Neousys Technology Inc.

Nuvo-9501 Series

User Manual

Revision 1.2

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Legal Information

All Neousys Technology Inc. products shall be subject to the latest Standard Warranty Policy

Neousys Technology Inc. may modify, update or upgrade the software, firmware or any accompanying user documentation without any prior notice. Neousys Technology Inc. will provide access to these new software, firmware or documentation releases from download sections of our website or through our service partners.

Before installing any software, applications or components provided by a third party, customer should ensure that they are compatible and interoperable with Neousys Technology Inc. product by checking in advance with Neousys Technology Inc.. Customer is solely responsible for ensuring the compatibility and interoperability of the third party's products. Customer is further solely responsible for ensuring its systems, software, and data are adequately backed up as a precaution against possible failures, alternation, or loss.

For questions in regards to hardware/ software compatibility, customers should contact Neousys Technology Inc. sales representative or technical support.

To the extent permitted by applicable laws, Neousys Technology Inc. shall NOT be responsible for any interoperability or compatibility issues that may arise when (1) products, software, or options not certified and supported; (2) configurations not certified and supported are used; (3) parts intended for one system is installed in another system of different make or model.

Contact Information

For our contact information, please visit our official website.

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.

Copyright Notice

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Windows is a registered trademark of Microsoft Corporation.

Intel®, Core™ are registered trademarks of Intel Corporation

NVIDIA®, GeForce® are registered trademarks of NVIDIA Corporation

All other names, brands, products or services are trademarks or registered trademarks of their respective owners.

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
- This product is intended to be supplied by a Listed Power Adapter or DC power source, rated 8-35V, 16A, Tma 60 degree C and 5000m altitude during operation. If further assistance is required, please contact Neousys Technology
- If the system is not going to be used for a long time, disconnect it from mains (power socket) to avoid transient over-voltage

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.

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

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

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

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

About This Manual

This guide introduces Neousys Nuvo-9501 series system. It is a compact fanless embedded computer with Intel® Core™ processor (Series 2) with P-cores/ 14th/ 13th/ 12th Gen Core™ i9/ i7/ i5/ i3 processor.

The guide also demonstrates the system's basic installation procedures.

Revision History

Version	Date	Description
1.0	Jul. 2023	Initial release
1.1	Mar. 2025	Updated Nuvo-9501 DC input specification
1.2	Oct. 2026	Updated CPU support list, packing list content

1 Introduction

Nuvo-9501 is a cost-effective compact fanless embedded computers based on the Intel® Core™ processor (Series 2) with P-cores/ 14th/ 13th/12th-Gen platform. Built on the advanced Intel 7 process, Intel 13th Gen processors offer up to 24 cores/ 32 threads to deliver up to 2x the performance when compared to previous Intel 10th or 11th Gen platforms. Nuvo-9501 is a cost-effective, compact and yet powerful fanless embedded computer that offers the ultimate computing for various industrial applications.

Nuvo-9501

Nuvo-9501 with fan

Nuvo-9501 offers essential I/O functions for general industrial needs including dual 2.5GbE ports, dual display ports and four USB3.2 ports. In addition, it features a Gen4 x4 M.2 NVMe slot for the latest NVMe SSDs with read/ write speeds up to 7000 MB/s. Also, it supports a 2.5” or 3.5” HDD storage for high capacity storage needs such as data collection or surveillance applications. It also offers two mPCIe and one M.2 E key slots for installing WiFi or 5G/ 4G wireless communication modules.

As a cost-effective and compact embedded computer, Nuvo-9501 delivers excellent computing performance and offers essential necessary I/O connectivity to meet customers’ needs and cost. It is suitable for a variety of industrial applications.

1.1 Product Specifications

1.1.1 Nuvo-9501 Specifications

System Core		
Processor[1]	Supporting Intel® Core™ processor (Series 2) with P-cores (LGA1700 socket, 65W/ 45W TDP) - Intel® Core™ 9 273PE/ 273PTE - Intel® Core™ 7 253PE/ 253PTE - Intel® Core™ 5 223PE/ 223PTE Supporting Intel® Core™ processor (Series 2) (LGA1700 socket, 65W/ 45W TDP) - Intel® Core™ 7 251E/ 251TE - Intel® Core™ 5 221E/ 221TE - Intel® Core™ 3 201E/ 201TE	Supports Intel® 14th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-14900/ i9-14900T - Intel® Core™ i7-14700/ i7-14700T - Intel® Core™ i5-14500/ i5-14400/ i5-14500T - Intel® Core™ i3-14100/ i3-14100T
	Supporting Intel® 13th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-13900E/ i9-13900TE - Intel® Core™ i7-13700E/ i7-13700TE - Intel® Core™ i5-13500E/ i5-13400E/ i5-13500TE - Intel® Core™ i3-13100E/ i3-13100TE	Supporting Intel® 12th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-12900E/ i9-12900TE - Intel® Core™ i7-12700E/ i7-12700TE - Intel® Core™ i5-12500E/ i5-12500TE - Intel® Core™ i3-12100E/ i3-12100TE - Intel® Pentium® G7400E/ G7400TE - Intel® Celeron® G6900E/ G6900TE
Chipset	Intel® H610E platform controller hub	
Graphics	Integrated Intel® UHD Graphics 770 (32EU)/ 730 (24EU)	
Memory	Up to 32 GB non-ECC DDR4 3200 SDRAM (one SODIMM slot)	
TPM	Supports fTPM 2.0	
I/O Interface		
Ethernet port	2x 2.5GBASE-T Ethernet ports by Intel® I226-V GbE controller	
USB	4x USB 3.2 Gen1 (5 Gbps) ports 2x USB 2.0 ports	
Video Port	1x VGA output, supporting 1920 x 1200 resolution 1x DisplayPort, supporting 4096 x 2304 resolution	

Serial Port	1x software-programmable RS-232/422/485 ports (COM1) 3x 3-wire RS-232 ports (COM2/3/4) or 1x RS-422/485 port (COM2)
Audio	1x 3.5 mm jack for mic-in and speaker-out
Storage Interface	
SATA HDD	1x internal SATA port for 3.5" HDD or 2.5" HDD/ SSD
M.2	1x M.2 2280 M key socket (PCIe Gen4 x4) for NVMe SSD
Expansion Bus/ Internal I/O Interface	
mini-PCIe	2x full-size mini PCI Express socket with internal SIM sockets
M.2 E Key	1x M.2 2230 E key socket for WiFi6/ WiFi5, or Google Edge TPU module
Power Supply	
DC Input	1x 3-pin pluggable terminal block for 8 to 35V DC power input with remote on/off control
Maximum Power Consumption	With i7-12700 (65W mode): 141.4W (Max.) @ 24V With i7-12700TE (35W mode): 106.6W (Max.) @ 24V With i5-12400 (35W mode): 105.1W (Max.) @ 24V With i5-12400 (65W mode): 120.5W (Max.) @ 24V
Mechanical	
Dimension	212 mm (W) x 165 mm (D) x 80 mm (H)
Weight	2.5 kg
Mounting	Wall-mount (optional) or DIN-rail (optional)
Environmental	
Storage Temperature	-40°C to 85°C
Operating Temperature	With 35W CPU -10°C to 60°C[2] With 45W CPU -25°C to 50°C[2][3] With 65W CPU (installation of the optional fan kit is recommended) -10°C to 60°C [2][3]
Humidity	10%~90% , non-condensing
Vibration	MIL-STD-810H, Method 514.8, Category 4
Shock	MIL-STD-810H, Method 516.8, Procedure I
EMC	CE/FCC Class A, according to EN 55032 & EN 55035

[1] A BIOS update may be required for the system to recognize Core™ Processor (Series 2). Please contact Neousys Technology for more information.

