Neousys Technology Inc.

RGS-8805GC Series

User Manual

Revision 1.0

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Contact Information

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Declaration of Conformity

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

CE

The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

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Safety Precautions

- Read these instructions carefully before you install, operate, or transport the system.
- Install the system or DIN rail associated with, at a sturdy location
- Install the power socket outlet near the system where it is easily accessible
- Secure each system module(s) using its retaining screws
- Place power cords and other connection cables away from foot traffic. Do not place items over power cords and make sure they do not rest against data cables
- Shutdown, disconnect all cables from the system and ground yourself before touching internal modules
- Ensure that the correct power range is being used before powering the device
- Should a module fail, arrange for a replacement as soon as possible to minimize down-time
- By means of a power cord connected to a socket-outlet with earthing connection
- If the system is not going to be used for a long time, disconnect it from mains (power socket) to avoid transient over-voltage

Mesures de sécurité

- Lire attentivement ces directives avant d’installer, d’utiliser ou de transporter le système.
- Installer le système ou la barrette DIN qui lui est associée, à un endroit solide
- Installer la prise de courant près du système et pour qu’elle soit facilement accessible
- Fixer chaque module du système à l'aide de ses vis de fixation
- Éloigner de la circulation piétonne les cordons d'alimentation et autres câbles de connexion. Ne jamais placer d’objets sur les cordons d’alimentation et s’assurer qu’ils ne reposent pas contre les câbles de données
- Avant de toucher les modules internes, arrêter, débrancher tous les câbles du système et raccordez-vous à la terre
- S’assurer que la bonne plage de puissance est utilisée avant d'alimenter l'appareil
- Prévoir un remplacement dès que possible en cas de défaillance d'un module, afin de minimiser les temps d'arrêt
- Au moyen d'un cordon d'alimentation branché à une prise de courant avec mise à la terre (MALT)
- Si le système ne sera pas être utilisé pendant une période prolongée, le débrancher du réseau (prise de courant) pour éviter une surtension transitoire

Service and Maintenance

- ONLY qualified personnel should service the system
- Shutdown the system, disconnect the power cord and all other connections before servicing the system
- When replacing/ installing additional components (expansion card, memory module, etc.), insert them as gently as possible while assuring proper connector engagement

Avertissement concernant les piles

- Les piles risquent d'exploser si elles sont mal installées.
- Ne jamais essayer de recharger, d'ouvrir de force ou de chauffer les piles.
- Remplacer les piles uniquement avec le même type ou l’équivalent recommandé par le fabricant.

Hot Surface Warning

HOT SURFACE. DO NOT TOUCH. "ATTENTION: Surface chaude. Ne pas toucher."

WARNING!

Components/ parts inside the equipment may be hot to touch! Please wait one-half hour after switching off before handling parts.

Surface chaude

AVERTISSEMENT : *SURFACE CHAUDE. NE PAS TOUCHER.*

Les composants et pièces à l'intérieur de l'équipement peuvent être chauds au toucher. Après l'arrêt, attendre au moins 30 minutes pour que le système refroidisse avant d'effectuer l'entretien.

- Respecter les règles de sécurité et d'entretien mentionnées au début du guide d'utilisation!

Battery Warning

- Batteries are at risk of exploding if incorrectly installed
- Do not attempt to recharge, force open, or heat the battery
- Replace the battery only with the same or equivalent type recommended by the manufacturer

Entretien et réparation

- La réparation du système ne peut être effectuée que par du personnel qualifié
- Avant de réparer le système, arrêter le système, débrancher le cordon d'alimentation et toutes les autres connexions
- Lors du remplacement ou de l'installation de composants supplémentaires (carte d'extension, module de mémoire, etc.), les insérer le plus doucement possible tout en s’assurant que les connecteurs sont bien engagés jusqu’au bout

ESD Precautions

- Handle add-on module, motherboard by their retention screws or the module's frame/ heat sink. Avoid touching the PCB circuit board or add-on module connector pins
- Use a grounded wrist strap and an anti-static work pad to discharge static electricity when installing or maintaining the system
- Avoid dust, debris, carpets, plastic, vinyl and styrofoam in your work area.
- Do not remove any module or component from its anti-static bag before installation

Précautions nécessaires de décharge électrostatique (ESD)

- Tenir le module complémentaire et la carte mère par leurs vis de rétention ou le châssis/dissipateur de chaleur du module. Éviter de toucher la carte de circuit imprimé ou les broches du connecteur du module complémentaire
- Afin de décharger l'électricité statique, utiliser une dragonne mise à la terre et un tapis de travail antistatique lors de l'installation ou de l'entretien du système
- Éviter la poussière, les débris, les tapis, le plastique, le vinyle et la mousse de polystyrène dans votre zone de travail.
- Ne retirer aucun module ou composant de son sac antistatique avant l'installation

Restricted Access Location

The controller is intended for installation only in certain environments where both of the following conditions apply:

- Access can only be gained by QUALIFIED SERVICE PERSONNEL who have been instructed on the reasons for restrictions applied to the location and any precautions that shall be taken
- Access is through the use of a TOOL, lock and key, or other means of security, and is controlled by the authority responsible for the location

Lieu d’accès restreint

Le contrôleur doit être installé uniquement dans les environnements où les deux conditions suivantes sont présentes :

- Le lieu ne peut être accédé que par du PERSONNEL TECHNIQUE QUALIFIÉ informé des raisons des restrictions appliquées à l'emplacement et des précautions à prendre
- L'accès est contrôlé par l'autorité responsable de l'emplacement et se fait au moyen d'un OUTIL, d'une serrure et d'une clé ou d'autres moyens de sécurité

About This Manual

This manual introduces RGS-8805GC series featuring AMD EPYC Milan server processor up to 64-core/ 128-thread and up to 512GB of registered memory support. The system also supports an NVIDIA RTX A6000/ A4500 inference accelerator for AI computation capability. This manual introduces and demonstrates the system's installation procedures.

Revision History

Version	Date	Description
1.0	Aug. 2023	Initial release

1 Introduction

RGS-8805GC is a rugged HPC server powered by the AMD EPYC™ 7003 series "MILAN" processor with up to 64-core/ 128-thread unparalleled computing power and 512GB memory capacity. Utilizing a unique partitioned enclosure design, it provides a highly effective airflow for CPU and other components to guarantee a reliable -25°C to 60°C operation for field deployment.

To fuel versatile advanced edge AI applications, RGS-8805GC can host one high-end NVIDIA® RTX A6000 or A4500 GPU which provides up to 38.7 TFLOPS FP32 or 309.7 TFLOPS tensor performance. It comes with a unique enclosure design that creates a sealed tunnel to efficiently dissipate the heat generated from the RTX GPU. RGS-8805GC offers an exceptional balance of CPU and GPU for modern edge AI applications, such as autonomous driving, DL-based vision inspection, and intelligent video analytics.

RGS-8805GC has two 10G Ethernet ports for high-speed data transmission that are backward compatible with 5GBASE-T and 2.5GBASE-T to work with NBASE-T industrial cameras. It also has four Gigabit PoE+ and four USB 3.1 Gen1 ports for connecting additional devices, and four easy-swappable 2.5" HDD trays for data storage. The system provides two x16 PCIe slots for installing additional I/O cards such as frame grabber or GMSL image capture cards. As one of few HPC servers that accept wide-range DC input, it can adapt to versatile deployment environments.

RGS-8805GC addresses the challenge of deploying a CPU/ GPU server to the field, where installation space, operating temperature, and power supply are some of the most commonly faced issues. A rugged HPC system that can be installed outside of an air-conditioned environment and capable of operating in harsh environments opens the door to new AI-assisted edge computing for more advanced telecom infrastructure, factory automation, ADAS, and V2X applications.

1.1 Product Specifications

1.1.1 RGS-8805GC Specifications

<table>
<tr><td colspan="2">System Core</td></tr>
<tr><td>Processor</td><td>AMD® EPYC™ 7003 "Milan" series server CPU, up to 64 cores/ 128 threads</td></tr>
<tr><td>Graphics</td><td>Integrated ASPEED AST2500 BMC graphics supporting 1920x1200 resolution</td></tr>
<tr><td>Memory</td><td>4x RDIMM/ LRDIMM slots, supporting up to 512GB DDR4-3200</td></tr>
<tr><td>TPM</td><td>Supports TPM 2.0</td></tr>
<tr><td colspan="2">I/O Interface</td></tr>
<tr><td>10G Ethernet</td><td>2x 10GBASE-T ports by Intel® X550-AT2, supporting NBASE-T (5G/ 2.5G)</td></tr>
<tr><td>Ethernet port</td><td>4x GbE ports by Intel® I350-AM4</td></tr>
<tr><td>PoE+</td><td>IEEE 802.3at PoE+ PSE capability on the four GbE ports</td></tr>
<tr><td>Video Port</td><td>1x VGA port via ASPEED AST2500 BMC</td></tr>
<tr><td>USB</td><td>4x USB 3.1 Gen1 (5Gbps) ports</td></tr>
<tr><td>Serial Port</td><td>2x software-programmable RS-232/ 422/ 485 ports</td></tr>
<tr><td colspan="2">Storage Interface</td></tr>
<tr><td>SATA</td><td>4x easy-swappable HDD trays for 2.5” HDD/ SSD installation (up to 7mm thickness)</td></tr>
<tr><td>M.2</td><td>1x M.2 2280 M key NVMe socket (PCIe Gen4 x4) for NVMe SSD</td></tr>
<tr><td colspan="2">Expansion Bus</td></tr>
<tr><td>PCI Express</td><td>1x PCIe x16 slot@Gen4, 16-lanes for RTX A6000/ A4500 installation
2x PCIe x16 slots@ Gen4, 8-lanes</td></tr>
<tr><td>Mini PCI-E</td><td>2x full-size mini PCI Express socket with USIM support</td></tr>
<tr><td>M.2</td><td>1x M.2 3042/ 3052 B key socket with dual micro-SIM sockets for 4G/ 5G module</td></tr>
<tr><td colspan="2">Power Supply</td></tr>
<tr><td>DC Input</td><td>2x 4-pin 7.62mm pitch pluggable terminal pluggable terminal block for 8~48V DC and ignition control input</td></tr>
<tr><td>Maximum Power Consumption</td><td>Windows idle consumption with AMD EPYC 7543P:
<table>
<tr><td>12V</td><td>24V</td><td>35V</td><td>48V</td></tr>
<tr><td>66.72W</td><td>70.32W</td><td>76.3W</td><td>79.68W</td></tr>
</table>
Burn-in test (CPU/ 2D/ 3D/ RAM) with AMD EPYC 7543P
<table>
<tr><td>12V</td><td>24V</td><td>35V</td><td>48V</td></tr>
<tr><td>297.96W</td><td>278.16W</td><td>294.7W</td><td>279.84W</td></tr>
</table></td></tr>
</table>

Mechanical	
Dimension	444.4 mm (W) x 350 mm (D) x 88.1 mm (H)
Weight	8.6Kg (including CPU & RDIMM)
Mounting	Wall-mount with damping brackets (standard) Rack-mount (optional)
Environmental	
Operating Temperature	-25°C to 60°C with 100% CPU/ GPU loading */ **
Storage Temperature	-40°C to 85°C
Humidity	10% to 90% , non-condensing
Vibration	Operating, MIL-STD-810G, Method 514.6, Category 4
Shock	Operating, MIL-STD-810G, Method 516.6, Procedure I, Table 516.6-II
EMC	CE/ FCC Class A, according to EN 55032 & EN 55035

***** The CPU and GPU loading tests are applied using Passmark® BurnInTest 9.1 with a 225W CPU. Operating temperature degrades with higher CPU TDP. For detailed testing criteria, please contact Neousys Technology

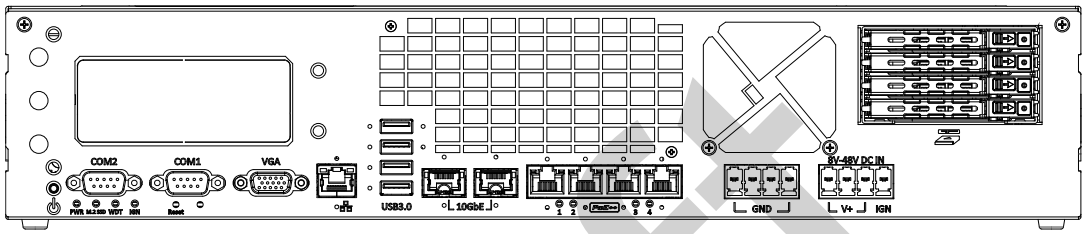
****** For sub-zero operating temperature, a wide temperature HDD or Solid State Disk (SSD) is required.

1.2 RGS-8805GC Dimension

NOTE

All measurements are in millimeters (mm).

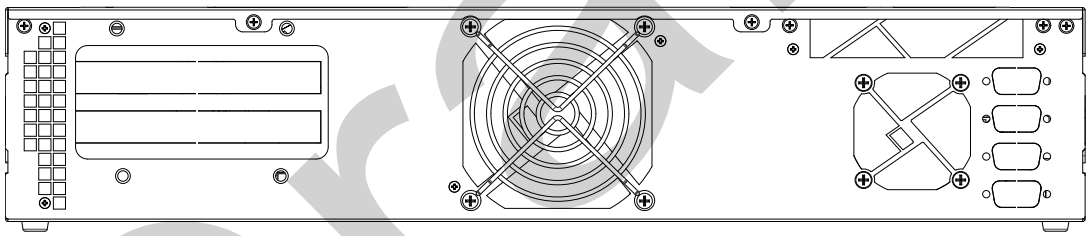
1.2.1 RGS-8805GC Front Panel View



88.1

444.4

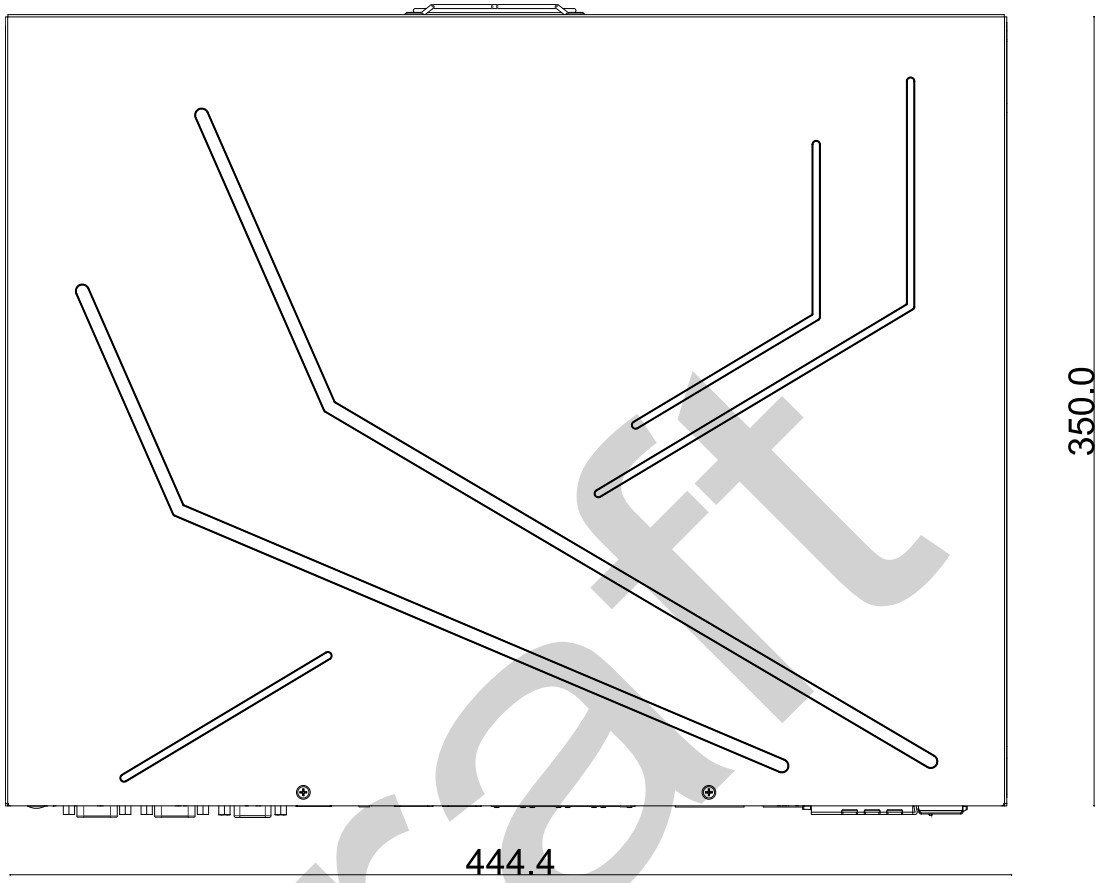
1.2.2 RGS-8805GC Rear Panel View



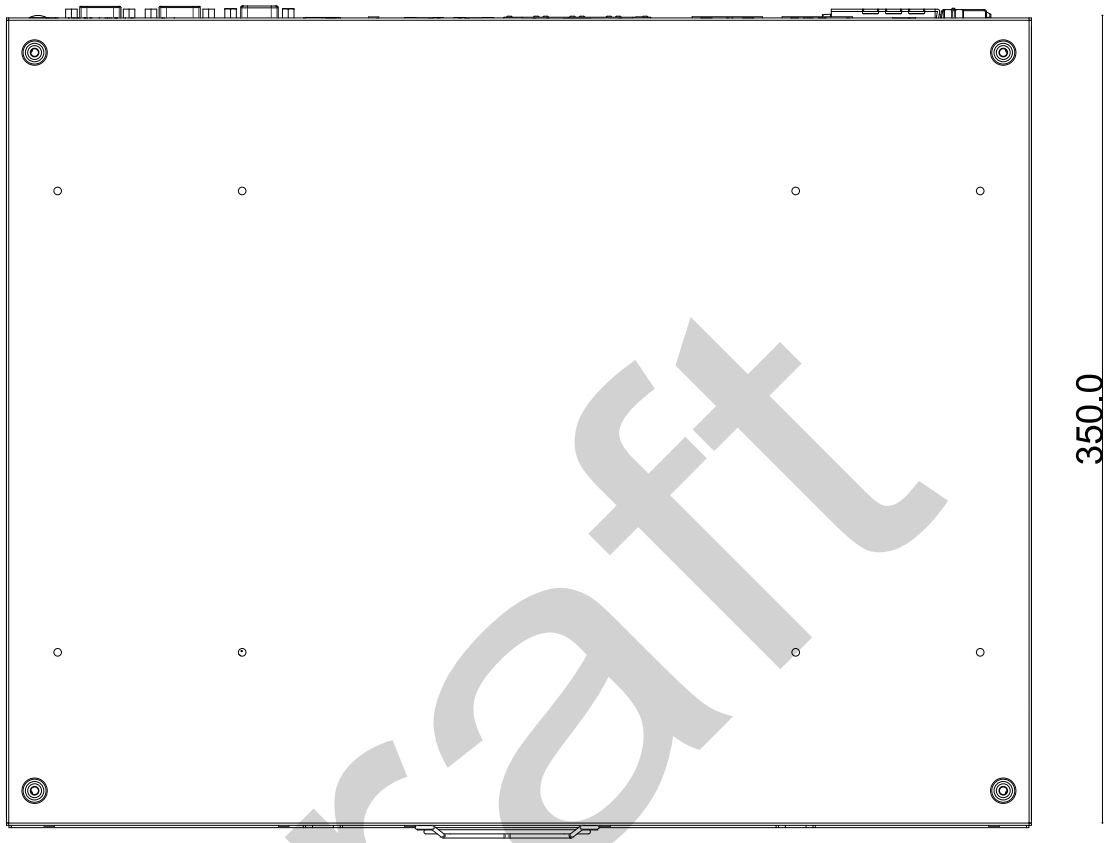
88.1

444.4

1.2.3 RGS-8805GC Top View



1.2.4 RGS-8805GC Bottom View



2 System Overview

Upon receiving and unpacking your RGS-8805GC series system, please check immediately if the package contains all the items listed in the following table. If any item(s) are missing or damaged, please contact your local dealer or Neousys Technology.

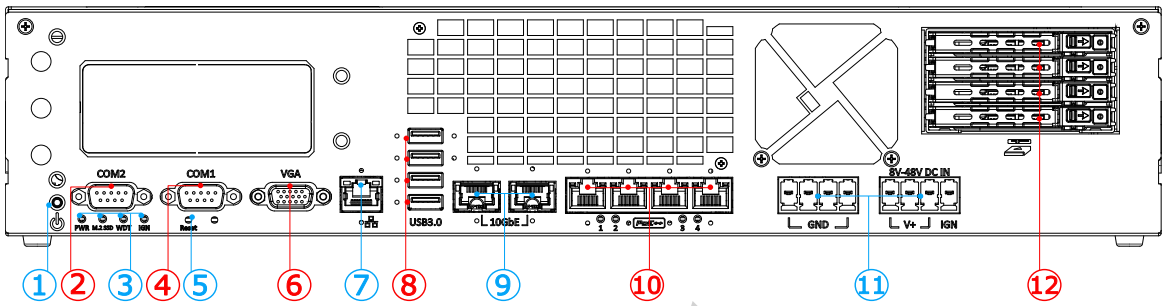
2.1 Packing List

2.1.1 RGS-8805GS Series Packing List

System / Pack	RGS-8805GC	Qty
1	RGS-8805GC series system (If you ordered CPU/ RAM/ HDD, please verify these items)	1
2	Accessory box, which contains ● CPU bracket ● Wall-mount bracket ● 3-pin power terminal block ● Screw pack ● Rubber spacer	 1 2 2 1 4

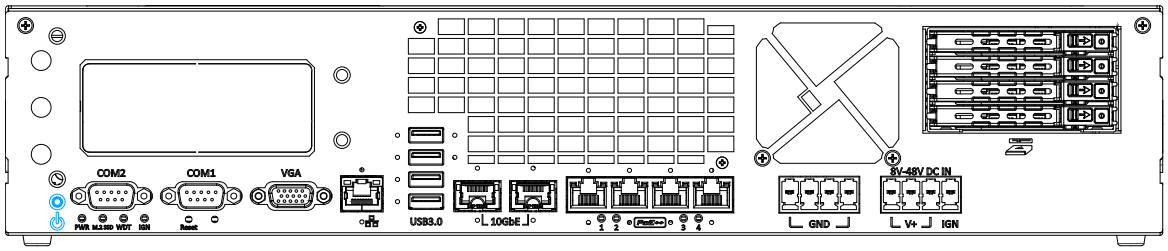
2.2 Front Panel I/O

The RGS-8805GC systems' front panel features the following external I/O connections.



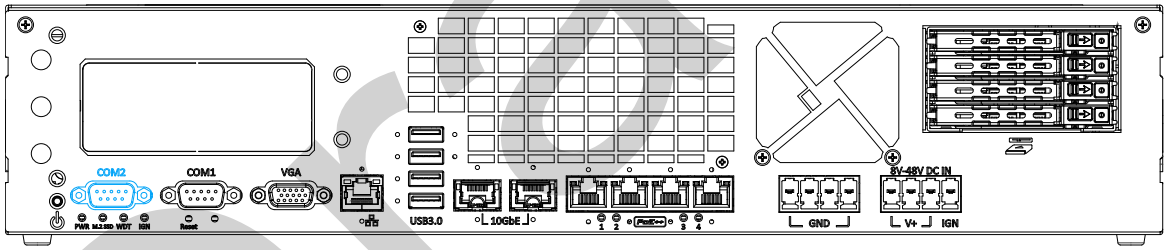
No.	Item	Description
1	Power button	Use this button to turn on or shutdown the system.
2	COM2 port	A software-selectable RS-232/422/485 port, the operation mode can be set in the BIOS.
3	Status LEDs	From left to right, the LEDs are four status LEDs on the front panel: power (PWR), M.2 SSD, Watchdog timer (WDT), and ignition control (IGN).
4	COM1 port	A software-selectable RS-232/422/485 port, the operation mode can be set in the BIOS.
5	Reset button	Use this button to manually reset the system.
6	VGA port	VGA output supports resolution up to 1920x1200@60Hz
7	Reserved	Reserved port
8	USB3.2 Gen1 port	USB3.2 Gen 1 offers up to 5Gbps of data-throughput performance
9	10GbE port	2x 10GBASE-T ports by Intel® X550-AT2, supporting NBASE-T (5G/ 2.5G)
10	PoE+ GbE port	4x Gigabit Ethernet ports by Intel I350-AM4 with IEEE 802.3at PoE+ PSE capability
11	DC input	2x 4-pin 7.62mm pitch pluggable terminal block for 8 to 48V DC input and ignition control input
12	2.5" Drive trays	4x easy-swappable HDD trays for 2.5" HDD/ SSD installation (supports up to 7mm drive thickness)

2.2.1 Power Button

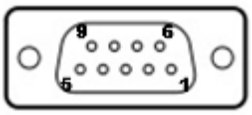


The power button is a non-latched switch for ATX mode on/off operation. To turn on the system, press the power button and the PWR LED should light-up green. To turn off the system, issuing a shutdown command in OS is preferred, or you can simply press the power button. To force shutdown when the system freezes, press and hold the power button for 5 seconds. Please note that there is a 5-second interval between on/off operations (i.e. once the system is turned off, there is a 5-second wait before you can power-on the system).

2.2.2 COM2 Port



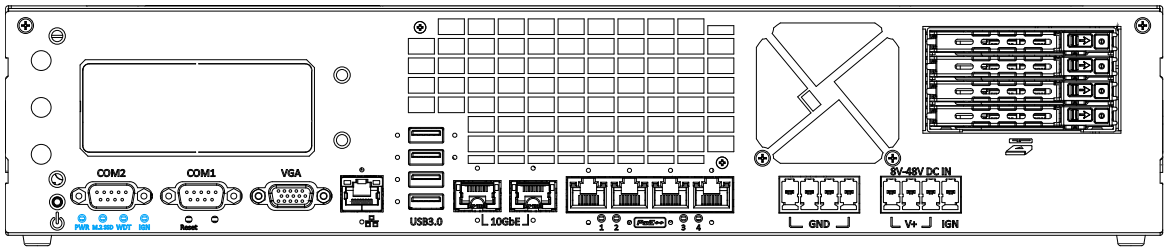
The COM2 port is implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate. It is a software-configurable RS-232/ 422/ 485 ports. The operation mode of COM1 and COM2 can be set in BIOS setup utility. The following table describes the pin definition of COM ports.



COM Port Pin Definition

	COM2		
Pin#	**RS-232 Mode**	**RS-422 Mode**	**RS-485 Mode(Two-wire 485)**
1	DCD		
2	RX	422 TXD+	485 TXD+/RXD+
3	TX	422 RXD+	
4	DTR	422 RXD-	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS	422 TXD-	485 TXD-/RXD-
9	RI		

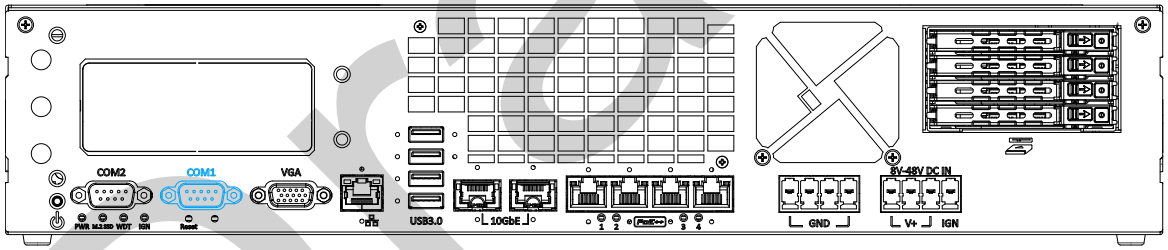
2.2.3 Status LEDs



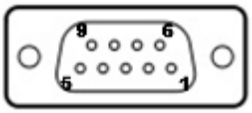
There are four LED indicators on the I/O panel: PWR (power), M.2 SSD, WDT (Watchdog timer), and IGN (ignition). The descriptions of these four LEDs are listed below:

Indicator	Color	Description
PWR	Green	Power indictor, lid when system is on.
M.2 SSD	Red	M.2 SSD indicator, flashing when hard disk drive is active.
WDT	Yellow	Watchdog timer LED, flashing when WDT is active.
IGN	Yellow	Ignition signal indicator, lit when IGN is high (12V/ 24V).

2.2.4 COM1 Port



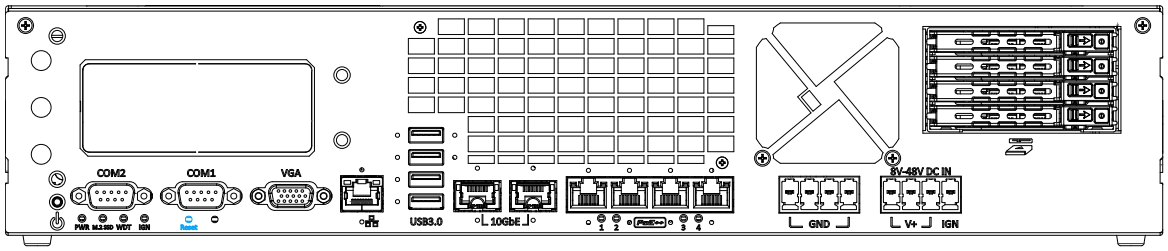
The COM1 port is implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate. It is a software-configurable RS-232/ 422/ 485 ports. The operation mode of COM1 and COM2 can be set in BIOS setup utility. The following table describes the pin definition of COM ports.



COM Port Pin Definition

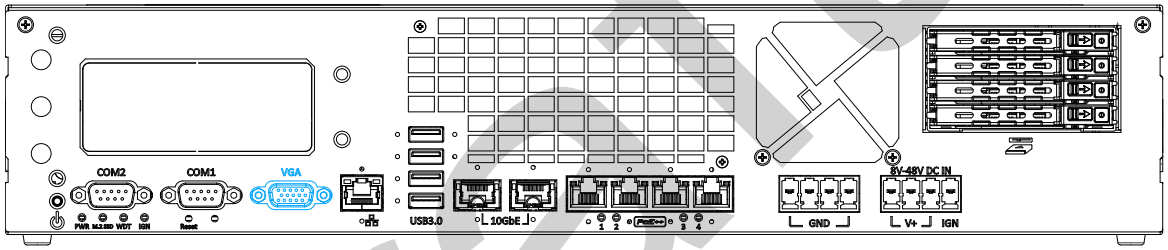
	COM1		
Pin#	**RS-232 Mode**	**RS-422 Mode**	**RS-485 Mode(Two-wire 485)**
1	DCD		
2	RX	422 TXD+	485 TXD+/RXD+
3	TX	422 RXD+	
4	DTR	422 RXD-	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS	422 TXD-	485 TXD-/RXD-
9	RI		

2.2.5 Reset Button



The reset button is used to manually reset the system in case of system halt or malfunction. To avoid unexpected reset, the button is purposely placed behind the panel. To reset, please use a pin-like object (eg. tip of a pen) to access the reset button

2.2.6 VGA Port

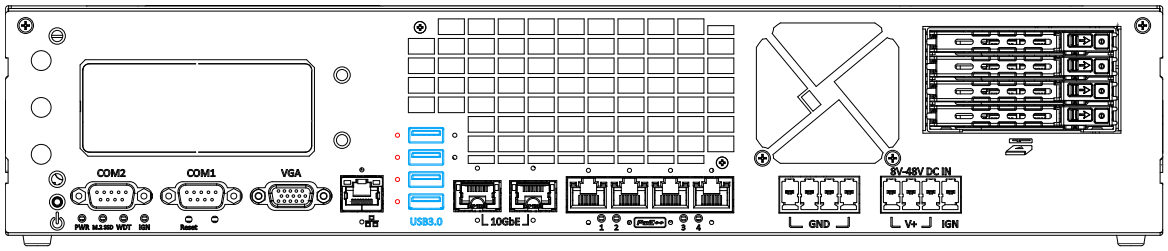


VGA connector is the most common video display connection. The VGA output supports up to 1920x1200@60Hz resolution. For the best VGA output resolution in Windows, you need to install corresponding graphics drivers. Please refer to section OS Support and Driver Installation for details.

NOTE

Please make sure your VGA cable includes SDA and SCL (DDC clock and data) signals for correct communication with monitor to get resolution/timing information. A cable without SDA/ SCL can cause blank screen on your VGA monitor due to incorrect resolution/timing output.

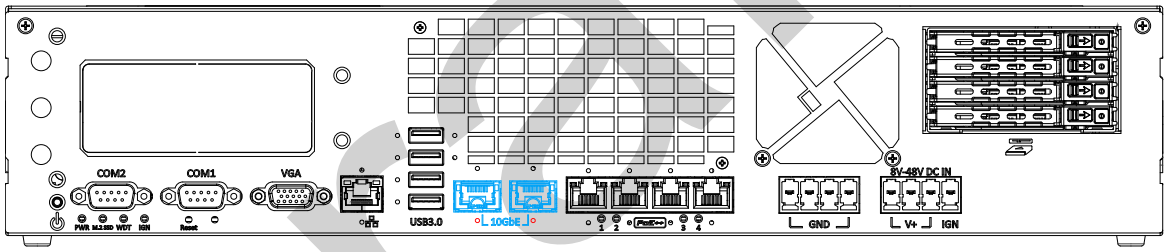
2.2.7 USB3.2 Gen 1 Port



The system's USB 3.2 Gen1x1 ports (5Gbps) are backward compatible with USB 2.0, USB 1.1 and USB 1.0 devices. UEFI USB is also supported so you can use USB keyboard/mouse in UEFI shell environment. Indicated in **red** is a screw-lock hole for the corresponding USB port.

xHCI driver is supported natively in Windows 10, therefore you do not need to install the xHCI driver prior to utilizing USB functions.

2.2.8 10GbE Port



The two high-speed data transmission 10G Ethernet ports are implemented by Intel® X550-AT2 and are backward compatible with 5GBASE-T and 2.5GBASE-T to work with NBASE-T industrial cameras. Indicated in **red** is a screw-lock hole for the corresponding Ethernet port.

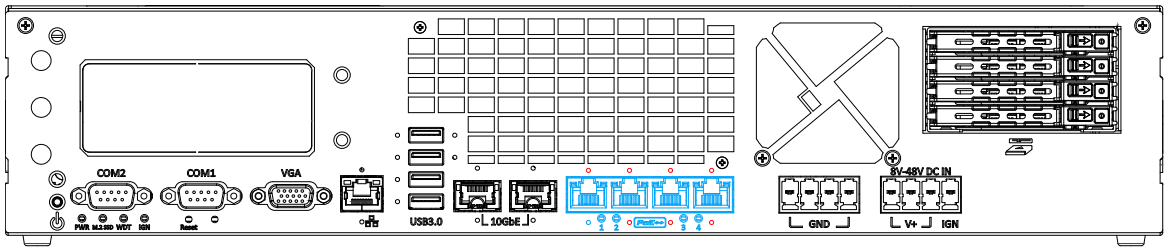
Active/Link LED (Right)

LED Color	Status	Description
Orange	Off	Ethernet port is disconnected
	On	Ethernet port is connected and no data transmission
	Flashing	Ethernet port is connected and data is transmitting/receiving

Speed LED (Left)

LED Color	Status	Description
Green or Orange	Off	10/100 Mbps
	Green	1000/ 2500 Mbps
	Orange	5000/ 10000 Mbps

2.2.9 Ethernet Port/ PoE+



The system offers four GbE ports that are implemented with Intel I225-IT 2.5G Ethernet controller, and marked in **blue** is implemented using Intel® I219-LM controller that supports Wake-on-LAN and is also compatible with Intel® AMT (Active Management Technology) to support advanced features such as remote SOL desktop and remote on/ off control. There are panel screw fix holes (indicated in **red**) for a firm and secure connection.

Power over Ethernet (PoE) supplies electrical power and data on a standard CAT-5/CAT-6 Ethernet cable. Acting as a PoE PSE (Power Sourcing Equipment), compliant with IEEE 802.3at, each PoE port delivers up to 25W to a Powered Device (PD). The system has a total 100W power budget. PoE ports can automatically detect and determine if the connected device requires power or not, so it is compatible with standard Ethernet devices as well.

Each port has one dedicated PCI Express link for maximum network performance.

Please refer to the table below for LED connection statuses.

Active/Link LED (Right)

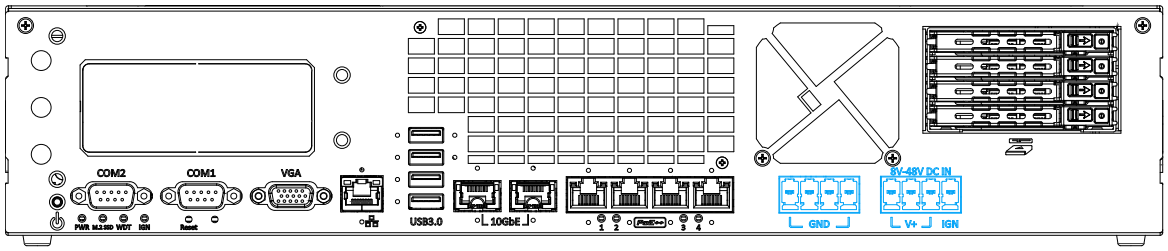
LED Color	Status	Description
Orange	Off	Ethernet port is disconnected
	On	Ethernet port is connected and no data transmission
	Flashing	Ethernet port is connected and data is transmitting/receiving

Speed LED (Left)

LED Color	Status	Description
Green or Orange	Off	10 Mbps
	Green	100 Mbps
	Orange	1000 Mbps

To utilize the Ethernet ports in Windows, you need to install corresponding Intel Ethernet controller driver.

