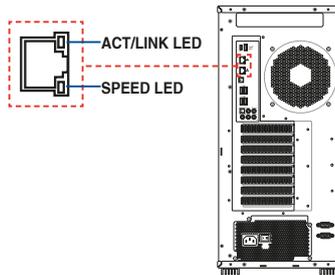
ACT/LINK LED

SPEED LED

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

Hardware Setup

2

This chapter lists the hardware setup procedures that you have to perform when installing system components. It includes description of the jumpers and connectors on the motherboard.

2.1 Chassis cover

2.1.1 Removing the side covers

• Ensure that you unplug the power cord before removing the side cover.

• 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.

• The images of the system shown in this section are for reference purposes only and may not exactly match the model you purchase.

1. Remove the two (2) screws from the rear of the side cover, then set them aside.

2. Lift the side cover to remove it.

Be careful not to apply pressure to the air vent on the side cover to avoid damages to the system.

3. Repeat steps 1 and 2 to remove the other side cover.

2.1.2 Replacing the side covers

1. Align and insert the front of the side cover to the front of the chassis, then replace the side cover onto the chassis.

2. Replace the two (2) removed previously to secure the side cover to the chassis.

3. Repeat steps 1 and 2 to replace the other side cover.

2.2 CPU installation

The motherboard comes with a surface mount LGA 3647 socket designed for the Intel® Xeon® W-3200 Series processors.
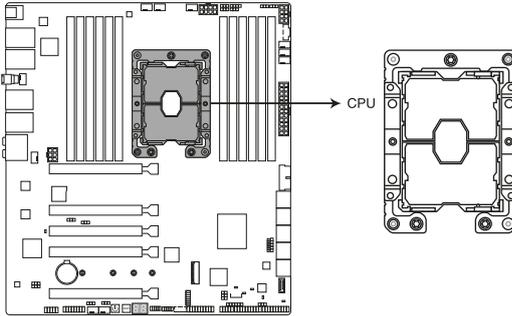
Pro WS C621-64L SAGE series CPU LGA3647 Socket

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

- Ensure that all power cables are unplugged before installing the CPU.

- Ensure that you install the correct CPU designed for LGA3647 socket only.

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

- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA3647 socket.

- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

The CPU is purchased separately.

1

2

CPU Carrier

C

A

Triangle mark

B

CPU
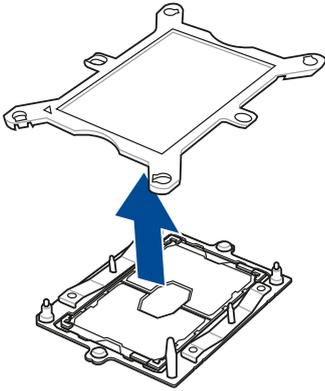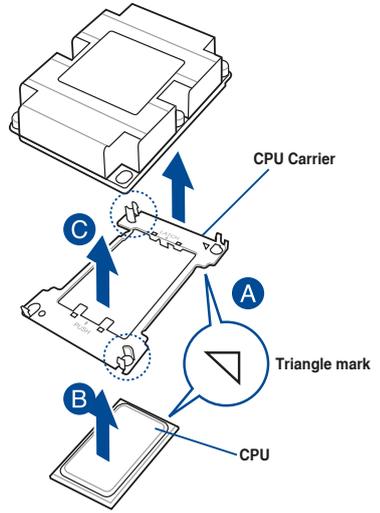
⚠ Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.

3

B

A

A

B

A

1 ↗

←3   4→

↙ 2
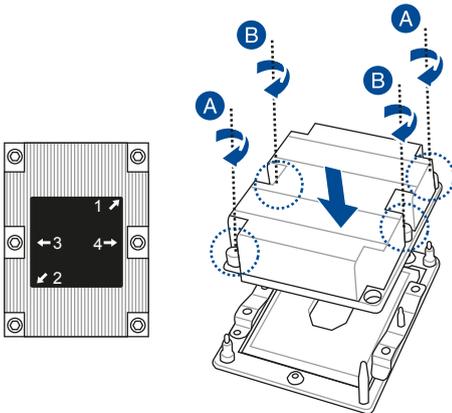
👆 The CPU and heatsink assembly fits in only one correct orientation. DO NOT force the CPU and heatsink assembly into the socket to prevent damaging the CPU pins on the socket.

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

2.3 System memory

The motherboard comes with twelve (12) Dual Inline Memory Modules (DIMM) slots designed for DDR4 (Double Data Rate 4) memory modules.

⚡ A DDR4 memory 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.
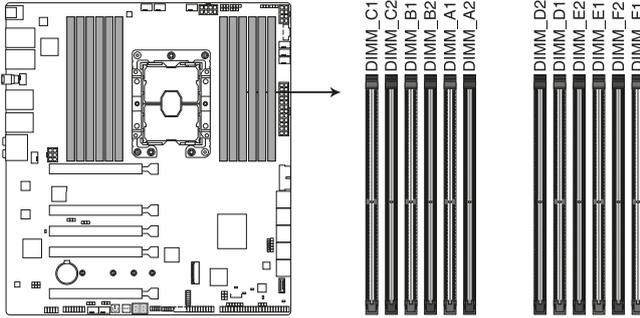
Pro WS C621-64L SAGE series 288-pin DDR4 DIMM socket

Memory configurations

You may install 16 GB and 32 GB RDIMMs; 32 GB, and 64 GB LRDIMMs; and 64GB, and 128GB LRDIMM 3DS 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.

- The DIMMs are purchased separately.

- Visit the ASUS website for the latest QVL.

Recommended memory configuration											
	C1	C2	B1	B2	A1	A2	D2	D1	E2	E1	F2	F1
1 DIMMs	-	-	-	-	✓	-	-	-	-	-	-	-
2 DIMMs	-	-	-	-	✓	-	-	✓	-	-	-	-
4 DIMMs	-	-	✓	-	✓	-	-	✓	-	✓	-	-
6 DIMMs	✓	-	✓	-	✓	-	-	✓	-	✓	-	✓
12 DIMMs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2.3.1 Installing a DIMM on a single clip DIMM socket

1. Unlock a DIMM socket by pressing the retaining clip outward.

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

DIMM notch

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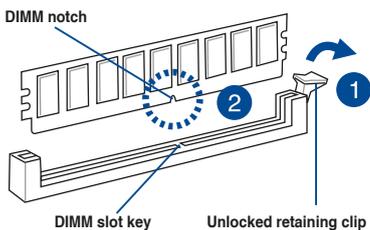
A DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket in the wrong direction to avoid damaging the DIMM.

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

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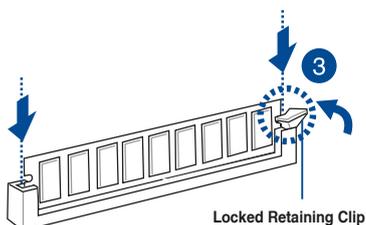
Always insert the DIMM into the socket vertically to prevent DIMM notch damage.

- To install two or more DIMMs, refer to the user guide bundled in the motherboard package.

- Refer to the ASUS website for qualified vendor lists of the memory modules.

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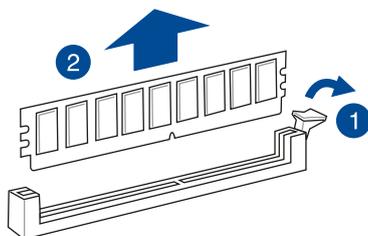
Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it flips out with extra force.

2.4 Air Duct

⚠️ 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!

2.4.1 Removing the air duct

To remove the air duct:

Remove the two (2) screws of the air duct then remove the air duct and place them aside.
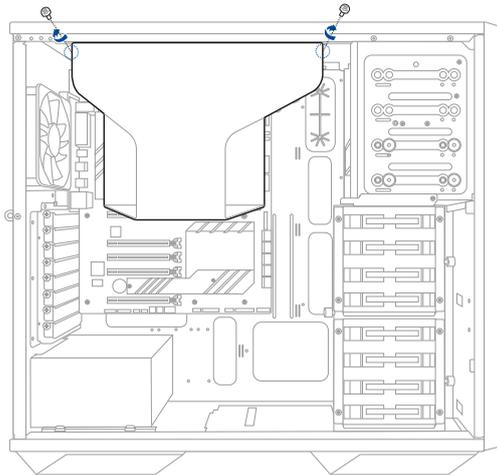
2.5 Storage devices

The server system supports eight (8) 3.5-inch Serial ATA hard disk drives or eight (8) 2.5-inch SSD drives via the storage device trays, or an optional four (4) NVME drives via the bottom four storage device trays.

- Support for the optional four (4) NVME is optional and is purchased separately.
- The storage devices are purchased separately.

2.5.1 Installing 3.5-inch storage devices

To install 3.5-inch storage devices:

1. Remove the side cover of the chassis. Refer to the **Removing the side cover** section for more information.

2. Prepare the 3.5-inch storage device and the bundled set of screws.

3. Press and hold the storage device tray latch from both sides, then pull the storage device tray out from the bay.
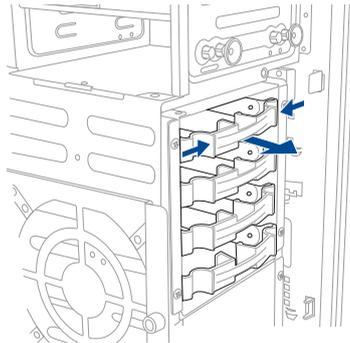
4.   Align and insert the 3.5-inch storage device into the storage device tray ensuring that
     the screw holes on the storage device matches the HDD notches on the storage device
     bay. Ensure the storage device is seated firmly in the storage device bay.

Screw holes (HDD)

HDD notches (Storage device tray)
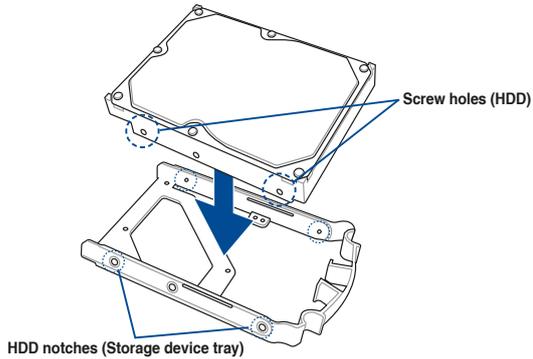
5.   Align the storage device tray and storage device assembly with the storage device tray
     railing in the bay.

6.   Push the storage device tray and storage device assembly all the way into the depth of
     the bay until the storage device tray is seated securely in the bay.
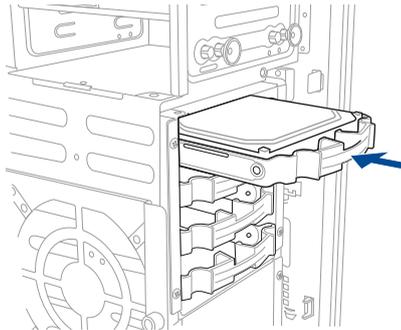
7.   Repeat steps 2 to 6 to install other 3.5" storage devices.

2.5.2 Installing 2.5-inch storage devices

To install 2.5-inch storage devices:

1. Remove the side cover of the chassis. Refer to the **Removing the side cover** section for more information.

2. Prepare the 2.5-inch storage device and the bundled set of screws.

3. Press and hold the storage device tray latch from both sides, then pull the storage device tray out from the bay.
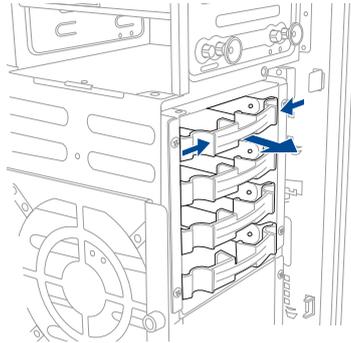
4. Carefully push the storage device tray lock pin out of the tray using a suitable tool. Please refer to the illustration below for the location of the storage device tray lock pin.

Storage device tray lock pin
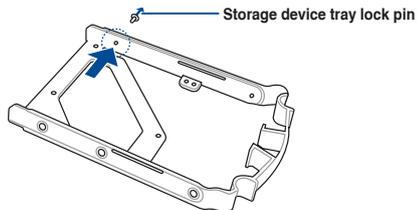
5. Align and insert the 2.5-inch storage device into the storage device tray ensuring that the screw holes on the storage device matches the screw holes on the storage bay, then secure the storage device to the storage device tray using the bundled screws.
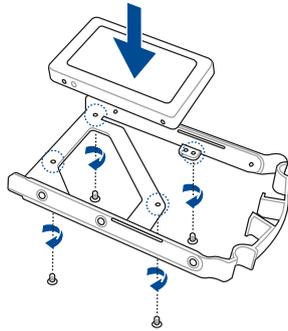
6. Align the storage device tray and storage device assembly with the storage device tray railing in the bay.