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

[3] For 65W CPUs, the optional fan kit is recommended for operating at ambient temperatures higher than 50°C.

1.1.2 Nuvo-9505D Specifications

System Core		
Processor[1]	Supporting Intel® Core™ processor (Series 2) with P-cores (LGA1700 socket, 65W/ 45W TDP) - Intel® Core™ 9 273PE/ 273PTE - Intel® Core™ 7 253PE/ 253PTE - Intel® Core™ 5 223PE/ 223PTE Supporting Intel® Core™ processor (Series 2) (LGA1700 socket, 65W/ 45W TDP) - Intel® Core™ 7 251E/ 251TE - Intel® Core™ 5 221E/ 221TE - Intel® Core™ 3 201E/ 201TE	Supports Intel® 14th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-14900/ i9-14900T - Intel® Core™ i7-14700/ i7-14700T - Intel® Core™ i5-14500/ i5-14400/ i5-14500T - Intel® Core™ i3-14100/ i3-14100T
	Supporting Intel® 13th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-13900E/ i9-13900TE - Intel® Core™ i7-13700E/ i7-13700TE - Intel® Core™ i5-13500E/ i5-13400E/ i5-13500TE - Intel® Core™ i3-13100E/ i3-13100TE	Supporting Intel® 12th-Gen Core™ CPU (LGA1700 socket, 65W/ 35W TDP) - Intel® Core™ i9-12900E/ i9-12900TE - Intel® Core™ i7-12700E/ i7-12700TE - Intel® Core™ i5-12500E/ i5-12500TE - Intel® Core™ i3-12100E/ i3-12100TE - Intel® Pentium® G7400E/ G7400TE - Intel® Celeron® G6900E/ G6900TE
Chipset	Intel® H610E platform controller hub	
Graphics	Integrated Intel® UHD Graphics 770 (32EU)/ 730 (24EU)	
Memory	Up to 32 GB non-ECC DDR4 3200 SDRAM (one SODIMM slot)	
TPM	Supports fTPM 2.0	
I/O Interface		
Ethernet port	2x 2.5GBASE-T Ethernet ports by Intel® I226-IT GbE controller	
USB	4x USB 3.2 Gen1 (5 Gbps) ports 2x USB 2.0 ports	
Video Port	1x VGA output, supporting 1920 x 1200 resolution 1x DisplayPort, supporting 4096 x 2304 resolution	
Serial Port	1x software-programmable RS-232/422/485 ports (COM1) 3x 3-wire RS-232 ports (COM2/3/4) or 1x RS-422/485 port (COM2)	

Audio	1x 3.5 mm jack for mic-in and speaker-out
Isolated DIO	4-CH isolated DI and 4-CH isolated DO
Storage Interface	
SATA HDD	1x internal SATA port for 3.5" HDD or 2.5” HDD/ SSD
M.2	1x M.2 2280 M key socket (PCIe Gen4 x4) for NVMe SSD
Expansion Bus/ Internal I/O Interface	
mini-PCIe	2x full-size mini PCI Express socket with internal SIM sockets
M.2 E Key	1x M.2 2230 E key socket for WiFi6/ WiFi5, or Google Edge TPU module
Power Supply	
DC Input	1x 3-pin pluggable terminal block for 8 to 35V DC power input with remote on/off control
Maximum Power Consumption	With i7-12700 (65W mode): 141.4W (Max.) @ 24V With i7-12700TE (35W mode): 106.6W (Max.) @ 24V With i5-12400 (35W mode): 105.1W (Max.) @ 24V With i5-12400 (65W mode): 120.5W (Max.) @ 24V
Mechanical	
Dimension	212 mm (W) x 165 mm (D) x 80 mm (H)
Weight	2.5 kg
Mounting	Wall-mount (optional) or DIN-rail (optional)
Environmental	
Storage Temperature	-40°C to 85°C
Operating Temperature	With 35W CPU -10°C to 60°C[2] With 45W CPU -25°C to 50°C[2][3] With 65W CPU (installation of the optional fan kit is recommended) -10°C to 60°C [2][3]
Humidity	10%~90% , non-condensing
Vibration	MIL-STD-810H, Method 514.8, Category 4
Shock	MIL-STD-810H, Method 516.8, Procedure I
EMC	CE/FCC Class A, according to EN 55032 & EN 55035

[1] A BIOS update may be required for the system to recognize Core™ Processor (Series 2). Please contact Neousys Technology for more information.

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

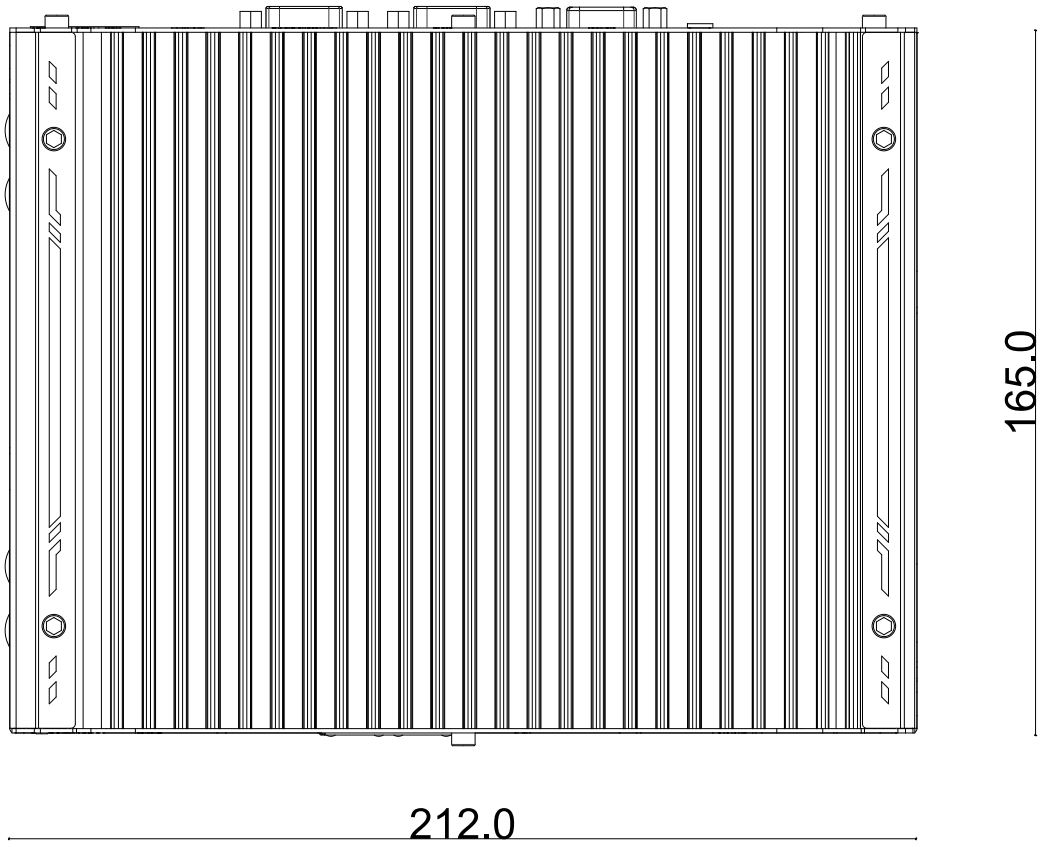
[3] For 65W CPUs, the optional fan kit is recommended for operating at ambient temperatures higher than 50°C.