2.2.10 DC Input



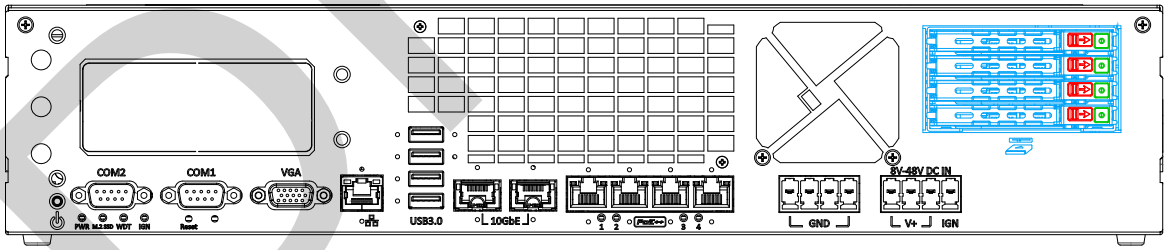
The system accepts a wide range of DC power input from 8 to 48V via dual 4-pin pluggable terminal blocks, fit for field usage where DC power is usually provided. The screw clamping mechanism on the terminal block offers connection reliability when wiring DC power.

In addition to DC power input, this terminal block can also accept ignition signal input (IGN) for in-vehicle applications.

WARNING

Please make sure the voltage of DC power is correct before you connect it to the system. Supplying a voltage over 48V will damage the system.

2.2.11 2.5” Easy-swappable Drive Trays



There are four 2.5 inch easy-swap hard drive trays on the front IO panel. Each 2.5” tray supports a 2.5” HDD or SSD up to 7mm thick. There is a lock (indicated in **green**) for each tray, and flick the switch (indicated in **red**) to the right to open each tray. When installing a HDD/ SSD, please make sure the SATA connector end into the enclosure first.

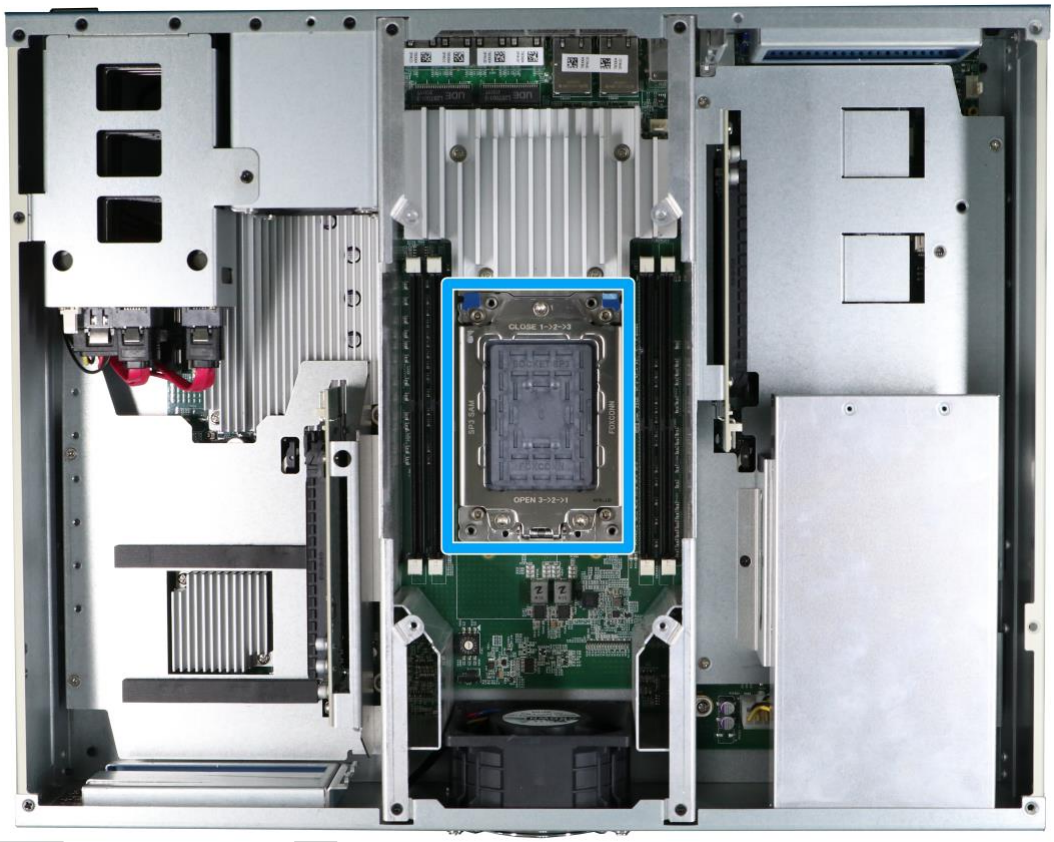
NOTE

The trays support hard drives with up to 7mm thickness.

2.3 Internal I/O Functions

In addition to I/O connectors on the front panel, the system also provides internal on-board connectors, such as remote on/off control, LED status output, internal USB 2.0 ports, etc. In this section, we'll illustrate these internal I/O functions.

2.3.1 CPU Socket

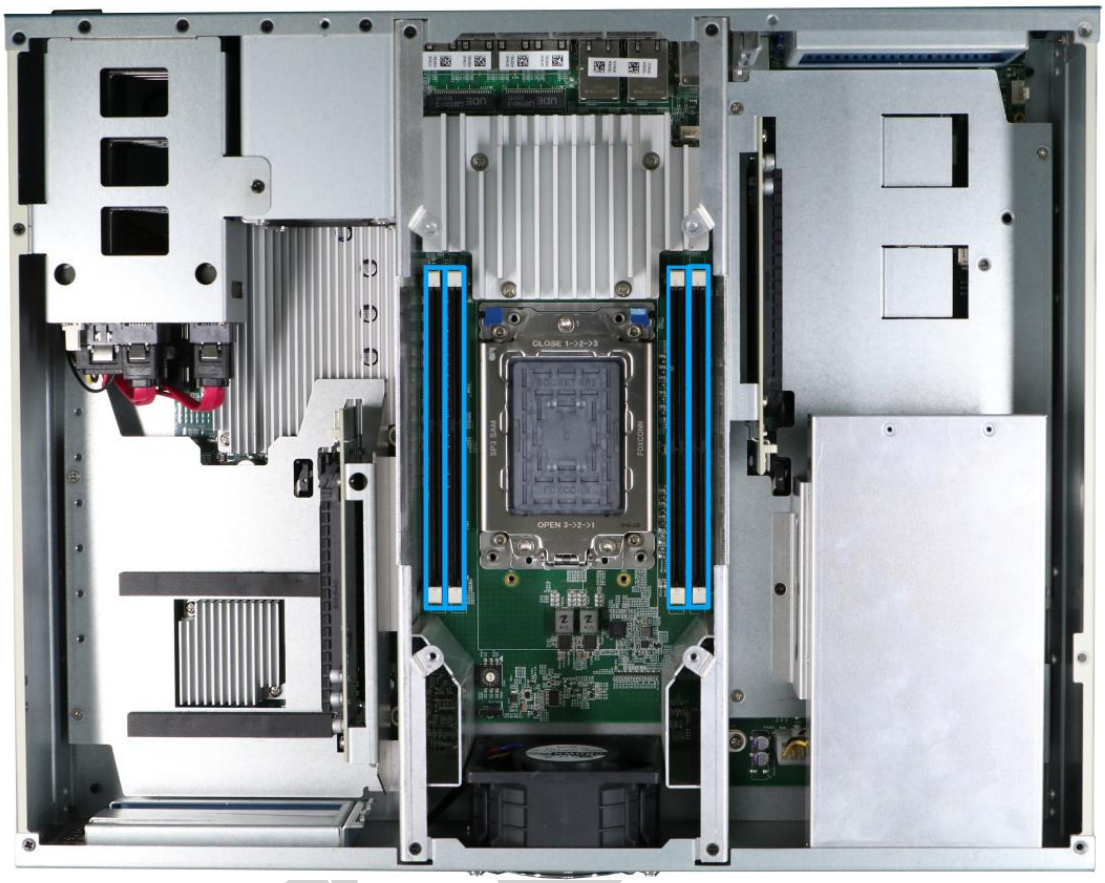


The system supports server-grade AMD EPYC™ 7003 series processors that are based on Zen-3 and Infinity microarchitecture. With industry leading IO, 7nm manufacturing, integrated on-die security processor, supporting up to 64 cores/ 128 threads while providing up to 32MB L3 cache per core, interleaving multi-channel memory optimization, etc., it delivers one of the best CPU performances in the industry.

WARNING

*To avoid possible CPU socket pin damages, **DO NOT** remove the CPU socket cover until you have the CPU, and is ready to install it into the socket!*

2.3.2 DRAM Slots

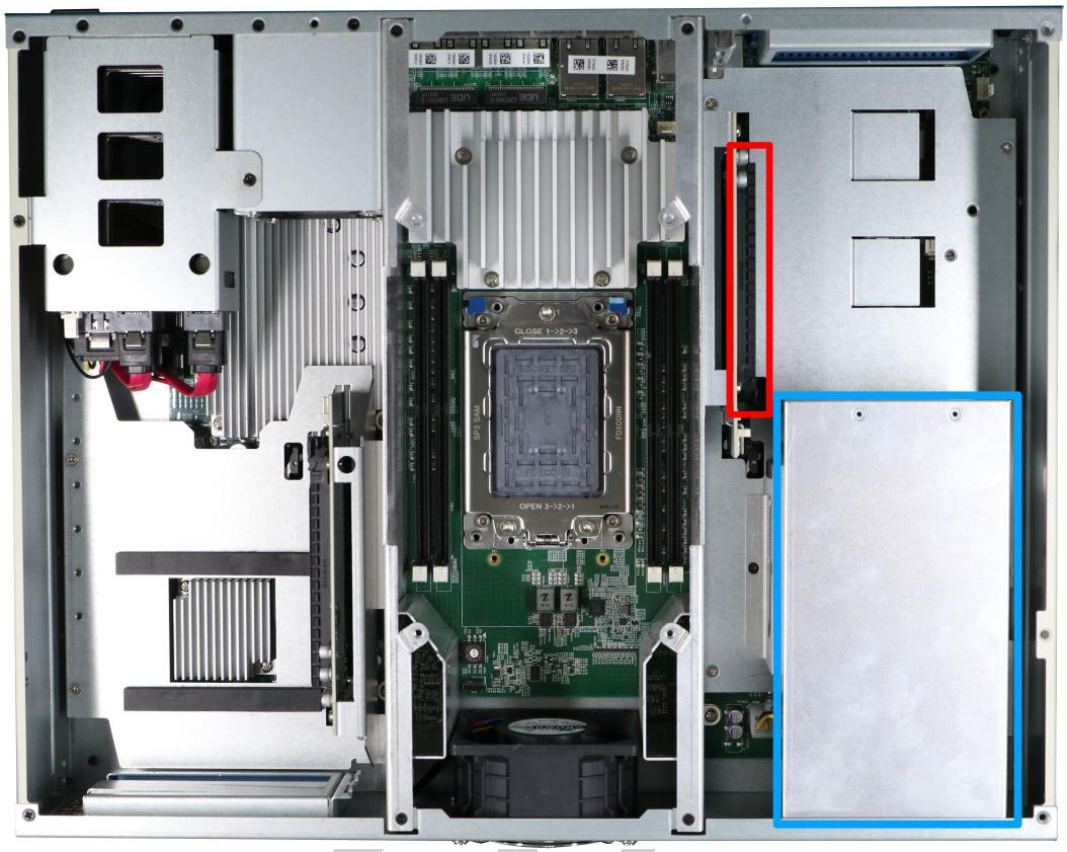


The system supports four registered DDR4 DIMMs up to 3200MHz, and up to 512GB in capacity. When installing the modules, please install into the specific slots accordingly. For details, please refer to the Registered DDR4 Module Installation section.

NOTE

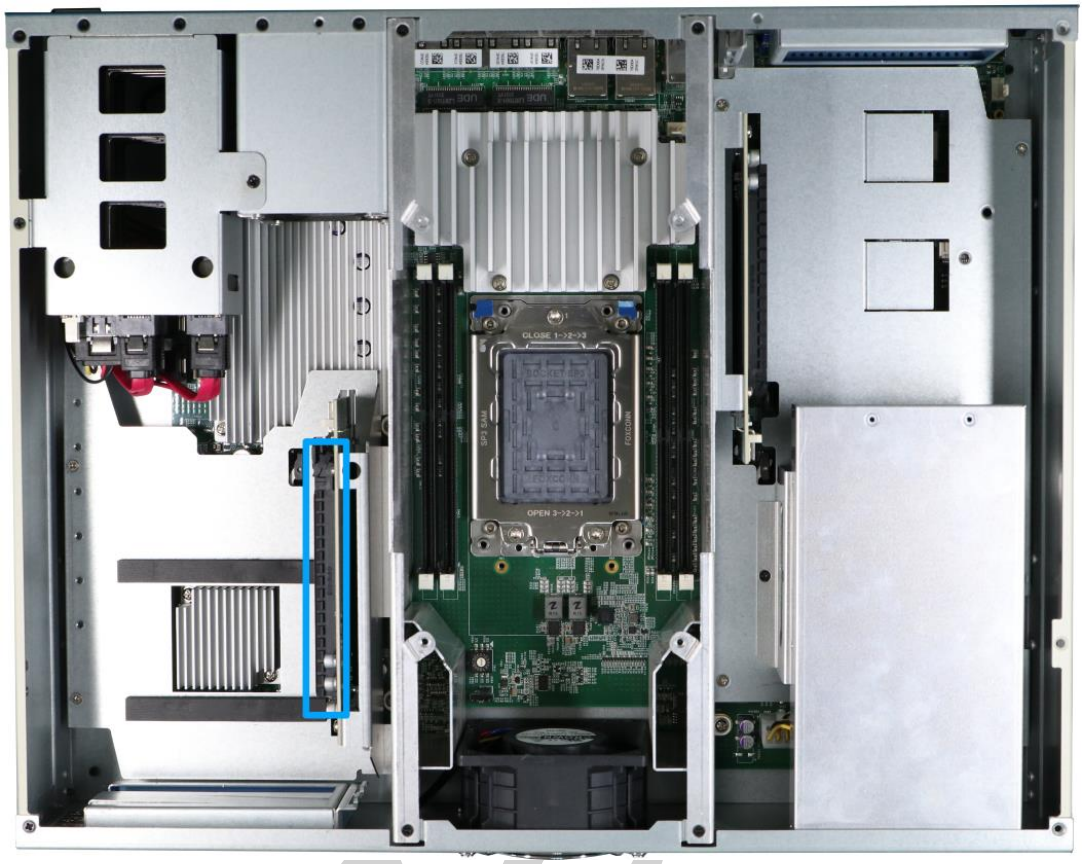
When changes are made to DRAM module(s), such as additionally install or remove and reinstall (into the same/ different slot), it will result in approximately a 30 to 60 seconds delay when booting up for the first time after such change(s).

2.3.3 PCIe x16 Slot for Inference Accelerator Installation



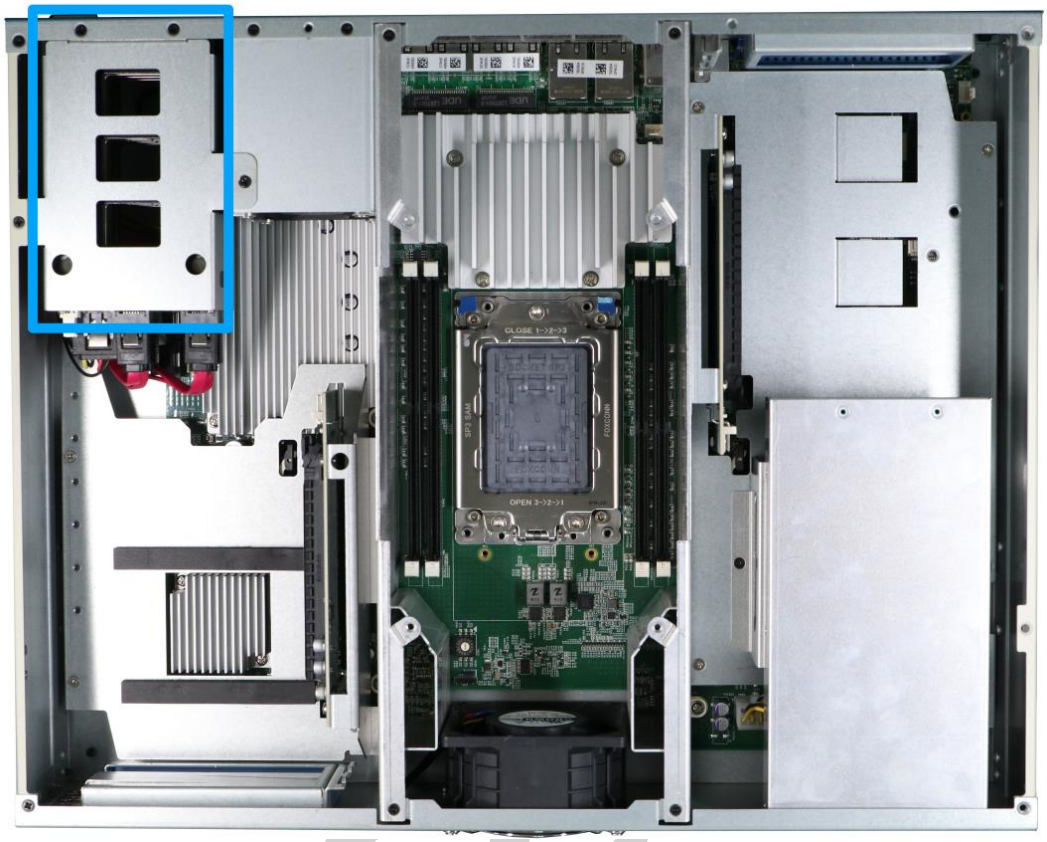
The system features a PCIe x16 slot (indicated in **red**) and supports an inference accelerator (NVIDIA RTX A6000 or A4500), providing up to 38.7 TFLOPS FP32 or 309.7TFLOPS tensor performance. There is also a dedicated inference accelerator tunnel duct (indicated in **blue**) optimizing airflow to ensure operation stability.

2.3.4 PCIe x8 Slot for Add-on Card Installation



The system has two slots that are PCIe x16 Gen4 8-lanes (indicated in **blue**) for installing add-on cards, for additional I/O expansion or function cards such as a frame grabber card.

2.3.5 2.5” Hard Drive Cage

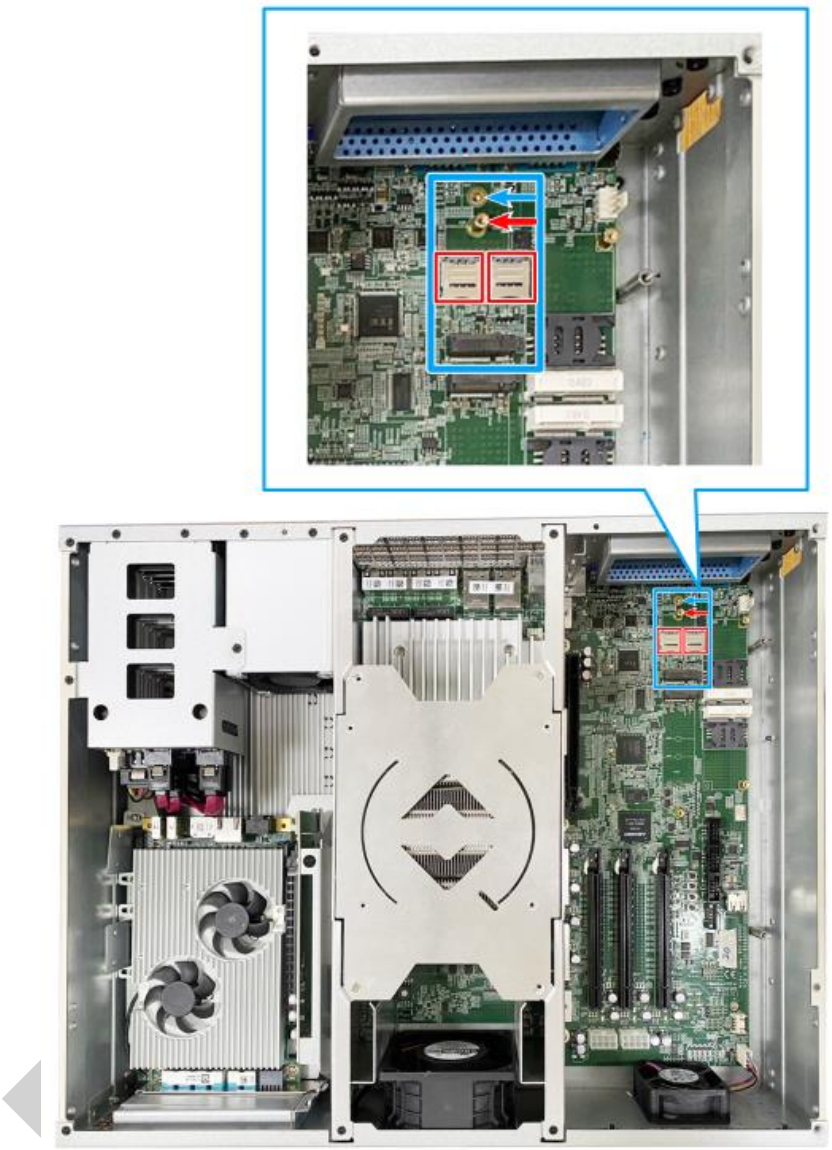


The system provides a 2.5” hard drive cage that can hold up to four 2.5” HDDs/ SSDs with each connected via a Gen3, 6 Gb/s SATA port. The installation trays can be accessed via the I/O panel.

NOTE

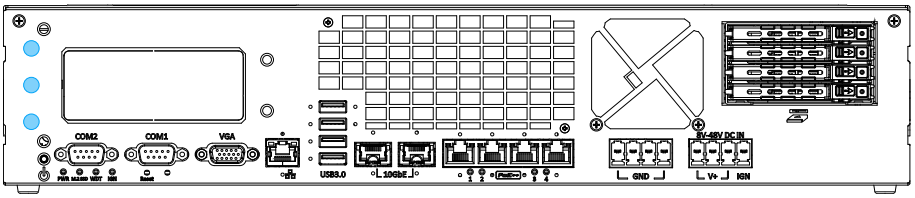
Supports up to 15mm thickness HDD/ SSD.

2.3.6 M.2 3042/ 3052 B Key Slot with Dual SIM slots



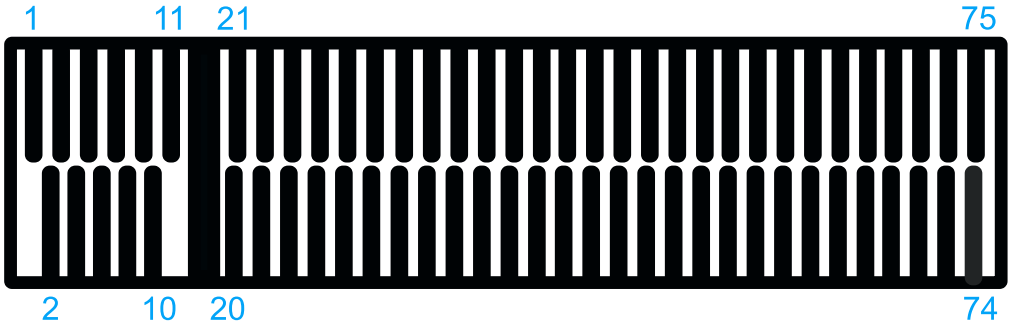
The system has an M.2 3042/ 3052 slot (indicated in **blue rectangle**) with a 5G/ 4G SIM slot (indicated in **red rectangle**). A copper standoff is provided for you to secure onto the motherboard into the **red arrow** location for an M.2 3042 module, or into the **blue arrow** location for an M.2 3052 module. By installing a 5G or 4G M.2 module and SIM card, you can access the internet via the provider's network.

For wireless 5G/ 4G, SMA antenna apertures are located on front/ rear panels.



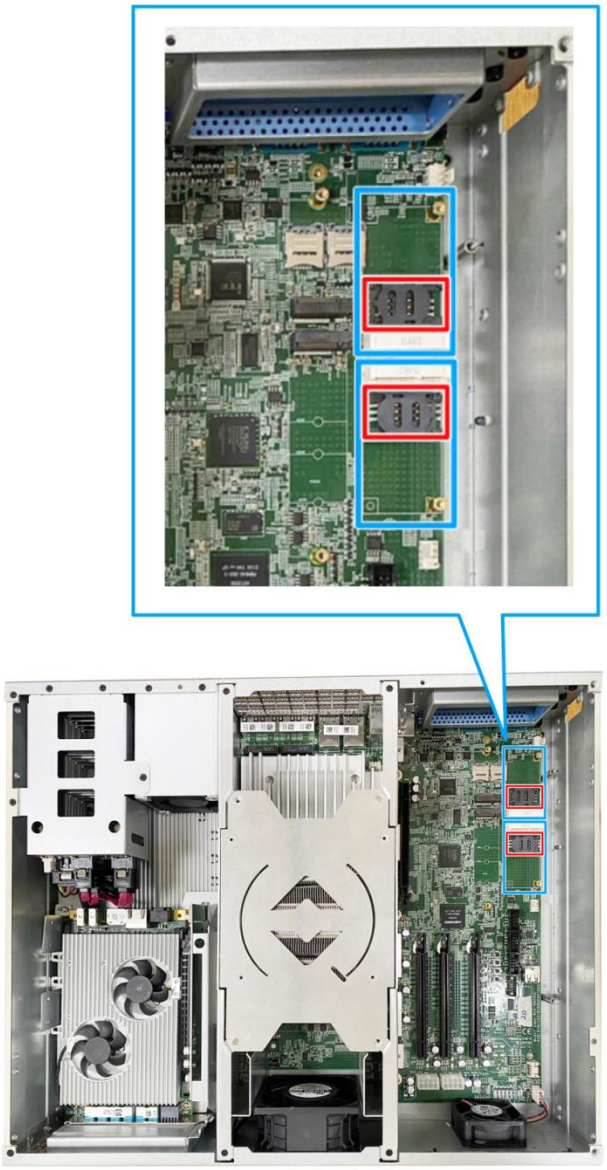
Front panel antenna opening

M.2 (B Key) Slot Pin Definition



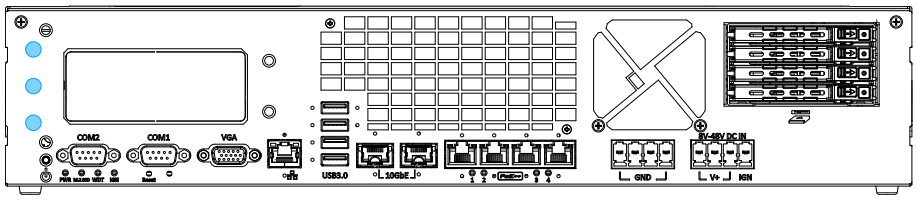
Pin #	Signal	Pin #	Signal
1	-	2	+3V3
3	GND	4	+3V3
5	GND	6	FULL_CARD_POWER_OFF_N
7	USB_D+	8	W_DISABLE_N
9	USB_D-	10	-
11	GND		
Mechanical Key			
21	-	20	-
23	-	22	-
25	-	24	-
27	GND	26	-
29	USB3.0-RX-	28	-
31	USB3.0-RX+	30	UIM1-RESET
33	GND	32	UIM1-CLK
35	USB3.0-TX-	34	UIM1-DATA
37	USB3.0-TX+	36	UIM1-PWR
39	GND	38	-
41	PERn0 / SATA-B+	40	UIM2-DET
43	PERp0 / SATA-B-	42	UIM2-DATA
45	GND	44	UIM2-CLK
47	PETn0 / SATA-A-	46	UIM2-RST
49	PETp0 / SATA-A+	48	UIM2-PWR
51	GND	50	PERST_N
53	REFCLKN	52	-
55	REFCLKP	54	-
57	GND	56	-
59	-	58	-
61	-	60	-
63	-	62	-
65	-	64	-
67	RESET_N	66	UIM1_DETECT
69	CONFIG_1	68	-
71	GND	70	+3V3
73	GND	72	+3V3
75	-	74	+3V3

2.3.7 mini-PCIe and SIM Slot



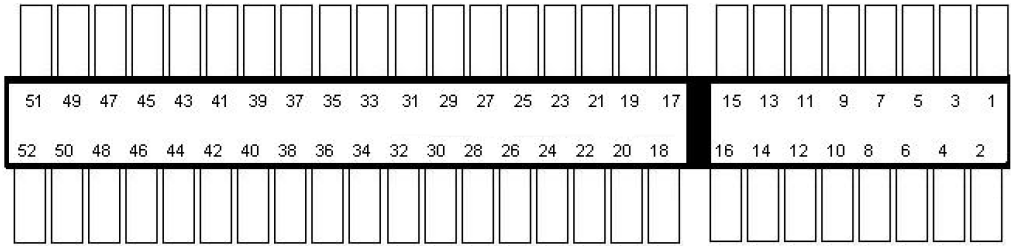
The system provides two mini-PCIe sockets (indicated in **blue**) that is in compliance with mini-PCIe specification rev. 1.2. This mini-PCIe socket is designed with SIM card (slot indicated in **red**) support. With a SIM card installed, your system can access the internet via your network provider's 4G/ 3G network.

For wireless (WiFi/ 4G/ 3G) communication, multiple SMA antenna apertures can be located on the front and rear panel.



Front panel antenna opening

mini-PCIe socket definition

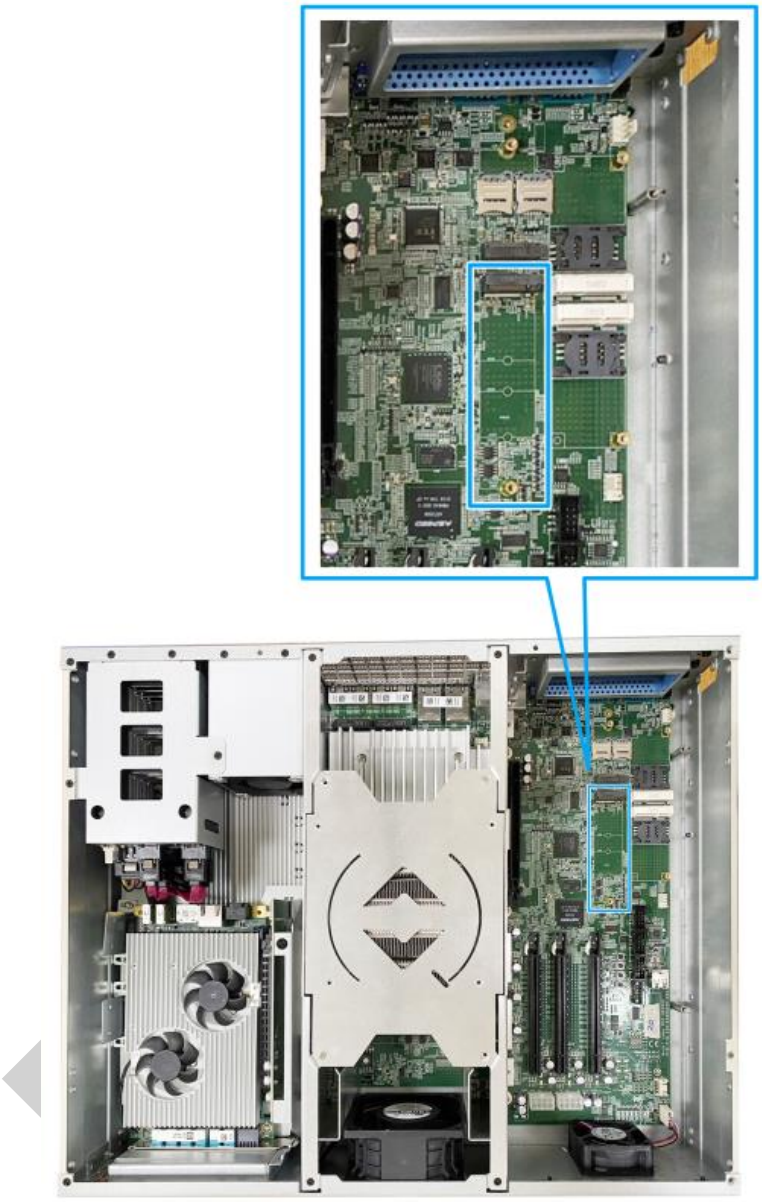


Pin	Signal (mPCIe)	Pin #	Signal (mPCIe)
1	WAKE#	2	+3.3Vaux
3	-	4	GND
5	-	6	+1.5V
7	CLKREQ#	8	UIM_PWR
9	GND	10	UIM_DATA
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_RESET
15	GND	16	UIM_VPP
Mechanical Key			
17	Reserved* (UIM_C8)	18	GND
19	Reserved* (UIM_C4)	20	W_DISABLE#
21	GND	22	PERST#
23	PERn0	24	3.3V
25	PERp0	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PETn0	32	SMB_DATA
33	PETp0	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	3.3V	40	GND
41	3.3V	42	-
43	GND	44	-
45	Reserved	46	-
47	Reserved	48	+1.5V
49	Reserved	50	GND
51	Reserved	52	3.3V

WARNING

Some off-the-shelf mini-PCIe 5G/4G modules are not compliant to standard mini-PCIe interface. They use 1.8V I/O signals instead of standard 3.3V I/O and may cause signal conflict. Please consult with Neousys for compatibility when in doubt! Installing an incompatible 4G module may damage the system or the module itself may be damaged.

2.3.8 M.2 2280 (M Key) Slot for NVMe SSD

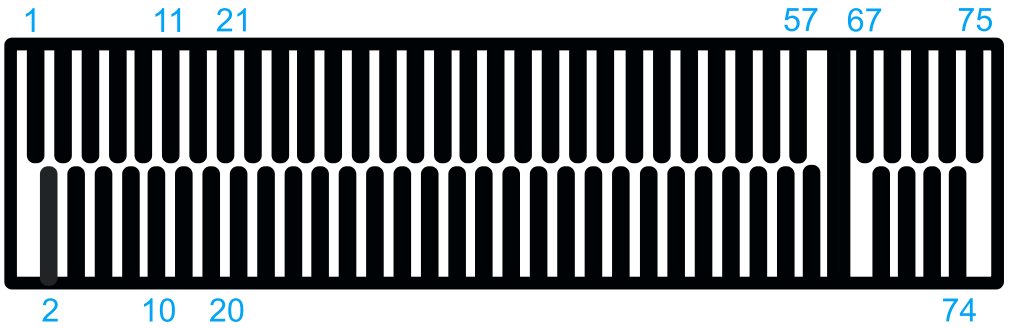


The system has an x4 PCIe M.2 2280 slot for you to install an NVMe SSD for the fast read/ write performance. An NVMe SSD offers significant performance advantages over 2.5” SSDs.

NOTE

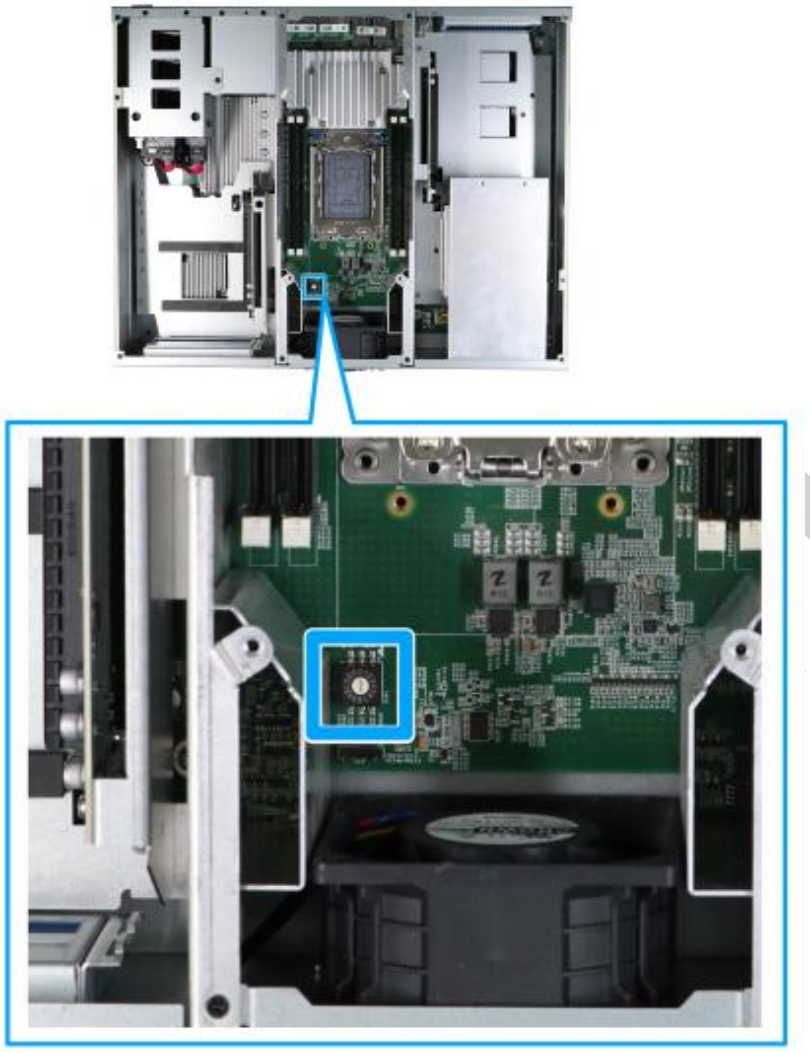
The M.2 2280 M key slot supports only PCIe signal.

