E900 G4

Workstation
User Guide

Contents

Contents

Contents

Contents

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.

CLASS 1 LASER PRODUCT

Heavy System

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

About this guide

Audience

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

Contents

This guide contains the following parts:

1. **Chapter 1: Product Introduction**

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

2. **Chapter 2: Hardware 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	E900 G4
Accessories	2 x CPU heatsinks
	1 x E900 G4 support DVD
	2 x AC power cable
	4 x GPU cables
Optional Items	DVD-ROM / DVD-RW
	Cooler kit for passive GPU

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

1.2   Serial number label

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

1.3   E900 G4 specifications summary

The ASUS E900 G4 is a workstation featuring the ASUS WS C621E SAGE motherboard.

Processor / System Bus		2 x Socket P0 (LGA 3647, Square)
		1st Gen Intel® Xeon® Scalable Processor family (up to 205W)*
		2nd Gen Intel® Xeon® Scalable Processor family (up to 205W)*
		2 UPI up to 10.4 GT/s
		* Refer to www.asus.com for Intel® CPU support list.
Core Logic		Intel® C621 Chipset
Memory	**Total Slots**	12 (6-channel per CPU, 6 DIMM per CPU)
	Capacity	Maximum up to 1536GB
	Memory Type	DDR4 2933 (1 DIMM per Channel)
		DDR4 2666/2400/2133 RDIMM/LR-DIMM/LR-DIMM 3DS
		* 2933MHz will drop to 2666MHz when using 2DPC configurations.
	Memory Size	32GB, 16GB, 8GB, 4GB (RDIMM)
		64GB, 32GB (LRDIMM)
		128GB, 64GB (LRDIMM 3DS)
		* Refer to www.asus.com/support for more information
		** Actual memory frequency differs from Intel CPU types and memory module. Please check Intel® official site for more detail about the memory types supported by each CPU.
Expansion Slots	**Total PCI/PCI-X /PCI-E Slots**	7
	Slot Type	2 x PCIe 3.0 x16 slots (Gen3 x16 link), FH, FL
		2 x PCIe 3.0 x16 slots (single Gen3 x16 link, dual Gen3 x8/x8 link), FH, FL
		2 x PCIe 3.0 x16 slots (Gen3 x8 link), FH, FL
		1 x PCIe 3.0 x16 slot (Gen3 x16 link), FH, FL
	Micro SD Card Slot	1*
		* This is only supported when the ASMB9 card is installed.
Disk Controller	**SATA Controller**	**Intel® Lewisburg PCH**
		- 8 x SATA 6Gb/s ports (gray)
		Intel® RSTe (for Windows and Linux; Support software RAID 0, 1, 10 & 5)
		ASMedia® SATA RAID Controller*
		- 2 x SATA 6Gb/s ports
	SAS Controller	Optional kits:
		ASUS PIKE II 3008 8-port SAS HBA card
		ASUS PIKE II 3108 8-port SAS HW RAID card 12G SAS Support

(continued on the next page)

E900 G4 specifications summary

Storage Bays		8 x 3.5"/2.5" Hot-swap Storage Bays (4 x 3.5" SATA HDD + 4 x 2.5" SAS HDD with PIKE card)
		1 x M.2 Socket 3, supporting type 22110/2280/2260/2242 (PCIe Gen3 x4 and SATA mode)
		4 x U.2 connector (optional kit for NVMe support)*
		* Supports Intel® Virtual RAID on Chip (Intel® VROC).
		* NVMe RAID type and function will depend on Intel® VROC HW key installed. Intel® VROC HW key is purchased separately.
Networking	**LAN**	2 x Intel® i210-AT Gigabit LAN Controller
Graphic	**VGA**	Aspeed AST2500 64MB (optional)
Audio		Realtek® ALC S1220A 8-Channel High Definition Audio CODEC
Auxiliary Storage Device Bay (Floppy / Optical Drive)		2 x 5.25" media bays
		(Options: DVD-ROM/DVD-RW)
Front I/O		1 x Headphone jack
		1 x Microphone jack
		4 x USB 3.1 Gen 1 ports
Rear I/O		4 x USB 3.1 Gen 1 ports
		2 x USB 3.1 Gen 2 ports (1 x Type-A and 1 x Type-C™)
		2 x USB 2.0 ports (1 x supports USB BIOS Flashback)
		1 x USB BIOS Flashback button
		1 x PS/2 and keyboard mouse port
		2 x RJ-45 LAN ports
		1 x Optical S/PDIF Out port
		5 x Audio Jacks
Switch/LED		**Front Switch/LED:**
		1 x Power switch / LED
		1 x Reset switch
		1 x HDD Access LED
Other Options		Cooler kit for passive GPU support
OS Support		Windows® 10
		* Refer to http://www.asus.com/ for the latest OS support.
Management Solution	**Software**	ASUS Control Center support
	Out of Band Remote Management	ASMB9 Card

(continued on the next page)

E900 G4 specifications summary
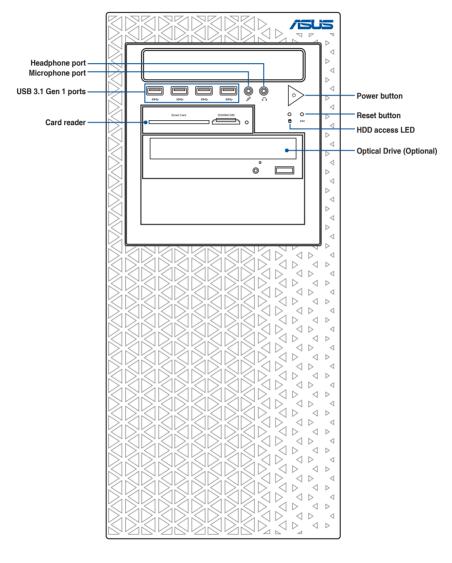
Dimension (HH x WW x DD)	532 mm x 243 mm x 582 mm (21.0" x 9.5" x 22.9")
Net Weight Kg (CPU, DRAM & HDD not inclu ded)	18.33kg
Power Supply and Rating	Dual 2000W Titanium, CRPS (1+1 Redundant) Rating: 100-127/200-240Vac, 9.5A (x2), 50-60Hz, Class 1 or 2000W Platinum ATX Power Supply Rating: 100-240Vac, 15-12A, 50-60Hz
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 E900 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.
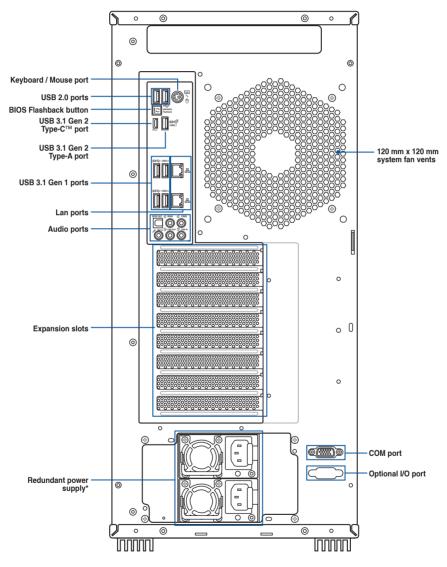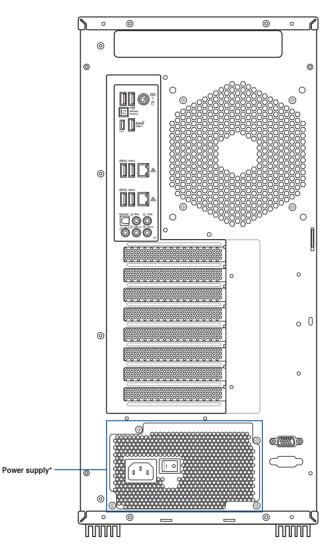
Refer to the Front panel LEDs section for the LED descriptions.

