WS C621E
SAGE Series

Motherboard

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Safety information

Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
- Ensure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

Operation safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
- Before using the product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- Place the product on a stable surface.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.

About this guide

This user guide contains the information you need when installing and configuring the motherboard.

How this guide is organized

This guide contains the following parts:

1. **Chapter 1: Product Introduction**

    This chapter describes the features of the motherboard and the new technology it supports. It includes description of the switches, jumpers, and connectors on the motherboard.

2. **Chapter 2: Basic Installation**

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

3. **Chapter 3: BIOS Setup**

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

4. **Chapter 4: RAID Support**

    This chapter describes the RAID configurations.

5. **Chapter 5: Multi GPU Support**

    This chapter describes how to install and configure multiple AMD® CrossFire™ graphics cards.

Where to find more information

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

1. **ASUS website**

    The ASUS website (www.asus.com) provides updated information on ASUS hardware and software products.

2. **Optional documentation**

    Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.

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 (+).

WS C621E SAGE Series specifications summary

Model Name	WS C621E SAGE	WS C621E SAGE (BMC)
CPU	Dual Intel® Socket-P / LGA-3647 square for Xeon® Processor Scalable Family (205W) UPI 9.6, 10.4 GT/s Supports Intel® Hyper-Threading Supports Intel® Turbo Boost Technology *** The Intel® Turbo Boost & Hyper-Threading Technology 2.0 support depends on the CPU types.** **** Refer to www.asus.com for Intel® CPU support list**	
Chipset	Intel® C621 PCH	
Memory	12 x DIMM (6-channel per CPU, 6 DIMM per CPU), Max. 768 GB DDR4 2666* / 2400 / 2133 RDIMM / LR-DIMM / RDIMM 3Ds / LR-DIMM 3Ds RDIMM: 4GB, 8GB, 16GB, 32GB LRDIMM: 32GB, 64GB *** Maximum memory capacity support depends on CPU type** **** Refer to www.asus.com for the Memory QVL (Qualified Vendors Lists).**	
Expansion slots	3 x PCIe 3.0 x 16 slots (@x16 link) 2 x PCIe 3.0 x 16 slots (single @ x16, dual @ x8/x8 link) 2 x PCIe 3.0 x 16 slot (@x8 link)	
VGA	Aspeed AST2500 64MB VGA Port (with Bracket) Supports VGA with Max. Resolution 1920 x 1200 @ 60Hz	
Multi-GPU support	Supports NVIDIA® 4-Way SLI® Technology Supports AMD® 4-Way CrossFireX™ Technology *** Actual numbers of Multi-graphic supported differs per Vendors' Graphic cards. Please check with Vendor beforehand.**	
Storage	**Intel® C621 with Intel® RSTe(for Windows only; Support software RAID 0, 1, 10 &5)** 8 x SATA 6Gb/s ports (gray) **ASMedia® SATA RAID Controller*** 2 x SATA 6Gb/s ports 4 x U.2 Connectors 1 x M.2 Socket 3, supporting type 2242/2260/2280/22110 (PCIe Gen 3 x4 and SATA mode) Supports Intel® Virtual RAID on CPU (Intel® VROC)** *** The functions will work depending on the CPU installed.** **** H/W Key to be purchased separately, functions will depend on H/W Key purchased**	
LAN	2 x Intel® i210-AT Gigabit LAN Controller	

(continued on the next page)

WS C621E SAGE Series specifications summary

Model Name	WS C621E SAGE	WS C621E SAGE (BMC)
USB	**ASMedia USB 3.1 Controllers** - 1 x USB 3.1 Type A port at back panel - 1 x USB 3.1 Type-C™ port at back panel" **Intel® C621 Chipset** - 8 x USB 3.0 (4@ back panel, 4@ mid-board) - 4 x USB 2.0 Ports (2@ back panel, 2@ mid-board)"	
Audio	**Realtek® ALC S1220A 8-Channel High Definition Audio CODEC** - Impedance sense for front and rear headphone outputs - Supports : Jack-detection, Multi-streaming, front Panel MIC Jack-retasking - High quality 120 dB SNR stereo playback output and 113 dB SNR recording input (Line-in) - Front panel audio connector (AAFP) - Supports up to 32-Bit/192kHz playback* **Audio Feature:** - DTS Connect - DTS Headphone:X - Premium Japanese-made audio capacitors: Provide warm, natural and immersive sound with exceptional clarity and fidelity - Unique de-pop circuit: Reduces start-up popping noise to audio outputs - Power pre-regulator: Reduces power input noise to ensure consistent performance *** Due to limitations in HDA bandwidth, 32-Bit/192kHz is not supported for 8-Channel audio. 32-Bit/192kHz is only available under Windows® 10.**	
Workstation Unique Features	- 7 x PCIe x16 slots - 10K hours Capacitors - ProCool Power Connector - Dr. Mos - USB BIOS Flashback - Beat Thermal Choke - Digi+ VRM - ASUS PIKE card (Optional)	- 7 x PCIe x16 slots - 10K hours Capacitors - ProCool Power Connector - Dr. Mos - USB BIOS Flashback - Beat Thermal Choke - Digi+ VRM - ASUS PIKE card (Optional) - BMC Remote Management

WS C621E SAGE specifications summary

Model Name	WS C621E SAGE	WS C621E SAGE (BMC)
Rear Panel I/O Ports	2 x USB 3.1 (1 x Type-C™ and 1 x Type-A) 4 x USB 3.0 ports (blue) 2 x USB 2.0 ports (1 x USB 2.0 port supports USB BIOS Flashback) 1 x USB BIOS Flashback button 1 x PS/2 KB port 2 x LAN (RJ45) ports (2 x Intel® LAN) 1 x Optical S/PDIF Out port 8-channel Audio I/O	
Internal I/O Connectors	2 x USB 3.0 connectors support additional 4 x USB 3.0 ports (19-pin) 1 x USB 2.0 connectors support additional 2 x USB 2.0 ports 4 x U.2 connectors 1 x M.2 Socket 3 10 x SATA 6.0Gb/s connectors (Gray) 2 x CPU Fan connectors (4-pin) 7 x Chassis Fan connectors (4-pin) (5 x front, 2 x rear) 1 x Serial Port headers (COM port header) 1 x VROC key header 1 x VGA connector 1 x Front panel audio connector(AAFP) 1 x System Panel header (20 pin) 1 x AUX panel header 1 x SMBus header 1 x Clear CMOS header 1 x TPM connector (14-1 pin) 2 x 8-pin EATX 12V Power connectors 1 x 6-pin EATX 12V_3 Power connector 1 x Power button 1 x Reset button 1 x Chassis intrusion (2-pin)	

(continued on the next page)

WS C621E SAGE specifications summary

Model Name	WS C621E SAGE	WS C621E SAGE (BMC)
ASUS Special Features	**CPU Power** - Digital 7 + 1 Phase Power Design **DRAM Power** - Digital 2 Phase Power Design **Dual Front Panel USB 3.0 Support** **ASUS Q-Design** - ASUS Q-Code (80 port) - ASUS Q-Shield - ASUS Q-Slot - ASUS Q-DIMM **ASUS EZ DIY** - ASUS CrashFree BIOS 3 - ASUS EZ Flash Utility - ASUS MyLogo 2 - Multi-language BIOS **TPM header** **UEFI BIOS** - Most advanced options with fast response time **ASUS SafeSlot Designed** - Protect your graphics card Investment	
BIOS Features	256 Mb Flash ROM, UEFI BIOS, PnP, WfM2.0, SMBIOS 2.6.1, ACPI 3.0, ASUS EZ Flash Utility, ASUS CrashFree Technology	
Manageability	WfM 2.0, DMI 2.0, WOL by PME, PXE	
Operating System	Windows® Server 2016 64-bit Windows® Server 2012 R2 64-bit Windows® Server 2012 64-bit Windows® 10 64-bit	
Form Factor	EEB Form Factor, 12"x 13"	

> • Specifications are subject to change without notice.
>
> • Visit the ASUS website for the software manual.

Package contents

Check your motherboard package for the following items.

Motherboard	WS C621E SAGE Series
Cables	10 x Serial ATA 6Gb/s cables
	1 x VGA bracket cable
	1 X USB 2.0 bracket cable
Accessories	1 x M.2 screws kit
	1 x ASUS 4-Way SLI™ bridge
	1 x ASUS 3-Way SLI™ bridge
	1 x ASUS SLI™ bridge
	1 x COM port brackets
	1 X I/O Shield
Application DVD	Motherboard support DVD
Documentation	User manual

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

Installation tools and components
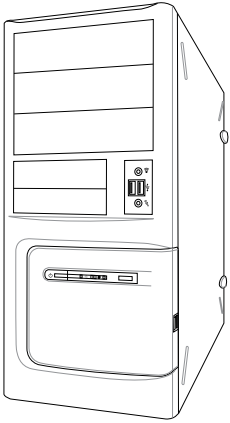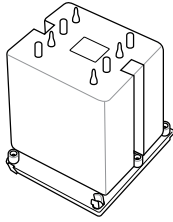
Intel® LGA3647 compatible CPU Fan

Intel® LGA3647 CPU

PC chassis
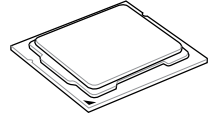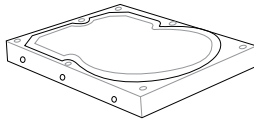
SATA hard disk drive

Phillips (cross) screwdriver
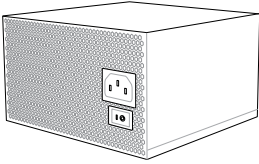
Power supply unit
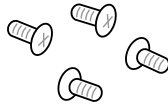
1 bag of screws
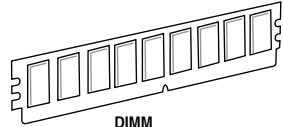
DIMM
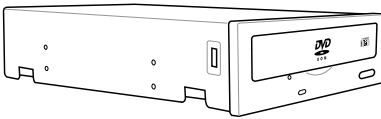
SATA optical disc drive (optional)
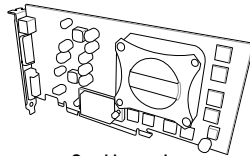
Graphics card

The tools and components in the table above are not included in the motherboard package.

Product Introduction

1

1.1 Motherboard overview

1.1.1 Before you proceed

Take note of the following precautions before you install motherboard components or change any motherboard settings.

⚠️
- Unplug the power cord from the wall socket before touching any component.

- Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.

- Hold components by the edges to avoid touching the ICs on them.

- Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.

- Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

1.1.2   Motherboard layout
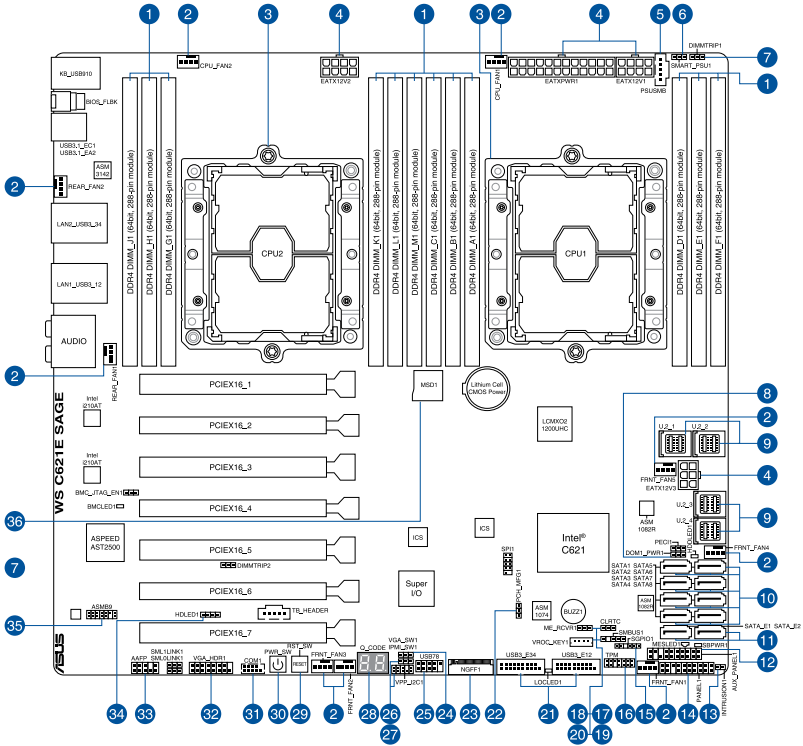
Refer to **1.1.9 Internal connectors** and **2.3.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

Layout contents

Connectors/Jumpers/Buttons and switches/Slots	Page
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7. DDR4 thermal event setting (3-pin DIMMTRIP1-2)	1-11
8. SATADOM power setting (3-pin DOM1_PWR1)	1-11
9. U.2 connectors (U.2_1; U.2_2; U.2_3; U.2_4)	1-21
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11. ASMedia® Serial ATA 6 Gb/s connectors (7-pin SATA_E1-2)	1-18
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19. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)	1-30
20. VROC_KEY connector (4-pin VROC_KEY1)	1-22
21. USB 3.0 connector (20-1 pin USB3_E12; 20-1 pin USB3_E34)	1-24
22. PCH_MFG1 Setting (3-pin PCH_MFG1)	1-13
23. M.2 (NGFF) connectors (NGFF1)	1-22
24. VGA controller setting (3-pin VGA_SW1)	1-13
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26. IPMI SW setting (3-pin IPMI_SW1)	1-14
27. VPP_I2C1 connector (10-1 pin VPP_I2C1)	1-30
28. Q-Code LEDs	1-17
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31. Serial port connector (10-1 pin COM1)	1-29
32. VGA connector (16-1 pin VGA_HDR1)	1-21
33. Front panel audio connector (10-1 pin AAFP)	1-19
34. Hard disk activity LED connector (4-pin HDLED1)	1-19
35. BMC connector (14-1 pin ASMB9) (for WS C621E SAGE (BMC) only)	1-31
36. Micro SD card slot (MSD1)	1-32

1.1.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA 3647 socket designed for the Intel® Xeon® Skylake-SP product family series processors.
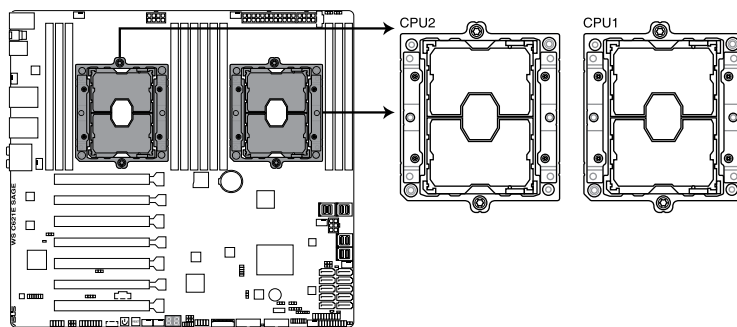
WS C621E SAGE CPU LGA3647 Socket

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.

