

# Technical Specifications

RenderCube XL Rev. 2  
Single CPU

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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.

## 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 (+).

## specifications summary

CPU	<p>LGA2066 Socket for Intel® Xeon-W Series Processors  Supports 14nm CPU  Supports Intel® Turbo Boost Max Technology 2.0*</p> <p>* The Intel® Turbo Boost Max Technology 2.0 Support Depends on the CPU types.</p>
Chipset	Intel® C422 Chipset
Memory	<p>8 x DIMM, Max. 512GB, DDR4 2666/2400/2133* MHz, RDIMM/LRDIMM  Quad Channel Memory Architecture</p> <p>* Memory capacity supported depends on both CPU installed and Memory installed.</p>
Expansion slots	<p><b>48-Lane CPU</b>  2 x PCI Express 3.0 x 16 slot (x16 link)  2 x PCI Express 3.0 x 16 slot (single @ x16 link, dual @ x8/x8 link)  1 x PCI Express 3.0 x 4 slot (x4 link)</p>
Multi-GPU support	<p>Supports AMD® 3-Way CrossFireX™ Technology  Supports NVIDIA® 3-Way SLI™ Technology*</p> <p>* Actual numbers of Multi-graphic supported differs per Vendors' Graphic cards. Please check with Vendor beforehand.</p>
Storage	<p>- 1 x M.2_2 (Gen 3 x4) socket3, type 2242/2260/2280/22110 storage devices support (PCIe mode)*  - 1 x M.2_1 (Gen 3 x4) socket3, type 2242/2260/2280 storage devices support (both SATA &amp; PCIe mode)  - 1 x U.2 connector (supports U.2 NVMe device)*  <b>Intel® C422 Chipset with RAID 0, 1, 5, 10 and Intel® Rapid Storage Technology enterprise 5.0 support</b>  - 6 x SATA 6.0 Gb/s Ports  <b>Intel® Virtual RAID (VROC) support for CPU RAID**</b></p> <p>* Bandwidth is shared between M.2_2 and U.2  ** SATA Bandwidth is shared between M.2_1 and SATA6G_1  *** Intel® VROC is supported via RSTe, Hyper M.2 x 16 card, and Intel® VROC_HW_key. Hyper M.2 x 16 card and VROC_HW_Key are to be purchased separately  *** NVMe RAID type and function will depend on Intel® VROC_HW_key installed</p>
LAN	2 x Intel® I210-AT Gigabit LAN Controller
USB	<p><b>Intel® C422 Chipset</b>  - 6 x USB 3.1 Gen1 ports (4 ports at rear, 2 ports at mid-board)  - 6 x USB 2.0 ports (4 ports at rear, 2 ports at mid-board)  <b>ASMedia® USB 3.1 Gen 2 Controller</b>  - 2 x USB 3.1 Gen 2 ports @ rear (1 x Type A; 1 x Type C)  - 1 x USB 3.1 Gen 2 port @ front (optional Type A or Type C)</p>

(continued on the next page)

# specifications summary

Audio	<p>Realtek® ALC S1220A 8-Channel High Definition Audio CODEC featuring Crystal Sound 3</p> <ul style="list-style-type: none"><li>- Power pre-regulator reduces power input noise to ensure consistent performance</li><li>- Separate layer for left and right track, ensuring both sound deliver equal quality</li><li>- Impedance sense for front and rear headphone outputs</li><li>- Audio Shielding: Ensures precision analog/digital separation and greatly reduced multi-lateral interference</li><li>- Internal audio Amplifier to enhance the highest quality sound for headphone and speakers</li><li>- Unique de-pop circuit: Reduces start-up popping noise to audio outputs</li><li>- Premium Japanese-made audio capacitors provides warm, natural, and immersive sound with exceptional clarity and fidelity</li><li>- High quality 120dB SNR stereo playback output (Line-out@back) &amp; 113dB SNR input (Line-in) support</li><li>- Supports up to 32-Bit/192kHz playback*</li><li>- DTS Connect</li><li>- DTS Headphone: X</li><li>- Supports: Jack-detection, Multi-streaming, Front Panel Jack-retasking (MIC)</li><li>- Optical S/PDIF out port(s) at back panel</li></ul> <p>* Due to limitations in HAD bandwidth, 32-Bit/192kHz is not supported for 8-channel audio.32-Bit/192kHz is only available under Windows® 10</p>
Rear Panel I/O Ports	<p>1 x USB BIOS Flashback Button</p> <p>2 x USB 3.1 Gen 2 ports (Type-C™ &amp; Type-A)</p> <p>4 x USB 3.1 Gen 1 ports (Blue)</p> <p>4 x USB 2.0 ports (1 Supports USB BIOS Flashback)</p> <p>1 x Optical S/PDIF Out Port</p> <p>2 x Intel LAN (RJ45) Ports</p> <p>8-channel Audio I/O Ports</p>

(continued on the next page)

# specifications summary

Internal I/O Connectors	1 x Aura Addressable Strip Header
	1 x AAFP connector
	1 x Aura RGB Strip Header
	1 x USB 3.1 Gen 1 connector supports additional 2 USB 3.1 Gen 1 ports
	1 x USB 2.0 connector(s) support(s) additional 2 USB 2.0 port(s)
	1 x USB 3.1 Gen 2 front panel connector
	1 x M.2 Socket 3 with M key, type 2242/2260/2280 storage devices support (SATA & PCIe 3.0 x 4 mode)
	1 x M.2 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode)
	6 x SATA 6Gb/s connectors
	1 x VROC_HW_Key
	2 x CPU Fan connectors
	1 x FRNT_Fan connector
	1 x REAR_Fan connector
	1 x PUMP connector
	1 x AIO_PUMP connector
	1 x Thunderbolt header
	1 x 24-pin EATX Power connector
	2 x 8-pin ATX 12V Power connectors
	1 x 6-pin ATX 12V Power connector
	3 x System panels
	1 x 5-pin EXT_FAN(Extension Fan) connector
	1 x MemOK! button
	1 x Thermal sensor connector
	1 x Power-on button
	1 x Reset button
	1 x Clear CMOS button
	1 x U.2 connector
	1 x CPU_OV jumper
	1 x COM port header
	1 x VGA port header

(continued on the next page)

## specifications summary

### Special Features

#### **DIGI+ Power Control**

- CPU Power: Digital 8-phase power design
- DRAM: Digital 2-phase power design

#### **Turbo LAN**

#### **Intel® Virtual RAID on CPU (VROC) ready**

#### **ASMedia USB 3.1 Gen 2 Controller supports Multiple-Ins function**

#### **Thunderbolt 3 support**

- Blistering-fast 40 Gb/s data transfers upgrades with ThunderboltEX 3 cards

#### **M.2 and U.2 Onboard (The Latest Transfer Technology with up to 32Gb/s Data-transfer Speeds for M.2 and U.2)**

#### **SafeSlot and SafeSlot Core:** Fortified PCIe Slot preventing damages

#### **Overvoltage Protection:** World-class circuit-protecting power design

#### **Enhanced DRAM Overcurrent Protection**

- Short circuit damage prevention

#### **Stainless-Steel Back I/O:** 3X corrosion-resistance for greater durability!

#### **ESD Guards**

Enhanced ESD protection

#### **AURA Sync**

Aura RGB Strip Headers

Aura Lighting Effects Synchronization with compatible ROG devices

Aura Addressable Strip Header

#### **Ai Charger +**

#### **Supporting Control Center (ACC) Management IT software File Transfer**

#### **Cloud GO!**

#### **File Transfer**

#### **Q-Design**

Q-Shield

Q-Code

Q-LED (CPU, DRAM, VGA, Boot Device LED)

Q-Slot

Q-DIMM

#### **USB BIOS Flashback**

#### **Onboard Button:** Power/Reset

*(continued on the next page)*



# specifications summary

Special Features	<b>UEFI BIOS</b> <ul style="list-style-type: none"><li>- CrashFree BIOS 3</li><li>- EZ Flash3</li><li>- EZ Tuning Wizard</li><li>- UEFI BIOS EZ Mode</li><li>- Multi-language BIOS</li></ul> <b>MemOK!</b> <b>Quiet Thermal Solution</b> <ul style="list-style-type: none"><li>- Stylish M.2 Heat-sink</li></ul>
	<b>Form Factor</b> solution ATX Form Factor 12" x 9.6"



- Specifications are subject to change without notice.
- Visit the website for the software manual.

# Package contents

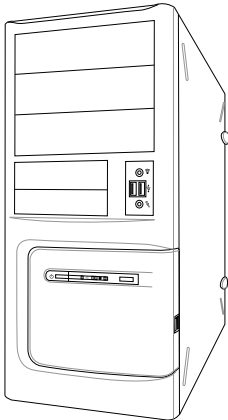
Check your motherboard package for the following items.

Motherboard	1 x motherboard
Cables	6 x Serial ATA 6Gb/s cables
	1 x VGA bracket cable
	1 x USB 2.0 bracket cable
	1 x RGB Addressable LED extension cable
Accessories	2 x M.2 screws kits
	1 x 3-Way SLI™ bridge 1 x SLI™ bridge
	1 x COM port brackets
	1 X I/O shield
Application DVD	1 x Motherboard support DVD
Documentation	1 x User guide

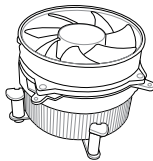


If any of the above items is damaged or missing, contact your retailer.