1.2 Dimension

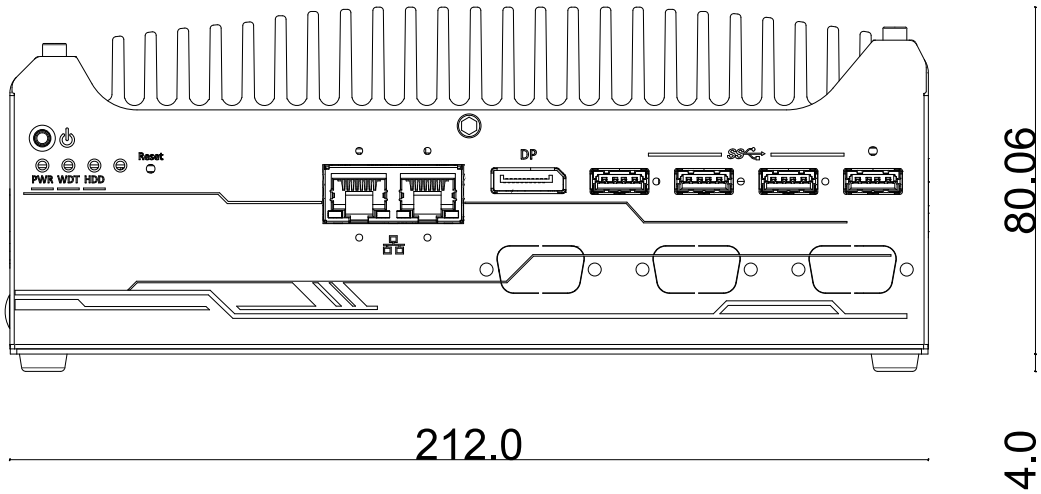
NOTE

All measurements are in millimeters (mm).