- 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.

1.1.4   System memory

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

> ⚠️ A DDR4 module is notched differently from a DDR, DDR2 or DDR3 module. DO NOT install a DDR, DDR2 or DDR3 memory module to the DDR4 slot.
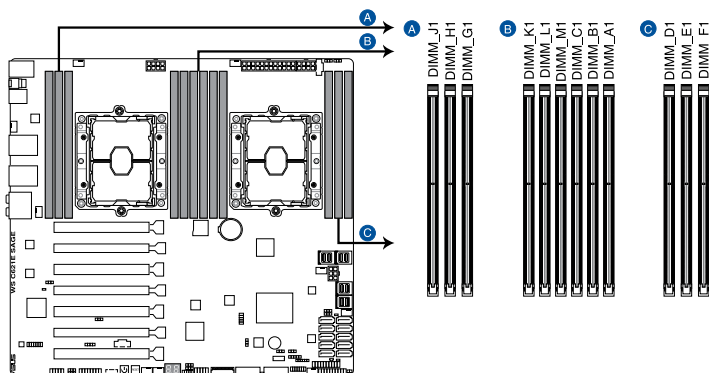
WS C621E SAGE 288-pin DDR4 DIMM sockets

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.
>
> • 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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1.1.5 Expansion slots

Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.
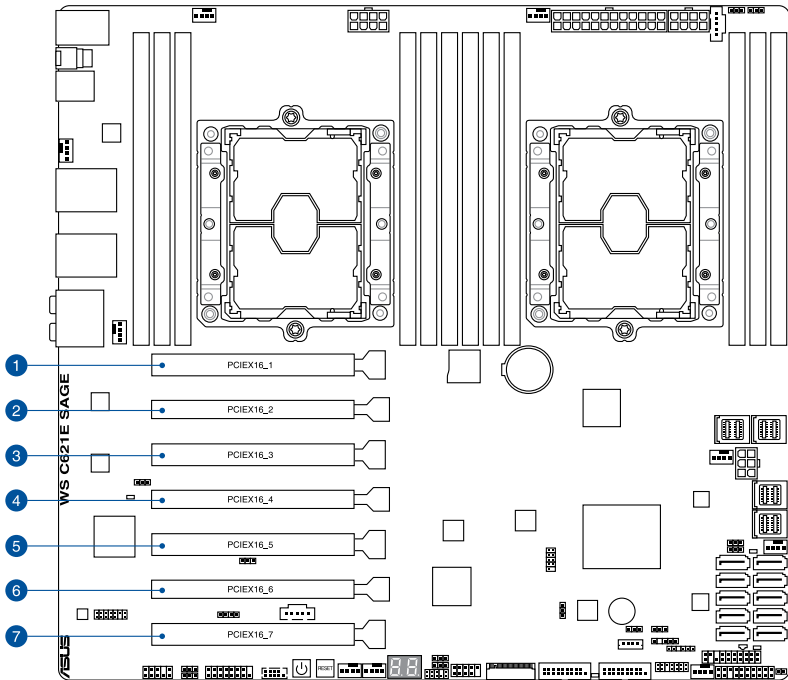
Slot No.	Slot Description
1	PCIe x16_1 slot
2	PCIe x16_2 slot
3	PCIe x16_3 slot
4	PCIe x16_4 slot (max. at x8 mode)
5	PCIe x16_5 slot
6	PCIe x16_6 slot
7	PCIe x16_7 slot

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.

1.1.6   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
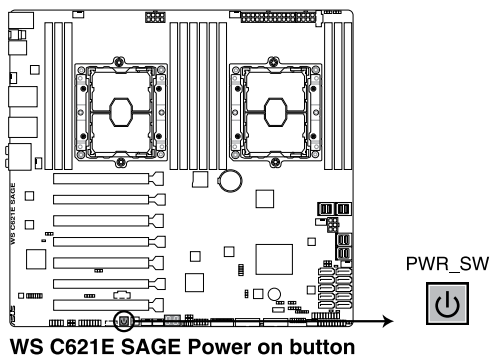
2.   Reset button

Press the reset button to reboot the system.

RST_SW

WS C621E SAGE Reset button
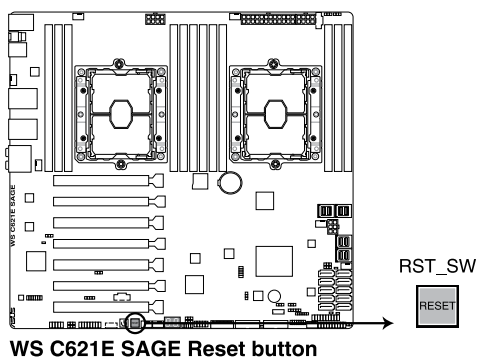
1.1.7   Jumpers

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.

CLRTC1

1 2   2 3

Normal   Clear CMOS
(Default)

WS C621E SAGE Clear RTC RAM
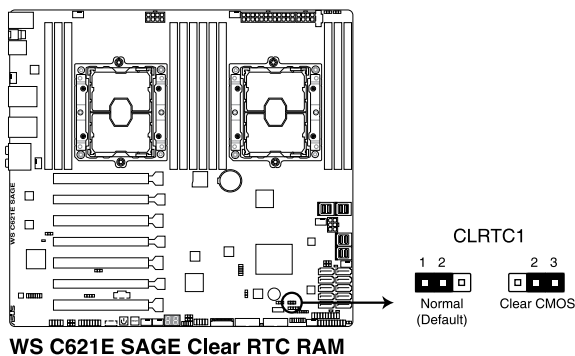
2. **DDR4 thermal event setting (3-pin DIMMTRIP1-2)**

These jumpers allow you to enable or disable DDR4 DIMM thermal sensing event pin.
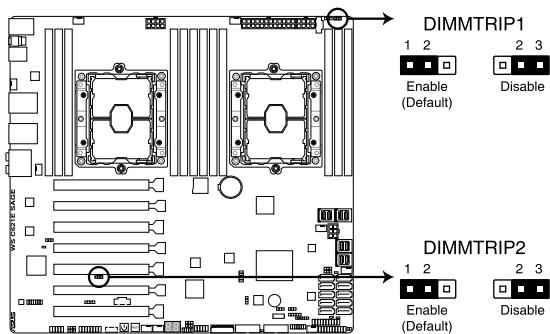
WS C621E SAGE Thermaltrip setting

3. **SATADOM power setting (3-pin DOM1_PWR1)**

This jumper allows SATA5 and SATA6 to support SATADOM which do not need external power connections. Set to pins 2-3 to activate the SATA8 support feature.
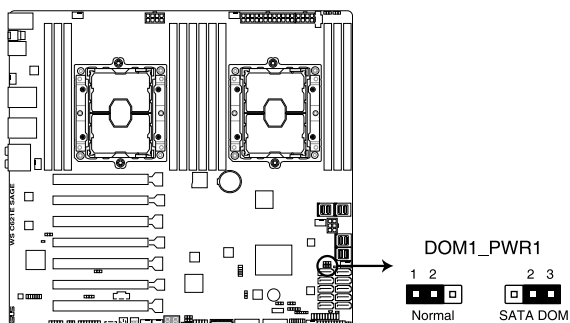
WS C621E SAGE DOM1_PWR1 setting

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

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

SMART_PSU1

1 2   2 3

PMBus 1.2   Others
              (Default)
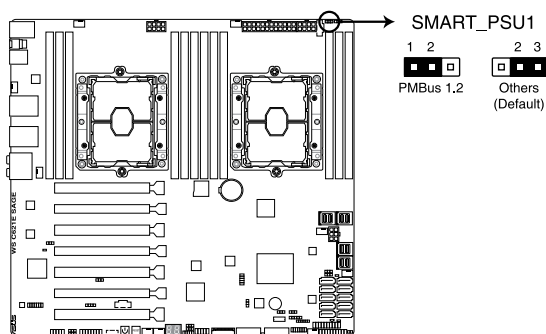
WS C621E SAGE PMBus 1.2 PSU setting

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

1 2   2 3

Normal   Force ME Recovery
(Default)
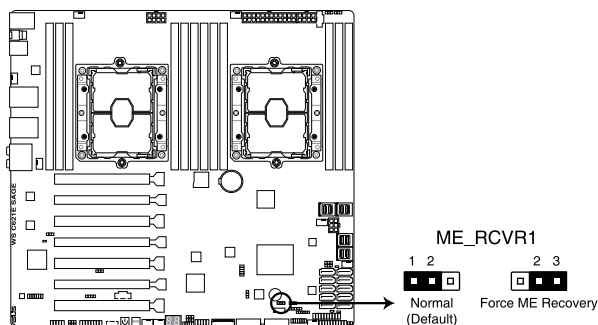
WS C621E SAGE ME recovery setting

6.   PCH_MFG1 setting (3-pin PCH_MFG1)

This jumper allows you to update the BIOS ME block.

PCH_MFG1

Normal   Security override
(Default)
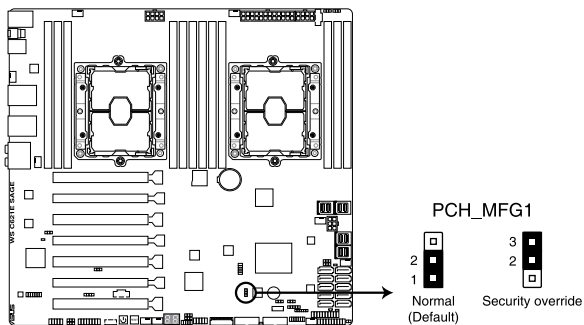
WS C621E SAGE PCH_MFG setting

7.   VGA controller setting (3-pin VGA_SW1)

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

VGA_SW1

1 2   2 3

Enable   Disable
(Default)
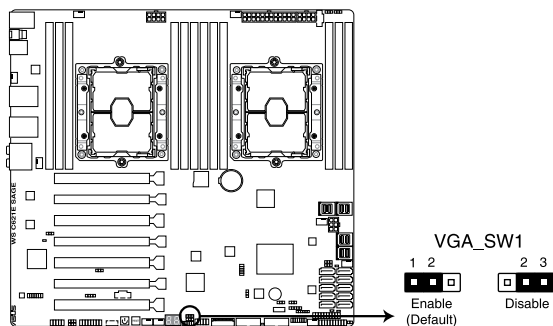
WS C621E SAGE VGA setting

8.   IPMI SW setting (3-pin IPMI_SW1)

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

WS C621E SAGE IPMI_SW1 setting
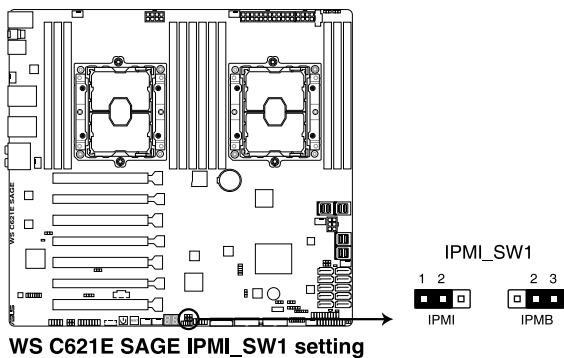
1.1.8　Onboard LEDs

1.　Standby Power LED (SBPWR1)

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

SBPWR1

ON
Standby Power

OFF
Powered Off

WS C621E SAGE Standby Power LED
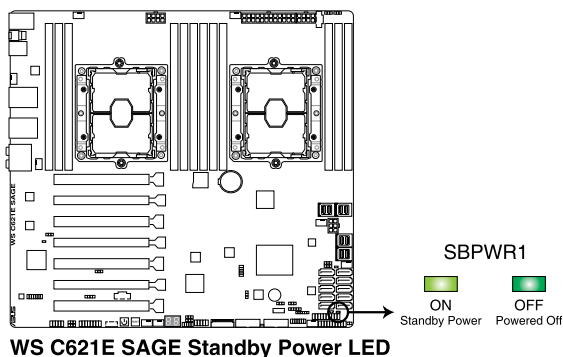
2.　Location LED (LOCLED1)

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

LOCLED1

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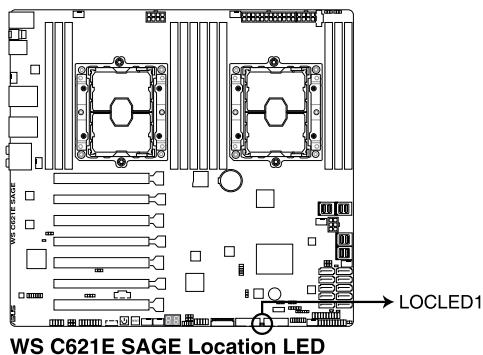
3. **Hard disk activity LED (HDDLED1)**

