



ASRock®

PHANTOM GAMING

Z790 NOVA



User Manual

Contact Information

If you need to contact ASRock or want to know more about ASRock, you're welcome to visit ASRock's website at <http://www.asrock.com>; or you may contact your dealer for further information. For technical questions, please submit a support request form at <https://event.asrock.com/tsd.asp>

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Chapter 1 Introduction

Thank you for purchasing ASRock Z790 Nova WiFi motherboard, a reliable motherboard produced under ASRock's consistently stringent quality control. It delivers excellent performance with robust design conforming to ASRock's commitment to quality and endurance.



Because the motherboard specifications and the BIOS software might be updated, the content of this documentation will be subject to change without notice. In case any modifications of this documentation occur, the updated version will be available on ASRock's website without further notice. If you require technical support related to this motherboard, please visit our website for specific information about the model you are using. You may find the latest VGA cards and CPU support list on ASRock's website as well. ASRock website <http://www.asrock.com>.

1.1 Package Contents

- ASRock Z790 Nova WiFi Motherboard (ATX Form Factor)
- ASRock Z790 Nova WiFi User Manual
- 4 x Serial ATA (SATA) Data Cables (Optional)
- 1 x Graphics Card Holder (Optional)
- 1 x ASRock WiFi 2.4/5/6 GHz Antenna (Optional)
- 1 x ARGB Splitter Cable (Optional)
- 3 x Thermistor Cables (Optional)
- 5 x Screws for M.2 Sockets (Optional)
- 5 x Standoffs for M.2 Sockets (Optional)

1.2 Specifications

- Platform**
- ATX Form Factor
 - 8 Layer PCB
 - 2oz Copper PCB

- CPU**
- Supports 14th, 13th & 12th Gen Intel® Core™ Processors (LGA1700)
 - Supports Intel® Hybrid Technology
 - Supports Intel® Turbo Boost Max 3.0 Technology
 - Supports Intel® Thermal Velocity Boost (TVB)
 - Supports Intel® Adaptive Boost Technology (ABT)
 - Supports ASRock Hyper BCLK Engine

- Chipset**
- Intel® Z790

- Memory**
- Dual Channel DDR5 Memory Technology
 - 4 x DDR5 DIMM Slots
 - Supports DDR5 non-ECC, un-buffered memory up to 8000+(OC)*
 - Max. capacity of system memory: 192GB
 - Supports Intel® Extreme Memory Profile (XMP) 3.0
- * Please refer to Memory Support List on ASRock's website for more information. (<http://www.asrock.com/>)

- Expansion Slot**
- CPU:
- 1 x PCIe 5.0 x16 Slot (PCIE1), supports x16 mode*
- Chipset:
- 1 x PCIe 4.0 x16 Slot (PCIE2), supports x4 mode*
 - 1 x PCIe 3.0 x1 Slot (PCIE3)*
 - 1 x Vertical M.2 Socket (Key E), supports type 2230 WiFi/BT PCIe WiFi module and Intel® CNVio/CNVio2 (Integrated WiFi/BT)

* Supports NVMe SSD as boot disks

* If M2_1 is occupied, PCIE1 will downgrade to x8 mode.

- Supports AMD CrossFire™
- 15μ Gold Contact in VGA PCIe Slot (PCIE1)

Graphics

- Intel® UHD Graphics Built-in Visuals and the VGA outputs can be supported only with processors which are GPU integrated.
- Intel® X^c Graphics Architecture (Gen 12)
- 1 x HDMI 2.1 TMDs Compatible, supports HDCP 2.3 and max. resolution up to 4K 60Hz
- 1 x DisplayPort 1.4 with DSC (compressed), supports HDCP 2.3 and max. resolution up to 8K 60Hz / 5K 120Hz

Audio

- 7.1 CH HD Audio with Content Protection (Realtek ALC4082 Audio Codec)
- Individual PCB Layers for R/L Audio Channel
- Impedance Sensing on Rear Out port
- Nahimic Audio

LAN

- 2.5 Gigabit LAN 10/100/1000/2500 Mb/s
- Killer® E3100G
- Supports Killer LAN Software

Wireless LAN

- 802.11be 2x2 Wi-Fi 7 Module
- Supports IEEE 802.11a/b/g/n/ac/ax/be
- Supports 2.4GHz/5GHz/6GHz* frequency band
- Supports 320MHz channel bandwidth with 6GHz* frequency band

* Wi-Fi 7 (6GHz band) will be supported by Microsoft® Windows® 11. The availability will depend on the different regulation status of each country and region. It will be activated (for supported countries) through Windows Update and software updates once available.

* A 6GHz compatible router is required for 7 functionality.

- 1 antenna to support 2 (Transmit) x 2 (Receive) diversity technology
- Supports Bluetooth 5.4**

** Bluetooth® Audio Offload (HFP, A2DP, and LE Audio) is not supported.

- Supports MU-MIMO

USB

- 2 x USB 3.2 Gen2x2 Type-C (1 Rear, 1 Front)
- 4 x USB 3.2 Gen2 Type-A (Rear)
- 7 x USB 3.2 Gen1 Type-A (3 Rear, 4 Front)
- 6 x USB 2.0 (2 Rear, 4 Front)

* All USB ports support ESD Protection

Rear Panel I/O

- 2 x Antenna Ports
- 1 x HDMI Port
- 1 x DisplayPort 1.4
- 1 x Optical SPDIF Out Port
- 1 x USB 3.2 Gen2x2 Type-C Port (20 Gb/s)
- 4 x USB 3.2 Gen2 Type-A Ports (10 Gb/s) *
- 3 x USB 3.2 Gen1 Ports *
- 2 x USB 2.0 Ports
- 1 x RJ-45 LAN Port
- 1 x Clear CMOS Button
- 1 x Line Out Jack (Gold Audio Jack)
- 1 x Microphone Input Jack (Gold Audio Jack)

*USB32_12 support Ultra USB Power. USB32_34 are Lightning Gaming Ports.

Storage

CPU:

- 1 x Blazing M.2 Socket (M2_1, Key M), supports type 2260/2280 PCIe Gen5x4 (128 Gb/s) mode*
- 1 x Hyper M.2 Socket (M2_2, Key M), supports type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode*

Chipset:

- 1 x Hyper M.2 Socket (M2_3, Key M), supports type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode*
- 1 x Hyper M.2 Socket (M2_4, Key M), supports type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode*
- 1 x Hyper M.2 Socket (M2_5, Key M), supports type 2260/2280 SATA3 6.0 Gb/s & PCIe Gen4x4 (64 Gb/s) modes*
- 1 x Hyper M.2 Socket (M2_6, Key M), supports type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode*
- 4 x SATA3 6.0 Gb/s Connectors

* Supports Intel® Volume Management Device (VMD)

* Supports NVMe SSD as boot disks

* If M2_1 is occupied, PCIE1 will downgrade to x8 mode.

RAID

- Supports RAID 0, RAID 1, RAID 5 and RAID 10 for SATA storage devices
- Supports RAID 0, RAID 1, RAID 5 and RAID 10 for M.2 NVMe storage devices

Connector

- 3 x Thermistor Cable Headers
- 1 x SPI TPM Header
- 1 x Power LED and Speaker Header
- 1 x RGB LED Header*
- 3 x Addressable LED Headers**
- 1 x CPU Fan Connector (4-pin)***
- 1 x CPU/Water Pump Fan Connector (4-pin) (Smart Fan Speed Control)****
- 5 x Chassis/Water Pump Fan Connectors (4-pin) (Smart Fan Speed Control)*****
- 1 x VRM Fan Connector (4-pin) (Smart Fan Speed Control)*****
- 1 x 24 pin ATX Power Connector (Hi-Density Power Connector)
- 2 x 8 pin 12V Power Connectors (Hi-Density Power Connector)
- 1 x Front Panel Audio Connector (15 μ Gold Audio Connector)
- 1 x Thunderbolt AIC Connector (5-pin) (Supports ASRock Thunderbolt 4 AIC Card)
- 2 x USB 2.0 Headers (Support 4 USB 2.0 ports)
- 2 x USB 3.2 Gen1 Headers (Support 4 USB 3.2 Gen1 ports)
- 1 x Front Panel Type C USB 3.2 Gen2x2 Header (20 Gb/s)
- 1 x Dr. Debug with LED
- 1 x Power Button with LED
- 1 x Reset Button with LED

* Supports in total up to 12V/3A, 36W LED Strip

** Support in total up to 5V/3A, 15W LED Strip

*** CPU_FAN1 supports the fan power up to 1A (12W).

**** CPU_FAN2/WP supports the fan power up to 2A (24W).

***** CHA_FAN1~5/WP support the fan power up to 2A (24W).

***** CPU_FAN2/WP and CHA_FAN1~5/WP can auto detect if 3-pin or 4-pin fan is in use.

***** VRM_FAN supports the VRM fan power up to 2A (24W).

**BIOS
Feature**

- AMI UEFI Legal BIOS with GUI support

OS

- Microsoft® Windows® 10 64-bit / 11 64-bit

**Certifica-
tions**

- FCC, CE
- ErP/EuP ready (ErP/EuP ready power supply is required)

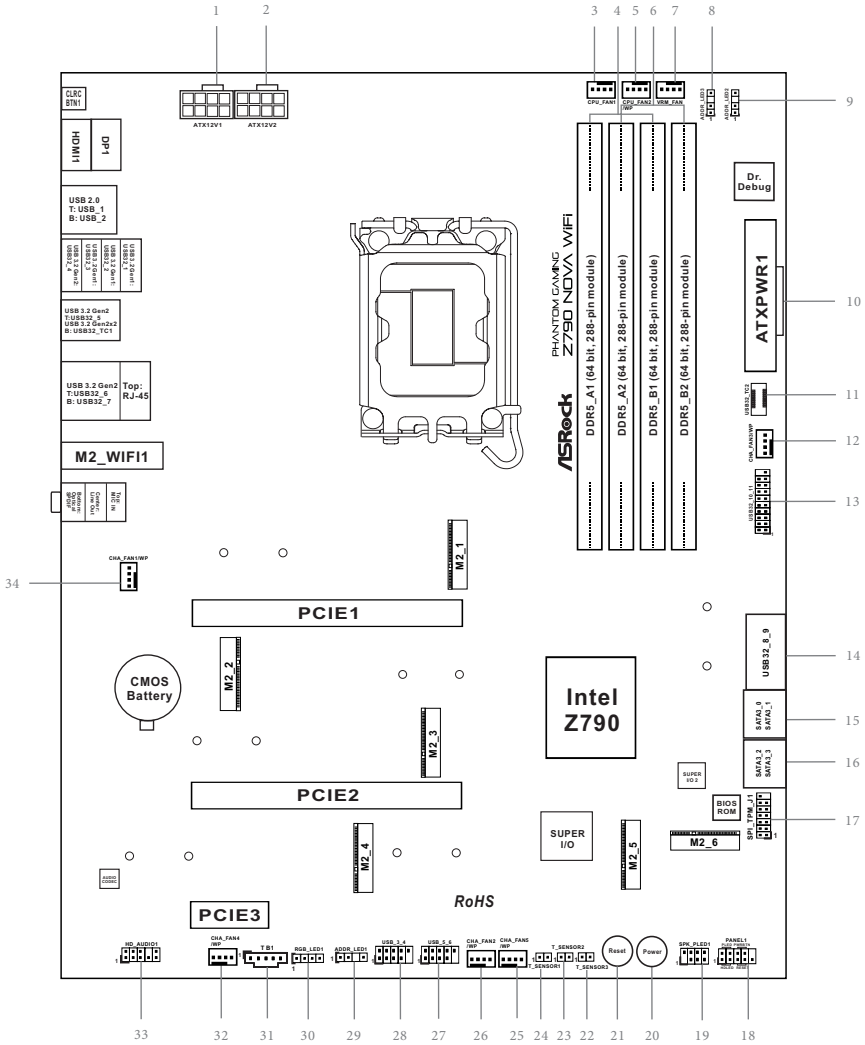
* For detailed product information, please visit our website: <http://www.asrock.com>



Please realize that there is a certain risk involved with overclocking, including adjusting the setting in the BIOS, applying Untied Overclocking Technology, or using third-party overclocking tools. Overclocking may affect your system's stability, or even cause damage to the components and devices of your system. It should be done at your own risk and expense. We are not responsible for possible damage caused by overclocking.