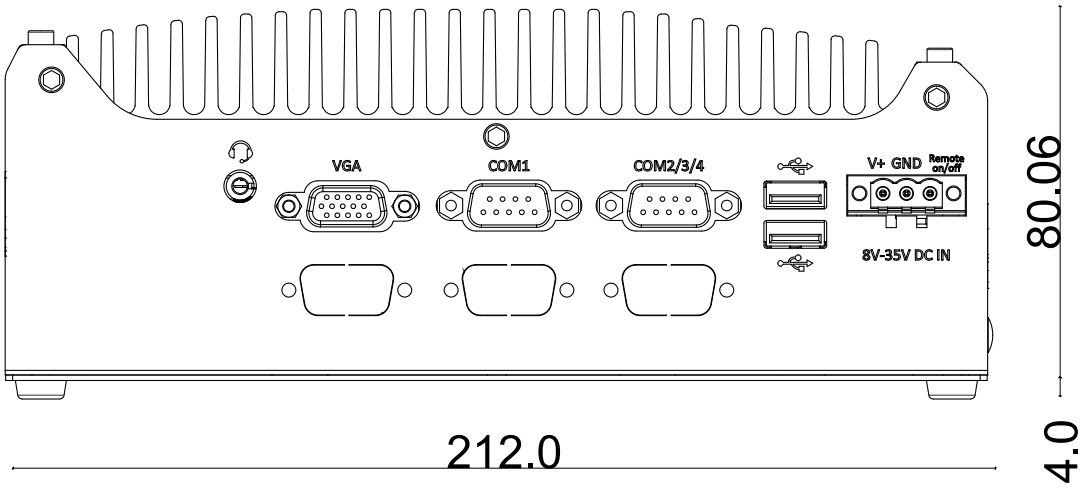
1.2.1 Top View of Nuvo-9501 Series



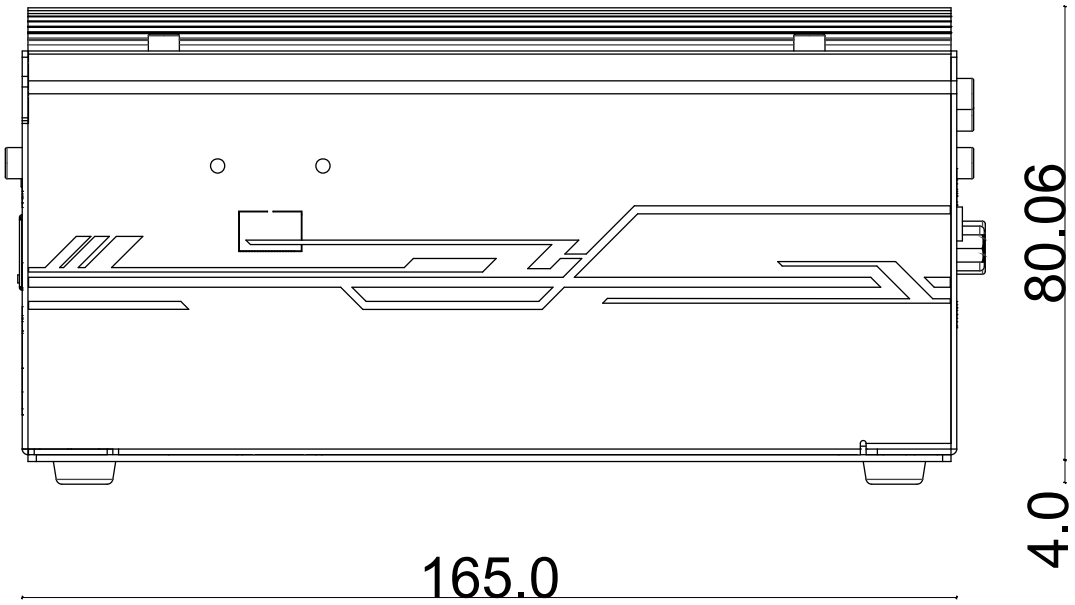
1.2.2 Front View of Nuvo-9501 Series



1.2.3 Back View of Nuvo-9501 Series



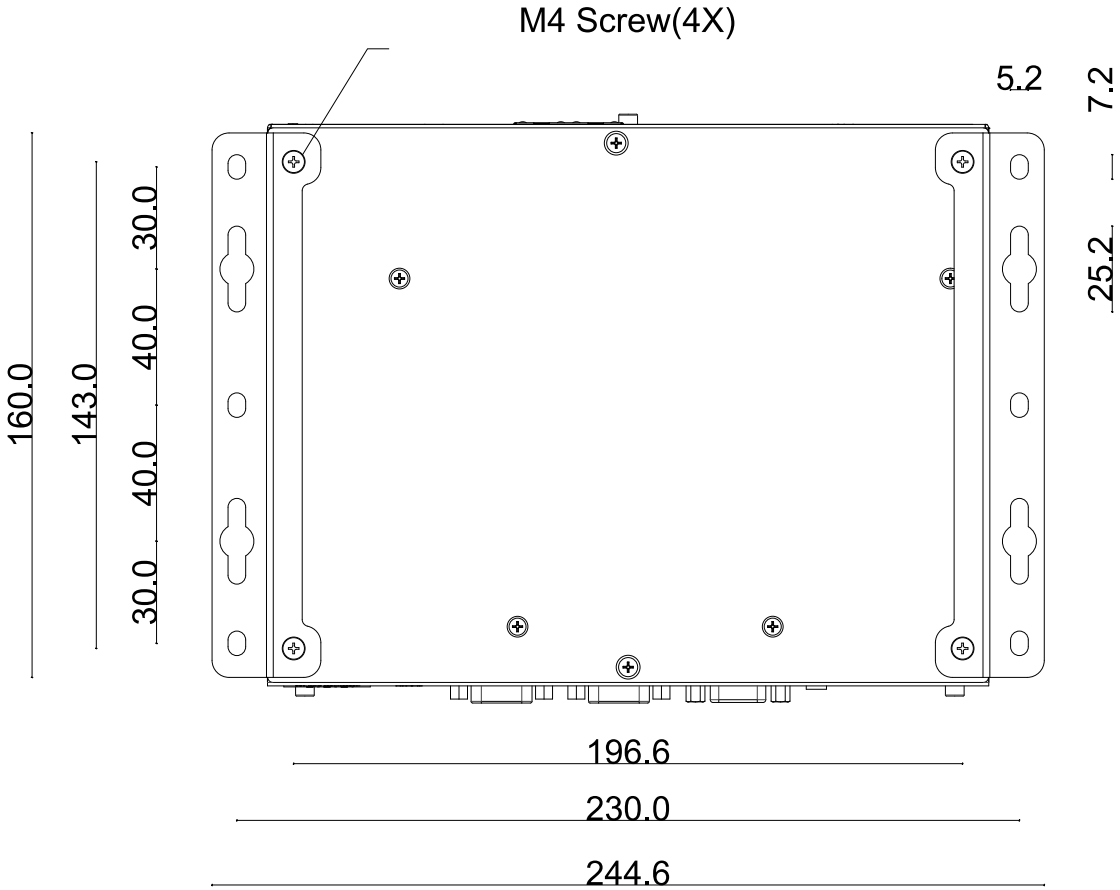
1.2.4 Side View of Nuvo-9501 Series



1.2.5 Wall Mount Installation Dimension

NOTE

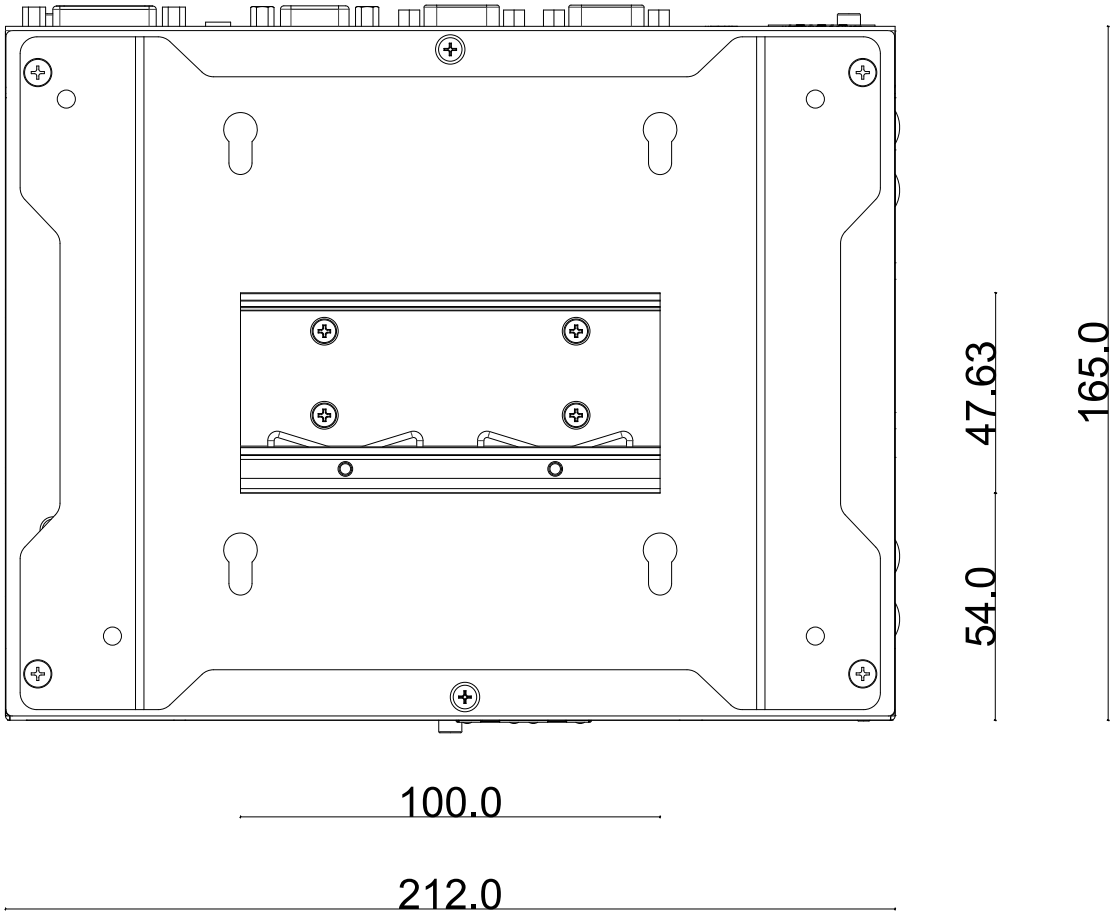
Wall mount bracket is an optional accessory.



1.2.6 DIN Rail Installation Dimension

NOTE

DIN rail bracket is an optional accessory.