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.
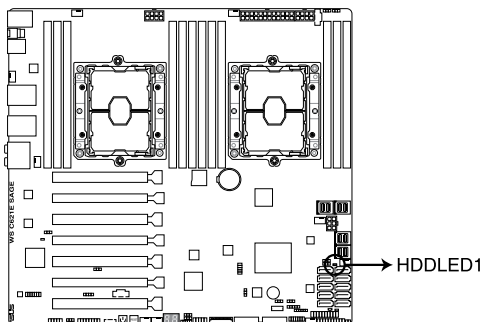
WS C621E SAGE HDD LED

4. **Baseboard Management Controller LED (BMCLED1)**
   (for WS C621E SAGE (BMC) only)

The BMC LED works with the ASUS ASMB management device and indicates its initiation status. When the PSU is plugged and the system is OFF, ASUS ASMB management device starts system initiation for about one (1) minute. The BMC LED blinks after system initiation finishes.
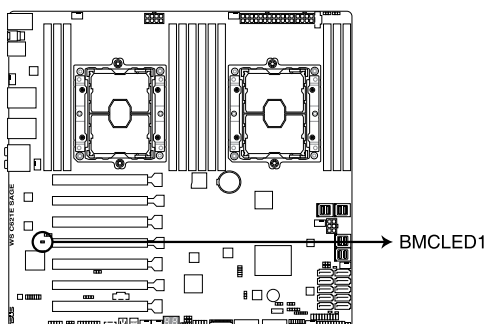
WS C621E SAGE BMC LED

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

5. **Q-Code LEDs**

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

Q-CODE

WS C621E SAGE Q-CODE LED
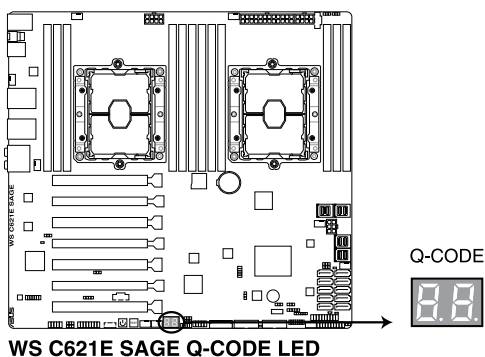
- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Please refer to the Q-Code table in the **Appendix** section for more details.

1.1.9 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.
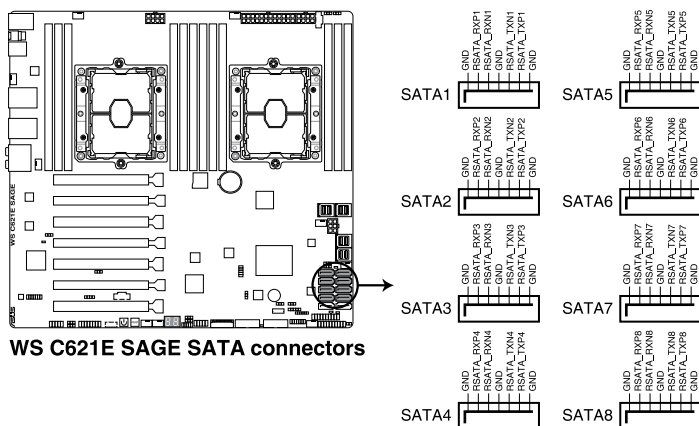
WS C621E SAGE SATA connectors

> • These connectors are set to **[AHCI Mode]** by default. If you intend to create a Serial ATA RAID set using these connectors, set the SATA Mode item in the BIOS to **[Intel RST Premium With Intel Optane System Acceleration (RAID)]**.
>
> • These SATA ports are for data drives only.

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.
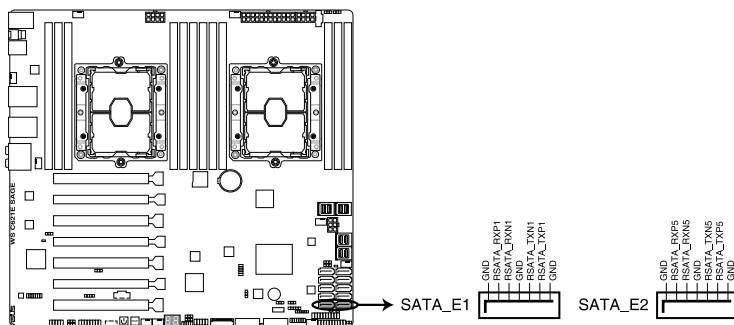
WS C621E SAGE ASMedia® SATA 6 Gb/s connectors

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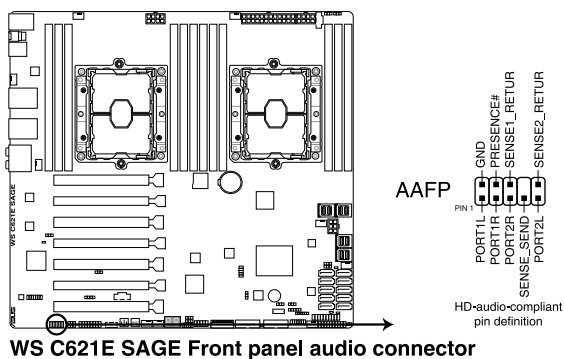
We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

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
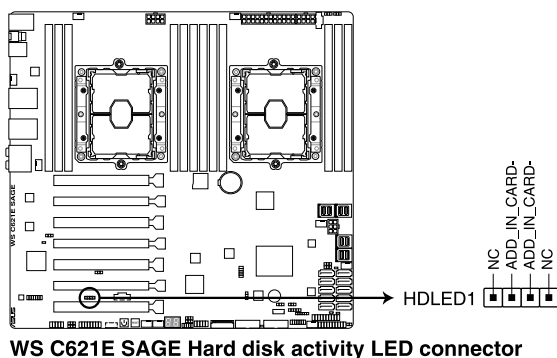
5.   Chassis intrusion connector (2-pin INTRUSION1)

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.

INTRUSION1

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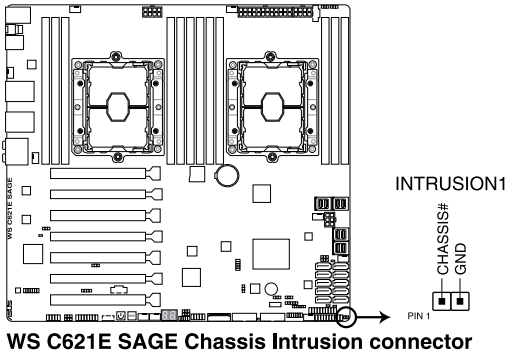
6.   TPM connector (14-1 pin TPM1)

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.

TPM1

WS C621E SAGE TPM connector
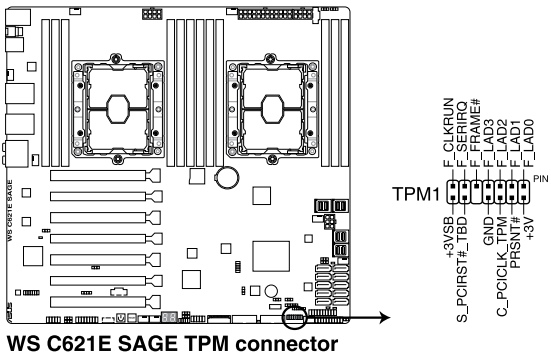
The TPM module is purchased separately.

7. **VGA connector (16-1 pin VGA_HDR1)**

This connector supports the VGA High Dynamic-Range interface.

VGA_HDR1
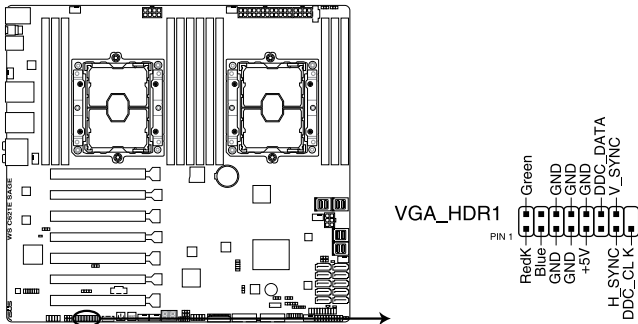
WS C621E SAGE Internal VGA connector

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.

U.2_1   U.2_2

U.2_3

U.2_4
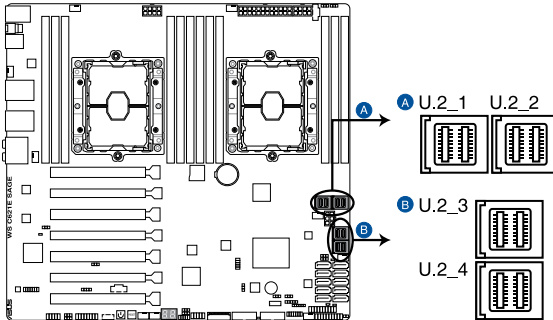
WS C621E SAGE U.2 connectors

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

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

NGFF1

WS C621E SAGE NGFF1 connector
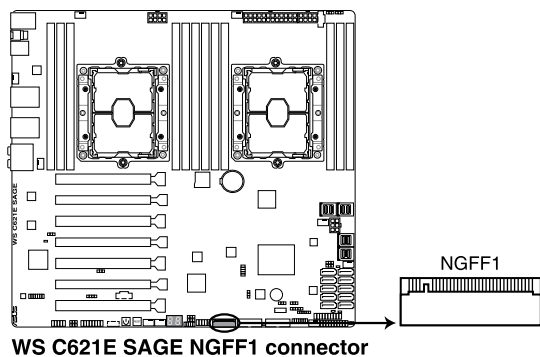
- This socket supports M Key and type 22110/2280/2260/2242 storage devices.
- This socket supports PCIe and SATA modes.
- The M.2 (NGFF) device is purchased separately.

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.

VROC_KEY1

PIN 1

GND
KEY1
GND
KEY2

WS C621E SAGE VROC_KEY1
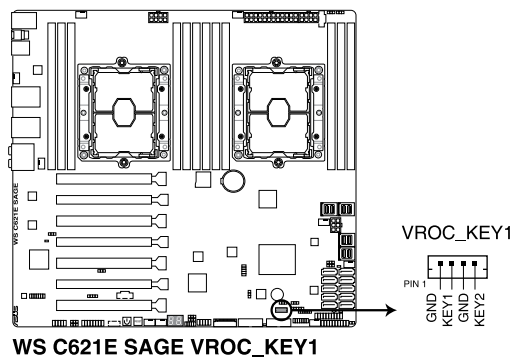
The KEY module is purchased separately.

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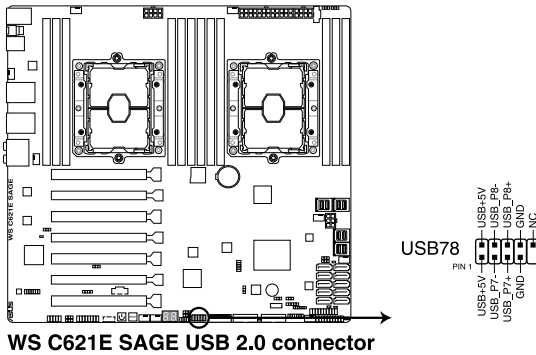
DO NOT connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

12.   USB 3.0 connector (20-1 pin USB3_E12; 20-1 pin USB3_E34)

These connectors allow you to connect a USB 3.0 module for additional USB 3.0 front or rear panel ports. With an installed USB 3.0 module, you can enjoy all the benefits of USB 3.0 including faster data transfer speeds of up to 5 Gb/s, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.0.
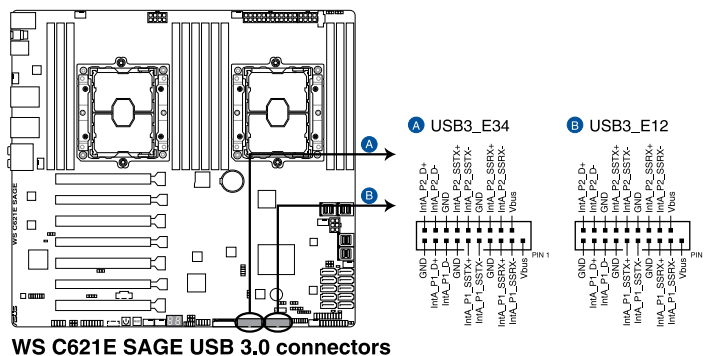
WS C621E SAGE USB 3.0 connectors

The USB 3.0 module is purchased separately.

The plugged USB 3.0 device may run on xHCI or EHCI mode depending on the operating system's setting.

13. CPU, front, and rear 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
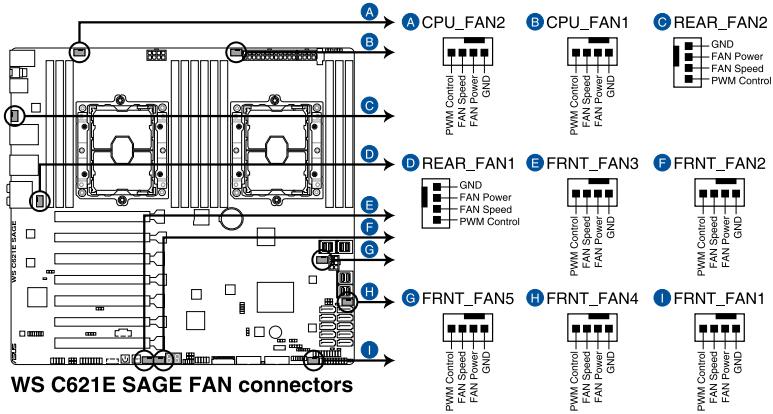
⚠️ • DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!

• 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.

Chapter 1

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

This connector supports several chassis-mounted functions.