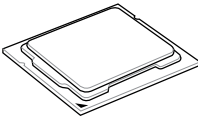
# Installation tools and components



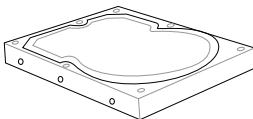
PC chassis



Intel® LGA2066 compatible CPU Fan



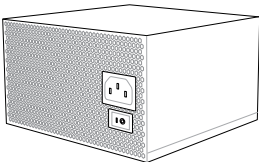
Intel® LGA2066 CPU



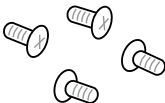
SATA hard disk drive



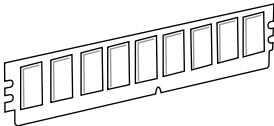
Phillips (cross) screwdriver



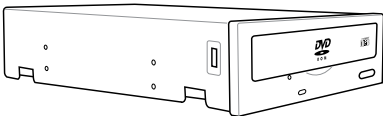
Power supply unit



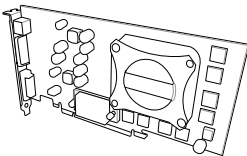
1 bag of screws



DIMM



SATA optical disc drive (optional)



Graphics card



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

# Product Introduction

# 1

## 1.1 Motherboard overview

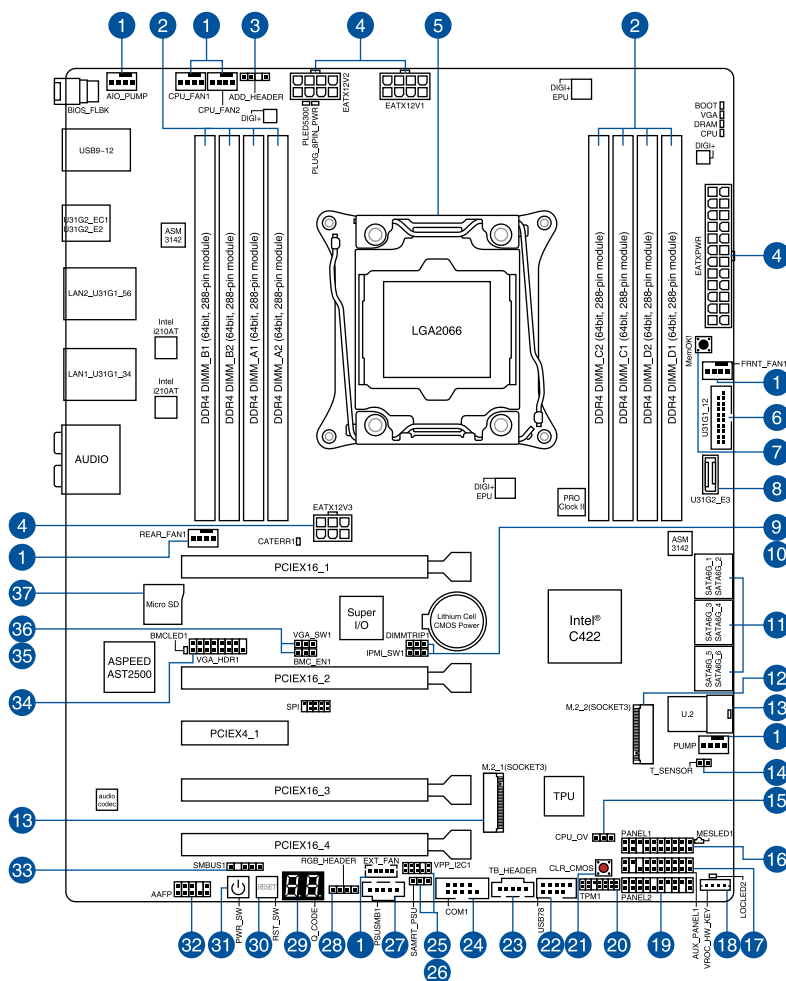
### 1.1.1 Before you proceed

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



- 
- Unplug the power cord from the wall socket before touching any component.
  - Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.
  - Hold components by the edges to avoid touching the ICs on them.
  - Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.
  - Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.
-

## 1.1.2 Motherboard layout



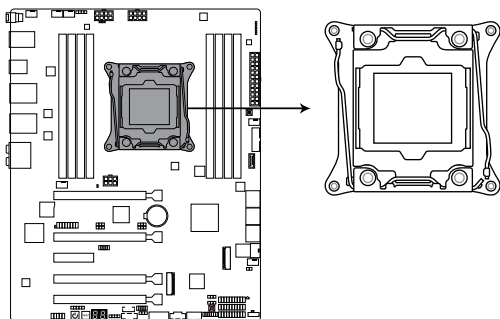
Refer to **1.1.9 Internal connectors** and **2.3.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

## Layout contents

Connectors/Jumpers/Buttons and switches/Slots	Page
1. CPU, AIO pump, front, rear, pump, and extension fan connectors (4-pin CPU_FAN1-2; 4-pin AIO_PUMP; 4-pin FRNT_FAN1; 4-pin REAR_FAN1; 4-pin PUMP; 5-pin EXT_FAN)	1-23
2. DDR4 DIMM slots	1-5
3. Aura Addressable RGB header (4-pin ADD_HEADER)	1-34
4. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V1; 8-pin EATX12V2; 6-pin EATX12V3)	1-27
5. LGA2066 CPU socket	1-4
6. USB 3.1 Gen 1 connector (20-1 pin U31G1_12)	1-20
7. MemOK! button	1-10
8. USB 3.1 Gen 2 front panel connector (U31G2_E3)	1-19
9. DDR4 thermal event setting (3-pin DIMMTRIP1)	1-12
10. IPMI SW setting (3-pin IPMI_SW1)	1-14
11. Intel® Serial ATA 6 Gb/s connectors (7-pin SATA6G_12; SATA 6G_34; SATA 6G_56)	1-18
12. M.2 sockets (M.2_1(Socket 3); M.2_2(Socket 3))	1-31
13. U.2 connector (U.2)	1-30
14. Thermal sensor connector (2-pin T_SENSOR)	1-32
15. CPU Over Voltage jumper (3-pin CPU_OV)	1-12
16. System panel connector (20-1 pin PANEL1)	1-24
17. Auxiliary panel connector (20-2 pin AUX_PANEL1)	1-26
18. VROC_KEY connector (4-pin VROC_HW_KEY)	1-22
19. System panel connector (20-3 pin PANEL2)	1-25
20. TPM connector (14-1 pin TPM)	1-21
21. Clear CMOS button (CLR_CMOS)	1-11
22. USB 2.0 connector (10-1 pin USB78)	1-21
23. Thunderbolt header (5-pin TB_HEADER)	1-30
24. Serial port connector (10-1 pin COM1)	1-28
25. VPP_I2C1 connector (10-1 pin VPP_I2C1)	1-29
26. PMBus 1.2 PSU select jumper (3-pin SMART_PSU1)	1-13
27. Power Supply SMBus connector (5-pin PSUSMB1)	1-28
28. Aura RGB header (4-pin RGB_HEADER)	1-33
29. Q-Code LED	1-17
30. Reset button	1-9
31. Power-on button	1-9
32. Front panel audio connector (10-1 pin AAFP)	1-19
33. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)	1-29
34. VGA connector (16-1 pin VGA_HDR1)	1-22
35. Baseboard Management Controller setting (3-pin BMC_EN1)	1-14
36. VGA controller setting (3-pin VGA_SW1)	1-13
37. MicroSD card slot (Micro SD)	1-32

### 1.1.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA2066 socket designed for the Intel® Skylake-W Series Processors.



**LGA2066 Socket**



Ensure that you install the correct CPU designed for LGA2066 socket only. DO NOT install a CPU designed for other sockets on the LGA2066 socket.



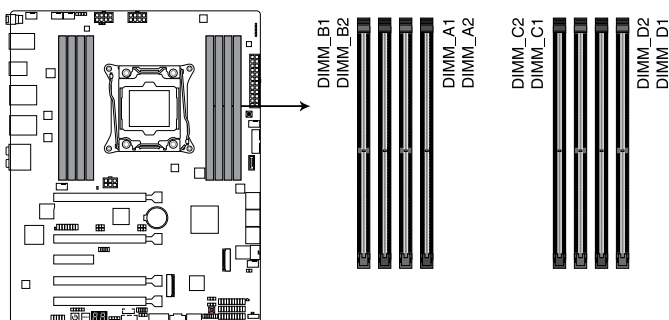
- Ensure that all power cables are unplugged before installing the CPU.
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA2066 socket.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

## 1.1.4 System memory

The motherboard comes with eight (8) DDR 4 (Double Data Rate 4) Dual Inline Memory Modules (DIMM) slots.



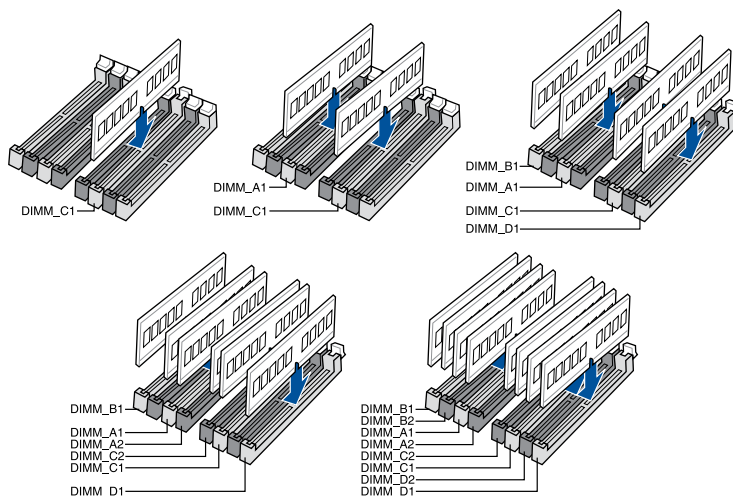
A DDR4 module is notched differently from a DDR, DDR2 or DDR3 module. DO NOT install a DDR, DDR2 or DDR3 memory module to the DDR4 slot.



288-pin DDR4 DIMM socket

### Recommended memory configurations

#### Intel® Skylake-W Series Processors





## Memory configurations

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



---

For Intel® Skylake-W Series Processors, you may install varying memory sizes in Channel A, Channel B, Channel C, and Channel D. The system maps the total size of the lower-sized channel for the quad-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.

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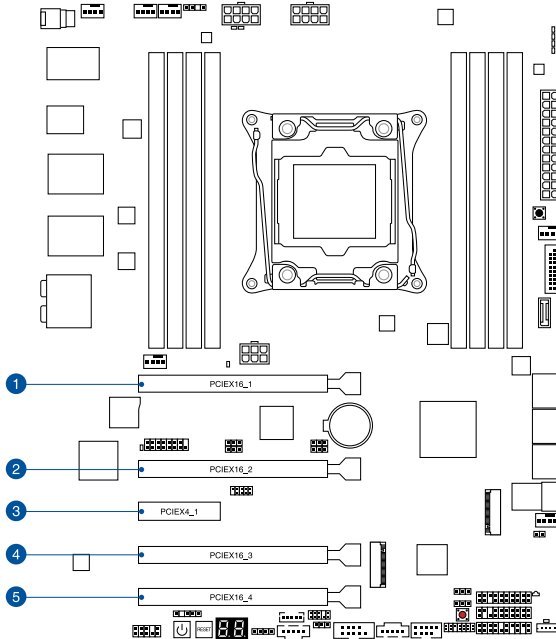


- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value.
  - For system stability, use a more efficient memory cooling system to support a full memory load (8 DIMMs) or overclocking condition.
  - Always install the DIMMS with the same CAS Latency. For an optimum compatibility, we recommend that you install memory modules of the same version or data code (D/C) from the same vendor. Check with the vendor to get the correct memory modules.
  - Visit the [website](#) for the latest QVL.
-

## 1.1.5 Expansion slots



Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.