2 System Overview

Upon receiving and unpacking your Nuvo-9501/ 9505D, 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.

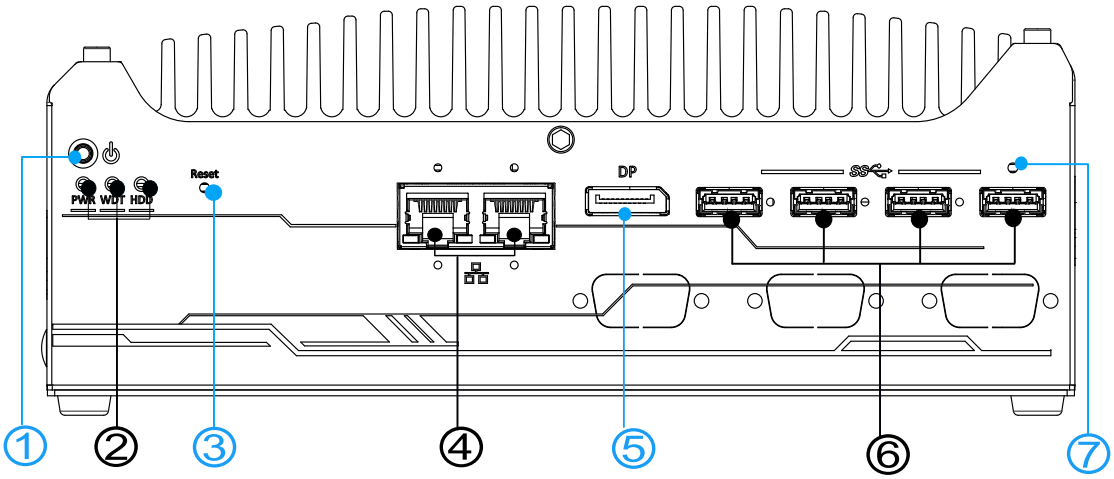
2.1 Nuvo-9501 Series Packing List

System / Pack	Nuvo-9501/ 9505D	Qty
1	Nuvo-9501 (If you ordered CPU/ RAM/ HDD, please verify these items)	1
2	Accessory box, which contains	
	● Thermal pad	3
	● CPU bracket	1
	● 3-pin power terminal block	1
	● Screw pack	1
	● High temperature warning label*	1

*A high-temperature warning sticker is provided for users to place on surfaces that may become hot during operation.

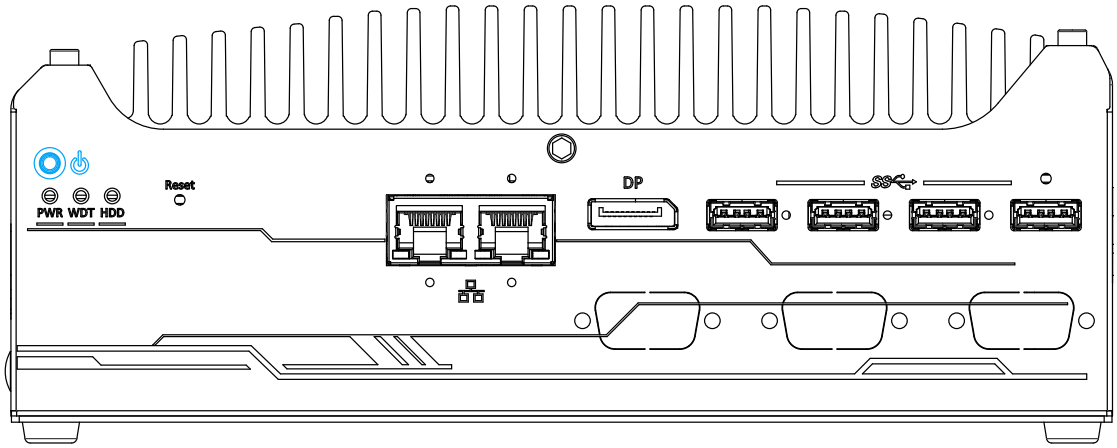
2.2 Front Panel I/O

The Nuvo-9501 I/O panel features a power button, system status LED, reset button, two 2.5G Ethernet ports, four USB3.2 Gen1 ports, and DisplayPort.



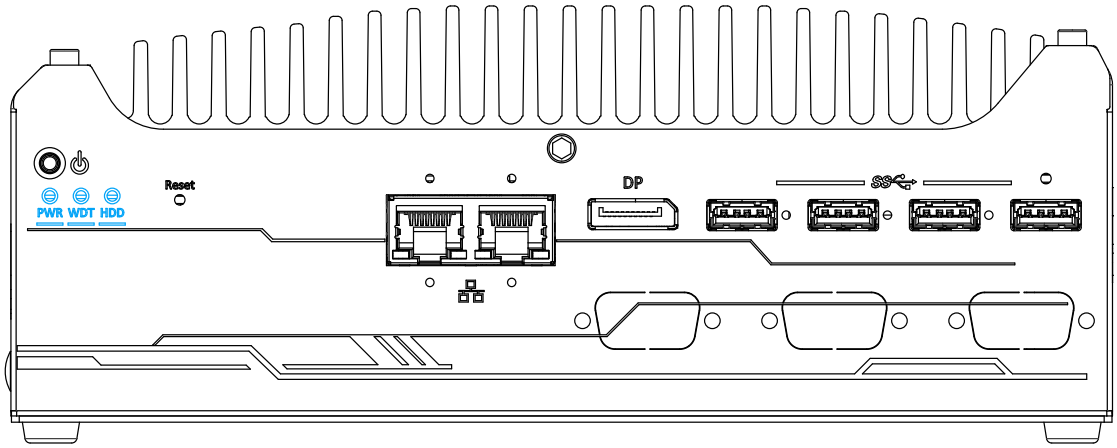
No.	Item	Description
1	Power button	Use this button to turn on or shutdown the system.
2	System status LED	Three system LEDs, Power (PWR), Watchdog Timer (WDT), and Hard Disk Drive (HDD).
3	Reset button	Use this button to manually reset the system.
4	2.5G Ethernet Port	The 2.5G Ethernet ports support 10/ 100/ 1000/ 2500 Mbps network connections
5	DisplayPort	The DisplayPort is a digital signal video output port supporting resolutions up to 4096 x 2304
6	USB 3.2 Gen1 port	USB 3.2 Gen1 port supports up to 5 Gbit/s data transfer bandwidth.
7	CMOS reset	Use this button to manually reset the CMOS.

2.2.1 Power Button



The power button is a non-latched switch for ATX mode on/off operation. Press to turn on the system, PWR LED should light up and to turn off, you can either issue a shutdown command in the OS, or just press the power button. In case of system halts, you can press and hold the power button for 5 seconds to force-shutdown the system. Please note that there is a 5 seconds interval between two on/off operations (i.e. once turning off the system, you will need to wait for 5 seconds to initiate another power-on operation).