M.2 (M Key) Slot Pin Definition



Pin #	Signal	Pin #	Signal
1	GND	**2**	+3V3
3	GND	**4**	+3V3
5	PERN3	**6**	-
7	PERP3	**8**	-
9	GND	**10**	DAS/DSS_N
11	PETN3	**12**	+3V3
13	PETP3	**14**	+3V3
15	GND	**16**	+3V3
17	PERN2	**18**	+3V3
19	PERP2	**20**	-
21	GND	**22**	-
23	PETN2	**24**	-
25	PETP2	**26**	-
27	GND	**28**	-
29	PERN1	**30**	-
31	PERP1	**32**	-
33	GND	**34**	-
35	PETN1	**36**	-
37	PETP1	**38**	-
39	GND	**40**	-
41	PERn0 / SATA-B+	**42**	-
43	PERp0 / SATA-B-	**44**	-
45	GND	**46**	-
47	PETn0 / SATA-A-	**48**	-
49	PETp0 / SATA-A+	**50**	PERST_N
51	GND	**52**	-
53	REFCLKN	**54**	-
55	REFCLKP	**56**	-
57	GND	**58**	-
Mechanical Key			
67	-	**68**	SUSCLK
69	PEDET	**70**	+3V3
71	GND	**72**	+3V3
73	GND	**74**	+3V3
75	GND		

2.3.9 Ignition Rotary Switch



The ignition power control switch features multiple modes for pre and post ignition settings. Please refer to the section Ignition Power Control for details.

3 System Installation

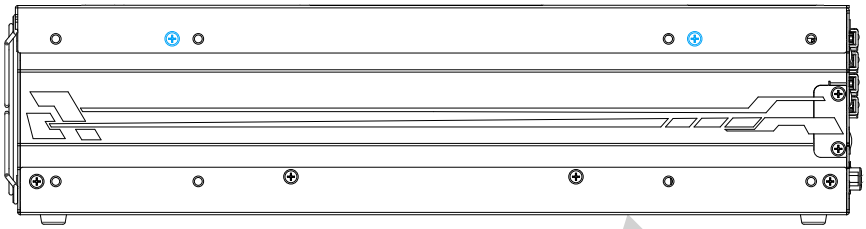
Before disassembling the system enclosure and installing components and modules, please make sure you have done the following:

- It is recommended that only qualified service personnel should install and service this product to avoid injury or damage to the system.
- Please observe all ESD procedures at all times to avoid damaging the equipment.
- Before disassembling your system, please make sure the system has powered off, all cables and antennae (power, video, data, etc.) are disconnected.
- Place the system on a flat and sturdy surface (remove from mounts or out of server cabinets) before proceeding with the installation/ replacement procedure.

3.1 Disassembling the System

To access system internal components, please refer to the instructions below to disassemble the enclosure.

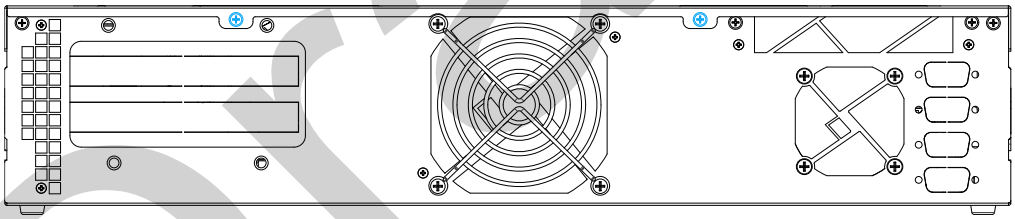
1. Remove the screws indicated on both sides of the enclosure.



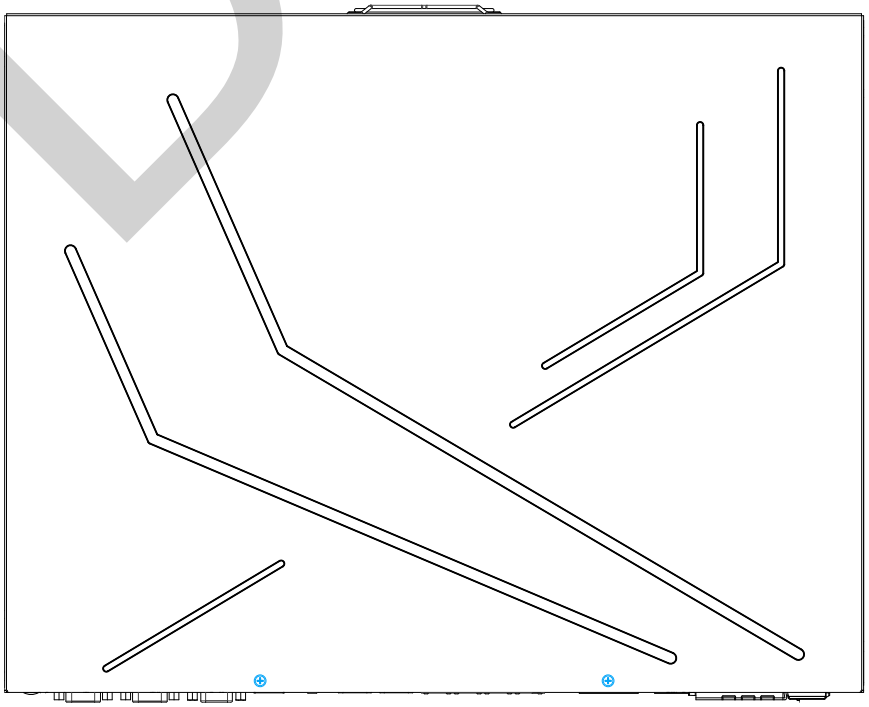
Left side (facing the I/O panel)

Right side (facing the I/O panel)

2. Remove the screws indicated on the rear panel.

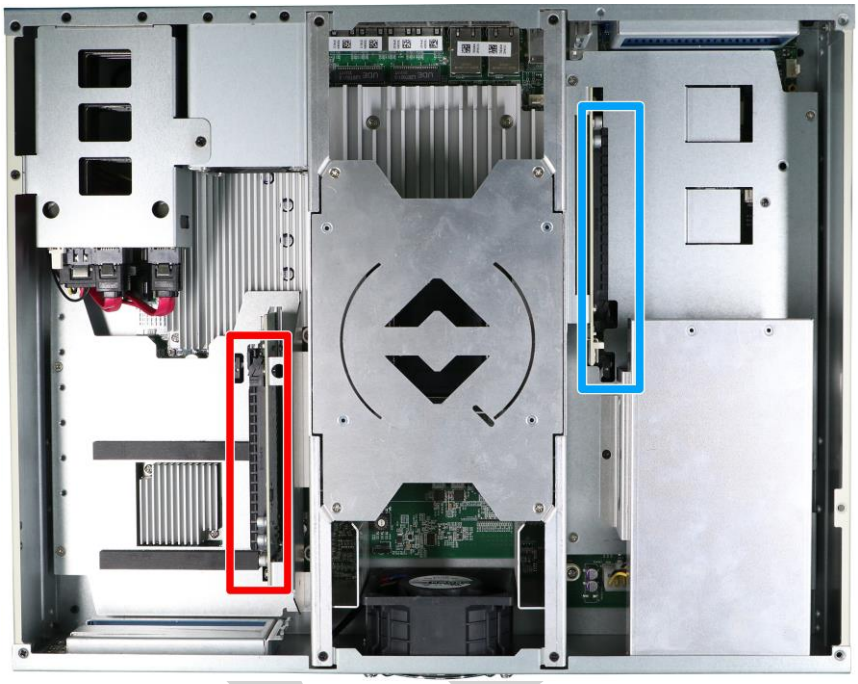


3. Remove the screws indicated on the top panel.

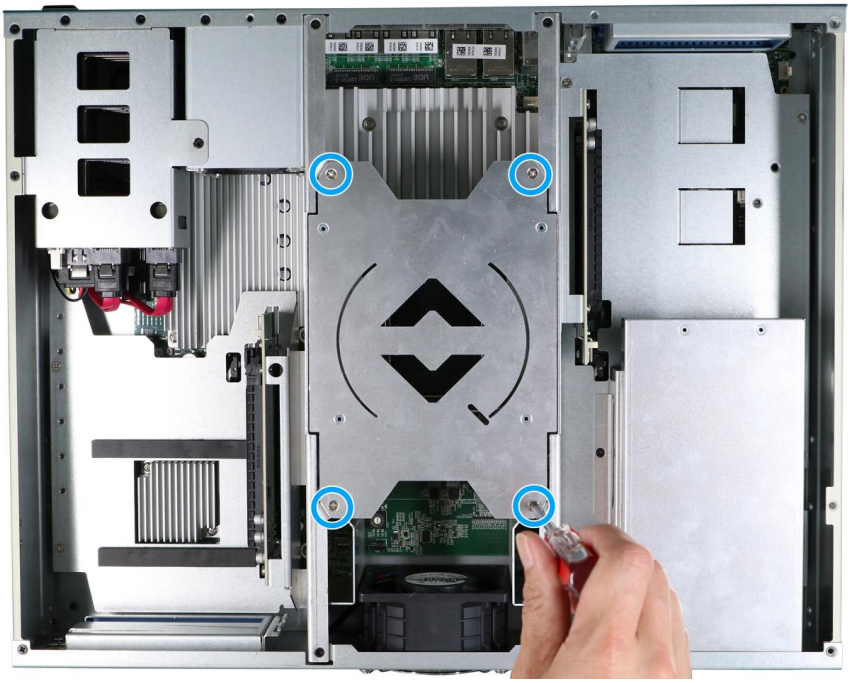


4. Slide the top panel towards the direction of the rear panel and lift the top panel to separate it from the enclosure.

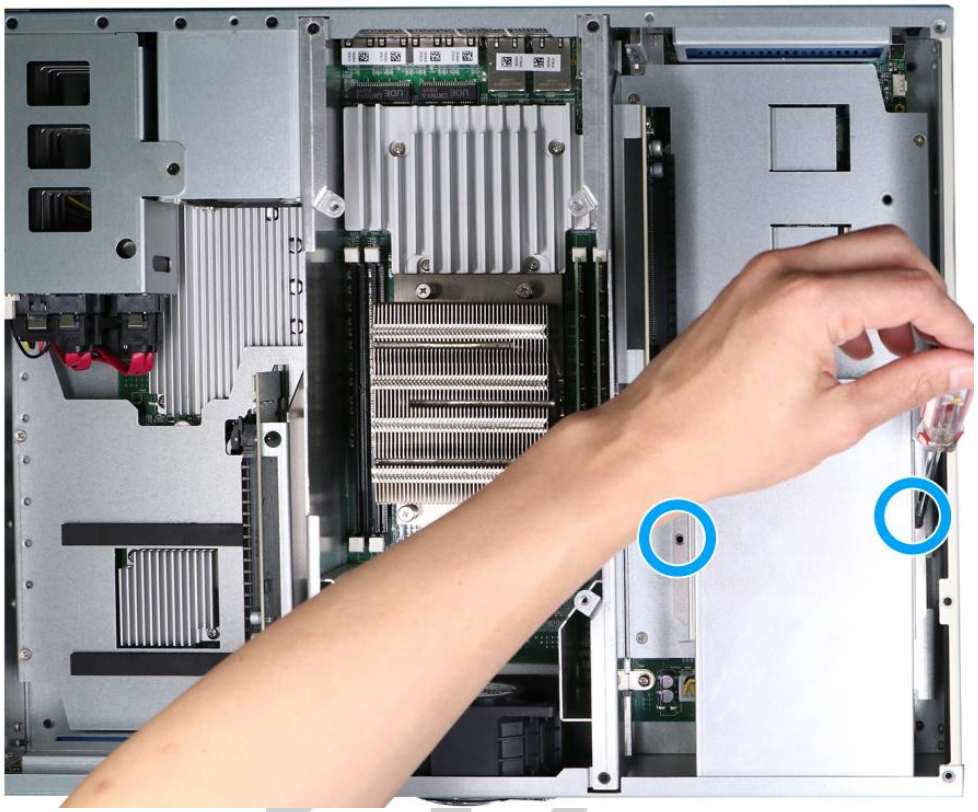
5. Once the top panel has been removed, you should see the PCIe slot for inference accelerator (indicated in **blue**), and the two PCIe slots for add-on card installation (indicated in **red**).



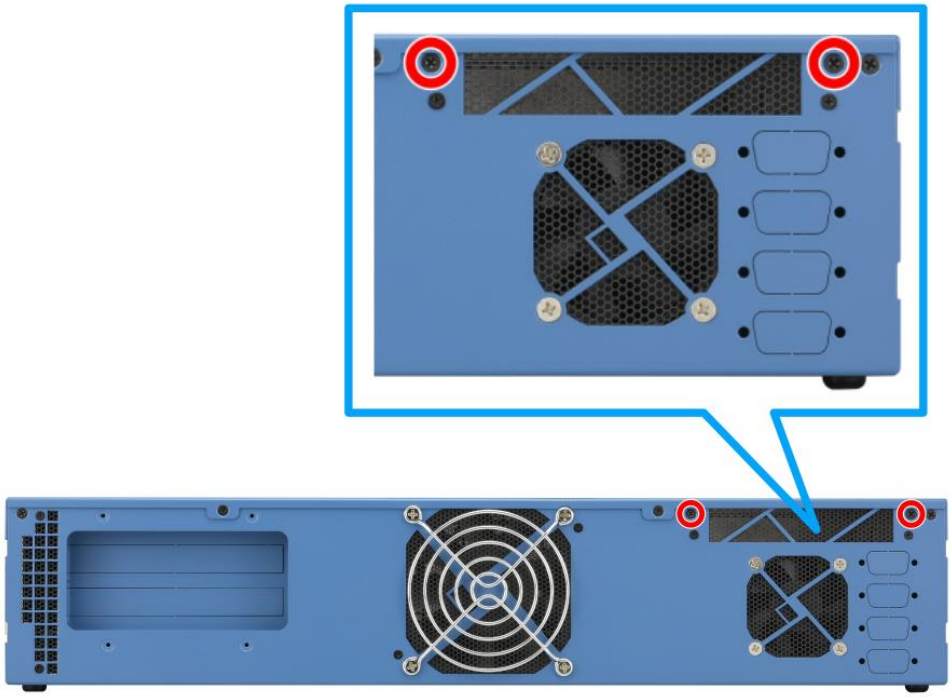
6. To access the CPU socket and DRAM slots, remove the four screws indicated and lift the cover.



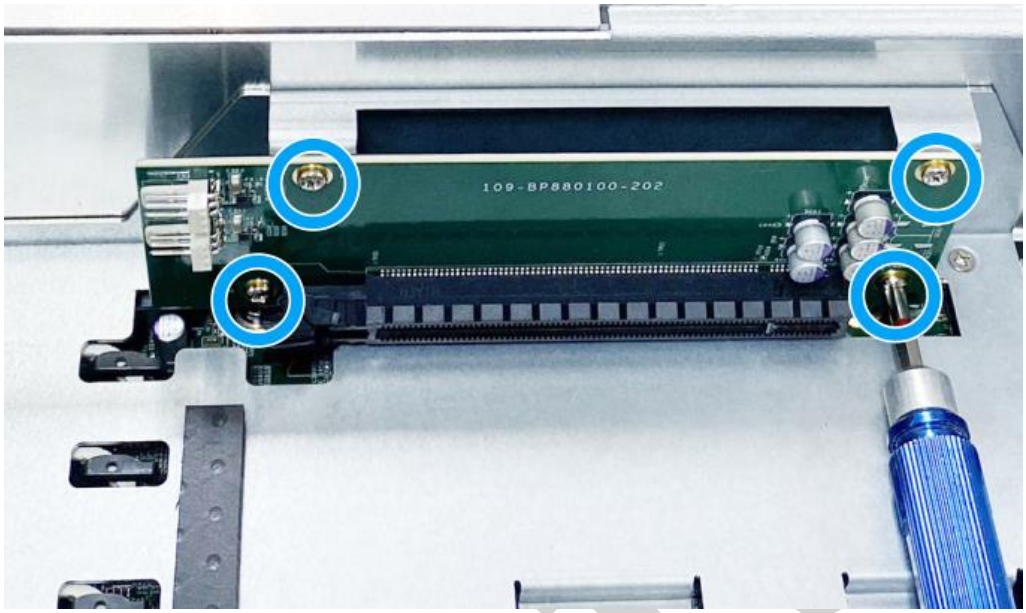
7. To access the mini-PCIe and M.2 slots, remove the internal screws for the tunnel duct.



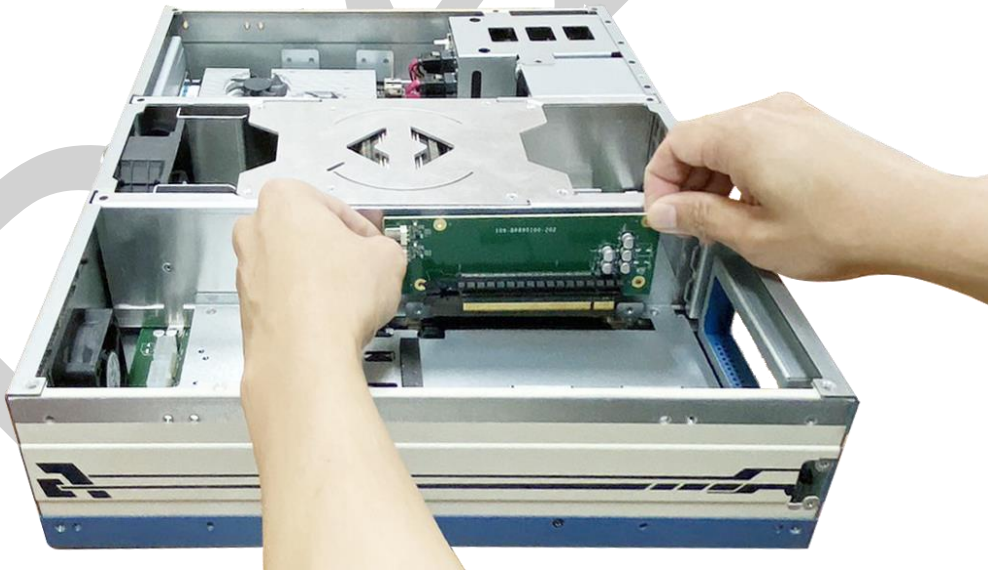
8. Remove the screws holding the tunnel duct at the rear, and remove the duct itself.



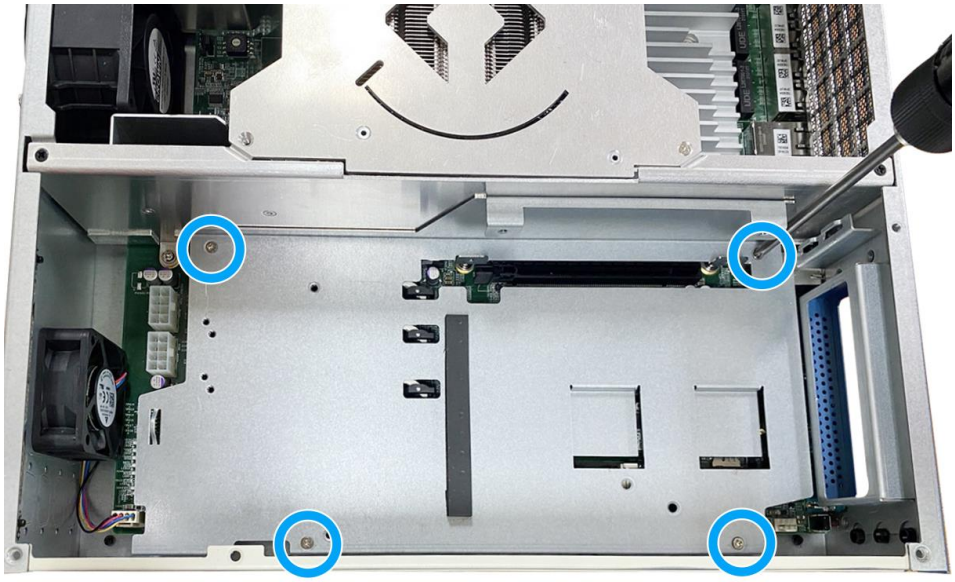
9. With the duct removed, remove the four screws holding the PCIe riser card.



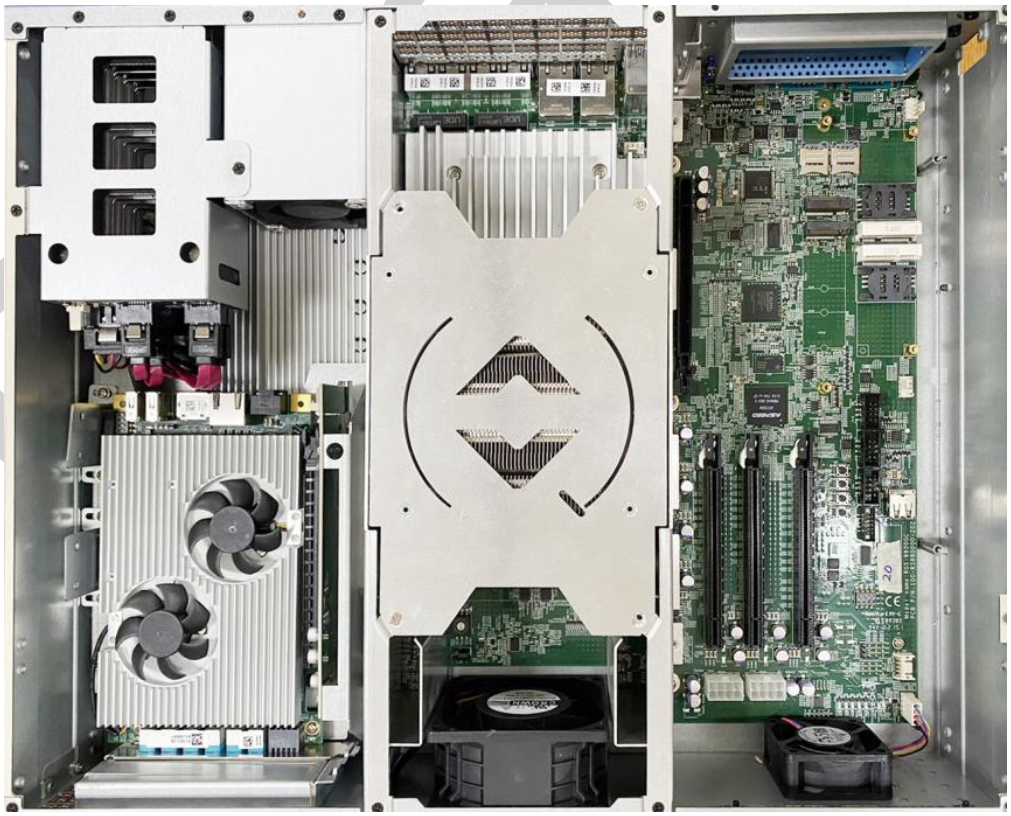
10. Gently wiggle and separate the riser card from the motherboard.



11. Remove the four screws indicated on the platform.



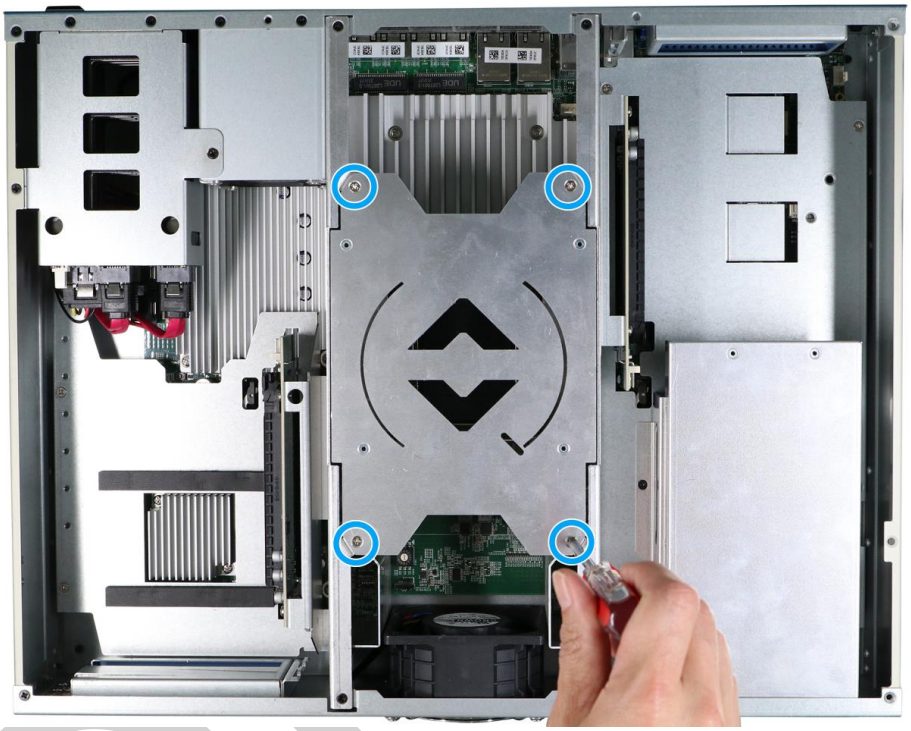
12. Gently wiggle and remove the platform, and you should see the system's M.2, mini-PCIe, and SIM slots.



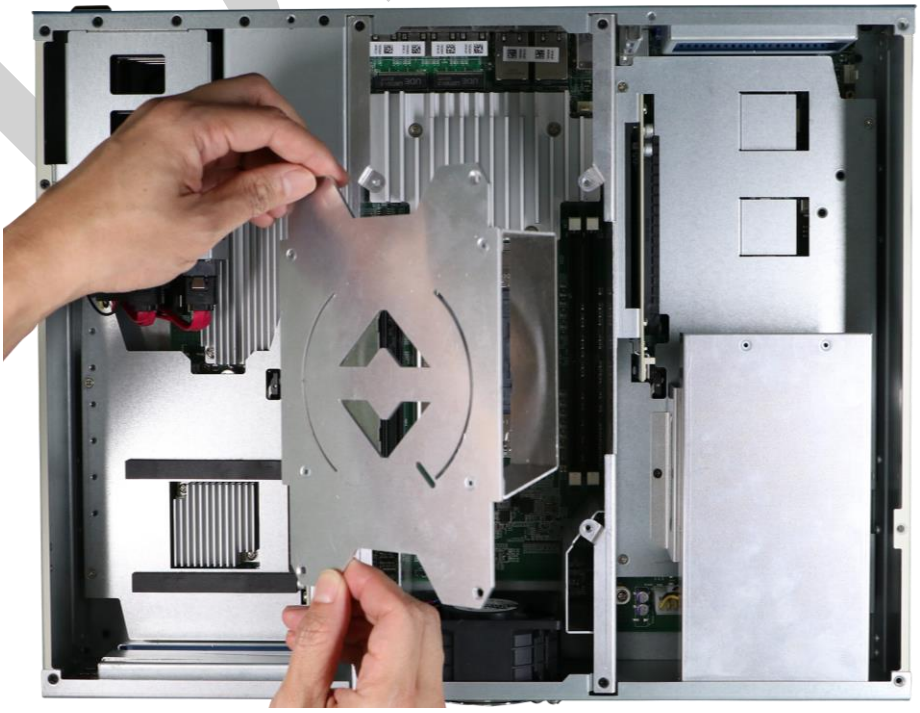
3.2 Installing Internal Components

3.2.1 CPU Installation Procedure

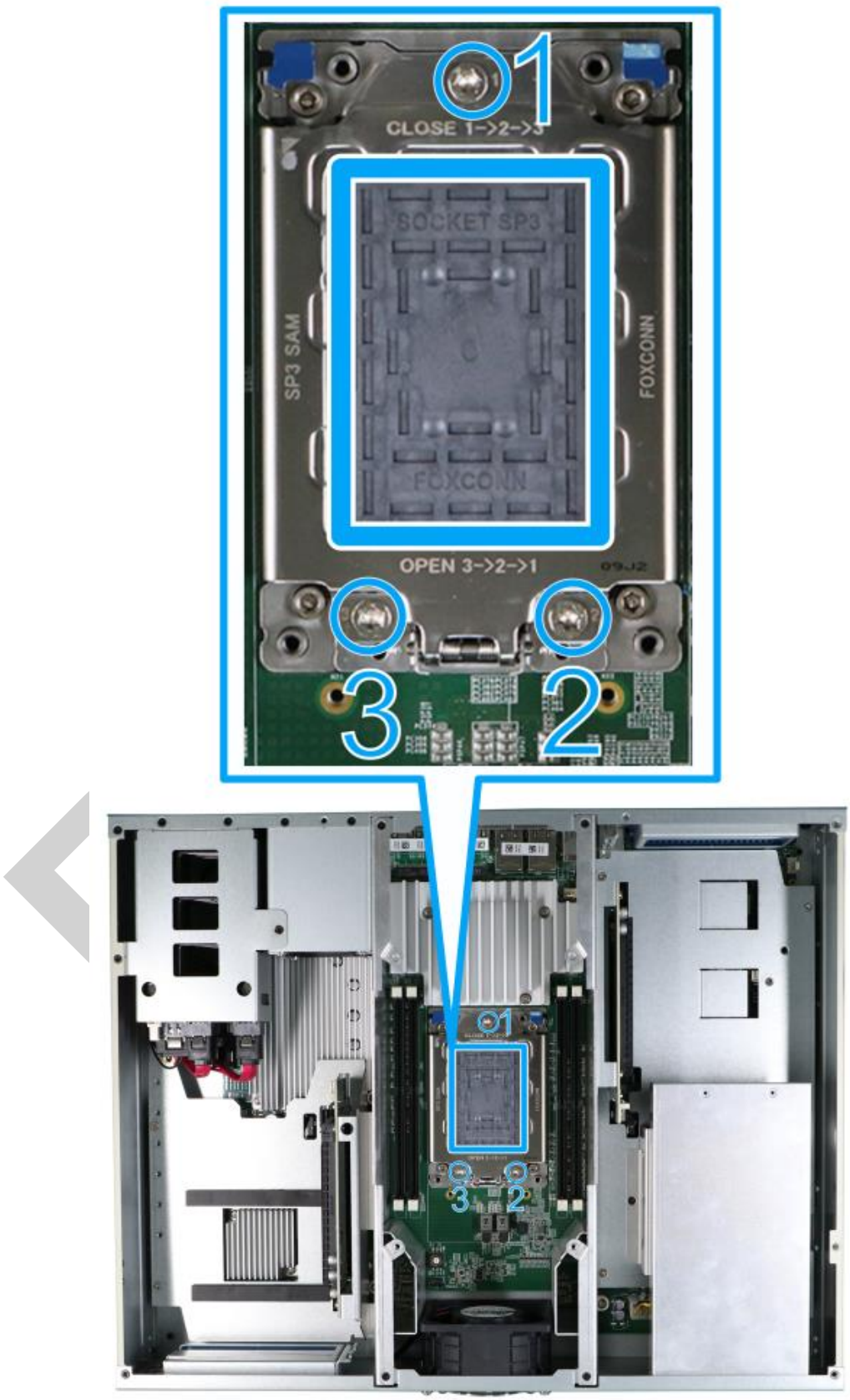
1. To gain access to internal components, please refer to the section “Disassembling the System”.
2. To gain access to the CPU socket, remove the four screws indicated.



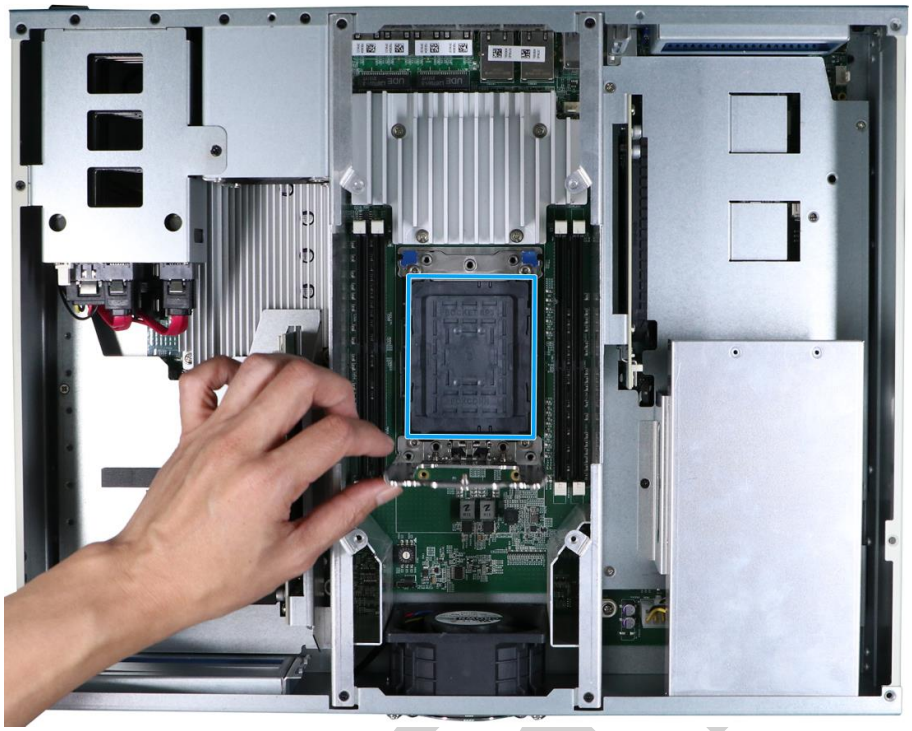
3. Remove the CPU socket / DRAM cover.



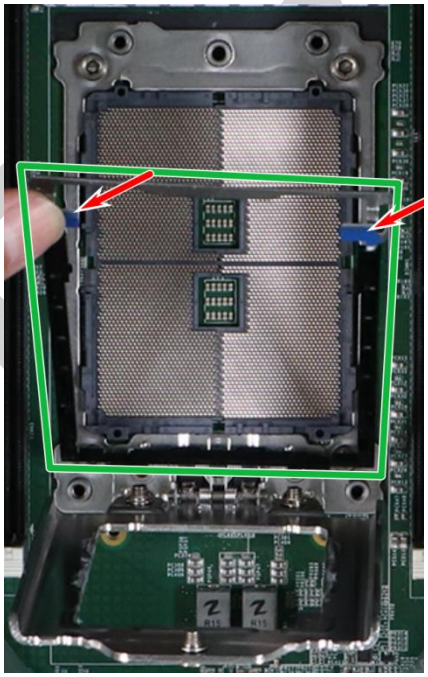
4. To open the CPU load plate and remove the CPU cover (indicated in **blue**), loosen the three Torx screws in the order 3->2->1.



5. Lift the CPU load plate, and gently remove the CPU socket protective cover.



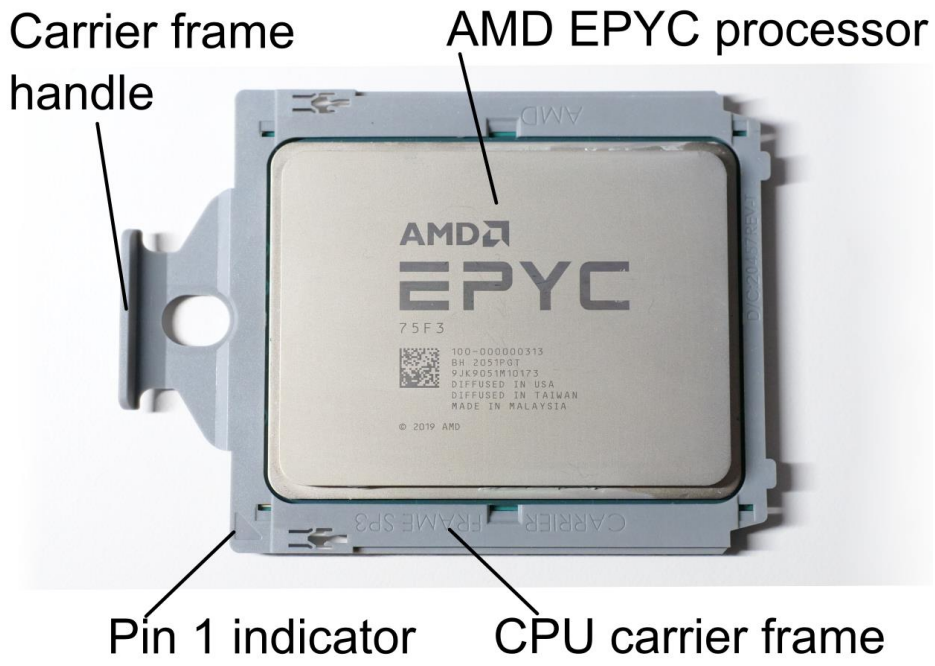
6. Gently pull the **blue tab** (indicated by the **red arrows**) to lift the CPU frame rail (indicated in **green**).