7. Push the storage device tray and storage device assembly all the way into the depth of the bay until the storage device tray is seated securely in the bay.
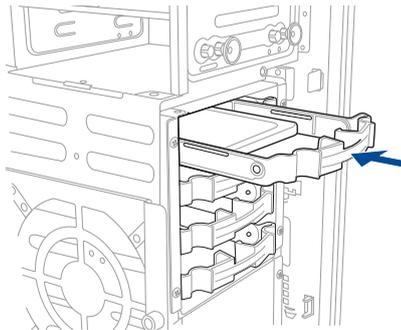
8. Repeat steps 2 to 7 to install other 2.5" storage devices.

2.6 Expansion slots

⚠️ Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.
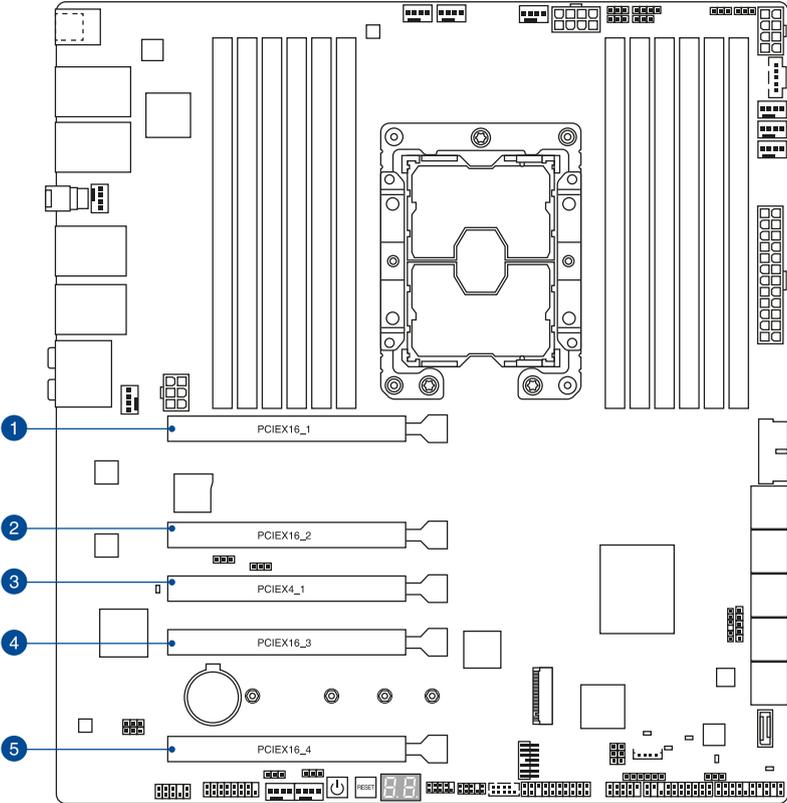
Slot No.	Slot Description
1	PCIe x16_1 slot
2	PCIe x16_2 slot
3	PCIe x4_1 slot
4	PCIe x16_3 slot
5	PCIe x16_4 slot

2.6.1 Installing an expansion card

The expansion cards, such as GPU cards are purchased separately.

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

2. Remove the GPU bar. Please refer to the section **Air Duct** for more information on removing the GPU bar.

3. Lay the system on its side on a flat, stable surface.

4. Release the screw(s) on the metal slot cover where you wish to install the expansion card.
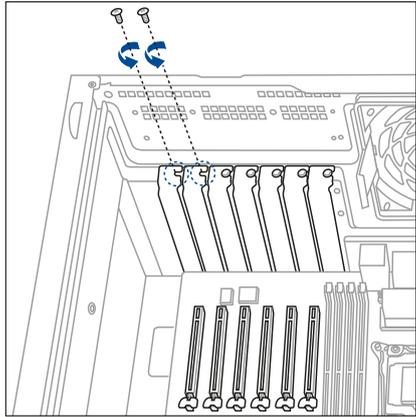
5. Remove the metal slot cover.
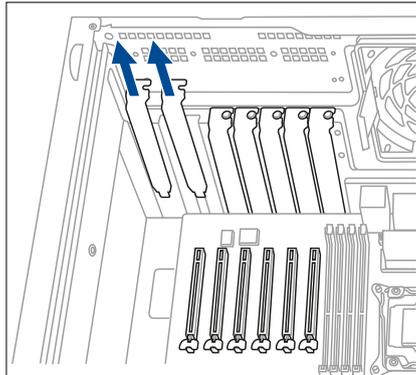
6. Align the card's golden fingers with the slot, and then press firmly until the card is completely seated on the slot.
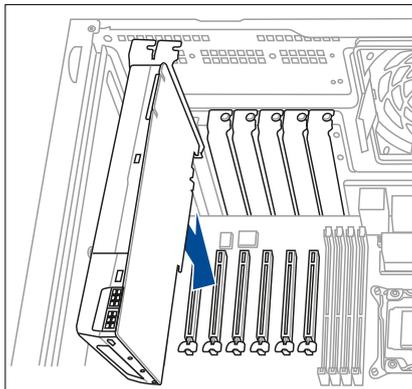
7. Secure the expansion card with the screw(s) that you removed earlier in step 4.
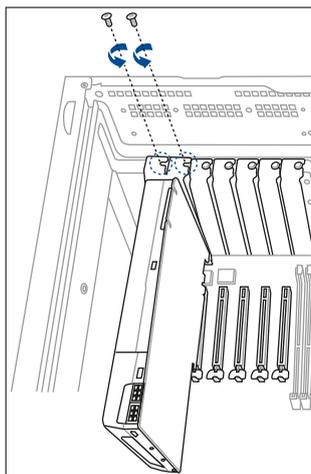
2.6.2 Configuring an expansion card

Recommended VGA configuration

Slot Description	Single GPU	2-way GPU	3-way GPU	4-way GPU (Xeon W-3200)	4-way GPU (Xeon Scalable)
PCIE 3.0 x16_1	x16	x16	x16	x16	x16
PCIE 3.0 x16_2	-	-	x16	x16	x8
PCIE 3.0 x4_1	-	-	-	-	-
PCIE 3.0 x16_3	-	x16	x16	x16	x16
PCIE 3.0 x16_4	-	-	-	x16	x8

We recommend that you provide sufficient power when running CrossFireX™ or SLI® mode.

2.6.3   Installing an M.2 card

To install an M.2 card:

1.   Remove the two (2) screws from the M.2 heatsink, then remove the M.2 heatsink and place them aside.
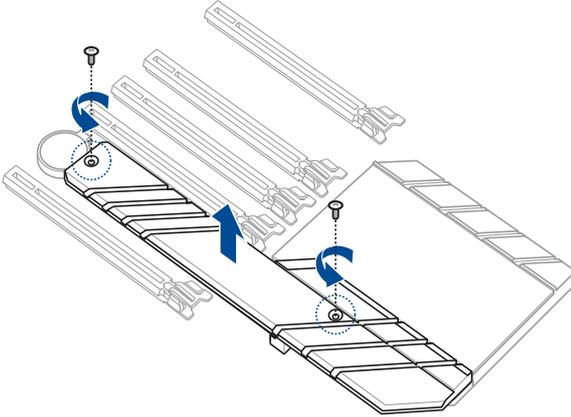
2.   Insert a stand screw to the M.2 slot you wish to install an M.2 to.
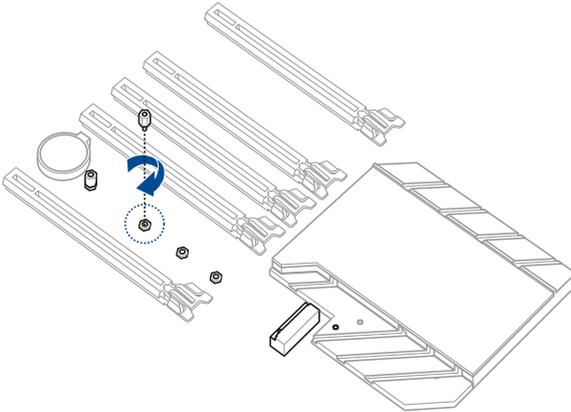
3. Align and insert the M.2 card into the M.2 slot, then secure it using a bundled screw.
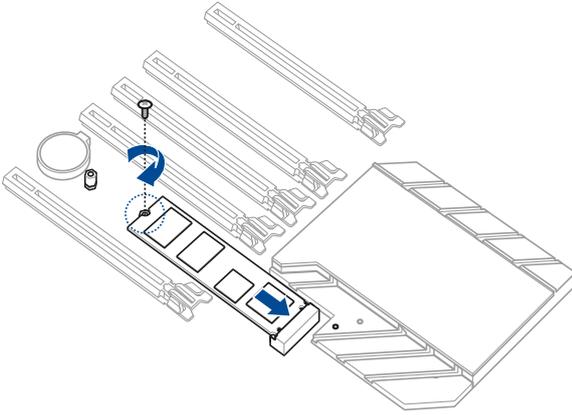
4. Peel off the plastic film on the thermal pad located on the bottom of the M.2 heatsink.

5. Align the M.2 heatsink to the screw holes on the motherboard, then secure the M.2 heatsink to the motherboard using the two (2) screws removed previously.
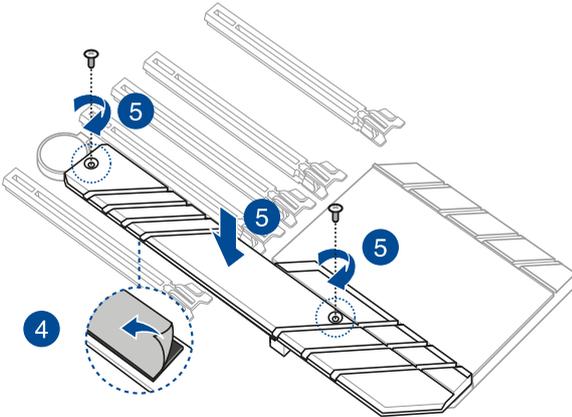
2.7   BIOS update utility

USB BIOS Flashback

USB BIOS Flashback allows you to easily update the BIOS without entering the existing BIOS or operating system. Simply insert a USB storage device to the USB port (the USB port hole marked in green on the I/O shield) then press the USB BIOS Flashback button for three seconds to automatically update the BIOS.

To use USB BIOS Flashback:

1.   Insert a USB storage device to the USB Flashback port.

> We recommend you to use a USB 2.0 storage device to save the latest BIOS version for better compatibility and stability.

2.   Visit https://www.asus.com/support/ and download the latest BIOS version for this motherboard.

3.   Rename the file as **WSC64LG.CAP**, then copy it to your USB storage device.

4.   Shut down your computer.

5.   Press the BIOS Flashback button for three seconds until the Flashback LED blinks three times, indicating that the BIOS Flashback function is enabled.

**USB BIOS
Flashback button**

**USB BIOS
Flashback port**
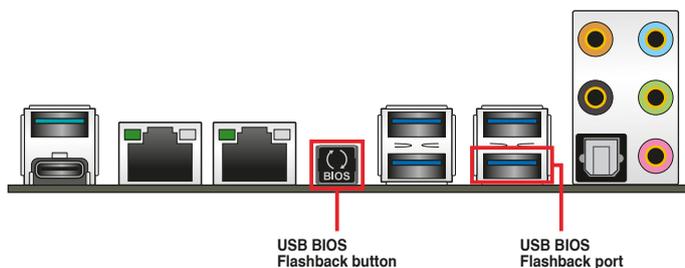
6.   Wait until the light goes out, indicating that the BIOS updating process is completed.

> For more BIOS update utilities in BIOS setup, refer to the section **Managing and updating your BIOS** in Chapter 4.

> • Do not unplug portable disk, power system, or press the CLR_CMOS button while BIOS update is ongoing, otherwise update will be interrupted. In case of interruption, please follow the steps again.
>
> • If the light flashes for five seconds and turns into a solid light, this means that the BIOS Flashback is not operating properly. This may be caused by improper installation of the USB storage device and filename/file format error. If this scenario happens, please restart the system to turn off the light.
>
> • Updating BIOS may have risks. If the BIOS program is damaged during the process and results to the system's failure to boot up, please contact your local ASUS Service Center.

2.8 Motherboard rear and audio connection

2.8.1 Rear I/O connection
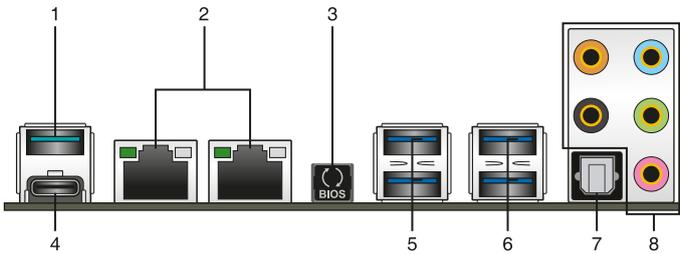
Rear panel connectors	
1.	USB 3.2 Gen 2 Type-A port E2
2.	10G LAN (RJ-45) ports*
3.	USB BIOS Flashback button
4.	USB 3.2 Gen 2 Type-C™ port EC1
5.	USB 3.2 Gen 1 ports 5, 6
6.	USB 3.2 Gen 1 ports 3, 4. Lower port supports USB BIOS Flashback function.
7.	Optical S/PDIF OUT port
8.	Audio I/O ports**

* and **:   Refer to the tables for LAN port LEDs and audio port definitions.

