

**Pro WS 621-64L**  
**SAGE Series**

**ASUS**<sup>®</sup>

**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](http://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 (+).

# Pro WS C621-64L SAGE Series specifications summary

Model Name	Pro WS C621-64L SAGE	Pro WS C621-64L SAGE/10G
<b>CPU</b>	1 x Socket-P (LGA-3647) Intel® Xeon W-3200 Processor Family (up to 205W) Intel® Xeon Processor Scalable Family (up to 205W)  * Refer to <a href="http://www.asus.com">www.asus.com</a> for Intel® CPU support list	
<b>Chipset</b>	Intel® C621 PCH	
<b>Memory</b>	12 x DIMM (6-channel), Max. 1,536GB DDR4 2933/2666 RDIMM/LR-DIMM/LR-DIMM 3DS  * Maximum memory capacity support depends on CPU type ** Refer to <a href="http://www.asus.com">www.asus.com</a> for the Memory QVL (Qualified Vendors Lists).	
<b>Expansion slots</b>	<b>Intel Xeon W-3200 Processor:</b> PCIe x16_1 Slot (Gen3 x16 link) PCIe x16_2 Slot (Gen3 x16 link) PCIe x4_1 Slot (Gen3 x4 link) PCIe x16_3 Slot (Gen3 x16 link) PCIe x16_4 Slot (Gen3 x16 link)  <b>Intel Xeon Scalable Processor:</b> PCIe x16_1 Slot (Gen3 x16 link) PCIe x16_2 Slot (Gen3 x16/x8 link) PCIe x4_1 Slot (Gen3 x4 link) PCIe x16_3 Slot (Gen3 x16 link) PCIe x16_4 Slot (Gen3 x0/x8 link)	
<b>VGA</b>	-	1 x BMC Integrated VGA header (Aspeed AST2500)
<b>Multi-GPU support</b>	Supports NVIDIA® SLI Technology Supports AMD CrossFireX Technology  * Actual numbers of Multi-graphic supported differs per Vendors' Graphic cards. Please check with Vendor beforehand.	
<b>Storage</b>	<b>ASMedia® ASM1062R</b> - 2 x SATA 6Gbps ports <b>Intel® C621 PCH with Intel® RSTe (for windows only, support software RAID 0,1,5,10)</b> - 8 x SATA 6Gbps ports - 1 x M.2 Connector, up to 22110 (PCIe 3.0 x4 or SATA mode)*  * The M.2 socket shares bandwidth with PCIEX4_1 when using M.2 PCIe mode device.	

(continued on the next page)

## Pro WS C621-64L SAGE Series specifications summary

Model Name	Pro WS C621-64L SAGE	Pro WS C621-64L SAGE/10G
LAN	2 x Intel® I210 Gigabit LAN Controllers	1 x Dual port Intel® X550 10GbE LAN Controllers
USB	<b>ASMedia® ASM3142</b> - 3 x USB 3.2 Gen2 ports (2 ports at rear, 1 port at mid-board) <b>Intel® C621 PCH</b> - 6 x USB 3.2 Gen1 ports (4 ports at rear, 2 ports at mid-board) - 2 x USB 2.0 port (2 ports at mid-board)	<b>ASMedia® ASM3142</b> - 2 x USB 3.2 Gen2 ports (2 ports at rear) <b>Intel® C621 PCH</b> - 6 x USB 3.2 Gen1 ports (4 ports at rear, 2 ports at mid-board) - 2 x USB 2.0 port (2 ports at mid-board)
Audio	<b>Realtek® ALC1220A 7.1-channel HD Audio CODEC</b> - Impedance sense for front and rear headphone outputs - Jack-detection, Multi-streaming, Front Panel Jack-retasking - Optical S/PDIF output - Premium Japan-made Audio Capacitor	
Workstation Unique Features	- ECC memory prevents system crash caused by memory error	- ECC memory prevents system crash caused by memory error - Out-of-band remote management by ASMB9
Rear Panel I/O Ports	2 x USB 3.2 Gen 2 ports (1 x Type-A, 1 x Type-C™) 4 x USB 3.2 Gen 1 ports 2 x Gigabit LAN ports (RJ45) 5 x Audio Jacks 1 x Optical S/PDIF output	2 x USB 3.2 Gen 2 ports (1 x Type-A, 1 x Type-C™) 4 x USB 3.2 Gen 1 ports 2 x 10GbE LAN ports (RJ45) 5 x Audio Jacks 1 x Optical S/PDIF output

*(continued on the next page)*

# Pro WS C621-64L SAGE Series specifications summary

Model Name	Pro WS C621-64L SAGE	Pro WS C621-64L SAGE/10G
<b>Internal I/O Ports</b>	1 x USB 3.2 Gen 2 connector support additional 1 external port 1 x USB 3.2 Gen 1 connector support additional 2 external ports 1 x USB 2.0 connector support additional 2 external ports 10 x SATA 6Gbps connectors 1 x M.2 connector, up to 22110 (PCIe 3.0 x4 or SATA mode) 2 x CPU Fan connectors (4-pin) 8 x Chassis Fan Connectors (4-pin) 1 x TPM connector (14-1 pin) 1 x COM connector 1 x VROC key connector 1 x Front Panel Audio connector (AAFP) 1 x 24-pin EATX power connector 2 x 8-pin EATX 12V power connectors 1 x System Panel connector 1 x Chassis Intrusion connector (2-pin)	1 x USB 3.2 Gen 1 connector support additional 2 external ports 1 x USB 2.0 connector support additional 2 external ports 10 x SATA 6Gbps connectors 1 x M.2 connector, up to 22110 (PCIe 3.0 x4 or SATA mode) 2 x CPU Fan connectors (4-pin) 8 x Chassis Fan Connectors (4-pin) 1 x VGA connector (16-1 pin) 1 x TPM connector (14-1 pin) 1 x COM connector 1 x VROC key connector 1 x Front Panel Audio connector (AAFP) 1 x 24-pin EATX power connector 2 x 8-pin EATX 12V power connectors 1 x System Panel connector 1 x Chassis Intrusion connector (2-pin)
<b>BIOS Features</b>	256 Mb Flash ROM, UEFI BIOS, PnP, ASUS EZ Flash, ASUS CrashFree Technology	
<b>Manageability</b>	WOL by PME, PXE ASUS Control Center	WOL by PME, PXE ASUS Control Center ASMB9-iKVM (on-board)
<b>Operating System</b>	Windows® 10 64-bit	
<b>Form Factor</b>	CEB Form Factor, 12" x 10.9"	



- 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	1 x Pro WS C621-64L SAGE Series motherboard
Cables	10 x Serial ATA 6Gb/s cables
	1 x COM port flat cable
	1 x USB cable (2 ports) with bracket
	1 x VGA port flat cable (for Pro WS C621-64L SAGE/10G)
Accessories	1 x M.2 screws kit
	1 x CPU Carrier
	1 X I/O Shield
Application DVD	1 x Motherboard support DVD
Documentation	1 x User manual



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



# Product Introduction

# 1

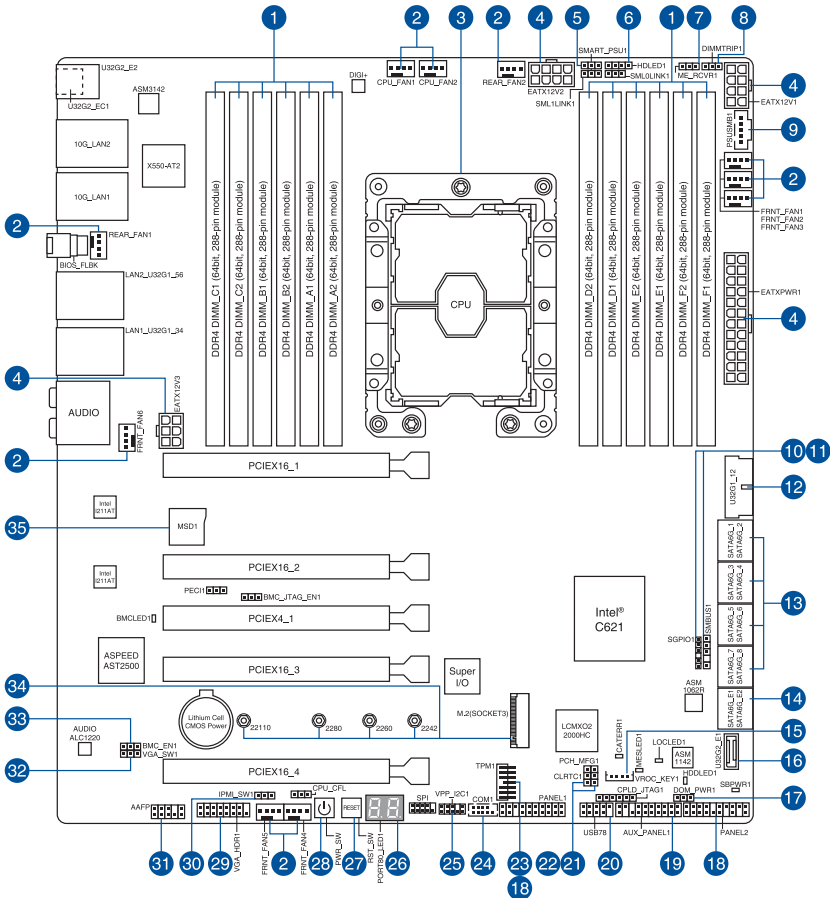
## 1.1 Before you proceed

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.
-

## 1.2 Motherboard layout

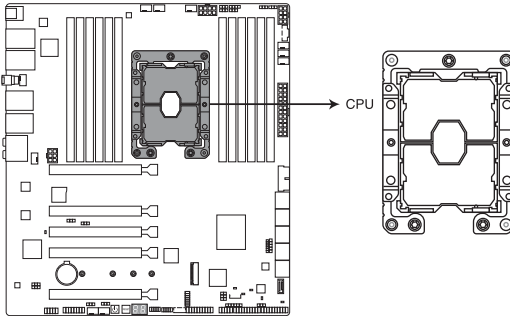


- Refer to **Internal connectors** and **Rear I/O connection** for more information about rear panel connectors and internal connectors.
- The components on the motherboard may differ between models, some components may only be available for Pro WS C621-64L SAGE/10G.

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## 1.3 Central Processing Unit (CPU)

This motherboard comes with a surface mount LGA 3647 socket designed for the Intel® Xeon W-3200 Processor Family Processors.



**Pro WS C621-64L SAGE series CPU LGA3647 Socket**



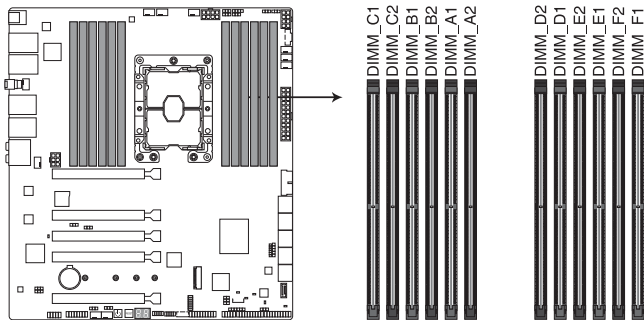
- Ensure that you install the correct CPU designed for LGA3647 socket only. **DO NOT** install a CPU designed for other sockets on the LGA3647 socket.
- The CPU fits in only one correct orientation. **DO NOT** force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU.
- 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.

## 1.4 System memory

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



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



Pro WS C621-64L SAGE series 288-pin DDR4 DIMM socket

## Memory configurations

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



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

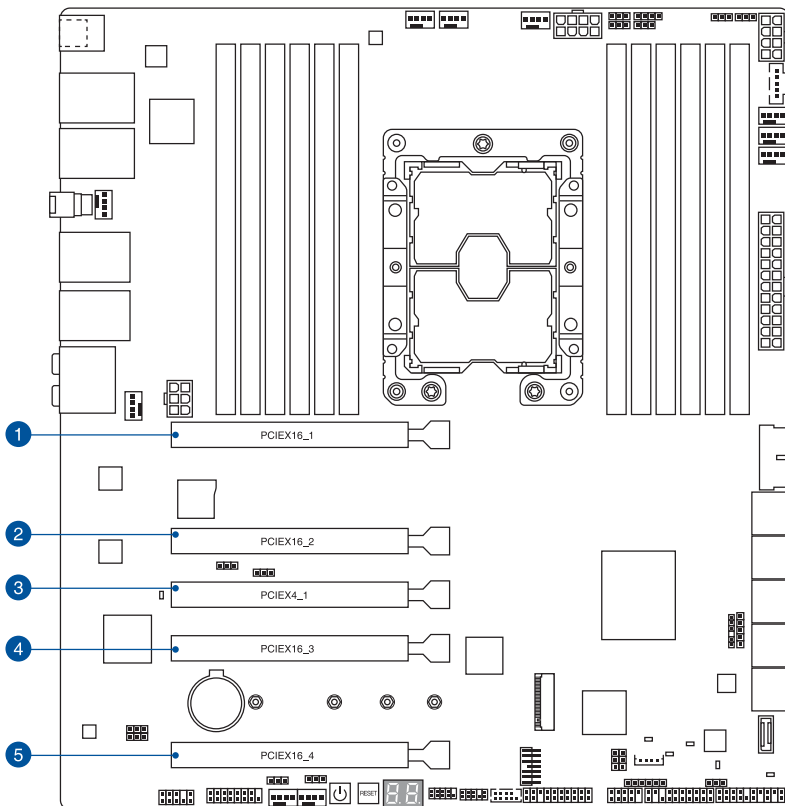
Recommended memory configuration												
	C1	C2	B1	B2	A1	A2	D2	D1	E2	E1	F2	F1
<b>1 DIMMs</b>	-	-	-	-	✓	-	-	-	-	-	-	-
<b>2 DIMMs</b>	-	-	-	-	✓	-	-	✓	-	-	-	-
<b>4 DIMMs</b>	-	-	✓	-	✓	-	-	✓	-	✓	-	-
<b>6 DIMMs</b>	✓	-	✓	-	✓	-	-	✓	-	✓	-	✓
<b>12 DIMMs</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



## 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 x4_1 slot
4	PCIe x16_3 slot
5	PCIe x16_4 slot

## Recommended VGA configuration

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

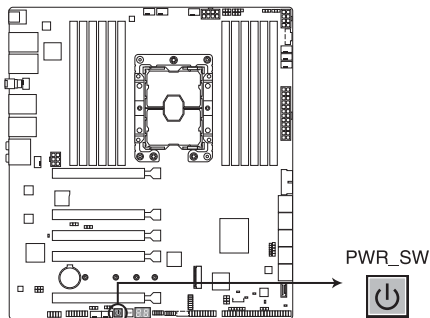


We recommend that you provide sufficient power when running CrossFireX™ or SLI® mode.

## 1.6 Onboard buttons

### 1. Power button

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



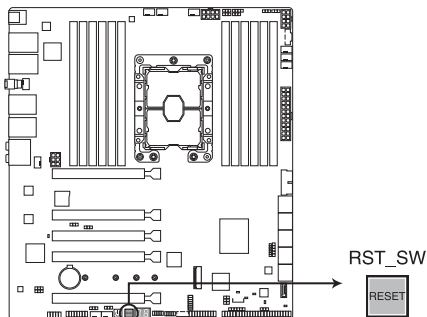
**Pro WS C621-64L SAGE series Power on button**



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

### 2. Reset button

Press the Reset button to reboot the system.

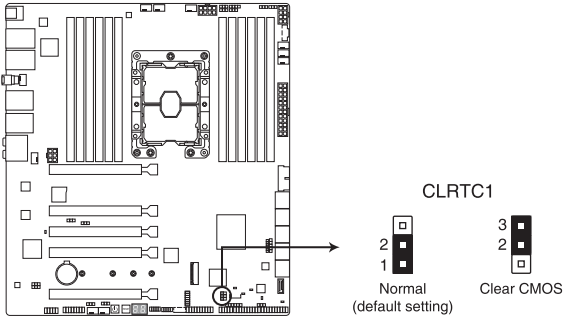


**Pro WS C621-64L SAGE series Reset button**

## 1.7 Onboard jumpers

### 1. Clear RTC RAM jumper

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



#### Pro WS C621-64L SAGE series Clear RTC RAM jumper

To erase the RTC RAM:

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



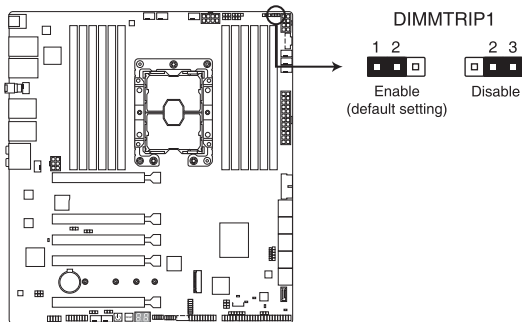
DO NOT short-circuit the pins except when clearing the RTC RAM. Short-circuiting or placing a jumper cap will cause system boot failure!