WS C621E SAGE System panel connector
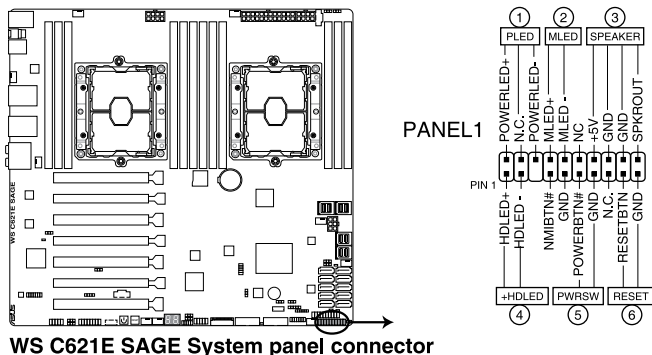
1. System power LED (3-pin PLED)

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

2. Message LED (2-pin MLED)

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

This connector may be disabled depending on the model.

3. System warning speaker (4-pin SPEAKER)

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

4. Hard disk drive activity LED (2-pin HDLED)

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

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

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

6. Reset button (2-pin RESET)

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

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

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

AUX_PANEL1

WS C621E SAGE Auxiliary panel connector
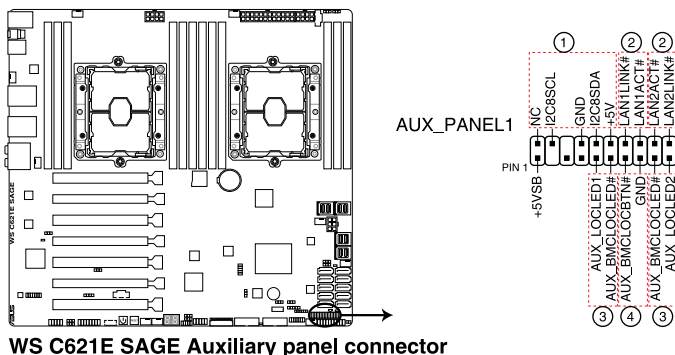
1. Front panel SMB (6-1 pin FPSMB)

This connector connects the front panel SMBus cable.

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

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

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

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

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

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

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

These connectors are for ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.
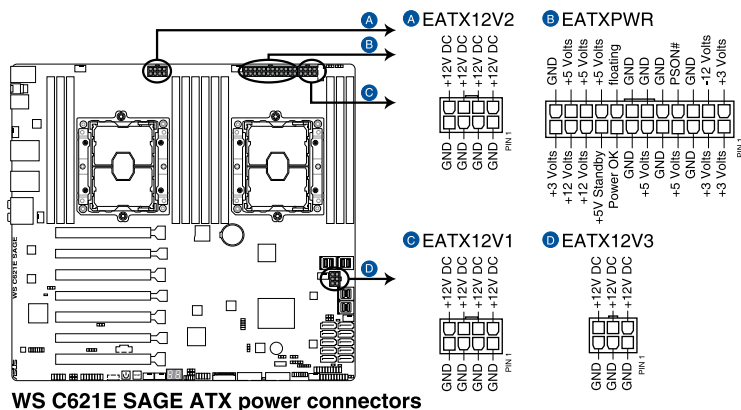
WS C621E SAGE ATX power connectors

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

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

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

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

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

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

This connector allows you to connect SMBus (System Management Bus) to the PSU (power supply unit) to read PSU information. Devices communicate with an SMBus host and/or other SMBus devices using the SMBus interface.
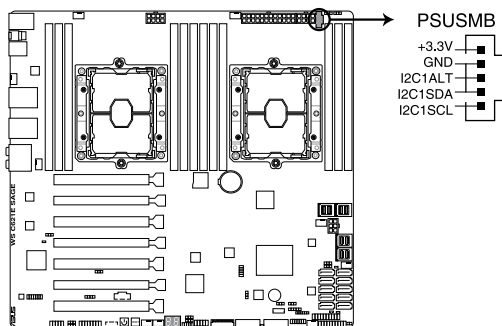
WS C621E SAGE Power supply SMBus connector

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

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

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

This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.
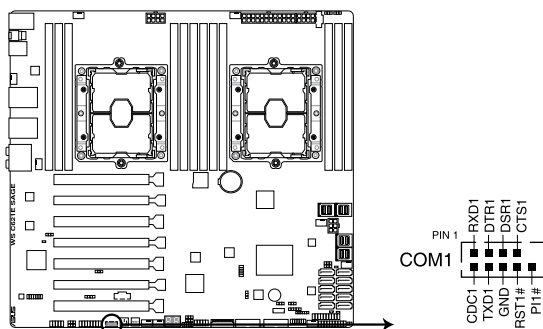
WS C621E SAGE Serial port connector

The COM module is purchased separately.

19.   VPP_I2C1 connector (10-1 pin VPP_I2C1)

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

WS C621E SAGE VPP_I2C1 connector
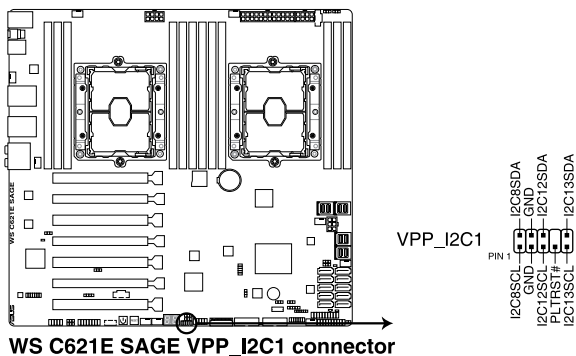
20.   System Management Bus (SMBUS) connector (5-1 pin SMBUS1)

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

WS C621E SAGE SMBUS connector
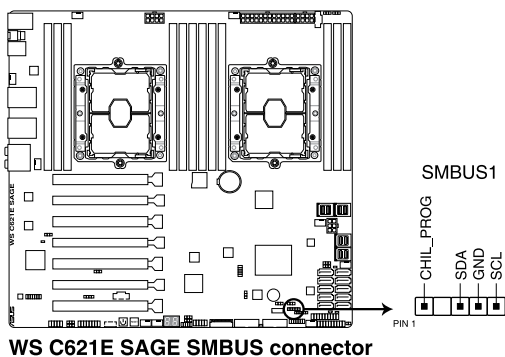
21.   Serial General Purpose Input/Output connector (6-1 pin SGPIO1)

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

WS C621E SAGE SGPIO1 connector
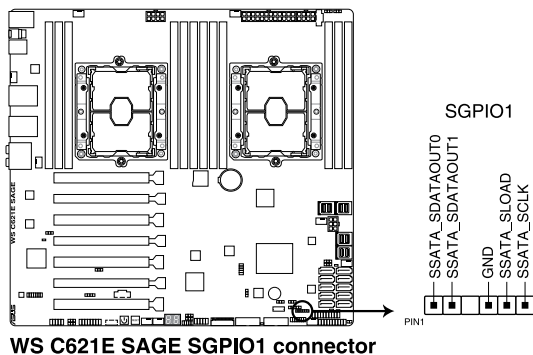
22.   BMC connector (14-1 pin ASMB9) (for WS C621E SAGE (BMC) only)

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

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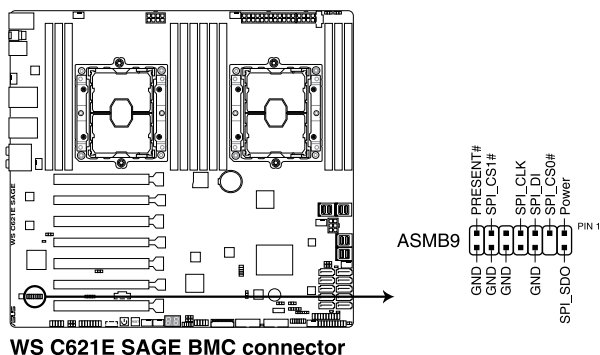
• This connector is only enabled for the WS C621E SAGE (BMC) model.

• The Baseboard Management Card is only available with the WS C621E SAGE (BMC) model.

23. Micro SD card slot (MSD1) (for WS C621E SAGE (BMC) only)

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

WS C621E SAGE MSD1
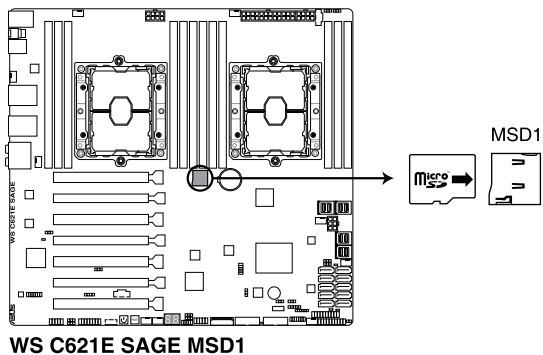
Some memory cards may not be compatible with your motherboard. Ensure that you use only compatible memory cards to prevent loss of data, damage to your device, or memory card, or both.

Basic Installation

2

2.1 Building your PC system

The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

2.1.1 CPU and heatsink installation

- 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.

- 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.

Triangle mark
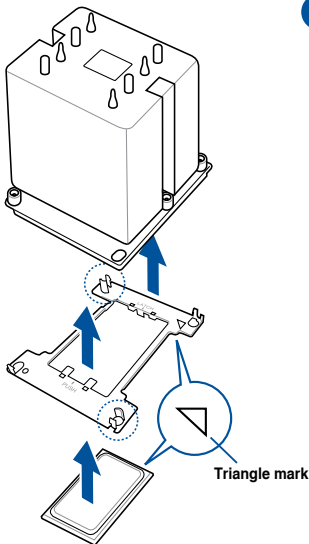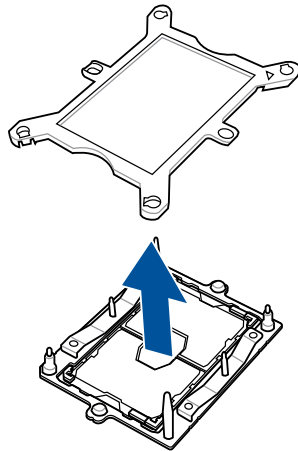
Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.
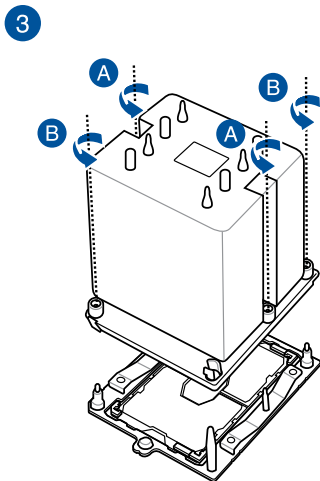
The CPU and heatsink assembly fits in only one correct orientation. DO NOT force the CPU and heatsink assembly into the socket to prevent damaging the CPU pins on the socket.

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

2.1.2   Motherboard installation

1.   Install the ASUS Q-Shield to the chassis rear I/O panel.
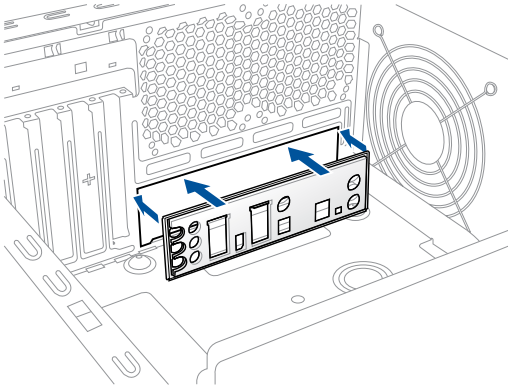
2.   Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.
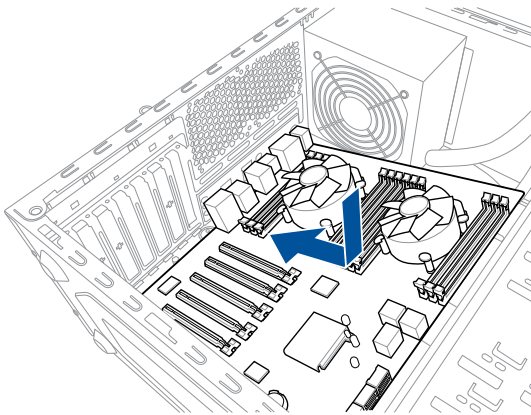
3. Place nine (9) screws into the holes indicated by circles to secure the motherboard to the chassis.
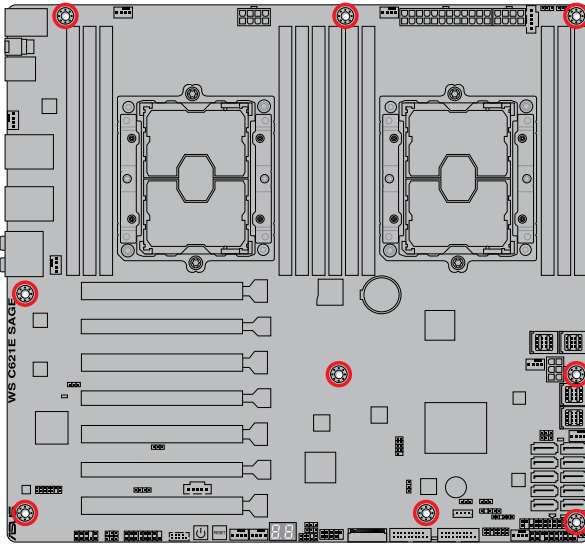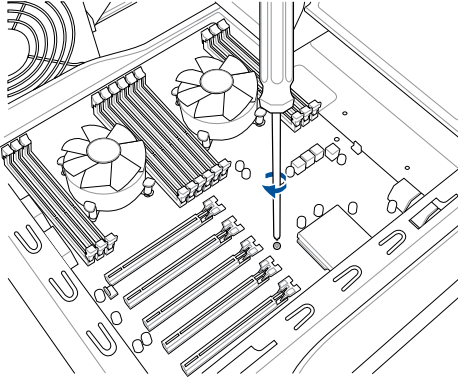
⚠️ DO NOT overtighten the screws! Doing so can damage the motherboard.