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.
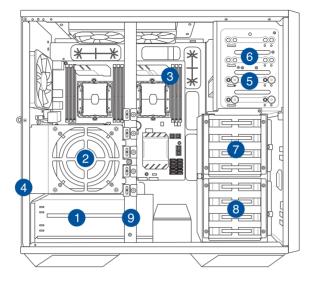
Keyboard / Mouse port

USB 2.0 ports

BIOS Flashback button

USB 3.1 Gen 2 Type-C™ port

USB 3.1 Gen 2 Type-A port

USB 3.1 Gen 1 ports

Lan ports

Audio ports

Expansion slots

Redundant power supply*

120 mm x 120 mm system fan vents

COM port

Optional I/O port

* The power supply unit may vary between models

Power supply*

* The power supply unit may vary between models

1.6 Internal features

The ASUS E900 G4 Pedestal server system includes the basic components as shown:

1. Power supply unit

2. GPU fan

3. ASUS WS C621E SAGE motherboard

4. Expansion card locks (hidden)

5. Optical drive (Optional)

6. Front I/O board (hidden)

7. Storage device bay (Top)

8. Storage device bay (Bottom)

9. GPU bar

Turn off the system power and detach the power supply before removing or replacing any system component.
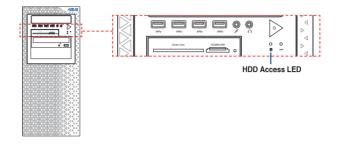
The barebone server does not include a floppy disk drive. If you need to use a floppy disk, connect the USB floppy disk drive to any of the USB ports on the front or rear panel.

WARNING
HAZARDOUS MOVING PARTS
KEEP FINGERS AND OTHER BODY PARTS AWAY
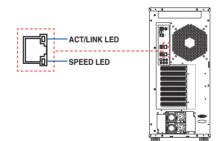
1.7 LED information

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	10 Mbps connection
YELLOW	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection
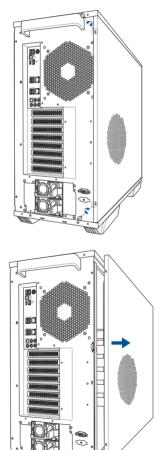
2

Hardware Setup

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.
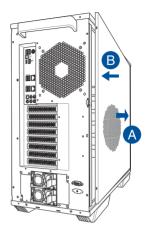
> Be careful not to apply pressure to the air vent on the side cover to avoid damages to the system.
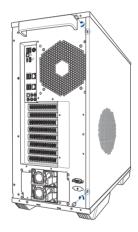
3. Repeat steps 1 and 2 to remove the other side cover.

2.1.2   Replacing the side covers

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

2.   Replace the two (2) removed
       previously to secure the side cover to
       the chassis.
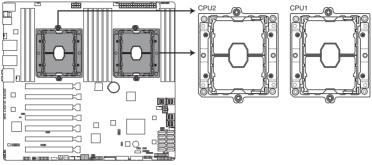
3.   Repeat steps 1 and 2 to replace the other side cover.

2.2   CPU installation

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

WS C621E SAGE 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.
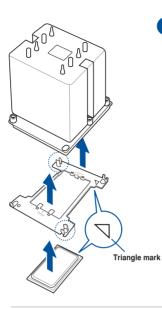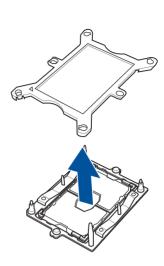
- Ensure that all power cables are unplugged before installing the CPU.

- 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.

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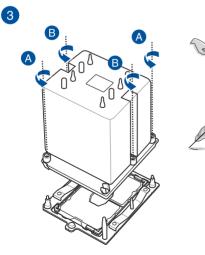
Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.

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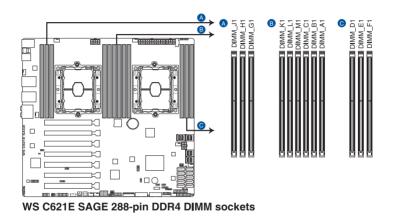
The heatsink screws are T30 models. A torque value of 12 inch-lbf is recommended.

2.3 System memory

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

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

WS C621E SAGE 288-pin DDR4 DIMM sockets

Memory configurations

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

- For system stability, use a more efficient memory cooling system to support a full memory load (12 DIMMs) or overclocking condition.

- Always install the DIMMS with the same CAS Latency. For an optimum compatibility, we recommend that you install memory modules of the same version or data code (D/C) from the same vendor. Check with the vendor to get the correct memory modules.

- The DIMMs are purchased separately.

- Visit the ASUS website for the latest QVL.

Single CPU configuration

You can refer to the following recommended memory population for a single CPU configuration.
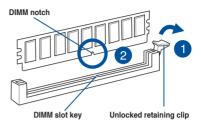
Single CPU configuration (must be installed on CPU1)						
	A1	B1	C1	D1	E1	F1
1 DIMM	✓	-	-	-	-	-
2 DIMMs	✓	✓	-	-	-	-
4 DIMMs	✓	✓	-	✓	✓	-
6 DIMMs	✓	✓	✓	✓	✓	✓

Dual CPU configuration

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

Dual CPU configuration												
	A1	B1	C1	D1	E1	F1	G1	H1	J1	K1	L1	M1
2 DIMMs	✓	-	-	-	-	-	✓	-	-	-	-	-
4 DIMMs	✓	✓	-	-	-	-	✓	✓	-	-	-	-
6 DIMMs	✓	✓	✓	-	-	-	✓	✓	✓	-	-	-
8 DIMMs	✓	✓	-	✓	✓	-	✓	✓	-	✓	✓	-
12 DIMMs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
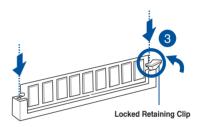
2.3.1   Installing a DIMM on a single clip DIMM socket

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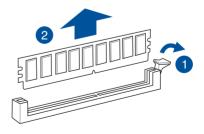
Always insert the DIMM into the socket vertically to prevent DIMM notch damage.

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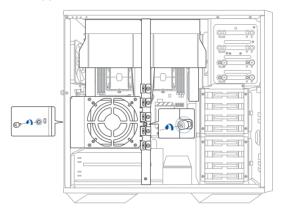
⚠️ Ensure to unplug the power cable before installing or removing any system components. Failure to do so may cause damage to the motherboard and other system components!
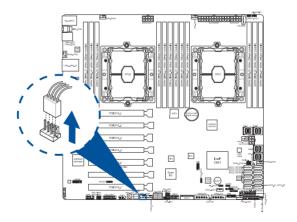
2.4.1 Removing the air duct

To remove the air duct:
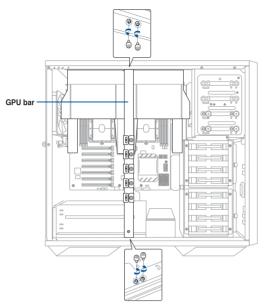
1. Remove the two (2) screws from the fan.
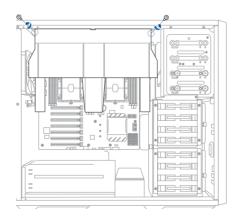
2. Remove the fan connector from the **FRNT_FAN3** connector on the motherboard.