Slot No.	Slot Description
1	PCIe 3.0 x16_1 slot
2	PCIe 3.0 x16_2 slot
3	PCIe 3.0 x4_1 slot
4	PCIe 3.0 x16_3 slot
5	PCIe 3.0 x16_4 slot (max. at x8 mode)

VGA / PCIe configuration	PCI Express 3.0 operating mode		
	Single VGA / PCIe card	Dual VGA / PCIe cards	Triple VGA / PCIe cards
PCIe 3.0 x16_1	x16 (single VGA recommended)	x16	x16
PCIe 3.0 x16_2	N/A	x16	x16
PCIe 3.0 x16_3	N/A	N/A	x16
PCIe 3.0 x16_4	N/A	N/A	N/A



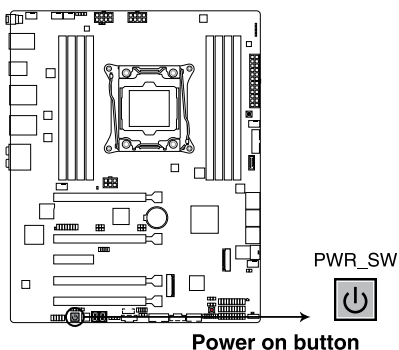
- We recommend that you provide sufficient power when running CrossFireX™ or SLI™ mode.
- The PCIe 3.0/2.0 x16\_2 slot is not recommended for VGA cards or PCIe cards running at x8 mode or above.

## 1.1.6 Onboard buttons and switches

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

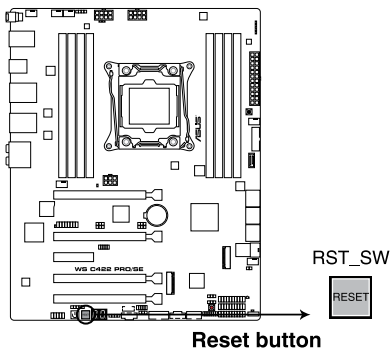
### 1. Power-on button

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



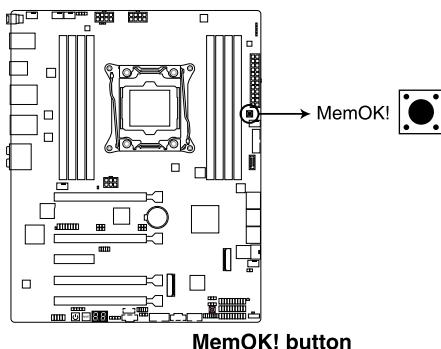
### 2. Reset button

Press the reset button to reboot the system.



### 3. MemOK! button

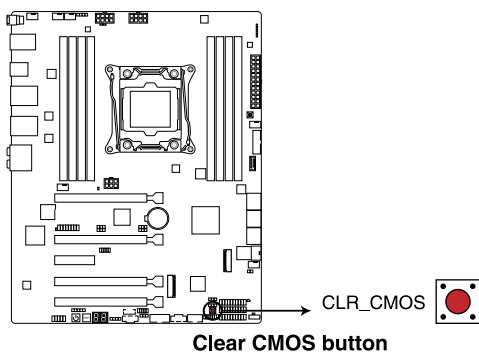
Installing DIMMs that are not compatible with the motherboard may cause system boot failure. If the system fails to boot during POST stage and the DRAM\_LED near the MemOK! button lights continuously, press the MemOK! button until the DRAM\_LED starts blinking. System will begin automatic memory compatibility tuning and reboot for successful boot.



- Refer to section 1.1.8 Onboard LEDs for the exact location of the DRAM\_LED.
- The DRAM\_LED also lights up when the DIMM is not properly installed. Turn off the system and reinstall the DIMM before using the MemOK! function.
- The MemOK! button does not function under Windows® OS environment.
- During the tuning process, the system loads and tests failsafe memory settings. It takes about 30 seconds for the system to test one set of failsafe settings. If the test fails, the system reboots and tests the next set of failsafe settings. The blinking speed of the DRAM\_LED increases, indicating different test processes.
- Due to memory tuning requirement, the system automatically reboots when each timing set is tested. If the installed DIMMs still fail to boot after the whole tuning process, the DRAM\_LED lights continuously. Replace the DIMMs with ones recommended in the Memory QVL (Qualified Vendors Lists) at [www..com](http://www..com).
- If you turn off the computer and replace DIMMs during the tuning process, the system continues memory tuning after turning on the computer. To stop memory tuning, turn off the computer and unplug the power cord for about 5–10 seconds.
- If your system fails to boot up due to BIOS overclocking, press the MemOK! button to boot and load the BIOS default settings. A message will appear during POST reminding you that the BIOS has been restored to its default settings.
- We recommend that you download and update to the latest BIOS version from [www..com](http://www..com) after using the MemOK! function.

#### 4. Clear CMOS button (CLR\_CMOS)

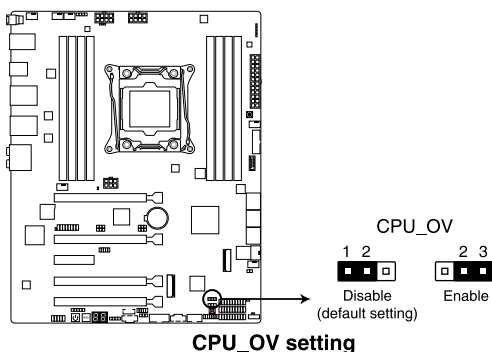
Press this button to clear the BIOS setup information only when the systems hangs due to overclocking.



## 1.1.7 Jumpers

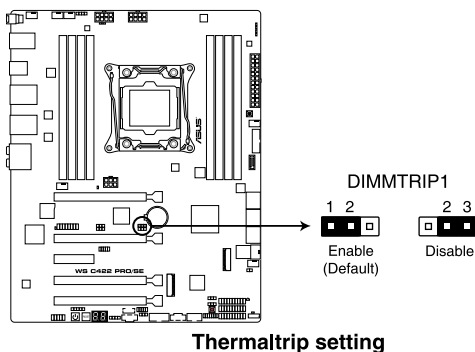
### 1. CPU Over Voltage jumper (3-pin CPU\_OV)

The CPU Over Voltage jumper allows you to set a higher CPU voltage for a flexible overclocking system, depending on the type of the installed CPU. To gain more CPU voltage setting, insert the jumper to pins 2-3. To go back to its default CPU voltage setting, insert the jumper to pins 1-2.



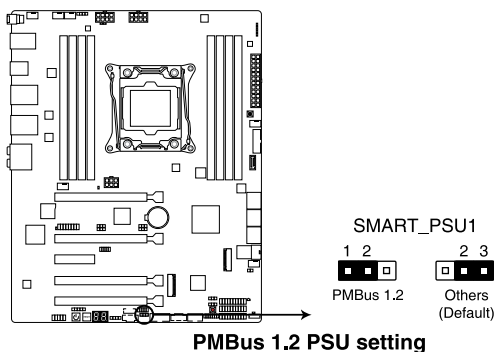
### 2. DDR4 thermal event setting (3-pin DIMMTRIP1)

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



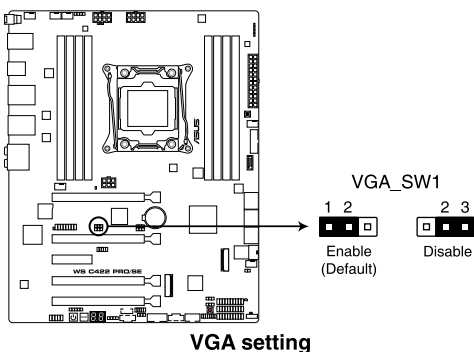
### 3. PMBus 1.2 PSU select jumper (3-pin SMART\_PSU1)

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



### 4. VGA controller setting (3-pin VGA\_SW1)

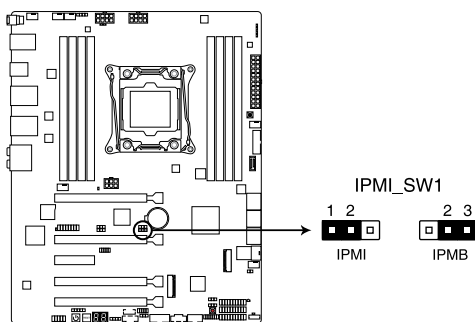
This jumper allows you to enable or disable the onboard VGA controller. Set to pins 1–2 to activate the VGA feature.





## 5. IPMI SW setting (3-pin IPMI\_SW1)

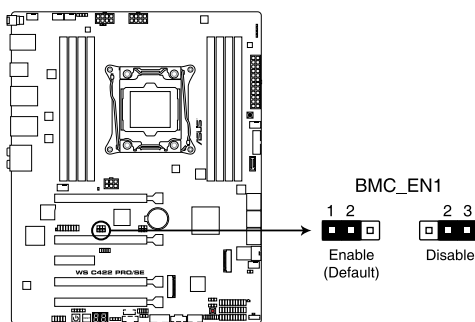
This jumper allows you to select which protocol in the GPU sensor to function.



**IPMI\_SW1 setting**

## 6. Baseboard Management Controller setting (3-pin BMC\_EN1)

This jumper allows you to enable (default) or disable on-board BMC. Ensure to set this BMC jumper to enabled to avoid system fan control and hardware monitor error.

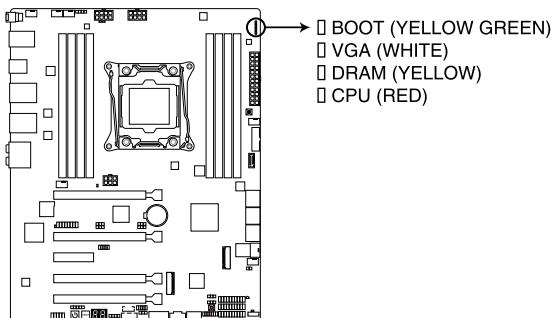


**BMC setting**

## 1.1.8 Onboard LEDs

### 1. Q LED (CPU, DRAM, VGA, BOOT)

Q LED checks key components (CPU, DRAM, VGA card, and booting devices) in sequence during motherboard booting process. If an error is found, the corresponding LED remains lit until the problem is solved. This user-friendly design provides an intuitive way to locate the root problem within seconds.



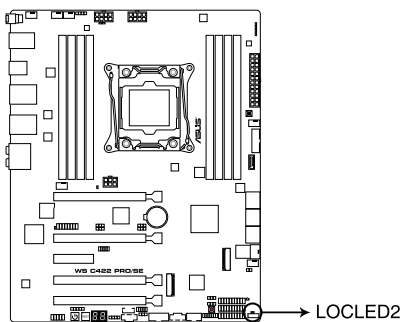
**CPU/ DRAM/  
BOOT\_DEVICE/ VGA LED**



The Q 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.

### 2. Location LED (LOCLED2)

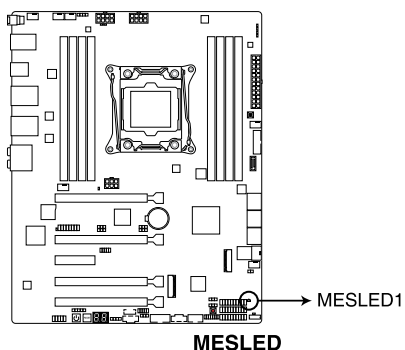
This onboard LED lights up when the Location button on the server is pressed or when triggered by a system management software. The Location LED helps visually locate and quickly identify the server in error on a server rack.