2.1.3 DIMM installation
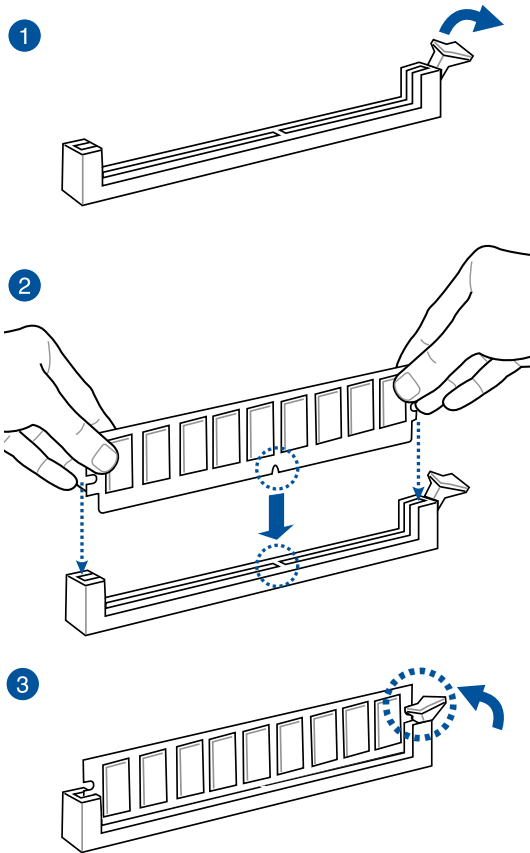
To remove a DIMM
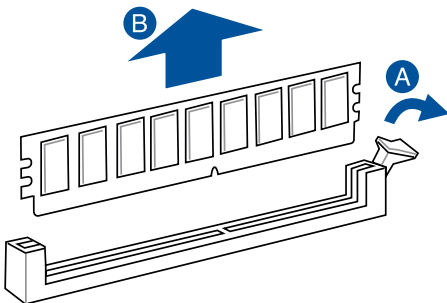
2.1.4 ATX power connection

1

2

OR   AND
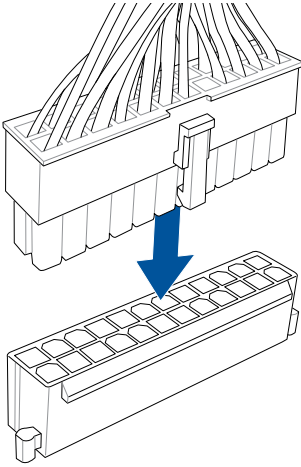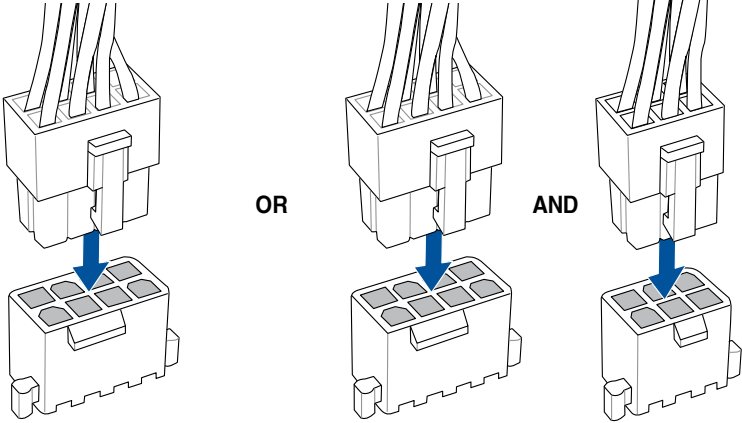
⚠ • DO NOT connect the 6-pin power plug only, the motherboard may overheat under
heavy usage.

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

2.1.5   SATA device connection

OR
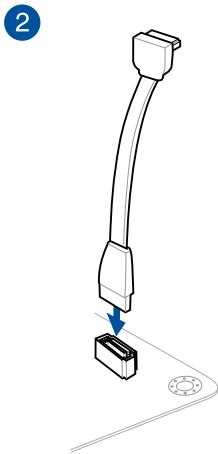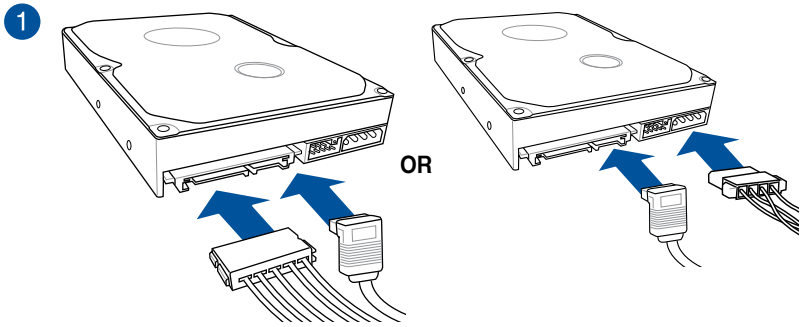
2.1.6 Front I/O connector

To install USB 2.0 connector

USB 2.0
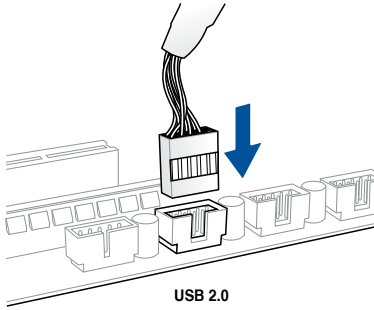
To install front panel audio connector

AAFP
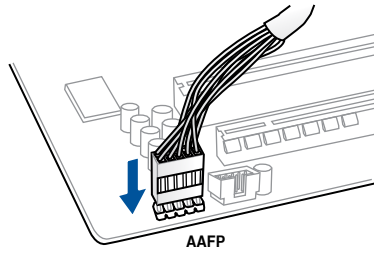
To install USB 3.0 connector

USB 3.0

Chapter 2
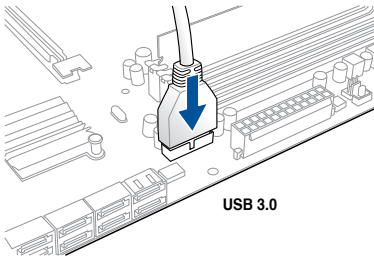
2.1.7   Expansion card installation

To install PCIe x16 cards

Chapter 2
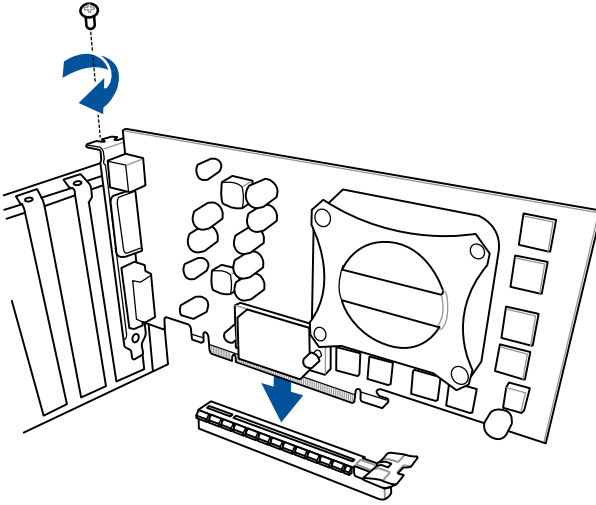
2.2 BIOS update utility

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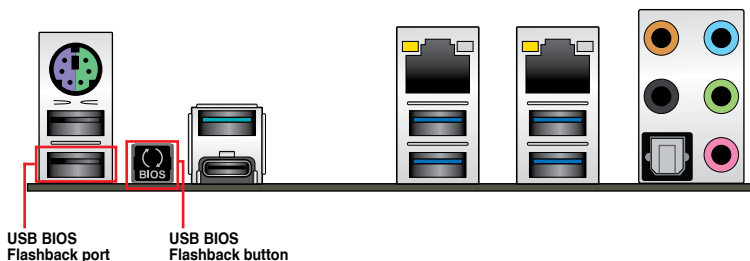
6. Wait until the light goes out, indicating that the BIOS updating process is completed.

    For more BIOS update utilities in BIOS setup, refer to the section **3.11 Updating BIOS** in Chapter 3.

    *   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.

2.3 Motherboard rear and audio connections

2.3.1 Rear I/O connection
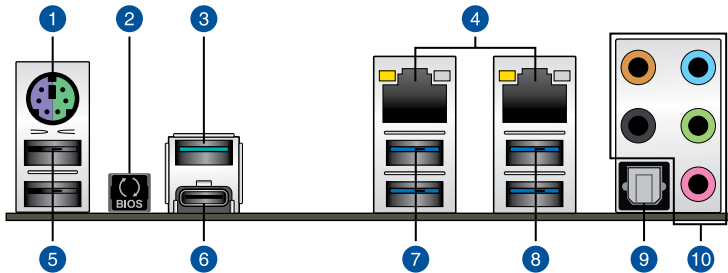
Rear panel connectors
1. PS/2 and keyboard Mouse port
2. USB BIOS Flashback button
3. USB 3.1 Type-A port EA2
4. LAN (RJ-45) ports 1, 2*
5. USB 2.0 ports 9, 10. Lower port supports USB BIOS Flashback function.
6. USB 3.1 Type-C™ port EC1
7. USB 3.0 ports 3, 4
8. USB 3.0 ports 1, 2
9. Optical S/PDIF OUT port
10.. Audio I/O ports**

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

- USB 3.0/3.1 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 3.0 devices to USB 3.0 ports and your USB 3.1 devices to USB 3.1 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
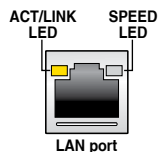
** Audio 2, 4, 6 or 8-channel configuration

Port	Headset 2-channel	4-channel	6-channel	8-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

2.3.2 Audio I/O connections

Audio I/O ports
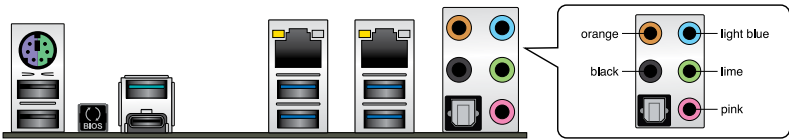
Connect to Headphone and Mic

Connect to Stereo Speakers
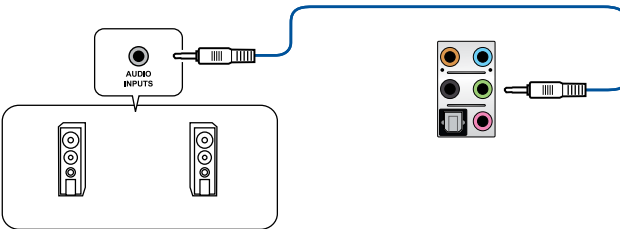
Connect to 2 Speakers
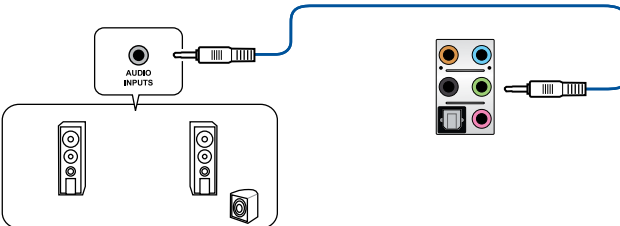
Connect to 4 Speakers
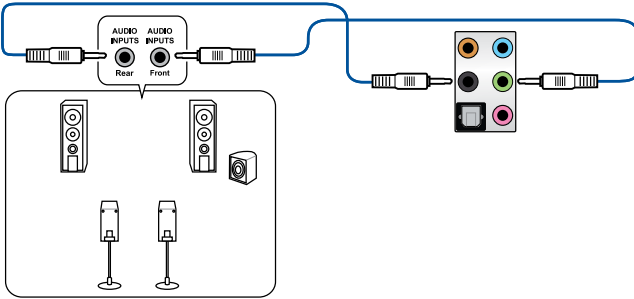
Connect to 6 Speakers
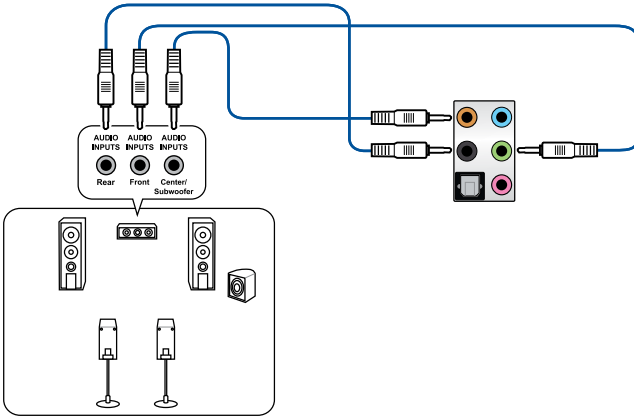
Connect to 8 Speakers
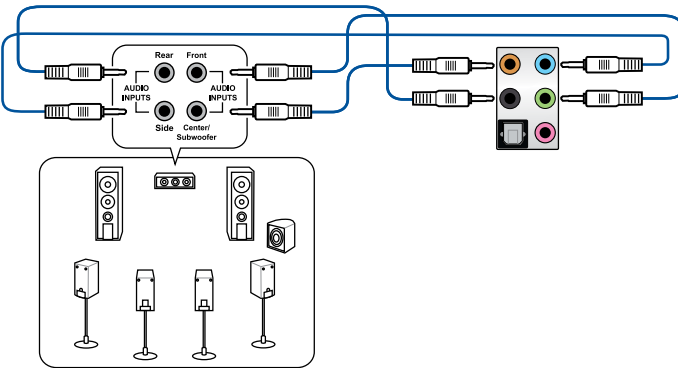
2.4   Starting up for the first time

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.