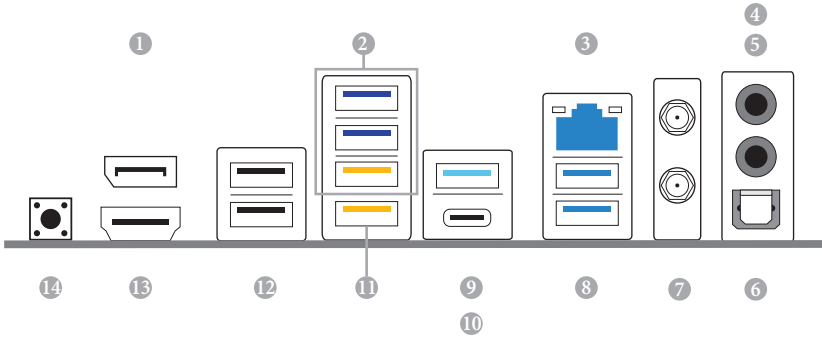
1.3 Motherboard Layout

Top Side View



No.	Description
1	ATX 12V Power Connector (ATX12V1)
2	ATX 12V Power Connector (ATX12V2)
3	CPU Fan Connector (CPU_FAN1)
4	2 x 288-pin DDR5 DIMM Slots (DDR5_A1, DDR5_B1)
5	CPU/Water Pump Fan Connector (CPU_FAN2/WP)
6	2 x 288-pin DDR5 DIMM Slots (DDR5_A2, DDR5_B2)
7	VRM Fan Connector (VRM_FAN)
8	Addressable LED Header (ADDR_LED3)
9	Addressable LED Header (ADDR_LED2)
10	ATX Power Connector (ATXPWR1)
11	Front Panel Type C USB 3.2 Gen2x2 Header (USB32_TC2)
12	Chassis/Water Pump Fan Connector (CHA_FAN3/WP)
13	USB 3.2 Gen1 Header (USB32_10_11)
14	USB 3.2 Gen1 Header (USB32_8_9)
15	SATA3 Connectors (SATA3_0)(Upper), (SATA3_1)(Lower)
16	SATA3 Connectors (SATA3_2)(Upper), (SATA3_3)(Lower)
17	SPI TPM Header (SPI_TPM_J1)
18	System Panel Header (PANEL1)
19	Power LED and Speaker Header (SPK_PLED1)
20	Power Button (PWRBTN1)
21	Reset Button (RSTBTN1)
22	Thermistor Cable Header (T_SENSOR3)
23	Thermistor Cable Header (T_SENSOR2)
24	Thermistor Cable Header (T_SENSOR1)
25	Chassis/Water Pump Fan Connector (CHA_FAN5/WP)
26	Chassis/Water Pump Fan Connector (CHA_FAN2/WP)
27	USB 2.0 Header (USB_5_6)
28	USB 2.0 Header (USB_3_4)
29	Addressable LED Header (ADDR_LED1)
30	RGB LED Header (RGB_LED1)
31	5-pin Thunderbolt AIC Connector (TB1)
32	Chassis/Water Pump Fan Connector (CHA_FAN4/WP)
33	Front Panel Audio Header (HD_AUDIO1)
34	Chassis/Water Pump Fan Connector (CHA_FAN1/WP)

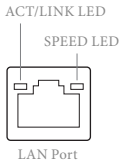
1.4 I/O Panel



No.	Description	No.	Description
1	DisplayPort 1.4	9	USB 3.2 Gen2 Type-A Port
2	USB 3.2 Gen1 Type-A Ports (USB32_123)*	(USB32_5)	
3	2.5G LAN RJ-45 Port**	10	USB 3.2 Gen2x2 Type-C Port
4	Microphone Input Jack***	(USB32_TC1)	
5	Line Out Jack***	11	USB 3.2 Gen2 Type-A Port
6	Optical SPDIF Out Port	(USB32_4)*	
7	Antenna Ports	12	USB 2.0 Ports (USB_12)
8	USB 3.2 Gen2 Type-A Ports (USB32_67)	13	HDMI Port
		14	Clear CMOS Button

* Ultra USB Power is supported on USB32_12 ports. ACPI wake-up function is not supported on USB32_12 ports. USB32_34 are Lightning Gaming Ports.

** There are two LEDs on each LAN port. Please refer to the table below for the LAN port LED indications.

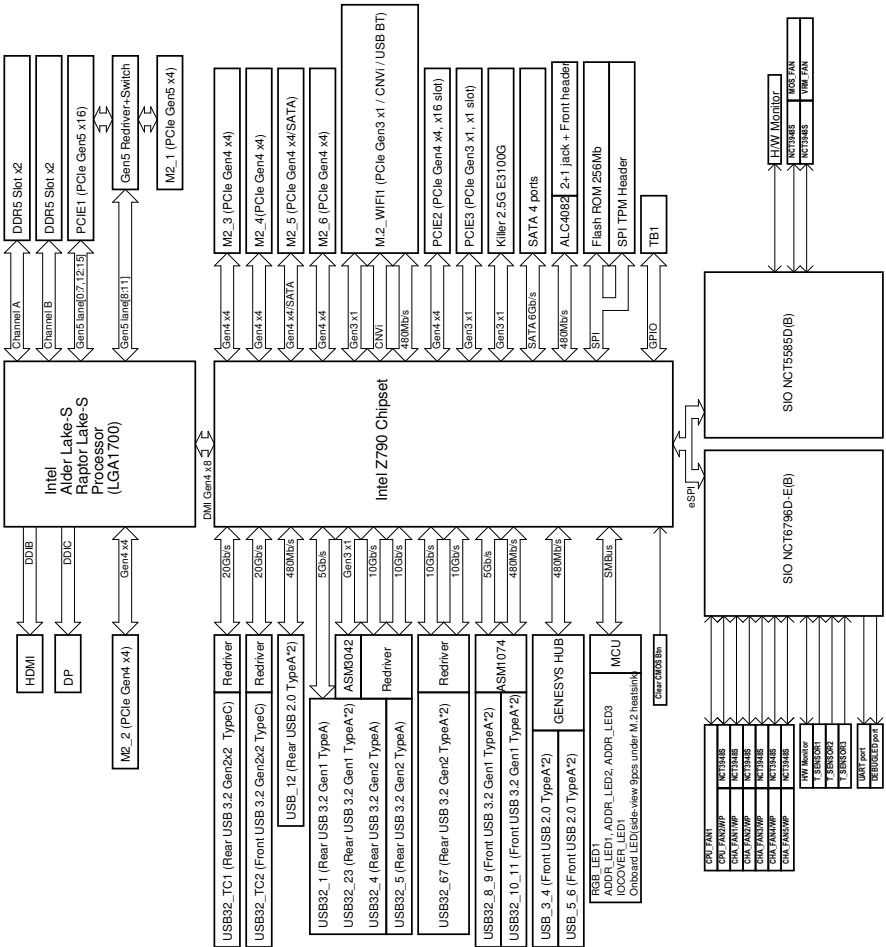


Activity / Link LED		Speed LED	
Status	Description	Status	Description
Off	No Link	Off	10Mbps connection
Blinking	Data Activity	Orange	100Mbps/1Gbps connection
On	Link	Green	2.5Gbps connection

*** *Function of the Audio Ports in 2, 4, 5.1 or 7.1-channel Configuration:*

Channel	Port	Function
2ch	Line Out Jack (Rear Panel)	Front speaker out
4ch	Pink-Mic (Front Panel)	Rear speaker out
5.1ch	Microphone Input Jack (Rear Panel)	Central/Subwoofer speaker out
7.1ch	Lime-Headphone (Front Panel)	Side Speaker out

1.5 Block Diagram



1.6 802.11be Wi-Fi 7 Module and ASRock WiFi 2.4/5/6 GHz Antenna

802.11be Wi-Fi 7 + BT Module

This motherboard comes with an exclusive 802.11 a/b/g/n/ac/ax/be Wi-Fi 7 + BT v5.4 module that offers support for 802.11 a/b/g/n/ac/ax/be Wi-Fi 7 connectivity standards and Bluetooth v5.4. Wi-Fi 7 + BT module is an easy-to-use wireless local area network (WLAN) adapter to support Wi-Fi 7 + BT. Bluetooth v5.4 standard features Smart Ready technology that adds a whole new class of functionality into the mobile devices.

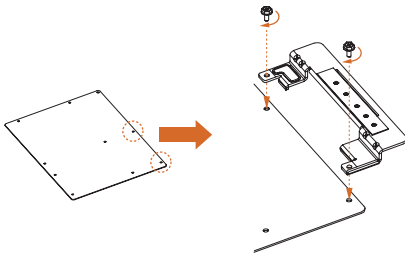
- * The transmission speed may vary according to the environment.
- * Wi-Fi 7 (6GHz band) will be supported by Microsoft® Windows® 11. The availability will depend on the different regulation status of each country and region. It will be activated (for supported countries) through Windows Update and software updates once available.
- * A 6GHz compatible router is required for 7 functionality.

1.7 Graphics Card Holder

Installing the Graphics Card Holder



Before installing the Graphics Card Holder, please make sure that your motherboard is properly installed into a PC case.



Type A

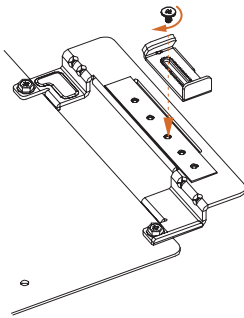


Type B

Step 1

Secure the Graphics Card Holder to the chassis with 2 screws.

*There are two types of screws in the package. Please use the appropriate type based on the standoffs on the motherboard tray of your PC case.



Step 2

After installing your graphics card, place the bracket in the proper position to make sure that it holds your graphics card in place. Then secure the bracket to the Graphics Card Holder with 1 screw.

Chapter 2 Installation

This is an ATX form factor motherboard. Before you install the motherboard, study the configuration of your chassis to ensure that the motherboard fits into it.

Pre-installation Precautions

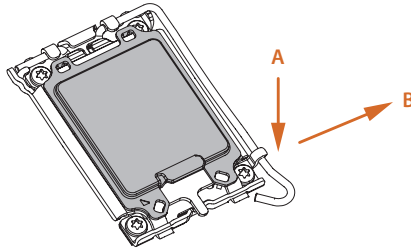
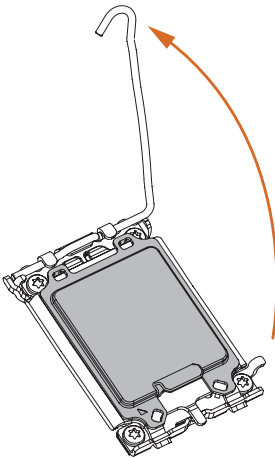
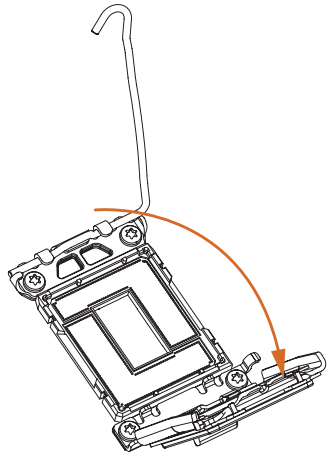
Take note of the following precautions before you install motherboard components or change any motherboard settings.