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

## 2. DDR4 Thermal Event jumper

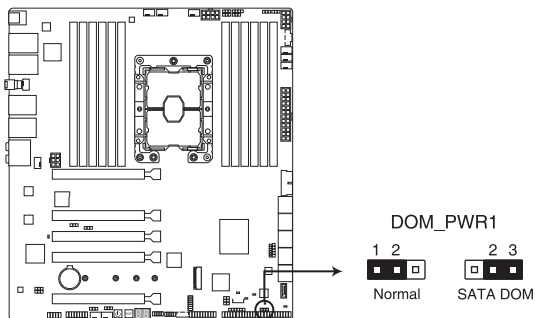
Set to pins 1-2 to enable DDR4 DIMM thermal sensing event.



Pro WS C621-64L SAGE series DDR4 Thermal Event jumper

## 3. SATADOM Power jumper

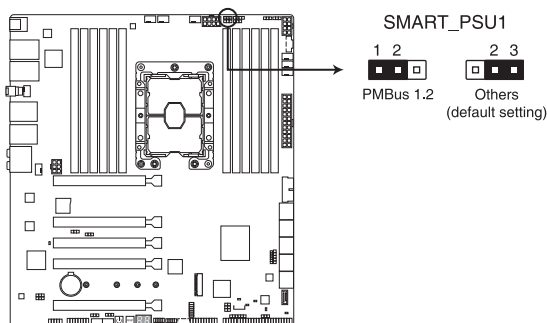
Set to pins 2-3 to enable SATA8 port to support SATADOM devices.



Pro WS C621-64L SAGE series SATADOM Power jumper

#### 4. PMBus 1.2 PSU Select jumper

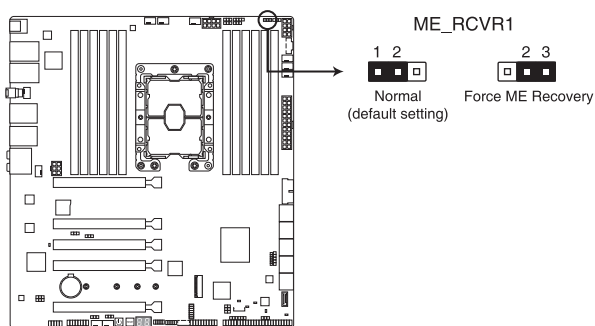
The PMBus 1.2 PSU Select jumper allows you to select the PSU PMBus version. Set to pins 1-2 for PMBus, set to pins 2-3 for others.



**Pro WS C621-64L SAGE series PMBus 1.2 PSU Select jumper**

#### 5. ME Firmware Force Recovery jumper

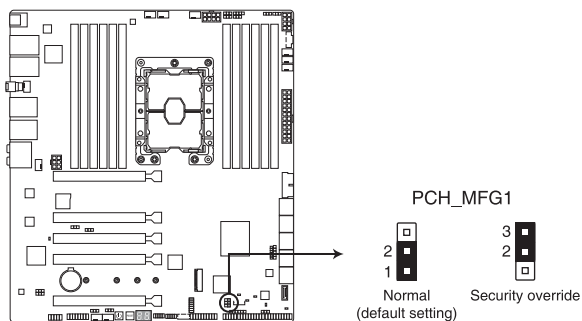
Set to pins 2-3 to force Intel® Management Engine (ME) boot from recovery mode when the ME becomes corrupted.



**Pro WS C621-64L SAGE series ME Firmware Force Recovery jumper**

## 6. PCH\_MFG1 jumper

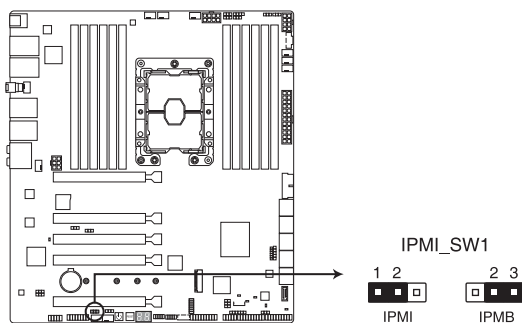
The PCH\_MFG1 jumper allows you to update the BIOS ME block.



**Pro WS C621-64L SAGE series PCH\_MFG1 jumper**

## 7. IPMI SW jumper (Pro WS C621-64L SAGE/10G only)

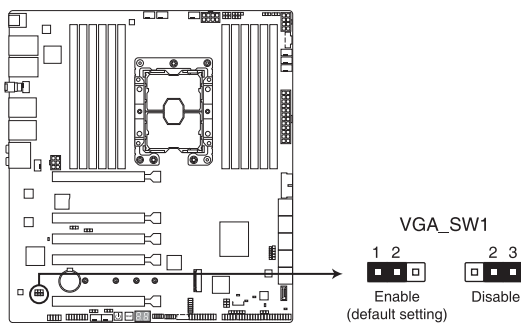
The IPMI SW jumper allows you to select which protocol in the GPU sensor to function.



**Pro WS C621-64L SAGE series IPMI SW jumper**

## 8. VGA Controller jumper (Pro WS C621-64L SAGE/10G only)

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



**Pro WS C621-64L SAGE series VGA Controller jumper**



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

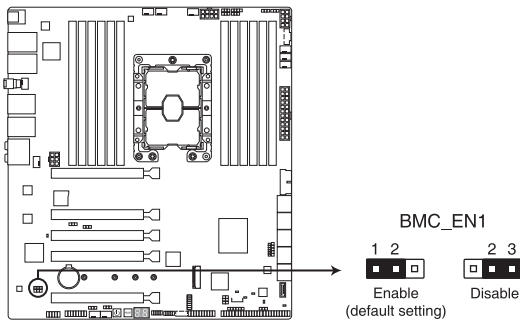


- If a VGA Card is installed into a PCI Express x16 Slot, the onboard VGA function will still be enabled.
- BMC Remote Management Function will still be available when VGA controller settings is set to disabled, but the display will be disabled on the client device.



## 9. Baseboard Management Controller setting (Pro WS C621-64L SAGE/10G only)

The Baseboard Management Controller jumper allows you to enable or disable the on-board BMC.



Pro WS C621-64L SAGE series

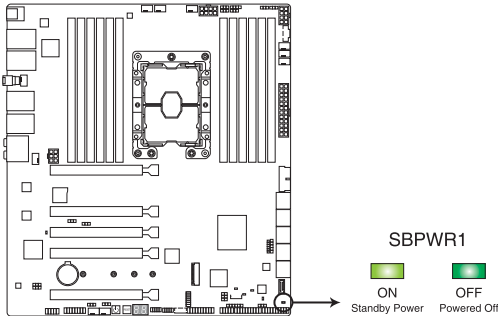


Ensure to set this BMC jumper to **Enable** to avoid system fan control and hardware monitor error.

## 1.8 Onboard LEDs

### 1. Standby Power LED

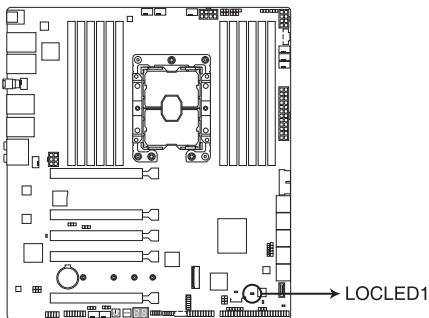
The Standby Power LED lights up to indicate that the system is ON, in sleep mode, in soft-off mode, or connected to a power source. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component.



**Pro WS C621-64L SAGE series Standby Power LED**

### 2. Location LED

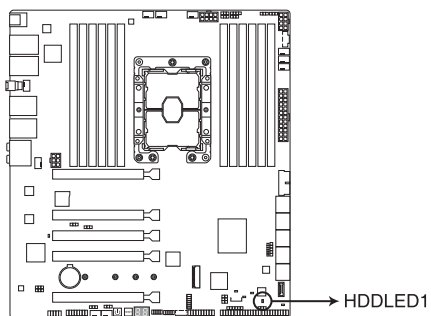
The Location LED lights up when the Location button on the server is pressed or when triggered by a system management software. The Location LED helps visually locate and quickly identify the server in error on a server rack.



**Pro WS C621-64L SAGE series Location LED**

### 3. Storage Device Activity LED

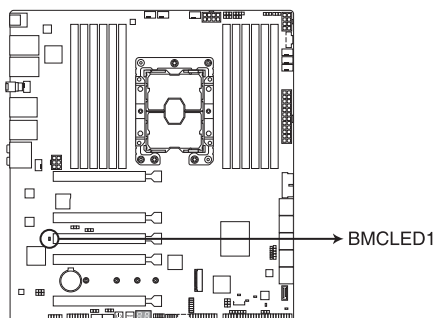
The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.



**Pro WS C621-64L SAGE series Storage Device Activity LED**

### 4. BMC LED (Pro WS C621-64L SAGE/10G only)

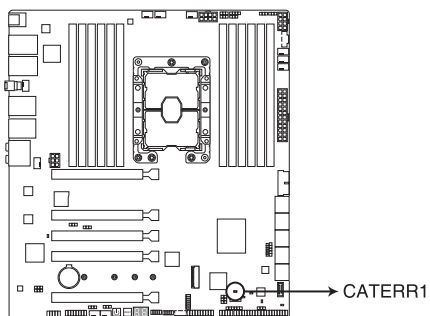
The BMC LED blinks to indicate that the on-board BMC is functional.



**Pro WS C621-64L SAGE series BMC LED**

## 5. Catastrophic Error LED

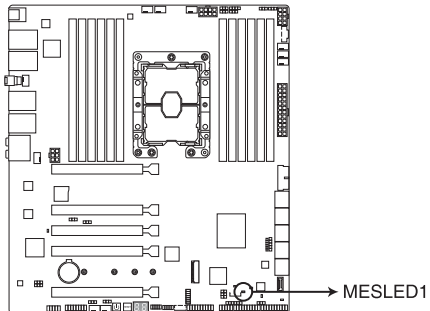
The Catastrophic Error LED indicates that the system has experienced a fatal or catastrophic error and cannot continue to operate.



**Pro WS C621-64L SAGE series Catastrophic Error LED**

## 6. Message LED

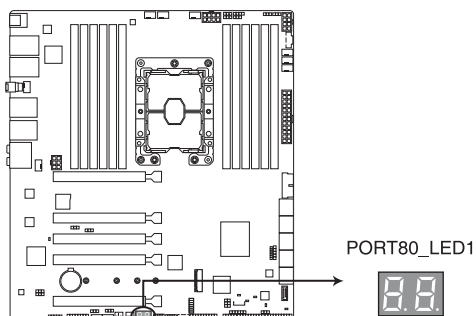
The Message LED lights up when a BMC event log is generated.



**Pro WS C621-64L SAGE series Message LED**

## 7. Q-Code LED

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



**Pro WS C621-64L SAGE series Q-Code LED**

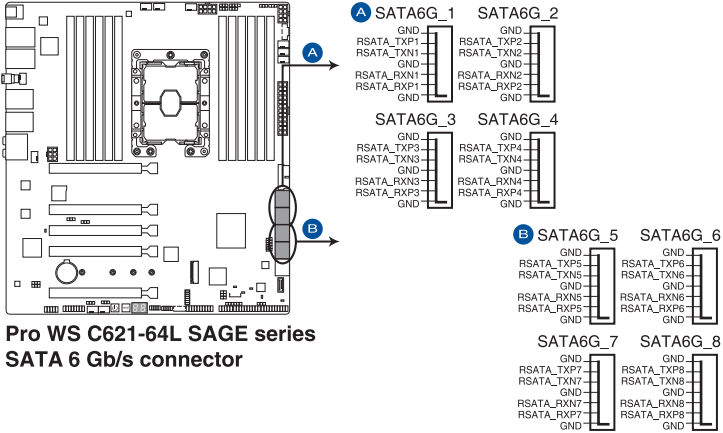


- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Please refer to the Q-Code table in the **Appendix** section for more details.

## 1.9 Internal connectors

### 1. SATA 6Gb/s connector

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



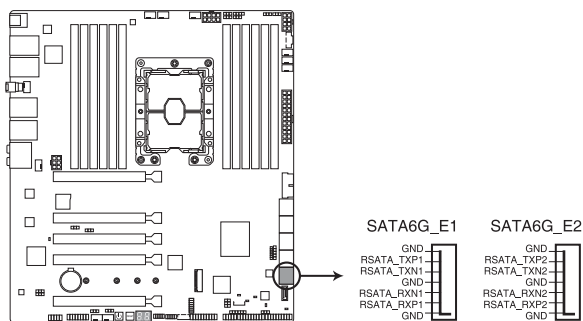
If you installed SATA storage devices, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® C621 chipset.



- The connectors are set to **[AHCI Mode]** by default. If you intend to create a SATA RAID set using these connectors, set the SATA Mode item in the BIOS to **[Intel RST Premium (RAID)]**.
- Before creating a RAID set, refer to the **RAID Configuration Guide**. You can download the **RAID Configuration Guide** from the ASUS website.

## 2. ASMedia® SATA 6 Gb/s connector

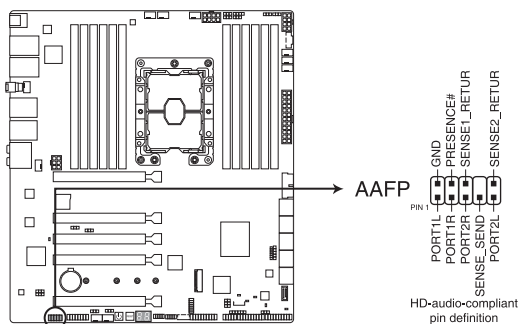
The SATA 6Gb/s connector allows you to connect SATA devices such as optical disc drives and hard disk drives via a SATA cable.



Pro WS C621-64L SAGE series ASMedia® SATA 6 Gb/s connector

## 3. Front Panel Audio connector

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



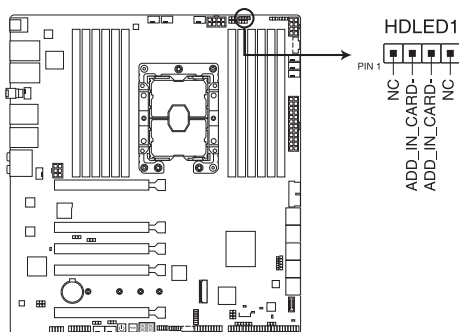
Pro WS C621-64L SAGE series Front Panel Audio connector



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

#### 4. Storage Add-on Card LED connector

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



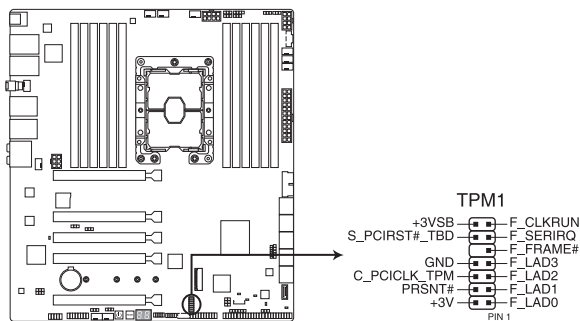
**Pro WS C621-64L SAGE series Storage Add-on Card LED connector**



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

#### 5. TPM connector

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



**Pro WS C621-64L SAGE series TPM connector**

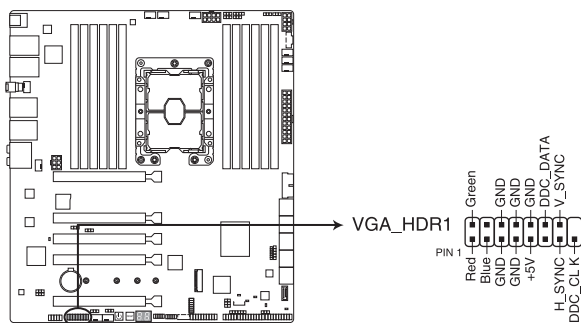


The TPM is purchased separately.