We strongly recommend that you connect your devices to ports with matching data transfer rate. Please connect your USB 3.2 Gen 1 devices to USB 3.2 Gen 1 ports and your USB 3.2 Gen 2 devices to USB 3.2 Gen 2 ports for faster and better performance for your devices.

Intel® X550 10GbE LAN port LED indications

Activity Link LED		Speed LED	
Status	**Description**	**Status**	**Description**
OFF	No link	OFF	100 Mbps connection
GREEN	Linked	GREEN	1 Gbps connection
BLINKING	Activity	ORANGE	10 Gbps connection

ACT/LINK LED   SPEED LED

LAN port
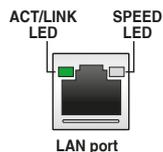
** Audio 2, 4, 5.1 or 7.1-channel configuration

Port	Headset 2-channel	4.channel	5.1-channel	7.1-channel
Light Blue	Line In	Line In	Line In	Side Speaker Out
Lime	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink	Mic In	Mic In	Mic In	Mic In
Orange	–	–	Center/Sub woofer	Center/Sub woofer
Black	–	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out

2.8.2   Audio I/O connections

Audio I/O ports

orange	light blue
black	lime
	pink
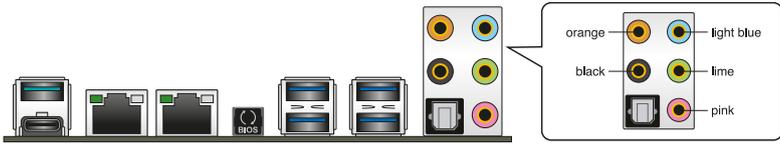
Connect to Headphone and Mic

Connect to Stereo Speakers
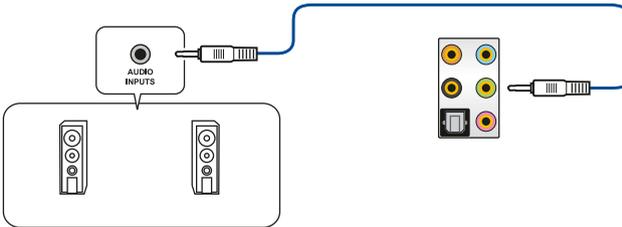
Connect to 2-channel Speakers
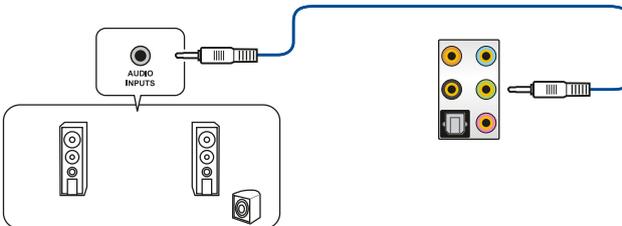
Connect to 4-channel Speakers
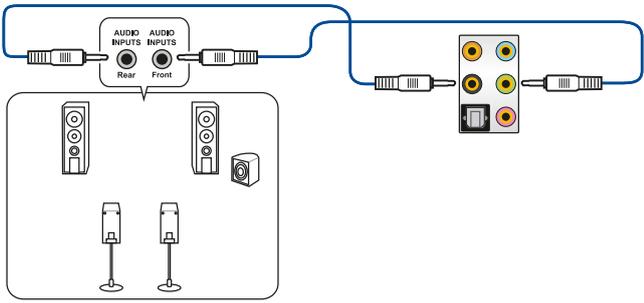
Connect to 5.1-channel Speakers
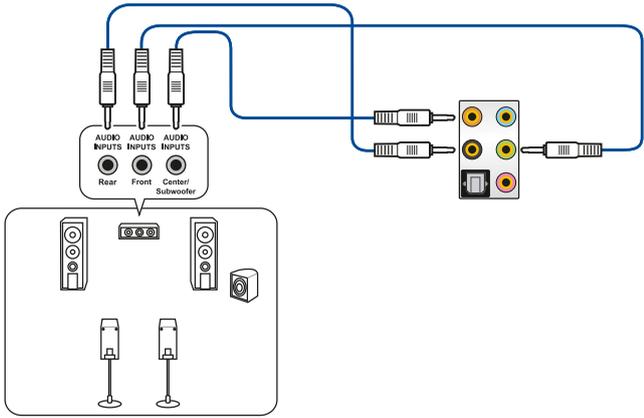
Connect to 7.1-channel Speakers
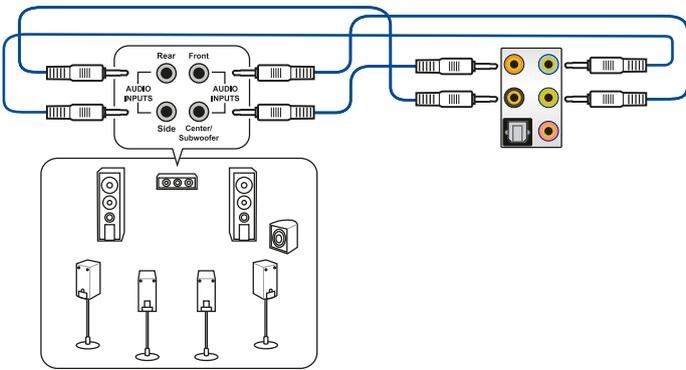
2.9   Starting up for the first time

1.   After making all the connections, replace the system case cover.

2.   Ensure that all switches are off.

3.   Connect the power cord to the power connector at the back of the system chassis.

4.   Connect the power cord to a power outlet that is equipped with a surge protector.

5.   Turn on the devices in the following order:

    a.   Monitor

    b.   External storage devices (starting with the last device on the chain)

    c.   System power

6.   After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with the "green" standards or if it has a "power standby" feature, the monitor LED may light up or change from orange to green after the system LED turns on.

The system then runs the power-on self tests (POST). While the tests are running, the BIOS beeps (refer to the BIOS beep codes table) or additional messages appear on the screen. If you do not see anything within 30 seconds from the time you turned on the power, the system may have failed a power-on test. Check the jumper settings and connections or call your retailer for assistance.

BIOS Beep	Description
One short beep	VGA detected Quick boot set to disabled No keyboard detected
One continuous beep followed by two short beeps then a pause (repeated)	No memory detected
One continuous beep followed by three short beeps	No VGA detected
One continuous beep followed by four short beeps	Hardware component failure

7.   At power on, hold down the <Delete> key to enter the BIOS Setup. Follow the instructions in Chapter 3.

2.10   Turning off the computer

While the system is ON, press the power button for less than four seconds to put the system on sleep mode or soft-off mode, depending on the BIOS setting. Press the power switch for more than four seconds to let the system enter the soft-off mode regardless of the BIOS setting.

Motherboard Information

3

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

3.1 Motherboard layout
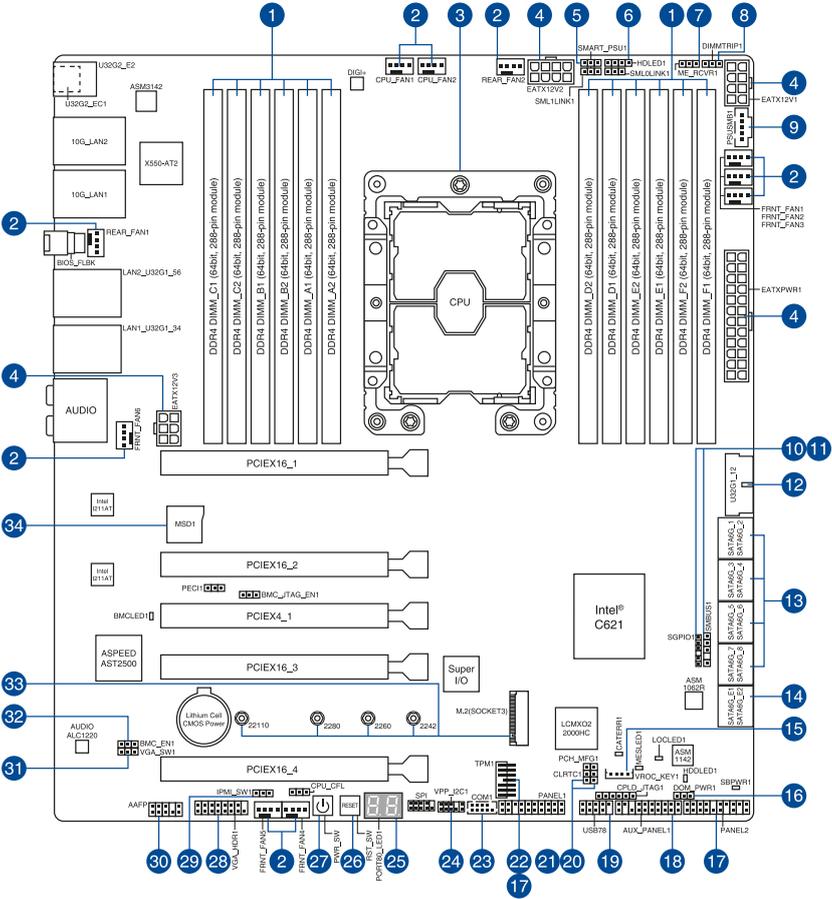
Refer to **Internal connectors** and **Rear I/O connection** for more information about rear panel connectors and internal connectors.

3.2 Onboard buttons

1. **Power button**

   Press the Power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).

PWR_SW
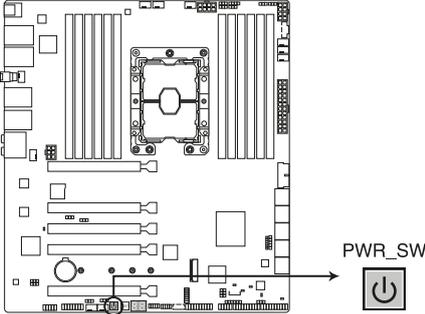
Pro WS C621-64L SAGE/10G Power on button

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.

2. **Reset button**

   Press the Reset button to reboot the system.

RST_SW
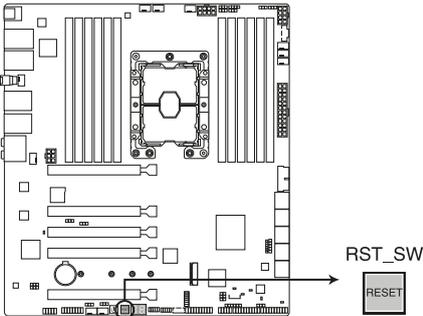
RESET

Pro WS C621-64L SAGE/10G Reset button

3.3   Onboard jumpers

1.   **Clear RTC RAM jumper**

The Clear RTC RAM jumper allows you to clear the Real Time Clock (RTC) RAM in the CMOS, which contains the date, time, system passwords, and system setup parameters.

CLRTC1

Normal
(default setting)

Clear CMOS
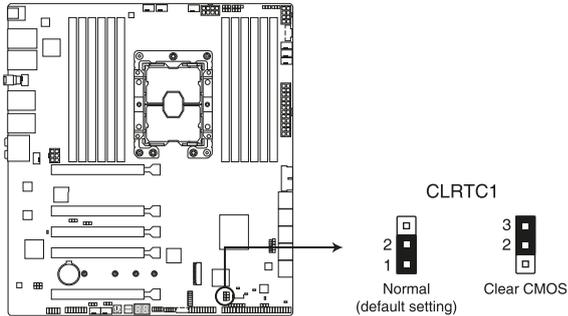
Pro WS C621-64L SAGE/10G Clear RTC RAM jumper

To erase the RTC RAM:

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

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

3.   Plug the power cord and turn ON the computer.

4.   Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.

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

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

2. **DDR4 Thermal Event jumper**

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

DIMMTRIP1

Enable
(default setting)

Disable
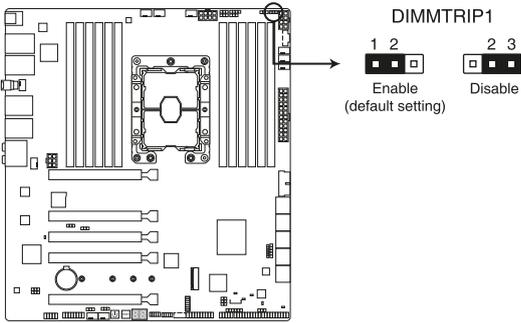
Pro WS C621-64L SAGE/10G DDR4 Thermal Event jumper

3. **SATADOM Power jumper**

   Set to pins 2-3 to enable SATA8 port to support SATADOM devices.