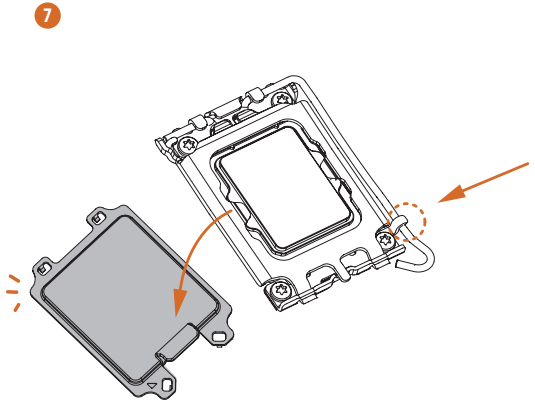
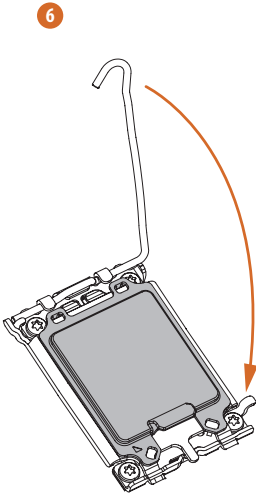
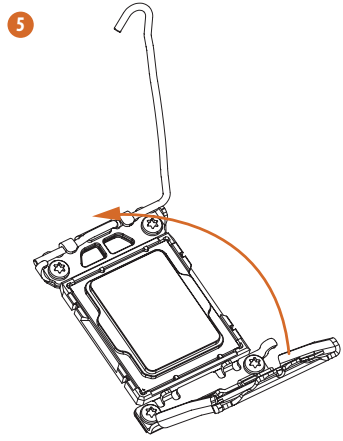
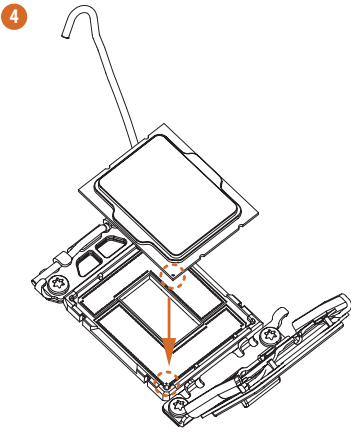
- Make sure to unplug the power cord before installing or removing the motherboard components. Failure to do so may cause physical injuries and damages to motherboard components.
- In order to avoid damage from static electricity to the motherboard's components, NEVER place your motherboard directly on a carpet. Also remember to use a grounded wrist strap or touch a safety grounded object before you handle the components.
- Hold components by the edges and do not touch the ICs.
- Whenever you uninstall any components, place them on a grounded anti-static pad or in the bag that comes with the components.
- When placing screws to secure the motherboard to the chassis, please do not over-tighten the screws! Doing so may damage the motherboard.

2.1 Installing the CPU



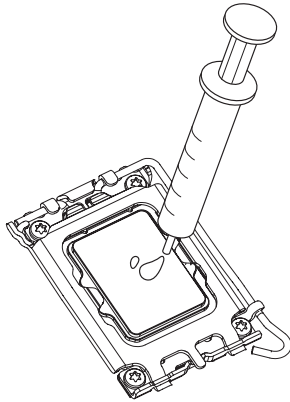
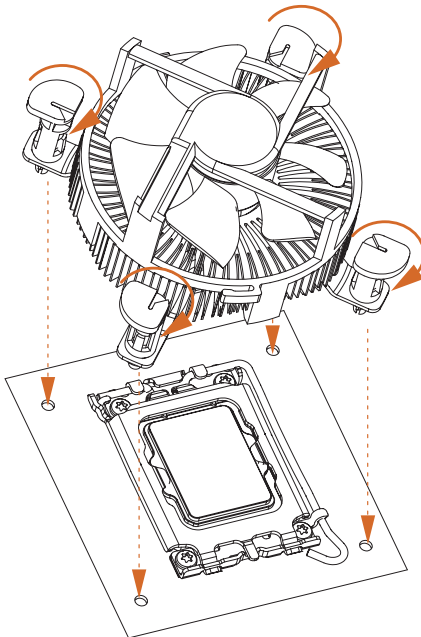
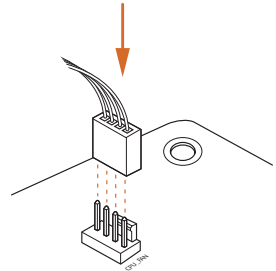
1. Before you insert the 1700-Pin CPU into the socket, please check if the **PnP cap** is on the socket, if the CPU surface is unclean, or if there are any **bent pins** in the socket. Do not force to insert the CPU into the socket if above situation is found. Otherwise, the CPU will be seriously damaged.
2. Unplug all power cables before installing the CPU.

1**2****3**



Please save and replace the cover if the processor is removed. The cover must be placed if you wish to return the motherboard for after service.

2.2 Installing the CPU Fan and Heatsink

**1****2**

2.3 Installing Memory Modules (DIMM)

This motherboard provides four 288-pin DDR5 (Double Data Rate 5) DIMM slots, and supports Dual Channel Memory Technology.



1. For dual channel configuration, you always need to install identical (the same brand, speed, size and chip-type) DDR5 DIMM pairs.
2. It is unable to activate Dual Channel Memory Technology with only one or three memory module installed.
3. It is not allowed to install a DDR, DDR2, DDR3 or DDR4 memory module into a DDR5 slot; otherwise, this motherboard and DIMM may be damaged.
4. The DIMM only fits in one correct orientation. It will cause permanent damage to the motherboard and the DIMM if you force the DIMM into the slot at incorrect orientation.

Recommended Memory Configuration

1 DIMM



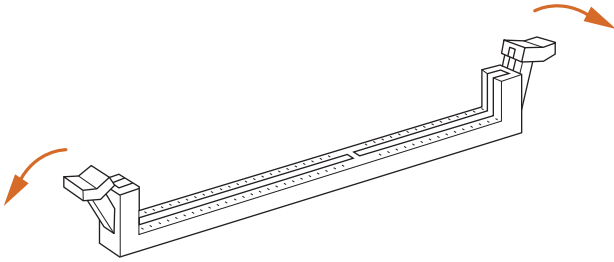
2 DIMMs



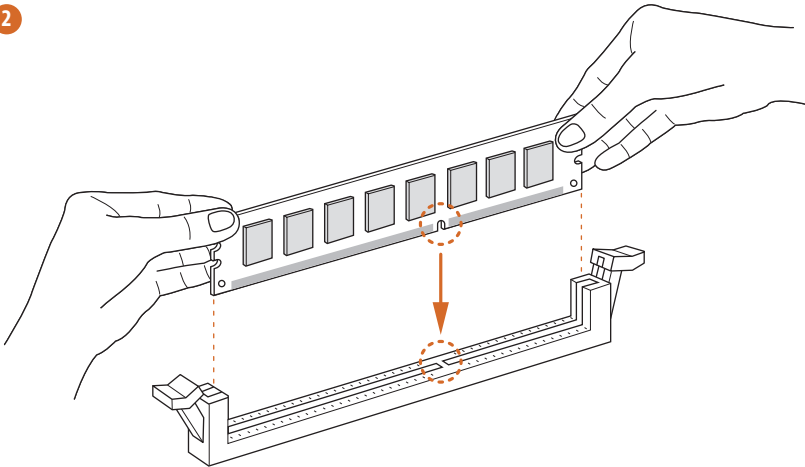
4 DIMMs



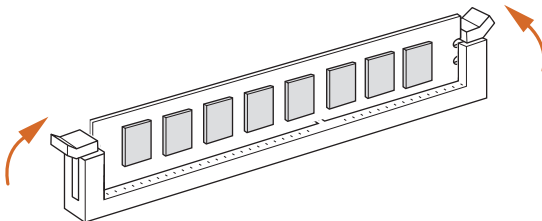
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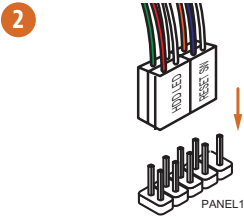
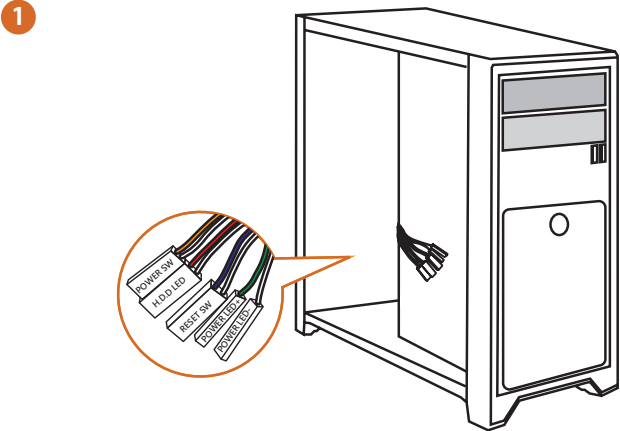
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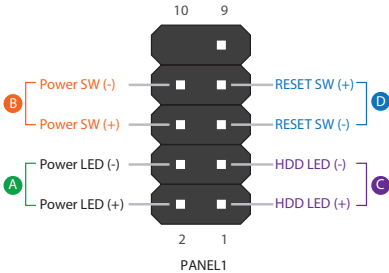
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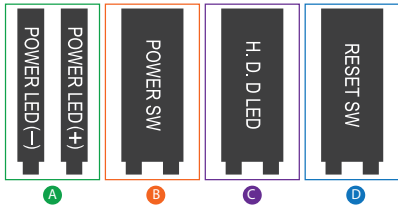
2.4 Connecting the Front Panel Header



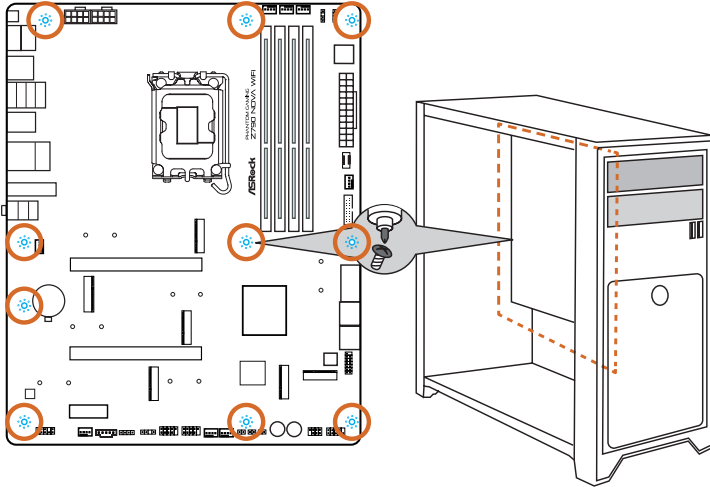
System Panel Header



Front Panel Wires

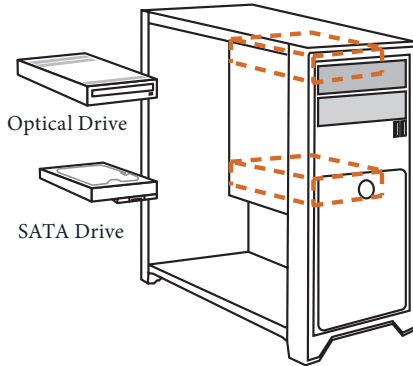


2.5 Installing the Motherboard

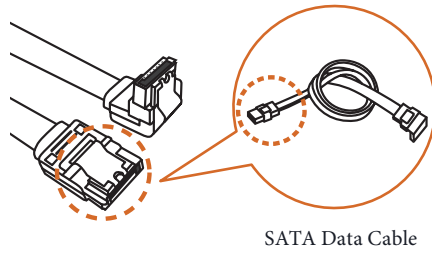


2.6 Installing SATA Drives

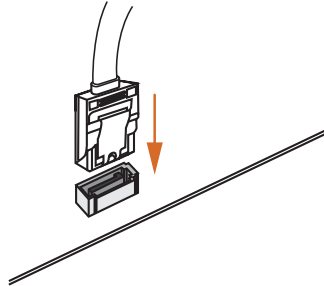
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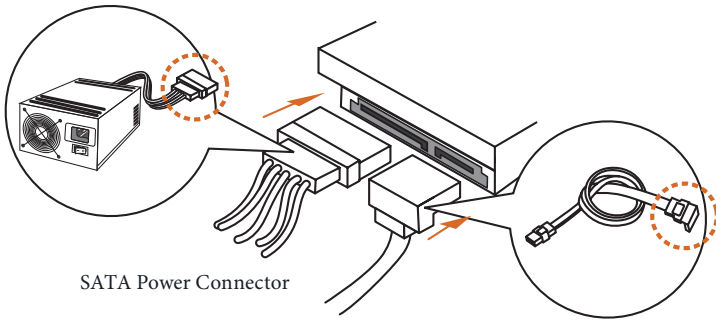
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3



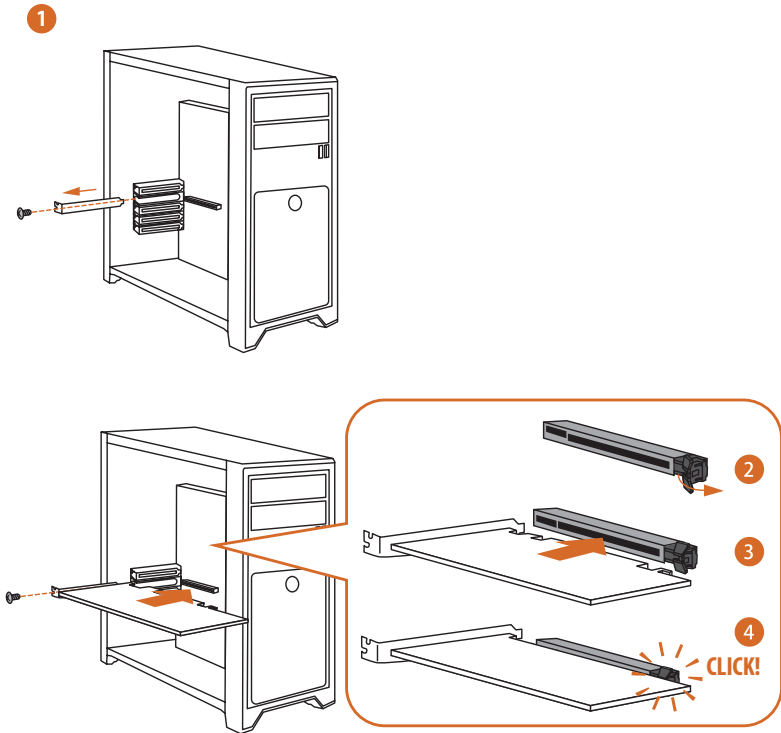
4



SATA Power Connector

SATA Data Connector

2.7 Installing a Graphics Card



Expansion Slots (PCIe Slots)

There are 3 PCI Express slots on the motherboard.