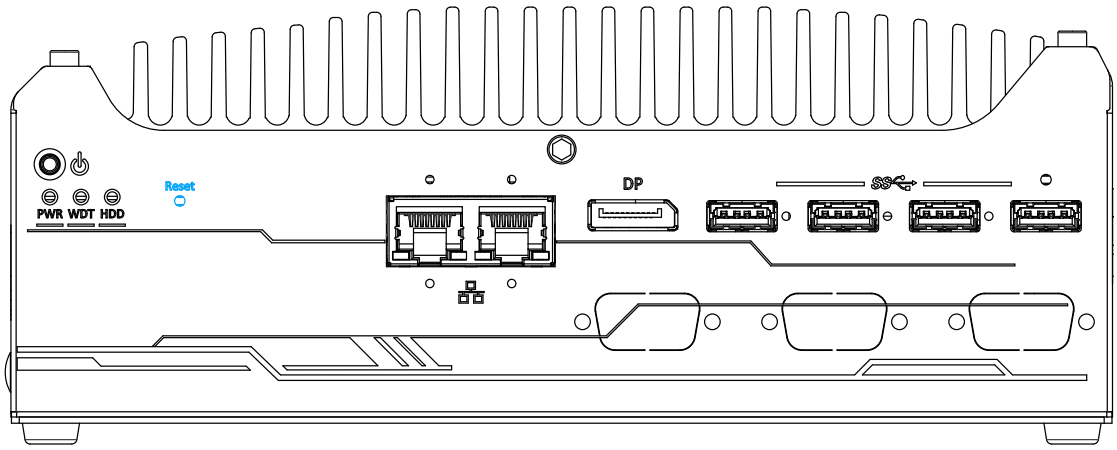
2.2.2 System Status LED



There are three LED indicators on the I/O panel: PWR, WDT and HDD. The descriptions of these three LED are listed in the following table.

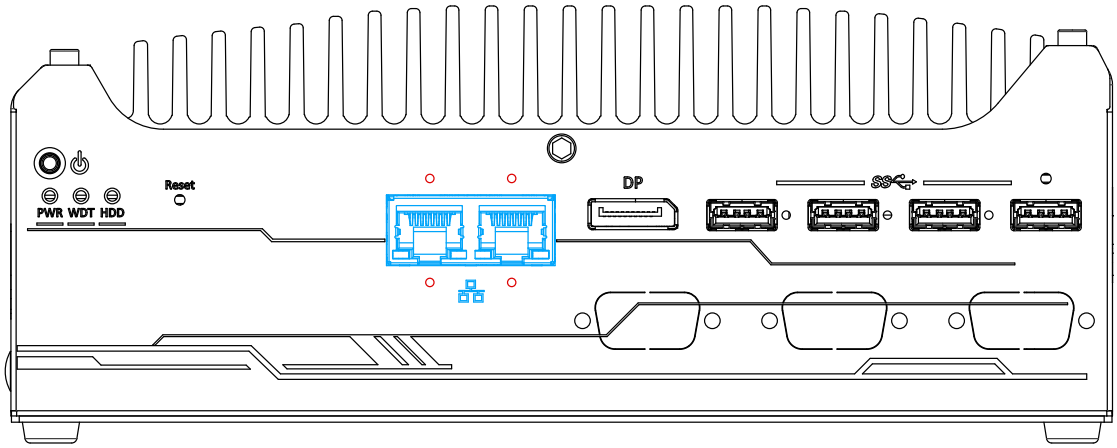
Indicator	Color	Description
PWR	Green	Power indicator, lighted-up when system is on.
WDT	Yellow	Watchdog timer LED, flashing when watchdog timer is started.
HDD	Red	Hard drive indicator, flashing when SATA HDD is active.

2.2.3 Reset Button



The reset button can be used to manually reset the system in case of abnormal condition. To avoid unexpected operation, the reset button is hidden behind the front panel. You need to use a pin-like object to push the reset button.

2.2.4 2.5G Ethernet Port



The system offers two 2.5Gb Ethernet ports using Intel® I226 controller, and each port each come with screw-lock mechanism (indicated in **red**). When plugged in and connected via the Ethernet cable, the LEDs on the RJ45 connector indicate connection status and speed.

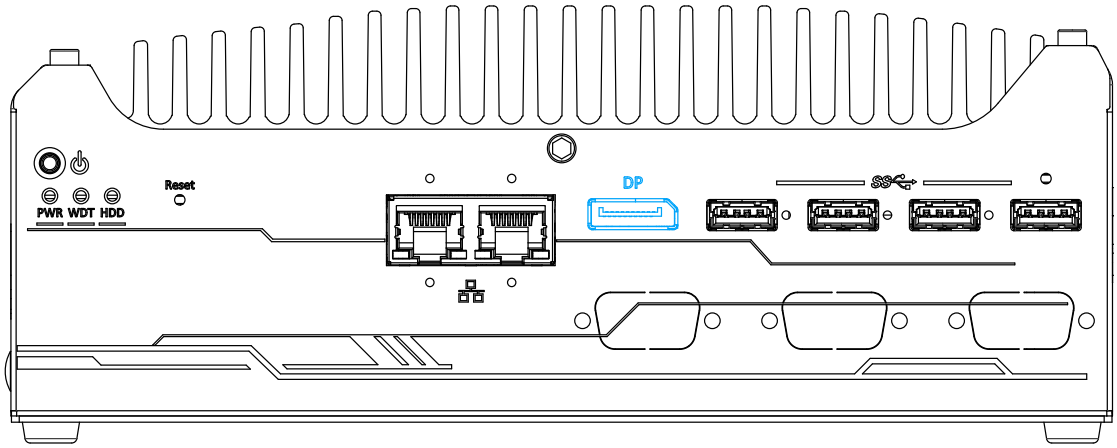
Active/Link LED

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

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

2.2.5 DisplayPort



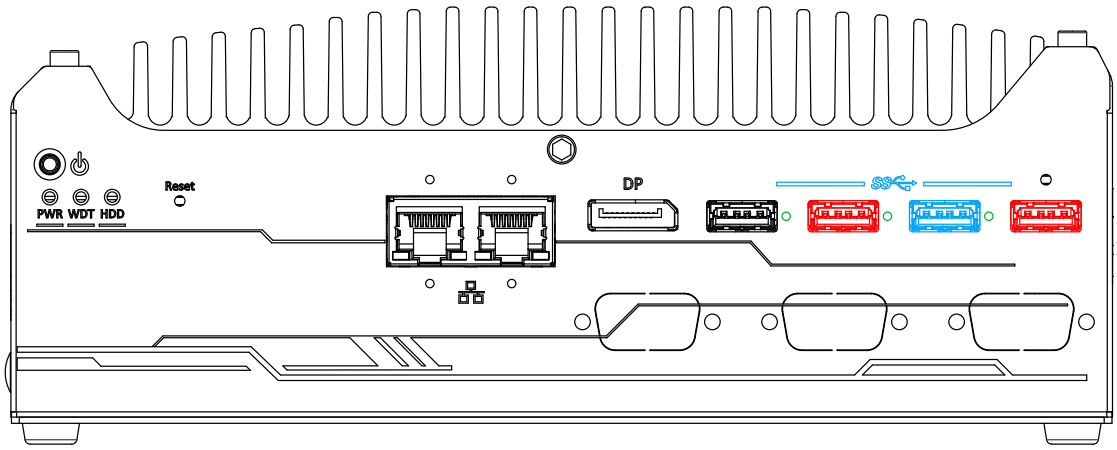
The system has a DisplayPort (DP) output which is a digital display interface that mainly connect video source and carry audio to a display device. When connecting a DP, it can deliver up to 4K UHD (4096 x 2304 @ 60Hz) in resolution. The system is designed to support passive DP adapter/ cable. You can connect to other display devices using DP-to-HDMI cable or DP-to-DVI cable.