3. Remove the four (4) screws from the GPU bar then remove the GPU bar and place it aside.

4. 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.
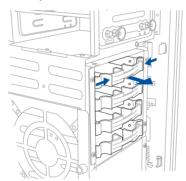
> • Support for the optional four (4) NVME is optional and is purchased separately.
>
> • The storage devices are purchased separately.
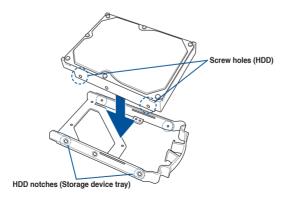
Installing 3.5-inch storage devices

To install 3.5-inch storage devices:
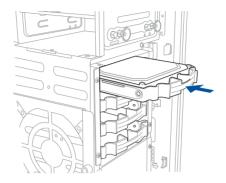
1. Remove the side cover of the chassis. Refer to the **Removing the side cover** section for more information.

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.
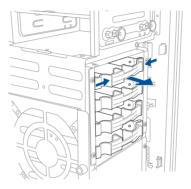
7.	Repeat steps 2 to 6 to install other 3.5" storage devices.

Installing 2.5-inch storage devices

To install 2.5-inch storage devices:
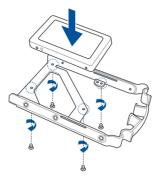
1. Remove the side cover of the chassis. Refer to the **Removing the side cover** section for more information.

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.
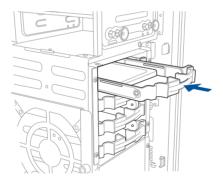
4. Carefully push the storage device tray lock pin out of the tray using a suitable tool. Please refer to the illustration below for the location of the storage device tray lock pin.

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.
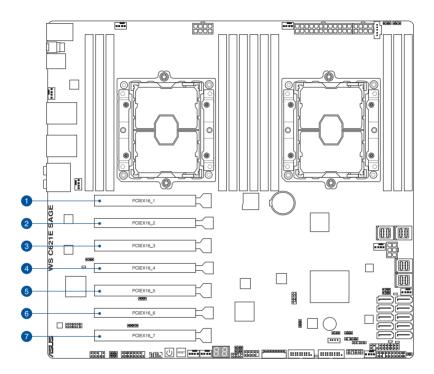
8.   Repeat steps 2 to 7 to install other 2.5" storage devices.

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.
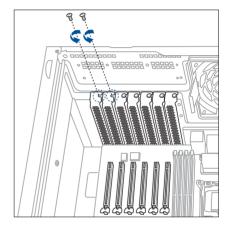
Slot No.	Slot Description
1	PCIe x16_1 slot
2	PCIe x16_2 slot (max. at x8 mode)
3	PCIe x16_3 slot
4	PCIe x16_4 slot (max. at x8 mode)
5	PCIe x16_5 slot
6	PCIe x16_6 slot (max. at x8 mode)
7	PCIe x16_7 slot

2.6.1   Installing an expansion card
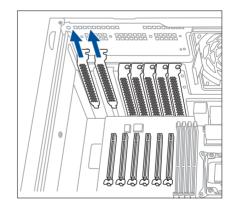
The expansion cards, such as GPU cards are purchased separately
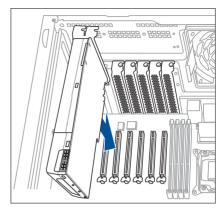
1.   Before installing the expansion card, read the documentation that came with it and make the necessary hardware settings for the card.

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.
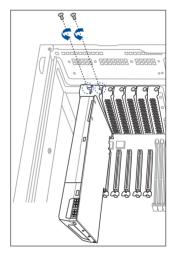
5.   Remove the metal slot cover.
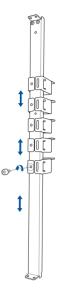
6. Align the card's golden fingers with the slot, and then press firmly until the card is completely seated on the slot.
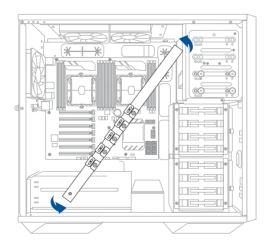
7. Secure the expansion card with the screw(s) that you removed earlier in step 4.
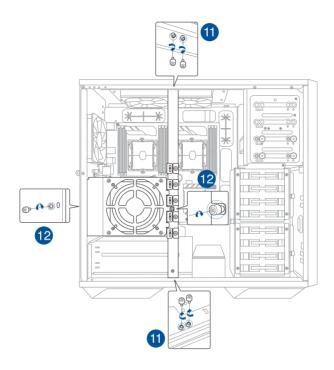
8. Remove the screws of the VGA supports on the GPU bar so that you can adjust it to match the position of the installed expansion card. Ensure that there is a support on either side of the expansion card, then replace the screws removed previously.
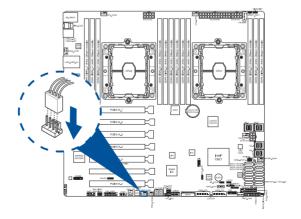
9. Position the GPU bar in a diagonal position, then place it into the system chassis.

10. Rotate and adjust the GPU bar in an anti-clockwise direction until the supports adjusted in step 8 fit in between the expansion card(s).

11. Secure the GPU bar using the four (4) screws removed previously.

12. Secure the fan to the GPU bar and chassis using the two (2) screws removed previously.

13. Connect the fan connector to the **FRNT_FAN3** connector on the motherboard.

2.6.2   Configuring an expansion card

PCI Express 3.0 operating mode				
Slot No.	Single VGA	2-way SLI® / CrossFireX™	3-way SLI® / CrossFireX™	4-way SLI® / CrossFireX™
1	-	-	x16	x16
2	-	-	-	-
3	x16 (single VGA recommended)	x16	x16	x16
4	-	-	-	-
5	-	x16	x16	x16
6	-	-	-	-
7	-	-	-	x16
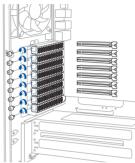
We recommend that you provide sufficient power when running CrossFireX™ or SLI® mode.

2.6.3   (optional) Installing a passive graphics card

⚠️ Unplug the power cord before installing or removing an expansion card. Failure to do so may cause severe damage to the motherboard and other system components!

1.   Remove the GPU bar and air duct from the chassis, please refer to section **Air Duct** for more details.

2.   Release the screws on the metal slot cover for all the metal covers, then remove all the metal slot covers.

3.   Install the bundled closed metal slot covers into the slots you do not wish to install your passive graphics card in.
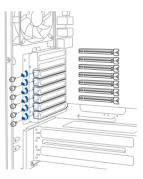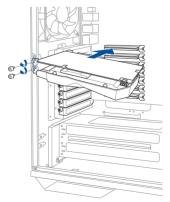
✎ The closed metal slots are bundled with the optional passive fan module.

4   Install your passive graphics card into the reserved empty expansion slot(s), then secure it using the screws removed earlier.

✎ The passive graphics card is purchased separately.

5.   Remove the metal cover of the passive fan
      module cable slot.

⚠️   Take extra care when removing the
      metal cover. Use tools such as a screw
      driver to bend and remove the metal
      cover to avoid physical injury.
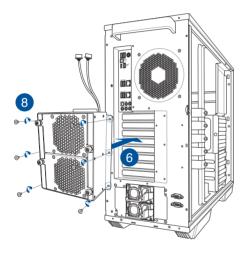
6.   Align the passive fan module to the screw holes around the expansion slots.
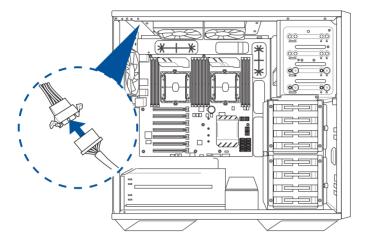
📝   The passive fan module is optional.