Before installing an expansion card, please make sure that the power supply is switched off or the power cord is unplugged. Please read the documentation of the expansion card and make necessary hardware settings for the card before you start the installation.

PCIe slots:

PCIe1 (PCIe 5.0 x16 slot) is used for PCIe x16 lane width graphics cards.

PCIe2 (PCIe 4.0 x16 slot) is used for PCIe x4 lane width graphics cards.

PCIe3 (PCIe 3.0 x1 slot) is used for PCIe x1 lane width cards.

* If M2_1 is occupied, PCIe1 will downgrade to x8 mode.

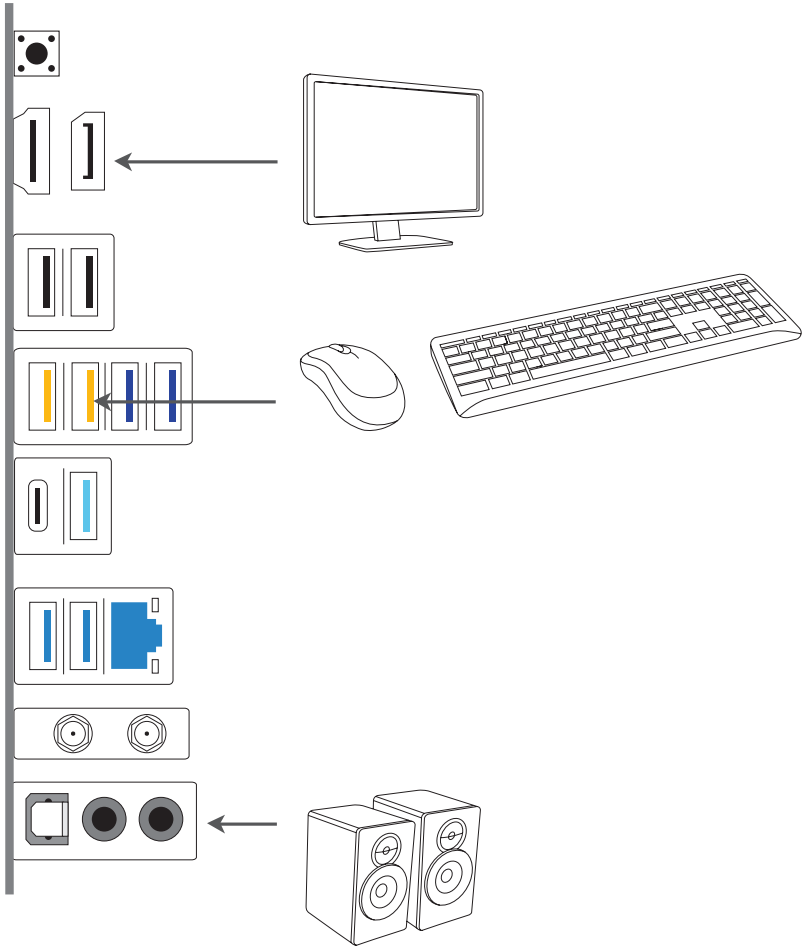
PCIe Slot Configurations

	PCIe1	PCIe2
Single Graphics Card	Gen5x16	N/A
Two Graphics Cards in CrossFire™ Mode	Gen5x16	Gen4x4

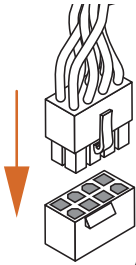
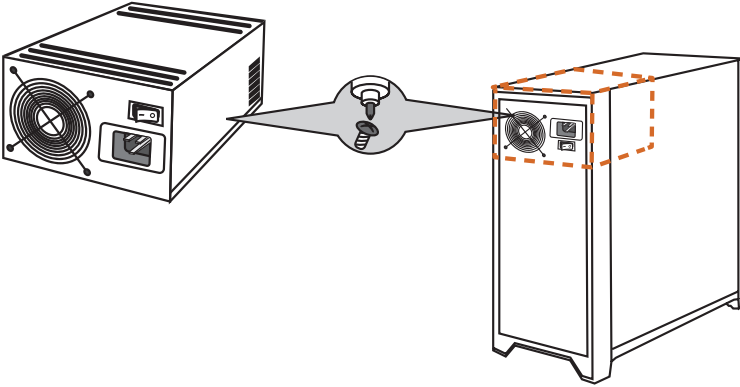


For a better thermal environment, please connect a chassis fan to the motherboard's chassis fan connector (CHA_FAN1-5/WP) when using multiple graphics cards.

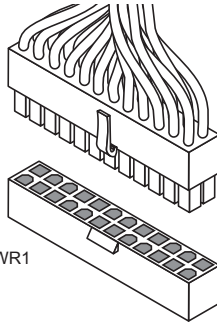
2.8 Connecting Peripheral Devices



2.9 Connecting the Power Connectors

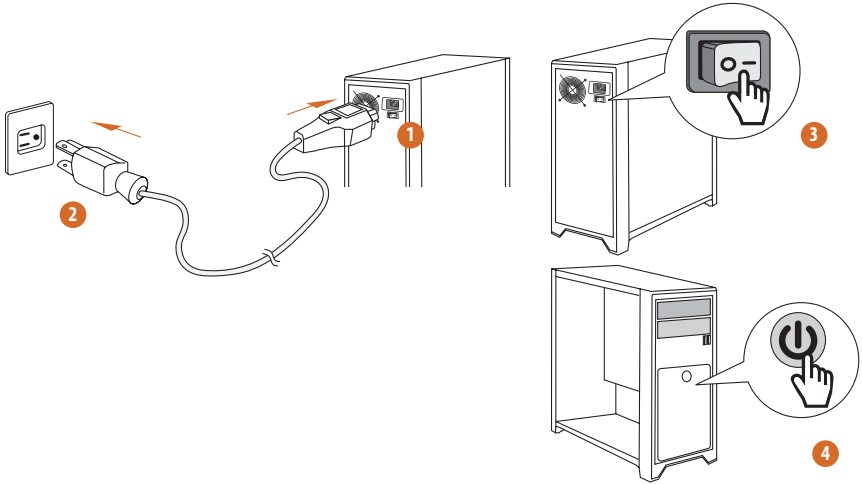


ATX12V1



ATXPWR1

2.10 Power On



2.11 Onboard Headers and Connectors

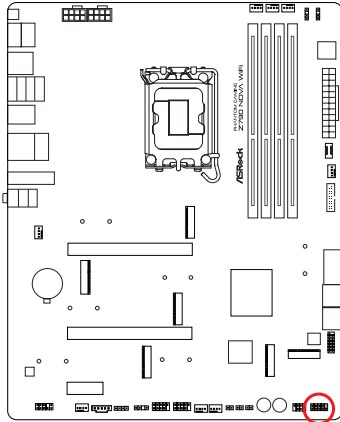


Onboard headers and connectors are NOT jumpers. Do NOT place jumper caps over these headers and connectors. Placing jumper caps over the headers and connectors will cause permanent damage to the motherboard.

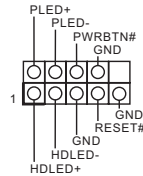
System Panel Header

(9-pin PANEL1) (see p.7, No. 18)

Connect the power button, reset button and system status indicator on the chassis to this header according to the pin assignments below. Note the positive and negative pins before connecting the cables.



PANEL1



PWRBTN (Power Button):

Connect to the power button on the chassis front panel. You may configure the way to turn off your system using the power button.

RESET (Reset Button):

Connect to the reset button on the chassis front panel. Press the reset button to restart the computer if the computer freezes and fails to perform a normal restart.

PLED (System Power LED):

Connect to the power status indicator on the chassis front panel. The LED is on when the system is operating. The LED keeps blinking when the system is in S1/S3 sleep state. The LED is off when the system is in S4 sleep state or powered off (S5).

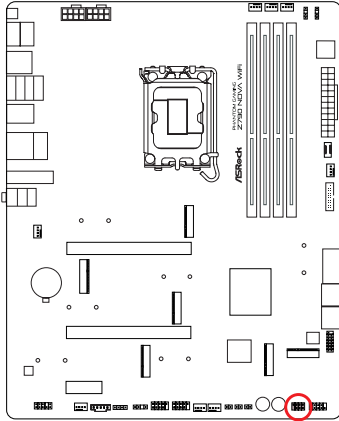
HDLED (Hard Drive Activity LED):

Connect to the hard drive activity LED on the chassis front panel. The LED is on when the hard drive is reading or writing data.

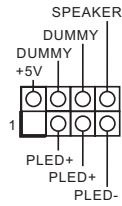
The front panel design may differ by chassis. A front panel module mainly consists of power button, reset button, power LED, hard drive activity LED, speaker and etc. When connecting your chassis front panel module to this header, make sure the wire assignments and the pin assignments are matched correctly.

Power LED and Speaker Header
(7-pin SPK_PLED1) (see p.7, No. 19)

Please connect the chassis power LED and the chassis speaker to this header.



SPK_PLED1



Serial ATA3 Connectors

Right Angle:

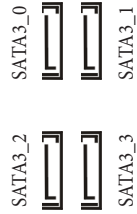
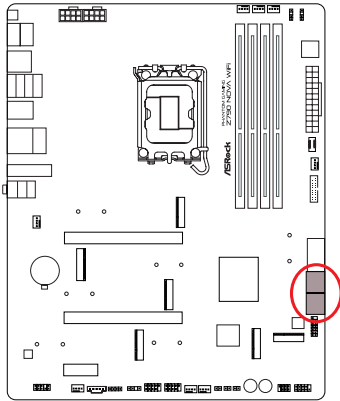
(SATA3_0) (see p.7, No. 15)(Upper)

(SATA3_1) (see p.7, No. 15)(Lower)

(SATA3_2) (see p.7, No. 16)(Upper)

(SATA3_3) (see p.7, No. 16)(Lower)

These four SATA3 connectors support SATA data cables for internal storage devices with up to 6.0 Gb/s data transfer rate.

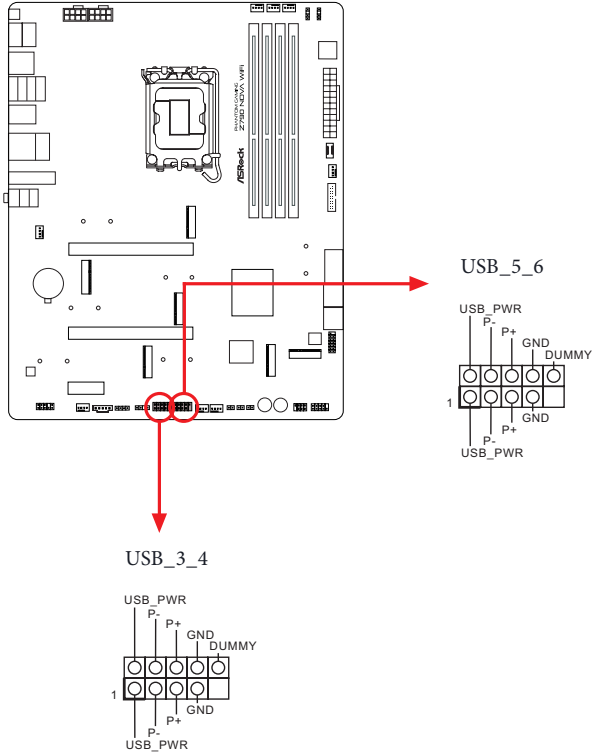


USB 2.0 Headers

(9-pin USB_3_4) (see p.7, No. 28)

(9-pin USB_5_6) (see p.7, No. 27)

There are two headers on this motherboard. Each USB 2.0 header can support two ports.