WARNING

With the protective cover removed, please be careful when handling the motherboard. DO NOT touch the pins in the socket!

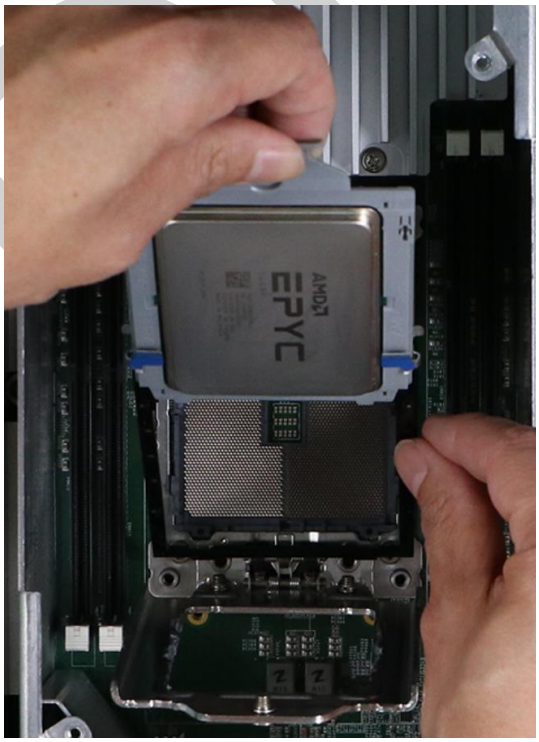
7. Retrieve the CPU and carrier frame out of the CPU container.



NOTE

DO NOT *separate the CPU carrier frame from the CPU. They must be inserted into the CPU frame rail together upon installation.*

8. Holding the carrier frame holder, insert the CPU into the CPU frame rail.

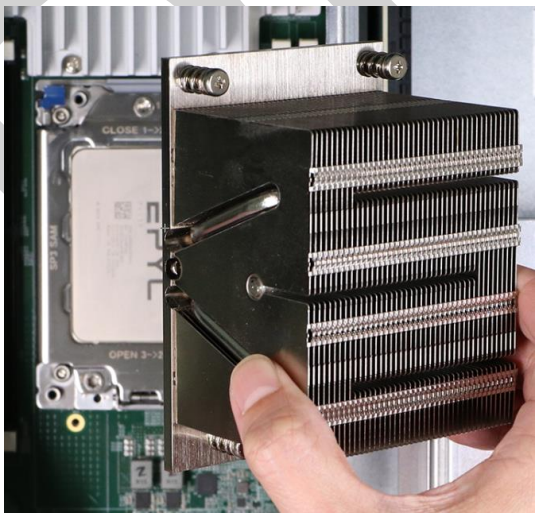


Insert into CPU frame rail

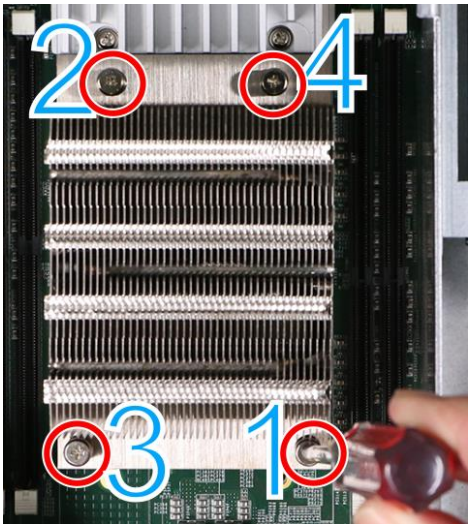
Make sure it is inserted properly

9. Gently lower the CPU frame rail and CPU onto the socket, and lower the CPU load plate. Secure the CPU into place by tightening the Torx screws in the order 1->2->3.

10. Remove the thermal paste protection film on the bottom of the CPU heatsink, lower the CPU heatsink onto the CPU/ socket, and secure the four screws. Make sure the screws are tightened gradually in the following order to ensure even pressure.

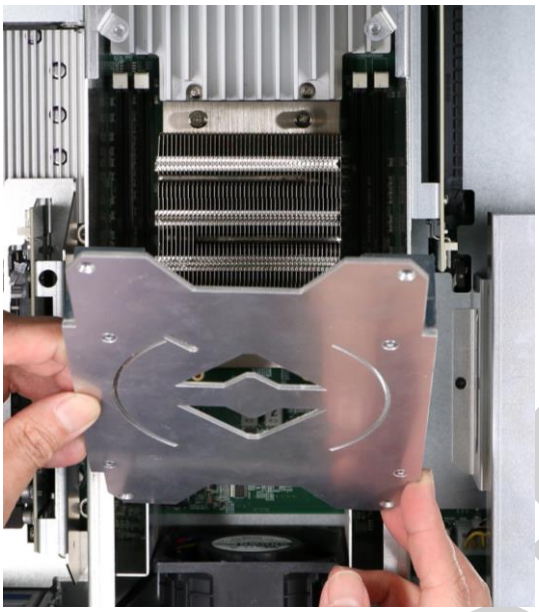


Lower the heatsink



Secure the heatsink

11. Place the CPU socket/ DRAM slot cover back on, and secure it with screws at the indicated locations.



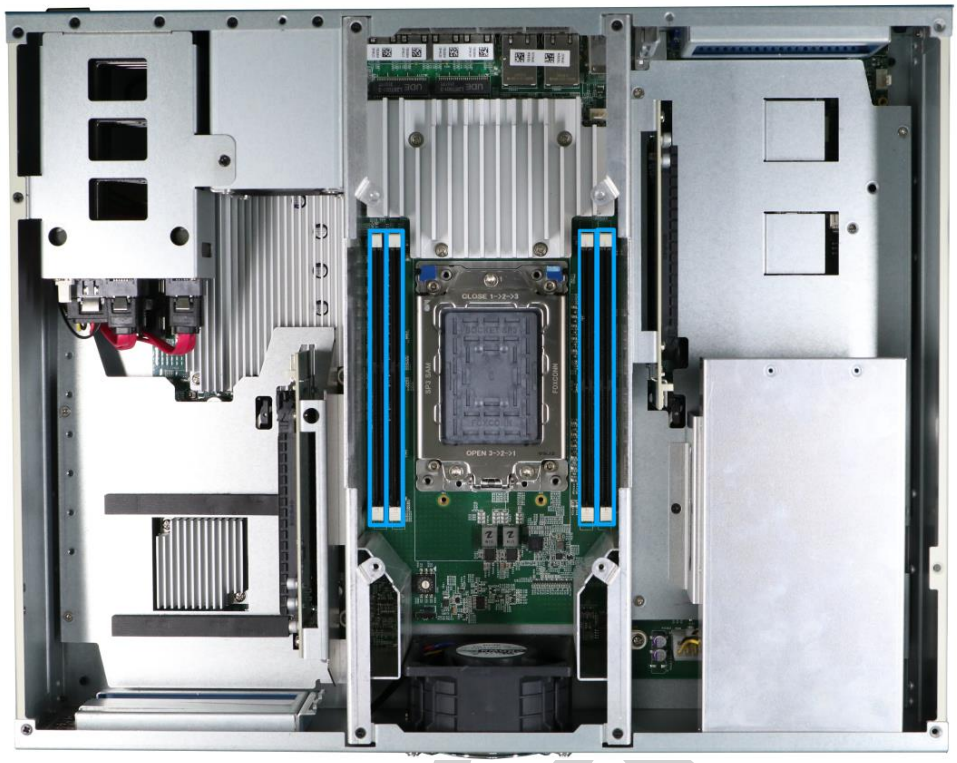
Place and secure the cover

Secure the cover

12. Reinstall the system panels module when done.

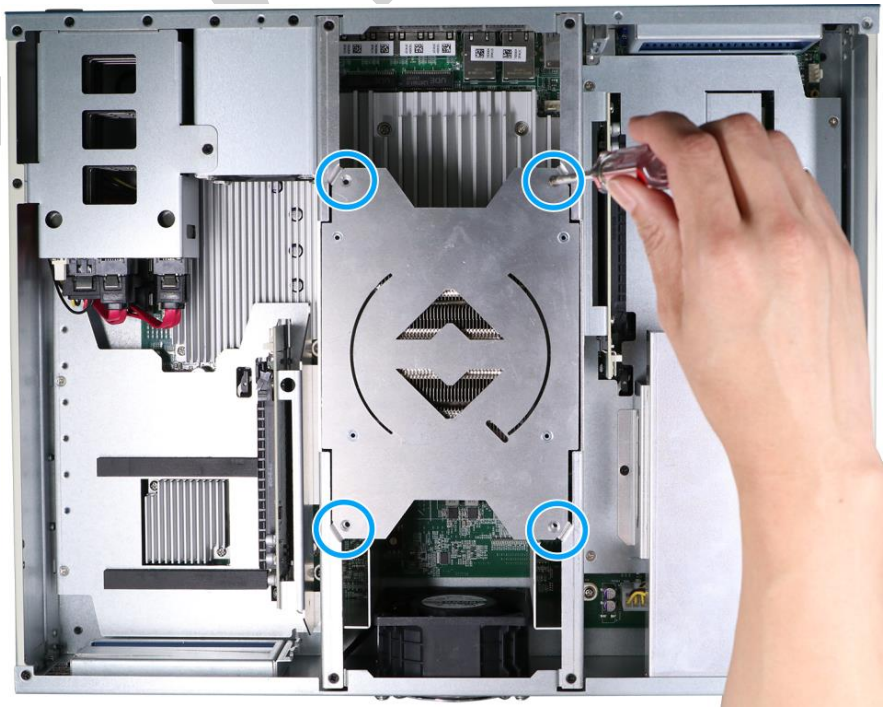
13. If you need to install other components, please refer to respective sections.

3.2.2 Registered DDR4 Module Installation

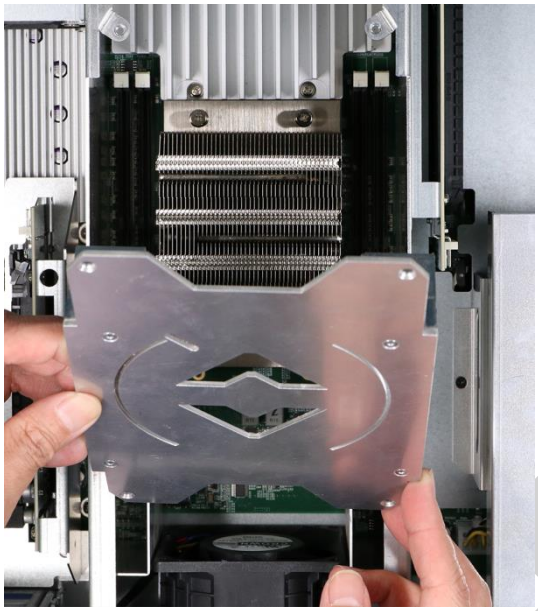


There are four DIMM memory slots (indicated in **blue**) on the motherboard that supports a total maximum of registered 512GB DDR4-3200. Please follow the procedures below to install the memory modules.

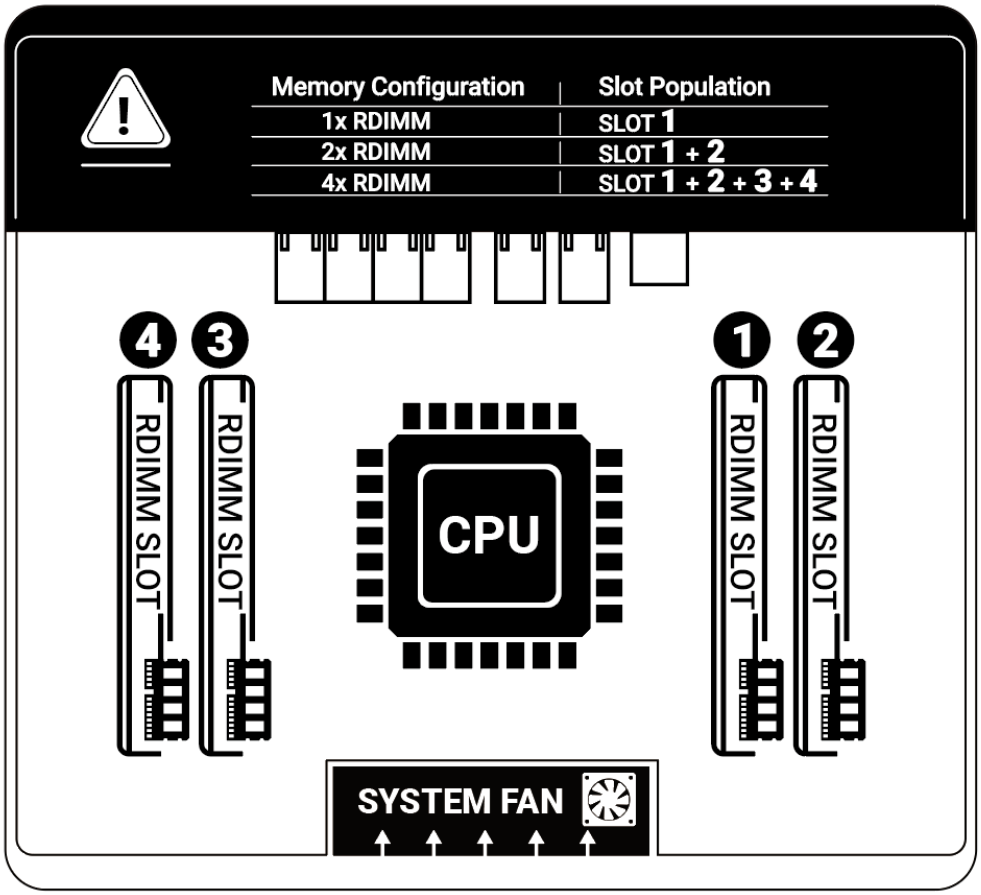
1. To gain access to internal components, please refer to the section "Disassembling the System".
2. To gain access to the DRAM slots, remove the four screws indicated.



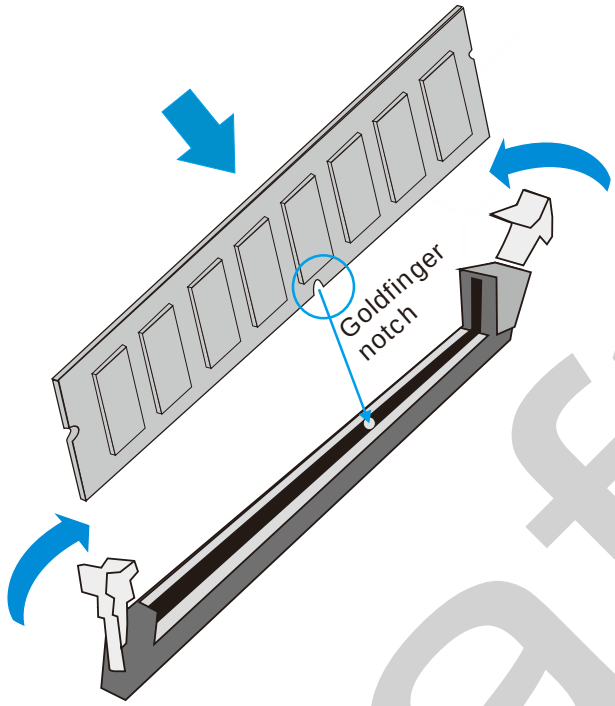
3. Remove the CPU socket / DRAM cover.



4. Depending on the number memory module(s) you are installing, the module(s) must be installed into particular slots. Please refer to the following illustration.

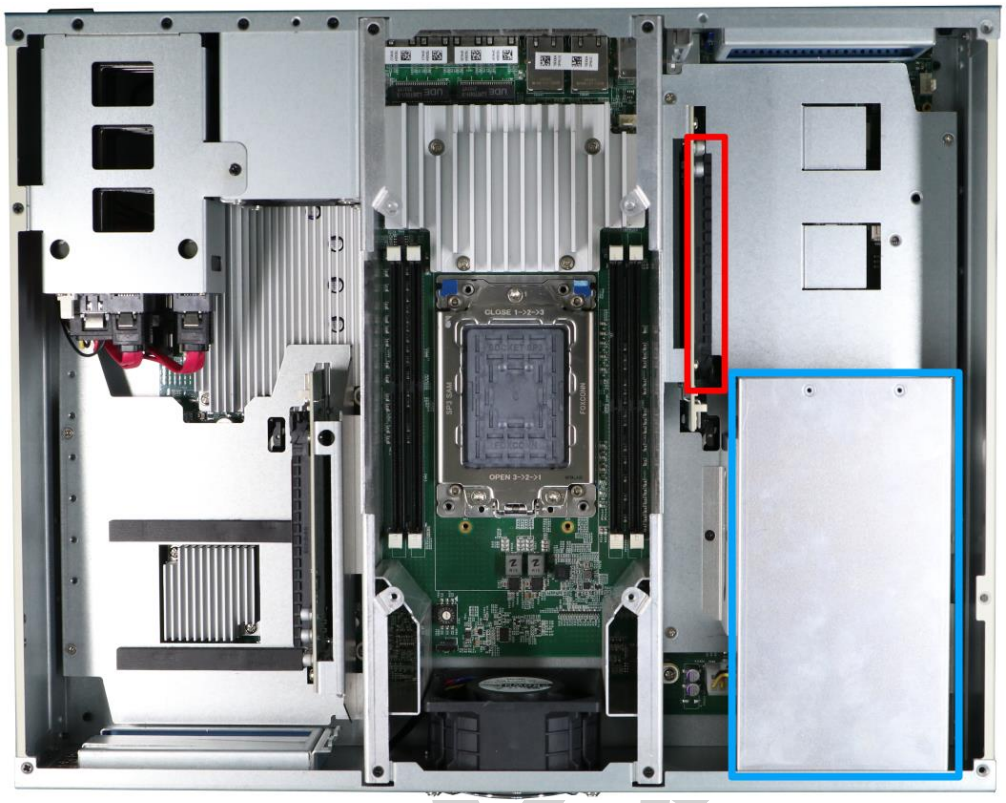


5. To install the memory module, match the goldfinger notch to the position on the slot, insert DRAM's gold fingers into the slot at a perpendicular angle, push the memory module down until clips on the sides clip the module into position.



6. Repeat step 5 to install other modules.
7. Reinstall the system enclosure and panel when done.
8. If you need to install other components, please refer to respective sections.

3.2.3 Inference Accelerator Installation

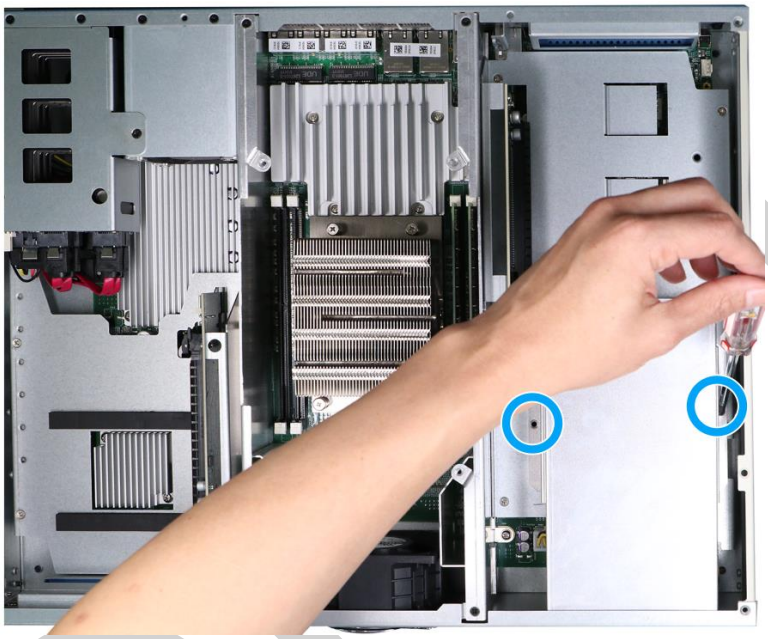


The system has a PCIe x16 (indicated in **red**) that supports an NVIDIA A6000 or A4500 inference accelerator to provide up to 38.7 TFLOPS FP32 or 309.7TFLOPS tensor performance. There is also a dedicated inference accelerator bracket (indicated in **blue**).

1. To gain access to internal components, please refer to the section "Disassembling the System".
2. Remove the punch-out panel for the inference accelerator on the I/O panel.

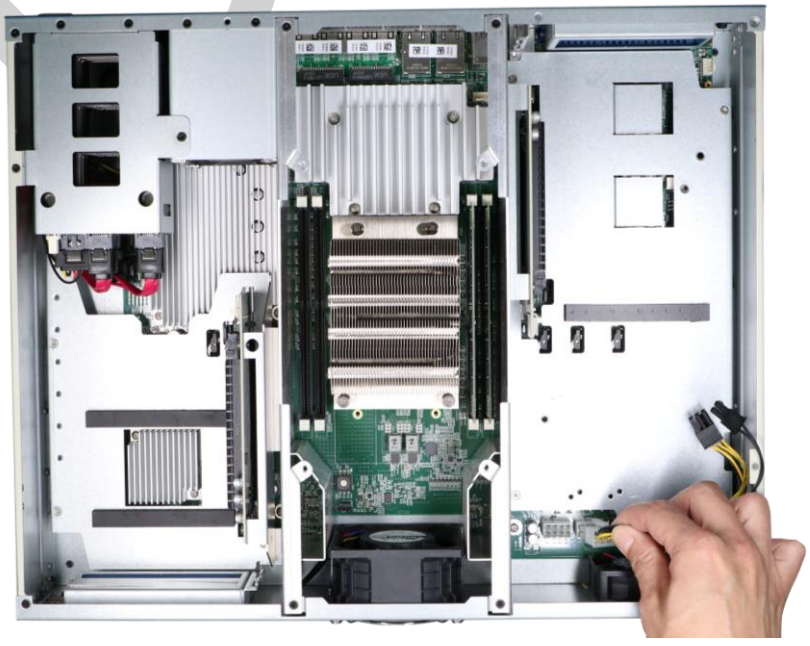
3. To install the inference accelerator, uninstall the tunnel duct by removing the screws shown.

Screws on the rear fan panel

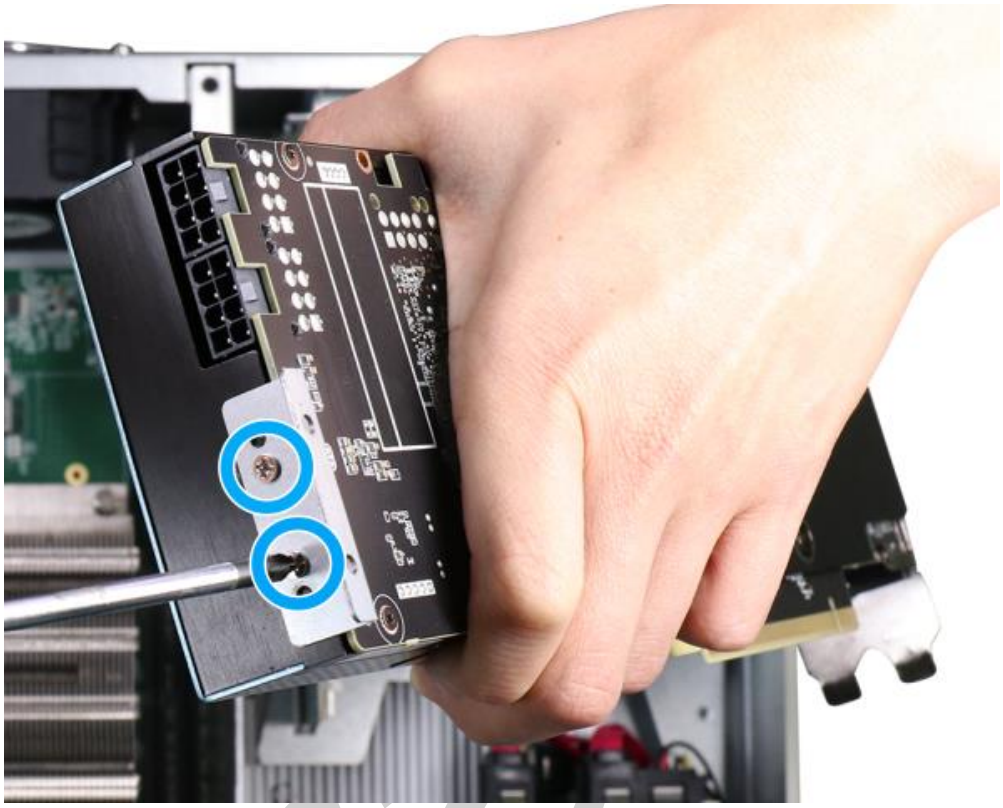


Screw on the side of the tunnel duct

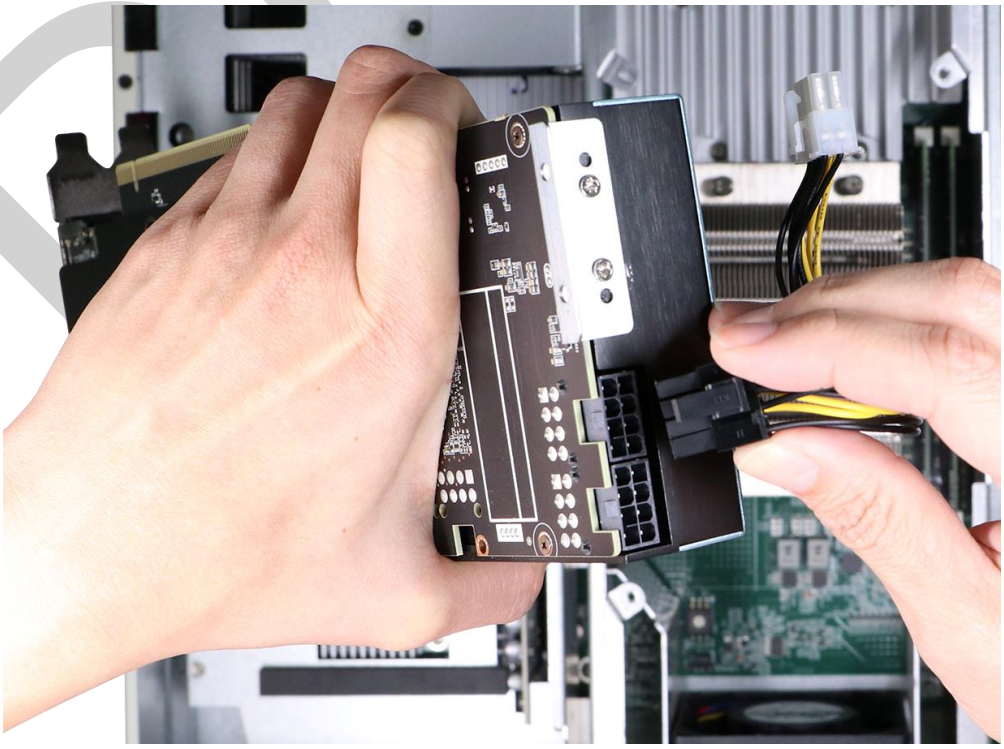
4. Remove the tunnel duct and unplug the supplied inference accelerator power cable from the motherboard end.



5. Take the inference accelerator out of its box/ static bag, and attach the L-shape stopper to the power connector end of the inference accelerator.

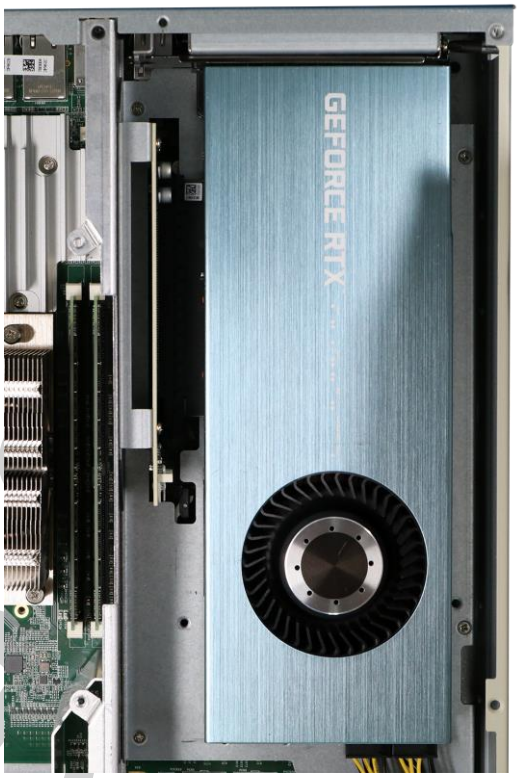


6. Connect the unplugged power cables from the motherboard to the inference accelerator.



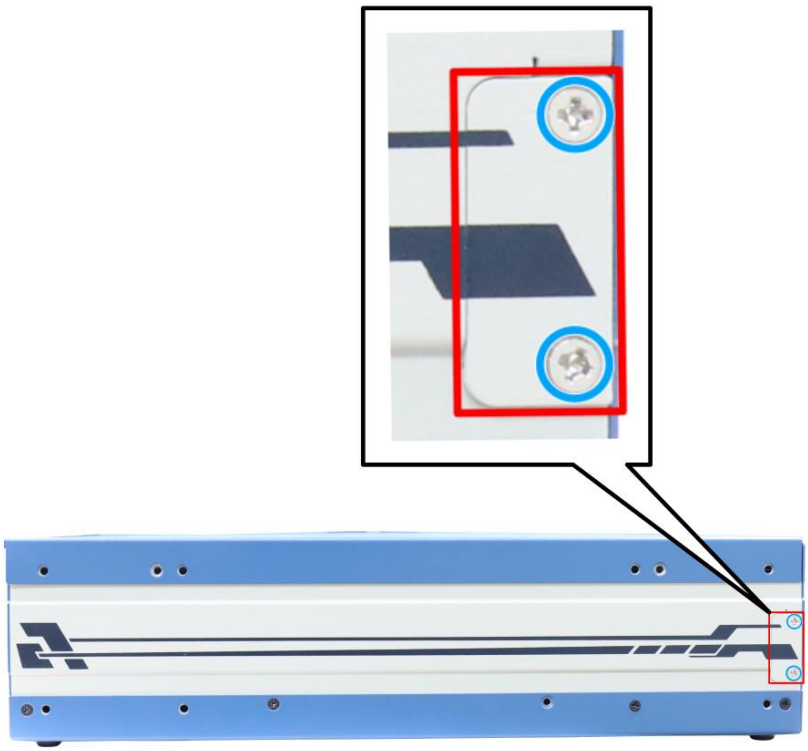
7. With the power cable end facing the fan side, align and insert the goldfingers of the inference accelerator to the PCIe x16 slot.

Align the goldfingers



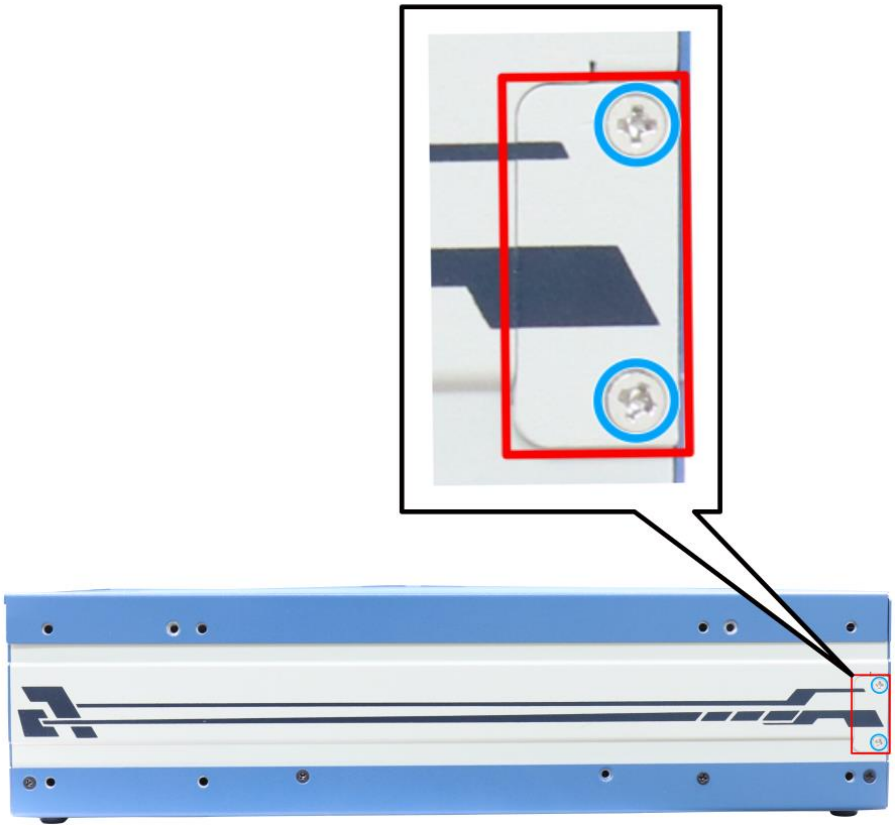
Fully insert the goldfingers

8. Remove the screws (indicated in **blue**) on the side panel, and the remove the trap door (indicated in **red**).

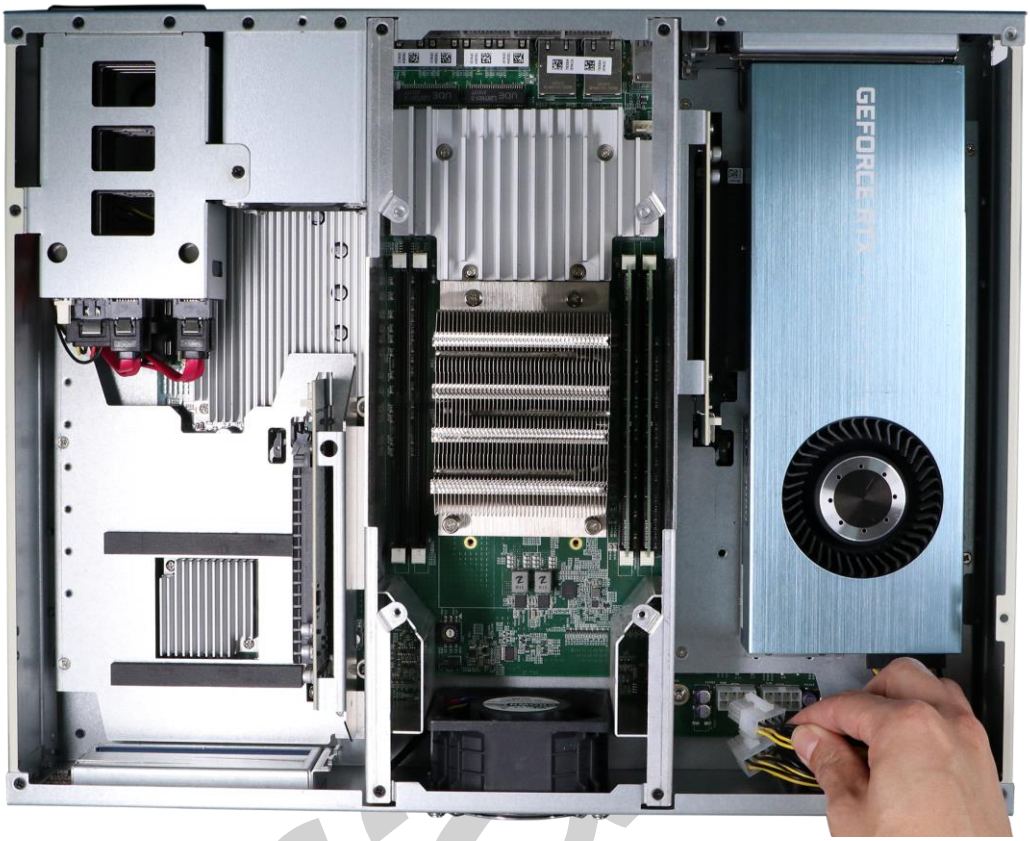


9. Secure the inference accelerator's panel with a screw.

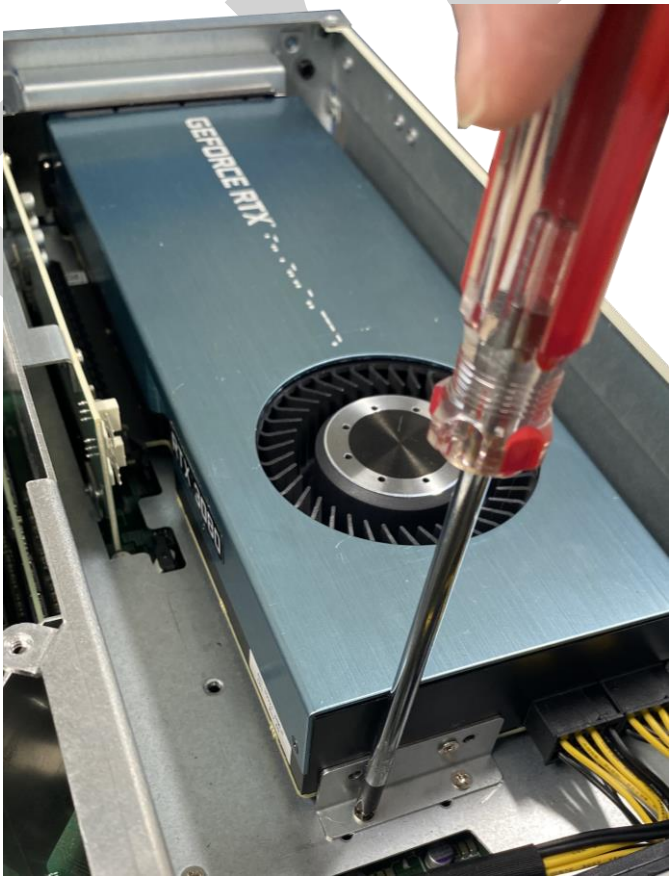
10. Place the trap door (indicated in **red**) back onto the side panel and secure with screws (indicated in **blue**).