DOM_PWR1

Normal
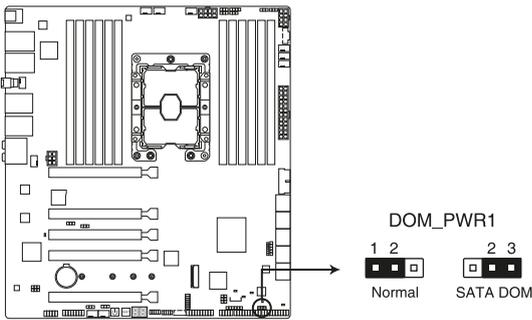
SATA DOM

Pro WS C621-64L SAGE/10G SATADOM Power jumper

4.   **PMBus 1.2 PSU Select jumper**

The PMBus 1.2 PSU Select jumper allows you to select the PSU PMBus version. Set to pins 1-2 for PMBus, set to pins 2-3 for others.

SMART_PSU1

1 2   2 3

PMBus 1.2   Others
(default setting)
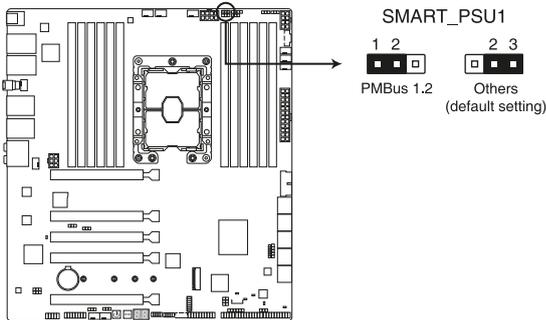
Pro WS C621-64L SAGE/10G PMBus 1.2 PSU Select jumper

5.   **ME Firmware Force Recovery jumper**

Set to pins 2-3 to force Intel® Management Engine (ME) boot from recovery mode when the ME becomes corrupted.

ME_RCVR1

1 2   2 3

Normal   Force ME Recovery
(default setting)
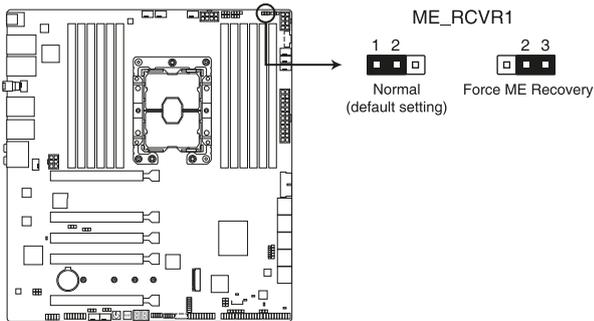
Pro WS C621-64L SAGE/10G ME Firmware Force Recovery jumper

6.   PCH_MFG1 jumper

The PCH_MFG1 jumper allows you to update the BIOS ME block.
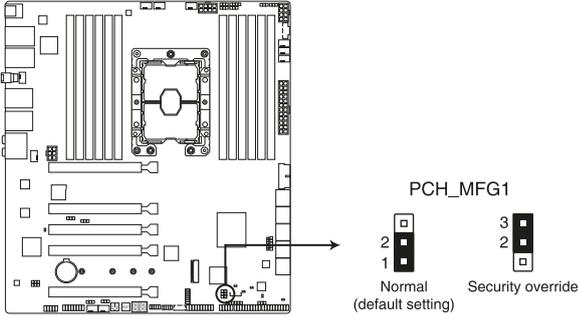
Pro WS C621-64L SAGE/10G PCH_MFG1 jumper

7.   IPMI SW jumper

The IPMI SW jumper allows you to select which protocol in the GPU sensor to function.
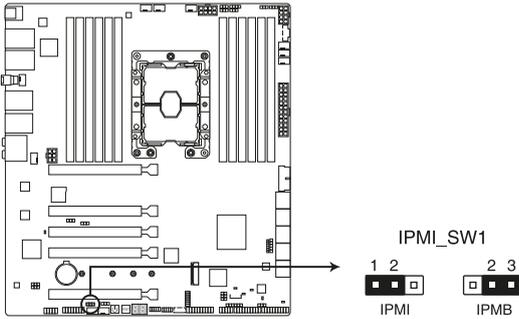
Pro WS C621-64L SAGE/10G IPMI SW jumper

8.   VGA Controller jumper

The VGA Controller jumper allows you to enable or disable the onboard VGA controller. Set to pins 1-2 to enable the onboard VGA.

VGA_SW1

1 2   2 3

Enable   Disable
(default setting)
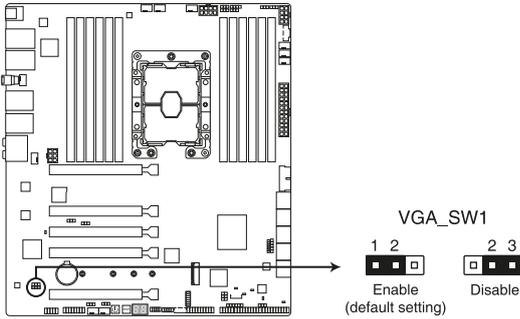
Pro WS C621-64L SAGE/10G VGA Controller jumper

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.

9. Baseboard Management Controller setting

The Baseboard Management Controller jumper allows you to enable or disable the on-board BMC.
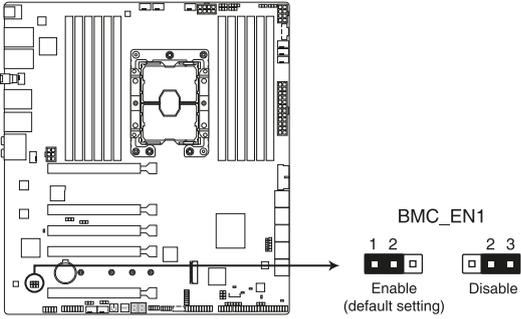
Pro WS C621-64L SAGE/10G
Baseboard Management Controller jumper

Ensure to set this BMC jumper to **Enable** to avoid system fan control and hardware monitor error.

3.4   Onboard LEDs

1.   **Standby Power LED**

The Standby Power LED lights up to indicate that the system is ON, in sleep mode, in soft-off mode, or connected to a power source. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component.

SBPWR1

ON   OFF
Standby Power   Powered Off
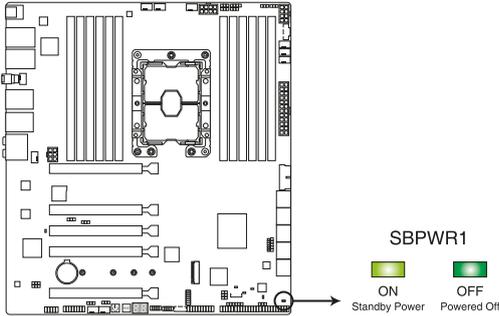
Pro WS C621-64L SAGE/10G Standby Power LED

2.   **Location LED**

The Location 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.

LOCLED1
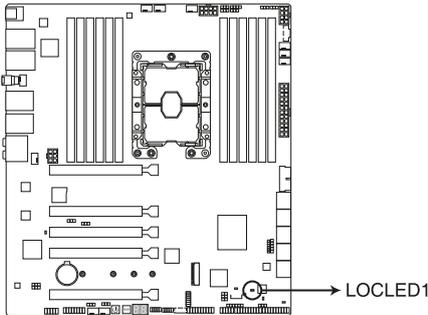
Pro WS C621-64L SAGE/10G Location LED

3.   **Storage Device Activity LED**

The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.

→ HDDLED1
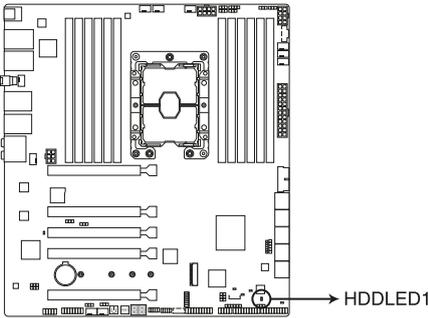
Pro WS C621-64L SAGE/10G Storage Device Activity LED

4.   **BMC LED**

The BMC LED blinks to indicate that the on-board BMC is functional.
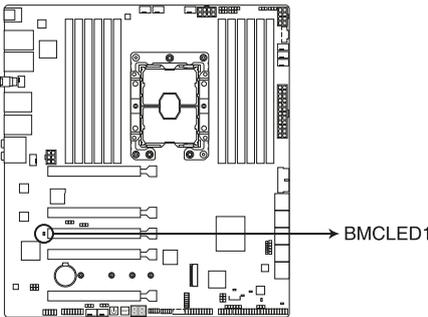
→ BMCLED1

Pro WS C621-64L SAGE/10G BMC LED

5. **Catastrophic Error LED**

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

 → CATERR1
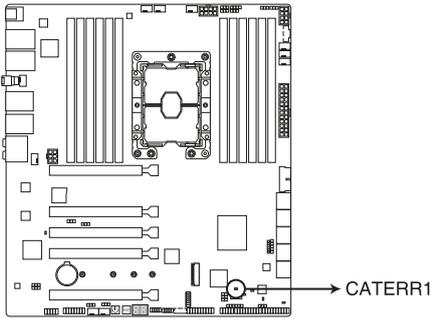
Pro WS C621-64L SAGE/10G Catastrophic Error LED

6. **Message LED**

    The Message LED lights up when a BMC event log is generated.

 → MESLED1
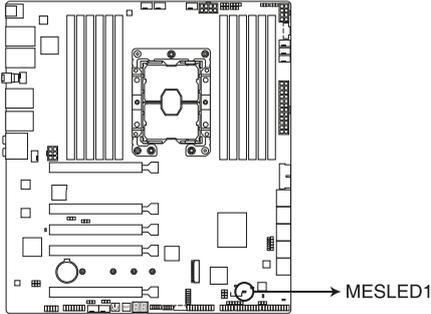
Pro WS C621-64L SAGE/10G Message LED

7.   **Q-Code LED**

The Q-Code LED design provides you with a 2-digit error code that displays the system status.

PORT80_LED1
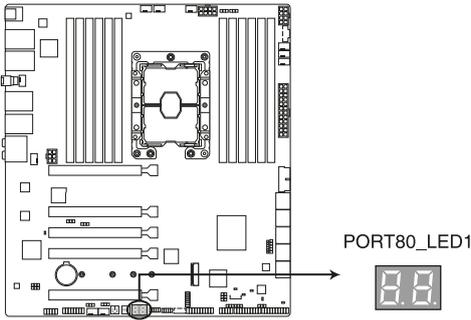
Pro WS C621-64L SAGE/10G Q-Code LED

• 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.

3.5 Internal connectors

1. SATA 6Gb/s connector

The SATA 6Gb/s connector allows you to connect SATA devices such as optical disc drives and hard disk drives via a SATA cable.

**Pro WS C621-64L SAGE/10G
SATA 6 Gb/s connector**
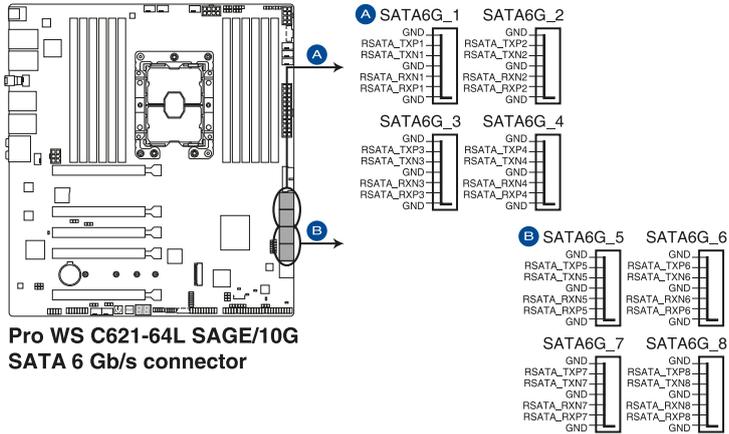
If you installed SATA storage devices, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® C621 chipset.

• The connectors are set to **[AHCI Mode]** by default. If you intend to create a SATA RAID set using these connectors, set the SATA Mode item in the BIOS to **[Intel RST Premium (RAID)]**.

• Before creating a RAID set, refer to the **RAID Configuration Guide**. You can download the **RAID Configuration Guide** from the ASUS website.

2.   **ASMedia® SATA 6 Gb/s connector**

The SATA 6Gb/s connector allows you to connect SATA devices such as optical disc drives and hard disk drives via a SATA cable.