USB 3.2 Gen1 Headers

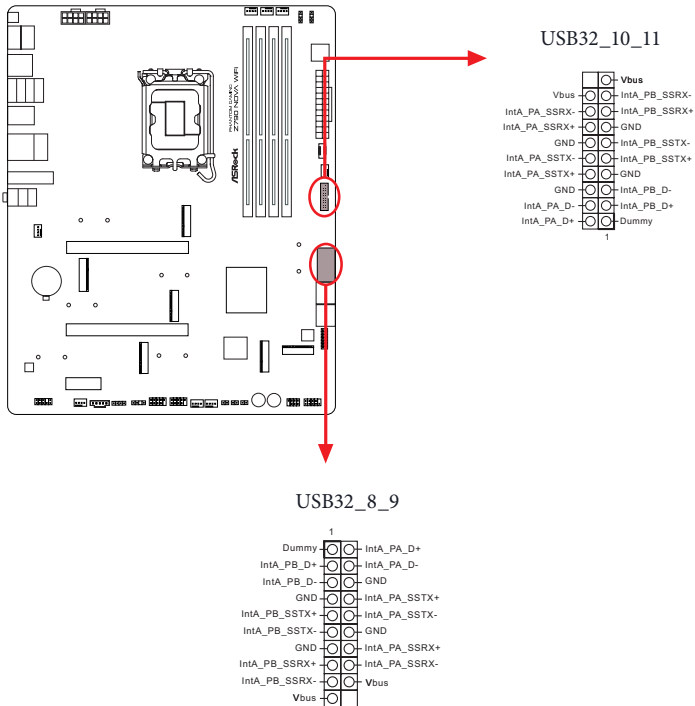
Right Angle:

(19-pin USB32_8_9) (see p.7, No. 14)

Vertical:

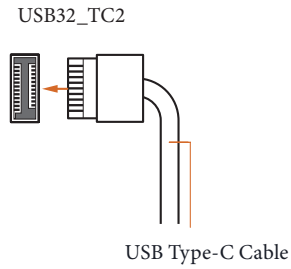
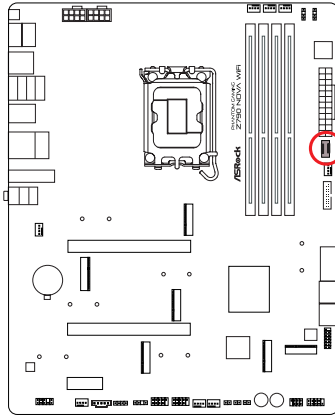
(19-pin USB32_10_11) (see p.7, No. 13)

There are two headers on this motherboard. Each USB 3.2 Gen1 header can support two ports.



Front Panel Type C USB 3.2 Gen2x2 Header
(20-pin USB32_TC2) (see p.7, No. 11)

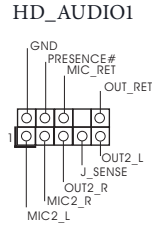
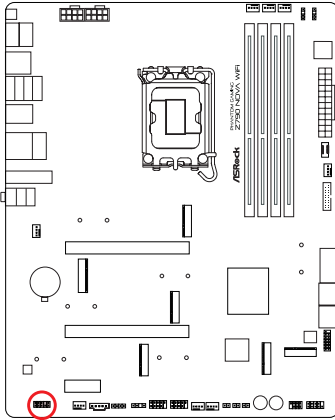
There is one Front Panel Type C USB 3.2 Gen2x2 Header on this motherboard.
This header is used for connecting a USB 3.2 Gen2x2 module for additional USB 3.2 Gen2x2 ports.



Front Panel Audio Header

(9-pin HD_AUDIO1) (see p.7, No. 33)

This header is for connecting audio devices to the front audio panel.



High Definition Audio supports Jack Sensing, but the panel wire on the chassis must support HDA to function correctly. Please follow the instructions in our manual and chassis manual to install your system.

Chassis/Water Pump Fan Connectors

(4-pin CHA_FAN1/WP) (see p.7, No. 34)

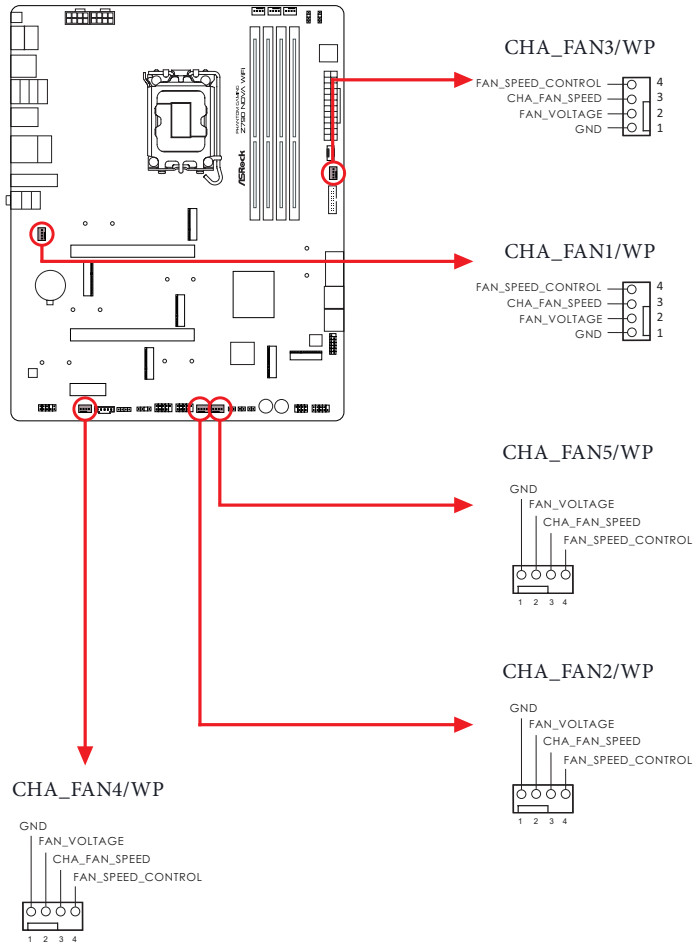
(4-pin CHA_FAN2/WP) (see p.7, No. 26)

(4-pin CHA_FAN3/WP) (see p.7, No. 12)

(4-pin CHA_FAN4/WP) (see p.7, No. 32)

(4-pin CHA_FAN5/WP) (see p.7, No. 25)

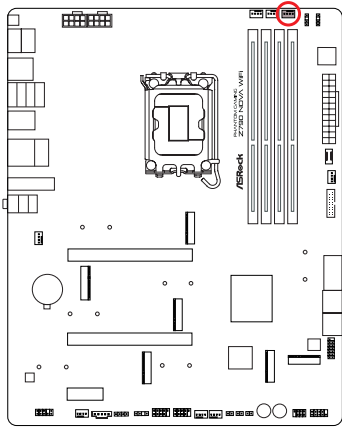
This motherboard provides five 4-Pin water cooling chassis fan connectors. If you plan to connect a 3-Pin chassis water cooler fan, please connect it to Pin 1-3.



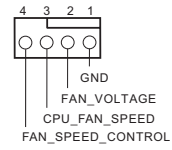
VRM Fan Connector

(4-pin VRM_FAN) (see p.7, No. 7)

This motherboard provides a 4-Pin VRM fan connector. If you plan to connect a 3-Pin VRM fan, please connect it to Pin 1-3.



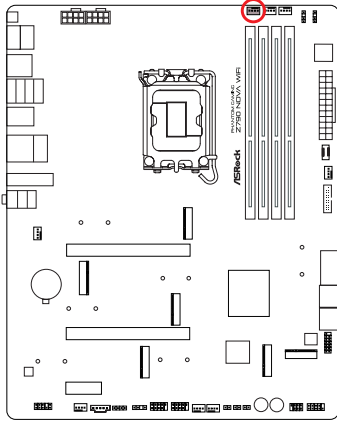
VRM_FAN



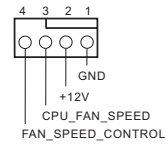
CPU Fan Connector

(4-pin CPU_FAN1) (see p.7, No. 3)

This motherboard provides a 4-Pin CPU fan (Quiet Fan) connector. If you plan to connect a 3-Pin CPU fan, please connect it to Pin 1-3.



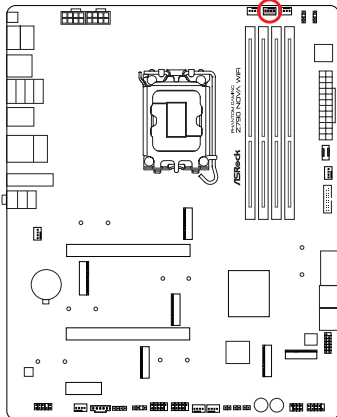
CPU_FAN1



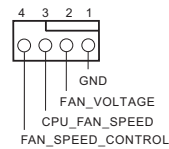
CPU/Water Pump Fan Connector

(4-pin CPU_FAN2/WP) (see p.7, No. 5)

This motherboard provides a 4-Pin water cooling CPU fan connector. If you plan to connect a 3-Pin CPU water cooler fan, please connect it to Pin 1-3.



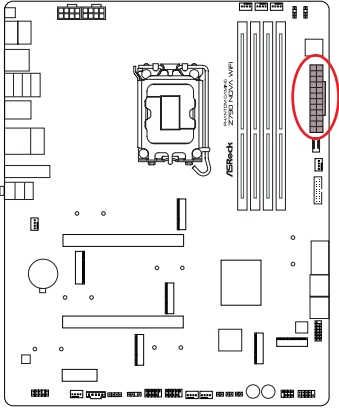
CPU_FAN2/WP



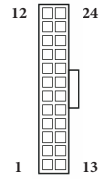
ATX Power Connector

(24-pin ATXPWR1) (see p.7, No. 10)

This motherboard provides a 24-pin ATX power connector. To use a 20-pin ATX power supply, please plug it along Pin 1 and Pin 13.



ATXPWR1



ATX 12V Power Connectors

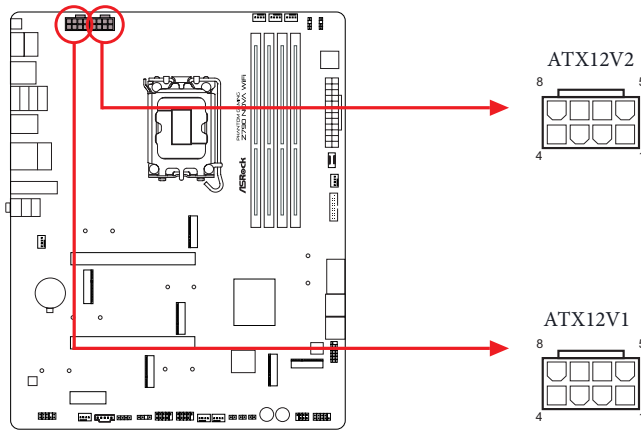
(8-pin ATX12V1) (see p.7, No. 1)

(8-pin ATX12V2) (see p.7, No. 2)

This motherboard provides two 8-pin ATX 12V power connectors. To use a 4-pin ATX power supply, please plug it along Pin 1 and Pin 5.

*Connecting an ATX 12V 8-pin cable to ATX12V2 is optional.