**Location LED**

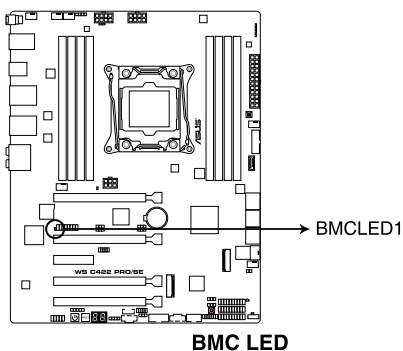
### 3. Message LED (MESLED1)

This onboard LED lights up to red when there is temperature warning or a BMC event log is generated.



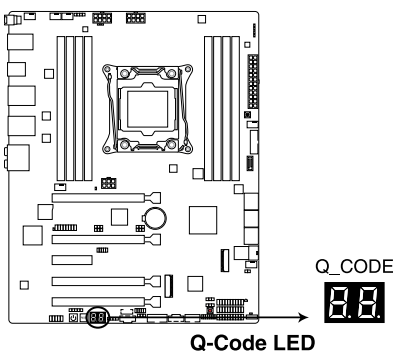
### 4. Baseboard Management Controller LED (BMCLED1)

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



## 5. Q-Code LED

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



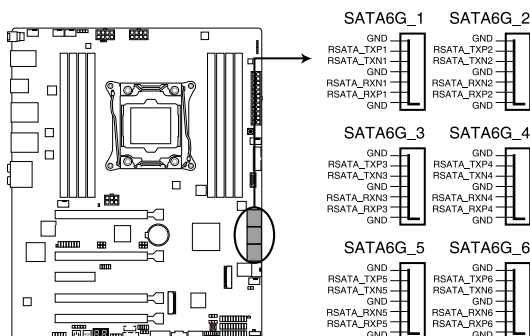
- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Please refer to the Q-Code table in the **Appendix** section for more details.

## 1.1.9 Internal connectors

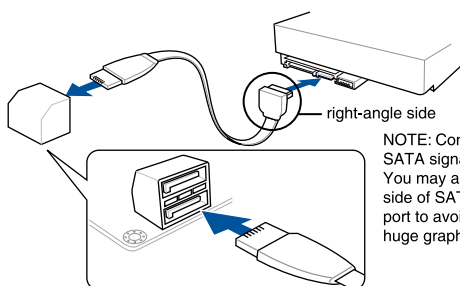
### 1. Intel® Serial ATA 6 Gb/s connectors (7-pin SATA6G\_12; SATA 6G\_34; SATA 6G\_56)

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

If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology enterprise through the onboard Intel® X299 chipset.



Intel® Serial ATA 6 Gb/s connectors



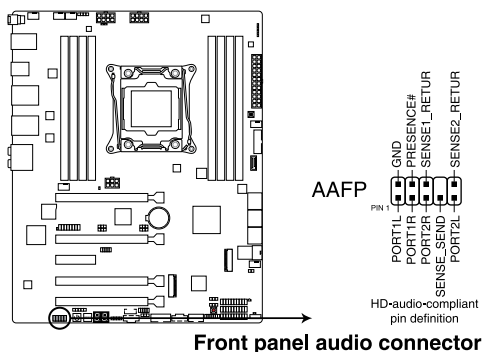
**NOTE:** Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.



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

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

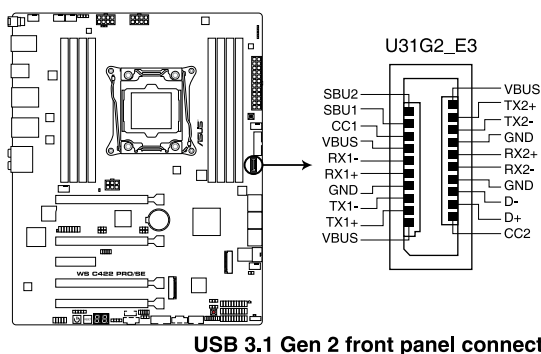
This connector is for a chassis-mounted front panel audio I/O module that supports HD Audio. Connect one end of the front panel audio I/O module cable to this connector.



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.

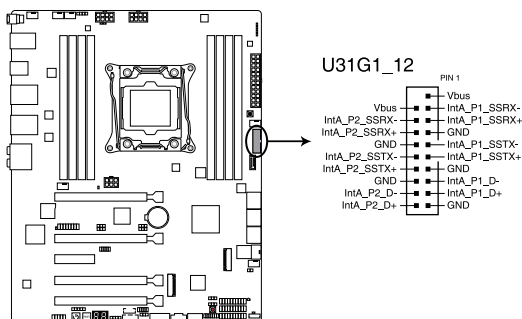
## 3. USB 3.1 Gen 2 front panel connector (U31G2\_E3)

This connector allows you to connect a USB 3.1 Gen 2 module for additional USB 3.1 Gen 2 ports. The latest USB 3.1 Gen 2 connectivity provides data transfer speeds of up to 10 Gbps.



#### 4. USB 3.1 Gen 1 connector (20-pin U31G1\_12)

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



**USB 3.1 Gen 1 connector**



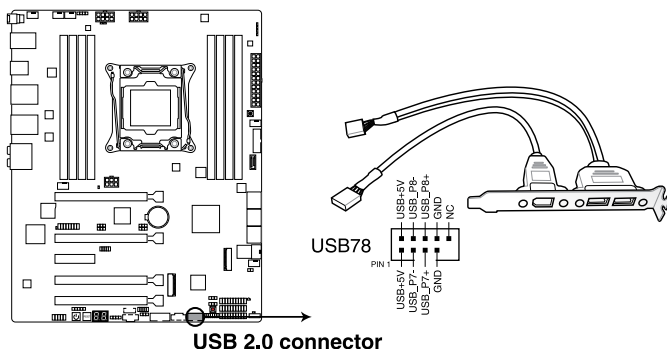
The USB 3.1 Gen 1 module is purchased separately.



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

## 5. USB 2.0 connector (10-1 pin USB78)

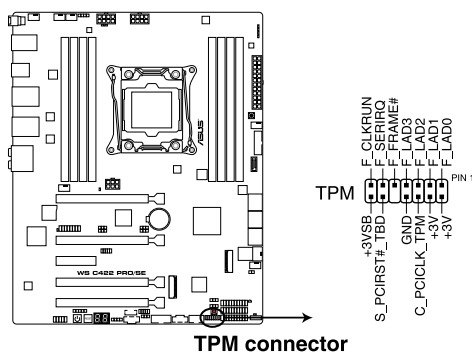
This connector is for USB 2.0 ports. Connect the USB module cable to this connector, then install the module to a slot opening at the back of the system chassis. This USB connector complies with USB 2.0 specification that supports up to 480 Mb/s connection speed.



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

## 6. TPM connector (14-1 pin TPM)

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

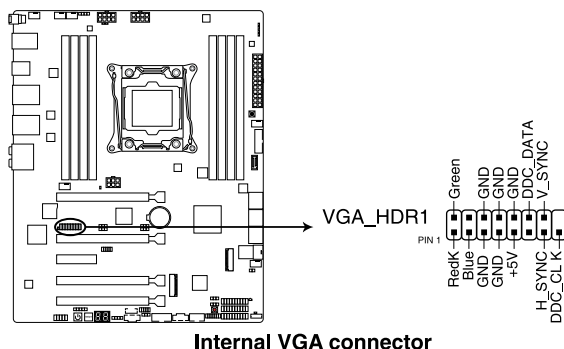


The TPM module is purchased separately.



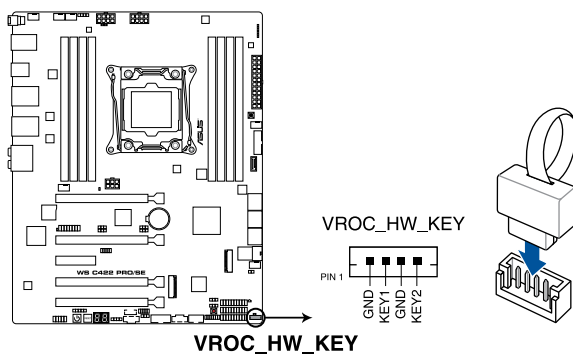
## 7. VGA connector (16-1 pin VGA\_HDR1)

This connector supports the VGA High Dynamic-Range interface.



## 8. VROC\_KEY connector (4-pin VROC\_HW\_KEY)

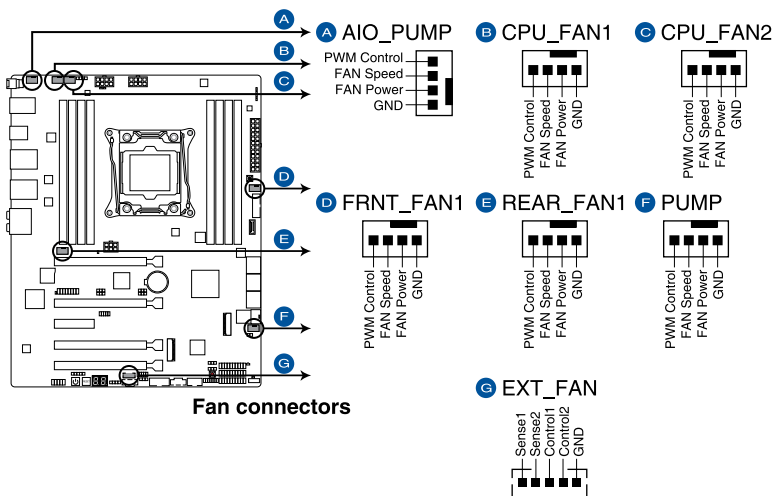
This connector allows you to connect a KEY module to enable CPU RAID functions with Intel® CPU RSTe.



The KEY module is purchased separately.

9. CPU, AIO pump, front, rear, pump, and extension fan connectors (4-pin CPU\_FAN1-2; 4-pin AIO\_PUMP; 4-pin FRNT\_FAN1; 4-pin REAR\_FAN1; 4-pin PUMP; 5-pin EXT\_FAN)

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



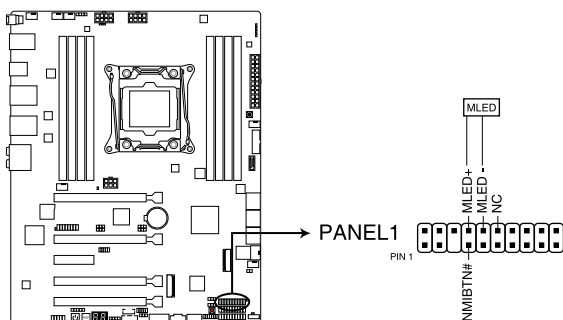
- DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!
- Ensure that the CPU fan cable is securely installed to the CPU fan connector.



- The CPU\_FAN connector supports the CPU fan of maximum 1A (12 W) fan power.
- W\_PUMP+ function support depends on water cooling device.
- Connect the fan of your water cooling kit to the AIO\_PUMP/W\_PUMP+ connector.

## 10. System panel connector (20-pin PANEL1)

This connector supports a chassis-mounted function.