7.   Thread the passive fan module cables through the passive fan module cable slot.

8.   Secure the passive fan module to the chassis using the bundled screws.
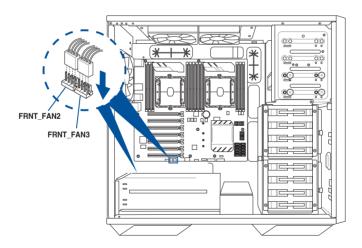
9.	Connect the passive fan module cables to the cables located inside the chassis.

10.	Connect the fan cables located near the bottom of the motherboard to the **FRNT_FAN2** and **FRNT_FAN3** connectors on the motherboard.

Ensure to remove all other cables on the **FRNT_FAN2** and **FRNT_FAN3** connectors before conencting the fan cables.

FRNT_FAN2

FRNT_FAN3

2.6.4 Installing a PIKE II card
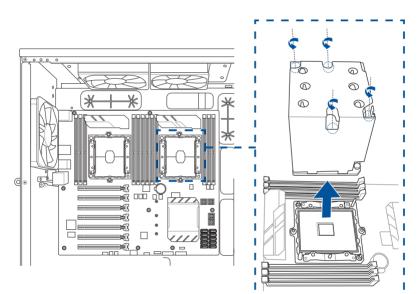
Unplug the power cord before installing or removing an expansion card. Failure to do so may cause severe damage to the motherboard and other system components!
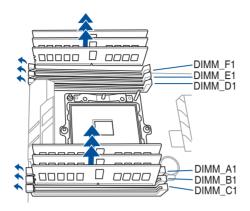
1. Remove the GPU bar and air duct from the chassis, please refer to section **Air Duct** for more details.

2. Loosen the heatsink screws in the order shown, then lift and remove the CPU and heatsink.
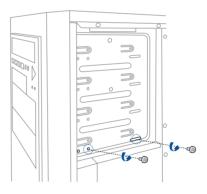
The heatsink screws are T30 models. A torque value of 12 inch-lbf is recommended.
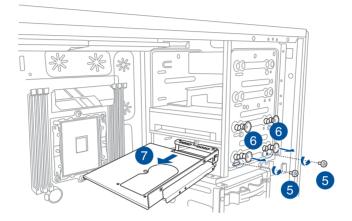
3. Remove the DIMMs from the DIMM slots A1-F1.

DIMM_F1
DIMM_E1
DIMM_D1

DIMM_A1
DIMM_B1
DIMM_C1
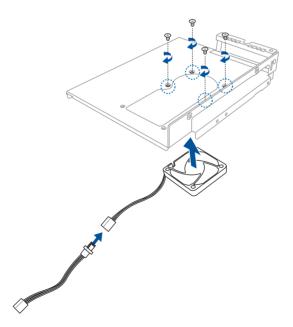
4. Remove the two (2) bay screws securing the riser card tray from the right side of the system.
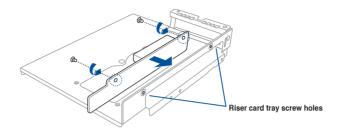
5. Remove the other two (2) bay screws securing the riser card tray from the left side of the system.

6. Pull the 5.25-inch bay locks outwards.

7. Remove the riser card tray from the 5.25-inch bay.
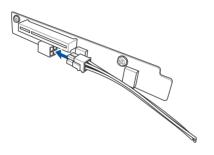
8. Attach the riser card tray fan to the riser card tray and secure it with the bundled four (4) screws, then connect the extension cable.
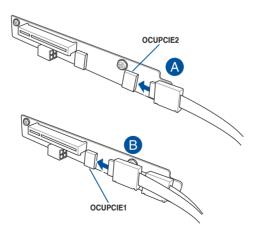
9. Align the riser card with the screw holes on the riser card tray, then secure the riser card to the tray using the bundled two (2) screws.

Riser card tray screw holes
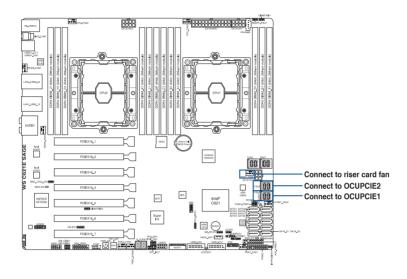
10. Connect the bundled power cable to the 4-pin power connector on the riser card.
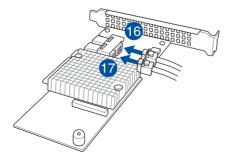
11. Connect two (2) OCuLink cables to the riser card.

OCUPCIE2

A

B

OCUPCIE1
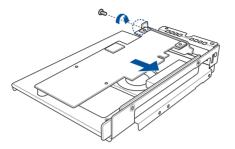
12. Connect the OCuLink cables to the motherboard. Ensure to connect the cable connected to **OCUPCIE1** to the **U.2_4** connector on your motherboard, and the cable connected to **OCUPCIE2** to the **U.2_3** connector on your motherboard.

13. Connect the fan extension cable to the **FRNT_FAN5** connector on your motherboard.

Connect to riser card fan
Connect to OCUPCIE2
Connect to OCUPCIE1
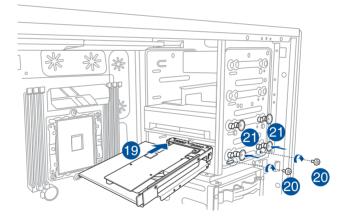
14. Connect the power cable to a 4-pin molex connector from the power supply unit.

15. Prepare your PIKE II card.

16. Connect a Mini SAS HD cable to the Mini SAS HD connector closest to the metal frame on your PIKE II card for the four (4) top storage bays.

17. Connect a Mini SAS HD cable to the other Mini SAS HD connector for the four (4) bottom storage bays.
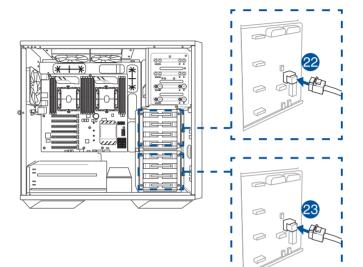
18.	Install the PIKE II card to the riser card, then secure it with a screw.

19.	Install the riser card and tray into the 5.25-inch bay.

20.	Ensure the screw holes on the riser card tray are aligned with the bay screw holes, then replace the two (2) screws removed from before.

21.	Push the bay lock inwards to secure the riser card tray.

22. Connect the Mini SAS HD cable from step 16 to the **MSAS_HD1** connector on the *top back plane*. The top back plane is located on the reverse side of the illustration below.

23. Connect the Mini SAS HD cable from step 17 to the **MSAS_HD1** connector on the *bottom back plane*. The bottom back plane is located on the reverse side of the illustration below.
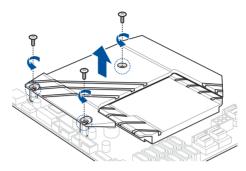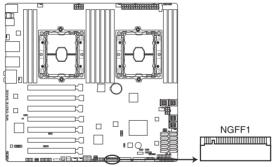
2.6.5   Installing M.2 (NGFF) cards

To install an M.2 card:

1.   Remove the three (3) screws from the M.2 heatsink on your motherboard, then lift and remove the M.2 heatsink.
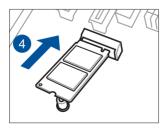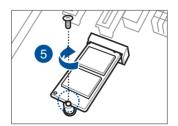
2.   Locate the M.2 connector (NGFF1) on the motherboard.