SATA6G_E1   SATA6G_E2

GND   GND
RSATA_TXP1   RSATA_TXP2
RSATA_TXN1   RSATA_TXN2
GND   GND
RSATA_RXN1   RSATA_RXN2
RSATA_RXP1   RSATA_RXP2
GND   GND
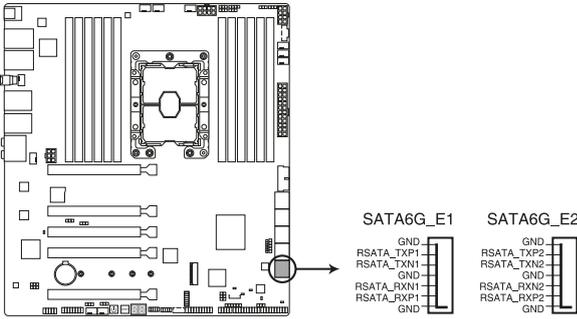
Pro WS C621-64L SAGE/10G ASMedia® SATA 6 Gb/s connector

3.   **Front Panel Audio connector**

The front panel audio 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.

AAFP

GND
PRESENCE#
SENSE1_RETUR
SENSE2_RETUR

PIN 1

PORT1L
PORT1R
PORT2R
SENSE_SEND
PORT2L

HD-audio-compliant
pin definition
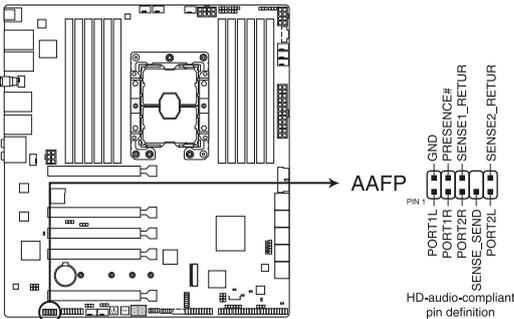
Pro WS C621-64L SAGE /10G Front Panel Audio connector

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. **Storage Add-on Card LED connector**

The Storage Add-on Card LED connector allows you to connect the storage device activity LED cable from a storage add-on card. The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device add-on card.

HDLED1

PIN 1

NC
ADD_IN_CARD-
ADD_IN_CARD-
NC
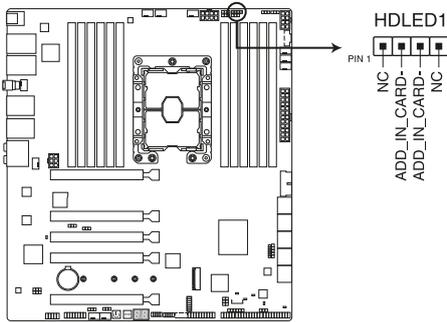
Pro WS C621-64L SAGE/10G Storage Add-on Card LED connector

Refer to section **Onboard LEDs** for the exact location of the **Storage Device Activity LED**.

5. **TPM connector**

The TPM connector allows you to connect a Trusted Platform Module (TPM). A TPM securely stores keys, digital certificates, passwords, data, and also helps enhance network security, protect digital identities, and ensures platform integrity.

TPM1

+3VSB — F_CLKRUN
S_PCIRST#_TBD — F_SERIRQ
— F_FRAME#
GND — F_LAD3
C_PCICLK_TPM — F_LAD2
PRSNT# — F_LAD1
+3V — F_LAD0
PIN 1
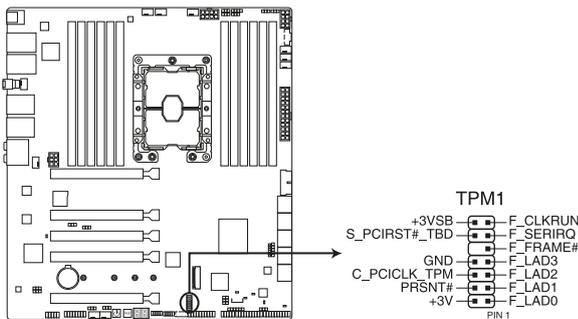
Pro WS C621-64L SAGE/10G TPM connector

The TPM is purchased separately.

6.   VGA connector

The VGA connector allows you to connect a VGA output interface.
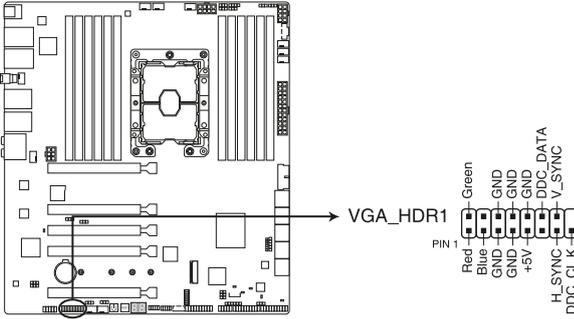
Pro WS C621-64L SAGE/10G VGA connector

7.   M.2 slot

The M.2 slot allows you to install M.2 devices such as M.2 SSD modules.
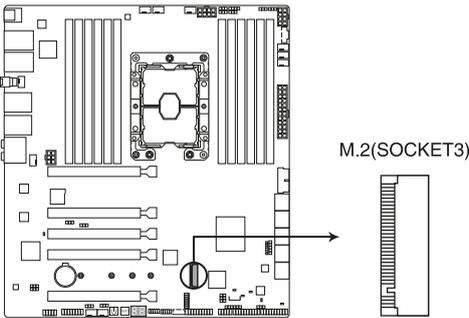
Pro WS C621-64L SAGE/10G M.2 slot

This connector supports type 22110 devices on both PCI-E and SATA interface.

The M.2 device is purchased separately.

8.   **VROC Key connector**

The VROC (Virtual Raid on CPU) Key connector allows you to connect a VROC hardware key to enable additional CPU RAID functions with Intel® CPU RSTe.
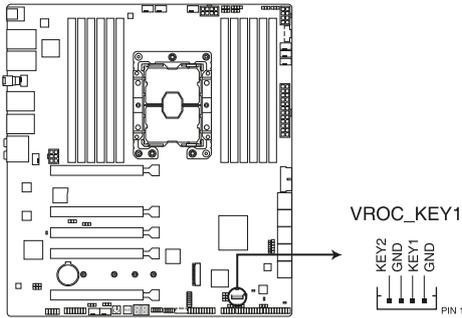
Pro WS C621-64L SAGE/10G VROC Key connector

> The VROC hardware key is purchased separately.

9.   **Serial Port connector**

The Serial (COM) Port connector allows you to connect a serial port module. Connect the serial port module cable to this connector, then install the module to a slot opening on the system chassis.
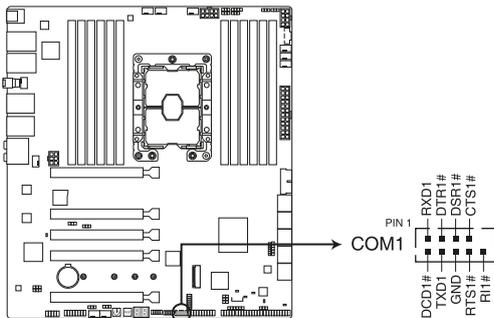
Pro WS C621-64L SAGE/10G Serial port connector

> The serial port module is purchased separately.

10. Power Supply SMBus connector

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

PSUSMB1

+3.3V
GND
I2C1ALT
I2C1SDA
I2C1SCL
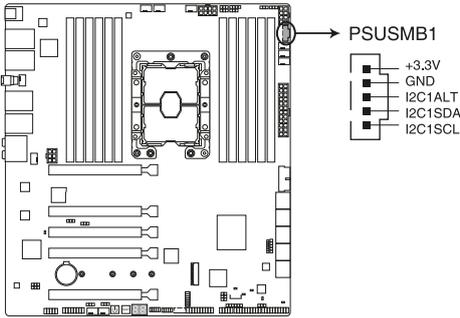
Pro WS C621-64L SAGE/10G Power Supply SMBus connector

11. USB 3.2 Gen 1 connector

The USB 3.2 Gen 1 connector allows you to connect a USB 3.2 Gen 1 module for additional USB 3.2 Gen 1 ports. The USB 3.2 Gen 1 connector provides data transfer speeds of up to 5 Gb/s.

U32G1_12

GND — IntA_P2_D+
IntA_P1_D+ — IntA_P2_D-
IntA_P1_D- — GND
GND — IntA_P2_SSTX+
IntA_P1_SSTX+ — IntA_P2_SSTX-
IntA_P1_SSTX- — GND
GND — IntA_P2_SSRX+
IntA_P1_SSRX+ — IntA_P2_SSRX-
IntA_P1_SSRX- — Vbus
Vbus —

PIN 1
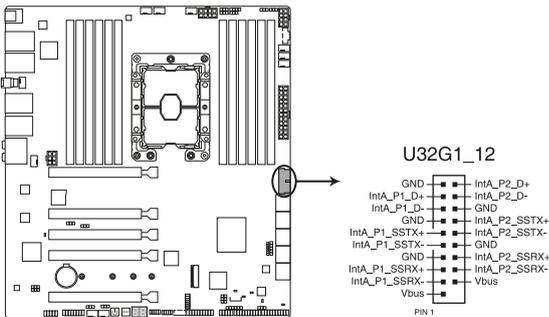
Pro WS C621-64L SAGE/10G USB 3.2 Gen 1 connector

The USB 3.2 Gen 1 module is purchased separately.

The plugged USB 3.2 Gen 1 device may run on xHCI or EHCI mode depending on the operating system's setting.

12. USB 2.0 connector

The USB 2.0 connector allows you to connect a USB module for additional USB 2.0 ports. The USB 2.0 connector provides data transfer speeds of up to 480 MB/s connection speed.
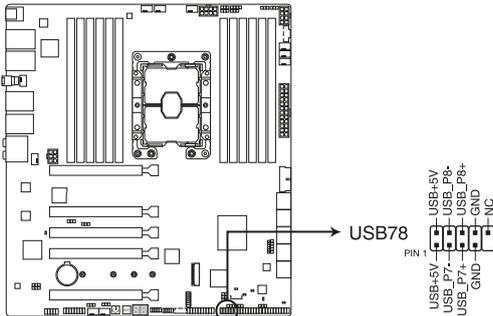
Pro WS C621-64L SAGE/10G USB 2.0 connector

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

The USB 2.0 module is purchased separately.

13. VPP_I2C1 connector

The VPP_I2C1 connector is used for the storage backplane with Intel VMD function and sensor readings.
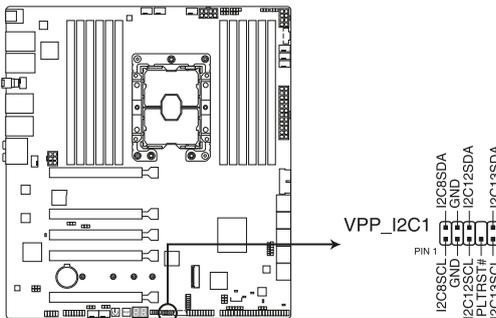
Pro WS C621-64L SAGE/10G VPP_I2C1 connector

14. Fan connector

The Fan connector allows you to connect fans to cool the system.

Pro WS C621-64L SAGE/10G Fan connectors

A CPU_FAN1 — GND, FAN Power, FAN Speed, PWM Control

B CPU_FAN2 — GND, FAN Power, FAN Speed, PWM Control

C REAR_FAN2 — GND, FAN Power, FAN Speed, PWM Control

D FRNT_FAN1 — GND, FAN Power, FAN Speed, PWM Control

E FRNT_FAN2 — GND, FAN Power, FAN Speed, PWM Control

F FRNT_FAN3 — GND, FAN Power, FAN Speed, PWM Control

G REAR_FAN1 — GND, FAN Power, FAN Speed, PWM Control

H FRNT_FAN6 — PWM Control, FAN Speed, FAN Power, GND

I FRNT_FAN5 — GND, FAN Power, FAN Speed, PWM Control

J FRNT_FAN4 — GND, FAN Power, FAN Speed, PWM Control

- • 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 the cable is fully inserted into the connector.

The fan connectors support a maximum of 1A (12W) fan power.

15. System Panel connector

The System Panel connector supports several chassis-mounted functions.
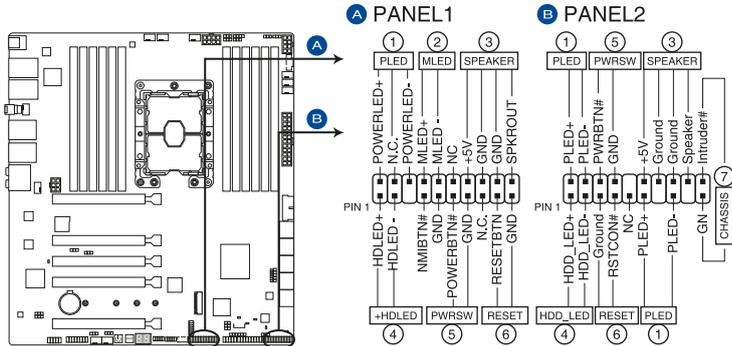
Pro WS C621-64L SAGE/10G System Panel connector

- **System Power LED connector (PLED)**
  The 2-pin and/or 3-1 pin connectors allow you to connect the System Power LED. The System Power LED lights up when the system is connected to a power source, or when you turn on the system power, and blinks when the system is in sleep mode.