**System panel connector**

- Message LED (2-pin MLED)**

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



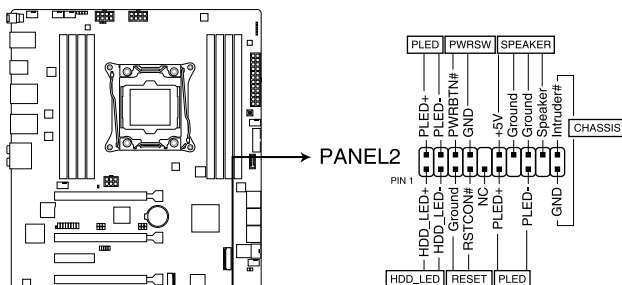

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This connector may be disabled depending on the model.

---

## 11. System panel connector (20-3 pin PANEL2)

This connector supports several chassis-mounted functions.



**System panel connector**

- **System power LED (2-pin or 3-1 pin PLED)**

The 2-pin or 3-1 pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

- **Hard disk drive activity LED (2-pin HDD\_LED)**

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

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

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

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

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

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

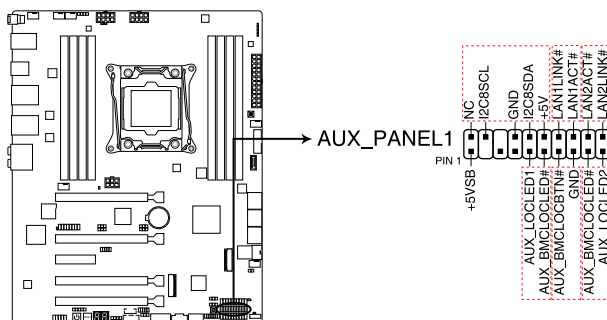
This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.

- **Chassis intrusion connector (2-pin CHASSIS)**

This connector is for a chassis-mounted intrusion detection sensor or switch. Connect one end of the chassis intrusion sensor or switch cable to this connector. The chassis intrusion sensor or switch sends a high-level signal to this connector when a chassis component is removed or replaced. The signal is then generated as a chassis intrusion event.

## 12. Auxiliary panel connector (20-2 pin AUX\_PANEL1)

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



**Auxiliary panel connector**

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

This connector is for the front panel SMBus cable.

- **LAN activity LED (2-pin LAN1\_LED, LAN2\_LED)**

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

- **Locator LED (2-pin LOCATORLED1, 2-pin LOCATORLED2)**

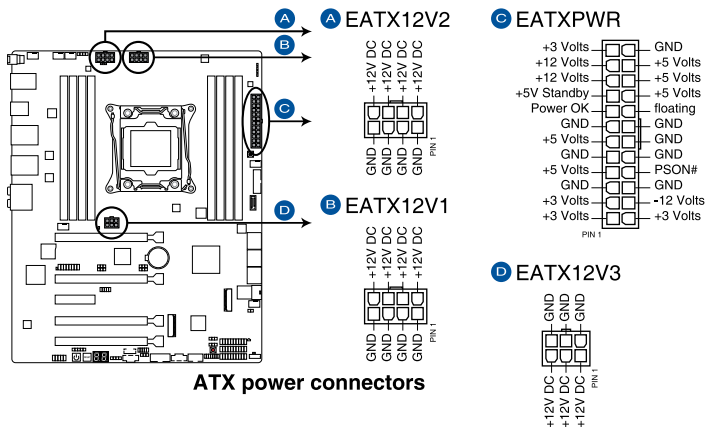
These connectors are for the locator LED1 and LED2 on the front panel. Connect the Locator LED cables to these 2-pin connector. The LEDs will light up when the Locator button is pressed.

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

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

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

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



ATX power connectors



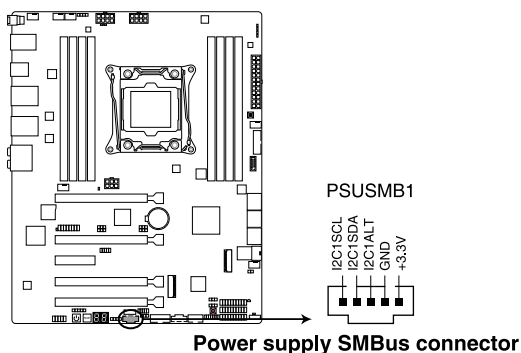
Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.



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

#### 14. Power Supply SMBus connector (5-pin PSUSMB1)

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



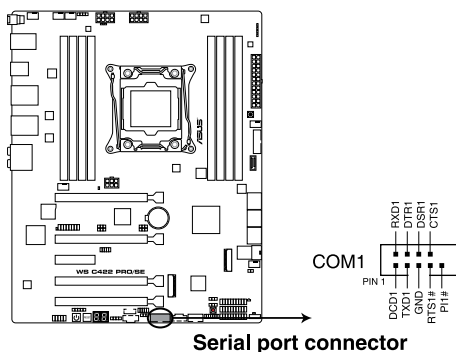
This connector functions only when you enable the ASMB9.



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

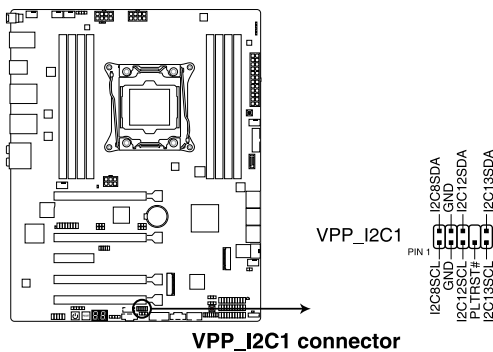
#### 15. Serial port connector (10-1 pin COM1)

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



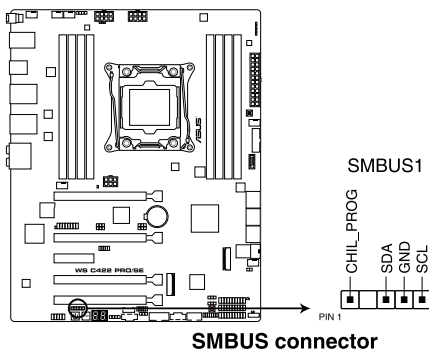
## 16. VPP\_I2C1 connector (10-1 pin VPP\_I2C1)

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



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

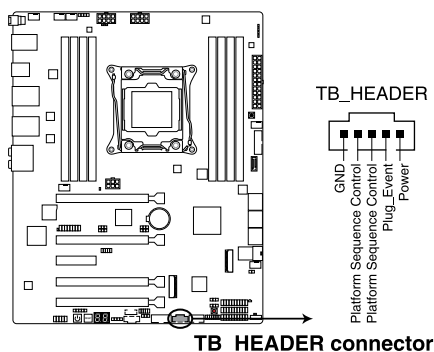
This connector controls the system and power management-related tasks. This connector processes the messages to and from devices rather than tripping the individual control lines.





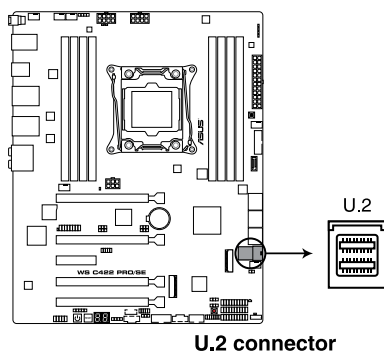
### 18. Thunderbolt header (5-pin TB\_HEADER)

This connector is for the add-on Thunderbolt I/O card that supports Intel's Thunderbolt Technology, allowing you to connect up to six Thunderbolt-enabled devices and a DisplayPort-enabled display in a daisy-chain configuration.



### 19. U.2 connector (U.2)

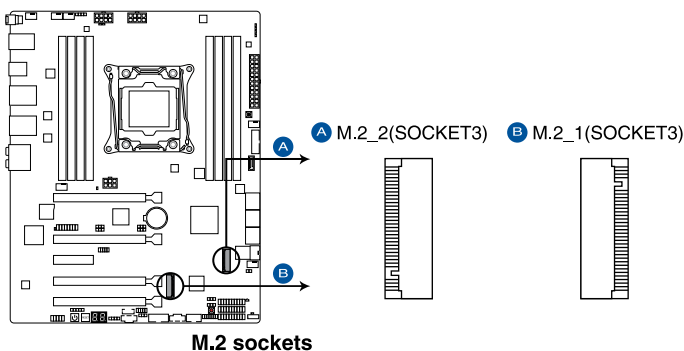
This motherboard comes with a U.2 connector which supports PCIe 3.0 x4 NVM Express storage.



The U.2 connector shares bandwidth with the M.2\_2 socket. Adjust the BIOS settings to use U.2 devices.

## 20. M.2 sockets (M.2\_1(Socket 3); M.2\_2(Socket 3))

These sockets allow you to install M.2 SSD modules.



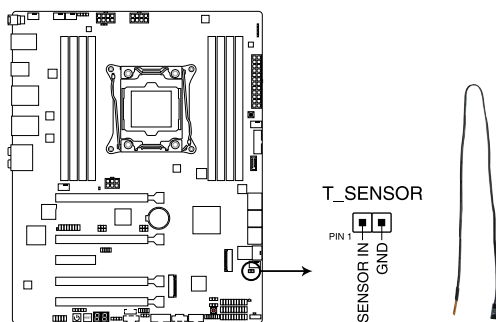
- M.2\_1 socket supports PCIe 3.0 x4 and SATA mode M Key design and type 2242 / 2260 / 2280 PCIe and SATA storage devices.
- M.2\_2 socket supports PCIe 3.0 x4 M Key design and type 2242 / 2260 / 2280 / 22110 PCIe storage devices.
- These sockets support IRSTe (Intel® Rapid Storage Technology enterprise).
- The M.2\_2 socket shares bandwidth with the U.2 connector. Adjust the BIOS settings to use U.2 devices.



The M.2 SSD module is purchased separately.

## 21. Thermal sensor connector (2-pin T\_SENSOR)

This connector is for the thermistor cable that monitors the temperature of the devices and the critical components inside the motherboard. Connect the thermistor cable and place the sensor on the device or the motherboard's component to detect its temperature.



**Thermal sensor connector**



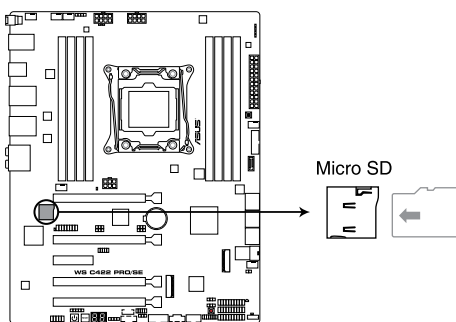

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The thermal sensor is purchased separately.

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## 22. MicroSD card slot (Micro SD)

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



**Micro SD**




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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.