2.5   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.

BIOS setup

3

3.1 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.

3.1.1 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.

3.1.2   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
```
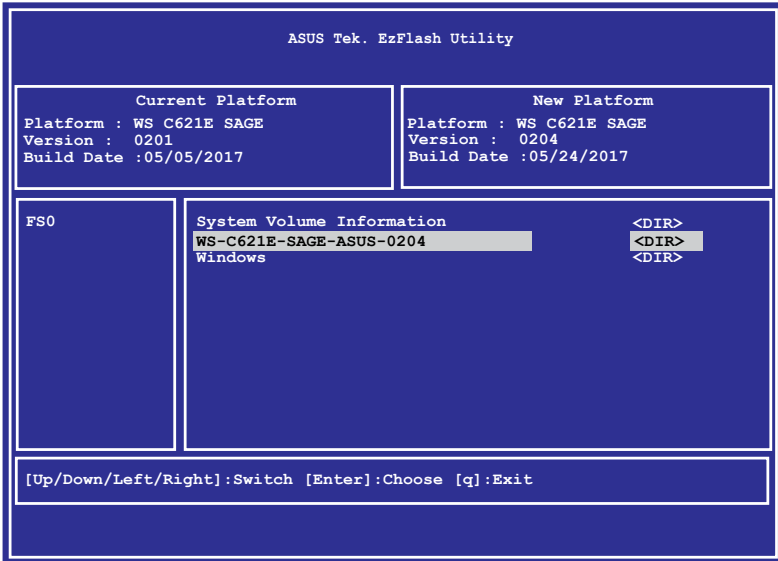
3.   Press <Tab> to switch to the **Drive** field.

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.

Chapter 3

- 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.

3.1.3 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.
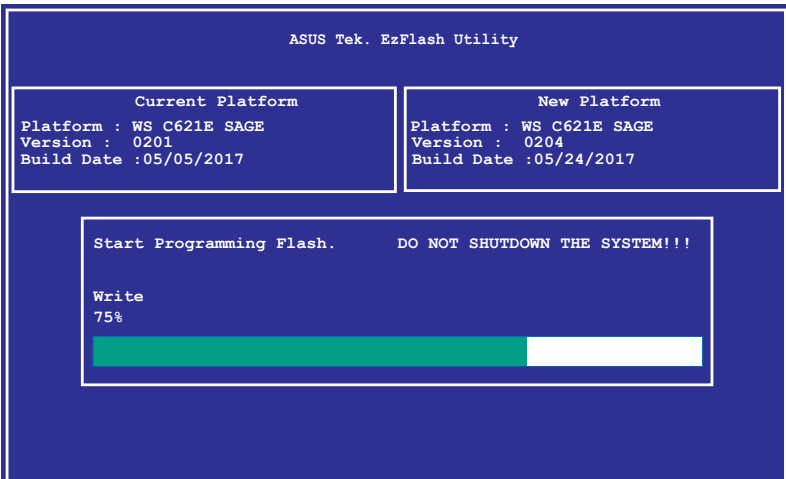
```
                        ASUS Tek. EzFlash Utility


              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:\>
```
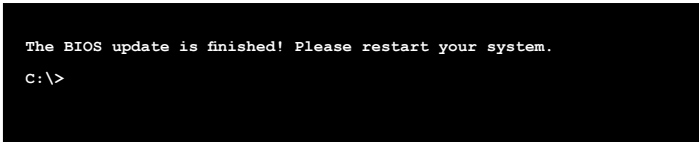
3.2 BIOS setup program

This motherboard supports a programmable firmware chip that you can update using the provided utility described in section **3.1 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.

3.2.1 BIOS menu screen

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

```
                Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
     Main  AiTweaker  Advanced  Platform Configuration  Socket Configuration  Event Logs

     BIOS Information                                              Set the Date. Use Tab to
     BIOS Vendor                   American Megatrends            switch between Date elements.
     Core Version                  5.12                           Default Ranges:
     Compliancy                    UEFI 2.5; PI 1.4               Year: 2005-2099
     Project Version               0303 x64                       Months: 1-12
     Build Date                    08/23/2017                     Days: dependent on month
     BMC Firmware Revision         Unknown
     System Serial Number          System Serial Number
     RC Revision                   142.R08

     Memory Information
     Total Memory                  16384 MB
     Memory Frequency              2133 MHz

     System Date                   [Tue 08/29/2017]
     System Time                   [07:36:33]                     →←: Select Screen
                                                                  ↑↓: Select Item
     Access Level                  Administrator                  Enter: Select
                                                                  +/-: Change Opt.
     INTEL I210 LAN1 MAC:          00:00:00:00:00:00              F1: General Help
     INTEL I210 LAN2 MAC:          00:00:00:00:00:00              F2: Previous Values
                                                                  F5: Optimized Defaults
                                                                  F10: Save Changes & Reset
                                                                  F12: Print Screen
                                                                  ESC: Exit

                Version 2.19.1268. Copyright (C) 2017 American Megatrends, Inc.
```

Navigation keys

3.2.2 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
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.

3.2.3 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.

3.2.4 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>.
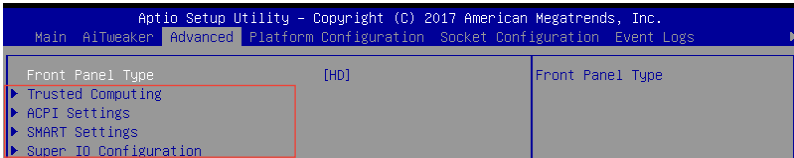
3.2.5 Navigation keys

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.

3.2.6 General help

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

3.2.7 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.

3.2.8 Pop-up window

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

3.2.9 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.

Chapter 3

3.3   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.

3.4   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]

3.5 Advanced menu

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

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

3.5.1 Trusted Computing

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

3.5.2 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)]

3.5.3 SMART Self Test

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

3.5.4 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]

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;]

3.5.5   Serial Port Console Redirection

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

3.5.6   Onboard LAN Configuration

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

Onboard I210 LAN Configuration

Intel LAN1 Enable

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

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]

Intel LAN ROM Type

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

3.5.7 APM

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

Restore AC Power Loss

When set to [Power Off], the system goes into off state after an AC power loss. When set to [Power On], the system will reboot after an AC power loss. When set to [Last State], the system goes into either off or on state, whatever the system state was before the AC power loss.
Configuration options: [Power Off] [Power On] [Last State]

Power On By PCIE

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

Power On By RTC

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

3.5.8 PCI Subsystem Settings

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

Load RT32 Image

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

Above 4G Decoding

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

SR-IOV Support

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

PCIE OPROM Slot Options

PCIE1-7 Slot OPROM

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

3.5.9 Network Stack Configuration

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

3.5.10 CSM Configuration

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

CSM Support

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

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

GateA20 Active

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

Option ROM Messages

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

INT19 Trap Response

This option allows you to control the BIOS reaction on INT19 trapping by Option ROM.
[Immediate]   Execute the trap right away.
[Legacy only]   Execute the trap during legacy boot.

Boot Option filter

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

Network / Storage / Video

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

Other PCI devices

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

3.5.11   NVMe Configuration

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

3.5.12   USB Configuration

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

3.5.13   iSCSI Configuration

Allows you to configure the iSCSi parameters.

3.5.14   Intel(R) Virtual RAID on CPU

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

Chapter 3

3.6 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.

3.6.1 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]

3.6.2 Miscellaneous Configuration

Active Video

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

3.6.3 Server ME Configuration

Displays the Server ME Technology parameters on your system.

3.6.4 Runtime Error Logging

Displays the Server ME Technology parameters on your system.

3.7 Socket Configuration menu

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

3.7.1 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]

3.7.2 Common RefCode Configuration

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

3.7.3 UPI Configuration

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

3.7.4 Memory Configuration

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

Memory Topology

Displays memory topology with DIMM population information.

3.7.5 IIO Configuration

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

Chapter 3

3.7.6 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]

3.8 Event Logs menu

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

3.8.1 Change Smbios Event Log Settings

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

3.8.2 View Smbios Event Log

Press <Enter> to view all smbios event logs.

3.9 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.

3.9.1 System Event Log

Allows you to change the SEL event log configuration.

3.9.2 BMC network configuration

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

3.9.3 View System Event Log

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

3.10 Monitor menu

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

3.11 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.

3.12 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.

3.13   Tool menu

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

```
                    Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
     ◄ Monitor  Security  Boot  Tool  Save & Exit

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

Start EzFlash

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

3.14   Save & Exit menu

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

```
                    Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
     ◄ Monitor  Security  Boot  Tool  Save & Exit

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

       Restore Defaults

       Boot Override
       IBA GE Slot 0400 v1572
       JetFlashTranscend 4GB 8.07
```
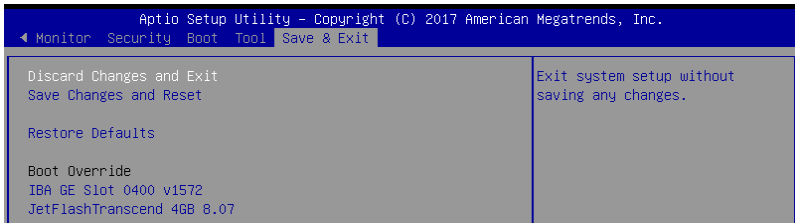
> Pressing <Esc> does not immediately exit this menu. Select one of the options from this menu or <F10> from the legend bar to exit.

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 Support

4

4.1   RAID configurations

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

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

4.1.1   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.

4.1.2　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.

4.1.3　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 3 for details on entering and navigating through the BIOS Setup.

4.1.4　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.

4.2 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.

4.2.1   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 ═══
```
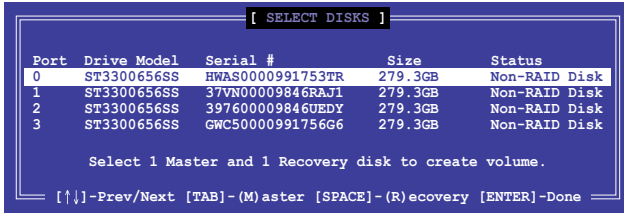
5.   Use the up/down arrow keys to move the selection bar then press <Space> to select a
      disk. A small triangle before the Port number marks the selected drive. Press <Enter>
      when you are done.

Chapter 4

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):

Chapter 4

4.2.2 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):
```

Chapter 4

4.2.3 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.