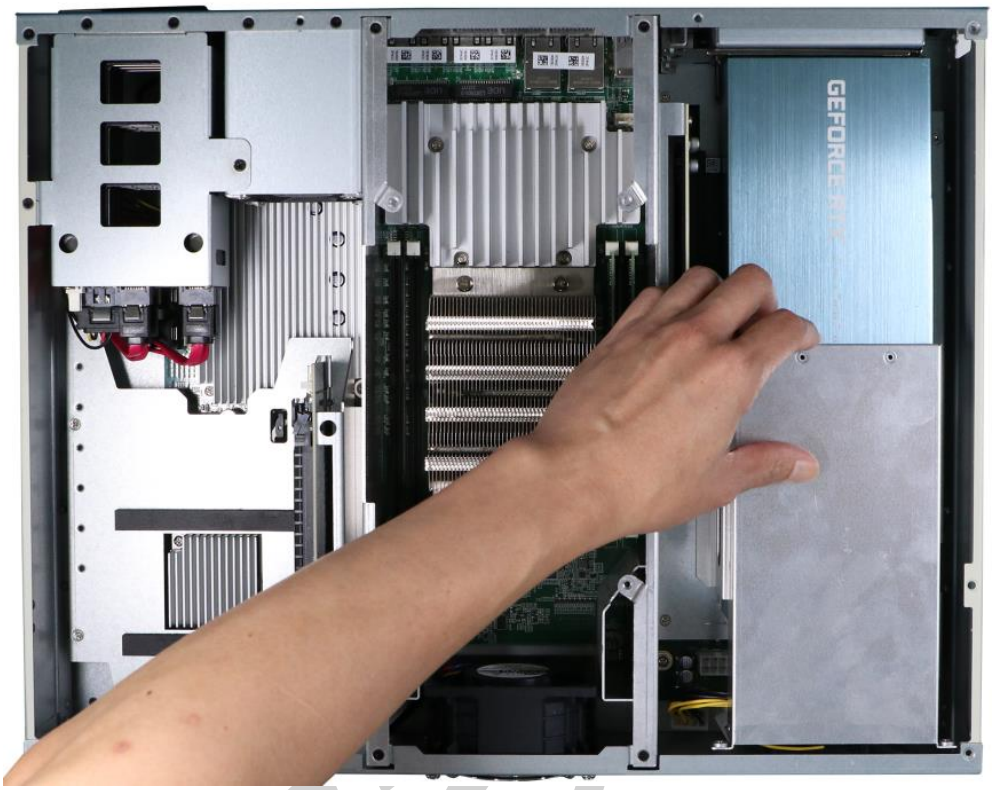
11. Connect the inference accelerator power cables to the motherboard.



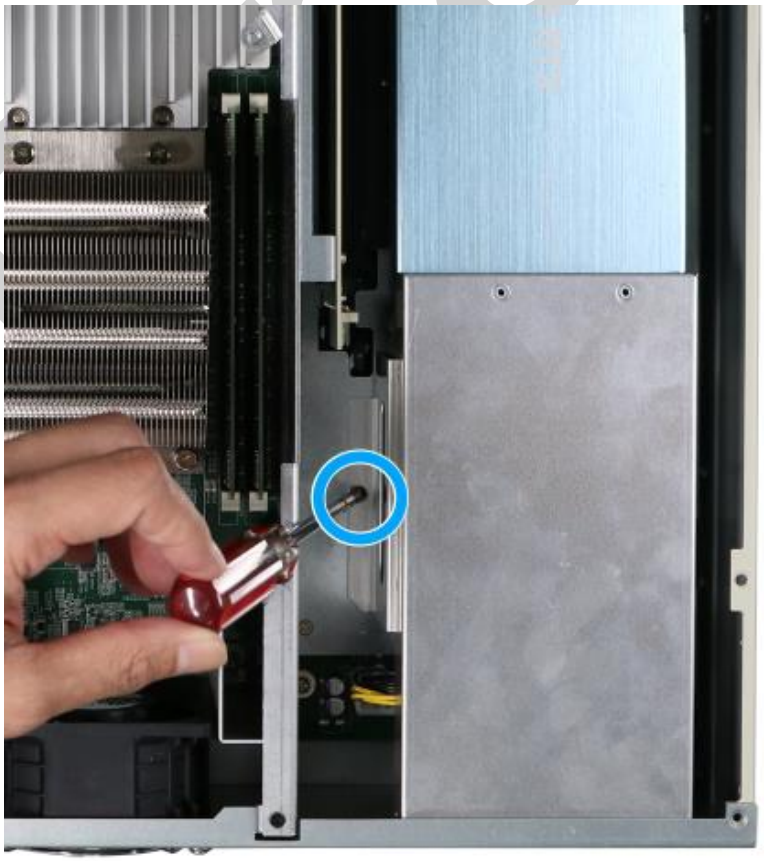
12. Secure the L-shape stopper at the end of the inference accelerator.



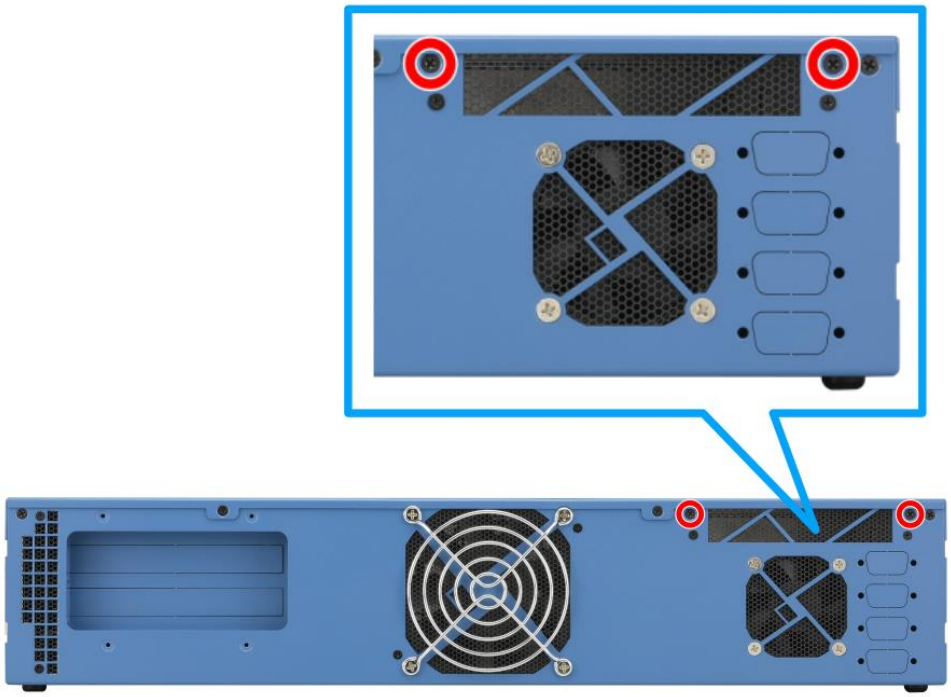
13. Place the tunnel duct back onto the inference accelerator and secure the screws indicated.



14. Secure the screw on the side of the tunnel duct.

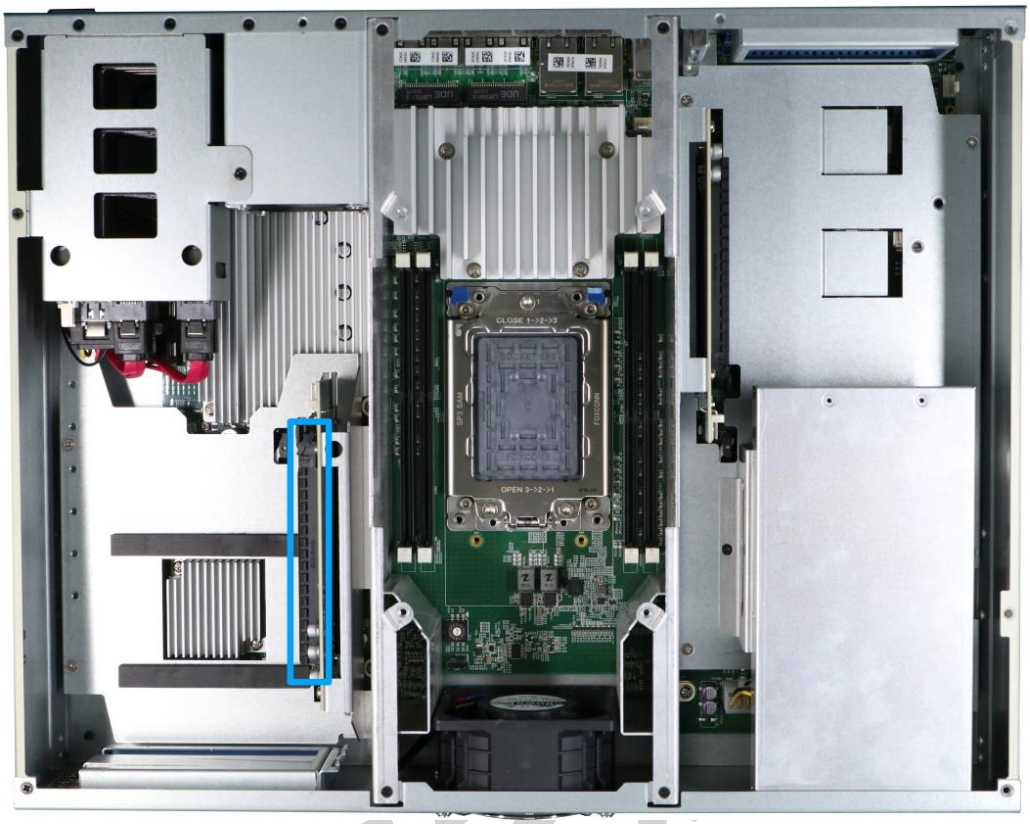


15. Secure the external screws for the tunnel duct on the rear panel to complete the inference accelerator installation.



16. Reinstall the system enclosure and panel when done.
17. If you need to install other components, please refer to respective sections.

3.2.4 PCIe x16 Gen4 8-lanes Add-on Card Installation

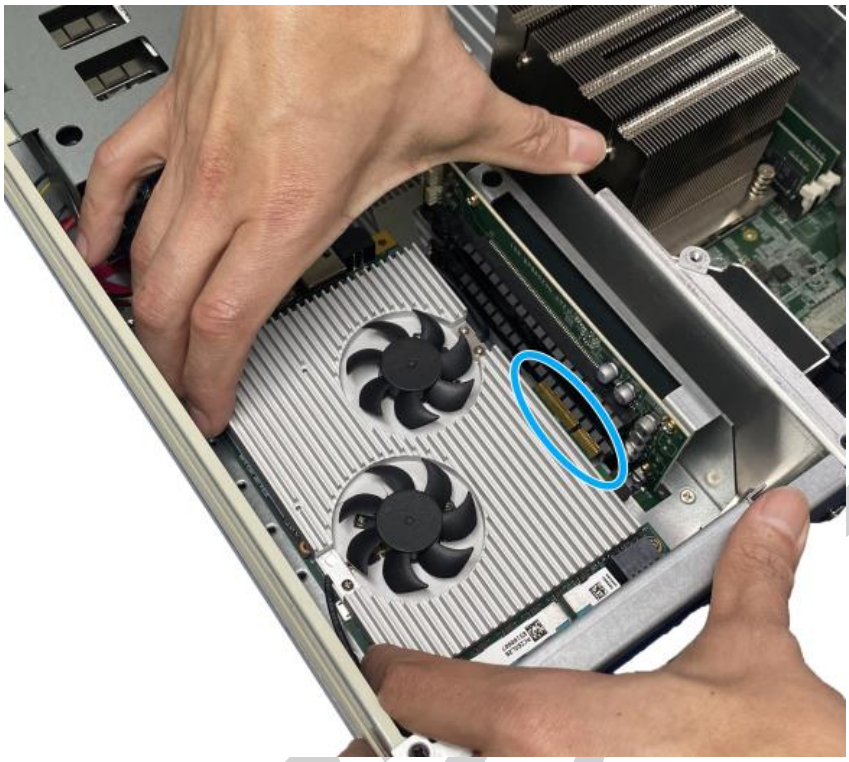


The system has two slots that are PCIe x16 Gen4 8-lanes (indicated in **blue**) for installing add-on cards, for additional I/O expansion or function cards (eg. frame grabber card).

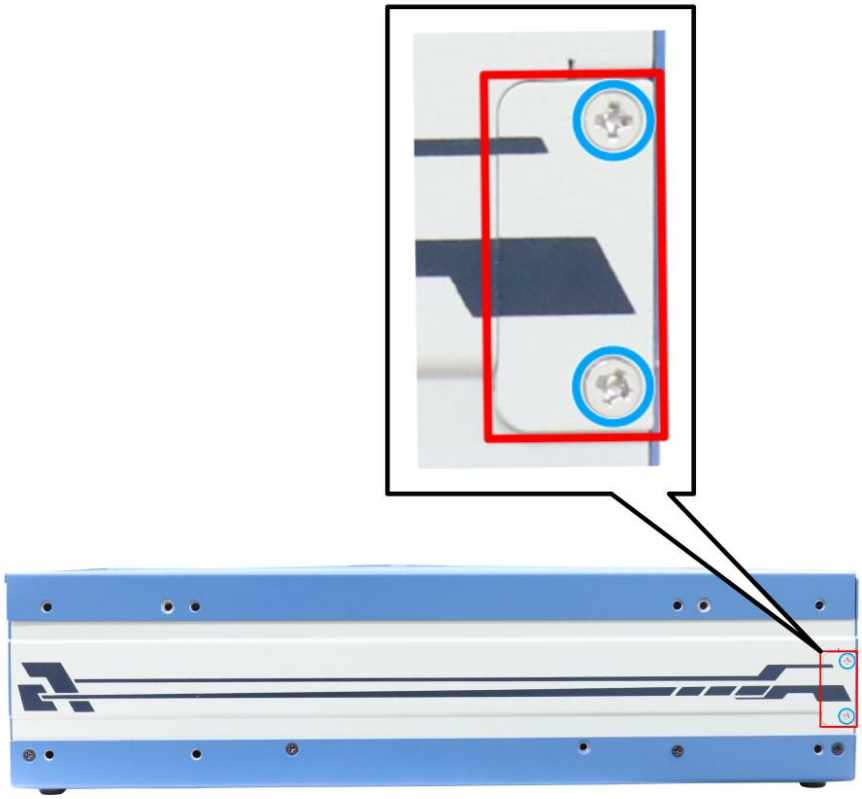
> **NOTE**
>
> *The Neousys PCIe-GL26 GMSL2 frame grabber card will be used for this installation demonstration.*

1. To gain access to internal components, please refer to the section "Disassembling the System".
2. Remove the punch-out panel for the PCIe card on the rear panel.

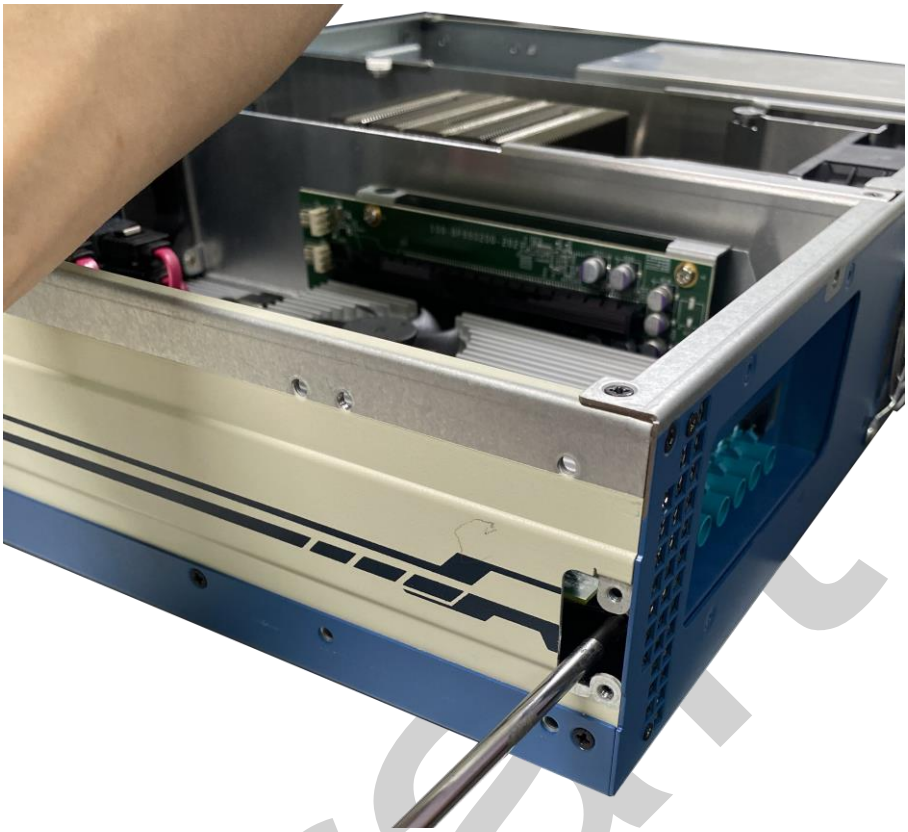
3. Take the PCIe card out of its box/ static bag, align and insert the goldfingers into the PCIe slot. There are two slots available, it is recommended to install into the bottom slot first.



4. Remove the screws (indicated in **blue**) on the side panel, and the remove the trap door (indicated in **red**).



5. Secure the PCIe card panel with a screw through the trap door.

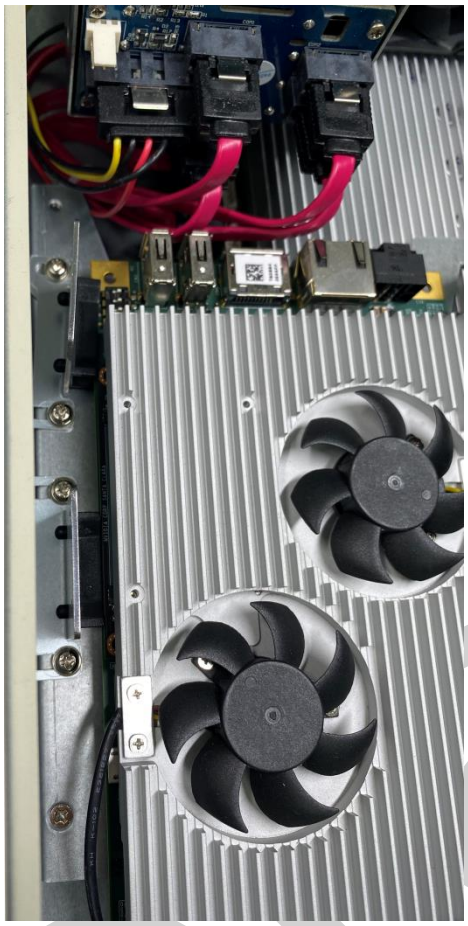


6. For a standard full-size PCIe card, there are L-shaped stopper brackets in the accessory box for securing the add-on card in place. Depending on the size of your add-on card, locate the appropriate screw-holes for placement. Secure two screws to position the stopper bracket in-place.

Screw-hole locations

Secure the L-shaped bracket

7. Secure at least one L-shape bracket towards the middle or mid-rear end of the PCIe card to complete the add-on PCIe card installation.

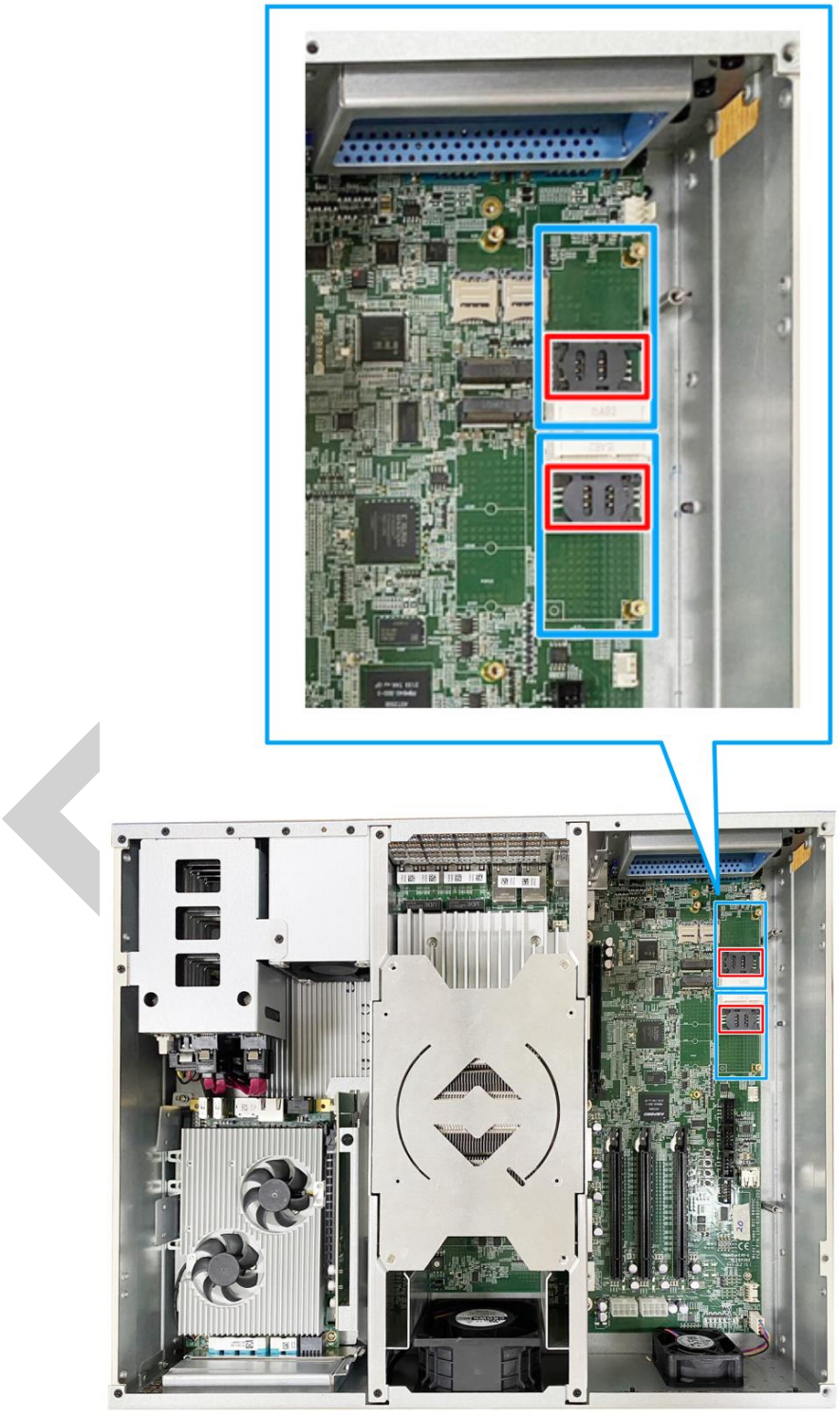


8. Reinstall the system enclosure and panel when done.
9. If you need to install other components, please refer to respective sections.

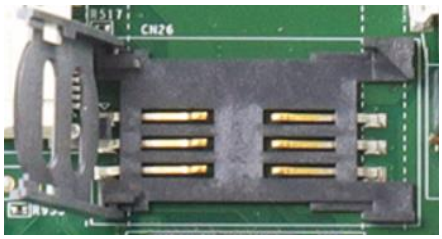
3.2.5 mini-PCIe Module, Mini-SIM (2FF) Card and Antenna Installation

The system has two mini-PCIe slots (indicated in **blue**) coupled with mini-SIM socket (indicated in **red**) for installing 3G/ 4G module. For installation, please refer to the following instructions.

1. Please refer to the section "Disassembling the System".
2. Locate the mini-PCIe and SIM card slots on the motherboard.



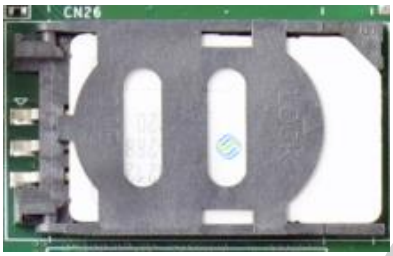
3. Before installing the mPCIe module, you need to insert the mini-SIM card. Slide the SIM slot holder and lift the SIM card holder. Insert the mini-SIM card (pins facing up), shut the SIM holder and slide it to lock the SIM card in-place.



Slide and lift SIM card holder

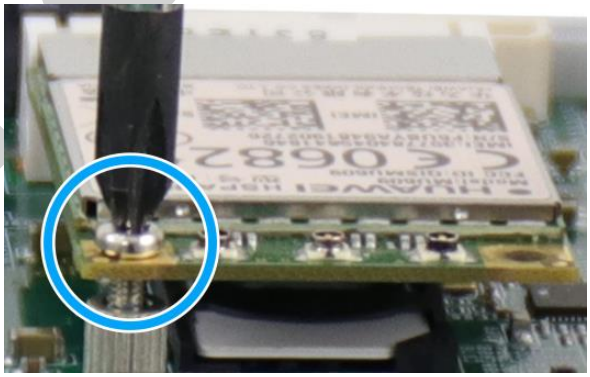
Insert mini-SIM card with pins facing up

4. Secure the Mini-SIM card by sliding the holder.



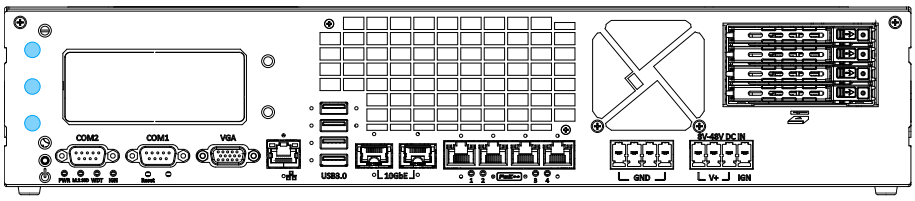
5. Insert the mPCIe module on a 45 degree angle into the mPCIe slot and secure the module.

Insert on 45 degree angle

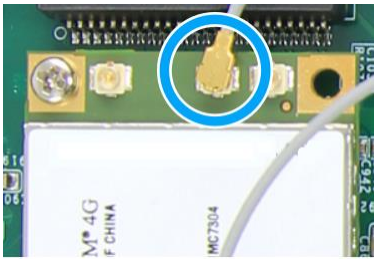


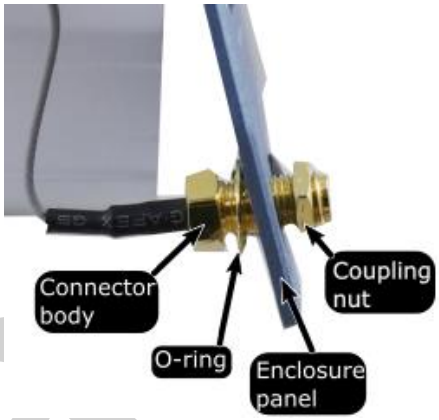
Secure the module

6. Clip on the IPEX-to-SMA cable to the module and secure the antenna to the front panel. Please refer to the module's manual for clip-on connection.



Antenna aperture on the I/O panel



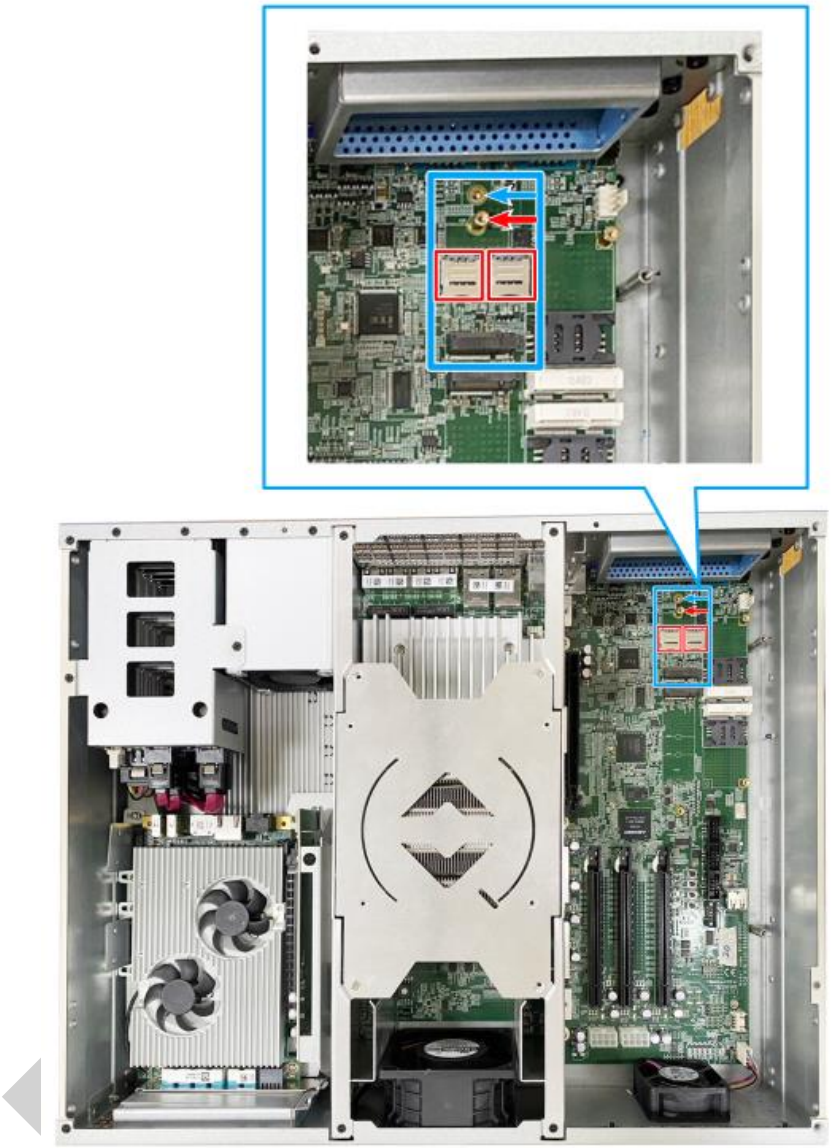


Clip on IPEZ-to-SMA cable **Secure antenna to rear panel**

7. Reinstall the system enclosure and panel when done.

8. If you need to install other components, please refer to respective sections.

3.2.6 M.2 2242 B Key Module and Micro-SIM (3FF) Card Installation



The system has an M.2 3042/ 3052 slot (indicated in **blue rectangle**) with 5G/ 4G SIM slots (indicated in **red rectangles**). A copper standoff is provided for you to secure onto the motherboard into the **red arrow** location for an M.2 3042 module, or into the **blue arrow** location for an M.2 3052 module.

For installation, please refer to the following instructions.

1. Please refer to the section "Disassembling the System".

2. You need to install the micro SIM card first. The micro SIM card slot utilizes a slide-and-clamp mechanism. To open the slot, slide the micro SIM cover towards the center of the system and flip open the slot. Place the micro SIM card into position, place the cover over the micro SIM card, and slide the cover towards the enclosure wall to secure it. Repeat this step if you are installing the second SIM card.

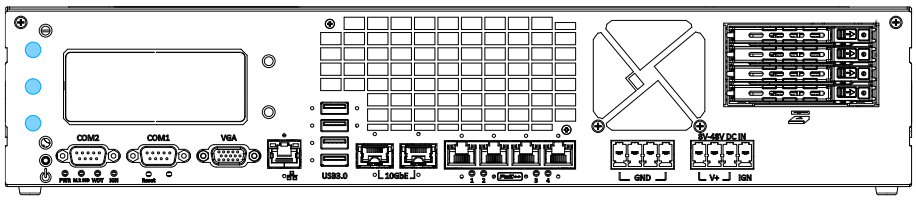
Slide and lift to open slot

Close and slide to lock SIM in place

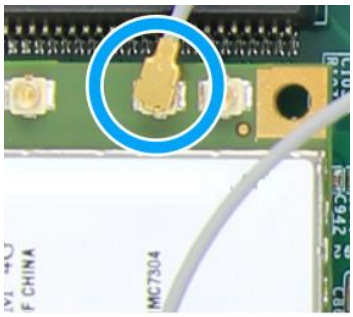
3. Insert the module on a 45 degree angle.

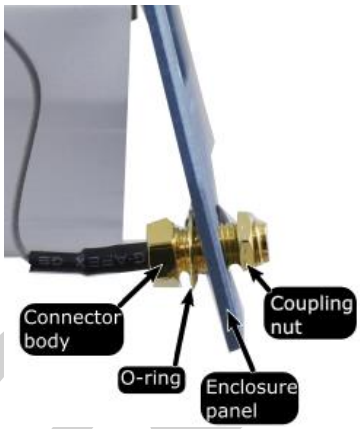
4. Gently press down and secure the module with an M2.5 P-head screw.

5. Clip on the IPEX-to-SMA cable to the module and secure the antenna to the front or rear panel. Please refer to the module's manual for clip-on connection.



Antenna aperture on the I/O panel



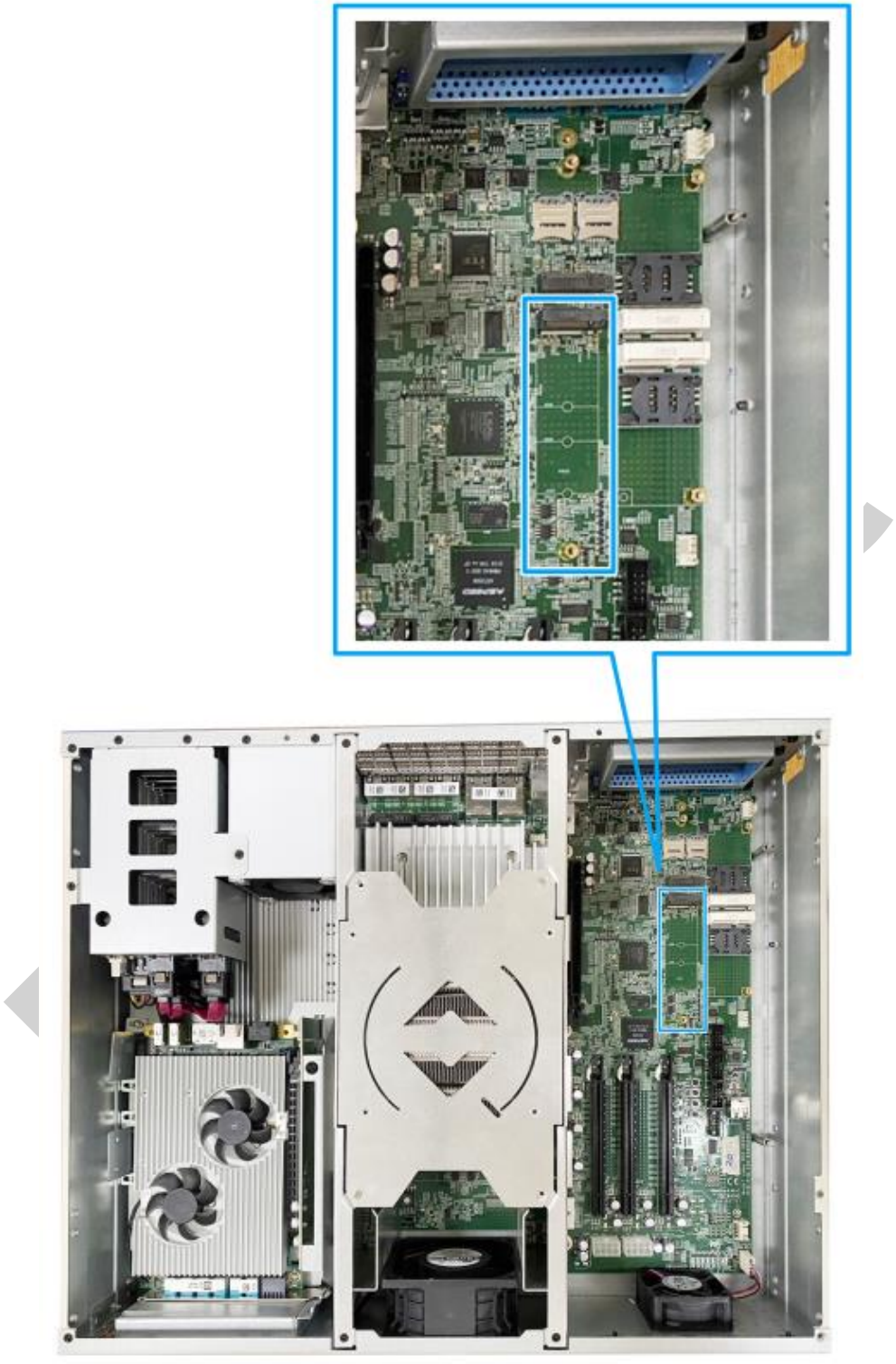


Clip on IPEZ-to-SMA cable **Secure antenna to rear panel**

6. Remove the thermal pad's protective film.

7. Reinstall the system enclosure and panel when done.
8. If you need to install other components, please refer to respective sections.