## 6. VGA connector (Pro WS C621-64L SAGE/10G only)

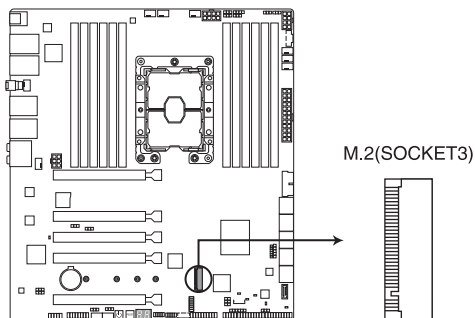
The VGA connector allows you to connect a VGA High Dynamic-Range interface module.



Pro WS C621-64L SAGE series VGA connector

## 7. M.2 slot

The M.2 slot allows you to install M.2 devices such as M.2 SSD modules.



Pro WS C621-64L SAGE series M.2 slot



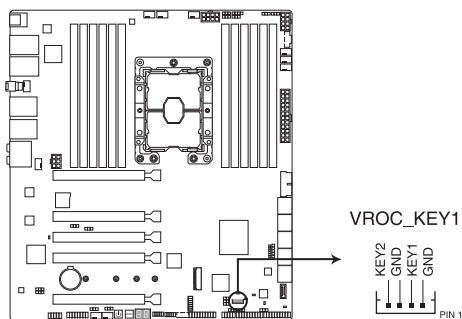
This connector supports type 22110 devices on both PCI-E and SATA interface.



The M.2 device is purchased separately.

## 8. VROC Key connector

The VROC (Virtual Raid on CPU) Key connector allows you to connect a VROC hardware key to enable additional CPU RAID functions with Intel® CPU RSTe.



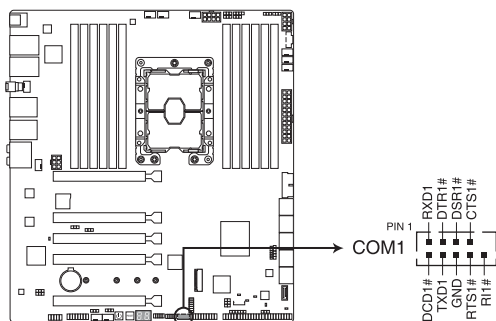
**Pro WS C621-64L SAGE series VROC Key connector**



The VROC hardware key is purchased separately.

## 9. Serial Port connector

The Serial (COM) Port connector allows you to connect a serial port module. Connect the serial port module cable to this connector, then install the module to a slot opening on the system chassis.



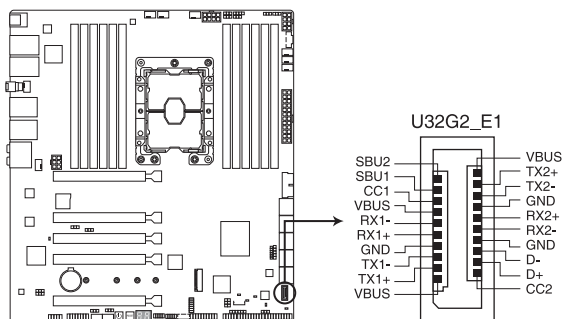
**Pro WS C621-64L SAGE series Serial port connector**



The serial port module is purchased separately.

## 10. USB 3.2 Gen 2 connector (Pro WS C621-64L SAGE only)

The USB 3.2 Gen 2 connector allows you to connect a USB 3.2 Gen 2 module for additional USB 3.2 Gen 2 ports. The USB 3.2 Gen 2 connector provides data transfer speeds of up to 10 Gb/s.



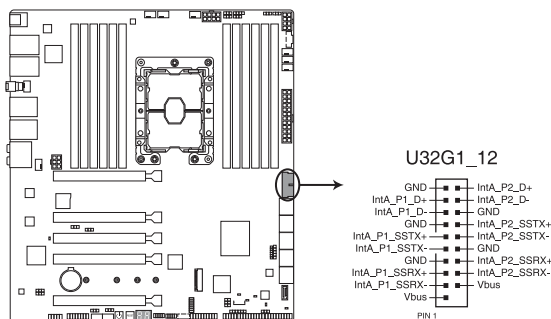
Pro WS C621-64L SAGE series USB 3.2 Gen 2 connector



The USB 3.2 Gen 2 module is purchased separately.

## 11. USB 3.2 Gen 1 connector

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



Pro WS C621-64L SAGE series USB 3.2 Gen 1 connector



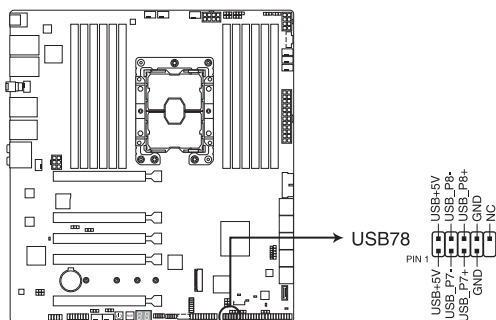
The USB 3.2 Gen 1 module is purchased separately.



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

## 12. USB 2.0 connector

The USB 2.0 connector allows you to connect a USB module for additional USB 2.0 ports. The USB 2.0 connector provides data transfer speeds of up to 480 MB/s connection speed.



**Pro WS C621-64L SAGE series USB 2.0 connector**



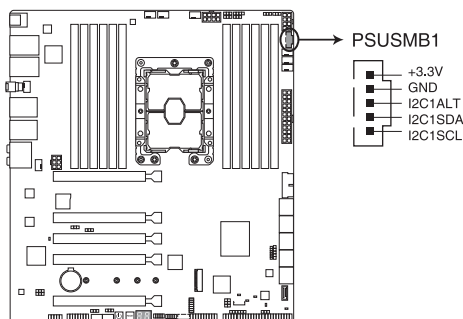
DO NOT connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!



The USB 2.0 module is purchased separately.

## 13. Power Supply SMBus connector

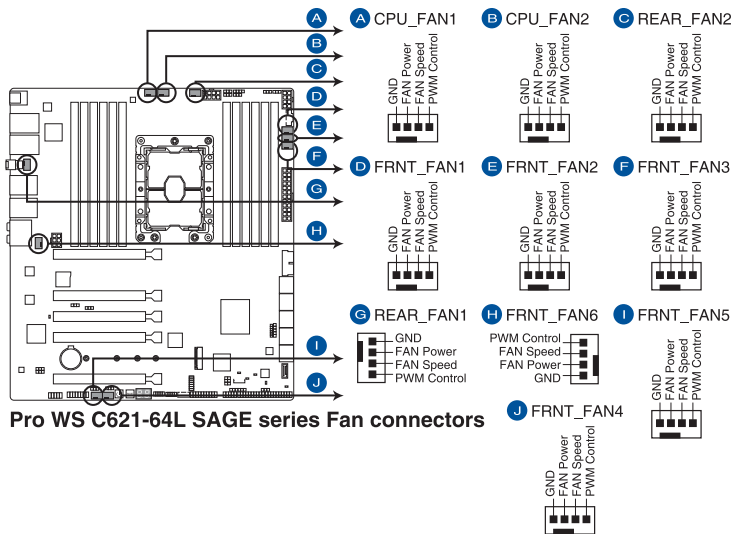
The Power Supply SMBus connector allows you to connect the SMBus (System Management Bus) to the PSU (power supply unit) to read the PSU information. Devices communicate with an SMBus host and/or other SMBus devices using the SMBus interface.



**Pro WS C621-64L SAGE series Power Supply SMBus connector**

## 14. Fan connector

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



- DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!
- Ensure the cable is fully inserted into the connector.



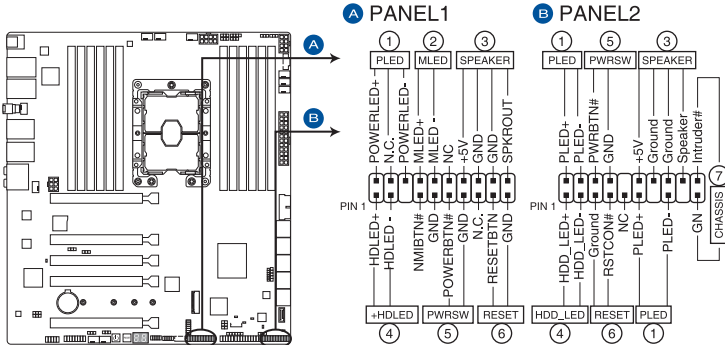
The fan connectors support a maximum of 1A (12W) fan power.

## 15. System Panel connector

The System Panel connector supports several chassis-mounted functions.



PANEL1 is only available for Pro WS C621-64L SAGE/10G only.

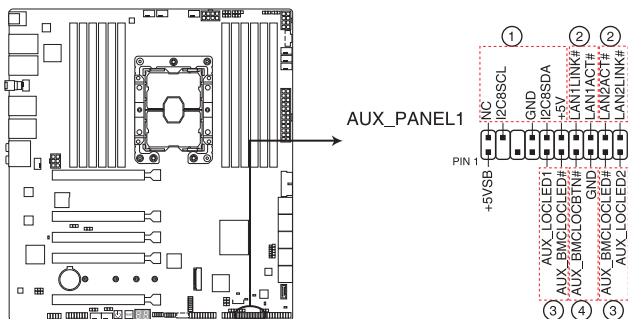


Pro WS C621-64L SAGE series System Panel connector

- **System Power LED connector (PLED)**  
The 2-pin and/or 3-1 pin connectors allow you to connect the System Power LED. The System Power LED lights up when the system is connected to a power source, or when you turn on the system power, and blinks when the system is in sleep mode.
- **Message LED (MLED)**  
The 2-pin connector allows you to connect the Message LED. The message LED is controlled by the hardware monitor to indicate an abnormal event occurrence.
- **Storage Device Activity LED connector (HDD\_LED/HOLED)**  
The 2-pin connector allows you to connect the Storage Device Activity LED. The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.
- **System Warning Speaker connector (SPEAKER)**  
The 4-pin connector allows you to connect the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.
- **Power Button/Soft-off Button connector (PWRSW)**  
The 3-1 pin connector allows you to connect the system power button. Press the power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).
- **Reset button connector (RESET)**  
The 2-pin connector allows you to connect the chassis-mounted reset button. Press the reset button to reboot the system.
- **Chassis intrusion connector (CHASSIS)**  
The 2-pin connector allows you to connect the chassis-mounted intrusion detection sensor or switch. The chassis intrusion sensor or switch sends a high-level signal to the connector when a chassis component is removed or replaced, the signal is then generated as a chassis intrusion event.

## 16. Auxiliary Panel connector (Pro WS C621-64L SAGE/10G only)

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

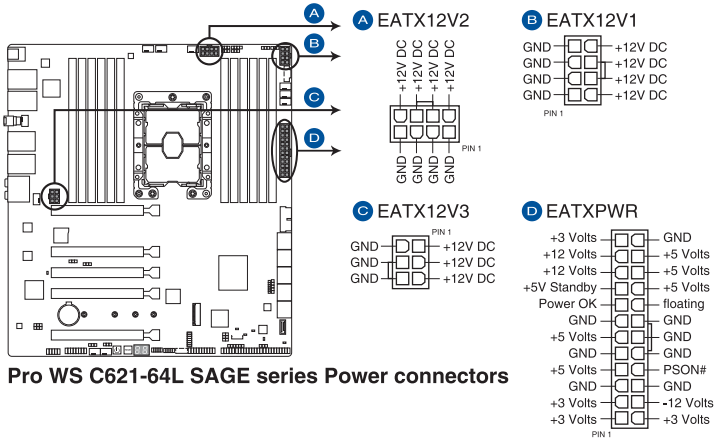


**Pro WS C621-64L SAGE series Auxiliary Panel connector**

- **Front panel SMB connector (FPSMB)**  
The 6-1 pin connector allows you to connect the front panel SMBus.
- **LAN activity LED connector (LAN1\_LED, LAN2\_LED)**  
The 2-pin connector allows you to connect the Gigabit LAN Activity LED.
- **Locator LED connector (LOCATORLED1, LOCATORLED2)**  
The 2-pin connector allows you to connect the Locator LED. The Location LED helps visually locate and identify the server in error on a server rack.
- **Locator button connector (LOCATORBTN)**  
The 2-pin connector allows you to connect the Locator button. Press the button to light up the Locator LED.

## 17. Power connectors

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



- DO NOT connect the 6-pin power plug only, the motherboard may overheat under heavy usage.
- Ensure to connect both the EATX12V1 and EATX12V2 8-pin power plugs, or connect both the 8-pin and 6-pin power plugs.

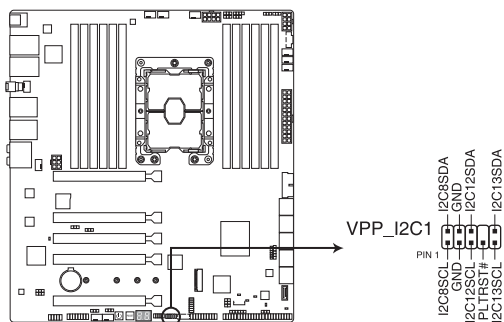


- For a fully configured system without additional add-on cards, we recommend that you use a power supply unit (PSU) that complies with ATX 12V Specification 2.0 (or later version) and provides a minimum power of 700 W.
- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you want to use two or more high-end PCI Express x16 cards, use a PSU with 2000W power or above with a 220V AC input to ensure the system stability.
- If you want to use two GPU cards, use a PSU with 1300W power or above to ensure the system stability.



### 18. VPP\_I2C1 connector (Pro WS C621-64L SAGE/10G only)

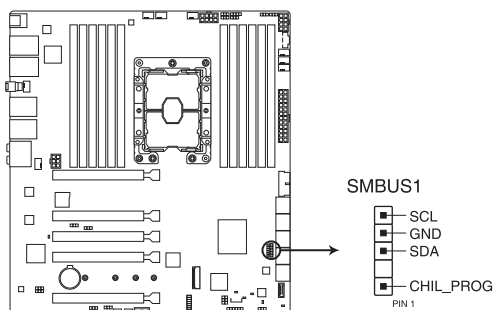
The VPP\_I2C1 connector is used for the storage backplane with Intel VMD function and sensor readings.



Pro WS C621-64L SAGE series VPP\_I2C1 connector

### 19. System Management Bus connector

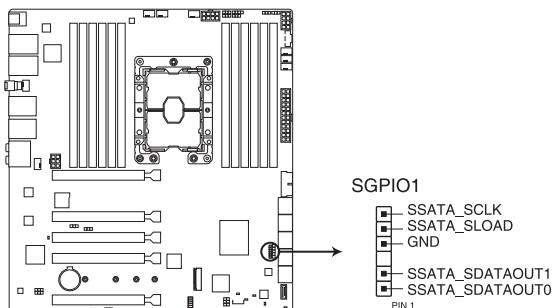
The System Management Bus (SMBus) connector allows you to connect SMBus devices. This connector is generally used for communication with the system and power management-related tasks.



Pro WS C621-64L SAGE series System Management Bus connector

## 20. Serial General Purpose Input/Output connector

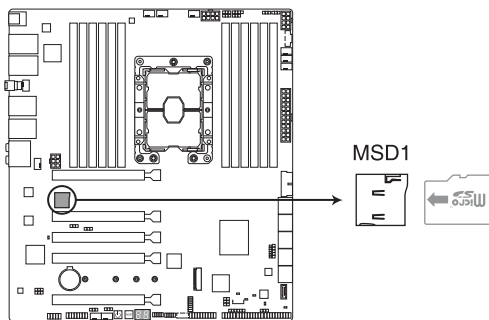
The Serial General Purpose Input/Output (SGPIO) connector allows you to connect the Intel Rapid Storage Technology Enterprise SGPIO interface. The SGPIO interface controls the LED pattern generation, device information, and general purpose data.



**Pro WS C621-64L SAGE series  
Serial General Purpose Input/Output connector**

## 21. MicroSD card slot (Pro WS C621-64L SAGE/10G only)

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



**Pro WS C621-64L SAGE series MicroSD card slot**



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



- Some memory cards may not be compatible with your motherboard. Ensure that you use only compatible memory cards to prevent loss of data, damage to your device, or memory card, or both.
- The MicroSD Slot is only supported with BMC Function and not supported for normal use under the OS.