4.2.4 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):
```

4.2.5 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**.

Chapter 4

4.2.6   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>.

4.3 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.
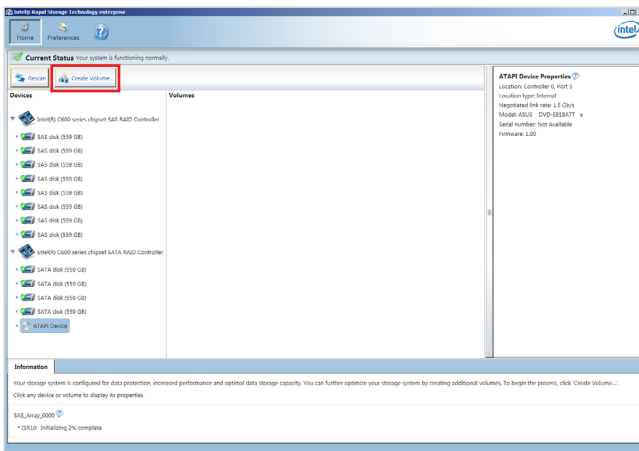
You can click **Rescan** to re-scan any attached hard disks.

4.3.1   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**.
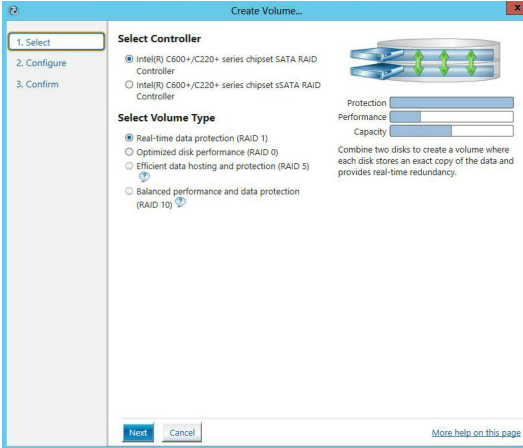
3. Enter a name for the RAID set, then select the array disks.

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

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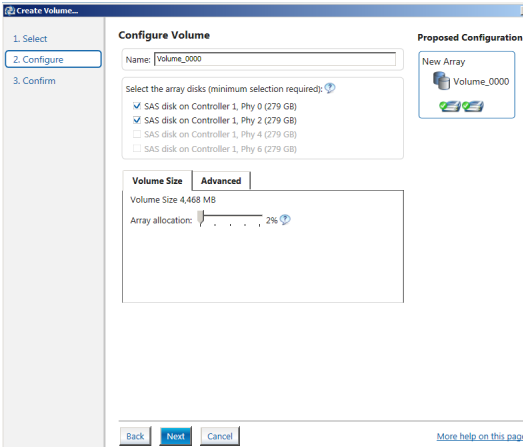
> • If you do not want to keep the data on one of the selected disks, select NO when prompted.
>
> • If you want to **Enable volume write-back cache** or **Initialize volume**, click **Advanced**.

Chapter 4

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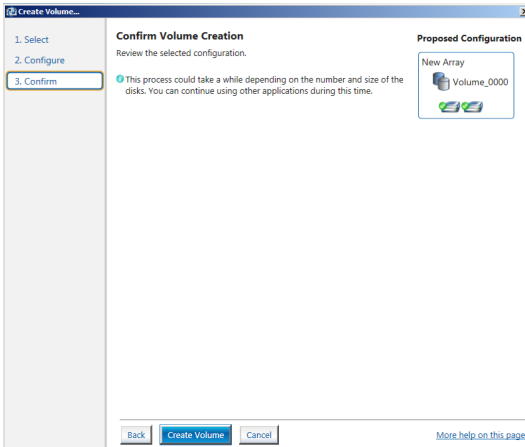
7.   Wait until the process is completed, then click **OK** when prompted.
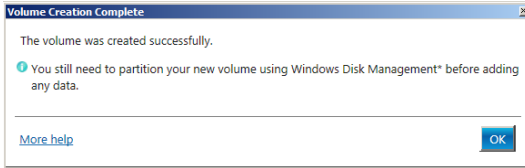
> You still need to partition your new volume using Windows Disk Management before adding any data.

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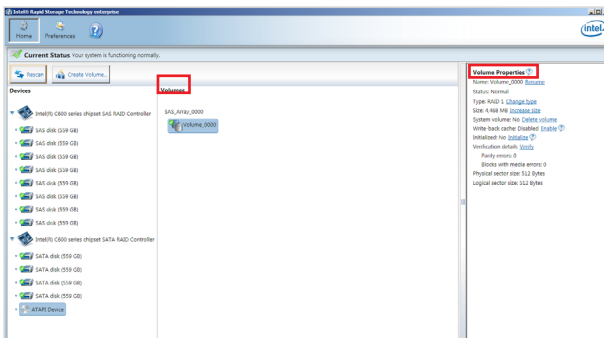
4.3.2 Changing a Volume Type

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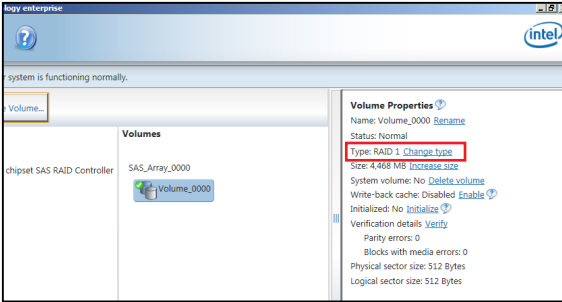
3. You can change the **Name**, **Select the new volume type**, and **Select additional disks to include in the new volume** if needed.

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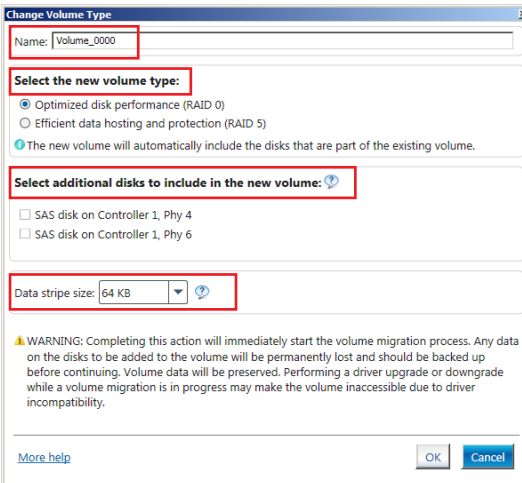
We recommend a lower stripe size for server systems, and a higher stripe size for multimedia computer systems used mainly for audio and video editing.

4.3.3   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.
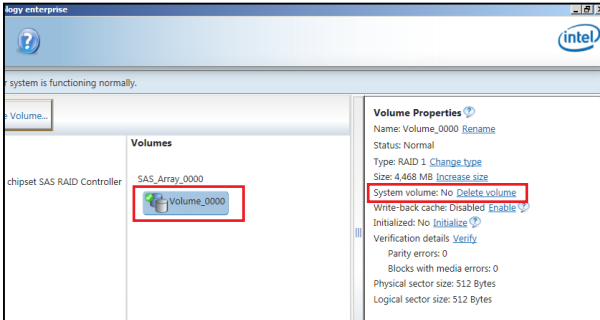
2.   Select **Delete volume** in **Volume Properties** field. The following screen appears.
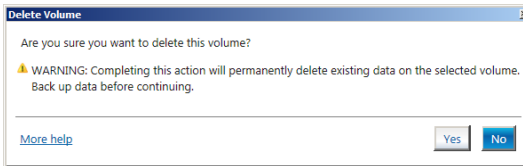
3.   Click **Yes** to delete the volume and return to the utility main menu, or click **No** to return to the main menu.

Chapter 4

4.3.4 Preferences

System Preferences

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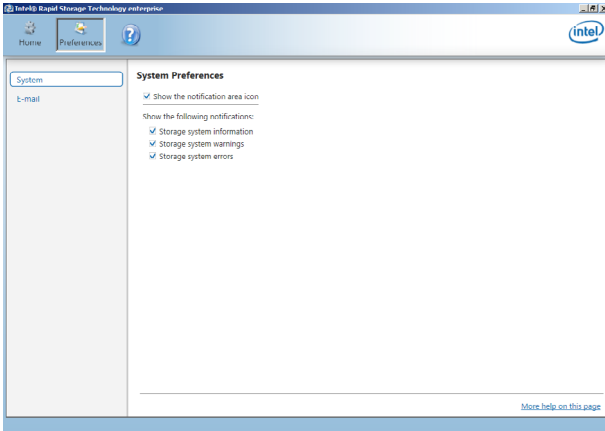
E-Mail Preferences

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

- Storage system information

- Storage system warnings

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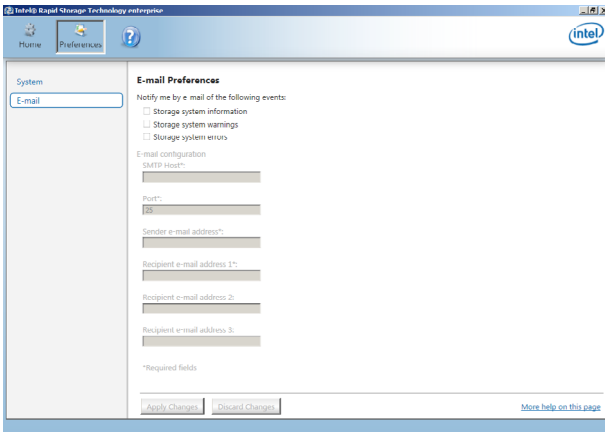
4.4 Intel® Virtual Raid on CPU in BIOS

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® Core™ X-series Processors (6-core or above) and Intel® SSD modules.
>
> • Refer to section **1.1.9 Internal connectors** for the location of the VROC_HW_KEY connector.

> Due to hardware design, your motherboard does not support CPU RAID configurations as OS drives.

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.

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

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


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



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

4.4.1   Creating a RAID set

To create a RAID set:

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

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

   Create RAID Volume                                            Select RAID Level

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

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

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

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

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

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

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

      -    RAID 0: 128 KB

      -    RAID 10: 64 KB

      -    RAID 5: 64 KB

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

Chapter 4

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

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

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

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

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

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

Chapter 4

4.4.2   Deleting a RAID set

<div style="border">

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

</div>

To delete a RAID set:

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

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

   RAID VOLUME INFO

   Volume Actions
 ▶ Delete

   Name:                           Volume0
   RAID Level:                     RAID5(Parity)
   Strip Size:                     64KB
   Size:                           1.03TB
   Status:                         Normal
   Bootable:                       Yes
   Block size:                     512
   RWH Policy:                     [Disable]
                                                    ➡➡: Select Screen
 ▶ Port 0, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212006W400NGN,...  ⬆⬇: Select Item
 ▶ Port 1, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212008H400NGN,...  Enter: Select
 ▶ Port 2, VMD0, INTEL SSDPE2MX400G4 SN:CVPD6212004T400NGN,...  +/-: Change Opt.
 ▶ Port 3, VMD0, INTEL SSDPE2MX400G4 SN:CVPD621200D5400NGN,...  F1: General Help
                                                    F2: Previous Values
                                                    F5: Optimized Defaults
                                                    F10: Save Changes & Reset
                                                    F12: Print Screen
                                                    ESC: Exit
```
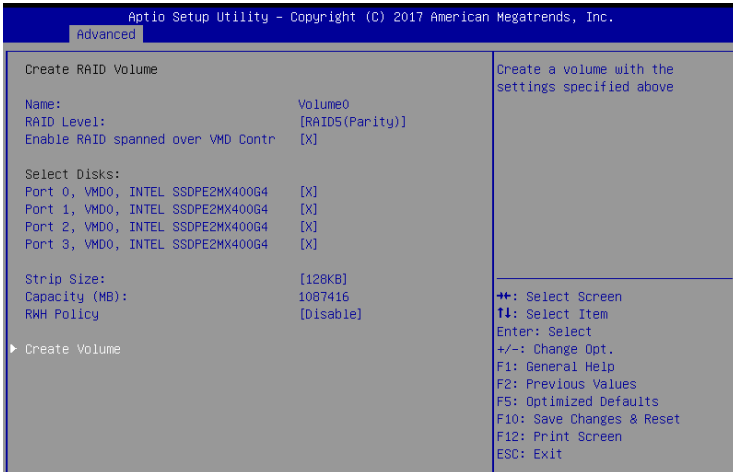
2. When the **Delete** item is selected, press <Enter>, then select **Yes** to delete the RAID volume and return to the Intel® Virtual Raid on CPU menu, or select **No** to cancel.

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

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

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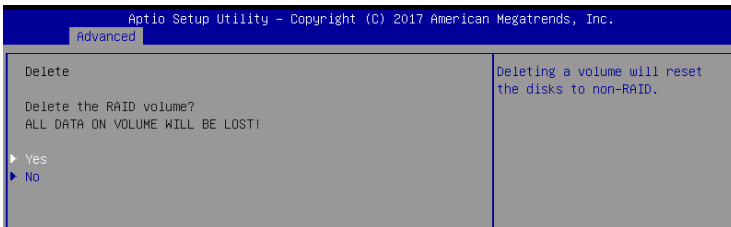
4.4.3 Installing the RAID controller driver during Windows® 10 OS installation

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)**.
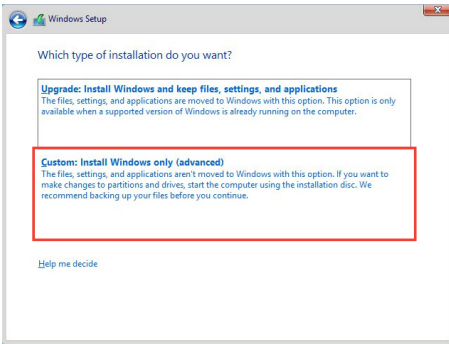
3. Click **Load Driver**.

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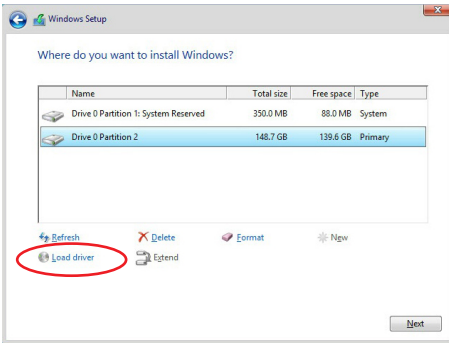
4.	A message appears, reminding you to insert the installation media containing the driver of the RAID controller driver. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive. Click **Browse**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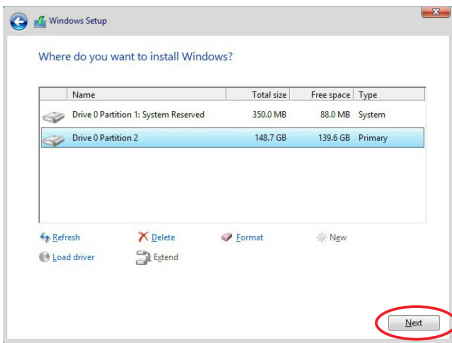
8.	Setup then proceeds with the OS installation. Follow screen instructions to continue.

Multiple GPU Support

5

5.1 AMD® CrossFireX™ technology

The motherboard supports the AMD® CrossFireX™ technology that allows you to install multi-graphics processing units (GPU) graphics cards. Follow the installation procedures in this section.

5.1.1 Requirements

- In Dual CrossFireX mode, you should have two identical CrossFireX-ready graphics cards or one CrossFireX-ready dual-GPU graphics card that are AMD® certified.

- Ensure that your graphics card driver supports the AMD CrossFireX technology. Download the latest driver from the AMD website (www.amd.com).

- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See Chapter 1 for details.

- We recommend that you install additional chassis fans for better thermal environment.

- Visit the AMD Game website (http://game.amd.com) for the latest certified graphics card and the supported 3D application list.

5.1.2 Before you begin

For AMD® CrossFireX™ to work properly, you have to uninstall all existing graphics card drivers before installing AMD® CrossFireX™ graphics cards to your system.

To uninstall existing graphics card drivers:

1. Close all current applications.

2. Press the Windows key on your keyboard to bring up the Start menu.

3. Type Control Panel in the search box, then select **Control Panel**.

4. Select **Programs and Features**.

5. Select your current graphics card driver/s, then select **Uninstall/Change**.

6. Turn off your computer.

5.1.3   Installing two CrossFireX™ graphics cards

The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

To install two CrossFire™ graphics cards:

1.   Prepare two CrossFireX-ready graphics cards.

2.   Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3.   Ensure that the cards are properly seated on the slots.