- **Message LED (MLED)**
  The 2-pin connector allows you to connect the Message LED. The message LED is controlled by the hardware monitor to indicate an abnormal event occurrence.

- **Storage Device Activity LED connector (HDD_LED/HDLED)**
  The 2-pin connector allows you to connect the Storage Device Activity LED. The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.

- **System Warning Speaker connector (SPEAKER)**
  The 4-pin connector allows you to connect the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

- **Power Button/Soft-off Button connector (PWRSW)**
  The 3-1 pin connector allows you to connect the system power button. Press the power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).

- **Reset button connector (RESET)**
  The 2-pin connector allows you to connect the chassis-mounted reset button. Press the reset button to reboot the system.

- **Chassis intrusion connector (CHASSIS)**
  The 2-pin connector allows you to connect the chassis-mounted intrusion detection sensor or switch. The chassis intrusion sensor or switch sends a high-level signal to the connector when a chassis component is removed or replaced, the signal is then generated as a chassis intrusion event.

16. **Auxiliary Panel connector**

The Auxiliary Panel connector is for additional front or rear panel features.

AUX_PANEL1
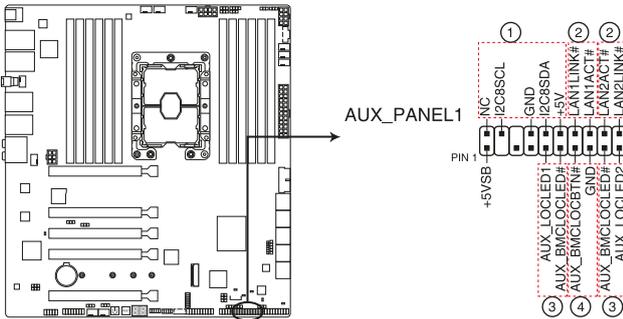
Pro WS C621-64L SAGE/10G Auxiliary Panel connector

- **Front panel SMB connector (FPSMB)**

  The 6-1 pin connector allows you to connect the front panel SMBus.

- **LAN activity LED connector (LAN1_LED, LAN2_LED)**

  The 2-pin connector allows you to connect the Gigabit LAN Activity LED.

- **Locator LED connector (LOCATORLED1, LOCATORLED2)**

  The 2-pin connector allows you to connect the Locator LED. The Location LED helps visually locate and identify the server in error on a server rack.

- **Locator button connector (LOCATORBTN)**

  The 2-pin connector allows you to connect the Locator button. Press the button to light up the Locator LED.

17. Power connectors

These Power connectors allow you to connect your motherboard to a power supply. The power supply plugs are designed to fit in only one orientation, find the proper orientation and push down firmly until the power supply plugs are fully inserted.

A EATX12V2

+12V DC
+12V DC
+12V DC
+12V DC

GND
GND
GND
GND

PIN 1

B EATX12V1

GND — +12V DC
GND — +12V DC
GND — +12V DC
GND — +12V DC

PIN 1

C EATX12V3

PIN 1

+12V DC — GND
+12V DC — GND
+12V DC — GND

D EATXPWR

+3 Volts — GND
+12 Volts — +5 Volts
+12 Volts — +5 Volts
+5V Standby — +5 Volts
Power OK — floating
GND — GND
+5 Volts — GND
GND — GND
+5 Volts — PSON#
GND — GND
+3 Volts — -12 Volts
+3 Volts — +3 Volts

PIN 1

Pro WS C621-64L SAGE/10G Power connectors
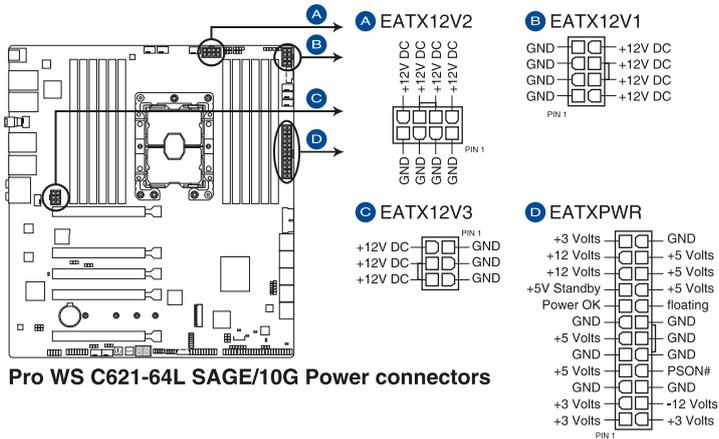
⚠️ • DO NOT connect the 6-pin power plug only, the motherboard may overheat under heavy usage.

• Ensure to connect both the EATX12V1 and EATX12V2 8-pin power plugs, or connect both the 8-pin and 6-pin power plugs.

✎ • For a fully configured system without additional add-on cards, we recommend that you use a power supply unit (PSU) that complies with ATX 12V Specification 2.0 (or later version) and provides a minimum power of 750 W.

• 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 2000W power or above with a 220V AC input to ensure the system stability.

• If you want to use two GPU cards, use a PSU with 1300W power or above to ensure the system stability.

19. **System Management Bus connector**

The System Management Bus (SMBus) connector allows you to connect SMBus devices. This connector is generally used for communication with the system and power management-related tasks.

SMBUS1

SCL
GND
SDA

CHIL_PROG

PIN 1
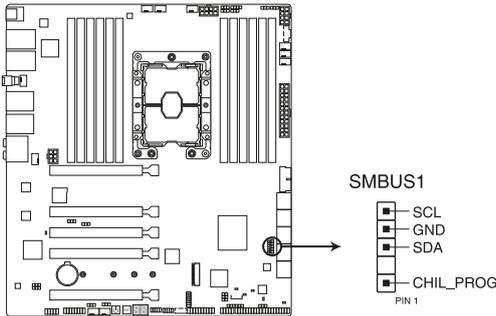
Pro WS C621-64L SAGE/10G System Management Bus connector

20. **Serial General Purpose Input/Output connector**

The Serial General Purpose Input/Output (SGPIO) connector allows you to connect the Intel Rapid Storage Technology Enterprise SGPIO interface. The SGPIO interface controls the LED pattern generation, device information, and general purpose data.

SGPIO1

SSATA_SCLK
SSATA_SLOAD
GND

SSATA_SDATAOUT1
SSATA_SDATAOUT0

PIN 1
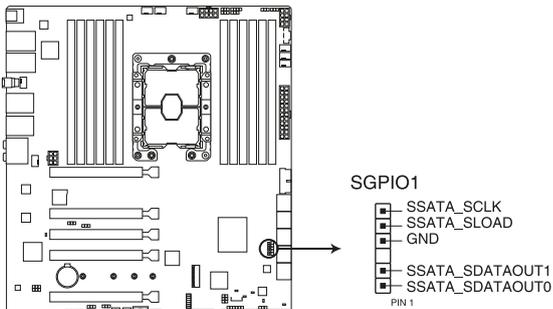
**Pro WS C621-64L SAGE/10G
Serial General Purpose Input/Output connector**

21. MicroSD card slot

The microSD card slot allows you to install a microSD memory card v2.00 (SDHC) / v3.00 (SDXC) to log BMC events.

MSD1
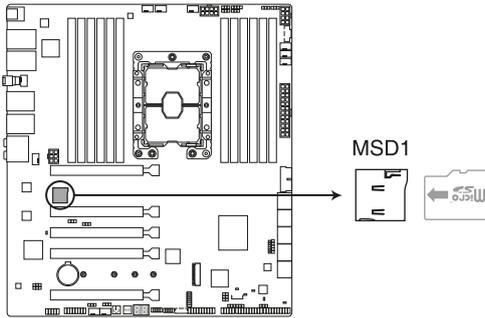
Pro WS C621-64L SAGE/10G MicroSD card slot

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

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

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

4

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.

4.1 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.

4.1.1 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.

4.1.2   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.

```
                        ASUS Tek. EzFlash Utility


            Current Platform                          New Platform
   Platform : Pro WS C621-64L SAGE/10G    Platform : Pro WS C621-64L SAGE/10G
   Version :   0101                       Version :   0202
   Build Date :04/14/2019                 Build Date :05/24/2019


   FS0            System Volume Information                    <DIR>
                  Pro-WS-C621-64L-SAGE-10G-ASUS-0202          <DIR>
                  Windows                                     <DIR>











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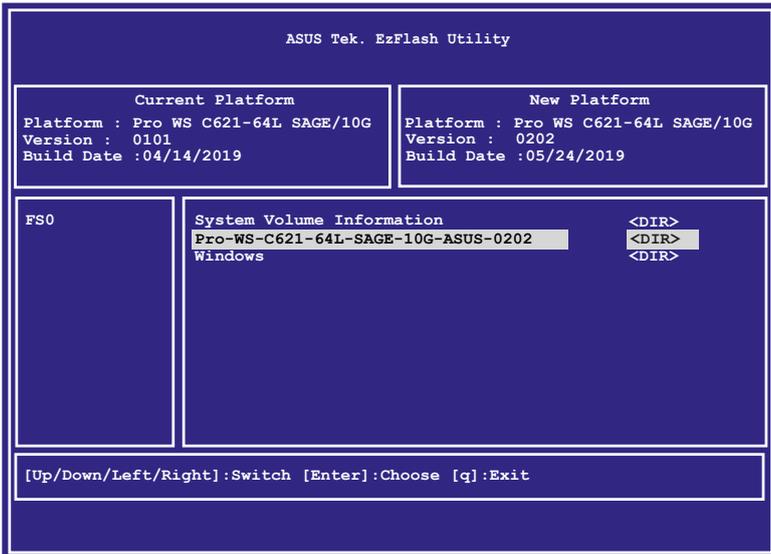
3.   Press <Tab> to switch to the **Drive** field.

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

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

6.   Press the Up/Down arrow keys to find the BIOS file 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.

4.1.3 BUPDATER utility

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

The BUPDATER utility allows you to update the BIOS file in 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.
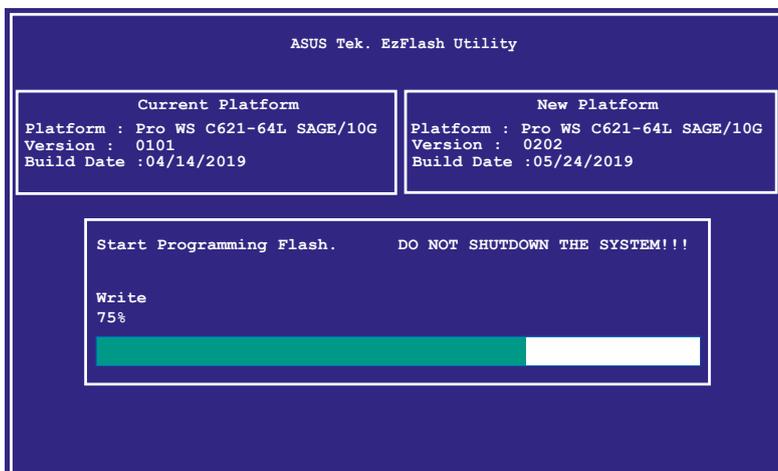
```
                        ASUS Tek. EzFlash Utility

              Current Platform                              New Platform
Platform : Pro WS C621-64L SAGE/10G        Platform : Pro WS C621-64L SAGE/10G
Version :  0101                            Version :   0202
Build Date :04/14/2019                     Build Date :05/24/2019


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


       Write
       75%
```

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

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

4.   Reboot the system from the hard disk drive.

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

    C:\>
```
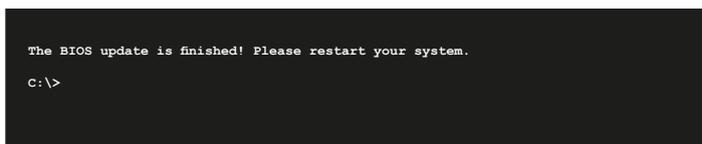
4.2   BIOS setup program

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

4.2.1   BIOS menu screen

Menu items   Menu bar   Configuration fields   General help

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

 BIOS Information                                           Set the Date. Use Tab to
 BIOS Vendor                   American Megatrends         switch between Date elements.
 Core Version                  5.14                        Default Ranges:
 Compliancy                    UEFI 2.7; PI 1.6            Year: 1998-9999
 Project Version               0101 x64                    Months: 1-12
 Build Date                    03/28/2019                  Days: Dependent on month
 BMC Firmware Revision         1.13                        Range of Years may vary.
 System Serial Number          System Serial Number
 RC Revision                   0571.D03

 Memory Information
 Total Memory                  16384 MB
 Memory Frequency              2400 MHz
                                                           ⏤⏤: Select Screen
 BIOS Sub Version              S19032850                   ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
 System Date                   [Mon 05/27/2019]            F1: General Help
 System Time                   [09:37:50]                  F2: Previous Values
                                                           F5: Optimized Defaults
 Access Level                  Administrator               F10: Save Changes & Reset
                                                           F12: Print Screen
                                                           ESC: Exit

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

Navigation keys

4.2.2   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.