DP-to-HDMI

DP-to-DVI

The system supports dual independent display outputs by connecting display devices to VGA and DisplayPort connection. To support multiple display outputs and achieve best DisplayPort output resolution in Windows, you need to install corresponding graphics drivers. Please refer to section OS Support and Driver Installation for details.

2.2.6 USB 3.2 Gen1 Port

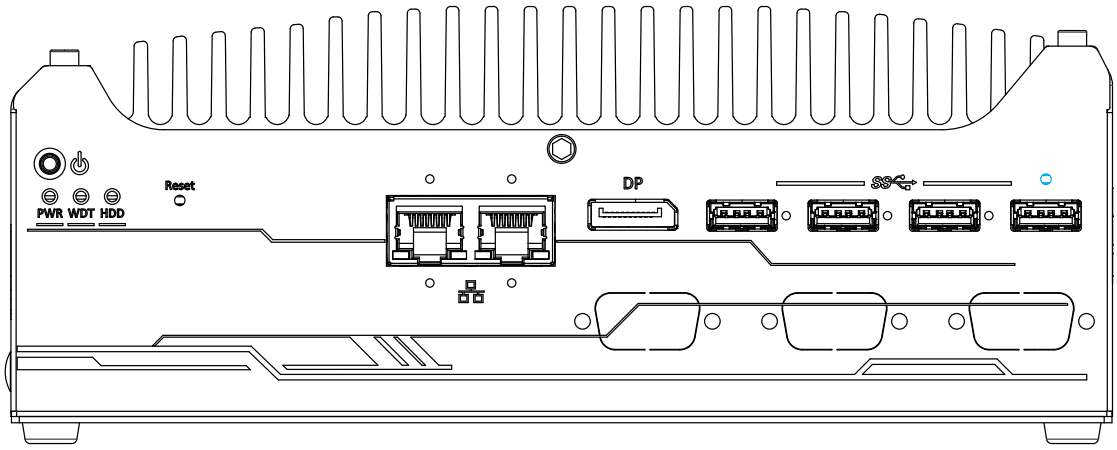


The system offers four USB 3.2 Gen1 (SuperSpeed USB) ports on its front panel with screw-lock mechanism. They are backward compatible with USB 2.0, USB 1.1 and USB 1.0 devices. UEFI USB is also supported so you can use USB keyboard/ mouse in UEFI shell environment. USB 3.2 Gen1 driver is supported natively in Windows 10. The screw-lock mechanism is available on the three ports indicated in **blue** and **red**, and due to the width of the screw-lock connector, only the USB ports indicated in **red** can be connected simultaneously when using the screw-lock mechanism.

NOTE

Depending on the design of your screw-lock USB connector, the CMOS reset button may be obstructed by the connected USB port below.

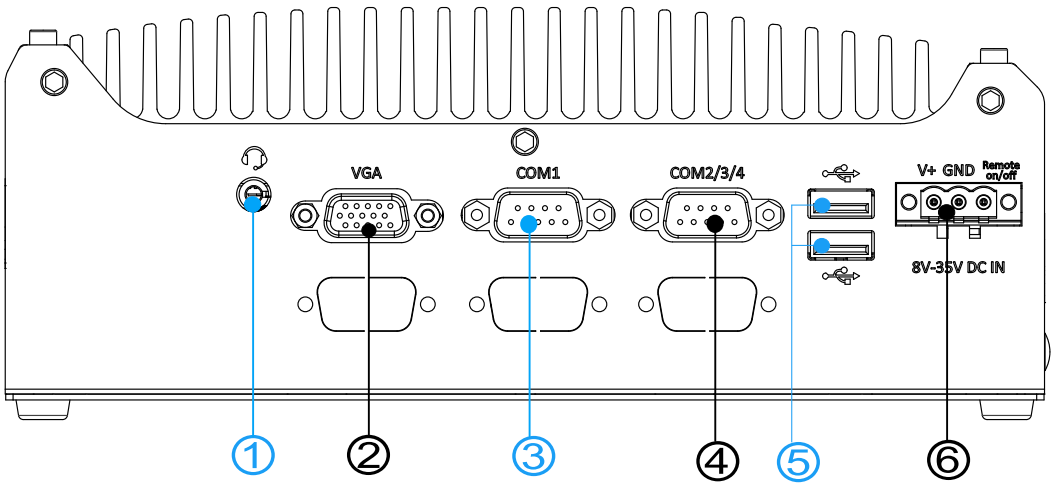
2.2.7 CMOS Reset Button



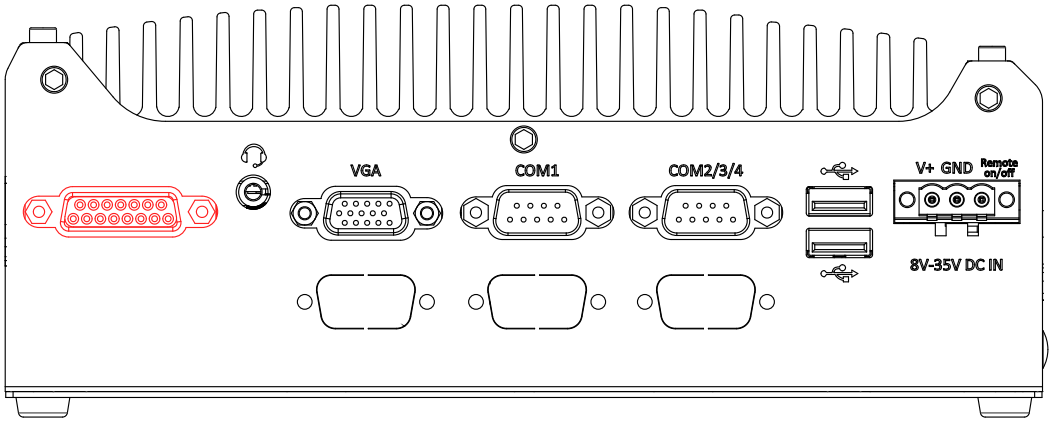
The CMOS Reset button is used to manually reset the motherboard BIOS in case of system halt or malfunction. To avoid unexpected operation, it is purposely placed behind the panel. To reset, please use the tip of a pen, press and hold for at least 5 seconds to reset the BIOS.