# Basic Installation

# 2

## 2.1 Building your PC system

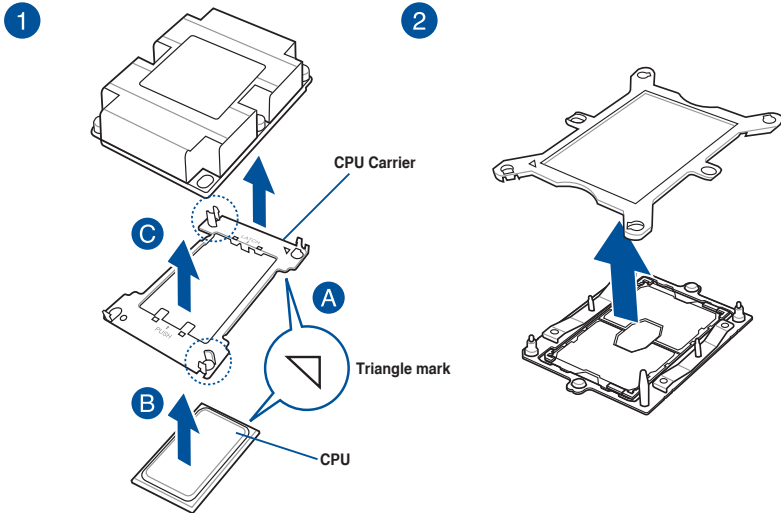


The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

### 2.1.1 CPU and heatsink installation

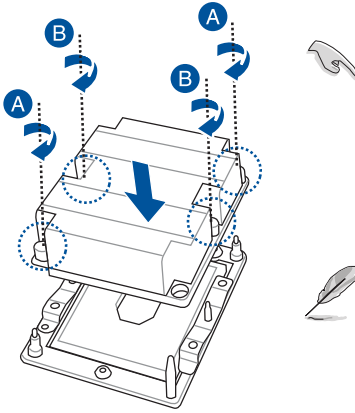
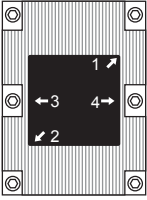


- Ensure that you install the correct CPU designed for LGA3647 socket only.
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard 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.



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

3



---

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.

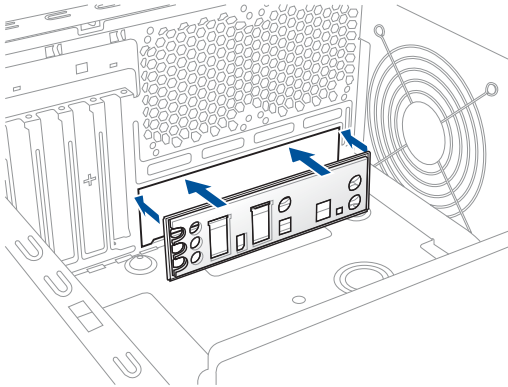
---

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

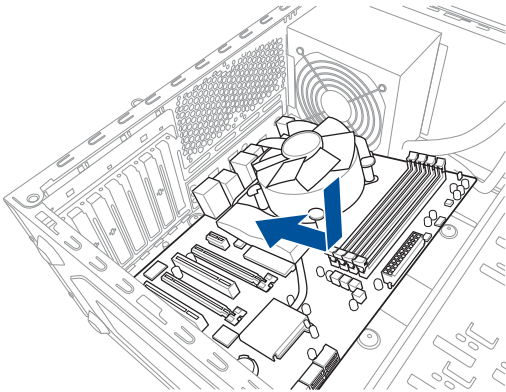
---

## 2.1.2 Motherboard installation

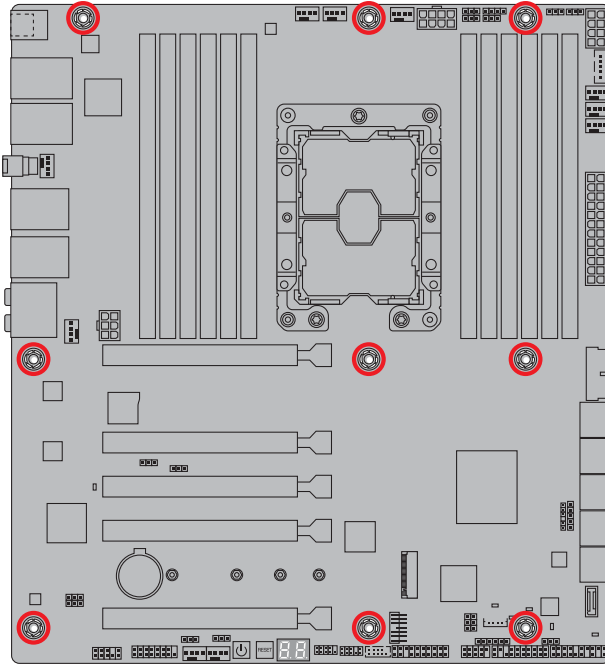
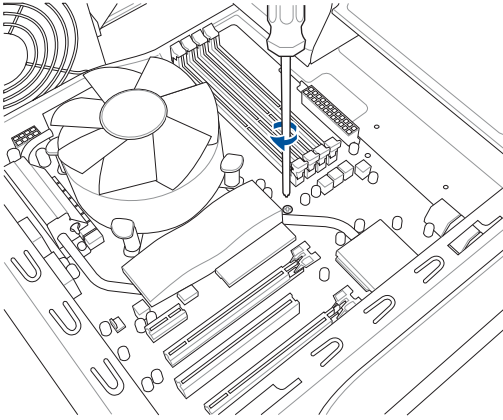
1. Install the ASUS Q-Shield to the chassis rear I/O panel.



2. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.

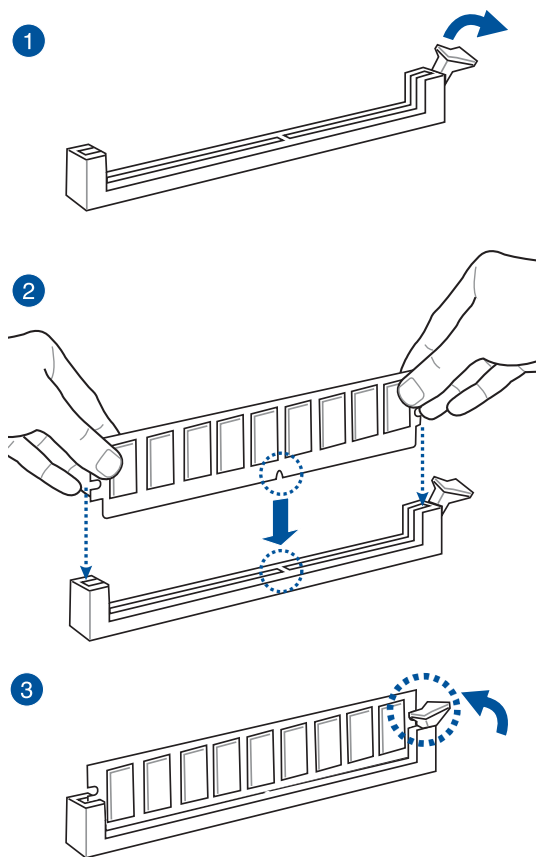


3. Place nine (9) screws into the holes indicated by circles to secure the motherboard to the chassis.

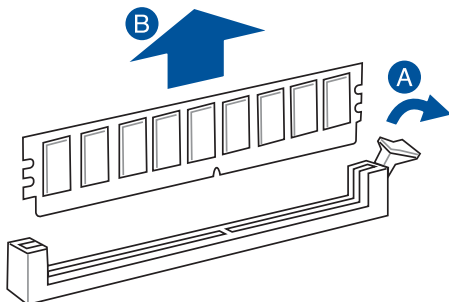


DO NOT overtighten the screws! Doing so can damage the motherboard.

### 2.1.3 DIMM installation

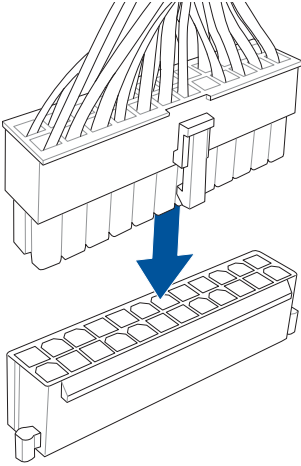


#### To remove a DIMM

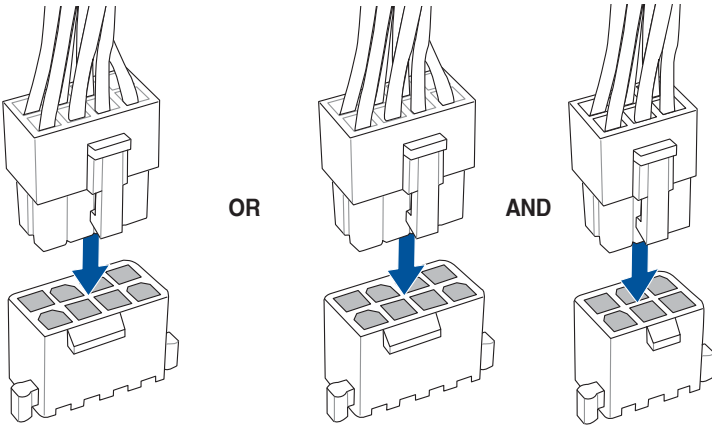


## 2.1.4 ATX power connection

1



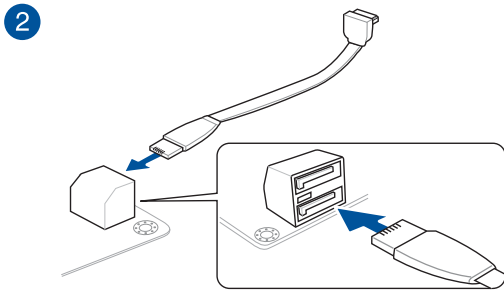
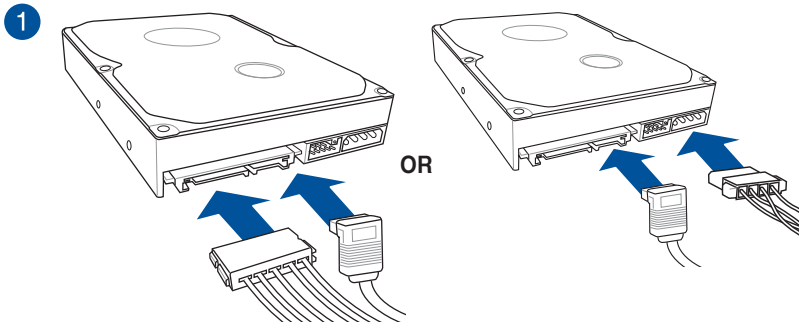
2



- 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.

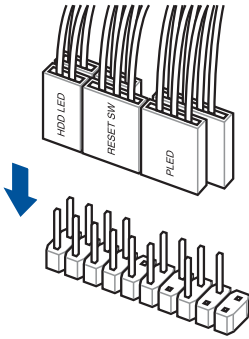


## 2.1.5 SATA device connection

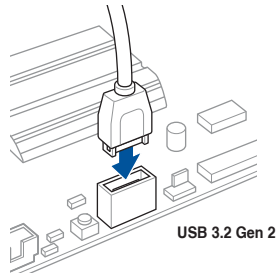


## 2.1.6 Front I/O connector

To install front panel connector

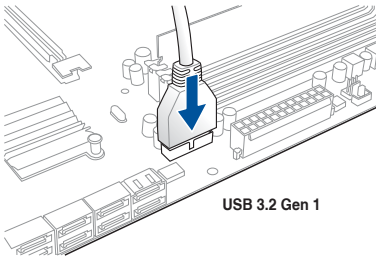


To install USB 3.2 Gen 2 connector

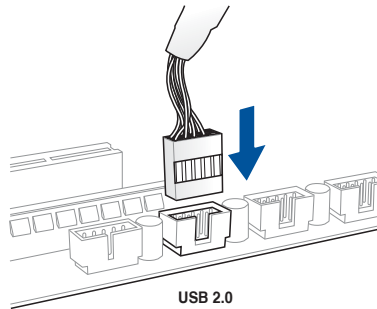


This connector will only fit in one orientation. Push the connector until it clicks into place.

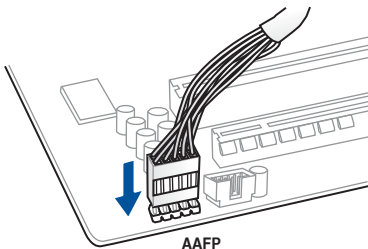
To install USB 3.2 Gen 1 connector



To install USB 2.0 connector

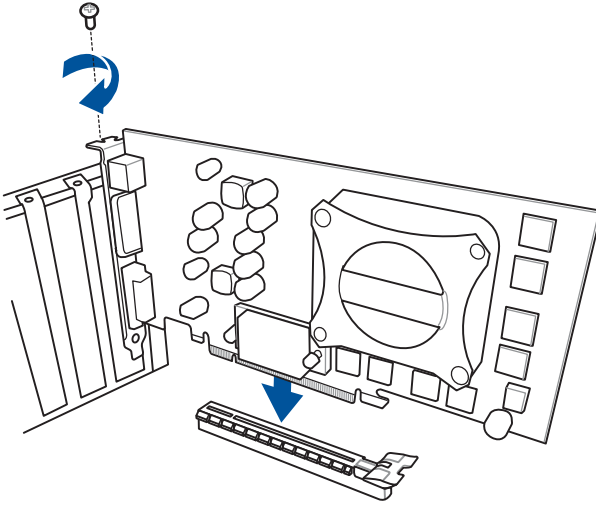


To install front panel audio connector



## 2.1.7 Expansion card installation

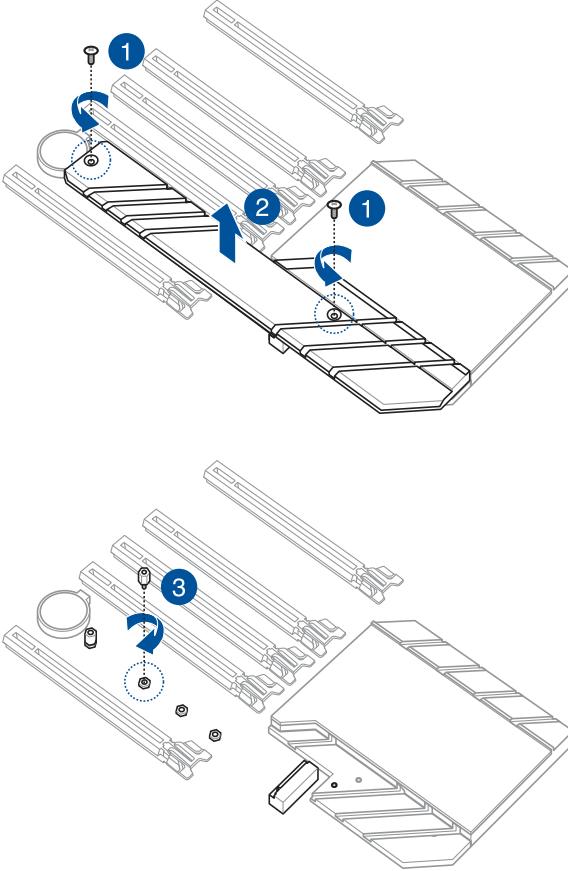
To install PCIe x16 cards

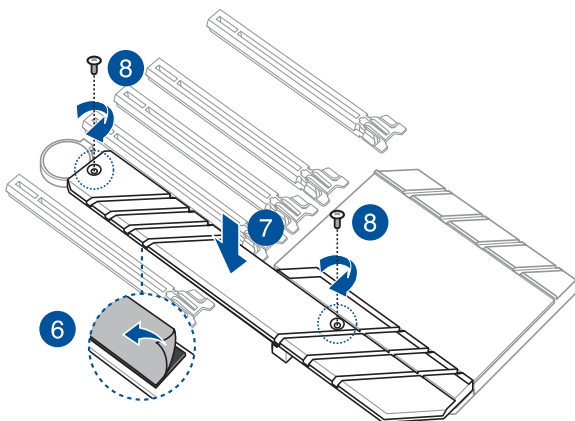
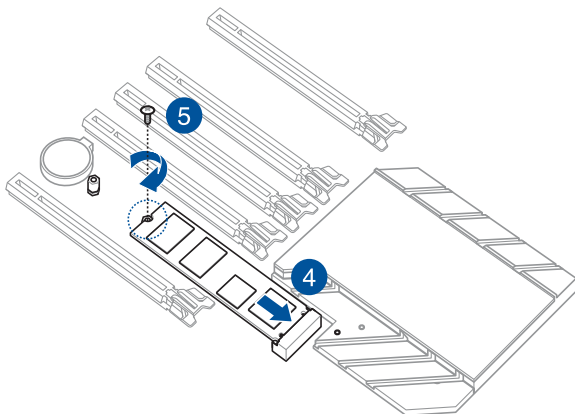


## 2.1.8 M.2 installation



Supported M.2 type varies per motherboard.