3.2.7 M.2 2280 M Key NVMe SSD Installation



The system has a x4 PCIe M.2 2280 slot for you to install an NVMe SSD for the fast read/ write performance. An NVMe SSD offers exceptional performance over 2.5” SSDs. For installation, please refer to the following instructions.

1. Please refer to the section “Disassembling the System”, you may not need to completely dismantle the system to gain access to the M.2 slot.
2. Insert the module on a 45 degree angle.

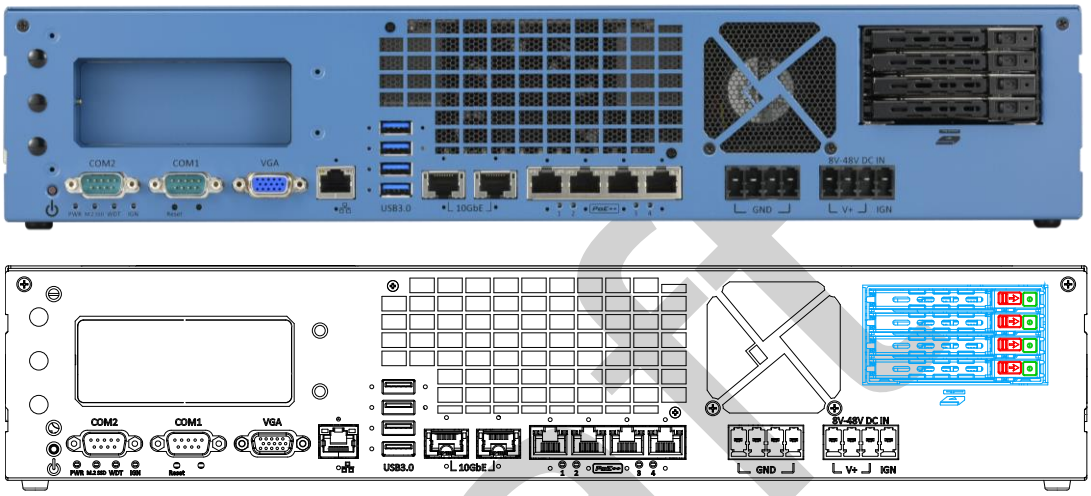
3. Gently press down and secure the module with an M2.5 P-head screw.

4. Remove the thermal pad’s protection film.

5. Reinstall the system enclosure and panel when done.
6. If you need to install other components, please refer to respective sections.

3.2.8 HDD/ SSD Installation

> NOTE
>
> *The system's 2.5" trays support up to 7mm thick disk drives.*



There are four 2.5 inch easy-swap hard drive trays on the front IO panel. Each 2.5" tray supports a 2.5" HDD or SSD up to 7mm thick. There is a lock (indicated in **green**) for each tray, and flick the switch (indicated in **red**) to the right to open each tray. When installing a HDD/ SSD, please make sure the SATA connector end into the enclosure first. Please refer to the following instructions on how to install 2.5" SATA HDD/SSD.

1. Flick the switch to the right and the tray handle should pop open.

Flick the switch to the right

Tray handle opens

2. Gently pull the tray out of the enclosure, slide the disk drive into the tray from the side, and secure the disk with screws (indicated in **blue**).

Slide disk into tray

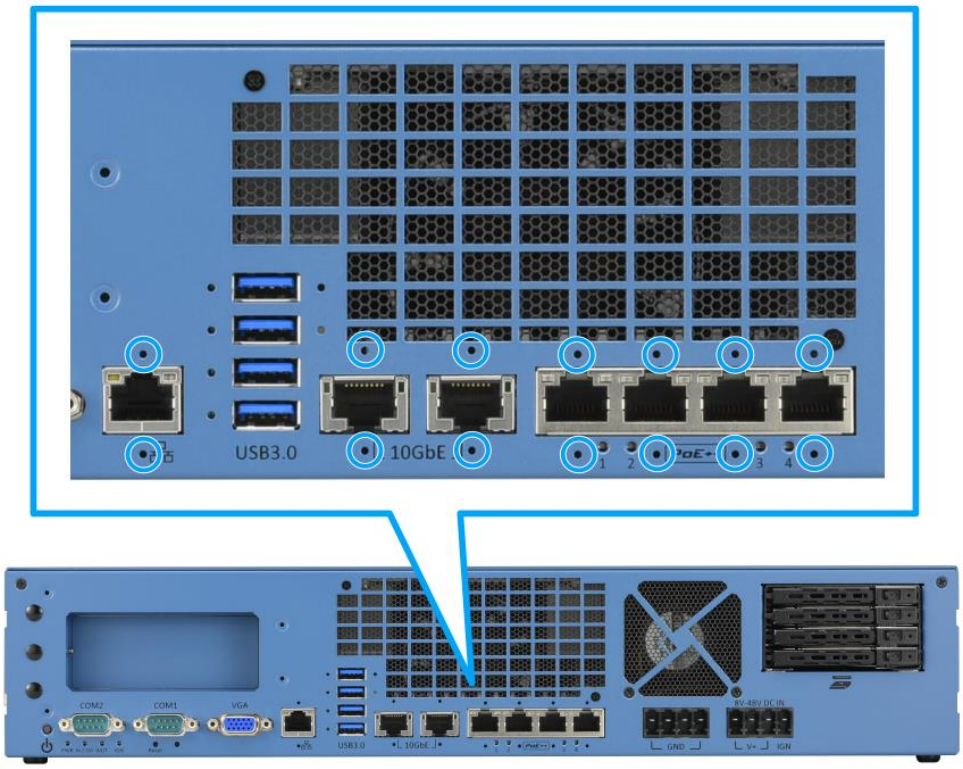
Secure disk with screws

3. Insert the installed disk drive and tray back into the enclosure.

4. Gently place and push the tray back into the enclosure to complete the disk drive installation. Please repeat steps 1 to 4 if you need to install disk drives into other trays.

3.2.9 Ethernet/ PoE+ Port Panel Screw Fix

The system's RJ45 Ethernet ports have panel screw fix holes (indicated in blue circles) to secure the cable connection.



1. To install and make use to the panel screw fix connection, you must acquire panel screw fix cables such as the cable shown below.

2. Simply insert the RJ45 connector into the RJ45 port and secure the top and bottom screws using your fingers or a screw driver.

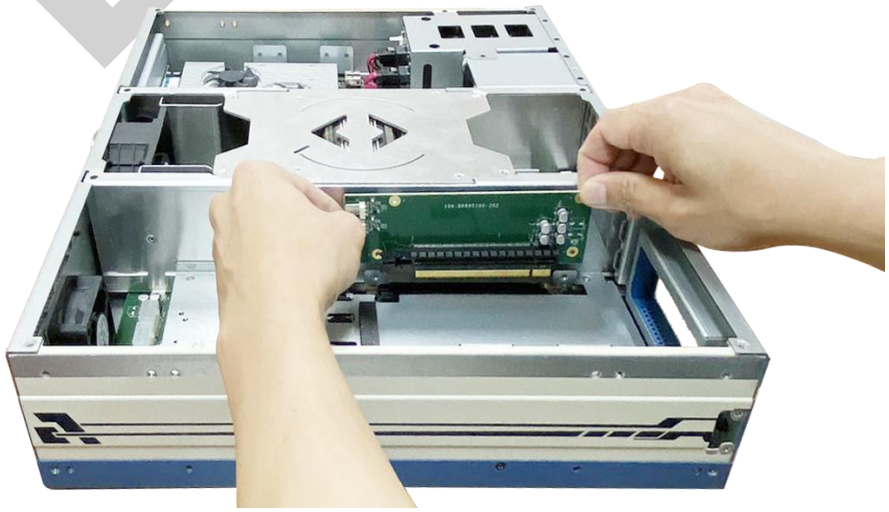
3.3 Installing the System Enclosure

1. If you've dismantled the system to install mini-PCIe and M.2 modules, you will need to install the internal platform. Make sure the respective protective films have been removed for the module installed.

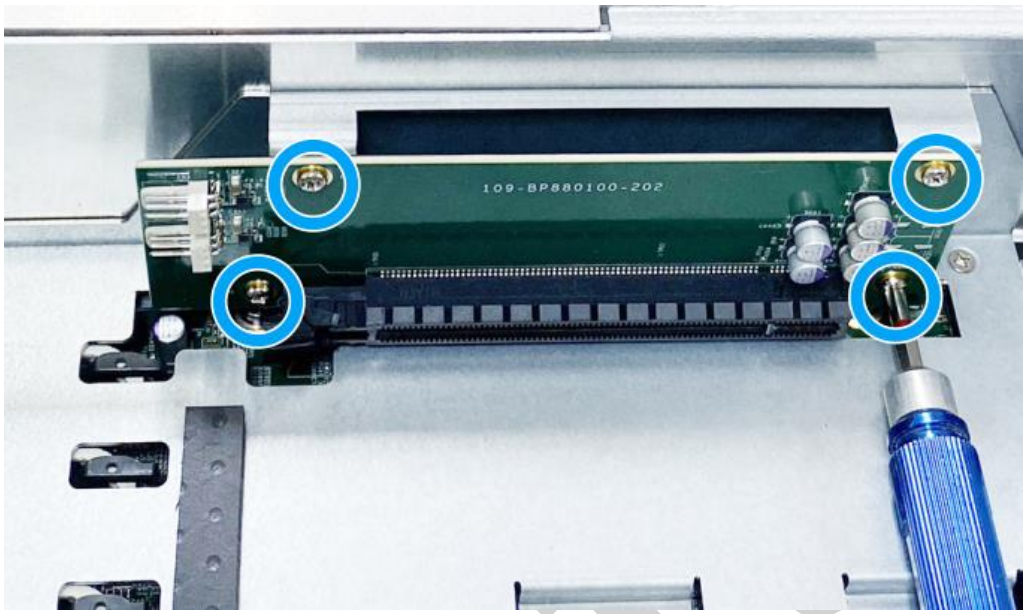
Thermal pad protective films

Place and secure the internal platform

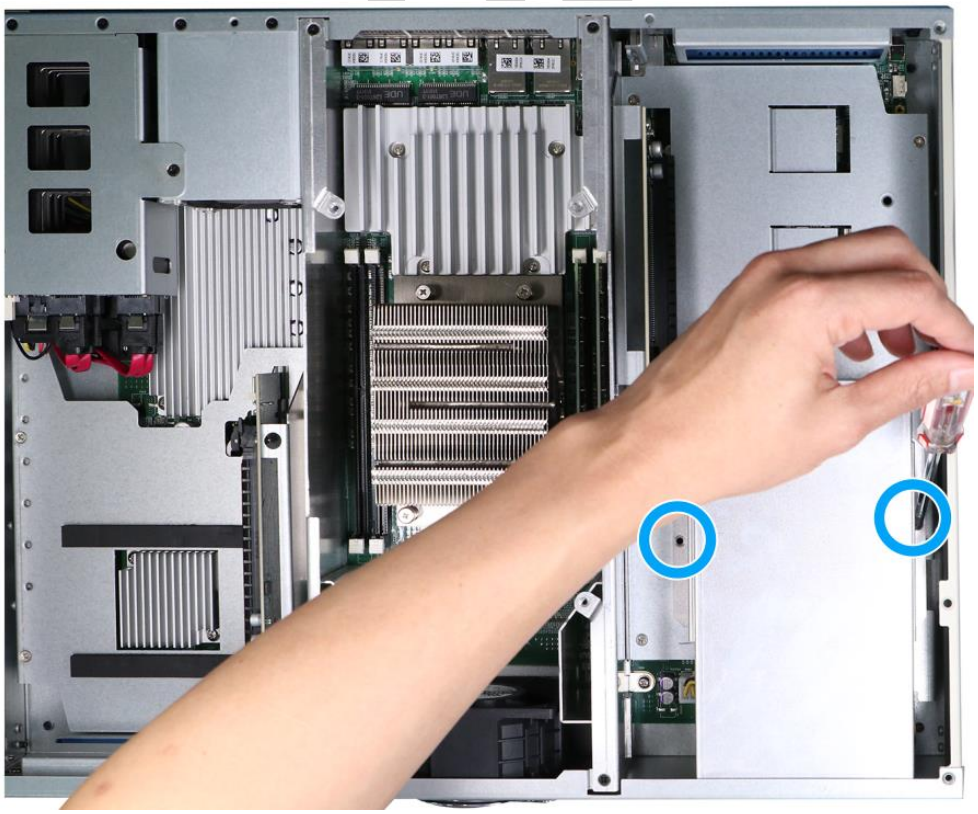
2. Reinsert and install the riser card onto the motherboard.



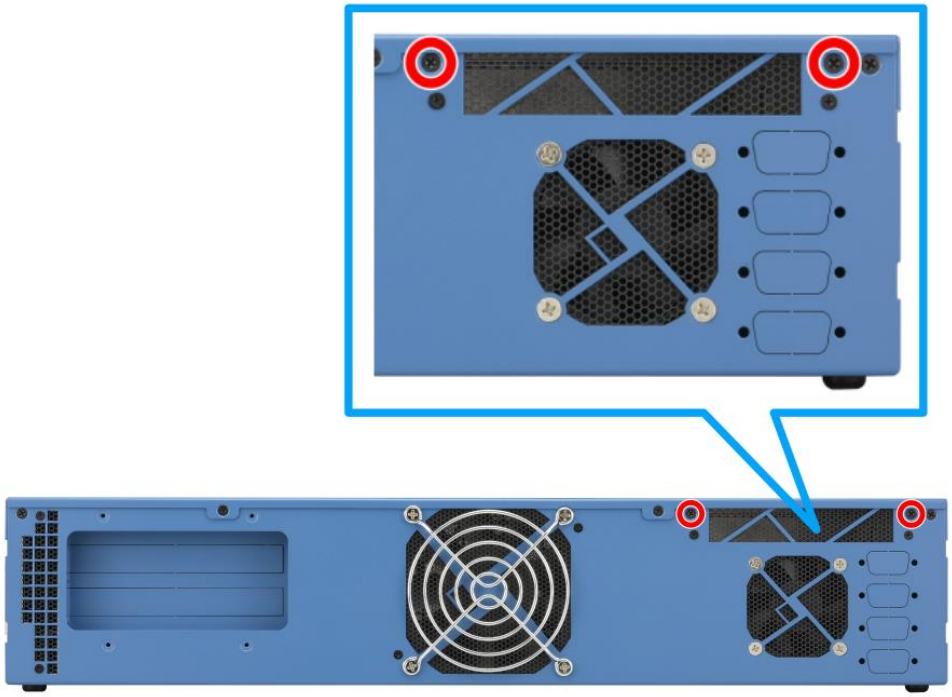
3. Secure the riser card.



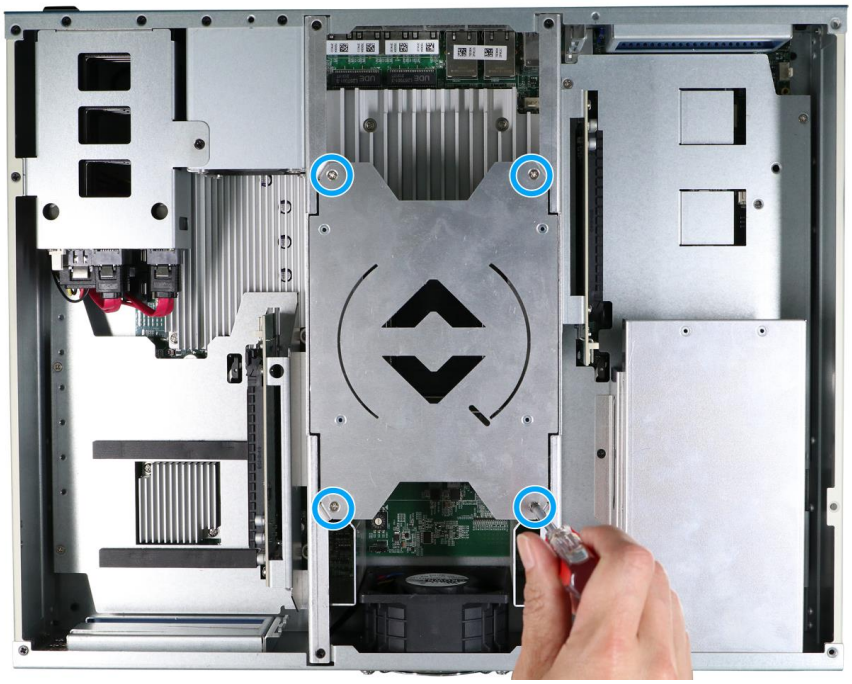
4. Install the tunnel duct for the inference accelerator by securing the two screws indicated.



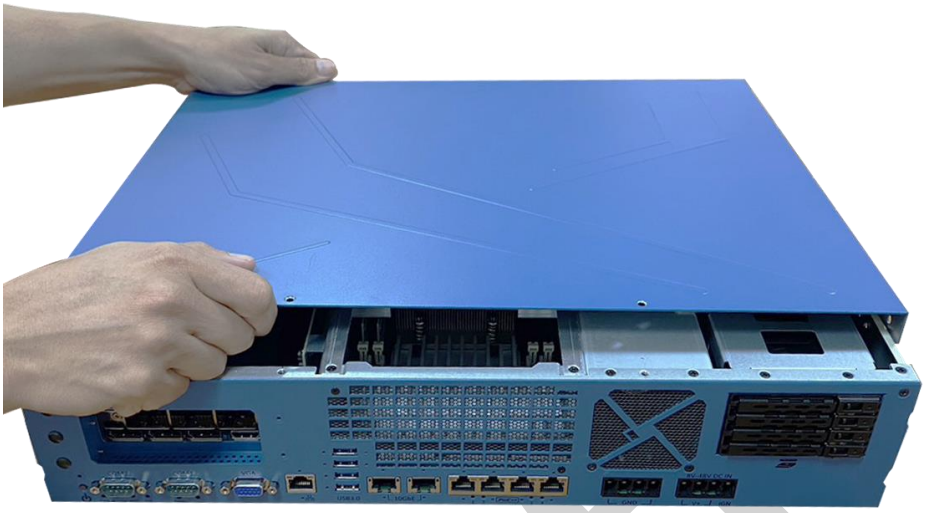
5. Secure the external screws for the tunnel duct.



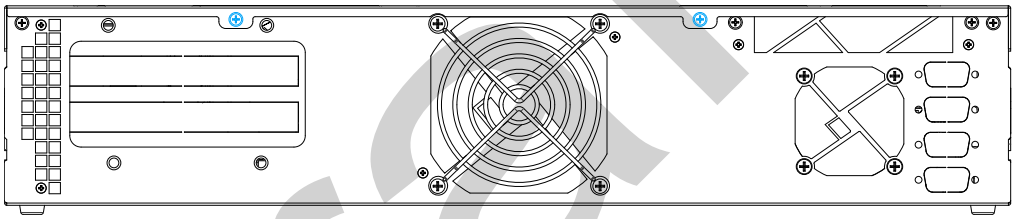
6. Secure the CPU/ DRAM cover if you removed it for installation.



7. Place the enclosure panel back on top of the system.

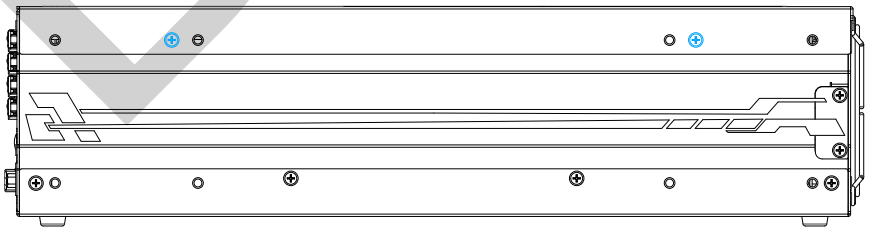


13. Secure the screws indicated on the rear fan panel.



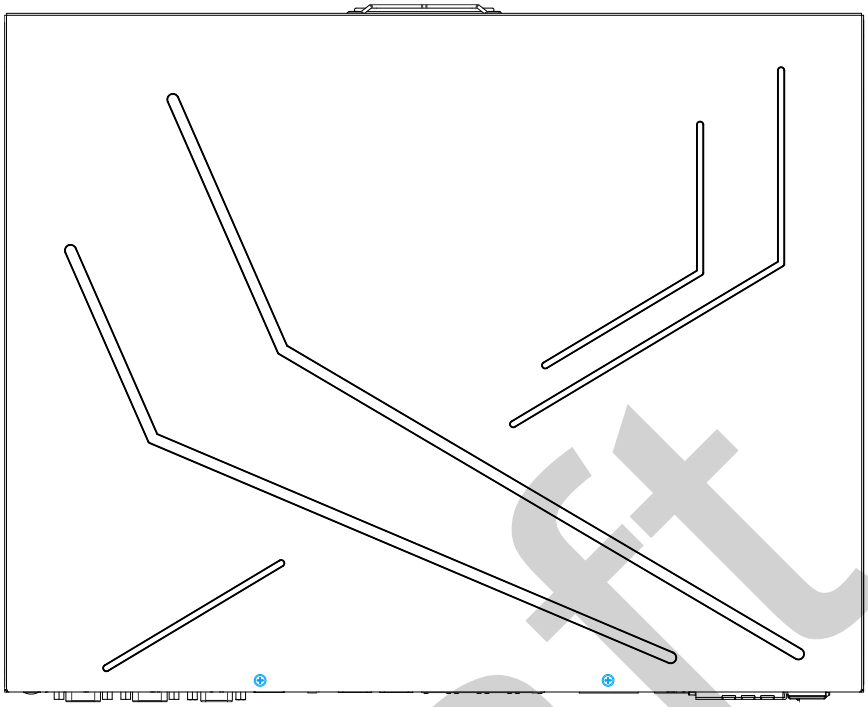
14. Secure the screws indicated on both sides of the enclosure.

Left side (facing the I/O panel)



Right side (facing the I/O panel)

15. Remove the screws indicated on the top panel.



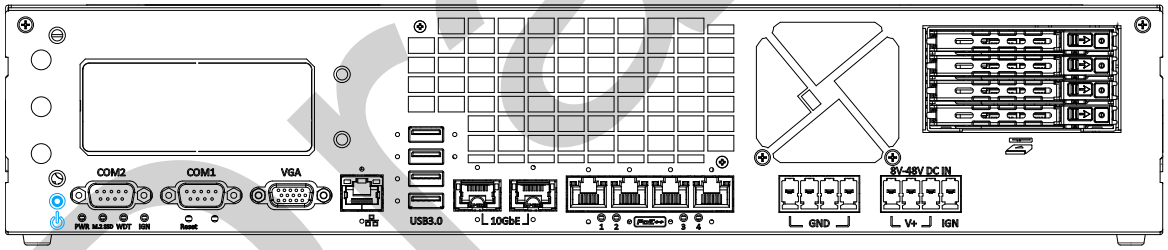
3.4 Powering On the System

There are three methods to power on the system

- Pressing the power button
- Sending a LAN packet via Ethernet (Wake-on-LAN)
- Powering on via ignition control (please refer to Ignition Control section)

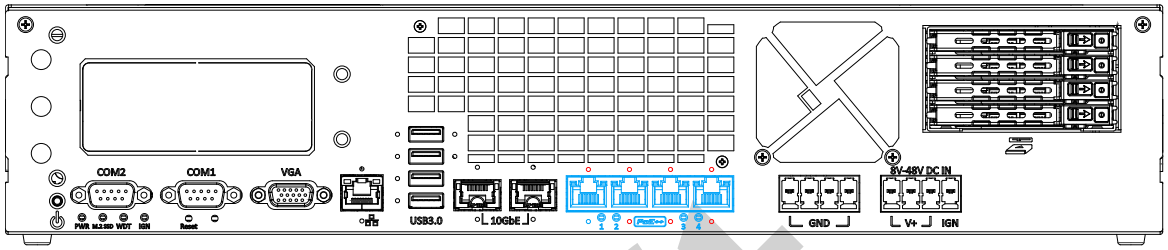
3.4.1 Powering On Using the Power Button

This is the simplest way to turn on your system. The power button on the front panel is a non-latched switch and behaves as the ATX-mode on/off control. With DC power connected, pushing the power button will turn on the system and the PWR LED indicator will light up. Pushing the button when system is on will turn off the system. If your operating system supports ATX power mode (i.e. Microsoft Windows or Linux), pushing the power button while the system is in operation will result in a pre-defined system behavior, such as shutdown or hibernation.



3.4.2 Powering On Using Wake-on-LAN

Wake-on-LAN (WOL) is a mechanism to wake up a computer system from a S5 (system off with standby power) state via issuing a magic packet. The system's Wake-on-LAN compatible GbE port is shown below.

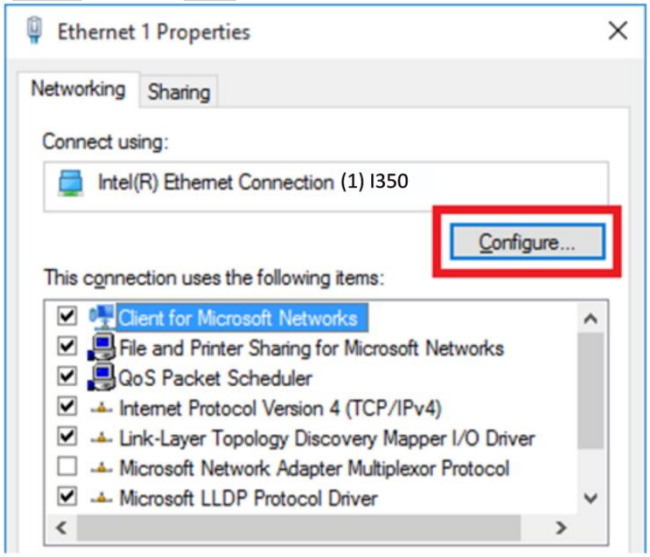


NOTE

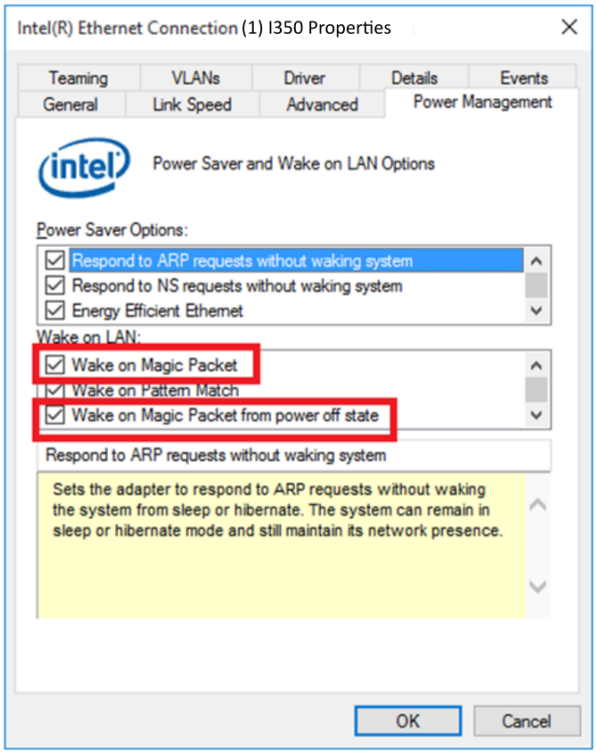
Please make sure the Intel® chipset and Ethernet driver has been properly installed prior to setting up WOL function.

To enable WOL function, please set up WOL settings in the BIOS and in the operating system by follow the steps described below.

1. When the system boots up, press F2 to enter BIOS setup utility.
2. Go to the **[Power]**>**[Wake On LAN]** and set it to **[Enabled]**.
3. Press F10 to "**Save changes and exit BIOS**" and allow the system boot into the operating system.
4. Once booted into the Windows system, press "**Windows key + E**", right-click on "**Network**>**Properties**>**Change adapter settings**". Locate and double-click on the adapter Intel® I219 Gigabit Network Connection, click on **Configure...**



5. Click on the **Power Management** tab and check the following options. Click on OK when done.



Magic Packet

The magic packet is a broadcast frame containing anywhere within its payload 6 bytes of all 255 (FF FFFFFFFFFF in hexadecimal), followed by sixteen repetitions of the target computer's 48-bit MAC address.

For example, NIC's 48-bit MAC Address is 78h D0h 04h 0Ah 0Bh 0Ch

DESTINATION SOURCE MISC

FF FFFFFFFFFF

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

78 D0 04 0A 0B 0C 78 D0 04 0A 0B 0C

MISC CRC

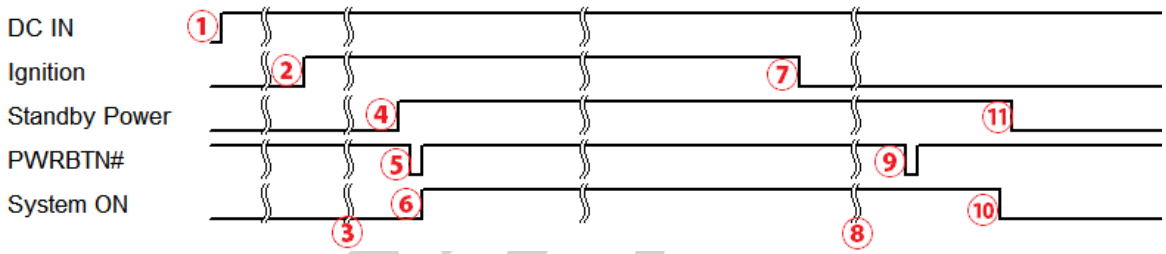
There are some free tools available on Internet that can be used to send a magic packet. Please refer to the following link to understand more about Magic Packet.

3.5 Ignition Power Control

The ignition power control module for in-vehicle applications is a MCU-based implementation that monitors the ignition signal and reacts to turn on/off the system according to predefined on/off delay. Its built-in algorithm supports other features such as ultra-low power standby, battery-low protection, system hard-off, etc. In this section, we'll illustrate the principle of ignition power control and operation modes.

3.5.1 Principles of Ignition Power Control

The basic concept of ignition power control module is to control the timing correlation between ignition signal and system power status. A typical timing correlation is described in following diagram.



1. When DC power is supplied to the system, MCU starts to periodically detect ignition signal. Note that only MCU is working at this moment and the overall power consumption is less than 2 mW.
2. Ignition signal is active (both 12VDC and 24VDC ignition signals are accepted).
3. MCU starts to count a pre-defined power-on delay.
4. Once power-on delay expired, MCU turns on necessary standby power for the system (3.3VSB & 5VSB).
5. A PWRBTN# pulse is then issued to turn on the system (equivalent to one pressing the power button on the front panel).
6. The system is booting and becomes operational.
7. After a period of time, the ignition signal becomes inactive.
8. MCU starts to count a pre-defined power-off delay.
9. Once power-off delay expired, another PWRBTN# pulse is issued to perform a soft-off for the system (ex. a normal shutdown process for Windows system).
10. The system is completely shut down.
11. As MCU detects system is off, it turns off the standby power for the system, and operates in low power mode again (< 2mW power consumption).

3.5.2 Additional Features of Ignition Power Control

In addition to the typical timing correlation, the ignition power control module offers additional features to provide additional reliability for in-vehicle applications.

1. **Low battery detection**

   The ignition power control module continuously monitors the voltage of DC input when the system is operational. If input voltage is less than 9V (for 12VDC input) or less than 18V (for 24VDC input) over a 60-second duration, it will shut down the system automatically.

2. **Guarded power-on/ power-off delay duration**

   If ignition signal goes inactive during the power-on delay duration, the ignition power control module will cancel the power-on delay process and go back to idle status. Likewise if ignition signal goes active during the power-off delay duration, the ignition power control module will cancel the power-off delay process and keep the system running.

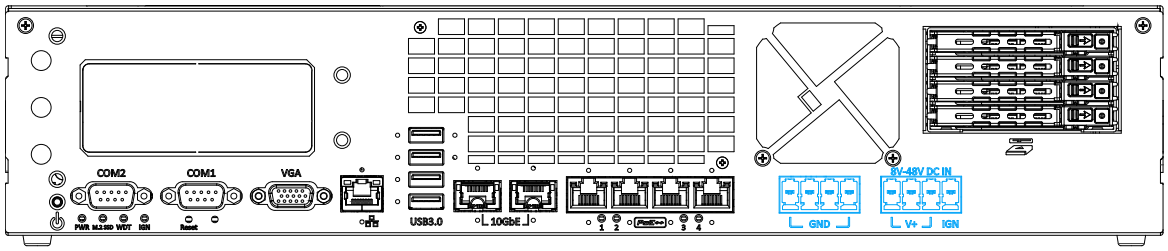
3. **System hard-off**

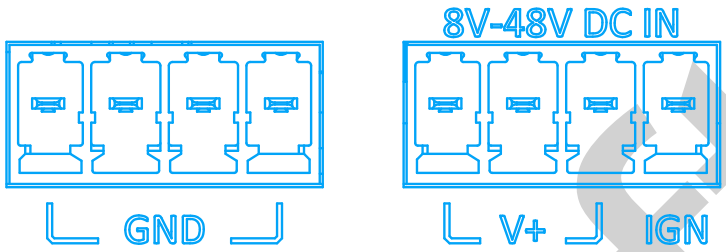
   In some cases, system may fail to shutdown via a soft-off operation due to system/ application halts. The ignition power control module offers a mechanism called “hard-off” to handle this unexpected condition. By detecting the system status, it can determine whether the system is shutting down normally. If not, the ignition power control module will force cut-off the system power 10 minutes after the power-off delay duration.

4. **Smart off-delay**

   The ignition power control module offers two modes (mode 13 & mode 14) which have very long power-off delay duration for applications require additional off-line time to process after the vehicle has stopped. In these two modes, the ignition power control module will automatically detect the system status during the power-off delay duration. If the system has shutdown (by the application software) prior to power-off delay expiring, it will cut off the system power immediately to prevent further battery consumption.

3.5.3 Wiring Ignition Signal





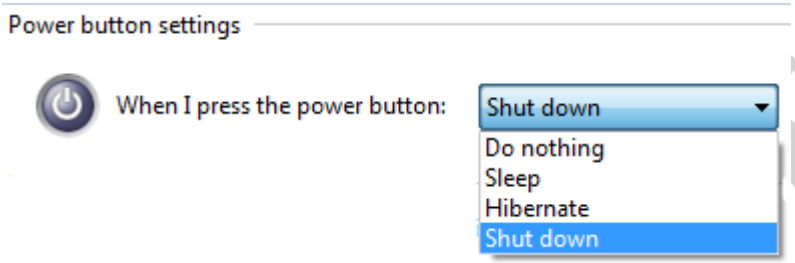
To have ignition power control for in-vehicle usage, you need to supply IGN signal to the system. The IGN input is located on the 3-pin pluggable terminal block (shared with DC power input). Below is the typical wiring configuration for in-vehicle applications.

1. Connect car Battery+ line (12V for sedan, 24V for bus/truck) to V+.
2. Connect car Battery-/ GND line to GND.
3. Connect ACC line to IGN.