NGFF1
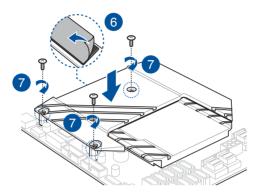
WS C621E SAGE NGFF1 connector

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

4.   Align and insert the M.2 card into the M.2 slot.

5.   Secure the M.2 card with the screw that you removed earlier in step 2.

6. Peel off the plastic film on the thermal pad located on the bottom side of the M.2 heatsink.

7. Replace the M.2 heatsink and secure it with the three (3) screws removed earlier.
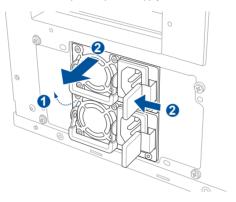
2.7 Removable components

You may need to remove previously installed system components when installing or removing system devices, or when you need to replace defective components. This section tells how to remove the Redundant power supply module.
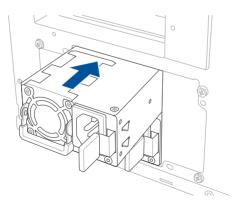
2.7.1 Redundant power supply module

To install the redundant power supply module:

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

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

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

2.8 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 **WSC621ES.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 port

USB BIOS
Flashback button

6.   Wait until the light goes out, indicating that the BIOS updating process is completed.
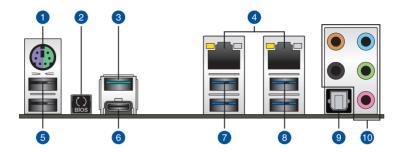
> For more BIOS update utilities in BIOS setup, refer to the section **4.1 Managing and updating your BIOS** in Chapter 4.

> •   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.

2.9 Motherboard rear and audio connection

2.9.1 Rear I/O connection

Rear panel connectors	
1.	PS/2 and keyboard Mouse port
2.	USB BIOS Flashback button
3.	USB 3.1 Gen 2 Type-A port EA2
4.	LAN (RJ-45) ports 1, 2* (Shared LAN is only supported when ASMB9 Card is installed)
5.	USB 2.0 ports 9, 10. Lower port supports USB BIOS Flashback function.
6.	USB 3.1 Gen 2 Type-C™ port EC1
7.	USB 3.1 Gen 1 ports 3, 4
8.	USB 3.1 Gen 1 ports 1, 2
9.	Optical S/PDIF OUT port
10.	Audio I/O ports**

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

- USB 3.1 Gen 1 / Gen 2 devices can only be used as data storage only.

- We strongly recommend that you connect your devices to ports with matching data transfer rate. Please connect your USB 3.1 Gen 1 devices to USB 3.1 Gen 1 ports and your USB 3.1 Gen 2 devices to USB 3.1 Gen 2 ports for faster and better performance for your devices.

* LAN ports LED indications

Activity Link LED		Speed LED	
Status	Description	Status	Description
Off	No link	Off	10 Mbps connection
Orange	Linked	Orange	100 Mbps connection
Orange (Blinking)	Data activity	Green	1 Gbps connection
Orange (Blinking then steady)	Ready to wake up from S5 mode		

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

2.9.2   Audio I/O connections

Audio I/O ports

orange

black

light blue

lime

pink
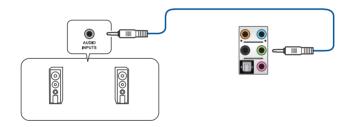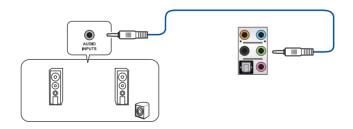
Connect to Headphone and Mic
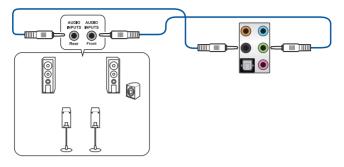
Connect to Stereo Speakers
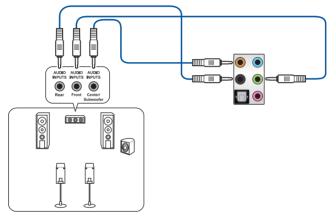
Connect to 2-channel Speakers
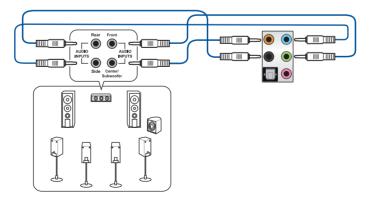
Connect to 4-channel Speakers

Connect to 5.1-channel Speakers

Connect to 7.1-channel Speakers

2.10   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.

2.11   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.
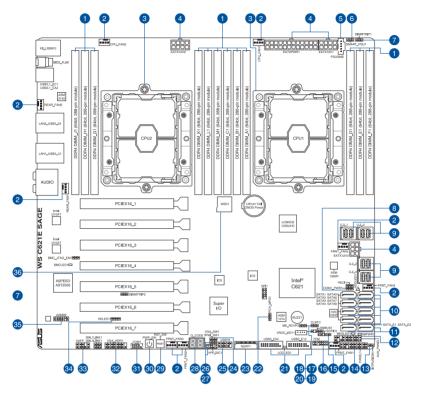
Motherboard Information

3

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

3.1 Motherboard layout

Refer to **3.5 Internal connectors** and **2.10.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

Layout contents
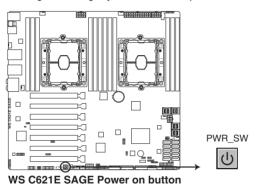
Connectors/Jumpers/Buttons and switches/Slots	Page
1. DDR4 DIMM slots	2-6
2. Fan connectors (4-pin CPU_FAN1-2; 4-pin FRNT_FAN1-5; 4-pin REAR_ FAN1-2)	3-20
3. LGA3647 CPU socket	2-4
4. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V1; 8-pin EATX12V2; 6-pin EATX12V3)	3-23
5. Power Supply SMBus connector (5-pin PSUSMB)	3-24
6. PMBus 1.2 PSU select jumper (3-pin SMART_PSU1)	3-7
7. DDR4 thermal event setting (3-pin DIMMTRIP1-2)	3-6
8. SATADOM power setting (3-pin DOM1_PWR1)	3-6
9. U.2 connectors (U.2_1; U.2_2; U.2_3; U.2_4)	3-16
10. Intel® C621 Serial ATA 6 Gb/s connectors (7-pin SATA1-8)	3-13
11. ASMedia® Serial ATA 6 Gb/s connectors (7-pin SATA_E1-2)	3-13
12. Auxiliary panel connector (20-2 pin AUX_PANEL1)	3-22
13. Chassis Intrusion connector (2-pin INTRUSION1)	3-15
14. System panel connector (20-1 pin PANEL1)	3-21
15. Serial General Purpose Input/Output connector (6-1 pin SGPIO1)	3-26
16. TPM connector (14-1 pin TPM1)	3-15
17. Clear RTC RAM (3-pin CLRTC1)	3-5
18. ME firmware force recovery setting (3-pin ME_RCVR1)	3-7
19. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)	3-25
20. VROC_KEY connector (4-pin VROC_KEY1)	3-17
21. USB 3.1 Gen 1 connectors (20-1 pin USB3_E12; 20-1 pin USB3_E34)	3-19
22. PCH_MFG1 Setting (3-pin PCH_MFG1)	3-8
23. M.2 (NGFF) connectors (NGFF1)	3-17
24. VGA controller setting (3-pin VGA_SW1)	3-9
25. USB 2.0 connector (10-1 pin USB78)	3-18
26. IPMI SW setting (3-pin IPMI_SW1)	3-8
27. VPP_I2C1 connector (10-1 pin VPP_I2C1)	3-25
28. Q-Code LED	3-12
29. Reset button	3-4
30. Power button	3-4
31. Serial port connector (10-1 pin COM1)	3-24
32. VGA connector (16-1 pin VGA_HDR1)	3-16
33. Front panel audio connector (10-1 pin AAFP)	3-14
34. Hard disk activity LED connector (4-pin HDLED1)	3-14
35. BMC connector (14-1 pin ASMB9)	3-26
36. Micro SD card slot (MSD1)	3-27

3.2 Onboard buttons and switches

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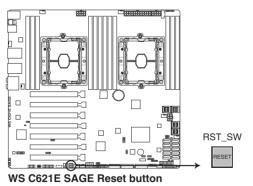
1. **Power-on button**

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

    PWR_SW

    WS C621E SAGE Power on button

2. **Reset button**

    Press the reset button to reboot the system.