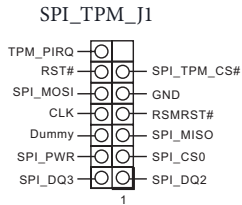
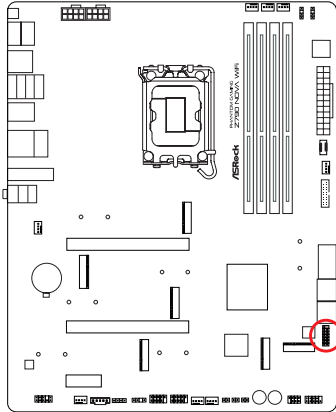
***Warning: Please make sure that the power cable connected is for the CPU and not the graphics card. Do not plug the PCIe power cable to this connector.**



SPI TPM Header

(13-pin SPI_TPM_J1) (see p.7, No. 17)

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

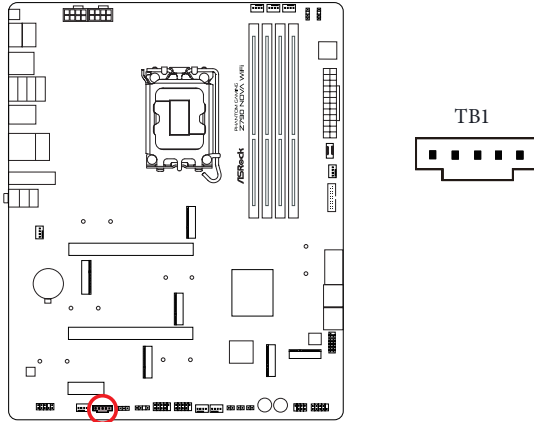


Thunderbolt AIC Connector

(5-pin TB1) (see p.7, No. 31)

Please connect a Thunderbolt™ add-in card (AIC) to the Thunderbolt AIC connector via the GPIO cable.

*Please install the Thunderbolt™ AIC card to PCIE2 (default slot).



*Thunderbolt Setting on Thunderbolt™ AIC card:

		
Force_PWR1	PD_RESET_1	RTD3
2-3 Floating (Default)	None*	3-4 No RTD3*

*Be sure to move the jumper cap from PD_RESET_1 (pins 2-3) to RTD3 (pins 3-4).

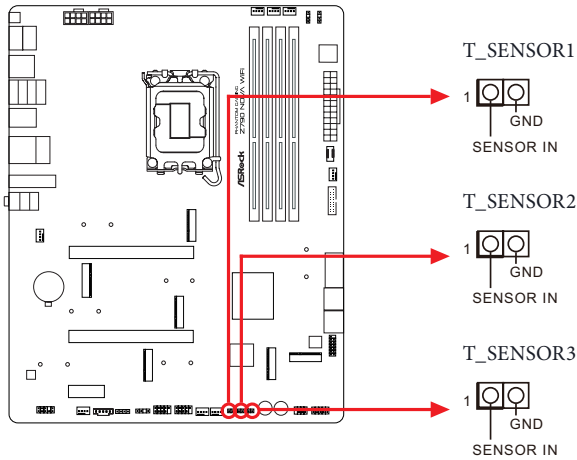
Thermistor Cable Headers

(2-pin T_SENSOR1) (see p.7, No. 24)

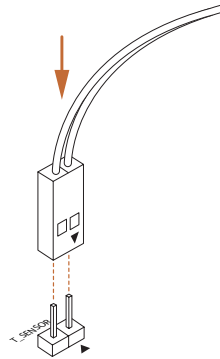
(2-pin T_SENSOR2) (see p.7, No. 23)

(2-pin T_SENSOR3) (see p.7, No. 22)

The Thermistor Cable Headers are used to connect thermistor cables to monitor the temperature of the critical components. Plug the thermistor cables that come with the package to these headers, and then attach the sensor ends to the components to detect their temperature.



Connect your Thermistor Cables to the **Thermistor Cable Headers (T_SENSOR1 / T_SENSOR2 / T_SENSOR3)** on the motherboard.



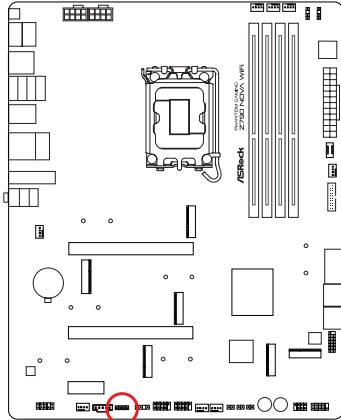
RGB LED Header

(4-pin RGB_LED1) (see p.7, No. 30)

This RGB header is used to connect RGB LED extension cable which allow users to choose from various LED lighting effects.

*The RGB LED extension cable is purchased separately.

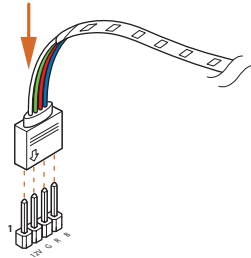
Caution: Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.



RGB_LED1



Connect your RGB LED strip to the **RGB LED Header (RGB_LED1)** on the motherboard.



1. Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.
2. Before installing or removing your RGB LED cable, please power off your system and unplug the power cord from the power supply. Failure to do so may cause damages to motherboard components.



1. Please note that the RGB LED strips do not come with the package.
2. The RGB LED header supports standard 5050 RGB LED strip (12V/G/R/B), with a maximum power rating of 3A (12V) and length within 2 meters.

Addressable LED Headers

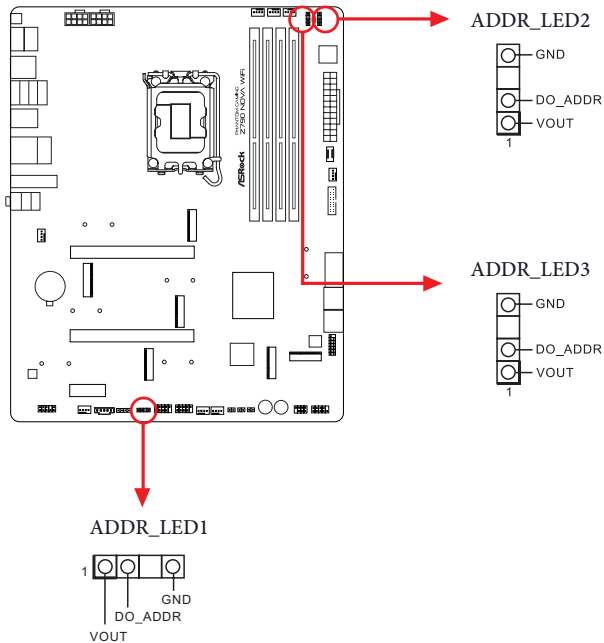
(3-pin ADDR_LED1) (see p.7, No. 29)

(3-pin ADDR_LED2) (see p.7, No. 9)

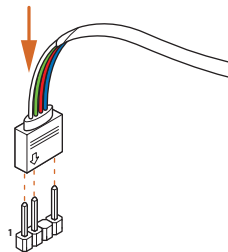
(3-pin ADDR_LED3) (see p.7, No. 8)

These headers are used to connect Addressable LED extension cables which allow users to choose from various LED lighting effects.

Caution: Never install the Addressable LED cable in the wrong orientation; otherwise, the cable may be damaged.



Connect your Addressable RGB LED strips to the **Addressable LED Headers (ADDR_LED1 / ADDR_LED2 / ADDR_LED3)** on the motherboard.



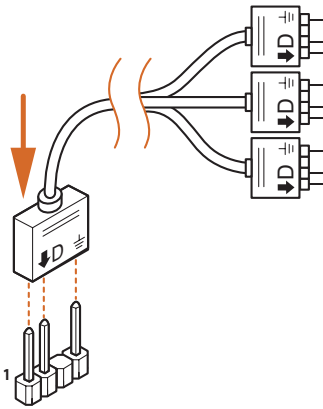


1. Never install the Addressable LED cable in the wrong orientation; otherwise, the cable may be damaged.
2. Before installing or removing your Addressable LED cable, please power off your system and unplug the power cord from the power supply. Failure to do so may cause damages to motherboard components.



1. Please note that the Addressable LED strips do not come with the package.
2. The Addressable LED header supports WS2812B addressable RGB LED strip (5V/Data/GND), with a maximum power rating of 3A (5V) and length within 2 meters.

The ARGB Splitter Cable that comes with the package allows you to extend and connect various addressable RGB LED strips or devices through a single 3-pin Addressable LED Header on the motherboard.



*ADDR_LED1 Header on this motherboard supports RGB 2.0 function. Please download the ASRock Polychrome SYNC Utility from the ASRock Live Update & APP Shop. You can also download the utility from the ASRock's website: "<https://www.asrock.com>". Go to the product page of your motherboard, select "Support" > "Download" to download the ASRock Polychrome RGB.

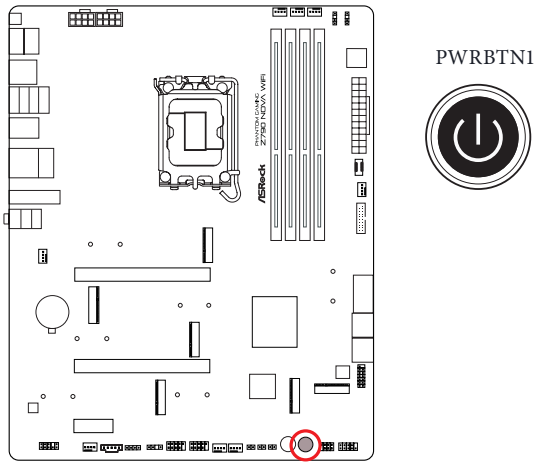
2.12 Smart Buttons

The motherboard has three smart buttons: Power Button, Reset Button and Clear CMOS Buttons, allowing users to quickly turn on/off the system, reset the system or clear the CMOS values.

Power Button

(PWRBTN1) (see p.7, No. 20)

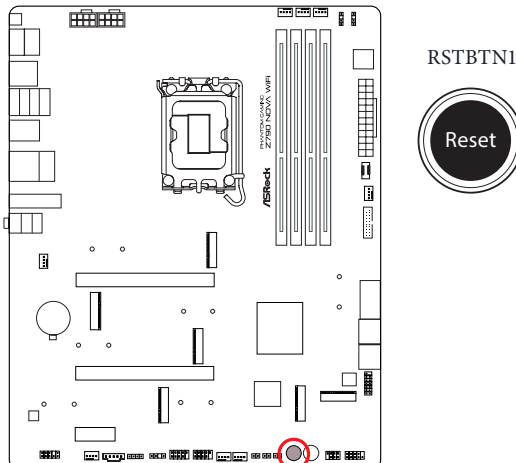
Power Button allows users to quickly turn on/off the system.



Reset Button

(RSTBTN1) (see p.7, No. 21)

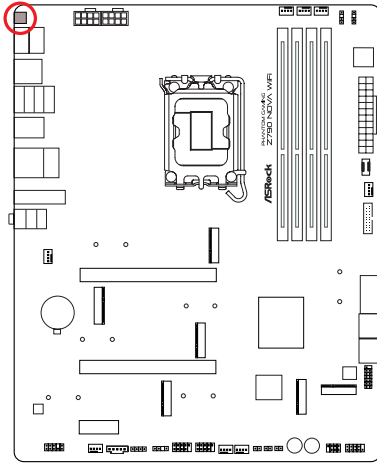
Reset Button allows users to quickly reset the system.



Clear CMOS Button

(CLRBTN1) (see p.9, No. 14)

Clear CMOS Button allows users to quickly clear the CMOS values.



CLRBTN1



This function is workable only when you power off your computer and unplug the power supply.

2.13 Dr. Debug

Dr. Debug is used to provide code information, which makes troubleshooting even easier. Please see the diagrams below for reading the Dr. Debug codes.