4.2.3   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.

4.2.4   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>.

4.2.5   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.

4.2.6   General help

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

4.2.7   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.

4.2.8   Pop-up window

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

4.2.9   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.

4.3 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.

4.4 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 **Ai Overclocking Tuner** is set 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 **Ai Overclocking Tuner** is set to **[OC Tune]**.

OC Tune Level

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

4.5 Performance Tuning menu

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

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

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

Optimized Performance Setting [Default]

Allows you to select performance settings for different scenarios.

[Default]   Default settings.

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

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

Configuration options:

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

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

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

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

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

Core Optimizer [Disabled]

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

Linux support may vary by version of the OS.

Engine Boost [Disabled]

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

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

4.6 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.

Front Panel Type

This item allows you to set the front panel audio connector (AAFP) mode to legacy AC'97 or high-definition audio depending on the audio standard that the front panel audio module supports.

[HD Audio]   Sets the front panel audio connector (AAFP) mode to high definition
                 audio.
[AC97]   Sets the front panel audio connector (AAFP) mode to legacy AC'97

4.6.1 Trusted Computing

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

4.6.2 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)]

4.6.3 SMART Self Test

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

4.6.4   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;]

4.6.5   Serial Port Console Redirection

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

4.6.6   CPU Storage Configuration

The items in this menu allow you to configure CPU storage configurations.

4.6.7   Onboard LAN Configuration

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

The items in this menu may vary according to your motherboard.

Onboard X550 LAN Configuration

Intel LAN1 & LAN2 Enable

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

The following item appears only when you set **Intel LAN1 & LAN2 Enable** to **[Enabled]**.

Intel LAN1 ROM Type

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

Intel LAN2 ROM Type

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

4.6.8   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.

4.6.9   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]

4.6.10   USB Configuration

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

4.6.11   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]

4.6.12   NVMe Configuration

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

4.6.13   Offboard SATA Controller Configuration

Allows you to configure the offboard SATA controller configuration.

4.6.14   Audio Configuration

The items in this menu allow you to enable or disable the onboard audio.

4.6.15   ASMedia Storage Controller

The items in this menu allow you to configure ASMedia storage controller.

4.6.16   Network Stack Configuration

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

4.6.17   iSCSI Configuration

Allows you to configure the iSCSi parameters.

4.7   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.

4.7.1   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 **SATA Controller** is set 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]

4.7.2   Miscellaneous Configuration

Active Video

Allows you to select the video type.

Configuration options: [Onboard Device] [Offboard Device]

4.7.3   Workstation ME Configuration

The items in this menu allow you to configure workstation ME technology parameters.

4.7.4   Runtime Error Logging

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

4.8   Socket Configuration menu

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

4.8.1   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]

4.8.2   UPI Configuration

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

4.8.3   Memory Configuration

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

Memory Topology

Displays memory topology with DIMM population information.

4.8.4   IIO Configuration

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

4.8.5   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]

4.9　　Event Logs menu

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

4.9.1　　Change Smbios Event Log Settings

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

4.9.2　　View Smbios Event Log

Press <Enter> to view all smbios event logs.

4.10　　Server Mgmt menu

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

4.10.1　　System Event Log

Allows you to change the SEL event log configuration.

4.10.2　　BMC network configuration

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

4.10.3　　View System Event Log

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

4.11　　Monitor menu

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

4.12　　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.

4.13   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.

4.14   Tool menu

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

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

                                                     Press ENTER to run the utility
     Start EzFlash                                   to select and update BIOS.
```
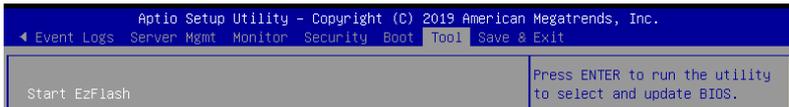
Start EzFlash

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

4.15   Save & Exit menu

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

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

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

        Restore Defaults

        Boot Override
        IBA XE Slot 0100 v2358
        IBA XE Slot 0101 v2358
```

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.

RAID Configuration

5

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

5.1   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 **5.2.1 Creating a RAID set** for details.

5.1.1   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.

5.1.2   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.

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

5.1.3   Setting the RAID item in BIOS

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

To do this:

1.   Enter the BIOS Setup during POST.

2.   Go to the **Platform Configuration** menu > **PCH Configuration** 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.

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

5.1.4   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.

5.2 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.

```
Intel(R) Rapid Storage Technology enterprise - SATA Option ROM - 3.6.0.1023
        Copyright(C) 2003-12 Intel Corporation.  All Rights Reserved.

================================[ MAIN MENU ]================================
        1. Create RAID Volume          3. Reset Disks to Non-RAID
        2. Delete RAID Volume          4. Exit


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

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




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

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

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

5.2.1 Creating a RAID set

To create a RAID set:

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

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

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

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


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



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

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

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

```
  ══════════════════════════════[ SELECT DISKS ]════════════════════════════

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

        Select 1 Master and 1 Recovery disk to create volume.

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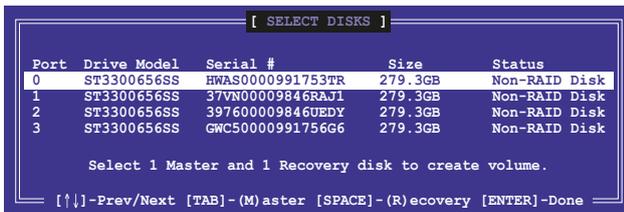
5. Use the up/down arrow keys to move the selection bar then press <Space> to select a disk. A small triangle before the Port number marks the selected drive. Press <Enter> when you are done.

6. Use the up/down arrow keys to select the stripe size for the RAID array (for RAID 0, 10 and 5 only) then press <Enter>. The available stripe size values range from 4 KB to 128 KB. The following are typical values:
RAID 0:   128KB
RAID 10:   64KB
RAID 5:   64KB

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

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

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

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

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

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

5.2.2 Deleting a RAID set

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

To delete a RAID set:

1. From the utility main menu, select **2. Delete RAID Volume** and press <Enter>.

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

```
     Intel(R) Rapid Storage Technology enterprise - SATA Option ROM - 3.6.0.1023
            Copyright(C) 2003-12 Intel Corporation.  All Rights Reserved.
    ========================= [ DELETE VOLUME MENU ] =========================
     Name          Level         Drives      Capacity      Status     Bootable
     Volume0       RAID0(Stripe)    2          298.0GB      Normal     Yes



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

              Deleting a volume will reset the disks to non-RAID

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



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

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

```
    ====================[ DELETE VOLUME VERIFICATION ]====================
                        ALL DATA IN THE VOLUME WILL BE LOST!
                       (This does not apply to Recovery volumes)

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

5.2.3 Resetting disks to Non-RAID

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

To reset a RAID set:

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

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

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

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

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

               Select the disks that should be reset.

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

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

5.2.4 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.

```
═══════════════════[ CONFIRM EXIT ]═══════════════════

            Are you sure you want to exit? (Y/N):

```

5.2.5 Rebuilding the RAID

This option is only for the RAID 1 set.

Rebuilding the RAID with other non-RAID disk

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

To rebuild the RAID with other non-RAID disk:

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

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

```
┌──────────────────[ DEGRADED VOLUME DETECTED ]──────────────────┐
│                                                                │
│ "Degraded" volume and disk available for rebuilding detected. Selectign│
│ a disk initiates a rebuild. Rebuild completes in the operating system.  │
│                                                                │
│   Select the port of destination disk for rebuilding (ESC to exit):    │
│   Port  Drive Model   Serial #              Size               │
│   X     XXXXXXXXXXX   XXXXXXXX              XXX.GB             │
│                                                                │
│                                                                │
│                                                                │
└════════════════[↑↓]-Previous/Next [ENTER]-Select [ESC]-Exit════════════┘
```

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

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

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


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

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




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

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

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

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

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

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

Rebuilding the RAID with a new hard disk

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

To rebuild the RAID with a new hard disk:

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

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

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

5.2.6 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>.

5.3   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.
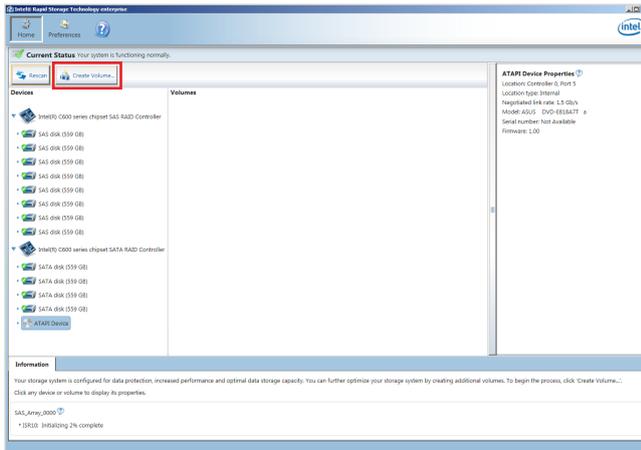
You can click **Rescan** to re-scan any attached hard disks.

5.3.1   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**.
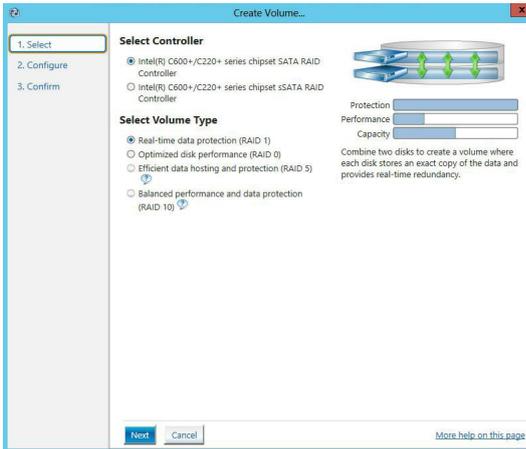
3.   Enter a name for the RAID set, then select the array disks.

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

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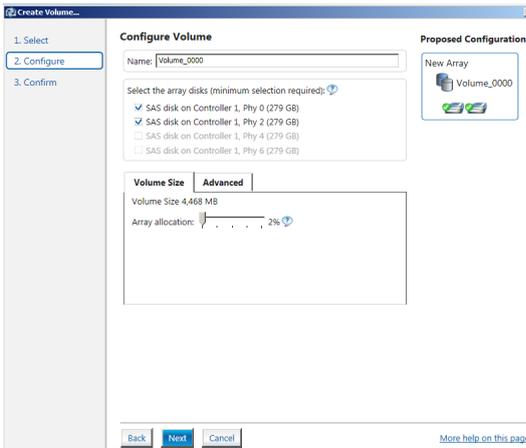
• If you do not want to keep the data on one of the selected disks, select NO when prompted.

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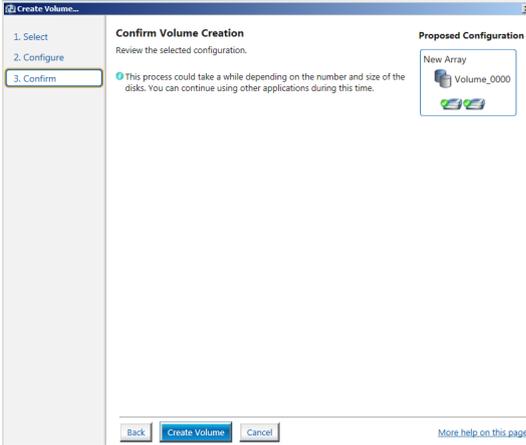
7.	Wait until the process is completed, then click **OK** when prompted.
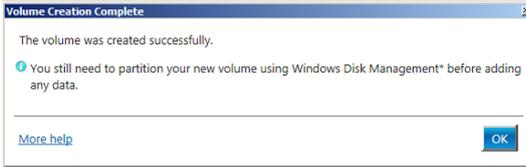
> You still need to partition your new volume using Windows Disk Management before adding any data.

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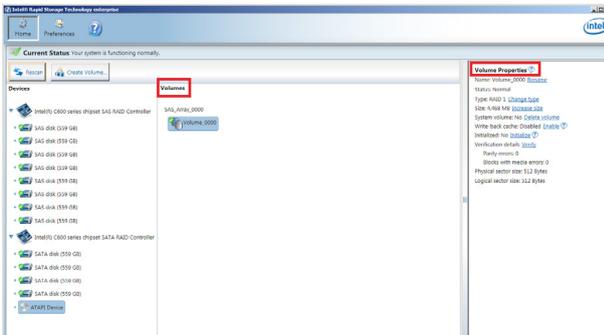
5.3.2 Changing a Volume Type

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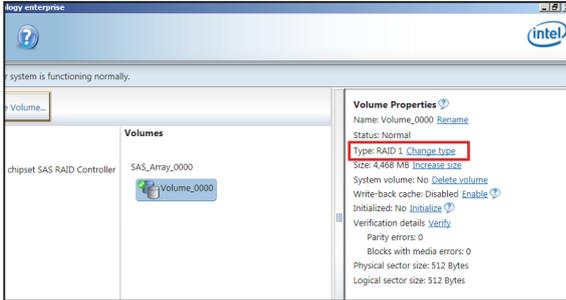
3. You can change the **Name**, **Select the new volume type**, and **Select additional disks to include in the new volume** if needed.