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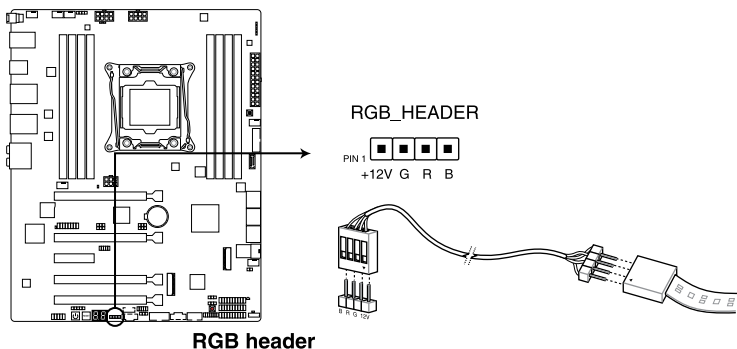

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Some memory cards may not be compatible with your motherboard. Ensure that you use only compatible memory cards to prevent loss of data, damage to your device, or memory card, or both.

---

### 23. Aura RGB header (4-pin RGB\_HEADER)

This connector is for RGB LED strips.



The RGB header supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 2A (12V), and no longer than 2 m.



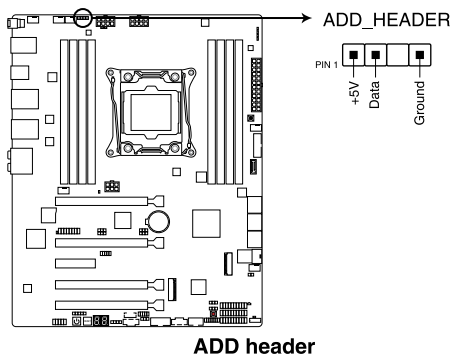
Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.



- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the RGB LED extension cable and the RGB LED strip is connected in the correct orientation, and the 12V connector is aligned with the 12V header on the motherboard.
- The LED strip will only light up under the operating system.
- The LED strip is purchased separately.

## 24. Aura Addressable RGB header (4-pin ADD\_HEADER)

This connector is for individually addressable RGB WS2812B LED strips or WS2812B based LED strips.



The addressable RGB header supports WS2812B addressable RGB LED strips (5V/Data/Ground), with a maximum power rating of 3A (5V) and a maximum of 60 LEDs.



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.



- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the addressable RGB LED strip is connected in the correct orientation, and the 5V connector is aligned with the 5V header on the motherboard.
- The addressable RGB LED strip will only light up under the operating system.
- The addressable RGB LED strip is purchased separately.

# Basic Installation

# 2

## 2.1 Building your PC system

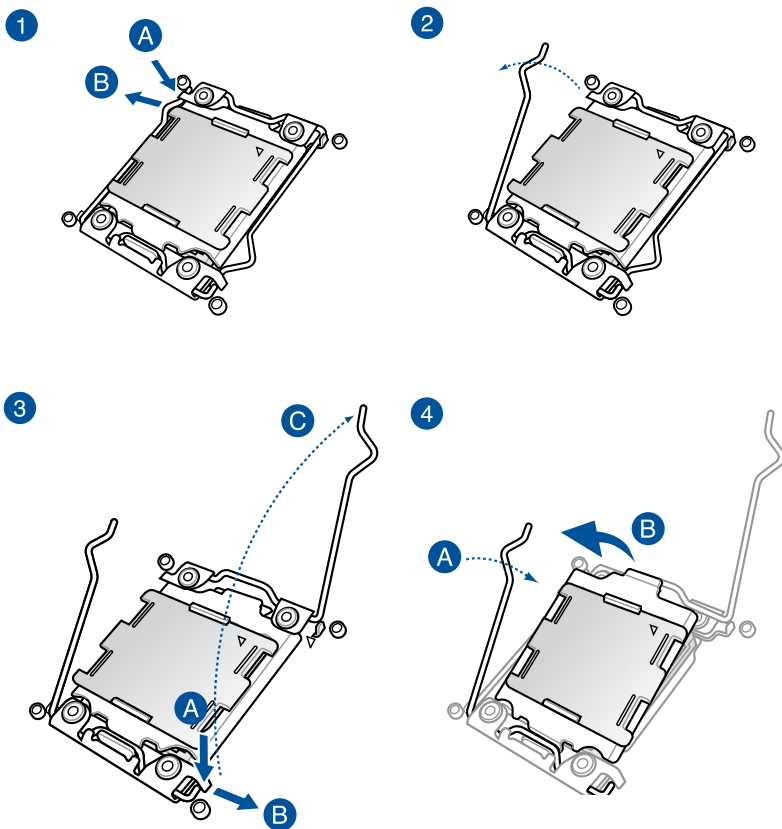


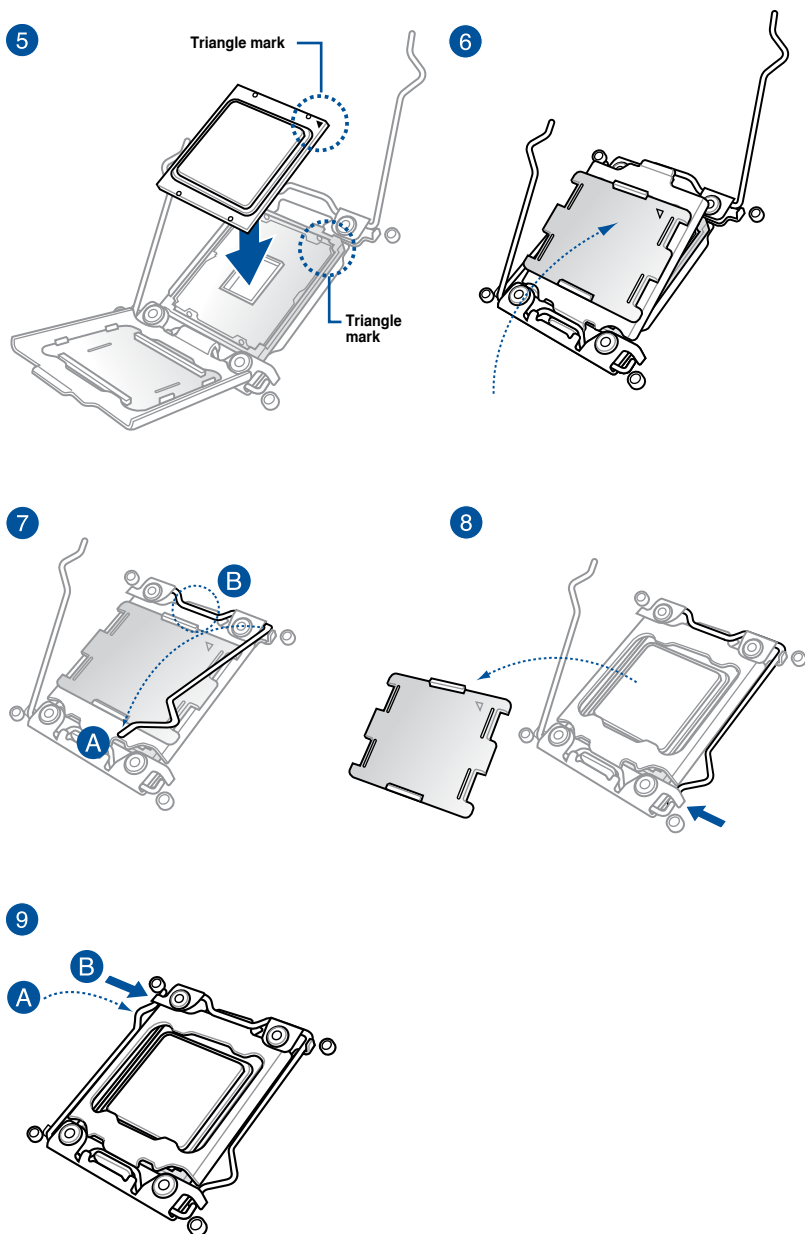
The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

### 2.1.1 CPU installation

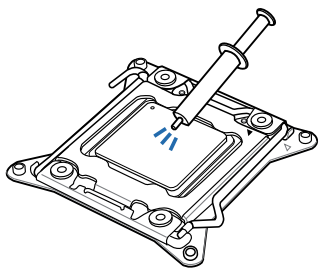


Please note the order in opening/ closing the double latch. Follow the instructions printed on the metal sealing hatch or the illustrations shown below in this manual. The plastic cap will pop up automatically once the CPU is in place and the hatch properly sealed down.



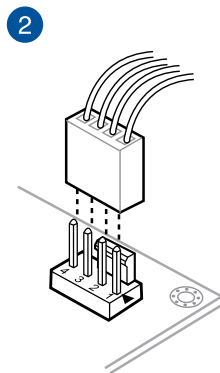
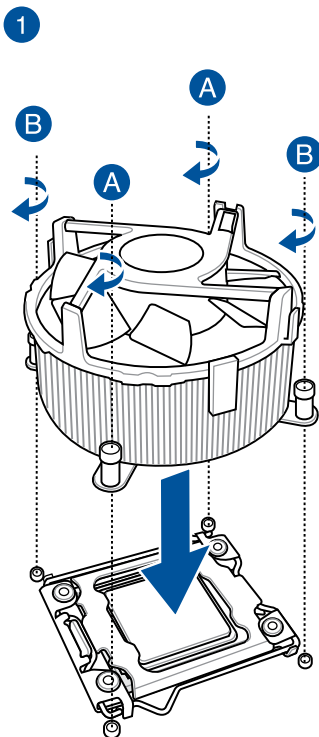


## 2.1.2 CPU heatsink and fan assembly installation



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

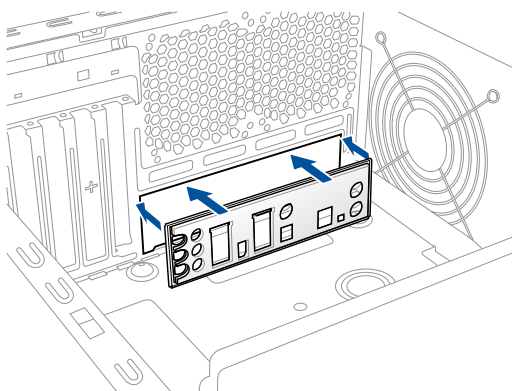
To install the CPU heatsink and fan assembly



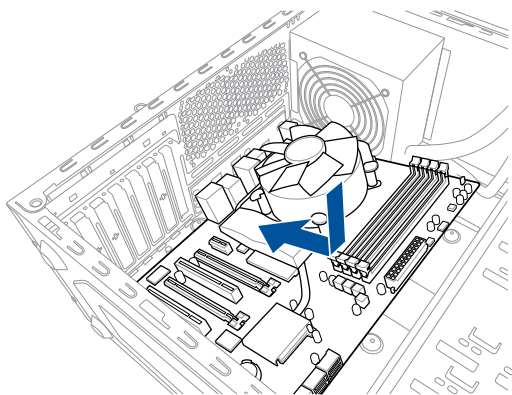


## 2.1.3 Motherboard installation

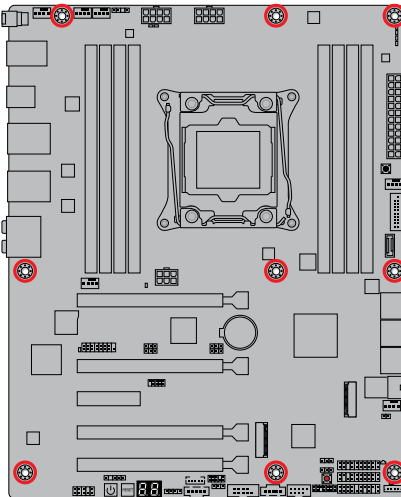
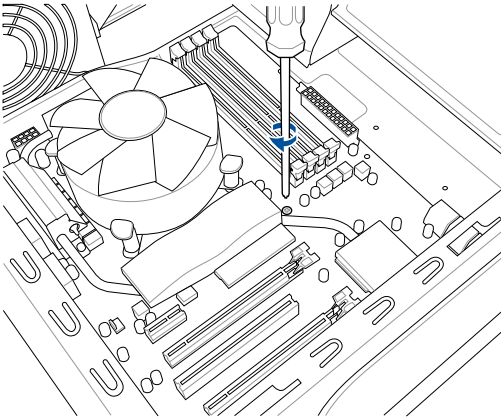
1. Install the Q-Shield to the chassis rear I/O panel.