## 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:

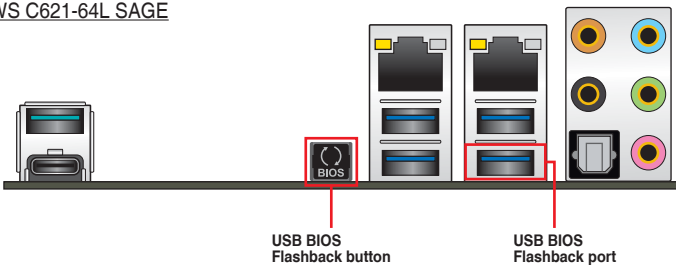
1. Insert a USB storage device to the USB Flashback port.



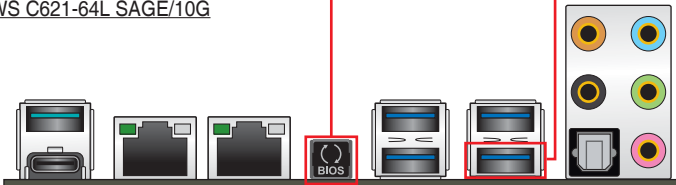
We recommend you to use a USB 2.0 storage device to save the latest BIOS version for better compatibility and stability.

2. Visit <https://www.asus.com/support/> and download the latest BIOS version for this motherboard.
3. Rename the file as according to your motherboard model,
  - for Pro WS C621-64L SAGE: **WSC64LS.CAP**,
  - for Pro WS C621-64L SAGE/10G: **WSC64LG.CAP**,then copy it to your USB storage device.
4. Shut down your computer.
5. Press the BIOS Flashback button for three seconds until the Flashback LED blinks three times, indicating that the BIOS Flashback function is enabled.

#### Pro WS C621-64L SAGE



#### Pro WS C621-64L SAGE/10G



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 **Updating BIOS** in Chapter 3.

---

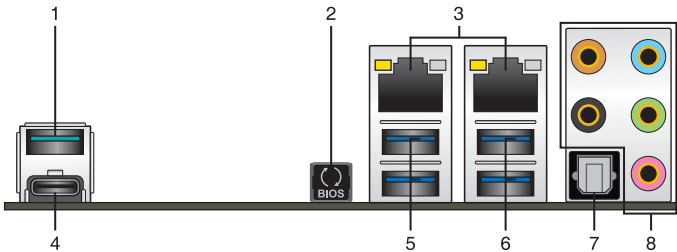


- Do not unplug portable disk, power system, or press the CLR\_CMOS button while BIOS update is ongoing, otherwise update will be interrupted. In case of interruption, please follow the steps again.
  - If the light flashes for five seconds and turns into a solid light, this means that the BIOS Flashback 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

#### Pro WS C621-64L SAGE



#### Rear panel connectors

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

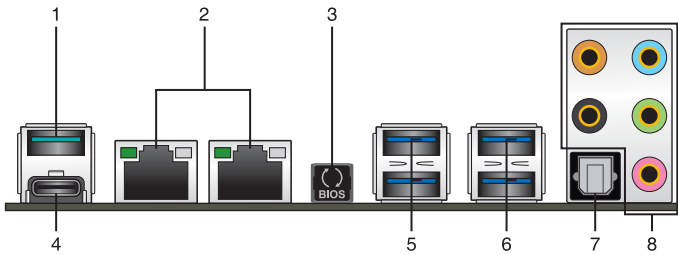
\* and \*\*: Refer to the tables for LAN port LEDs and audio port definitions.



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



## Pro WS C621-64L SAGE/10G



### Rear panel connectors

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

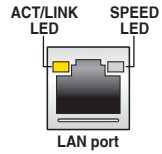
\* and \*\*: Refer to the tables for LAN port LEDs and audio port definitions.



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

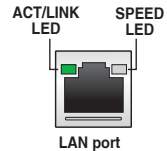
**\* LAN ports LED indications (for Pro WS C621-64L SAGE)**

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		



**Intel® X550 10GbE LAN port LED indications (for Pro WS C621-64L SAGE/10G)**

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

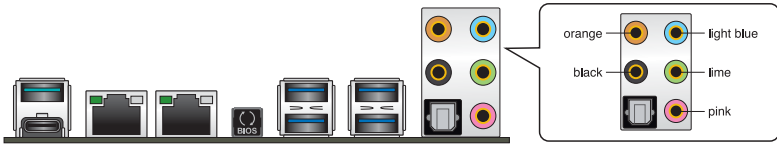


**\*\* Audio 2, 4, 5.1 or 7.1-channel configuration**

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

## 2.3.2 Audio I/O connections

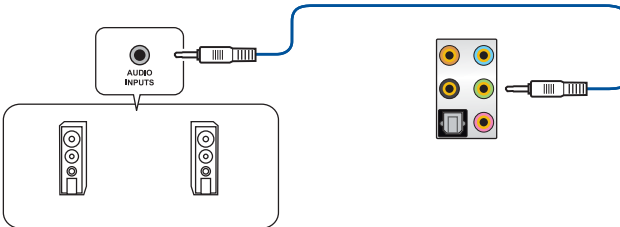
### Audio I/O ports



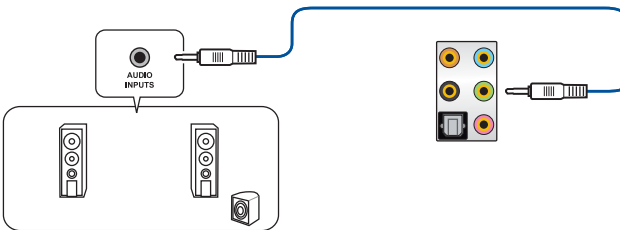
### Connect to Headphone and Mic



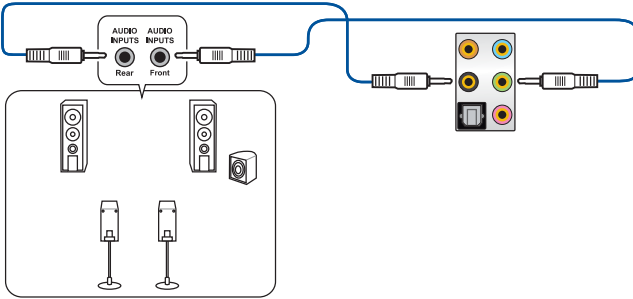
### Connect to Stereo Speakers



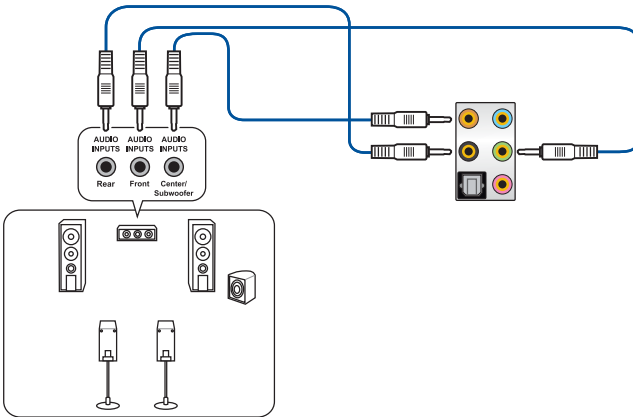
### Connect to 2-channel Speakers



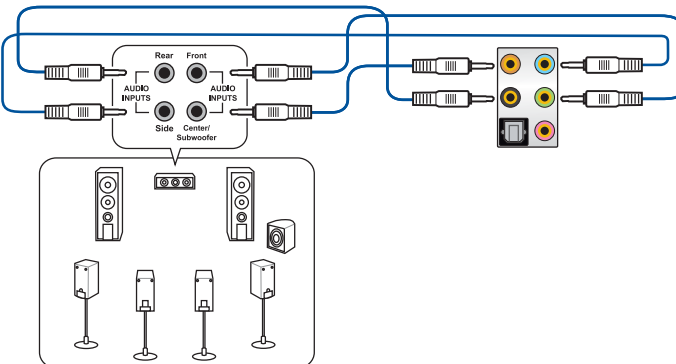
## Connect to 4-channel Speakers



## Connect to 5.1-channel Speakers



## Connect to 7.1-channel Speakers



## 2.4 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](http://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.



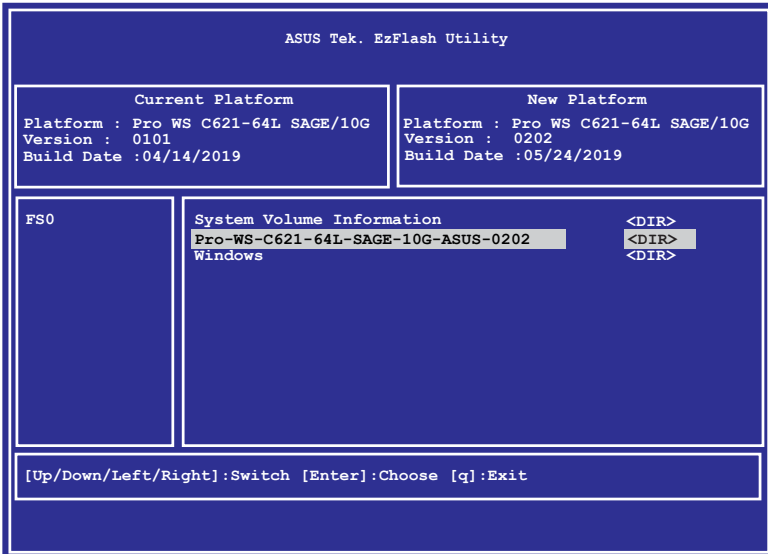
Download the latest BIOS from the ASUS website at [www.asus.com](http://www.asus.com) before using this utility.



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

To update the BIOS using EzFlash Utility:

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



3. Press <Tab> to switch to the **Drive** field.
4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS then press <Enter>.
5. Press <Tab> to switch to the **Folder Info** field.
6. Press the Up/Down arrow keys to find the BIOS file then press <Enter>.
7. Reboot the system when the update process is done.





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



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

### 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:

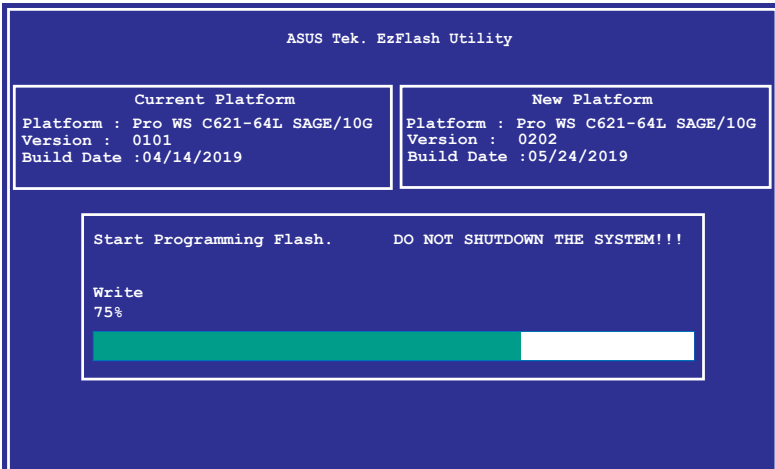
1. Visit the ASUS website at [www.asus.com](http://www.asus.com) and download the latest BIOS file for the motherboard. Save the BIOS file to a bootable USB flash disk drive.
2. Download the BUPDATER utility (BUPDATER.exe) from the ASUS support website at [support.asus.com](http://support.asus.com) to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

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

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

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

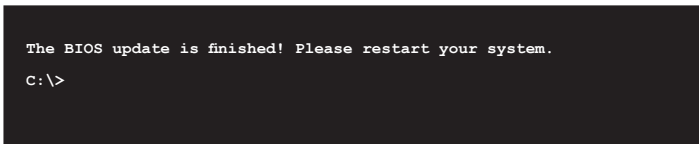
The utility verifies the file, then starts updating the BIOS file.



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

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

4. Reboot the system from the hard disk drive.



## 3.2 BIOS setup program

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

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

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

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

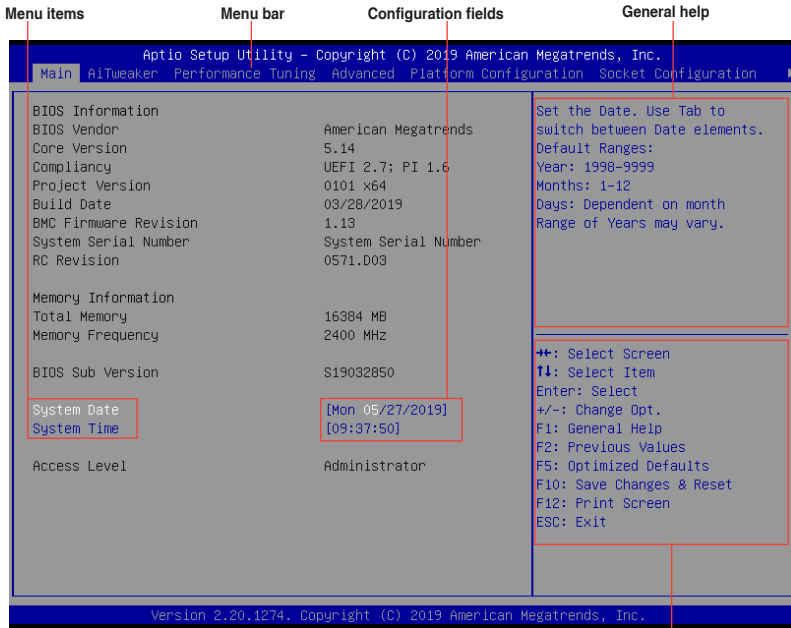
If you wish to enter Setup after POST, restart the system by pressing <Ctrl>+<Alt>+<Del>, or by pressing the reset button on the system chassis. You can also restart by turning the system off then back on. Do this last option only if the first two failed.

The Setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various sub-menus and make your selections from the available options using the navigation keys.



- 
- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Press <F5> and select Yes to load the BIOS default settings.
  - The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
  - Visit the ASUS website ([www.asus.com](http://www.asus.com)) to download the latest BIOS file for this motherboard.
-

## 3.2.1 BIOS menu screen



Navigation keys

## 3.2.2 Menu bar

The menu bar on top of the screen has the following main items:

<b>Main</b>	For changing the basic system configuration
<b>Ai Tweaker</b>	For changing the overclocking settings
<b>Performance Tuning</b>	For changing the performance settings
<b>Advanced</b>	For changing the advanced system settings
<b>Platform Configuration</b>	For changing the platform settings
<b>Socket Configuration</b>	For changing the socket settings
<b>Event Logs</b>	For changing the event log settings
<b>Server Mgmt</b>	For changing the server mgmt settings
<b>Monitor</b>	For displaying the system temperature, power status, and changing the fan settings
<b>Security</b>	For changing the security settings
<b>Boot</b>	For changing the system boot configuration
<b>Tool</b>	For configuring options for special functions
<b>Save &amp; Exit</b>	For selecting the save & exit options

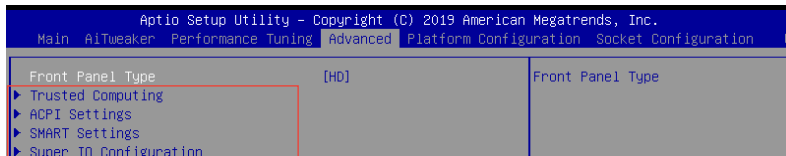
To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

### 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.

## 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 **Ai Overclocking Tuner** is set to **[Manual]**.

---

### BCLK Frequency

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



---

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

---



---

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

---

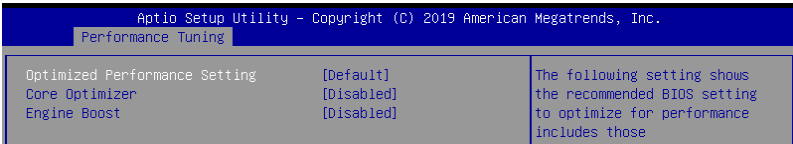
### OC Tune Level

Allows you to select the OC Tune Level.