    RST_SW

    WS C621E SAGE Reset button

3.3   Jumpers

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

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

To erase the RTC RAM:
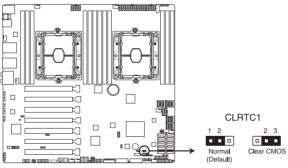
1.   Turn OFF the computer and unplug the power cord.

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

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

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

> Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!
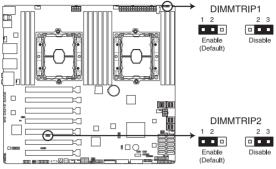
> If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.

WS C621E SAGE Clear RTC RAM

CLRTC1

1 2 — Normal (Default)   2 3 — Clear CMOS

2.   **DDR4 thermal event setting (3-pin DIMMTRIP1-2)**
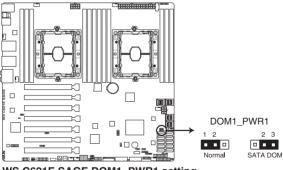
    These jumpers allow you to enable or disable DDR4 DIMM thermal sensing event pin.

DIMMTRIP1

1 2   2 3

Enable   Disable
(Default)

DIMMTRIP2

1 2   2 3

Enable   Disable
(Default)

WS C621E SAGE Thermaltrip setting

3.   **SATADOM power setting (3-pin DOM1_PWR1)**
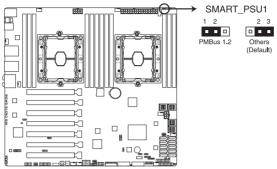
    This jumper allows SATA8 to support SATADOM which do not need external power
    connections. Set to pins 2-3 to activate the SATA8 support feature.

DOM1_PWR1

1 2   2 3

Normal   SATA DOM

WS C621E SAGE DOM1_PWR1 setting

4. **PMBus 1.2 PSU select jumper (3-pin SMART_PSU1)**
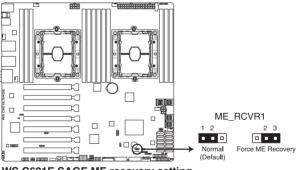
This jumper allows you to select PSU PMBus version. Set to pins 1–2 for PMBus, set to pins 2–3 for others.

SMART_PSU1

WS C621E SAGE PMBus 1.2 PSU setting

5. **ME firmware force recovery setting (3-pin ME_RCVR1)**
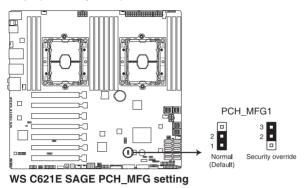
This jumper allows you to quickly recover the Intel Management Engine (ME) firmware when it becomes corrupted.

ME_RCVR1

WS C621E SAGE ME recovery setting
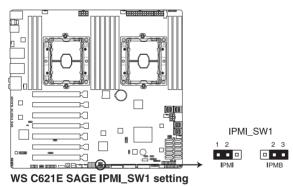
6.   **PCH_MFG1 setting (3-pin PCH_MFG1)**

This jumper allows you to update the BIOS ME block.

PCH_MFG1

Normal   Security override
(Default)

WS C621E SAGE PCH_MFG setting
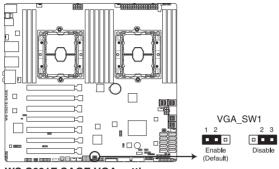
7.   **IPMI SW setting (3-pin IPMI_SW1)**

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

IPMI_SW1

IPMI   IPMB

WS C621E SAGE IPMI_SW1 setting

8. VGA controller setting (3-pin VGA_SW1)

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

VGA_SW1

1 2 Enable (Default)

2 3 Disable

WS C621E SAGE VGA setting
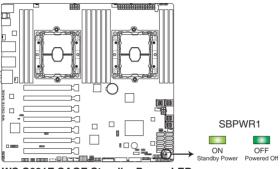
> Ensure the power supply is switched off or the power cord is detached from the power supply when enabling or disabling the VGA controller settings using this jumper.

> • 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.

3.4   Onboard LEDs

1.   Standby Power LED (SBPWR1)
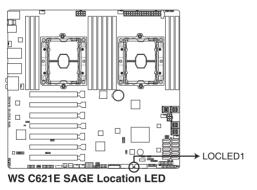
The motherboard comes with a standby power LED. The green LED lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows the location of the onboard LED.

WS C621E SAGE Standby Power LED

SBPWR1

ON
Standby Power

OFF
Powered Off
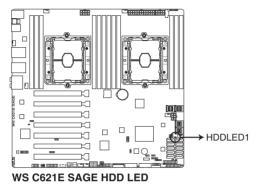
2.   Location LED (LOCLED1)

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

LOCLED1

WS C621E SAGE Location LED
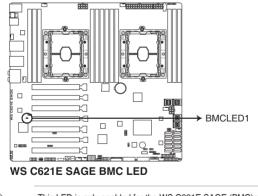
3. **Hard disk activity LED (HDDLED1)**

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

    WS C621E SAGE HDD LED
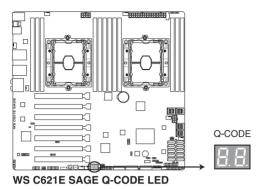
4. **Baseboard Management Controller LED (BMCLED1)**

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

    WS C621E SAGE BMC LED

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

5.   **Q-Code LED**

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

WS C621E SAGE Q-CODE LED
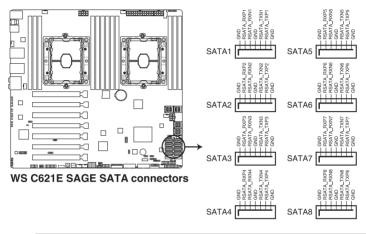
- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.

- Please refer to the Q-Code table in the **Appendix** section for more details.

3.5 Internal connectors

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

   These connectors connect to Serial ATA 6 Gb/s hard disk drives via Serial ATA 6 Gb/s signal cables.
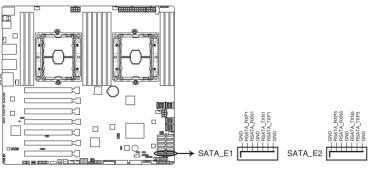
   If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology enterprise (Intel® RSTe) through the onboard Intel® C621 chipset.

WS C621E SAGE SATA connectors

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

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

   These connectors connect to Serial ATA 6 Gb/s hard disk drives via Serial ATA 6 Gb/s signal cables.
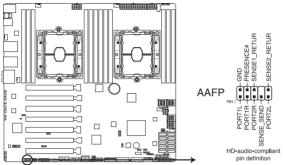
WS C621E SAGE ASMedia® SATA 6 Gb/s connectors

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

    This connector is for a chassis-mounted front panel audio I/O module that supports HD Audio. Connect one end of the front panel audio I/O module cable to this connector.
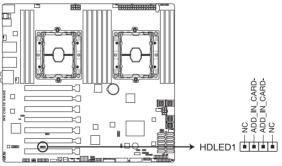
WS C621E SAGE Front panel audio connector

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

4. **Hard disk activity LED connector (4-pin HDLED1)**
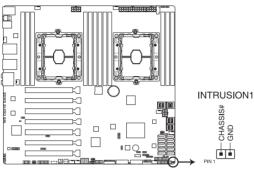
    This LED connector is for the storage add-on card cable connected to the SATA or SAS add-on card. The read or write activities of any device connected to the SATA or SAS add-on card causes the front panel LED to light up.