> WARNING
>
> *Please make sure your DC power source and IGN signal share the same ground.*
>
> *IGN input accepts 8-48VDC. Supply a voltage higher than 48VDC may damage the system.*

3.5.4 Configure your Windows system

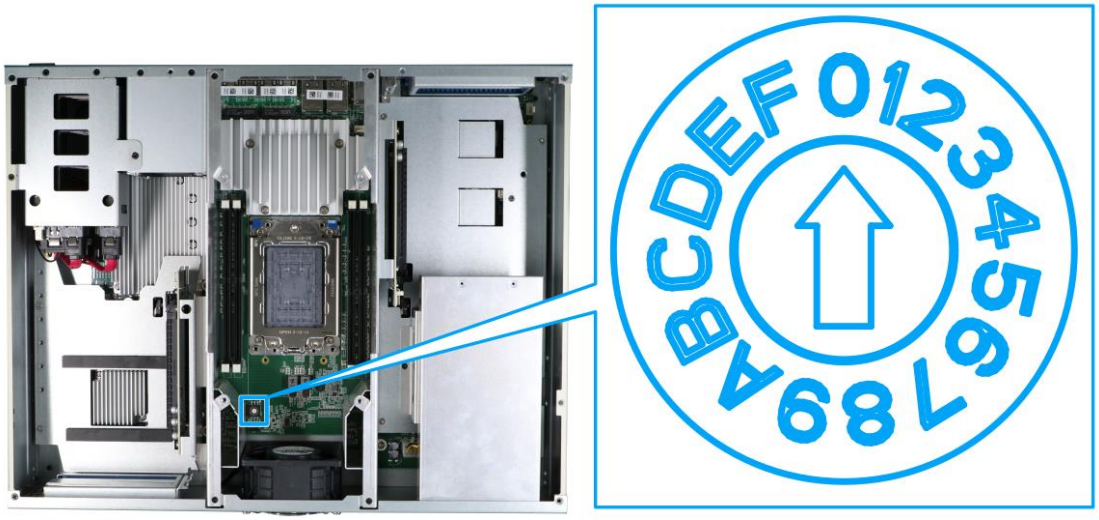
When applying ignition power control to your system, please make sure you've configured your Windows system to initiate a shutdown process when pressing the power button. By default, Windows 10 goes to sleep (S3) mode when power button is pressed. As sleep (S3) is not a complete shutdown behavior, the ignition control function does not recognize the finish of a normal shut down process and thus users will encounter a system hard-off (power cut-off after 10 minutes). Please configure "When I press the power button" to "Shut down" in your Windows system settings.



3.5.5 Operation Modes of Ignition Power Control

You can use the rotary switch to configure the operation mode. The system offers 16 (0~15) operation modes with different power-on/power-off delay configurations.

The ignition control rotary switch can be located on the motherboard. Please refer to the "Disassembling the system" section on how to remove the panel and gaining access to the rotary switch.



- **Mode 0**

  Mode 0 is the ATX mode without power-on and power-off delay. User can only use the power button on the front panel to turn on or turn off the system.

Mode	Power-on Delay	Power-off Delay	Hard-off Timeout
0	N/A	N/A	N/A

- **Mode 1**

  Mode 1 is AT mode without power-on and power-off delay. The system automatically turns on when DC power is applied. A retry mechanism is designed to repeat the power-on cycle if the system fails to boot up.

Mode	Power-on Delay	Power-off Delay	Hard-off Timeout
1	N/A	N/A	N/A

- **Mode 2**

  Mode 2 is designed to have a very minor power on/ off delay of 160ms for applications that requires the system to start up almost at the same as the rest of the equipment it is working in collaboration with.

Mode	Power-on Delay	Power-off Delay	Hard-off Timeout
2	160ms	160ms	10 minutes

- **Mode 3 ~ Mode 12**

  Mode 3 ~ Mode 12 have various power-on delay and power-off delay. Each mode

supports a hard-off timeout of 10 minutes.

Mode	Power-on Delay	Power-off Delay	Hard-off Timeout
3	10 seconds	10 seconds	10 minutes
4	10 seconds	1 minute	10 minutes
5	10 seconds	5 minutes	10 minutes
6	30 seconds	1 minute	10 minutes
7	30 seconds	5 minutes	10 minutes
8	30 seconds	10 minutes	10 minutes
9	3 minutes	1 minute	10 minutes
10 (A)	3 minutes	10 minutes	10 minutes
11 (B)	3 minutes	30 minutes	10 minutes
12 (C)	10 minutes	30 minutes	10 minutes

- **Mode 13 (D) / Mode 14 (E)**

  Mode 13 and Mode 14 are ignition power control modes with very long power-off delay. Both modes support the feature of “smart off-delay”, which automatically detect system status during power-off delay duration and cut off system power if system is off in prior to power-off delay expired.

Mode	Power-on Delay	Power-off Delay	Hard-off Timeout
13 (D)	30 seconds	2 hours	10 minutes
14 (E)	3 minutes	2 hours	10 minutes

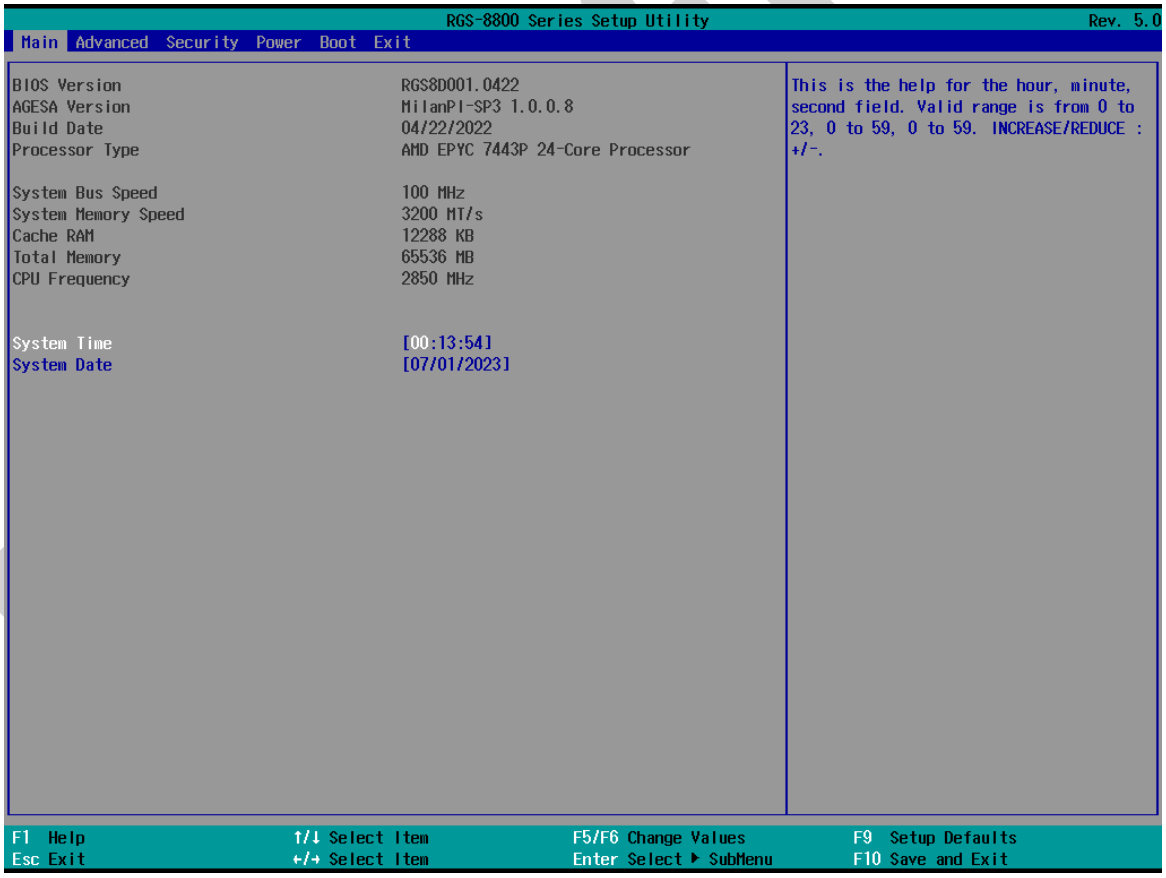
- **Mode 15 (F)**

  Reserved

4 System Configuration

4.1 BIOS Settings

The system is shipped with factory-default BIOS settings meticulously programmed for optimum performance and compatibility. In this section, we'll illustrate some of BIOS settings you may need to modify. Please always make sure you understand the effect of change before you proceed with any modification. If you are unsure of the function you are changing, it is recommended to change one setting at a time to see its effect(s).

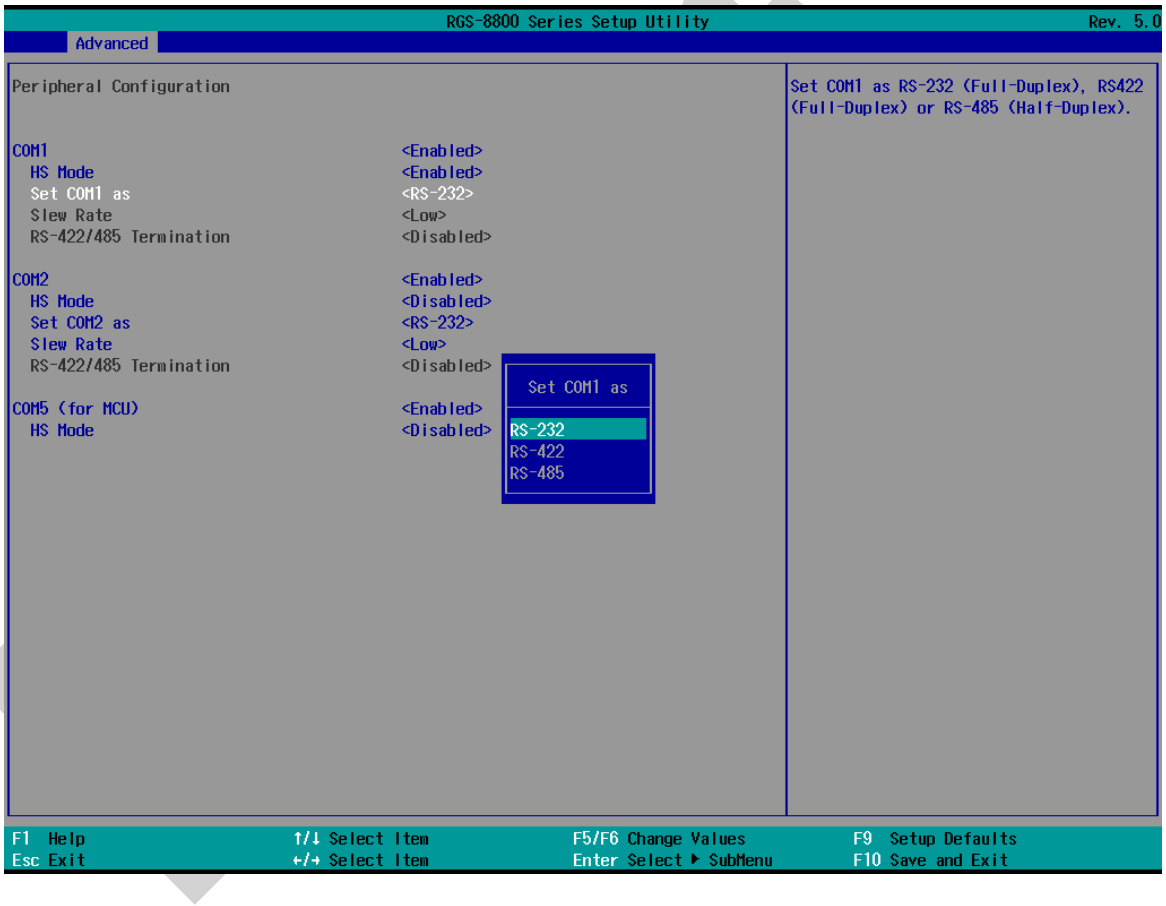


NOTE

Not all BIOS settings will be discussed in this section. If a particular setting/ function you are after requires specific BIOS settings but is not discussed in this section, please contact Neousys Technical Support staff.

4.1.1 COM Port Configuration

The system's COM1/ COM2 ports support RS-232 (full-duplex), RS-422 (full-duplex) and RS-485 (half-duplex) mode. You can set the COM1 operating mode via BIOS settings. Another option in BIOS called "*Slew Rate*" defines how sharp the rising/falling edge is for the output signal of COM1. For long-distance RS-422/485 transmission, you may set the "*Slew Rate*" option as "High" to improve signal quality. For RS-422/485 communication, the "*RS-422/485 Termination*" option determines whether to enable/disable internal termination of RS-422/485 transceiver according to your wiring configuration (e.g. with or without external termination).

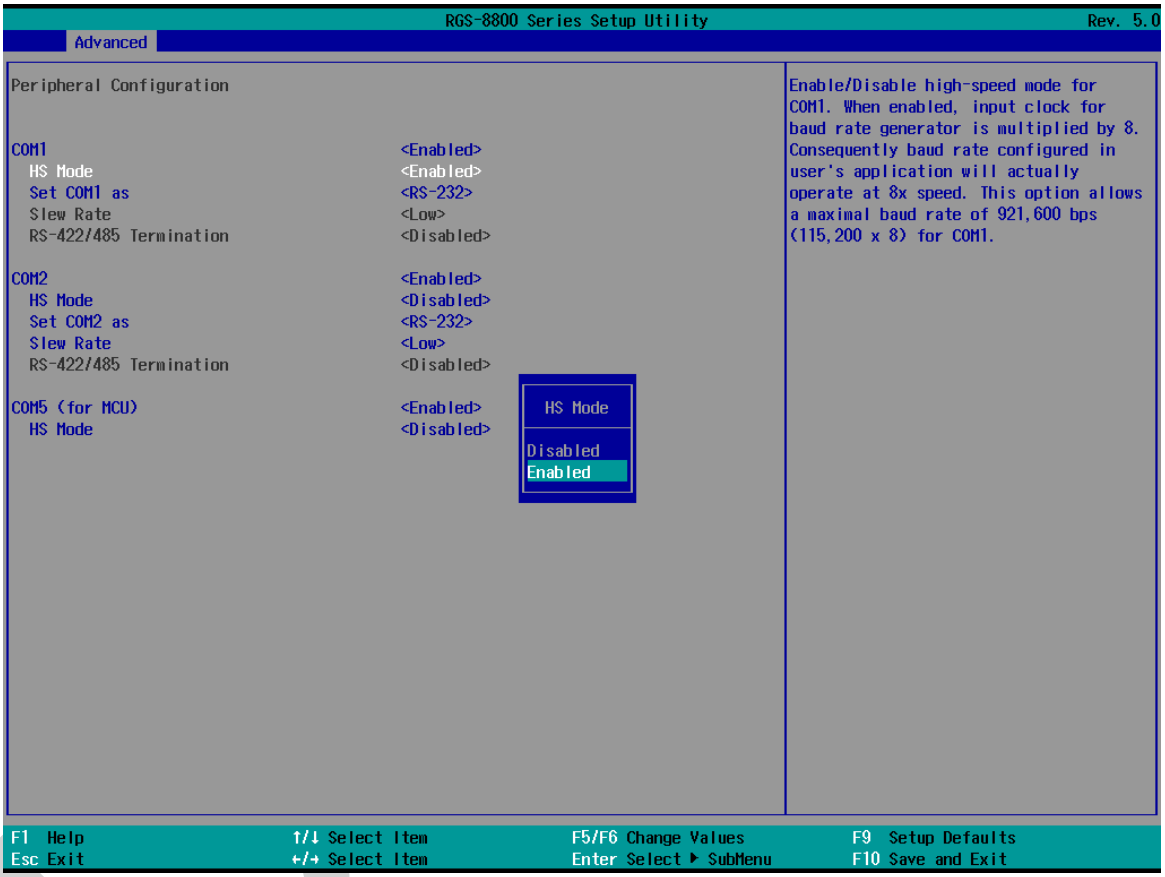


To set COM port operating mode:

1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced] > [Peripheral Configuration]**.
3. Set the **[Set COM1 Mode as]** option to the desired mode.
4. Once set, press **F10** to save setting and exit.

4.1.2 COM Port High Speed Mode

The high speed mode of each COM port effectively allows for the port's baud rate generator to operate at 8x the speed with an effective baud rate of 921,600 bps (115,200 x 8). Please refer to the following instructions on how to enable the high speed mode for your COM port (COM1 used as an example).

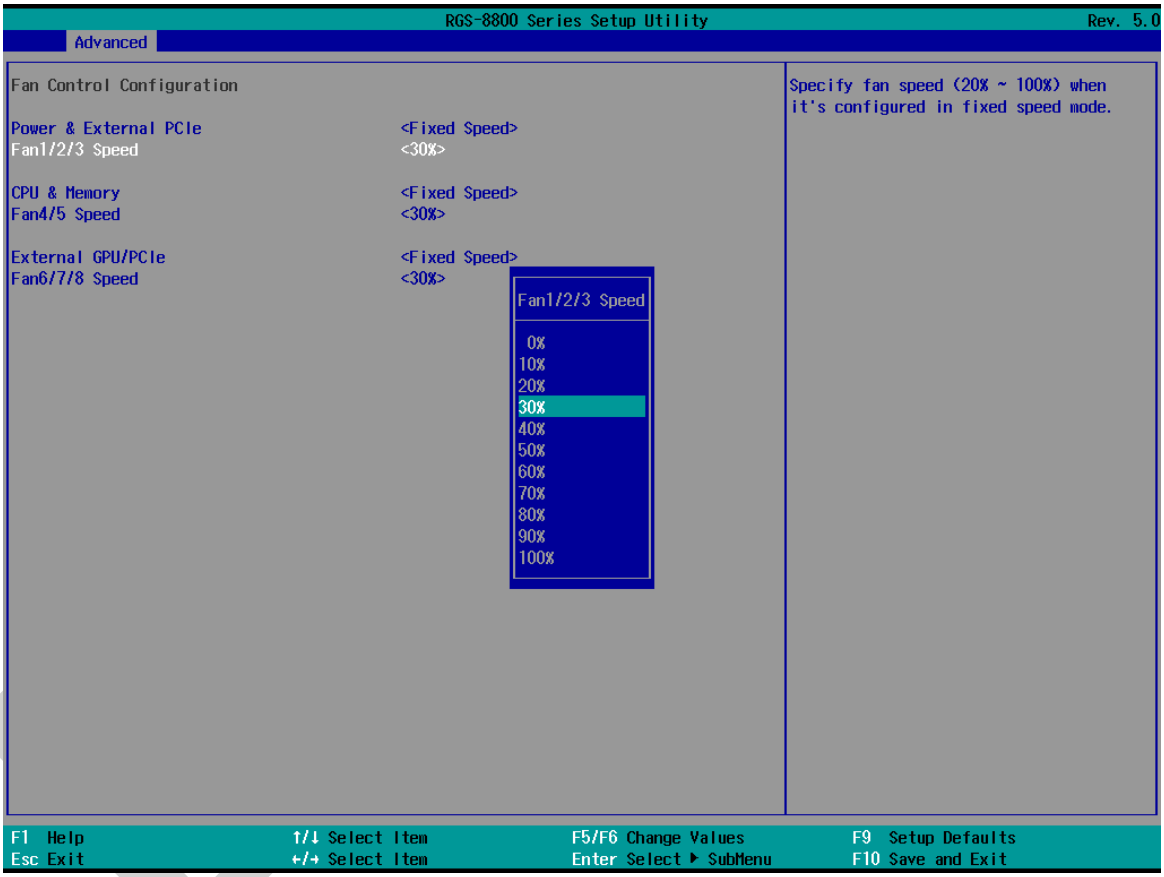


To set COM port high speed mode:

1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced] > [Peripheral Configuration]**.
3. Enable or set the **[Set COM1 Mode as]** option to the desired mode.
4. Highlight **[HS Mode]** and press ENTER to bring up options, highlight **[Enable]** and press ENTER.
5. Once set, press **F10** to save setting and exit.

4.1.3 Fan Control Configuration

Upon system startup, by default, the speed is set at 30% for all fans. The fans cool the three compartments in the system, power & add-on PCIe cards, CPU& memory, and the inference accelerator compartment. Users can manually adjust the default settings according to their deployment environment needs, from 0 to 100%, or set it to auto and the system will automatically adjust the fan speed percentage for you, according to temperature conditions. Users can choose the fan(s) they wish to adjust in this configuration.

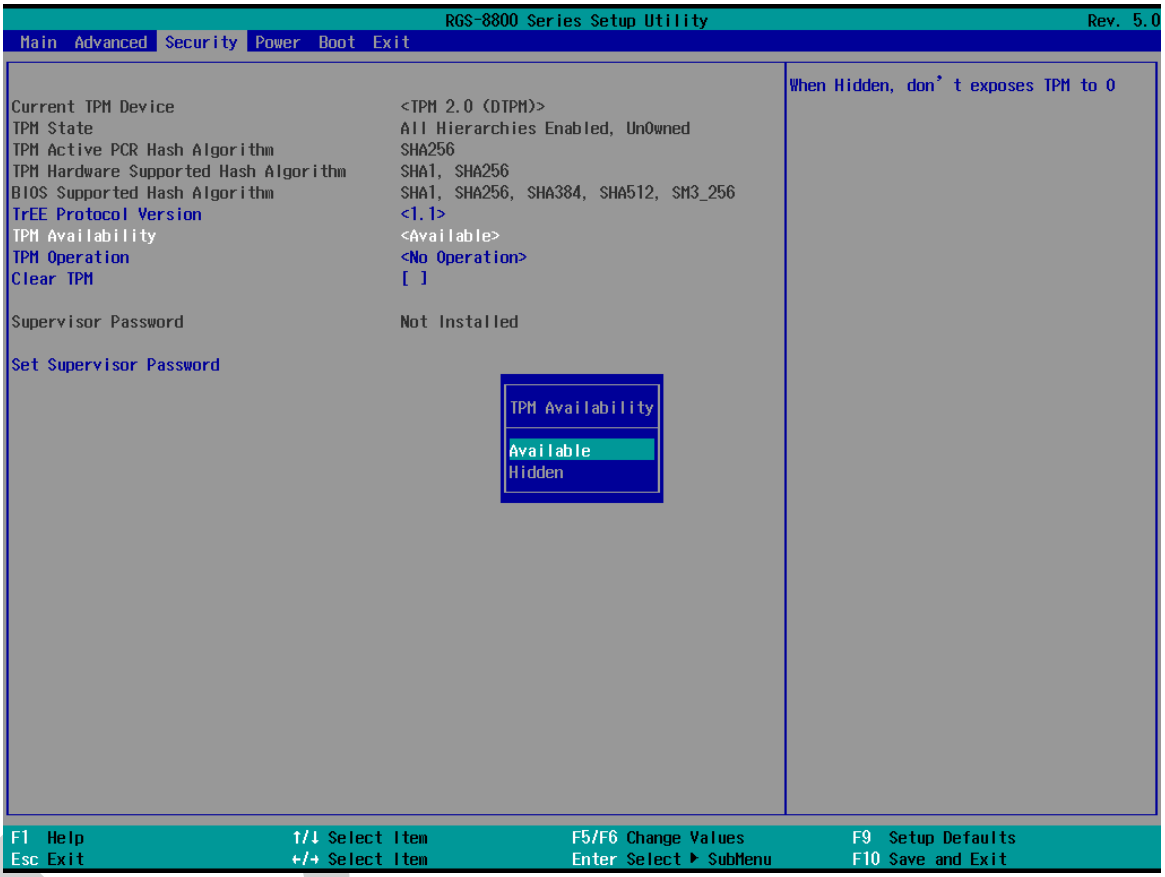


To set COM port high speed mode:

1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced] > [Fan Control Configuration]**.
3. Highlight the fan you wish to configure, such as **[Power & External PCIe]**, set it to **Auto** and the system will adjust the fan speed according to the system's temperature conditions.
4. Or set it to **Fixed Speed**, and highlight the fan speed percentage column to set the fan speed (0 – 100%) you wish the system to operate on.

4.1.4 TPM Availability

Trusted Platform Module (TPM) is a hardware-based cryptoprocessor to secure hardware by integrating cryptographic keys into devices. The system is designed with on-board TPM 2.0 module. As TPM 2.0 requires 64-bit Windows 10 with UEFI boot mode, it is enabled in BIOS by default.

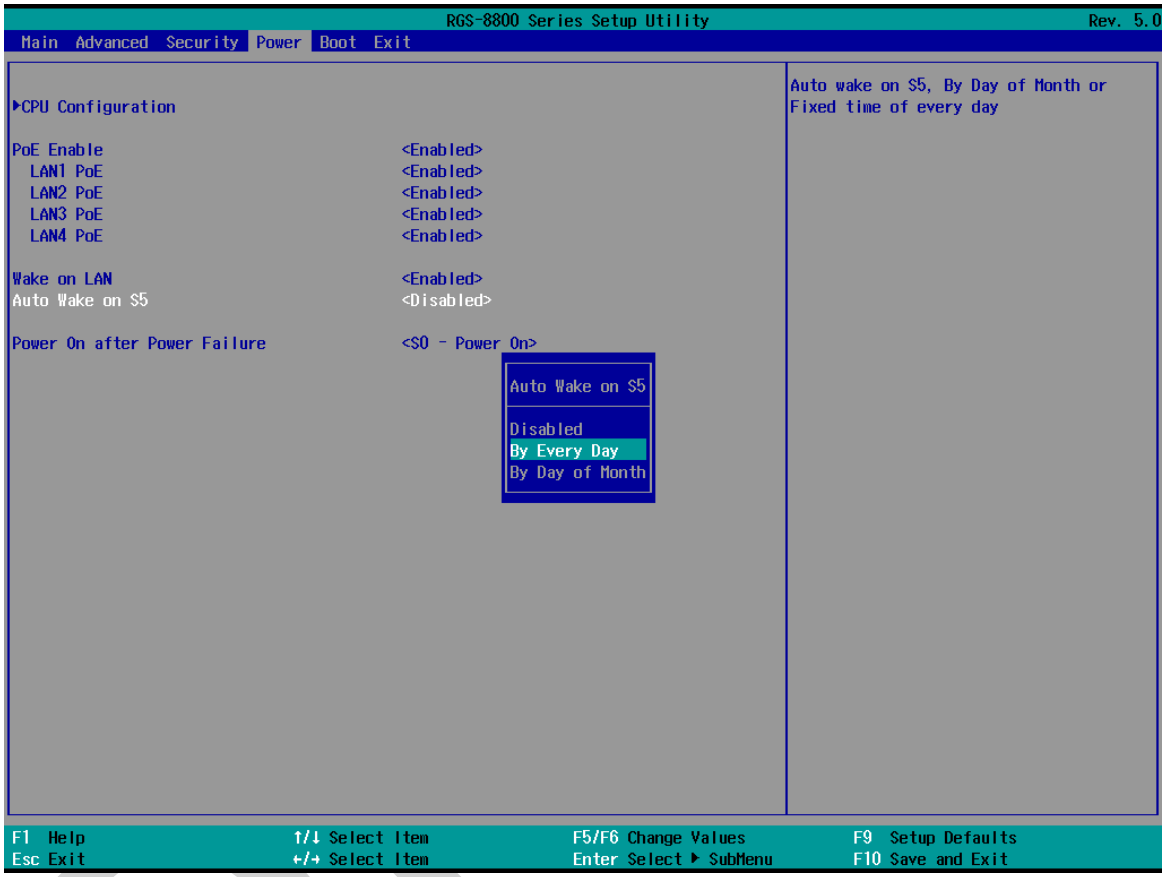


To enable TMP availability:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Security] > [TPM Availability]**, press ENTER to bring up Options, Available/ Hidden.
3. Highlight your selection, press Enter and press F10 to “Exit Saving Changes”.

4.1.5 Auto Wake on S5

When the system is set to operate in S5 state, the user can specify a time to turn on the system, daily or monthly.

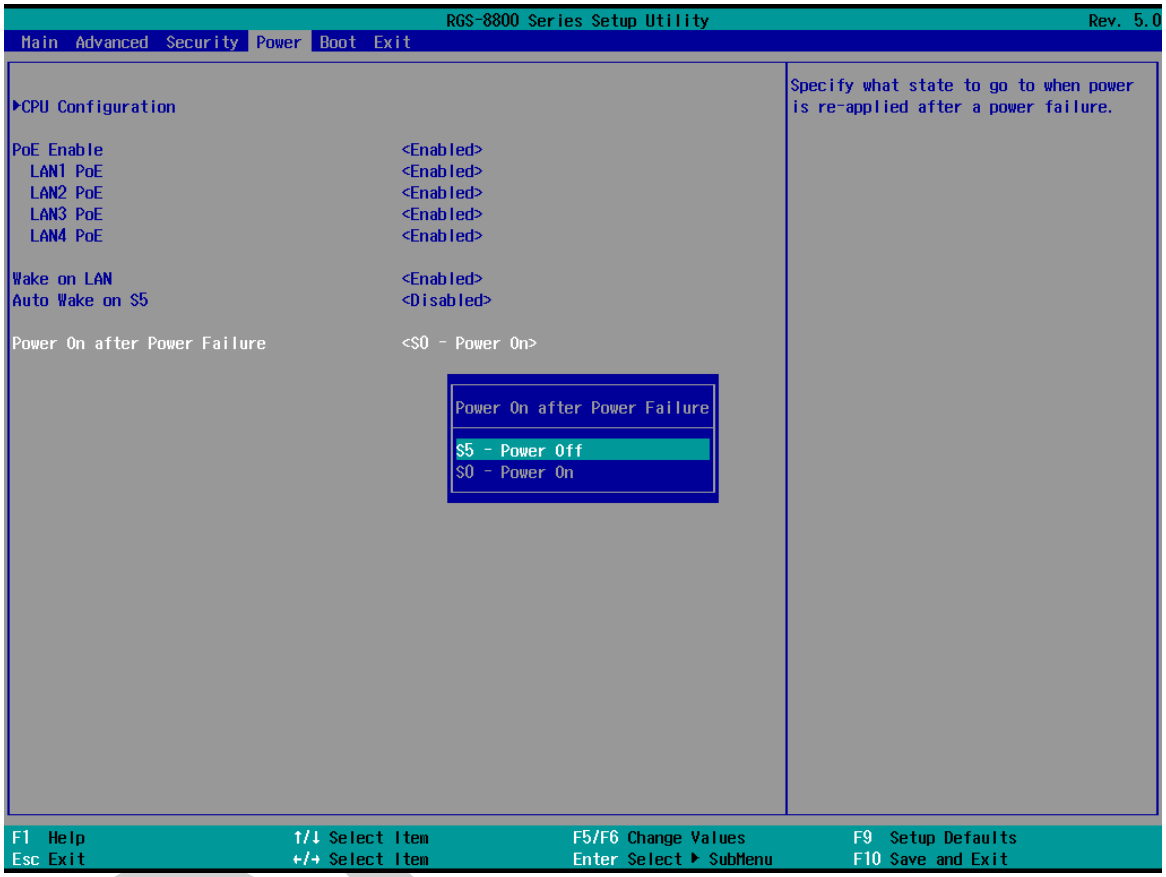


Value	Option	Description
Auto Wake on S5	Disabled	The system does not turn on when operating in state S5.
	By Every Day	The system turns on each day when operating in state S5. Specify the time of day.
	By Day of Month	The system turns on each month when operating in state S5. Specify the day and time.

Highlight your selection, press ENTER and press F10 to “Exit Saving Changes”.

4.1.6 Power On After Power Failure Option

This option defines the behavior of System series when DC power is supplied.



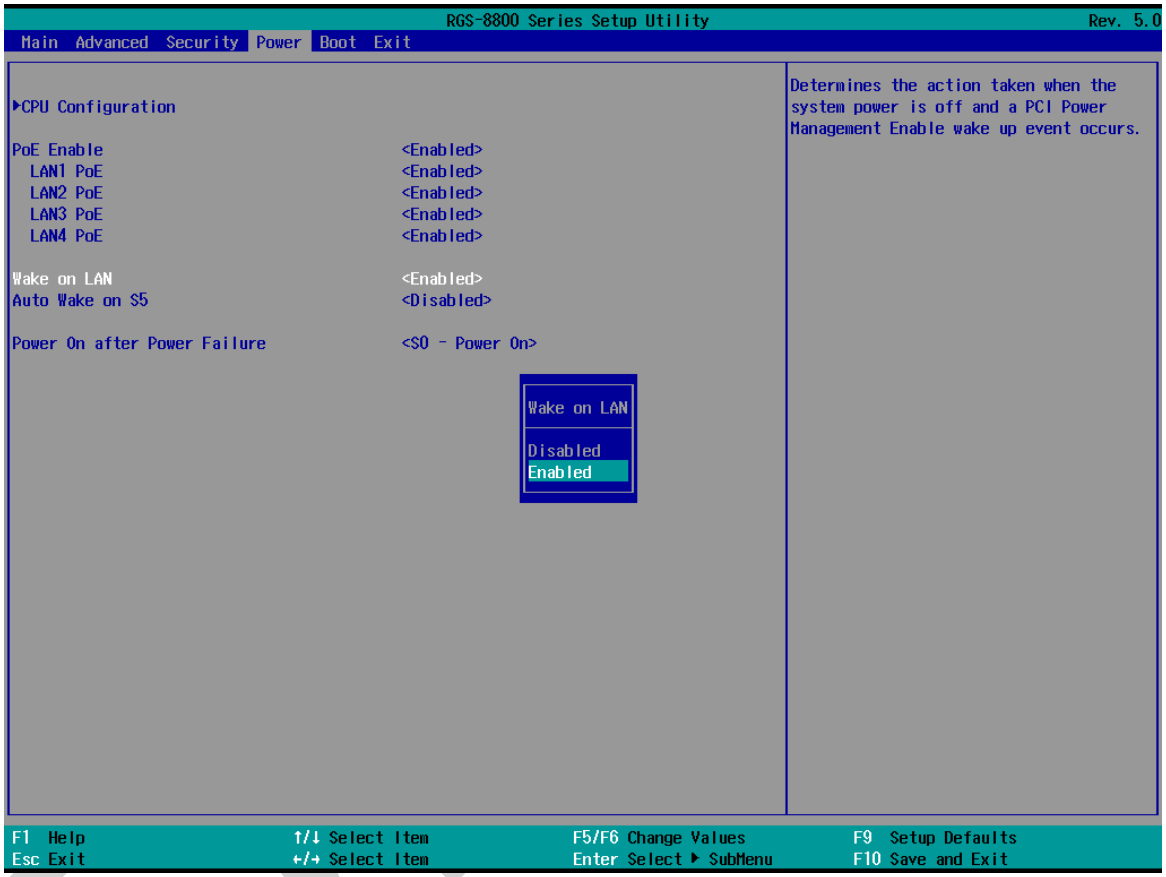
Value	Description
S0 – Power On	System is powered on when DC power is supplied.
S5 – Power Off	System is kept in off state when DC power is supplied.

To set “Power On after Power Failure” option:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Power] > [Power On after Power Failure]**.
3. Scroll down to highlight **[Power On after Power Failure]**, press ENTER to bring up setting options, S0 – Power On or S5 – Power Off, and press ENTER to select the setting.
4. Press F10 to “Exit Saving Changes”.

4.1.7 Wake on LAN Option

Wake-on-LAN (WOL) is a mechanism which allows you to turn on your System series via Ethernet connection. To utilize Wake-on-LAN function, you have to enable this option first in BIOS settings. Please refer "Powering On Using Wake-on-LAN" to set up the system.

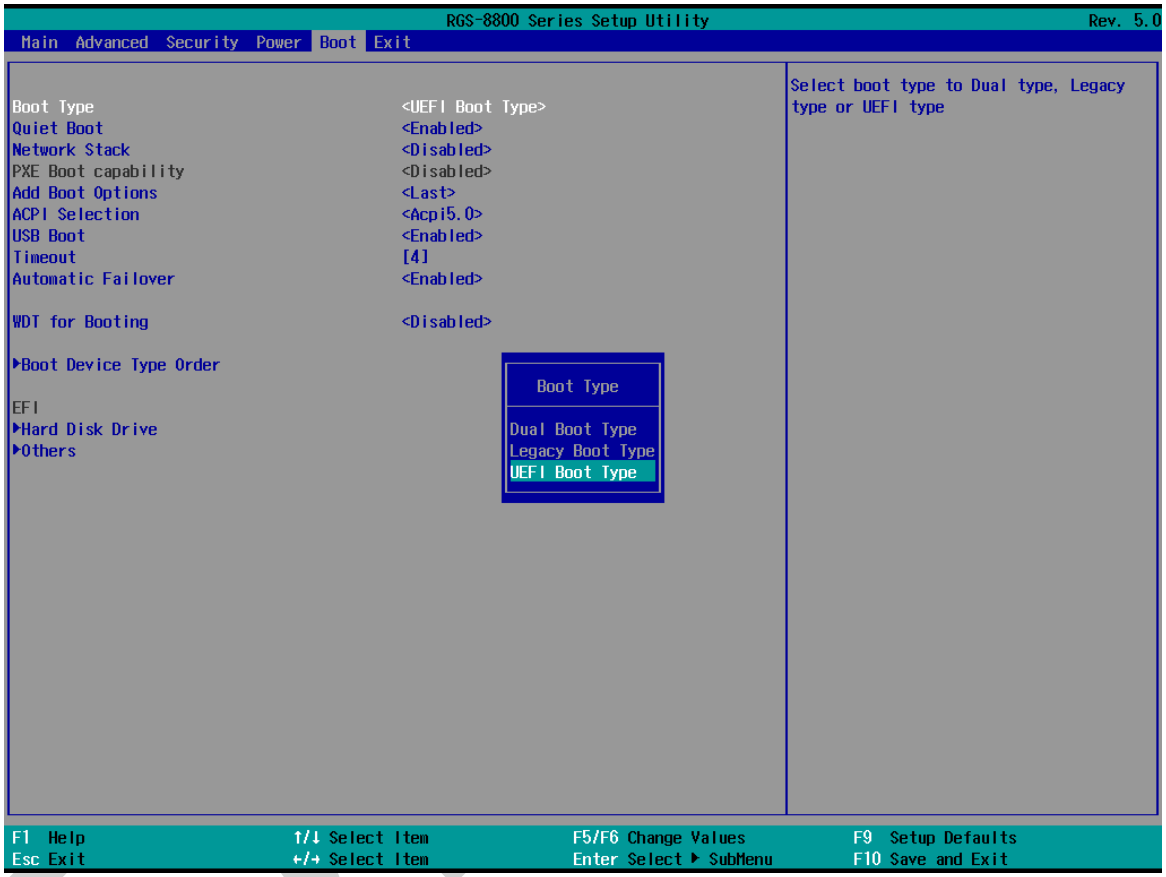


To enable/ disable "Wake on LAN" option:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Power] > [Wake on LAN]**.
3. Press ENTER to bring up setting options, scroll to the setting you desire and press Enter to set.
4. Press F10 to "Exit Saving Changes.