Configuration options: [Level 1] [Level 2] [Level 3]

## 3.5 Performance Tuning menu

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



### Optimized Performance Setting [Default]

Allows you to select performance settings for different scenarios.

- [Default] Default settings.
- [By Benchmark] Optimize for different kinds of benchmarks. Select this option, then select a benchmark type from the >> list.
- [By Workload] Optimize for different kinds of workloads. Select this option, then select a workload type from the >> list.

Configuration options:

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

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

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

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



---

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

---

### Core Optimizer [Disabled]

Enable this item to keep the processor operating at the turbo frequency.

Configuration options: [Disabled] [Enabled]



---

Linux support may vary by version of the OS.

---

### Engine Boost [Disabled]

Enable this item to boost the CPU's frequency.

Configuration options: [Disabled] [Level1] [Level2] [Level3(Max)]



---

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

---

## 3.6 Advanced menu

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



---

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

---

### Front Panel Type

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

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

### 3.6.1 Trusted Computing

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

### 3.6.2 ACPI Settings

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

#### Enable ACPI Auto Configuration

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

#### Enable Hibernation

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



---

This option may be not be effective with some OS.

---

#### ACPI Sleep State

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

### 3.6.3 SMART Self Test

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



### 3.6.4 Super IO Configuration

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

#### Serial Port 1 Configuration

Allows you to set the parameters of Serial Port 1.

##### Serial Port

Allows you to enable or disable Serial Port.

Configuration options: [Disabled] [Enabled]




---

The following item appears only when you set **Serial Port** to **[Enabled]**.

---

##### Change Settings

Allows you to choose the setting for Super IO device.

Configuration options: [Auto] [IO=3F8h; IRQ=4;] [IO=3F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;] [IO=2F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;] [IO=3E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;] [IO=2E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12;]

### 3.6.5 Serial Port Console Redirection

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

### 3.6.6 CPU Storage Configuration

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

### 3.6.7 Onboard LAN Configuration

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




---

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

---

#### Onboard I210 LAN Configuration (Pro WS C621-64L SAGE only)

##### Intel LAN1 Enable

Allows you to enable or disable the Intel LAN.

Configuration options: [Disabled] [Enabled]




---

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

---

##### Intel LAN1 ROM Type

Allows you to select the Intel LAN ROM type.

Configuration options: [Disabled] [PXE] [iSCSI]

##### Intel LAN2 Enable

Allows you to enable or disable the Intel LAN.

Configuration options: [Disabled] [Enabled]



---

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

---

#### **Intel LAN2 ROM Type**

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

### **Onboard X550 LAN Configuration (Pro WS C621-64L SAGE/10G only)**

#### **Intel LAN1 & LAN2 Enable**

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



---

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

---

#### **Intel LAN1 ROM Type**

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

#### **Intel LAN2 ROM Type**

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

## **3.6.8 APM**

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

### **Restore AC Power Loss**

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

Configuration options: [Power Off] [Power On] [Last State]

### **Power On By PCIE**

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

### **Power On By RTC**

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

## **3.6.9 PCI Subsystem Settings**

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

### **Load RT32 Image**

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

## Above 4G Decoding

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

Configuration options: [Disabled] [Enabled]

## SR-IOV Support

This option enables or disables Single Root IO Virtualization Support if the system has SRIOV capable PCIe devices.

Configuration options: [Disabled] [Enabled]

## AMD Crossfire

This option allows you to enable AMD Crossfire for when you need to setup Crossfire on an AMD graphics card.

Configuration options: [Disabled] [Enabled]



---

**AMD Crossfire** can only support 768G system memory.

---

## 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]

## 3.6.10 USB Configuration

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

## 3.6.11 CSM Configuration

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

### CSM Support

This option allows you to enable or disable CSM Support.

Configuration options: [Disabled] [Enabled]



---

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

---

#### GateA20 Active

This allows you to set the GA20 option.

[Upon Request]

GA20 can be disabled using BIOS services.

[Always]

Do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

#### Option ROM Messages

This allows you to set the display mode for option ROM.

Configuration options: [Force BIOS] [Keep Current]

### **INT19 Trap Response**

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

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

### **Boot Option filter**

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

### **Network / Storage / Video**

This option allows you to control the execution of UEFI and Legacy PXE/ Storage/ Video OpROM.

Configuration options: [UEFI ] [Legacy]

### **Other PCI devices**

This item determines the OpROM execution policy for devices other than Network, Storage, or Video.

Configuration options: [UEFI ] [Legacy]

## **3.6.12 NVMe Configuration**

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

## **3.6.13 Offboard SATA Controller Configuration**

Allows you to configure the offboard SATA controller configuration.

## **3.6.14 Audio Configuration**

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

## **3.6.15 ASMedia Storage Controller**

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

## **3.6.16 Network Stack Configuration**

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

## **3.6.17 iSCSI Configuration**

Allows you to configure the iSCSi parameters.

## 3.7 Platform Configuration menu

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



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

### 3.7.1 PCH Configuration

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

#### PCH SATA Configuration

##### SATA Controller

Allows you to enable or disable the SATA Controller.  
Configuration options: [Disabled] [Enabled]



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

##### Configure SATA as

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

##### Support Aggressive Link Power Management

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

##### SATA Port 0-7

###### Port 0-7

Allows you to enable or disable the SATA port.  
Configuration options: [Disabled] [Enabled]

### 3.7.2 Miscellaneous Configuration

#### Active Video

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

### 3.7.3 Workstation ME Configuration

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

### 3.7.4 Runtime Error Logging

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

## 3.8 Socket Configuration menu

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

### 3.8.1 Processor Configuration

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

#### Hyper-threading [ALL]

This item allows a hyper-threading processor to appear as two logical processors, allowing the operating system to schedule two threads or processors simultaneously.

Configuration options: [Disabled] [Enabled]

### 3.8.2 UPI Configuration

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

### 3.8.3 Memory Configuration

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

#### Memory Topology

Displays memory topology with DIMM population information.

### 3.8.4 IIO Configuration

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

### 3.8.5 Advanced Power Management Configuration

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

#### CPU P State Control

##### Boot performance mode

Allows you to switch between Boot performance mode.

Configuration options: [Max Performance] [Max Efficient] [Set by Intel Node Manager]

##### Energy Efficient Turbo

Allows you to enable or disable Energy Efficient Turbo.

Configuration options: [Disabled] [Enabled]

##### Turbo Mode

Allows you to enable or disable Turbo Mode.

Configuration options: [Disabled] [Enabled]

## Hardware PM State Control

### Hardware P-States

Allows you to switch between Hardware P-States mode.

Configuration options: [Disabled] [Native Mode] [Out of Band Mode]  
[Native Mode with no Legacy Support]

## CPU C State Control

### CPU C6 Report

Allows you to select CPU C6 Report.

Configuration options: [Disabled] [Enabled] [Auto]

### OS ACPI Cx

Allows you to select OS ACPI Cx Report.

Configuration options: [ACPI C2] [ACPI C3]

## Package C State Control

### Package C State

Allows you to select Package C State.

Configuration options: [C0/C1 state] [C2 state] [C6(non Retention state)]  
[C6(Retention state)] [No Limit] [Auto]

## CPU Thermal Management

### CPU T State Control

#### Software Controlled T-States

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

Configuration options: [Disabled] [Enabled]

## CPU - Advanced PM Tuning

### Energy Perf BIAS

#### Power Performance Tuning

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

## 3.9 Event Logs menu

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

### 3.9.1 Change Smbios Event Log Settings

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

### 3.9.2 View Smbios Event Log

Press <Enter> to view all smbios event logs.

## 3.10 Server Mgmt menu

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

### 3.10.1 System Event Log

Allows you to change the SEL event log configuration.

### 3.10.2 BMC network configuration

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

### 3.10.3 View System Event Log

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

## 3.11 Monitor menu

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

## 3.12 Security menu

This menu allows a new password to be created or a current password to be changed. The menu also enables or disables the Secure Boot state and lets the user configure the System Mode state.

## 3.13 Boot menu

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

### Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.



- To select the boot device during system startup, press <F8> when ASUS Logo appears.
- To access Windows OS in Safe Mode, please press <F8> after POST.

### Network Device BBS Priorities

This item allows you to set the booting from network.

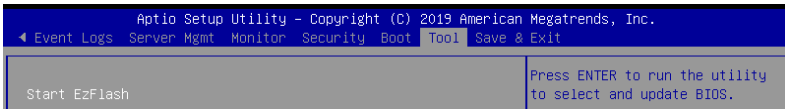
### Hard Drive BBS Priorities

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



## 3.14 Tool menu

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

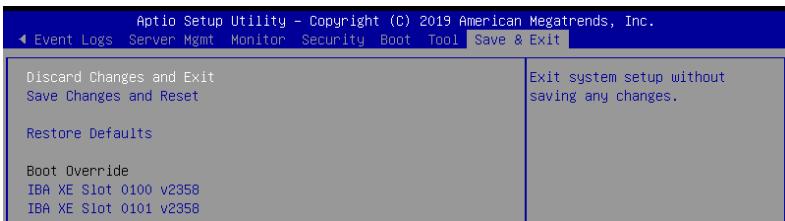


### Start EzFlash

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

## 3.15 Save & Exit menu

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



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

### Discard Changes and Exit

Exit System setup without saving any changes.

### Save Changes and Reset

Exit System setup after saving the changes.

### Restore Defaults

Restore/load default values for all the setup options.

### Boot Override

These items displays the available devices. The device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.



# RAID 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 **4.2.1 Creating a RAID set** 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 Option ROM Utility

The Intel® Rapid Storage Technology enterprise SATA 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 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      HMAS0000991753TR 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.

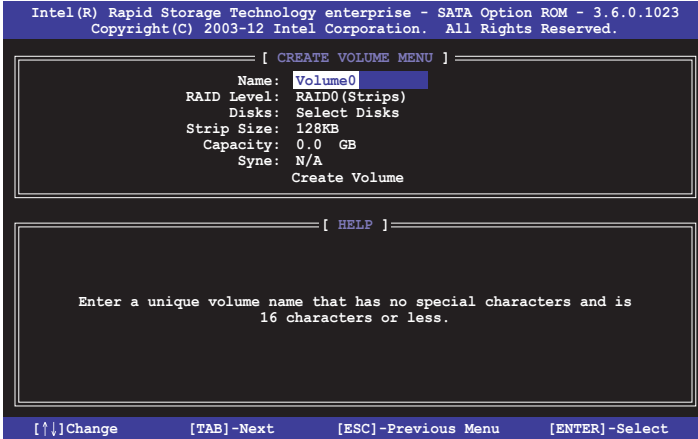


The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.

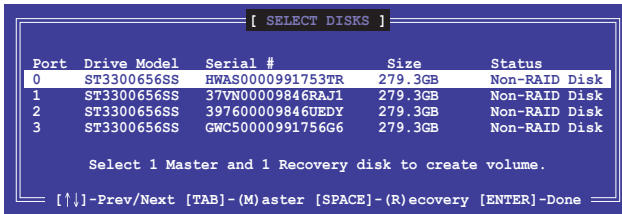
## 4.2.1 Creating a RAID set

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>.



3. Press the up/down arrow keys to select a RAID Level that you wish to create then press <Enter>.
4. From the **Disks** item field, press <Enter> to select the hard disk drives that you want to include in the RAID set.



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

- 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

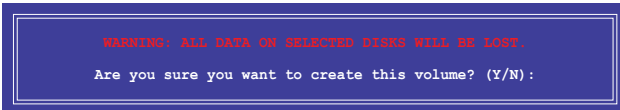


---

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.

---

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



## 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):
```



## 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 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     XXXXXXXXXXXX  XXXXXXXX     XXX.GB

[↑↓]-Previous/Next [ENTER]-Select [ESC]-Exit
```



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

- The utility immediately starts rebuilding after the disk is selected. When done, the status of the degraded RAID volume is changed to “Rebuild”.

```

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

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

----- [ DISK/VOLUME INFORMATION ] -----

RAID Volumes:
ID Name      Levell      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

```

- Press <Esc> to exit Intel Rapid Storage Technology and reboot the system.
- Select **Start > Programs > Intel Rapid Storage > Intel Rapid Storage Console** or click the **Intel Rapid Storage Technology** tray icon to load the Intel Rapid Storage Manager utility.
- From the **View** menu, select **Advanced Mode** to display the details of the Intel Rapid Storage Console.
- From the **Volumes view** option, select **RAID volume** to view the rebuilding status. When finished, the status is changed to “Normal”.

### Rebuilding the RAID with a new hard disk

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

To rebuild the RAID with a new hard disk:

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



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

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

## 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 utility.

To set the boot array in the BIOS:



---

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

---

1. Reboot the system and press <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.

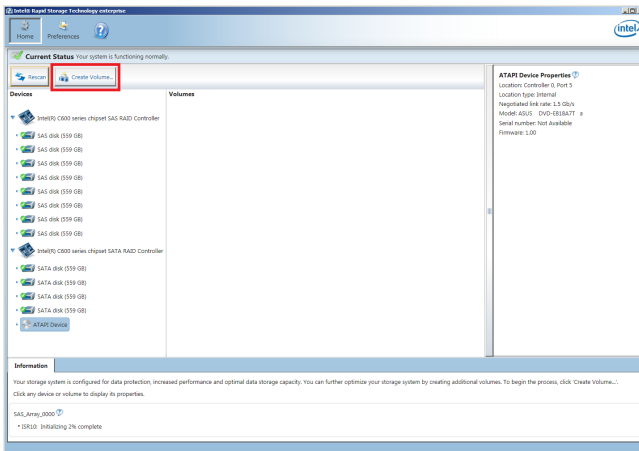


You need to manually install the Intel® Rapid Storage Technology enterprise utility on a Windows® operating system.

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.

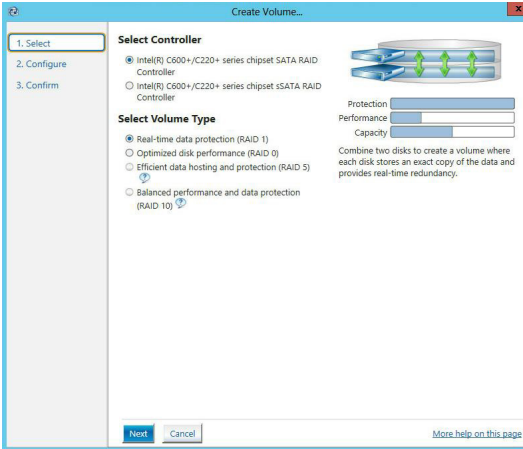


You can click **Rescan** to re-scan any attached hard disks.

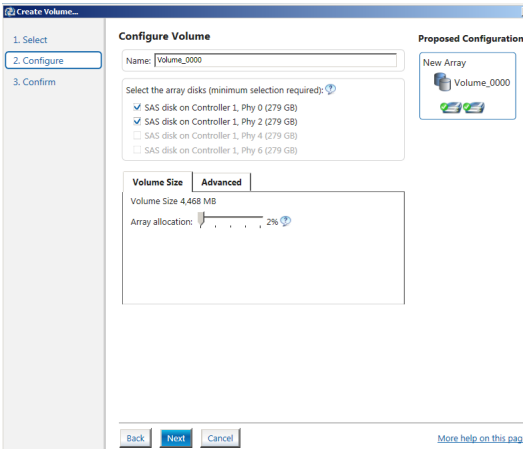
## 4.3.1 Creating a RAID set

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**.