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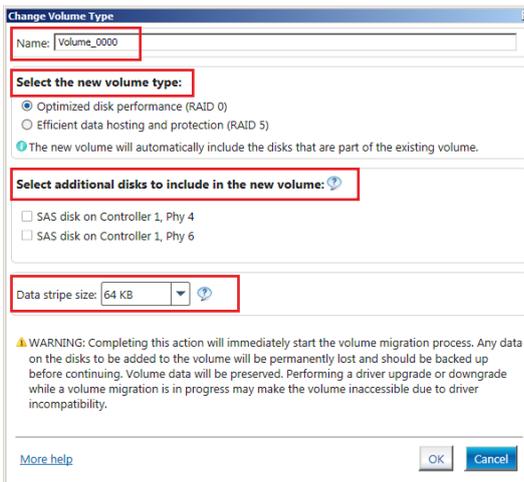
We recommend a lower stripe size for server systems, and a higher stripe size for multimedia computer systems used mainly for audio and video editing.

5.3.3   Deleting a volume

![warning icon] 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.
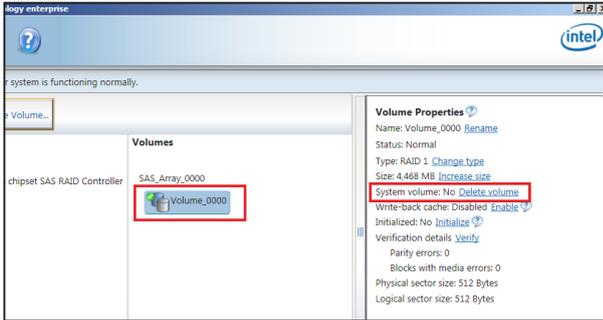
2.   Select **Delete volume** in **Volume Properties** field. The following screen appears.
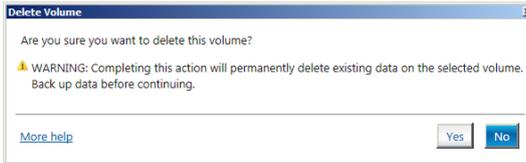
3.   Click **Yes** to delete the volume and return to the utility main menu, or click **No** to return to the main menu.

5.3.4   Preferences

System Preferences

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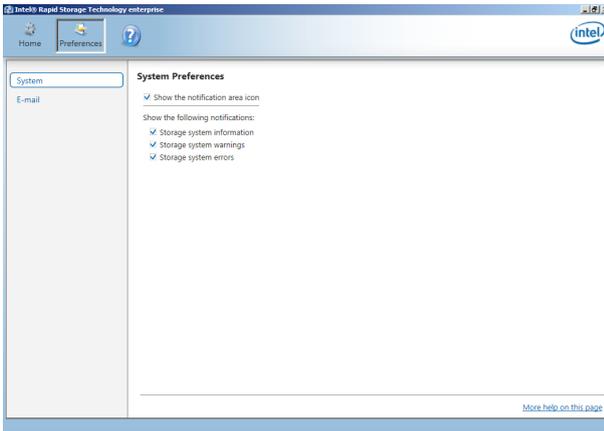
E-Mail Preferences

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

• Storage system information

• Storage system warnings

• Storage system errors
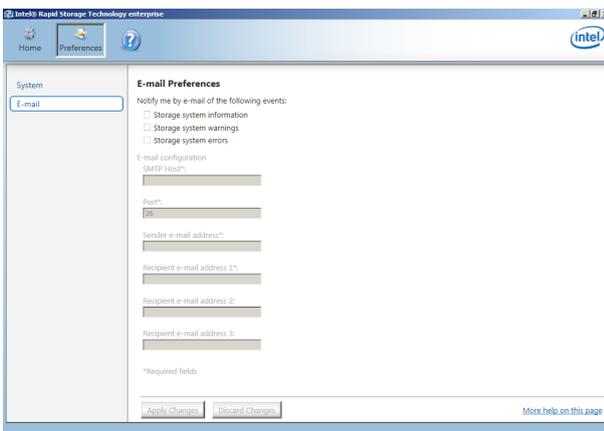
5.4 Intel® Virtual Raid on CPU in BIOS

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

> • The KEY module is purchased separately.
>
> • Due to chipset behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® SSD modules.
>
> • Refer to section **Internal connectors** for the location of the VROC_KEY1 connector.

> Due to hardware design, [PCIEX16_1], or [PCIEX16_2], or [PCIEX16_3], and [PCIEX16_4] can support CPU RAID configuration as OS drives, but OS RAID may not be built across the different [items] mentioned above.

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

1. Enter the BIOS Setup during POST.

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

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

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

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

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


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



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

5.4.1 Creating a RAID set

To create a RAID set:

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

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

    Create RAID Volume                                         Select RAID Level

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

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

2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.

3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.

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

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

6. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

    - RAID 0: 128 KB

    - RAID 10: 64 KB

    - RAID 5: 64 KB

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

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

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

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

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

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

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

5.4.2   Deleting a RAID set

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

To delete a RAID set:

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

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

   RAID VOLUME INFO

   Volume Actions
 ▶ Delete

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

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

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

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

 ▶ Yes
 ▶ No
```
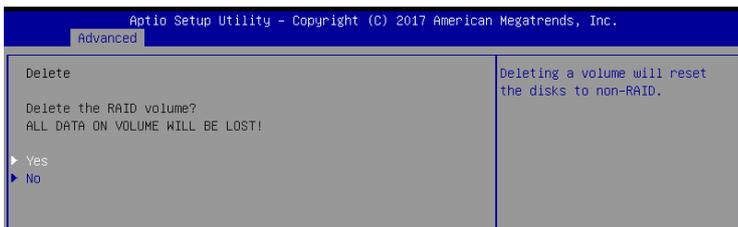
5.4.3   Installing the RAID controller driver during Windows® 10 OS installation

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)**.
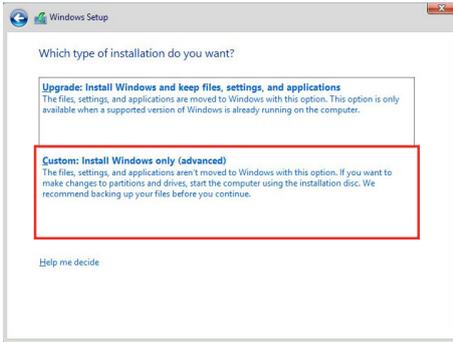
3.   Click **Load Driver**.
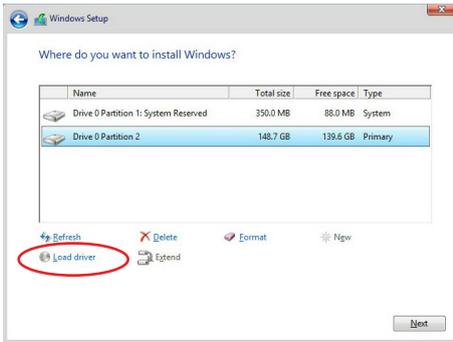
4.   A message appears, reminding you to insert the installation media containing the driver of the RAID controller driver. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive. Click **Browse** 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**.
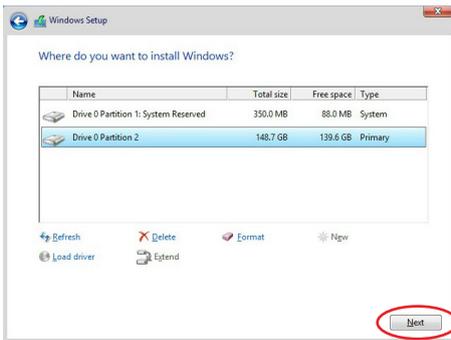
8.   Setup then proceeds with the OS installation. Follow screen instructions to continue.

Appendix

A

Pro WS C621-64L SAGE/10G block diagram

CPU 48 Lanes

| PCIE X16 Slot 1 | PCI-E 3.0X16 | PE1 |

| PCIE X16 Slot 2 X16 / X8 | PCI-E 3.0X8 |
| | PCI-E 8(H) |
| Q-SWITCH |
| PCI-E 8(L) |
| PCI-E 8(L) | PE2 |
| Q-SWITCH PCI-E 8(H) |
| PCIE X16 Slot 4 X0 / X8 | PCI-E 3.0X8 |

| PCIE X16 Slot 3 | PCI-E 3.0X16 | PE3 |

CPU 64 Lanes

PCIE X16 Slot 1	PCI-E 3.0X16	PE1
PCIE X16 Slot 2	PCI-E 3.0X16	PE2
PCIE X16 Slot 3	PCI-E 3.0X16	PE3
PCIE X16 Slot 4	PCI-E 3.0X16	PE4

CPU

Skylake-SP Processor

Up to 205W

Socket P0 (LGA3647)

| Channel A1/A2 | DDR4 AEP DIMM/RDIMM |
DDR4 1866/2133/2400/2667/2933
| Channel B1/B2 | DDR4 AEP DIMM/RDIMM |
DDR4 1866/2133/2400/2667/2933
| Channel C1/C2 | DDR4 AEP DIMM/RDIMM |
DDR4 1866/2133/2400/2667/2933
| Channel D1/D2 | DDR4 AEP DIMM/RDIMM |
DDR4 1866/2133/2400/2667/2933
| Channel E1/E2 | DDR4 AEP DIMM/RDIMM |
DDR4 1866/2133/2400/2667/2933
| Channel F1/F2 | DDR4 AEP DIMM/RDIMM |
DDR4 1866/2133/2400/2667/2933

DMI 3

Lewisburg

| M.2 (PCIE/SATA Mode) | PCIEx4 |
Q-SWITCH
PCIE X4 Slot (1BT)	PCIEx4
Back USB 3.1 A+C	USB 3.1	ASM3142	PCI-E 3.0X2
SATA III SATA [1~8]	SATA III x4
Fan * 9	FAN Control	H/W MONITOR NCT7904D	SMBUS
SATA III 2 ports	SATA III	ASM1062R	PCI-E 3.0X1
AI1315	SPI	SPI Flash 32Mbits	SPI

USB 3.0	USB 3.0 Back 2Port
USB 3.0	USB 3.0 Back 2Port
USB 3.0	USB 3.0 Front 2Port
USB 2.0	USB 2.0 Front 2Port
HDA	AUDIO ALC1220
PCI-E 3.0X4	Intel X550	10G Bade-T 2Ports

PCI-E 3.0X1

BMC ASPEED AST2500 4Gb/8Gb DDR4 SCRAM

LPC BUS

| Nuvoton NCT6793D Super IO | COM |

TPM

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

(continued on the next page)

Code	Description
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
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

(continued on the next page)

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

ACPI/ASL Checkpoints (under OS)

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

Notices

Federal Communications Commission Statement

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

• This device may not cause harmful interference, and

• This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class 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 manufacturer's 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.

Japan statement notice

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

Declaration of compliance for product environmental regulation

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

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

EU REACH and Article 33

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

EU RoHS

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

Japan JIS-C-0950 Material Declarations

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

India RoHS

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

Vietnam RoHS

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

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 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.

ENERGY STAR Qualified Product

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping us all save money and protect the environment through energy efficient products and practices.

All ASUS products with the ENERGY STAR logo comply with the ENERGY STAR standard, and the power management feature is enabled by default. The monitor is automatically set to sleep within 10 minutes of user inactivity; the computer is automatically set to sleep within 30 minutes of user inactivity. To wake your computer, click the mouse, press any key on the keyboard, or press the power button.

Please visit http://www.energystar.gov/powermanagement for detail information on power management and its benefits to the environment. In addition, please visit http://www.energystar.gov for detail information on the ENERGY STAR joint program.

Energy Star is NOT supported on FreeDOS and Linux-based operating systems.

EPEAT Registered Products

The public disclosure of key environmental information for ASUS EPEAT (Electronic Product Environmental Assessment Tool) registered products is available at https://csr.asus.com/english/article.aspx?id=41. More information about EPEAT program and purchase guidance can be found at www.epeat.net.

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Technical Support

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                       questionform/?lang=en-us

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                       questionform/?lang=cs-cz

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                   questionform/?lang=nl-nl

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                   questionform/?lang=pl-pl

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                   questionform/?lang=ru-ru