4.1.8 Boot Menu

The Boot menu in BIOS allows you to specify the system's boot characteristics by setting bootable device components (boot media) and method. Or, you may press F12 upon system start up and select a device you wish boot from.

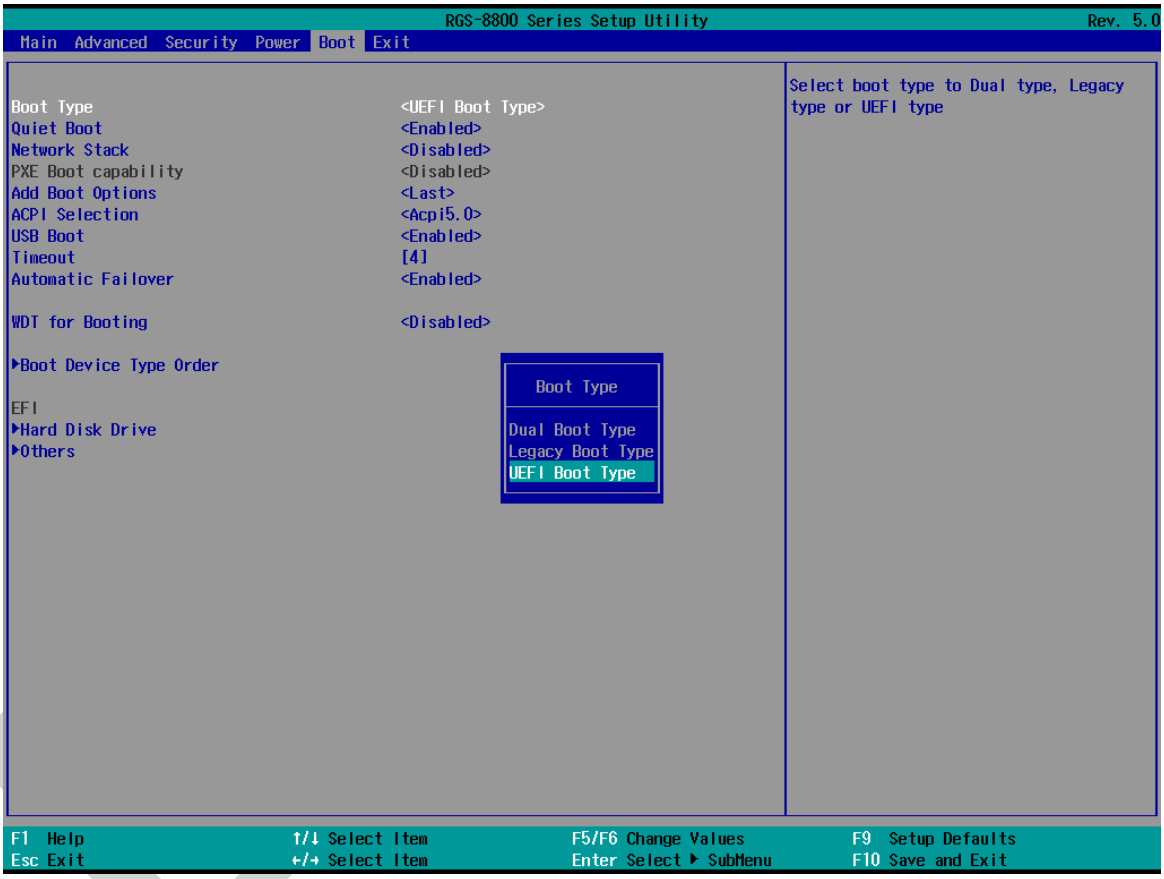


Value	Option	Description
Boot Type	Dual Boot Type	Both legacy and EFI boot media listed are approved as boot media.
	Legacy Boot Type	Only legacy boot media listed are approved as boot media.
	UEFI Boot Type	Only UEFI boot media listed are approved as boot media.
Quick Boot	Enabled	The system starts up faster because BIOS skips various hardware function tests
	Disabled	The system starts up slower because BIOS goes through various hardware functions tests
Network Stack	Enabled	The system is available for network access using UEFI.
	Disabled	The system is not available for network access

		using UEFI.
PXE Boot capability	Disabled	Only UEFI Network Stack is supported: Preboot eXecution Environment (PXE) is not supported
	Enabled	By enabling the PXE boot, one can choose to boot via **I219 Only**/ **I210 Only** or **All NICs**.
Add Boot Options	First	Newly detected boot media are placed at the top of the boot order.
	Last	Newly detected boot media are placed at the bottom of the boot order.
ACPI Selection	1.0B/ 3.0/ 4.0/ 5.0/ 6.0	Advanced Configuration and Power Interface allows the operating system to control system power management
USB Boot	Enabled	Allow boot from bootable USB devices.
	Disabled	Does not allow boot from bootable USB devices
Timeout	1, 2, 3, etc (in seconds)	Boot delay time in seconds to give the user time to activate the hotkey to access the BIOS
Automatic Failover	Enabled	Automatically checks for the next bootable device when the set default device fails.
	Disabled	Will only boot from the designated device.
WDT for booting	Disabled, 1, 3, 5, 10 (minutes)	WDT ensures a successful system boot by specifying a timeout value

4.1.9 Boot Type (Legacy/ UEFI)

The system supports both Legacy and Unified Extensible Firmware Interface (UEFI) boot modes. UEFI is a specification proposed by Intel to define a software interface between operating system and platform firmware. Most modern operating systems, such as Windows 10 and Linux support both Legacy and UEFI boot modes. The Legacy boot mode uses MBR partition for disk and VBIOS for video initialization, the UEFI boot mode uses GPT partition which supports greater than 2TB partition size and GOP driver for faster video initialization.



NOTE

If you choose Legacy mode, you will not be able to create disk partitions greater than 2TB or use TPM 2.0 function.

To configure Boot Type:

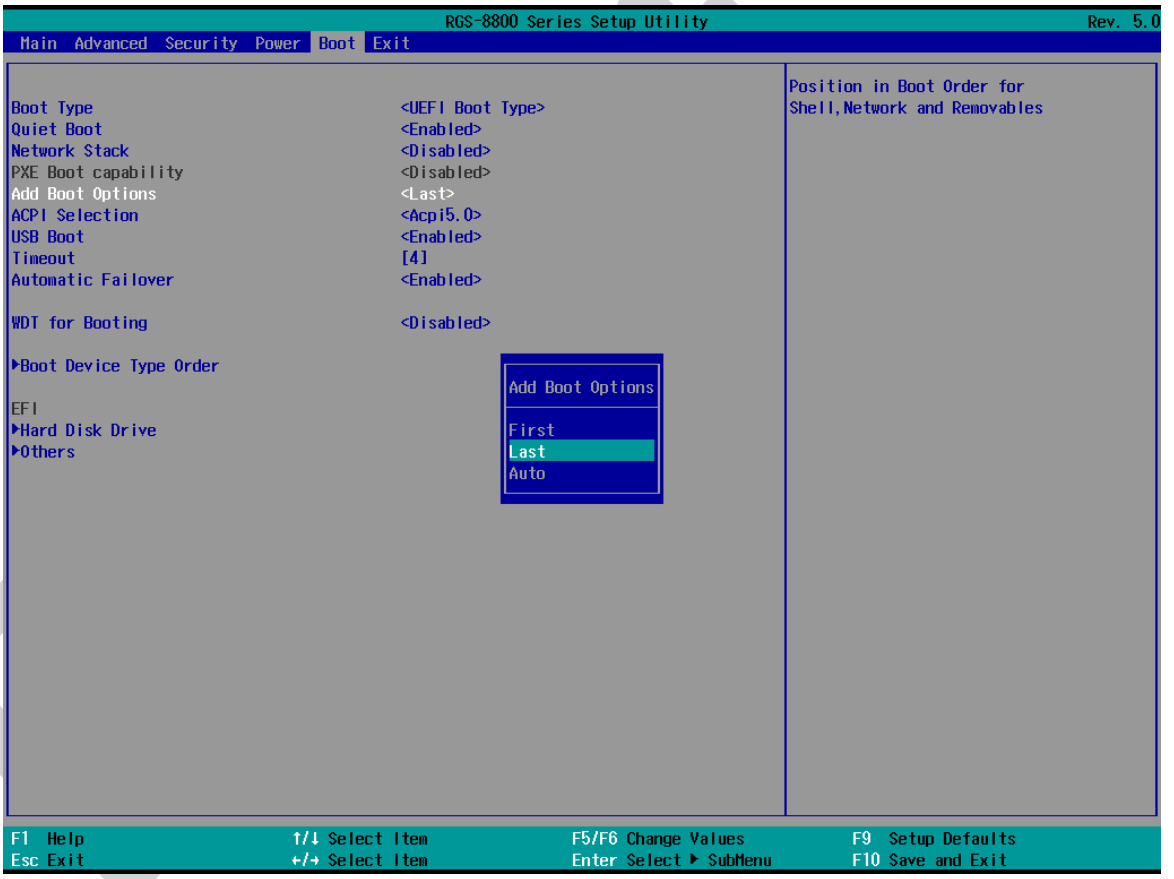
1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Boot]>[Boot Type]**, press ENTER to bring up options, Dual Boot (Legacy+UEFI), Legacy Boot Type, UEFI Boot Type.
3. Highlight your selection and press ENTER.
4. Press F10 to “Exit Saving Changes”.

4.1.10 Position New Boot Device

The “Add Boot Options” allow you to determine whether a newly added device (eg. USB flash disk) is to boot as the first device to boot or the last in the boot sequence.

To set the newly-installed boot device as the first or last boot device:

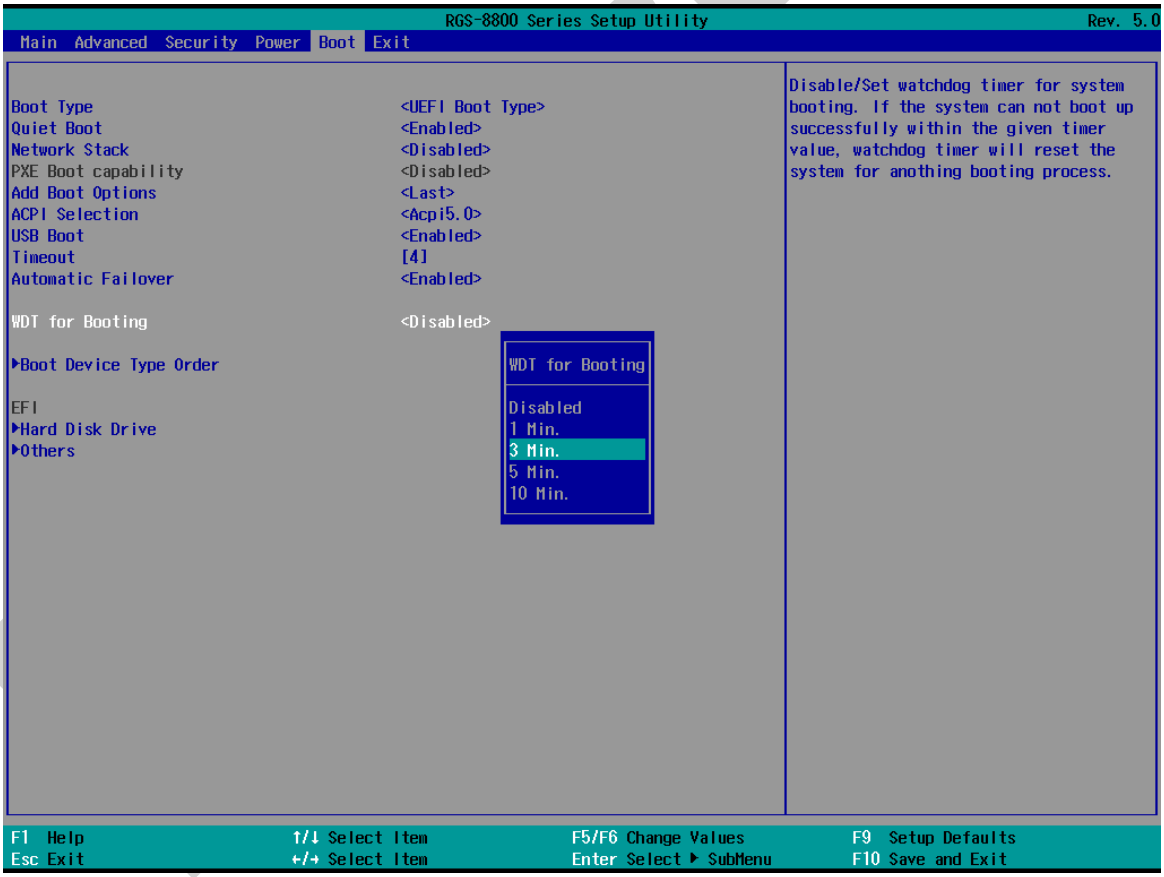
1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Boot] > [Add Boot Options]** menu.
3. Select **[First]** or **[Last]** for your newly-added boot device and press ENTER.



4. Once set, press F10 to save setting and exit.

4.1.11 Watchdog Timer for Booting

The watchdog timer secures the boot process by means of a timer. Once the timer expires, a reset command is issued to initiate another booting process. There are two options in BIOS menu, "*Automatically after POST*" and "*Manually after Entering OS*". When "*Automatically after POST*" is selected, the BIOS automatically stops the watchdog timer after POST (Power-On Self Test) OK. When "*Manually after Entering OS*" is selected, the user must stop the watchdog timer once booted into the OS. This guarantees the system can always boot into the OS, otherwise another booting process will be initiated. For information about programming watchdog timer, please refer to Watchdog Timer & Isolated DIO.

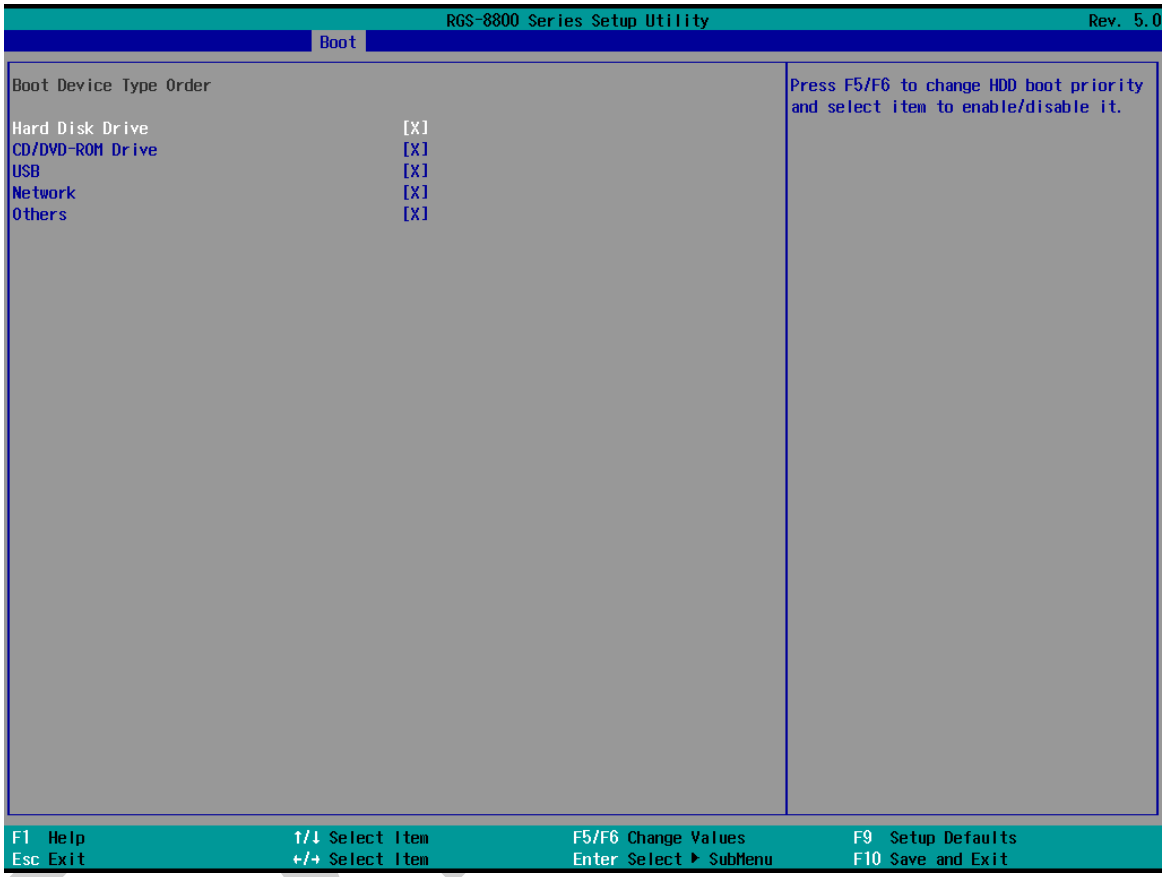


To set the watchdog timer for boot in BIOS:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Boot]** menu.
3. Disable or select timeout value for **[WDT for Booting]** option.
4. Once you give a timeout value, the **[WDT Stop Option]** option appears. You can select *"Automatically after POST"* or *"Manually after Entering OS"*.
5. Press F10 to "Exit Saving Changes.

4.1.12 Boot Device Type Order

When you wish to set a designated boot device, you may set it as the first device to boot. Or if you wish to manually select a boot device, you may do so by pressing F12 when the system boots up.



To set boot order for devices:

1. When system boots up, press F2 to enter BIOS setup utility
2. Go to **[Boot] > [Boot Device Type Order]**
3. Highlight the device you wish to make boot order changes to and press F5/ F6 or +/ - to change device boot order.
4. You may also highlight an item, press ENTER to enable/ disable the selection.

5 OS Support and Driver Installation

5.1 Operating System Compatibility

The following list contains the operating systems which have been tested by Neousys Technology.

- Microsoft Window Server 2016/ 2019
- Microsoft Windows 10 LTSC
- Ubuntu 18.04.5 LTS & Ubuntu 20.04.0 LTS **


NOTE

For other Linux OS, Linux kernel should upgrade to 4.15.18.

** For Linux system, user may need to manually compile and install the driver for AMD chipset, NVIDIA inference accelerator or Ethernet controller if the driver is not embedded in kernel. You can visit Intel website for further information.*

*** For distributions, graphics driver and RAID function may not be completely implemented in its kernel. You may encounter restrictions when using these features, such as triple independent display and RAID. For optimum operation, it is the users' responsibility to manually check for new drivers and upgrades!*

Neousys may remove or update operating system compatibility without prior notice. Please contact us if your operating system of choice is not on the list.

5.2 Driver Installation

The system drivers are available online, please click on this link to download the drivers.

5.3 Driver Installation for Watchdog Timer Control

Neousys provides a driver package which contain function APIs for Watchdog Timer control function. You should install the driver package (WDT_DIO_Setup.exe) in prior to use these functions. Please note that you must install WDT_DIO_Setup_v2.3.1.9 or later versions.

Please refer to this link to download WDT_DIO.

Appendix A Using WDT & DIO

The watchdog timer (WDT) function to ensure reliable system operation. The WDT is a hardware mechanism to reset the system if the watchdog timer is expired. Users can start the WDT and keeping resetting the timer to make sure the system or program is running. Otherwise, the system shall be reset.

In this section, we'll illustrate how to use the function library provided by Neousys to program the WDT functions. Currently, WDT driver library supports Windows 10 x64 and WOW64 platform. For other OS support, please contact Neousys Technology for further information.

Installing WDT_DIO Library

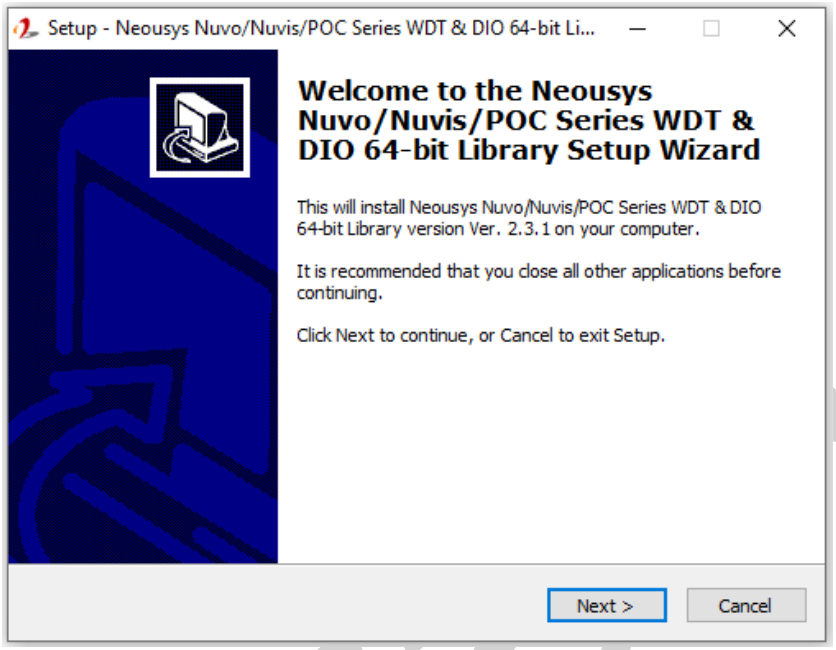
The WDT_DIO function library is delivered in the form of a setup package named **WDT_DIO_Setup.exe**. In prior to program WDT, you should execute the setup program and install the WDT library. Please use the following WDT_DIO_Setup packages according to your operating systems and application.

- For Windows 10 64-bit OS with 64-bit application (x64 mode), please install WDT_DIO_Setup_v2.3.1.9(x64).exe or later version.
- For Windows 10 64-bit OS with 32-bit application (WOW64 mode), please install WDT_DIO_Setup_v2.3.1.9(wow64).exe or later version.

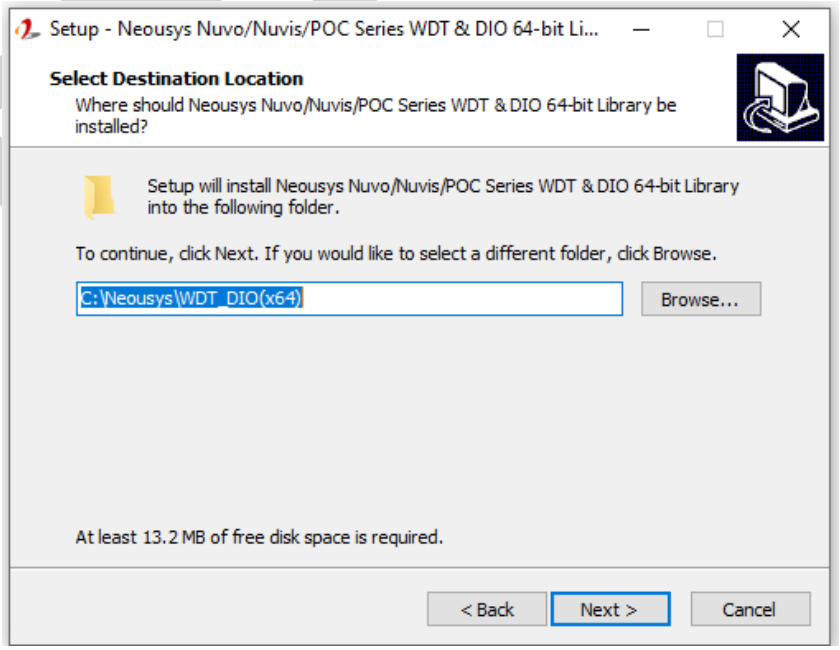
WDT and DIO Library Installation

To setup WDT & DIO Library, please follow instructions below.

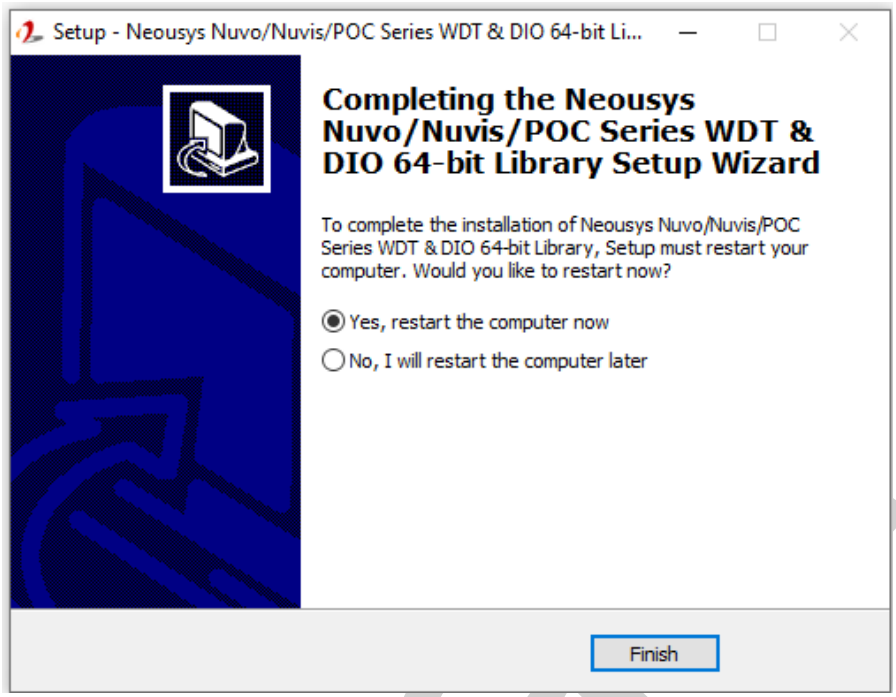
1. Execute **WDT_DIO_Setup.2.3.1.9.exe**. and the following dialog appears.



2. Click “Next >” and specify the directory of installing related files. The default directory is *C:\Neousys\WDT_DIO*.



3. Once the installation has finished, a dialog will appear to prompt you to reboot the system. The WDT & DIO library will take effect after the system has rebooted.



4. When programming your WDT or DIO program, the related files are located in

Header File:	\Include
Library File:	\Lib
Function Reference:	\Manual
Sample Code:	\Sample\WDT_Demo (Demo for Watchdog Timer)

WDT Functions

InitWDT

Syntax	BOOL InitWDT(void);
Description:	Initialize the WDT function. You should always invoke InitWDT() before set or start watchdog timer.
Parameter	None
Return Value	**TRUE:** Successfully initialized **FALSE:** Failed to initialize
Usage	BOOL bRet = InitWDT()

SetWDT

Syntax	BOOL SetWDT(WORD tick, BYTE unit);
Description	Set timeout value and unit for watchdog timer. When InitWDT() is invoked, a default timeout value of 255 seconds is assigned.
Parameter	*tick* WORD value (1 ~ 65535) to indicate timeout ticks. *unit* BYTE value (0 or 1) to indicate unit of timeout ticks. 0 : unit is minute 1: unit is second
Return Value	If value of unit is correct (0 or 1), this function returns TRUE, otherwise FALSE.

Usage	WORD tick=255;
	BYTE unit=1; //unit is second.
	BOOL bRet = SetWDT(tick, unit); //timeout value is 255 seconds

StartWDT

Syntax	BOOL StartWDT(void);
Description	Starts WDT countdown. Once started, the WDT LED indicator will begin blinking. If ResetWDT() or StopWDT is not invoked before WDT countdowns to 0, the WDT expires and the system resets.
Parameter	None
Return Value	If the timeout value is given in correct format (WDT started), this function returns TRUE, otherwise FALSE
Usage	BOOL bRet = StartWDT()

ResetWDT

Syntax	BOOL ResetWDT(void);
Description	Reset the timeout value to the value given by SetWDT().If ResetWDT() or StopWDT is not invoked before WDT countdowns to 0, the WDT expires and the system resets.
Parameter	None
Return Value	Always returns TRUE
Usage	BOOL bRet = ResetWDT()

StopWDT

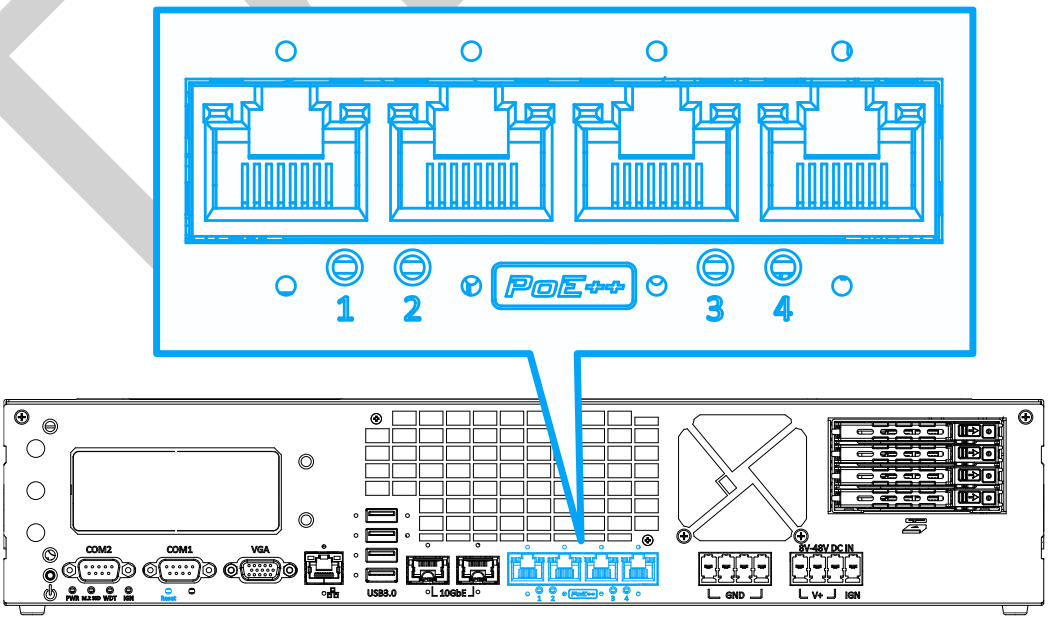
Syntax	BOOL StopWDT(void);
Description	Stops the countdown of WDT. When WDT has stopped, the WDT LED indicator stops blinking.
Parameter	None
Return Value	Always returns TRUE
Usage	BOOL bRet = StopWDT()

Appendix B PoE On/ Off Control

Nuvo-9000series offer 802.3at PoE+ ports and users are allowed to manually turn on or off the power supply of each PoE port. This can be useful in power device (PD) fault-recovery or power reset. The APIs are part of Neousys WDT_DIO driver package. Please follow the instructions in Appendix AWatchdog Timer & Isolated DIO for installation before programming PoE on/off control function.

GetStatusPoEPort

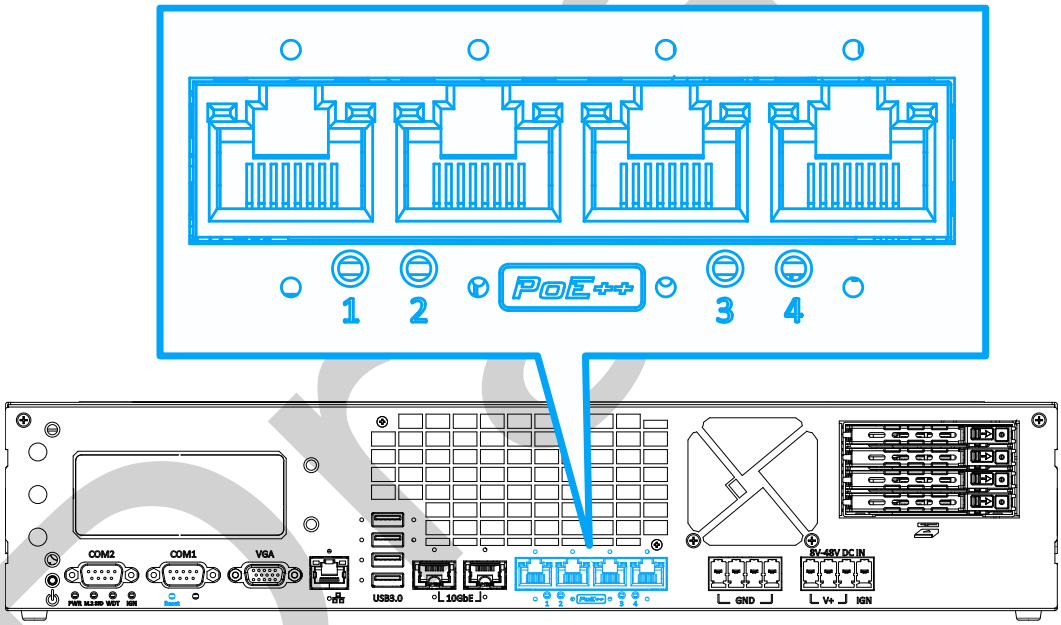
Syntax	BYTE GetStatusPoEPort (Byte port);
Description	Get current on/off status of designated PoE port.
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* should be a value of 1 ~ 4
Return Value	BYTE value indicating PoE on/off status 0 if port is disabled (off) 1 if port is enabled (on)
Usage	BYTE bEnabled = GetStatusPoEPort (1); //Get on/off status of PoE Port#1



PoE+ ports on the front panel

EnablePoEPort

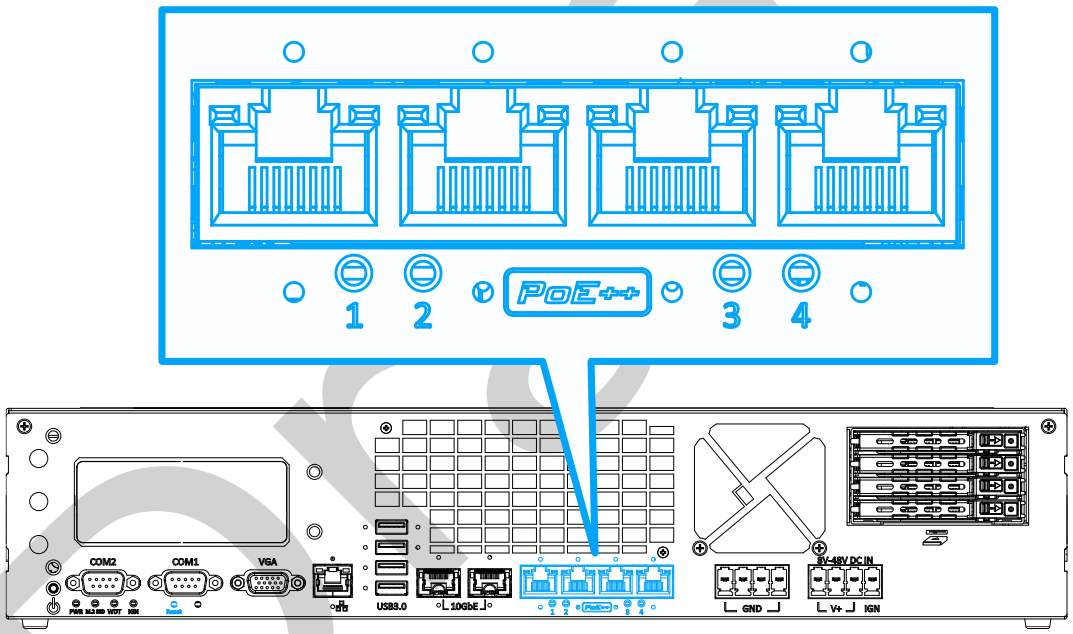
Syntax	BOOL EnablePoEPort (BYTE port);
Description	Turn on PoE power of designated PoE port.
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* should be a value of 1 ~ 4
Return Value	**TRUE** if enabled success **FALSE** if fail to enable.
Usage	BOOL bRet = EnablePoEPort (1); //Turn on PoE Port#1



PoE+ ports on the front panel

DisablePoEPort

Syntax	BOOL DisablePoEPort (BYTE port);
Description	Turn off PoE power of designated PoE port
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* should be a value of 1 ~ 4
Return Value	**TRUE** if disabled success **FALSE** if fail to disable
Usage	BOOL bRet = DisablePoEPort (1); //Turn off PoE Port#1



PoE+ ports on the front panel