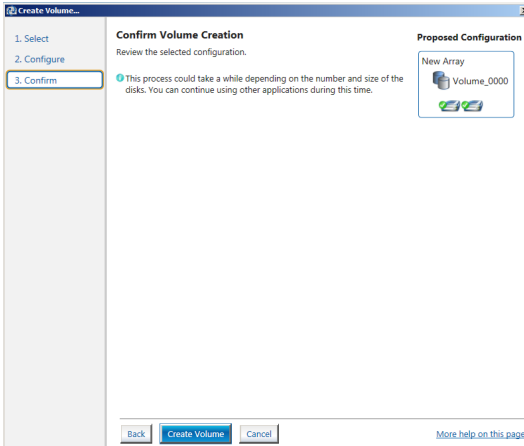


- If you do not want to keep the data on one of the selected disks, select **NO** when prompted.
- If you want to **Enable volume write-back cache** or **Initialize volume**, click **Advanced**.

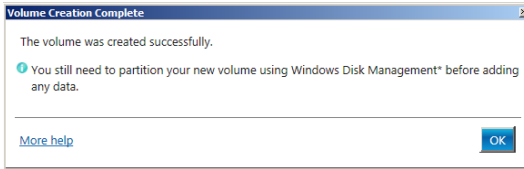
6. Confirm the volume creation, then click **Create Volume** to continue.



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

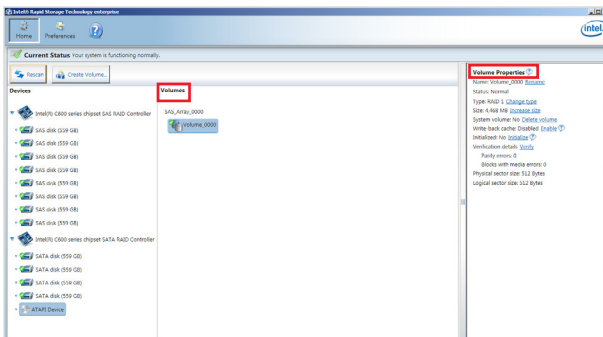


7. Wait until the process is completed, then click **OK** when prompted.



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

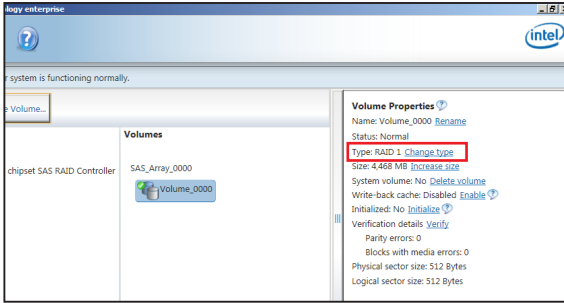
The RAID set is displayed in the **Volumes** list and you can change the settings in **Volume Properties**.



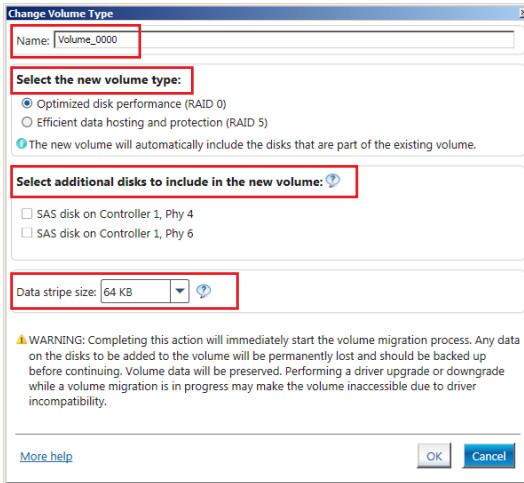
## 4.3.2 Changing a Volume Type

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.



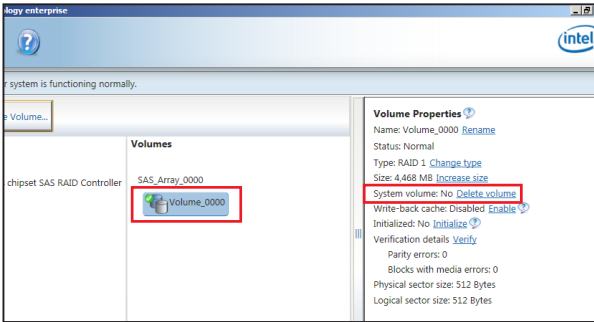
### 4.3.3 Deleting a volume



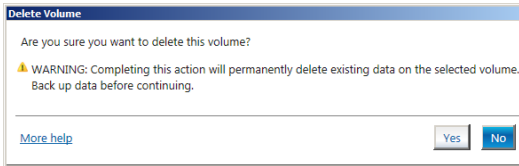
Be cautious when deleting a volume. You will lose all data on the hard disk drives. Before you proceed, ensure that you back up all your important data from your hard drives.

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.

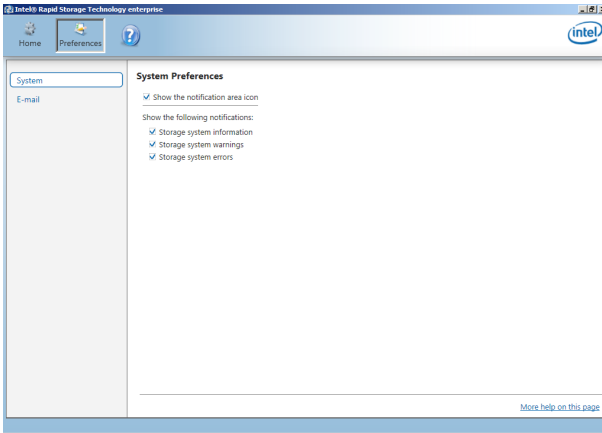


3. Click **Yes** to delete the volume and return to the utility main menu, or click **No** to return to the main menu.

## 4.3.4 Preferences

### System Preferences

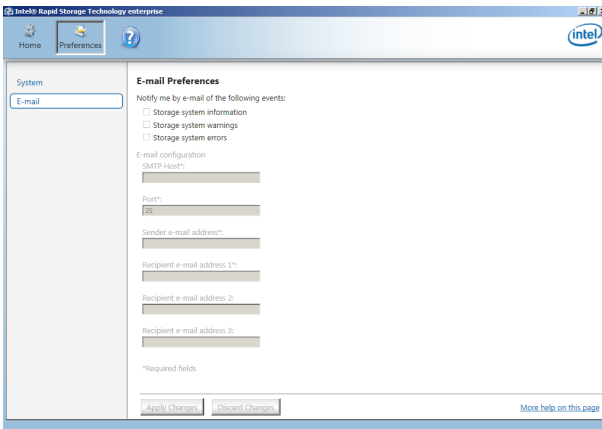
Allow you to set to show the notification area icon and show system information, warning, or errors here.



### 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.
- Refer to section **Internal connectors** for the location of the VROC\_HW\_KEY connector.



- Due to hardware design [PCIEX16\_1], or [PCIEX16\_2], or [PCIEX16\_3] can support CPU RAID configuration as OS drives, but OS RAID may not be built across the different [items] mentioned above.
- [PCIEX16\_1], or [PCIEX16\_2], or [PCIEX16\_3] can support OS RAID on Hyper M.2 cards installed on the [items] mentioned above.

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

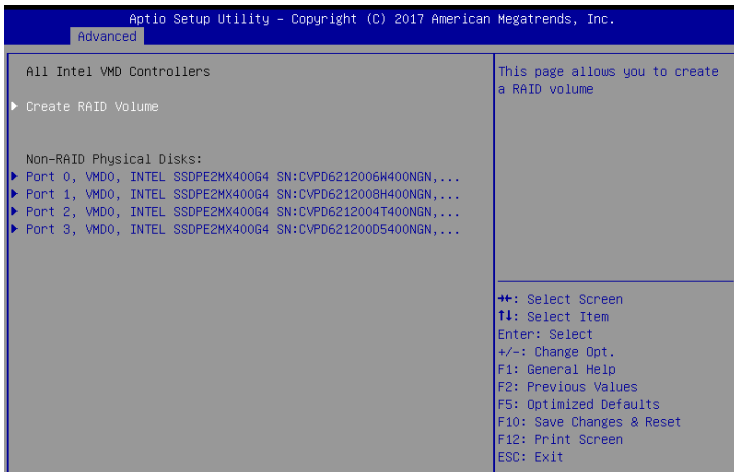
1. Enter the BIOS Setup during POST.
2. Go to the **Advanced** menu > **Intel(R) Virtual Raid on CPU** > **All Intel VMD Controllers** then press <Enter> to display the Intel® Virtual Raid on CPU menu.



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



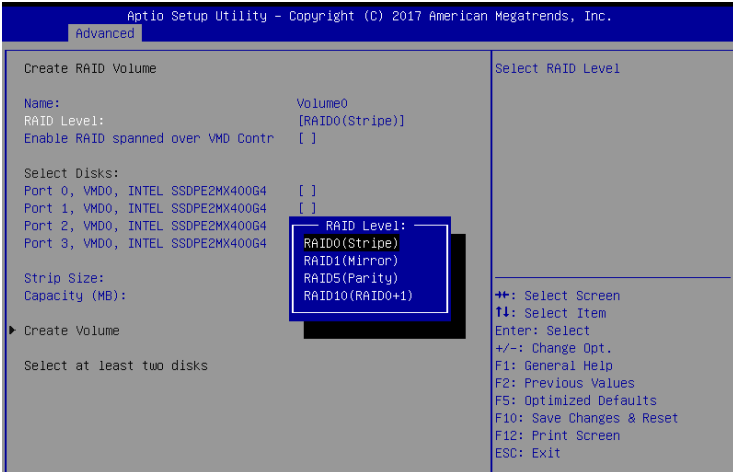
Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.



## 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:

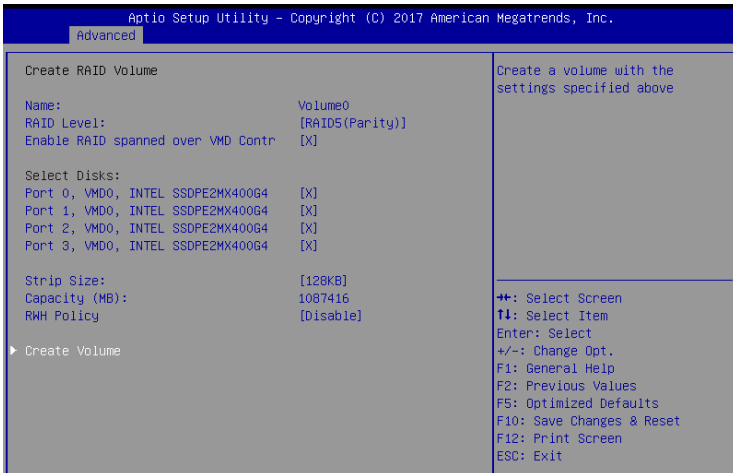


2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. When the **Enable RAID spanned over VMD Controllers** item is selected, press <Enter> and select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



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

7. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.
8. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.



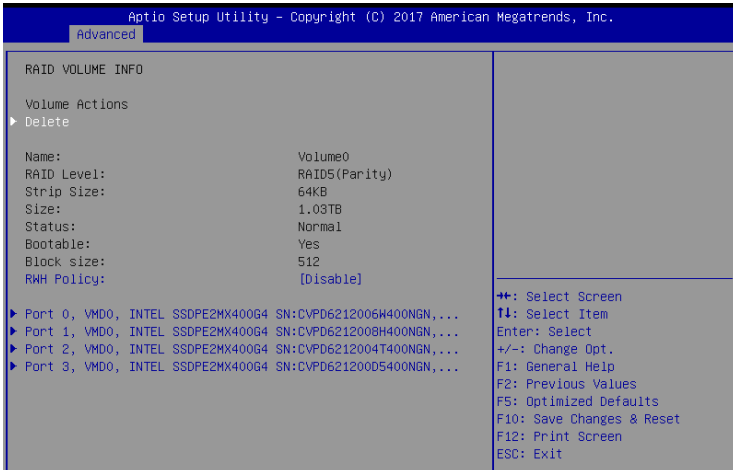
## 4.4.2 Deleting a RAID set



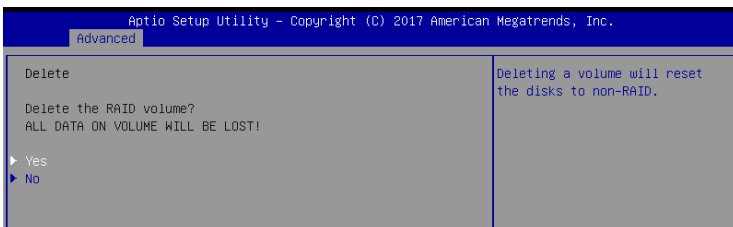
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

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



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

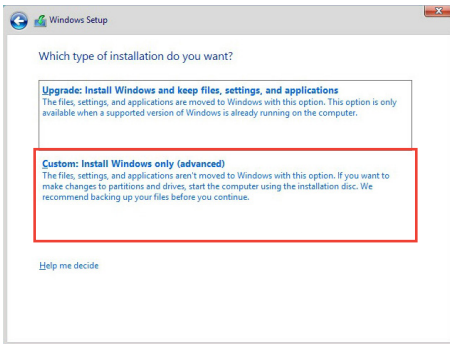


### 4.4.3 Installing the RAID controller driver during Windows® 10 OS installation

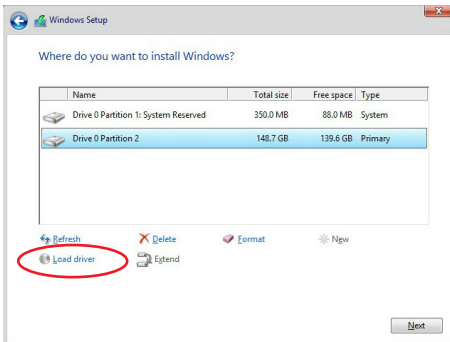
After creating the RAID sets, you are now ready to install an operating system to the independent drives or bootable array. This part provides the instructions on how to install the RAID controller drivers during OS installation.

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)**.



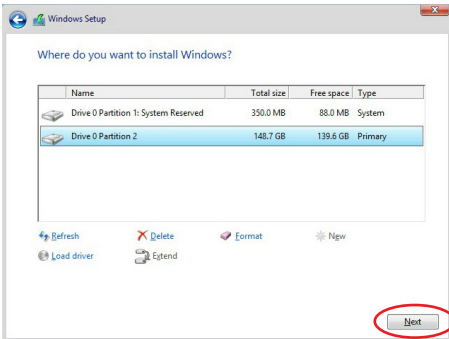
3. Click **Load Driver**.



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](http://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.

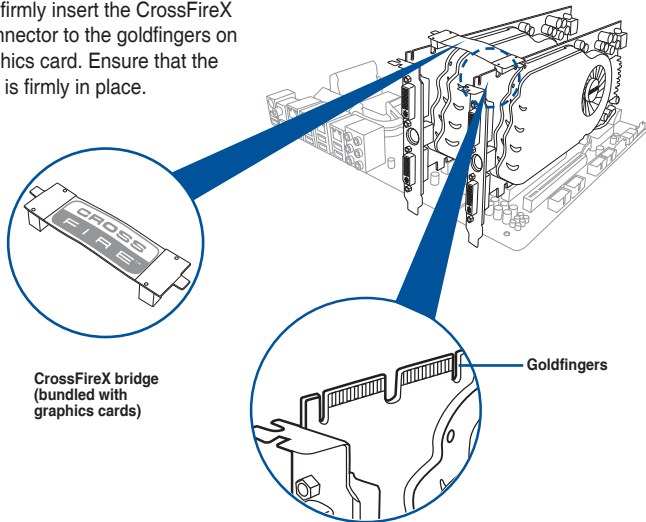
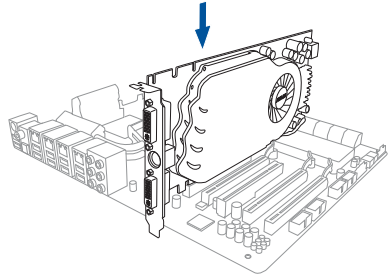
## 5.1.3 Installing two CrossFire™ graphics cards



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.