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

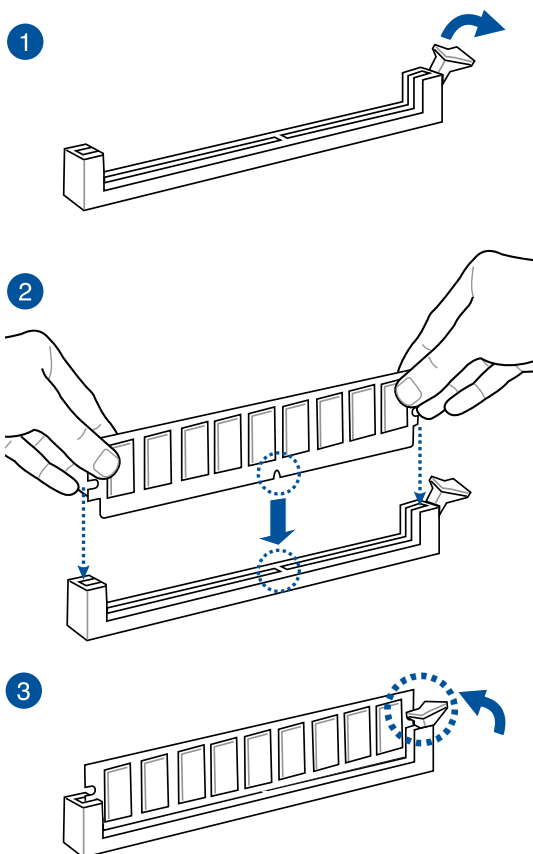


3. Place nine (9) screws into the holes indicated by circles to secure the motherboard to the chassis.

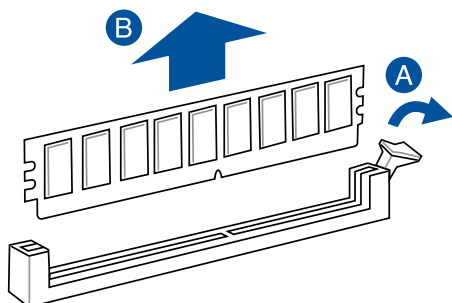


**DO NOT** overtighten the screws! Doing so can damage the motherboard.

## 2.1.4 DIMM installation

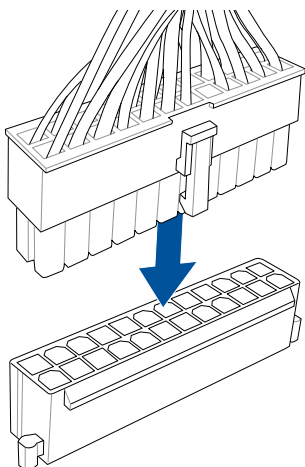


**To remove a DIMM**

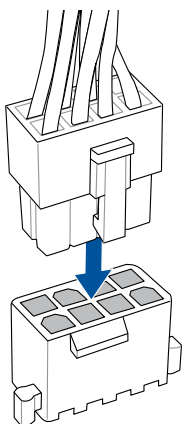


## 2.1.5 ATX power connection

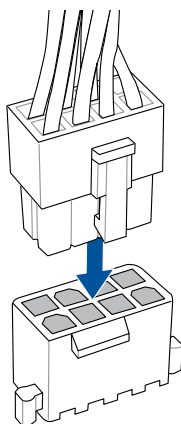
1



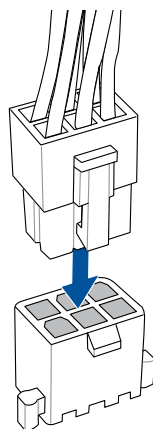
2



OR

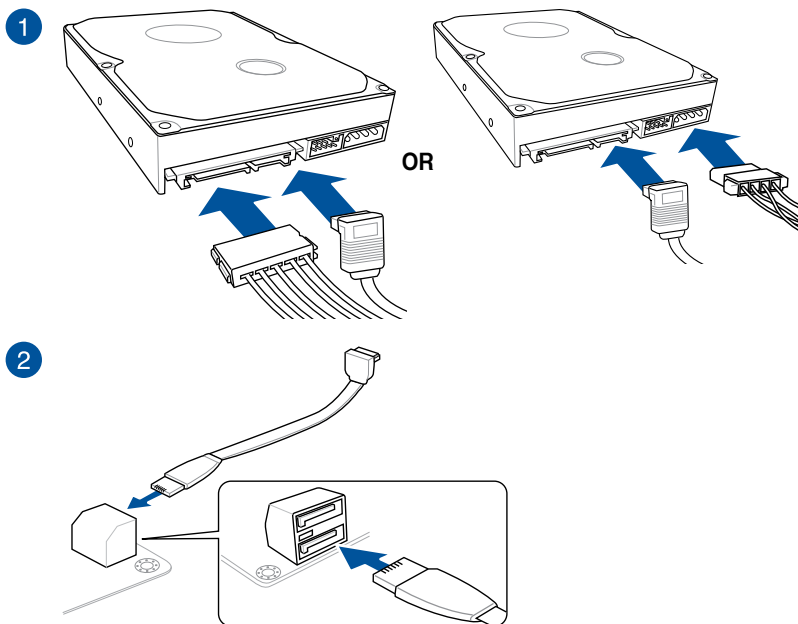


AND



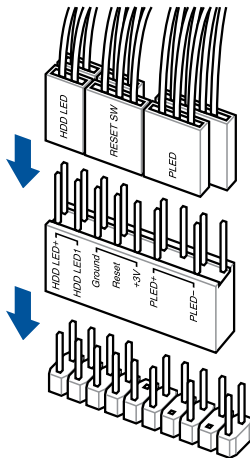
- DO NOT connect the 6-pin power plug only, the motherboard may overheat under heavy usage.
- Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.

## 2.1.6 SATA device connection

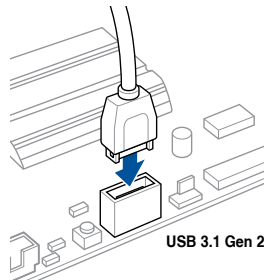


## 2.1.7 Front I/O connector

### To install Q-Connector

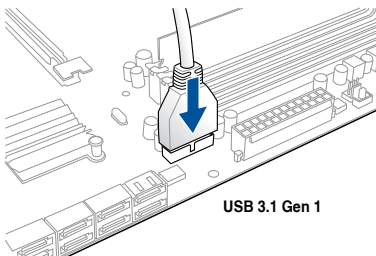


### To install USB 3.1 Gen 2 connector

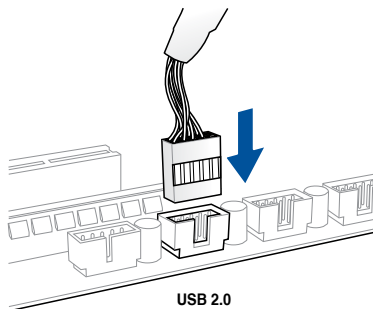


This connector will only fit in one orientation. Push the connector until it clicks into place.