WS C621E SAGE Hard disk activity LED connector

5. **Chassis intrusion connector (2-pin INTRUSION1)**
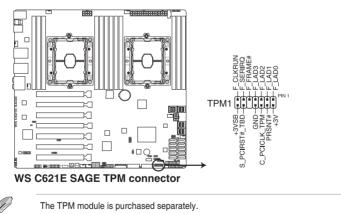
These leads are for the intrusion detection feature for chassis with intrusion sensor or microswitch. When you remove any chassis component, the sensor triggers and sends a high level signal to these leads to record a chassis intrusion event. The default setting is to short the CHASSIS# and the GND pin by a jumper cap to disable the function.

WS C621E SAGE Chassis Intrusion connector
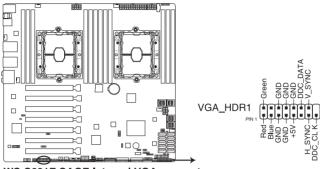
6. **TPM connector (14-1 pin TPM1)**

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

WS C621E SAGE TPM connector

The TPM module is purchased separately.

7. **VGA connector (16-1 pin VGA_HDR1)**
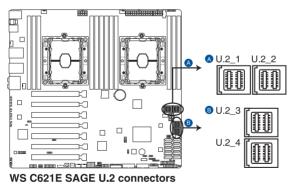
   This connector supports the VGA High Dynamic-Range interface.

WS C621E SAGE Internal VGA connector
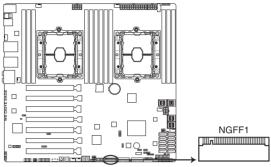
8. **U.2 connectors (U.2_1; U.2_2; U.2_3; U.2_4)**

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

WS C621E SAGE U.2 connectors

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

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

NGFF1
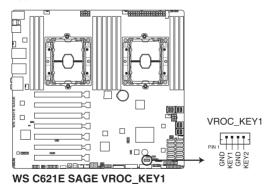
WS C621E SAGE NGFF1 connector

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

10. **VROC_KEY connector (4-pin VROC_KEY1)**

This connector allows you to connect a KEY module to enable CPU RAID functions with Intel® CPU RSTe. Intel® RSTe and the onboard VROC Key supports Intel® VROC functions, please refer to the table below for more information on the different RAID support of different KEY modules.

VROC_KEY1

PIN 1

GND
KEY1
GND
KEY2

WS C621E SAGE VROC_KEY1
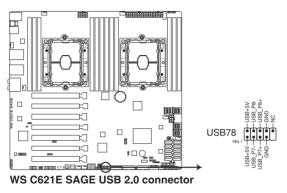
The KEY module is purchased separately.

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

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

WS C621E SAGE USB 2.0 connector
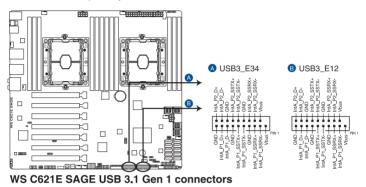
DO NOT connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

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

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

WS C621E SAGE USB 3.1 Gen 1 connectors
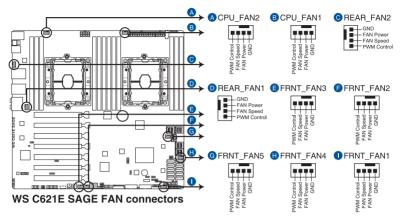
The USB 3.1 Gen 1 module is purchased separately.

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

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

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

WS C621E SAGE FAN connectors
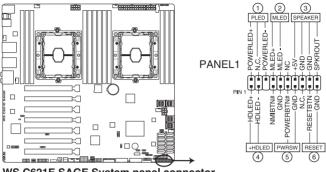
⚠ • DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!

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

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

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

    This connector supports several chassis-mounted functions.

WS C621E SAGE System panel connector

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

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

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

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

    This connector may be disabled depending on the model.

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

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

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

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

- **ATX power button/soft-off button (2-pin PWRSW)**
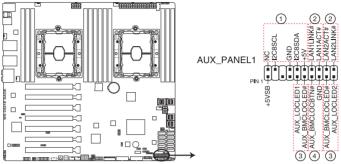
    This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the operating system settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

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

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

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

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

WS C621E SAGE Auxiliary panel connector

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

  This connector connects the front panel SMBus cable.

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

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

- **Locator LED (2-pin LOCATORLED1, 2-pin LOCATORLED2)**
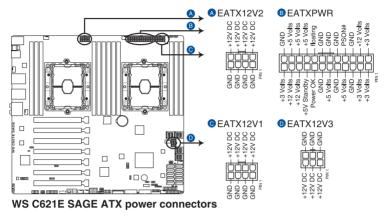
  These connectors are for the locator LED1 and LED2 on the front panel. Connect the Locator LED cables to these 2-pin connector. The LEDs will light up when the Locator button is pressed.

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

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

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

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

WS C621E SAGE ATX power connectors
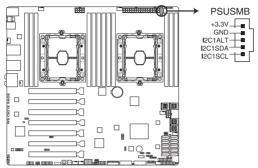
Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.

- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 350 W.

- DO NOT forget to connect the 8-pin EATX12V1/EATX12V2 power plugs. Otherwise, the system will not boot.

- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.

- If you want to use two or more high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability, and recommend connecting the 6-pin EATX12V3 power plug.

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

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

WS C621E SAGE Power supply SMBus connector
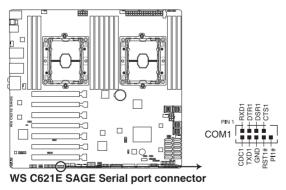
This connector functions only when you enable the ASUS ASMB card.

Power supply is required to meet PMBus specification and customized BMC FW may be needed. Please contact ASUS if your need further support
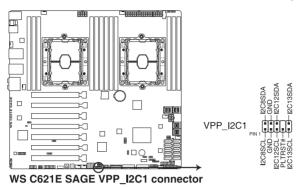
18.   Serial port connector (10-1 pin COM1)

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

WS C621E SAGE Serial port connector
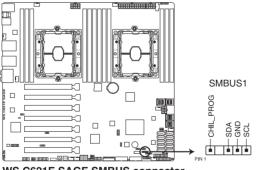
19. VPP_I2C1 connector (10-1 pin VPP_I2C1)

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

VPP_I2C1

PIN 1

I2C8SCL
GND
I2C12SCL
PLTRST#
I2C13SCL

I2C8SDA
GND
I2C12SDA
I2C13SDA

WS C621E SAGE VPP_I2C1 connector

20. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)
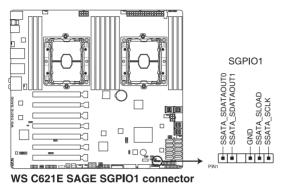
This connector controls the system and power management-related tasks. This connector processes the messages to and from devices rather than tripping the individual control lines.

SMBUS1

CHIL_PROG
SDA
GND
SCL

PIN 1

WS C621E SAGE SMBUS connector

21. **Serial General Purpose Input/Output connector (6-1 pin SGPIO1)**
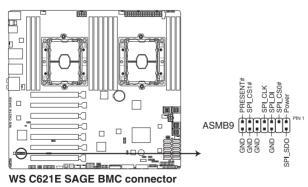
The SGPIO 1 connector is used for the Intel Rapid Storage Technology Enterprise SGPIO interface that controls the LED pattern generation, device information, and general purpose data.