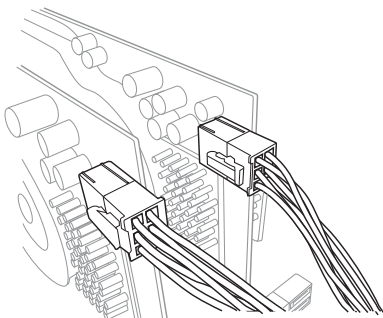


CrossFireX bridge  
(bundled with  
graphics cards)



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

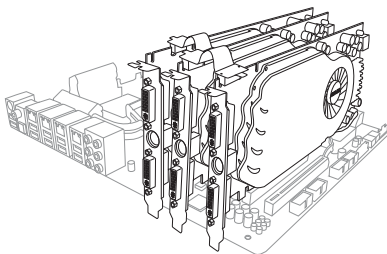
5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



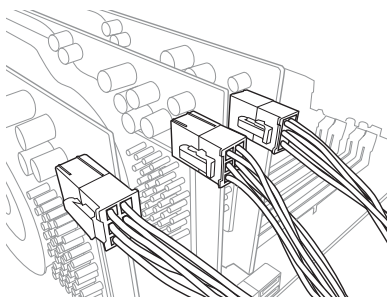
### 5.1.4 Installing three CrossFireX™ graphics cards

To install three CrossFireX™ graphics cards:

1. Prepare three CrossFireX™-ready graphics cards.
2. Insert the three graphics card into the PCIEX16 slots. If your motherboard has more than three 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 two CrossFireX™ bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.



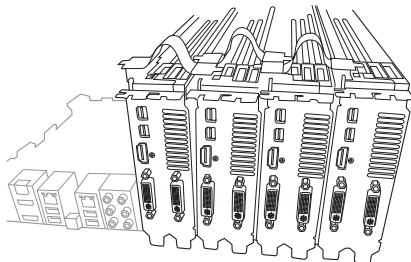
5. Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



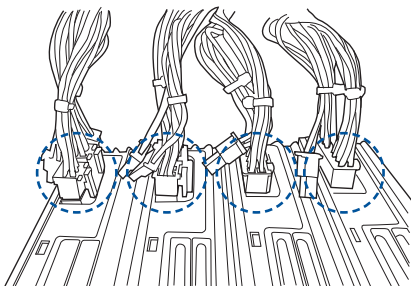
## 5.1.5 Installing four CrossFireX™ graphics cards

To install four CrossFireX™ graphics cards:

1. Prepare four CrossFireX™-ready graphics cards.
2. Insert the four graphics cards into the 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 three CrossFireX™ bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.



5. Connect four independent auxiliary power sources from the power supply to the four graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



## 5.1.6 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](http://www.amd.com).

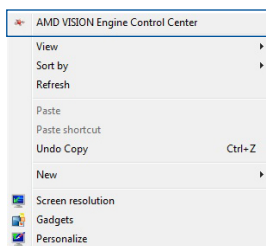
## 5.1.7 Enabling the AMD CrossFireX™ technology

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:

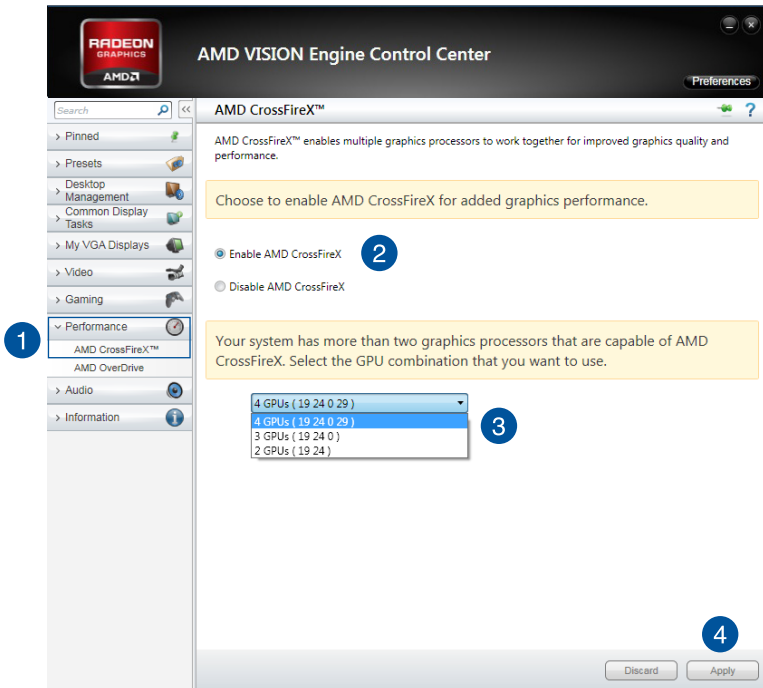
Right-click on the Windows® desktop and select **AMD VISION Engine Control Center**.



## Enabling Dual CrossFire™ 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.



## 5.2 NVIDIA® SLI® technology

The motherboard supports the NVIDIA® SLI® (Scalable Link Interface) technology that allows you to install multi-graphics processing units (GPU) graphics cards. Follow the installation procedures in this section.

### 5.2.1 Requirements

- In SLI® mode, you should have two identical SLI-ready graphics cards that are NVIDIA® certified.
- Ensure that your graphics card driver supports the NVIDIA® SLI® technology. Download the latest driver from the NVIDIA® website at [www.NVIDIA.com](http://www.NVIDIA.com).
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system.



- We recommend that you install additional chassis fans for better thermal environment.
- Visit the NVIDIA® zone website at <http://www.nzone.com> for the latest certified graphics card and supported 3D application list.

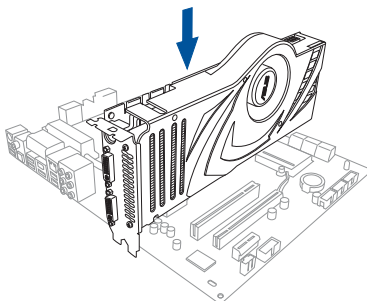
### 5.2.2 Installing two SLI-ready graphics cards



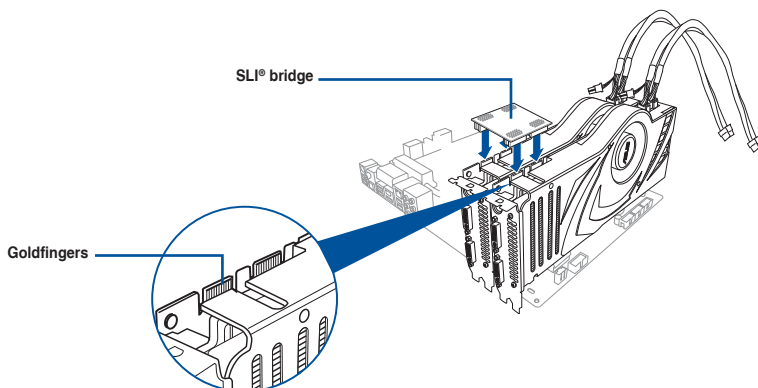
The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

To install two SLI-ready graphics cards:

1. Prepare two SLI-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 SLI® bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
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.

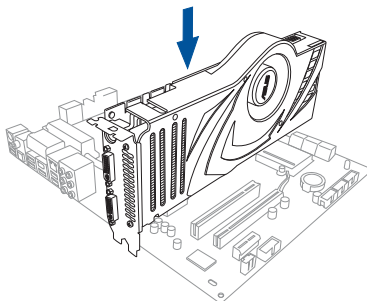


### 5.2.3 Installing three SLI-ready graphics cards

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

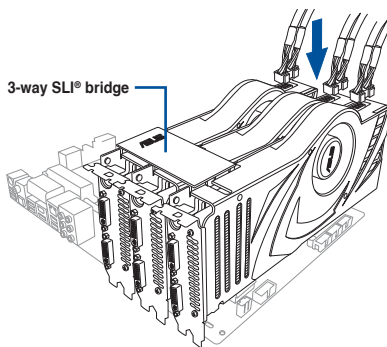
To install three SLI-ready graphics cards:

1. Prepare three SLI-ready graphics cards.
2. Insert the three graphics cards into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for locations of the PCIEX16 slots recommended for multi-graphics card installation.
3. Ensure that the cards are properly seated on the slots.





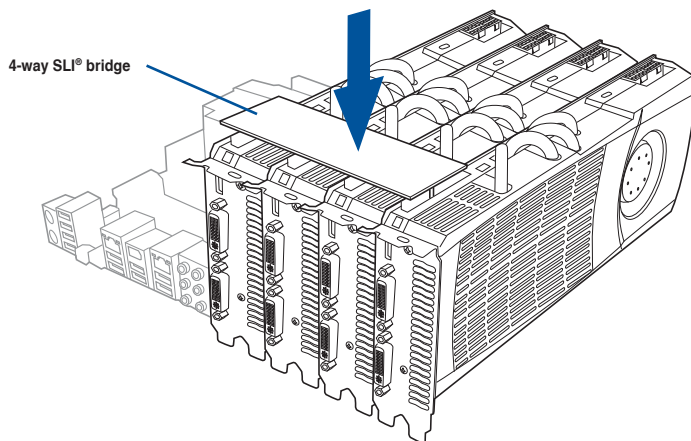
- Align and firmly insert the 3-way SLI® bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
- Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.
- Connect a VGA or a DVI cable to the graphics card.



## 5.2.4 Installing four SLI-ready graphics cards

To install four SLI-ready graphics cards:

- Prepare four SLI-ready graphics cards.
- Insert the four graphics cards 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.
- Ensure that the cards are properly seated on the slots.
- Align and firmly insert the 4-way SLI® bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
- Connect four independent auxiliary power sources from the power supply to the four graphics cards separately.
- Connect a VGA or a DVI cable to the graphics card.



## 5.2.5 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 NVIDIA® SLI® technology. Download the latest driver from the NVIDIA® website at [www.NVIDIA.com](http://www.NVIDIA.com).

## 5.2.6 Enabling the NVIDIA® SLI® technology

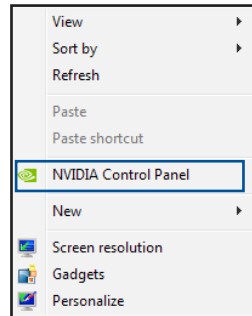
After installing your graphics cards and the device drivers, enable the SLI® feature in NVIDIA® Control Panel under the Windows® 7 operating system.

### Launching the NVIDIA® Control Panel

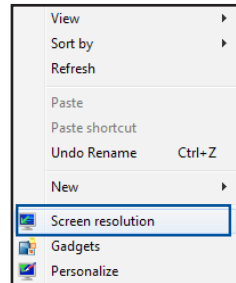
You can launch the NVIDIA® Control Panel by the following two methods:

- A. Right click on the empty space of the Windows® desktop and select **NVIDIA® Control Panel**.

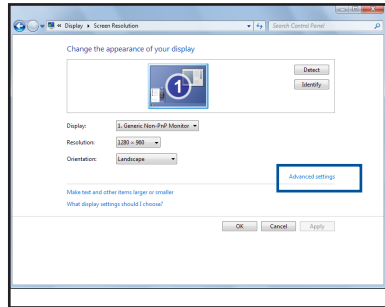
The NVIDIA® Control Panel window appears (See Step B3).



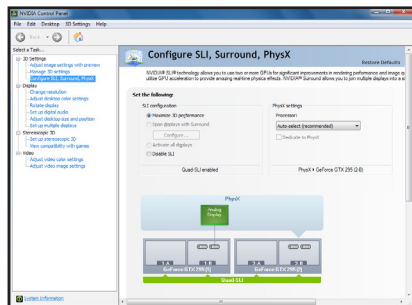
- B1. If you cannot see the NVIDIA® Control Panel item in step (A), select **Screen Resolution**.



- B2. From the Screen Resolution window, click **Advanced settings**.

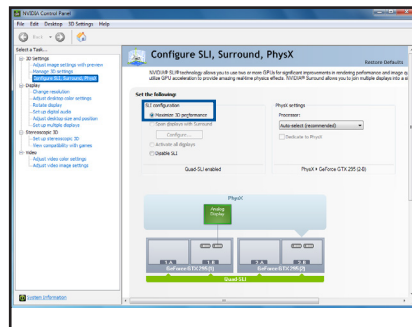


- B3. The NVIDIA® Control Panel window appears.



## Enabling SLI® settings

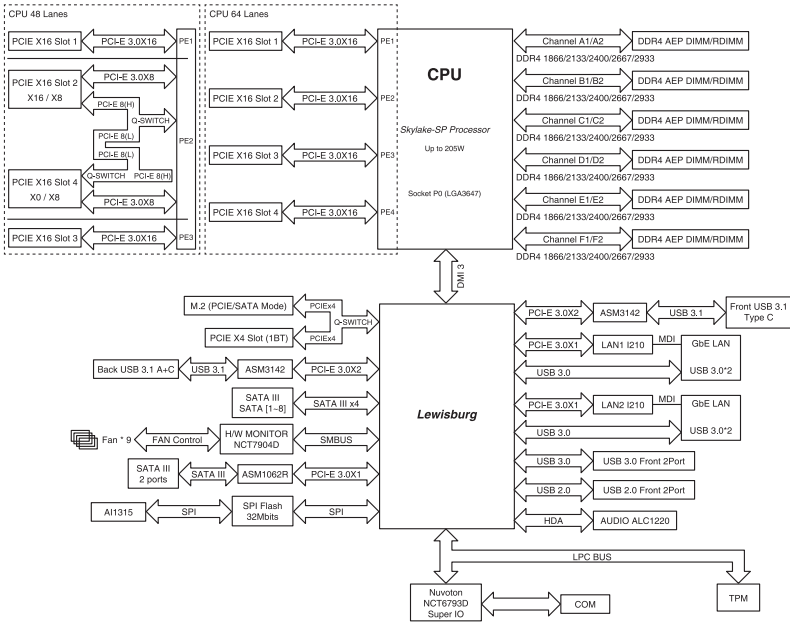
From the NVIDIA® Control Panel window, select **Configure SLI, Surround, PhysX**. In the **Quad-SLI enabled**, click **Maximize 3D Performance SLI** to set the display for viewing SLI® rendered content. When done, click **Apply**.





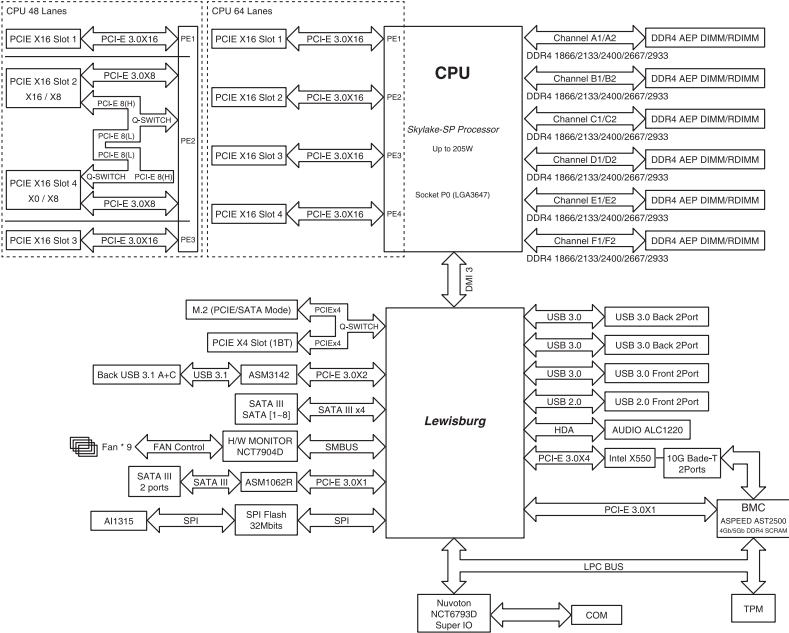
# Appendix

## Pro WS C621 64L SAGE block diagram



Appendix

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



Appendix

## 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 started (S3 Resume PPI is called by the DXE IPL)
E1	S3 Boot Script execution
E2	Video repost
E3	OS S3 wake vector call
E4 – E7	Reserved for future AMI progress codes
E8	S3 Resume Failed
E9	S3 Resume PPI not Found
EA	S3 Resume Boot Script Error
EB	S3 OS Wake Error
EC – EF	Reserved for future AMI error codes
F0	Recovery condition triggered by firmware (Auto recovery)
F1	Recovery condition triggered by user (Forced recovery)
F2	Recovery process started
F3	Recovery firmware image is found
F4	Recovery firmware image is loaded
F5 – F7	Reserved for future AMI progress codes
F8	Recovery PPI is not available
F9	Recovery capsule is not found

(continued on the next page)

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

(continued on the next page)



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

### ACPI/ASL Checkpoints (under OS)

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

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

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- Connect the equipment into 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.

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CAN ICES-3(B)/NMB-3(B)

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