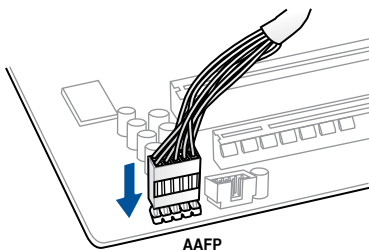
### To install USB 3.1 Gen 1 connector



### To install USB 2.0 connector

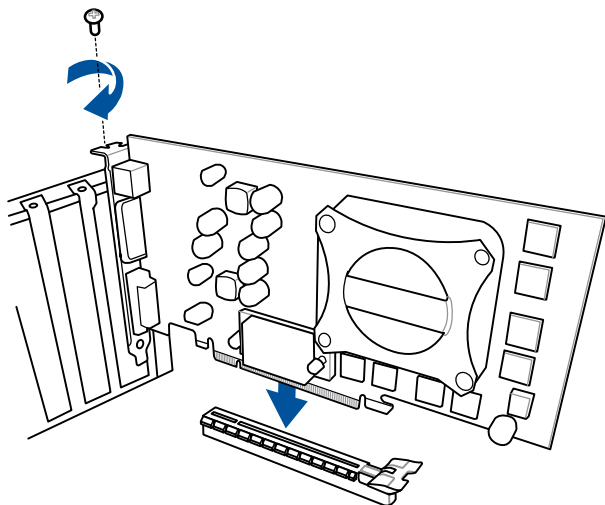


### To install front panel audio connector

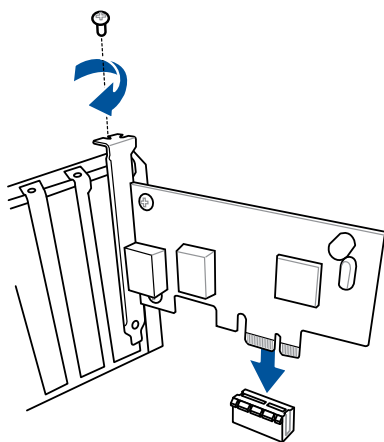


## 2.1.8 Expansion card installation

To install PCIe x16 cards

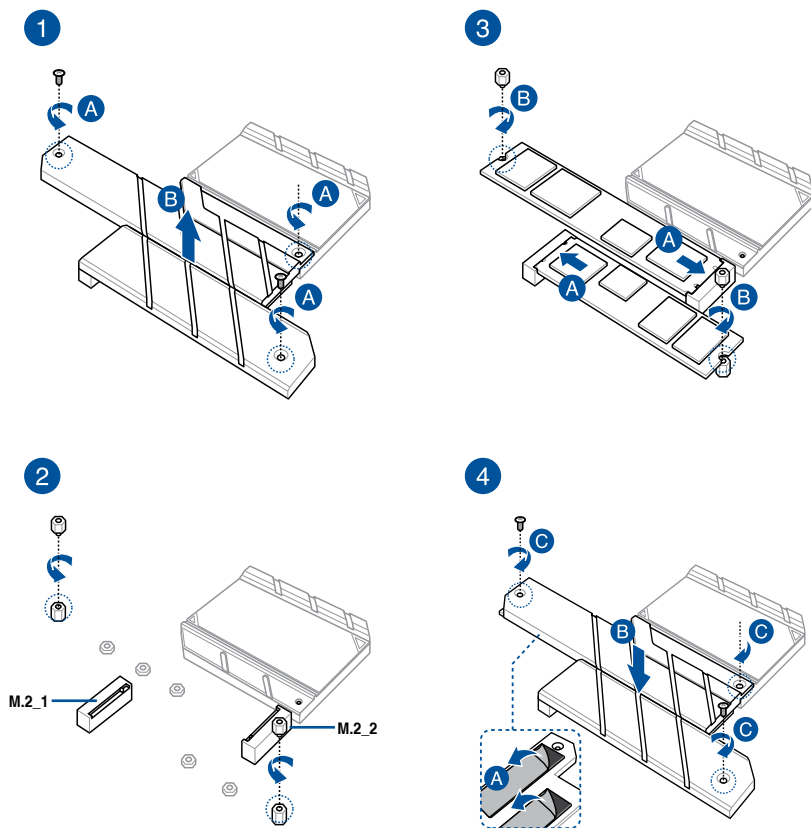


To install PCIe x1 cards



## 2.1.9 M.2 installation

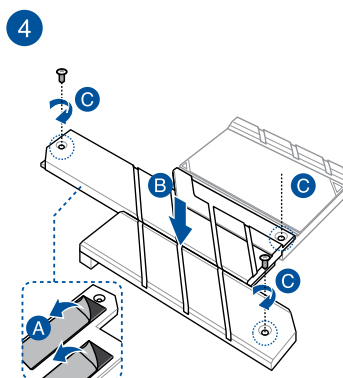
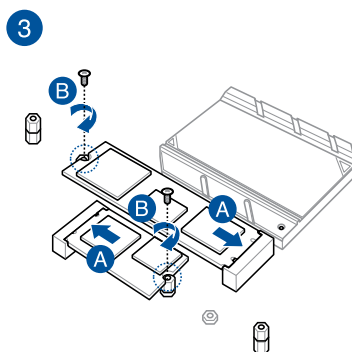
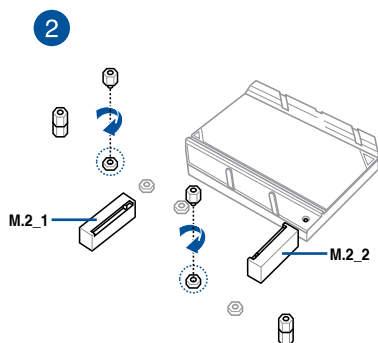
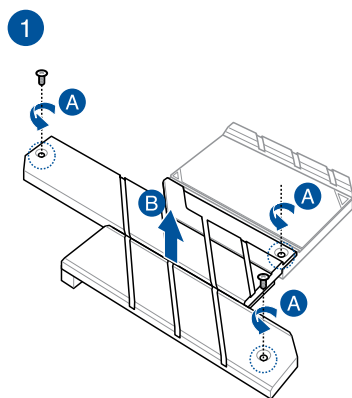
To install M.2 type 22110 storage device to M.2\_2 and/or M.2 type 2280 storage device to M.2\_1



Supported M.2 type varies per motherboard.



To install M.2 type 2242/2260/2280 storage device to M.2\_2 and/or  
M.2 type 2242/2260 storage device to M.2\_1



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.

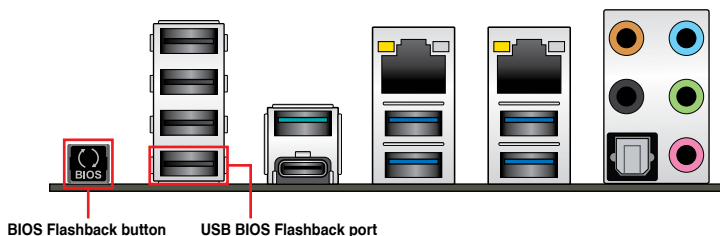
#### To use USB BIOS Flashback:

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 [CADnetwork.de](http://CADnetwork.de) and download the latest BIOS version for this motherboard.
3. Rename the file as **WCSSE.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.



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



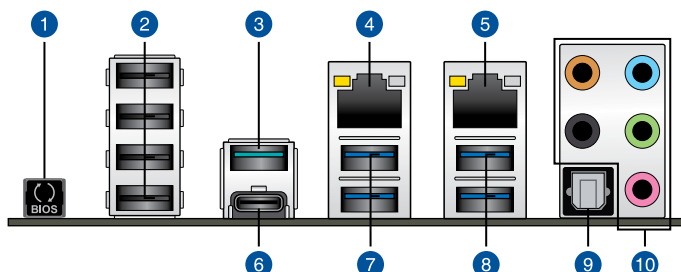
For more BIOS update utilities in BIOS setup, refer to the section **3.10 Updating BIOS** in Chapter 3.



- 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 Service Center.

## 2.3 Motherboard rear and audio connections

### 2.3.1 Rear I/O connection



#### Rear panel connectors

1. USB BIOS Flashback button	6. USB 3.1 Gen 2 Type-C™ port EC1
2. USB 2.0 ports 9-12 (bottom port supports USB BIOS Flashback)	7. USB 3.1 Gen 1 ports 56
3. USB 3.1 Gen 2 Type-A port E2	8. USB 3.1 Gen 1 ports 34
4. Intel® LAN port (LAN2)*	9. Optical S/PDIF Out port
5. Intel® LAN port (LAN1)*	10. Audio I/O ports**

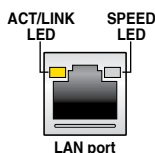
\* and \*\* : Refer to the tables on the next page for LAN port LEDs and audio port definitions.



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

### \* LAN ports LED indications

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



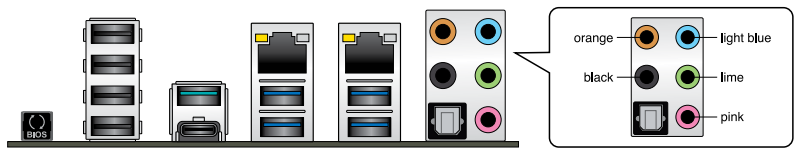
You can disable the LAN controllers in BIOS. Due to hardware design, the LAN1 port's LEDs may continue to blink even when disabled.

### \*\* Audio 2, 4, 6 or 8-channel configuration

Port	Headset 2-channel	4-channel	6-channel	8-channel
Light Blue	Line In	Line In	Line In	Side Speaker Out
Lime	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink	Mic In	Mic In	Mic In	Mic In
Orange	—	—	Center/Sub woofer	Center/Sub woofer
Black	—	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out

## 2.3.2 Audio I/O connections

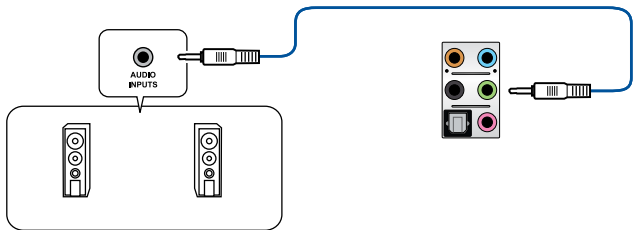
### Audio I/O ports



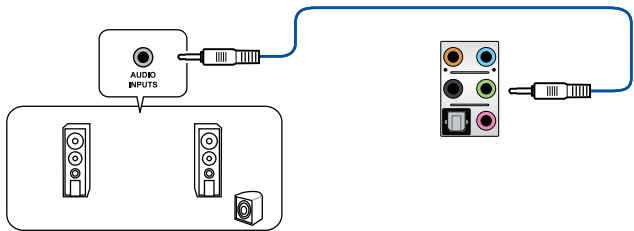
### Connect to Headphone and Mic



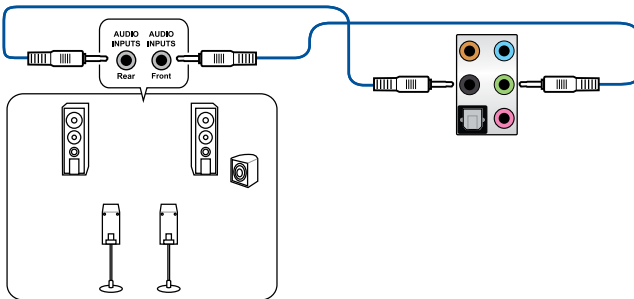
### Connect to Stereo Speakers



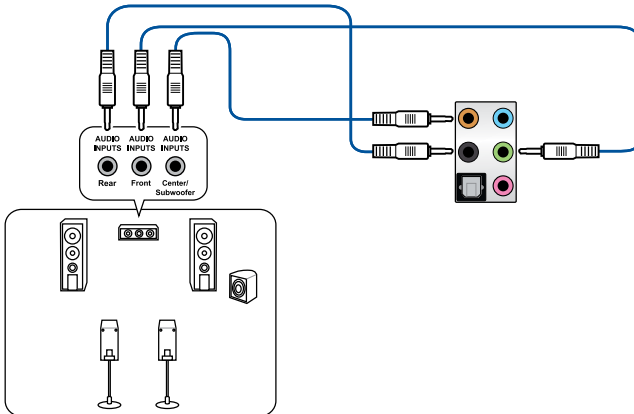
### Connect to 2 Speakers



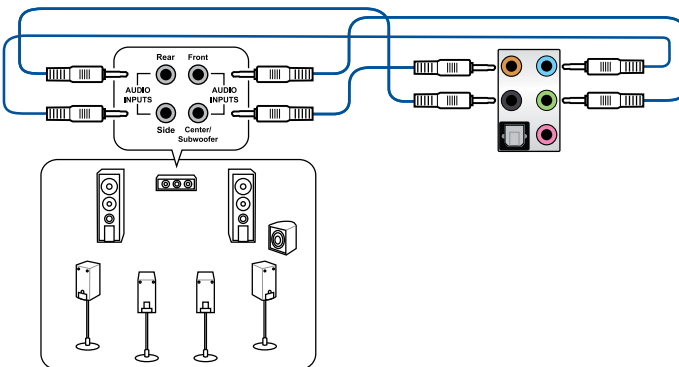
### Connect to 4 Speakers



### Connect to 6 Speakers



### Connect to 8 Speakers



## 2.4 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. Ensure that all switches are off.
3. Connect the power cord to the power connector at the back of the system chassis.
4. Connect the power cord to a power outlet that is equipped with a surge protector.
5. Turn on the devices in the following order:
  - a. Monitor
  - b. External SCSI 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.