WS C621E SAGE SGPIO1 connector

22. **BMC connector (14-1 pin ASMB9)**

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

WS C621E SAGE BMC connector

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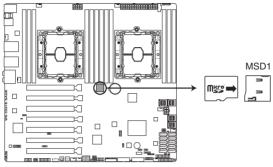
- The Baseboard Management Card is only available with the WS C621E SAGE (BMC) model.

23.   Micro SD card slot (MSD1)

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

WS C621E SAGE MSD1

- Some memory cards may not be compatible with your motherboard. Ensure that you use only compatible memory cards to prevent loss of data, damage to your device, or memory card, or both.
- The SD memory card is purchased separately.
- 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 : WS C621E SAGE              Platform : WS C621E SAGE
  Version :   0201                      Version :   0204
  Build Date :05/05/2017                Build Date :05/24/2017


  FS0             System Volume Information                <DIR>
                  WS-C621E-SAGE-ASUS-0204                  <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 : WS C621E SAGE                 Platform : WS C621E SAGE
Version :   0201                         Version :   0204
Build Date :05/05/2017                   Build Date :05/24/2017


     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 **4.1 Managing and updating your BIOS**.

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

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

The firmware chip on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press <Del> during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.
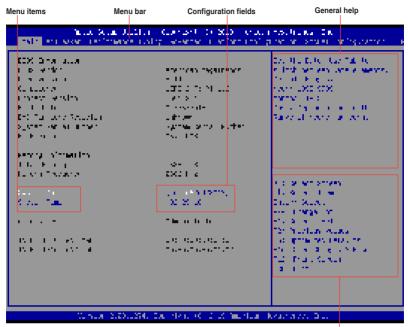
If you wish to enter Setup after POST, restart the system by pressing <Ctrl>+<Alt>+<Del>, or by pressing the reset button on the system chassis. You can also restart by turning the system off then back on. Do this last option only if the first two failed.

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 bar   Configuration fields   General help

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 you set the **Ai Overclocking Tuner** to **[Manual]**.

BCLK Frequency

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

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

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

OC Tune Level

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

4.5   Performance Tuning menu

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

Optimized Performance Setting [Default]

Allows you to select performance settings for different scenarios.

[Default]   Default settings.

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

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

Configuration options:

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

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

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

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

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

Core Optimizer [Disabled]

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

> Linux support may vary by version of the OS.

Engine Boost [Disabled]

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

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

Power Balancer [Disabled]

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

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.

Onboard I210 LAN Configuration

Intel LAN1 Enable

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

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

Intel LAN ROM Type

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

Intel LAN2 Enable

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

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

Intel LAN ROM Type

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

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.

Audio Configuration

This item allows you to enable or disable the onboard audio.
Configuration options: [Disabled] [Enabled] [Auto]

4.6.15 ASMedia Storage Controller

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

ASMedia Storage Controller

This item allows you to enable or disable the ASMedia storage controller.
Configuration options: [Disabled] [Enabled]

4.6.16 E900 Fan Mode Selection

The items in this menu allow you to select the E900 Fan Mode.

E900 Fan Mode Selection

This item allows you to select the fan mode type.
Configuration options: [Auto Mode] [Passive Mode]

4.6.17 Network Stack Configuration

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

4.6.18 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 you set **SATA Controller** to **[Enabled]**.

Configure SATA as

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

Support Aggressive Link Power Management

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

SATA Port 0-7

> *Port 0-7*
> Allows you to enable or disable the SATA port.
> Configuration options: [Disabled] [Enabled]

4.7.2   Miscellaneous Configuration

Active Video

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

4.7.3   Server ME Configuration

Displays the Server ME Technology parameters on your system.

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   Common RefCode Configuration

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

4.8.3 UPI Configuration

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

4.8.4 Memory Configuration

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

Memory Topology

Displays memory topology with DIMM population information.

4.8.5 IIO Configuration

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

4.8.6 Advanced Power Management Configuration

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

CPU P State Control

Boot performance mode

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

Energy Efficient Turbo

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

Turbo Mode

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

Hardware PM State Control

Hardware P-States

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

CPU C State Control

CPU C6 Report

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

OS ACPI Cx

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

Package C State Control

Package C State

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

CPU Thermal Management

CPU T State Control

Software Controlled T-States

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

CPU - Advanced PM Tuning

Energy Perf BIAS

Power Performance Tuning

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

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.

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

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.

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.

> 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
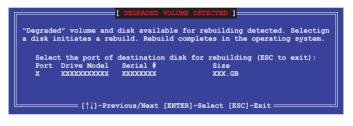
This option is only for the RAID 1 set.

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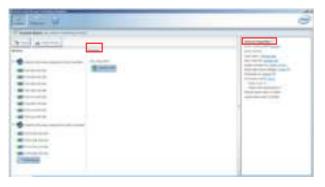
7.   Wait until the process is completed, then click **OK** when prompted.

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

> ⚠️ 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 **3.5 Internal connectors** for the location of the **VROC_KEY1** connector.

- • Due to hardware design, [U.2_1 to U.2_4], or [PCIEX16_1], or [PCIEX16_2], or [PCIEX16_3], or [PCIEX16_5], or [PCIEX16_6], or [PCIEX16_7], or [PCIEX16_2 and PCIEX16_6] can support CPU RAID configuration as OS drives, but OS RAID may not be built across the different [items] mentioned above.

- • [PCIEX16_1], or [PCIEX16_2], or [PCIEX16_3], or [PCIEX16_5], or [PCIEX16_6], or [PCIEX16_7], or [PCIEX16_2 and PCIEX16_6] can support OS RAID on Hyper M.2 cards installed on the [items] mentioned above.

- • [PCIEX16_2 and PCIEX16_6] can support OS RAID on installed Intel® P3500 or P3600 SSD.

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

1. Enter the BIOS Setup during POST.

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

Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.
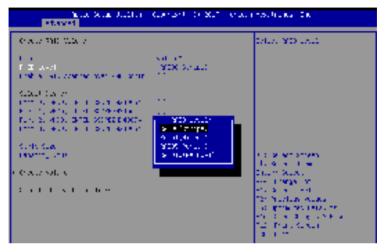
Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.

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:

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.
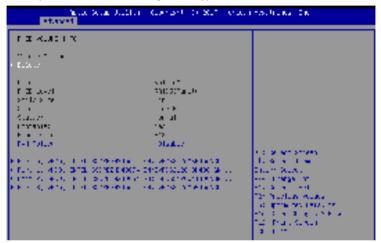
5.4.2 Deleting a RAID set

⚠️ 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:

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.

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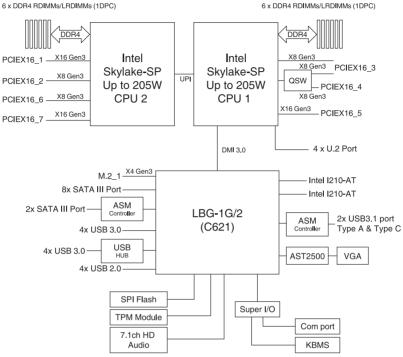
8.   Setup then proceeds with the OS installation. Follow screen instructions to continue.

Appendix

A

WS C621E SAGE block diagram

6 x DDR4 RDIMMs/LRDIMMs (1DPC)   6 x DDR4 RDIMMs/LRDIMMs (1DPC)

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)

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

ASUS Recycling/Takeback Services

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

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

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

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

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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.

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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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Online Support	https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=zh-tw

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Online support   https://www.asus.com/support/Product/ContactUs/Services/
                       questionform/?lang=en-us

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

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Online Support   https://www.asus.com/support/Product/ContactUs/Services/
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Online Support	https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=nl-nl

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

ASK-Service (Russia and CIS)

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Technical Support

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Online Support	https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=ru-ru