4.   Align and firmly insert the CrossFireX bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
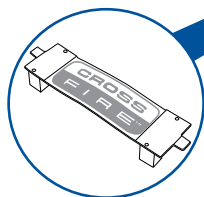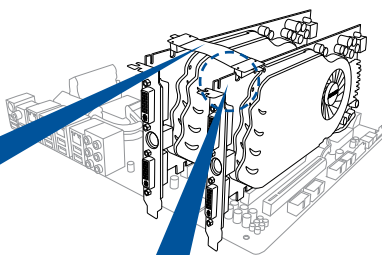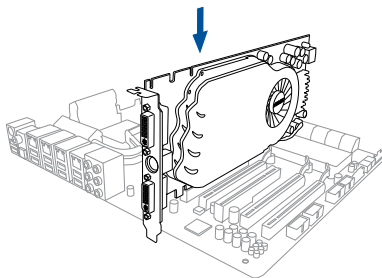
CrossFireX bridge (bundled with graphics cards)

Goldfingers
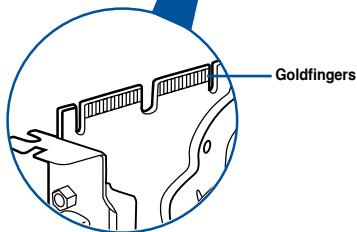
The CrossFireX™ bridge is only required for selected graphics cards.

5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.
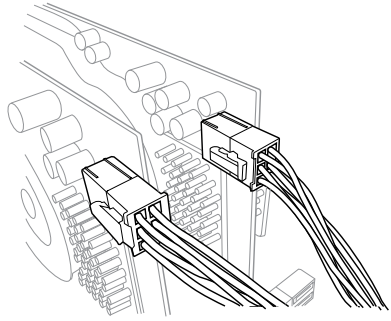
5.1.4 Installing the device drivers

Refer to the documentation that came with your graphics card package to install the device drivers.

Ensure that your PCI Express graphics card driver supports the AMD® CrossFireX™ technology. Download the latest driver from the AMD website at www.amd.com.

5.1.5 Enabling the AMD® CrossFireX™ technology

After installing your graphics cards and the device drivers, enable the CrossFireX™ feature through the AMD Vision Engine Control Center in Windows environment.

Launching the AMD VISION Engine Control Center

To launch the AMD VISION Engine Control Center:

Right-click on the Windows® desktop and select **AMD VISION Engine Control Center**.
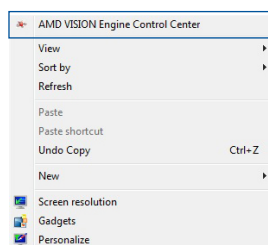
Enabling Dual CrossFireX™ technology

To enable Dual CrossFire™ technology:

1.   In the AMD Vision Engine Control Center window, click **Performance > AMD CrossFireX™**.

2.   Select **Enable CrossFireX™**.

3.   Select a GPU combination from the drop-down list.

4.   Click **Apply** to save and activate the GPU settings made.
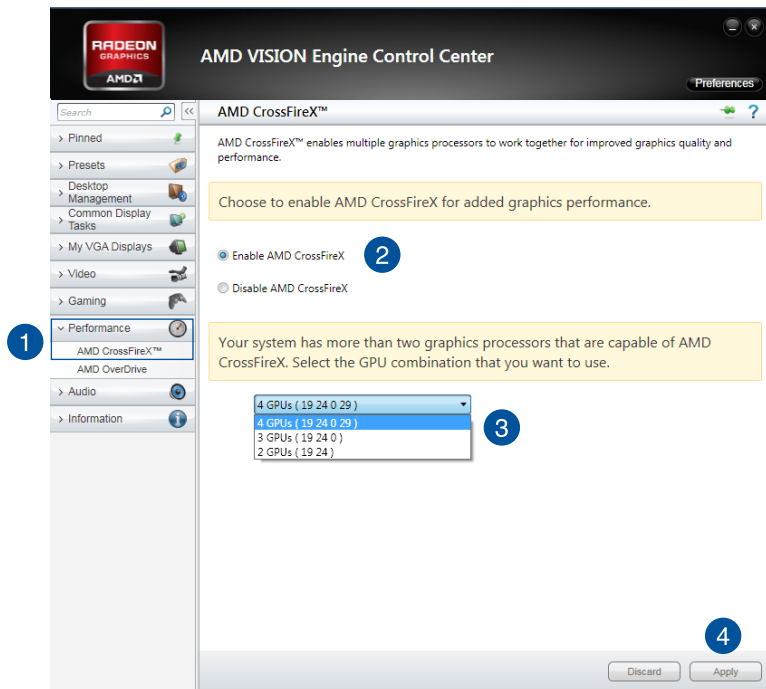
Appendix

WS C621E SAGE block diagram

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

DDR4 / DDR4

PCIEX16_1 — X16 Gen3
PCIEX16_2 — X8 Gen3
PCIEX16_6 — X8 Gen3
PCIEX16_7 — X16 Gen3

Intel Skylake-SP Up to 205W CPU 2

UPI

Intel Skylake-SP Up to 205W CPU 1

X8 Gen3 — PCIEX16_3
X8 Gen3 — QSW
PCIEX16_4
X8 Gen3
X16 Gen3 — PCIEX16_5

DMI 3.0

4 x U.2 Port

M.2_1 — X4 Gen3
8x SATA III Port
2x SATA III Port — ASM Controller
4x USB 3.0
4x USB 3.0 — USB HUB
4x USB 2.0

LBG-1G/2 (C621)

Intel I210-AT
Intel I210-AT

ASM Controller — 2x USB3.1 port Type A & Type C

AST2500 — VGA

SPI Flash
TPM Module
7.1ch HD Audio

Super I/O
Com port
KBMS

Q-Code table

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

Appendix

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

(continued on the next page)

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

ACPI/ASL Checkpoints (under OS)

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

Notices

Federal Communications Commission Statement

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

• This device may not cause harmful interference.

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with 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 Class B digital apparatus complies with Canadian ICES-003, RSS-210, and CAN ICES-3(B)/NMB-3(B).

This device complies with Industry Canada license 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.

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

Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003, RSS-210 et CAN ICES-3(B)/NMB-3(B).

Cet appareil est conforme aux normes CNR exemptes de licence d'Industrie Canada. Le fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité de l'appareil.

VCCI: Japan Compliance Statement

Class B ITE

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

VCCI−B

KC: Korea Warning Statement

B급 기기 (가정용 방송통신기자재)
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

Appendix

REACH

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

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.

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.

Regional notice for California

WARNING

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

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See the License for the specific language governing permissions and limitations under the License.

English ASUSTeK Computer Inc. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of related Directives. Full text of EU declaration of conformity is available at: www.asus.com/support

Français AsusTek Computer Inc. déclare par la présente que cet appareil est conforme aux critères essentiels et autres clauses pertinentes des directives concernées. La déclaration de conformité de l'UE peut être téléchargée à partir du site Internet suivant : www.asus.com/support

Deutsch ASUSTeK Computer Inc. erklärt hiermit, dass dieses Gerät mit den wesentlichen Anforderungen und anderen relevanten Bestimmungen der zugehörigen Richtlinien übereinstimmt. Der gesamte Text der EU-Konformitätserklärung ist verfügbar unter: www.asus.com/support

Italiano ASUSTeK Computer Inc. con la presente dichiara che questo dispositivo è conforme ai requisiti essenziali e alle altre disposizioni pertinenti con le direttive correlate. Il testo completo della dichiarazione di conformità UE è disponibile all'indirizzo: www.asus.com/support

Русский Компания ASUS заявляет, что это устройство соответствует основным требованиям и другим соответствующим условиям соответствующих директив. Подробную информацию, пожалуйста, смотрите на www.asus.com/support

Български С настоящото ASUSTeK Computer Inc. декларира, че това устройство е в съответствие със съществените изисквания и другите приложими постановления на свързаните директиви. Пълният текст на декларацията за съответствие на ЕС е достъпна на адрес: www.asus.com/support

Hrvatski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj sukladan s bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o sukladnosti dostupan je na: www.asus.com/support

Čeština Společnost ASUSTeK Computer Inc. tímto prohlašuje, že toto zařízení splňuje základní požadavky a další příslušná ustanovení souvisejících směrnic. Plné znění prohlášení o shodě EU je k dispozici na adrese: www.asus.com/support

Dansk ASUSTeK Computer Inc. erklærer hermed, at denne enhed er i overensstemmelse med hovedkravene og andre relevante bestemmelser i de relaterede direktiver. Hele EU-overensstemmelseserklæringen kan findes på: www.asus.com/support

Nederlands ASUSTeK Computer Inc. verklaart hierbij dat dit apparaat voldoet aan de essentiële vereisten en andere relevante bepalingen van de verwante richtlijnen. De volledige tekst van de EU-verklaring van conformiteit is beschikbaar op: www.asus.com/support

Eesti Käesolevaga kinnitab ASUSTeK Computer Inc, et see seade vastab asjakohaste direktiivide oluliste nõuetele ja teistele asjassepuutuvatele sätetele. EL vastavusdeklaratsiooni täielik tekst on saadaval järgmisel aadressil: www.asus.com/support

Suomi ASUSTeK Computer Inc. ilmoittaa täten, että tämä laite on asiaankuuluvien direktiivien olennaisten vaatimusten ja muiden tätä koskevien säädösten mukainen. EU-yhdenmukaisuusilmoituksen koko teksti on luettavissa osoitteessa: www.asus.com/support

Ελληνικά Με το παρόν, η AsusTek Computer Inc. δηλώνει ότι αυτή η συσκευή συμμορφώνεται με τις θεμελιώδεις απαιτήσεις και άλλες σχετικές διατάξεις των Οδηγιών της ΕΕ. Το πλήρες κείμενο της δήλωσης συμβατότητας είναι διαθέσιμο στη διεύθυνση: www.asus.com/support

Magyar Az ASUSTeK Computer Inc. ezennel kijelenti, hogy ez az eszköz megfelel a kapcsolódó Irányelvek lényeges követelményeinek és egyéb vonatkozó rendelkezéseinek. Az EU megfelelőségi nyilatkozat teljes szövege innen letölthető: www.asus.com/support

Latviski ASUSTeK Computer Inc. ar šo paziņo, ka šī ierīce atbilst saistīto Direktīvu būtiskajām prasībām un citiem citiem saistošajiem nosacījumiem. Pilns ES atbilstības paziņojuma teksts pieejams šeit: www.asus.com/support

Lietuvių „ASUSTeK Computer Inc." šiuo tvirtina, kad šis įrenginys atitinka pagrindinius reikalavimus ir kitas svarbias susijusių direktyvų nuostatas. Visą ES atitikties deklaracijos tekstą galima rasti: www.asus.com/support

Norsk ASUSTeK Computer Inc. erklærer herved at denne enheten er i samsvar med hovedsaklige krav og andre relevante forskrifter i relaterte direktiver. Fullstendig tekst for EU-samsvarserklæringen finnes på: www.asus.com/support

Polski Firma ASUSTeK Computer Inc. niniejszym oświadcza, że urządzenie to jest zgodne z zasadniczymi wymogami i innymi właściwymi postanowieniami powiązanych dyrektyw. Pełny tekst deklaracji zgodności UE jest dostępny pod adresem: www.asus.com/support

Português A ASUSTeK Computer Inc. declara que este dispositivo está em conformidade com os requisitos essenciais e outras disposições relevantes das Diretivas relacionadas. Texto integral da declaração da UE disponível em: www.asus.com/support

Română ASUSTeK Computer Inc. declară că acest dispozitiv se conformează cerințelor esențiale și altor prevederi relevante ale directivelor conexe. Textul complet al declarației de conformitate a Uniunii Europene se găsește la: www.asus.com/support

Srpski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj u saglasnosti sa osnovnim zahtevima i drugim relevantnim odredbama povezanih Direktiva. Pun tekst EU deklaracije o usaglašenosti je dostupan da adresi: www.asus.com/support

Slovensky Spoločnosť ASUSTeK Computer Inc. týmto vyhlasuje, že toto zariadenie vyhovuje základným požiadavkám a ostatým príslušným ustanoveniam príslušných smerníc. Celý text vyhlásenia o zhode pre štáty EÚ je dostupný na adrese: www.asus.com/support

Slovenščina ASUSTeK Computer Inc. izjavlja, da je ta naprava skladna z bistvenimi zahtevami in drugimi ustreznimi določbami povezanih direktiv. Celotno besedilo EU-izjave o skladnosti je na voljo na spletnem mestu: www.asus.com/support

Español Por la presente, ASUSTeK Computer Inc. declara que este dispositivo cumple los requisitos básicos y otras disposiciones pertinentes de las directivas relacionadas. El texto completo de la declaración de la UE de conformidad está disponible en: www.asus.com/support

Svenska ASUSTeK Computer Inc. förklarar härmed att denna enhet överensstämmer med de grundläggande kraven och andra relevanta föreskrifter i relaterade direktiv. Fulltext av EU-försäkran om överensstämmelse finns på: www.asus.com/support

Українська ASUSTeK Computer Inc. заявляє, що цей пристрій відповідає основним вимогам та іншим відповідним положенням відповідних Директив. Повний текст декларації відповідності стандартам ЄС доступний на: www.asus.com/support

Türkçe AsusTek Computer Inc., bu aygıtın temel gereksinimlerle ve ilişkili Yönergelerin diğer ilgili koşullarıyla uyumlu olduğunu beyan eder. AB uygunluk bildiriminin tam metni şu adreste bulunabilir: www.asus.com/support

Bosanski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj usklađen sa bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o usklađenosti dostupan je na: www.asus.com/support

ASUS contact information

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Appendix

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

FC

Responsible Party Name: **Asus Computer International**

Address: **800 Corporate Way, Fremont, CA 94539.**

Phone/Fax No: **(510)739-3777/(510)608-4555**

hereby declares that the product

Product Name : Motherboard

Model Number : WS C621E SAGE

Conforms to the following specifications:

☒   FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Representative Person's Name :   **Steve Chang / President**

Signature : *Steve Chang*

Date :   **Jul. 30, 2016**

Ver. 170324