Code	Description
0x10	PEI_CORE_STARTED
0x11	PEI_CAR_CPU_INIT
0x15	PEI_CAR_NB_INIT
0x19	PEI_CAR_SB_INIT
0x31	PEI_MEMORY_INSTALLED
0x32	PEI_CPU_INIT
0x33	PEI_CPU_CACHE_INIT
0x34	PEI_CPU_AP_INIT
0x35	PEI_CPU_BSP_SELECT
0x36	PEI_CPU_SMM_INIT
0x37	PEI_MEM_NB_INIT
0x3B	PEI_MEM_SB_INIT
0x4F	PEI_DXE_IPL_STARTED
0x60	DXE_CORE_STARTED
0x61	DXE_NVRAM_INIT
0x62	DXE_SBRUN_INIT

0x63	DXE_CPU_INIT
0x68	DXE_NB_HB_INIT
0x69	DXE_NB_INIT
0x6A	DXE_NB_SMM_INIT
0x70	DXE_SB_INIT
0x71	DXE_SB_SMM_INIT
0x72	DXE_SB_DEVICES_INIT
0x78	DXE_ACPI_INIT
0x79	DXE_CSM_INIT
0x90	DXE_BDS_STARTED
0x91	DXE_BDS_CONNECT_DRIVERS
0x92	DXE_PCI_BUS_BEGIN
0x93	DXE_PCI_BUS_HPC_INIT
0x94	DXE_PCI_BUS_ENUM
0x95	DXE_PCI_BUS_REQUEST_RESOURCES
0x96	DXE_PCI_BUS_ASSIGN_RESOURCES
0x97	DXE_CON_OUT_CONNECT
0x98	DXE_CON_IN_CONNECT

0x99	DXE_SIO_INIT
0x9A	DXE_USB_BEGIN
0x9B	DXE_USB_RESET
0x9C	DXE_USB_DETECT
0x9D	DXE_USB_ENABLE
0xA0	DXE_IDE_BEGIN
0xA1	DXE_IDE_RESET
0xA2	DXE_IDE_DETECT
0xA3	DXE_IDE_ENABLE
0xA4	DXE_SCSI_BEGIN
0xA5	DXE_SCSI_RESET
0xA6	DXE_SCSI_DETECT
0xA7	DXE_SCSI_ENABLE
0xA8	DXE_SETUP_VERIFYING_PASSWORD
0xA9	DXE_SETUP_START
0xAB	DXE_SETUP_INPUT_WAIT
0xAD	DXE_READY_TO_BOOT
0xAE	DXE_LEGACY_BOOT

0xAF	DXE_EXIT_BOOT_SERVICES
0xB0	RT_SET_VIRTUAL_ADDRESS_MAP_BEGIN
0xB1	RT_SET_VIRTUAL_ADDRESS_MAP_END
0xB2	DXE_LEGACY_OPROM_INIT
0xB3	DXE_RESET_SYSTEM
0xB4	DXE_USB_HOTPLUG
0xB5	DXE_PCI_BUS_HOTPLUG
0xB6	DXE_NVRAM_CLEANUP
0xB7	DXE_CONFIGURATION_RESET
0xF0	PEI_RECOVERY_AUTO
0xF1	PEI_RECOVERY_USER
0xF2	PEI_RECOVERY_STARTED
0xF3	PEI_RECOVERY_CAPSULE_FOUND
0xF4	PEI_RECOVERY_CAPSULE_LOADED
0xE0	PEI_S3_STARTED
0xE1	PEI_S3_BOOT_SCRIPT
0xE2	PEI_S3_VIDEO_REPOST

0xE3	PEI_S3_OS_WAKE
0x50	PEI_MEMORY_INVALID_TYPE
0x53	PEI_MEMORY_NOT_DETECTED
0x55	PEI_MEMORY_NOT_INSTALLED
0x57	PEI_CPU_MISMATCH
0x58	PEI_CPU_SELF_TEST_FAILED
0x59	PEI_CPU_NO_MICROCODE
0x5A	PEI_CPU_ERROR
0x5B	PEI_RESET_NOT_AVAILABLE
0xD0	DXE_CPU_ERROR
0xD1	DXE_NB_ERROR
0xD2	DXE_SB_ERROR
0xD3	DXE_ARCH_PROTOCOL_NOT_AVAILABLE
0xD4	DXE_PCI_BUS_OUT_OF_RESOURCES
0xD5	DXE_LEGACY_OPROM_NO_SPACE
0xD6	DXE_NO_CON_OUT
0xD7	DXE_NO_CON_IN

0xD8	DXE_INVALID_PASSWORD
0xD9	DXE_BOOT_OPTION_LOAD_ERROR
0xDA	DXE_BOOT_OPTION_FAILED
0xDB	DXE_FLASH_UPDATE_FAILED
0xDC	DXE_RESET_NOT_AVAILABLE
0xE8	PEI_MEMORY_S3_RESUME_FAILED
0xE9	PEI_S3_RESUME_PPI_NOT_FOUND
0xEA	PEI_S3_BOOT_SCRIPT_ERROR
0xEB	PEI_S3_OS_WAKE_ERROR

2.14 M.2 SSD Card Installation Guide (M2_1)

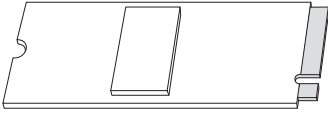
The M.2 is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Blazing M.2 Socket (M2_1, Key M) supports type 2260/2280 PCIe Gen5x4 (128 Gb/s) mode.

* If M2_1 is occupied, PCIe1 will downgrade to x8 mode.

Installing the M.2 SSD Card

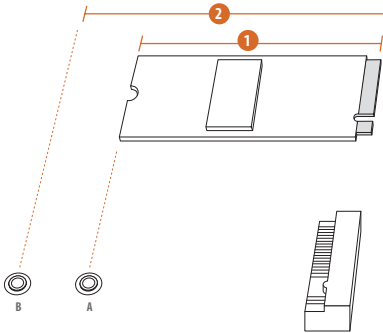
Step 1

Prepare a M.2 SSD card.



Step 2

Depending on the PCB type and length of your M.2 SSD card, find the corresponding nut location to be used.

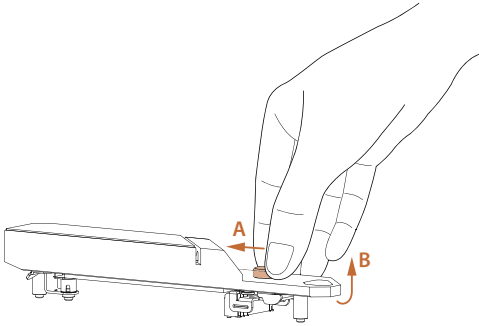


No.	1	2
Nut Location	A	B
PCB Length	6cm	8cm
Module Type	Type2260	Type 2280

Step 3

Push and hold the button on the M.2 heatsink (A). Then lift the heatsink up off the motherboard (B).

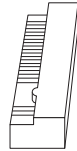
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD card.



Step 4

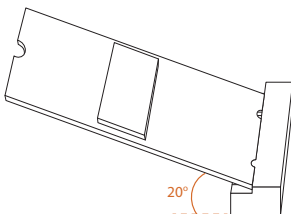
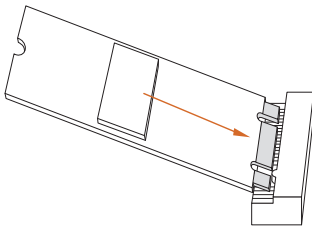
Peel off the yellow protective film on the nut A. Prepare the M.2 standoff and screw that come with the package, and hand tighten the standoff into the nut A.

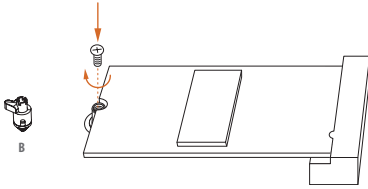
Skip Step 4 if your M.2 SSD card is Type 2280.



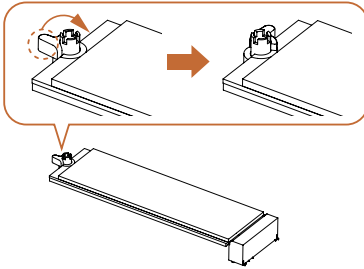
Step 5

Align and gently insert the M.2 SSD card into the M.2 slot. Please be aware that the M.2 SSD card only fits in one orientation.

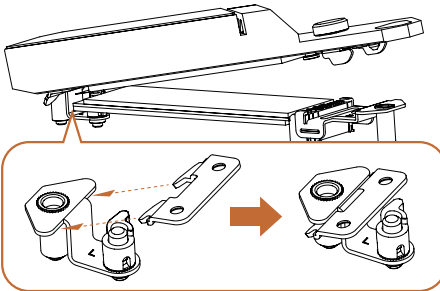


**Step 6**

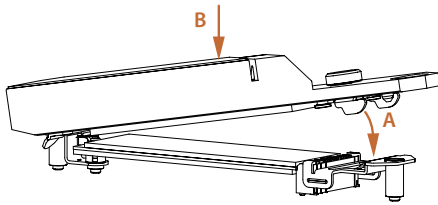
Tighten the screw with a screwdriver to secure the M.2 SSD card into place. Please do not overtighten the screw as this might damage the M.2 SSD card. Skip Step 6 if your M.2 SSD card is Type 2280.

**Step 7**

Ensure that the notch at the end of the M.2 SSD card aligns with the nut. Then secure the M.2 SSD card by turning the nut lock clockwise to its locked position. Skip Step 7 if your M.2 SSD card is Type 2260.

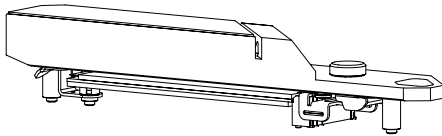
**Step 8**

Hook the tab of the M.2 heatsink back onto the standoff.



Step 9

Move the M.2 heatsink in the direction shown (A) and press it down (B).



Step 10

Complete.

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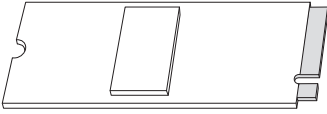
2.15 M.2 SSD Card Installation Guide (M2_2 and M2_3)

The M.2 is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Hyper M.2 Sockets (M2_2 and M2_3, Key M) support type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode.

Installing the M.2 SSD Card

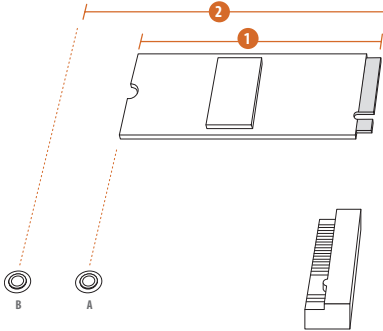
Step 1

Prepare a M.2 SSD card.

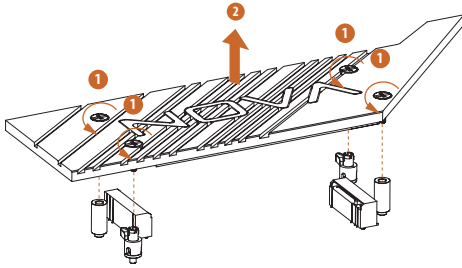


Step 2

Depending on the PCB type and length of your M.2 SSD card, find the corresponding nut location to be used.



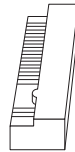
No.	1	2
Nut Location	A	B
PCB Length	6cm	8cm
Module Type	Type2260	Type 2280



Step 3

Before installing a M.2 SSD card, please loosen the screws to remove the M.2 heatsink.

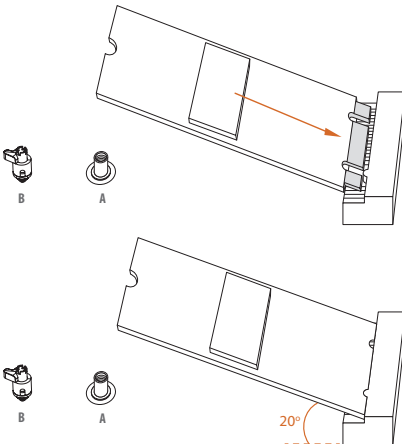
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD card.



Step 4

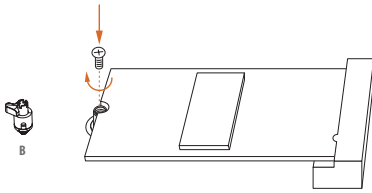
Peel off the yellow protective film on the nut A. Prepare the M.2 standoff and screw that come with the package, and hand tighten the standoff into the nut A.

Skip Step 4 if your M.2 SSD card is Type 2280.

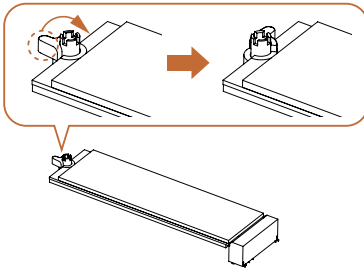


Step 5

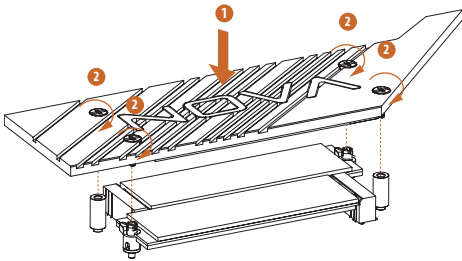
Align and gently insert the M.2 SSD card into the M.2 slot. Please be aware that the M.2 SSD card only fits in one orientation.

Step 6

Tighten the screw with a screwdriver to secure the M.2 SSD card into place. Please do not overtighten the screw as this might damage the M.2 SSD card. Skip Step 6 if your M.2 SSD card is Type 2280.

Step 7

Ensure that the notch at the end of the M.2 SSD card aligns with the nut. Then secure the M.2 SSD card by turning the nut lock clockwise to its locked position. Skip Step 7 if your M.2 SSD card is Type 2260.

Step 8

Tighten the screw with a screwdriver to secure the M.2 heatsink into place. Please do not overtighten the screw as this might damage the M.2 heatsink.

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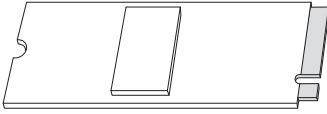
2.16 M.2 SSD Card Installation Guide (M2_4)

The M.2 is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Hyper M.2 Socket (M2_4, Key M) supports type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode.

Installing the M.2 SSD Card

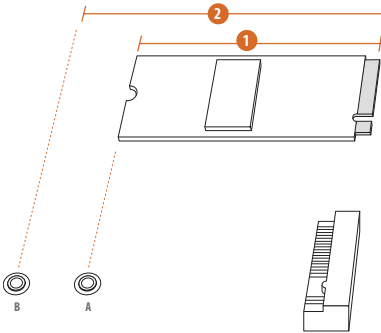
Step 1

Prepare a M.2 SSD card.



Step 2

Depending on the PCB type and length of your M.2 SSD card, find the corresponding nut location to be used.

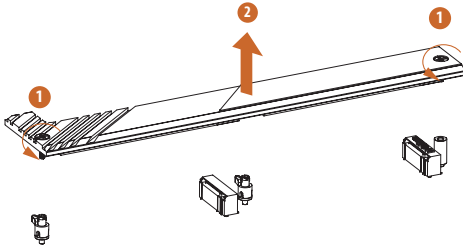


No.	1	2
Nut Location	A	B
PCB Length	6cm	8cm
Module Type	Type2260	Type 2280

Step 3

Before installing a M.2 SSD card, please loosen the screws to remove the M.2 heatsink.

*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD card.

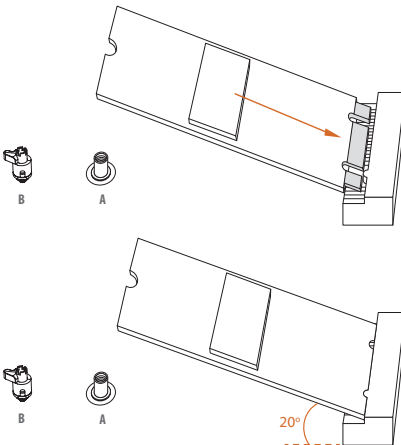
**Step 4**

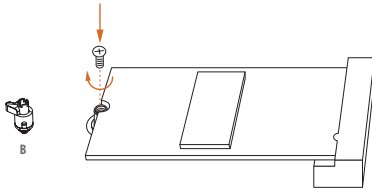
Peel off the yellow protective film on the nut A. Prepare the M.2 standoff and screw that come with the package, and hand tighten the standoff into the nut A.

Skip Step 4 if your M.2 SSD card is Type 2280.

**Step 5**

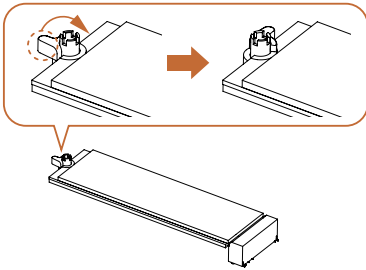
Align and gently insert the M.2 SSD card into the M.2 slot. Please be aware that the M.2 SSD card only fits in one orientation.





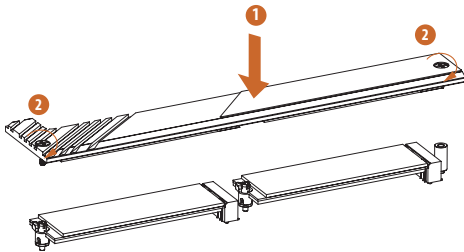
Step 6

Tighten the screw with a screwdriver to secure the M.2 SSD card into place. Please do not overtighten the screw as this might damage the M.2 SSD card. *Skip Step 6 if your M.2 SSD card is Type 2280.*



Step 7

Ensure that the notch at the end of the M.2 SSD card aligns with the nut. Then secure the M.2 SSD card by turning the nut lock clockwise to its locked position. *Skip Step 7 if your M.2 SSD card is Type 2260.*



Step 8

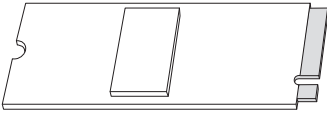
Tighten the screw with a screwdriver to secure the M.2 heatsink into place. Please do not overtighten the screw as this might damage the M.2 heatsink.

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2.17 M.2 SSD Card Installation Guide (M2_5)

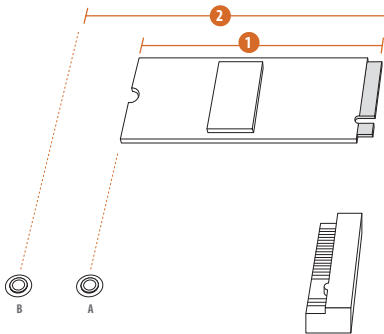
The M.2 is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Hyper M.2 Socket (M2_5, Key M) supports type 2260/2280 SATA3 6.0 Gb/s & PCIe Gen4x4 (64 Gb/s) modes.

Installing the M.2 SSD Card



Step 1

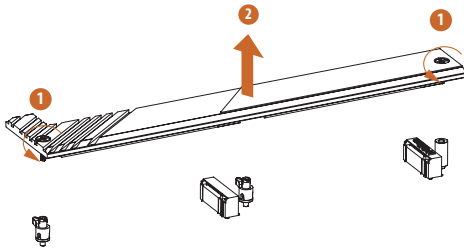
Prepare a M.2 SSD card.



Step 2

Depending on the PCB type and length of your M.2 SSD card, find the corresponding nut location to be used.

No.	1	2
Nut Location	A	B
PCB Length	6cm	8cm
Module Type	Type2260	Type 2280

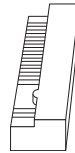


Step 3

Before installing a M.2 SSD card, please loosen the screws to remove the M.2 heatsink.

*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD card.

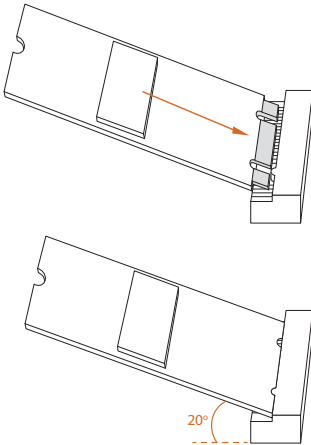
Step 4



Peel off the yellow protective film on the nut A. Remove the lock nut on the nut B with a screwdriver, and tighten it into the nut A.

Skip Step 4 if your M.2 SSD card is Type 2280.

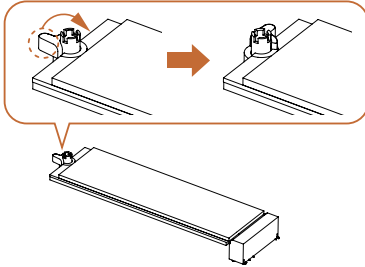
Step 5



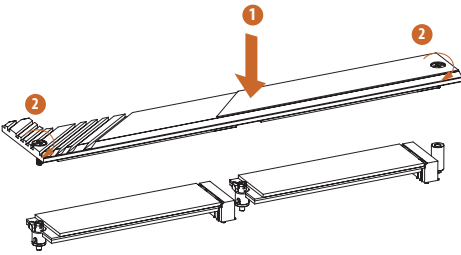
Align and gently insert the M.2 SSD card into the M.2 slot. Please be aware that the M.2 SSD card only fits in one orientation.

Step 6

Ensure that the notch at the end of the M.2 SSD card aligns with the nut. Then secure the M.2 SSD card by turning the nut lock clockwise to its locked position.

**Step 7**

Tighten the screw with a screwdriver to secure the M.2 heatsink into place. Please do not overtighten the screw as this might damage the M.2 heatsink.



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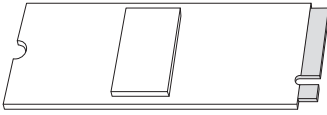
2.18 M.2 SSD Card Installation Guide (M2_6)

The M.2 is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Hyper M.2 Socket (M2_6, Key M) supports type 2260/2280 PCIe Gen4x4 (64 Gb/s) mode.

Installing the M.2 SSD Card

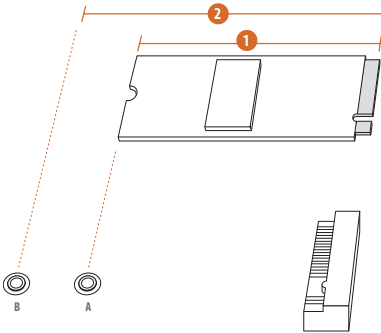
Step 1

Prepare a M.2 SSD card.

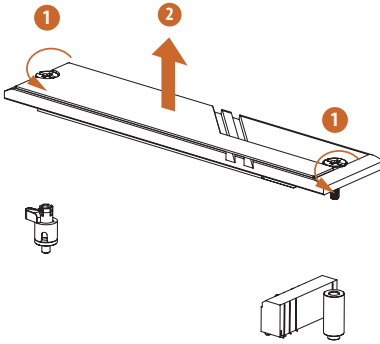


Step 2

Depending on the PCB type and length of your M.2 SSD card, find the corresponding nut location to be used.



No.	1	2
Nut Location	A	B
PCB Length	6cm	8cm
Module Type	Type2260	Type 2280

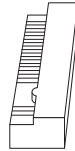


Step 3

Before installing a M.2 SSD card, please loosen the screws to remove the M.2 heatsink.

*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD card.

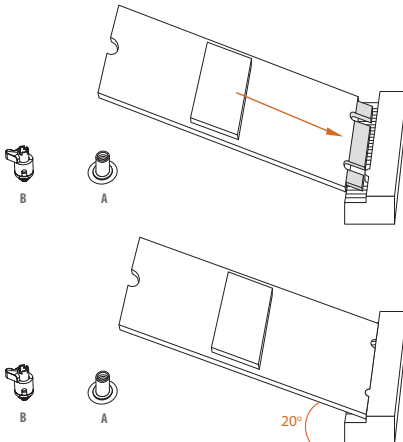
Step 4



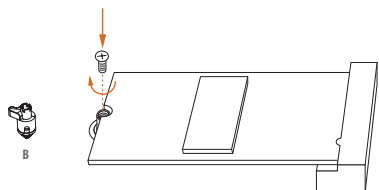
Peel off the yellow protective film on the nut A. Prepare the M.2 standoff and screw that come with the package, and hand tighten the standoff into the nut A.

Skip Step 4 if your M.2 SSD card is Type 2280.

Step 5

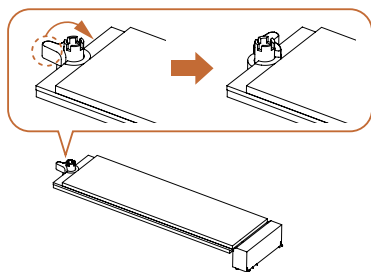


Align and gently insert the M.2 SSD card into the M.2 slot. Please be aware that the M.2 SSD card only fits in one orientation.



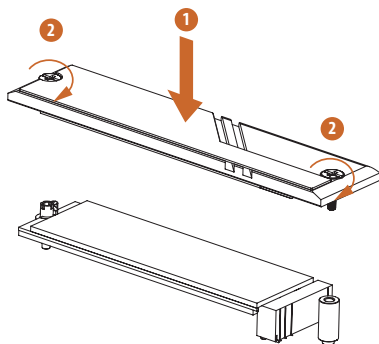
Step 6

Tighten the screw with a screwdriver to secure the M.2 SSD card into place. Please do not overtighten the screw as this might damage the M.2 SSD card. *Skip Step 6 if your M.2 SSD card is Type 2280.*



Step 7

Ensure that the notch at the end of the M.2 SSD card aligns with the nut. Then secure the M.2 SSD card by turning the nut lock clockwise to its locked position. *Skip Step 7 if your M.2 SSD card is Type 2260.*



Step 8

Tighten the screw with a screwdriver to secure the M.2 heatsink into place. Please do not overtighten the screw as this might damage the M.2 heatsink.

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Version 1.0

Published September 2023

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- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment 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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Please keep batteries out of sight or reach of children.

CALIFORNIA, USA ONLY

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“Perchlorate Material-special handling may apply, see www.dtsc.ca.gov/hazardouswaste/perchlorate”

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This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.