2.2 Rear Panel I/O

On the rear panel of the system, you will find a 4-pole female 3.5mm headphone (speaker)/ microphone jack, VGA port, two configurable COM ports, two USB2.0 ports, and a 3-pin terminal block for DC input. On Nuvo-9505D, you will find an isolated 4 channel digital input/ output connection (indicated in **red**).



Nuvo-9501

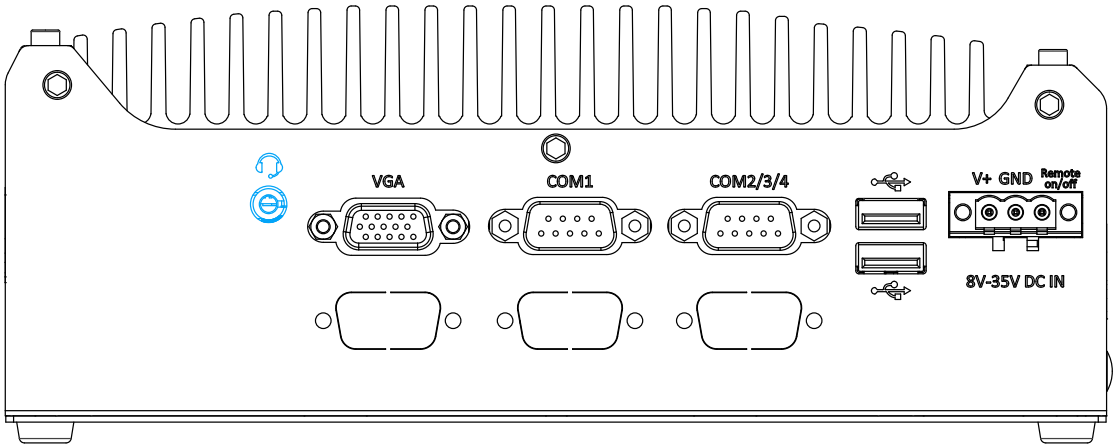


Nuvo-9505D

No.	Item	Description
1	4-Pole 3.5mm Microphone-in/ Speaker-out Jack	The 4-pole 3.5mm jack accepts microphone voice input and headphone speaker sound output.
2	VGA Port	VGA output supports resolution up to 1920x1200@60Hz

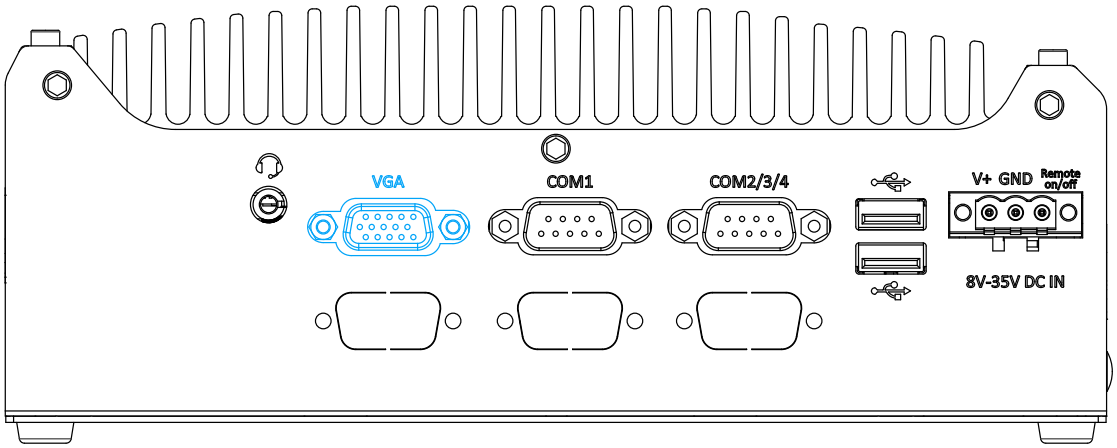
3	COM1 Port	Software programmable RS-232/ 422/ 485 port.
4	COM2/3/4 Port	**Can be configured as:** **COM2**: single RS-422/ 485 port **COM2/ COM3/ COM4**: three 3-wire RS-232 ports
5	USB2.0 Ports	The USB 2.0 ports are backward with USB 1.1 / 1.0.
6	3-pin Terminal Block DC Input & Remote on/ off	Compatible with DC power input from 8 to 35V, the terminal block is also used for remote on/ off signal.
Area in red		Isolated 4 channel digital input and output (Nuvo-9505D only)

2.3.1 4-Pole 3.5mm Microphone-in/ Speaker-out Jack



There is a female 4-pole audio jack for headphone (speaker) output and microphone input. To utilize the audio function in Windows, you need to install corresponding drivers. Please refer to the section, Driver Installation.

2.3.2 VGA Port

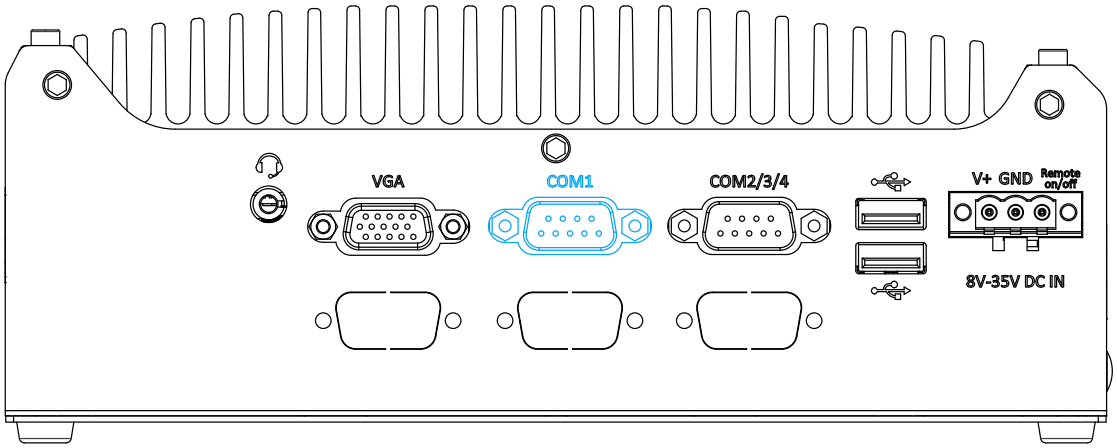


VGA connector is the most popular way for connecting a display. The VGA output on Nuvo-9501 series supports up to 1920 x 1200 resolution. To support multiple display outputs and achieve best VGA/ DP output resolution in Windows, you need to install corresponding graphics driver. Please refer to the driver installation section.

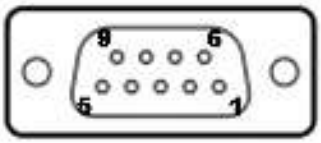
NOTE

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.

2.3.3 COM1 Port

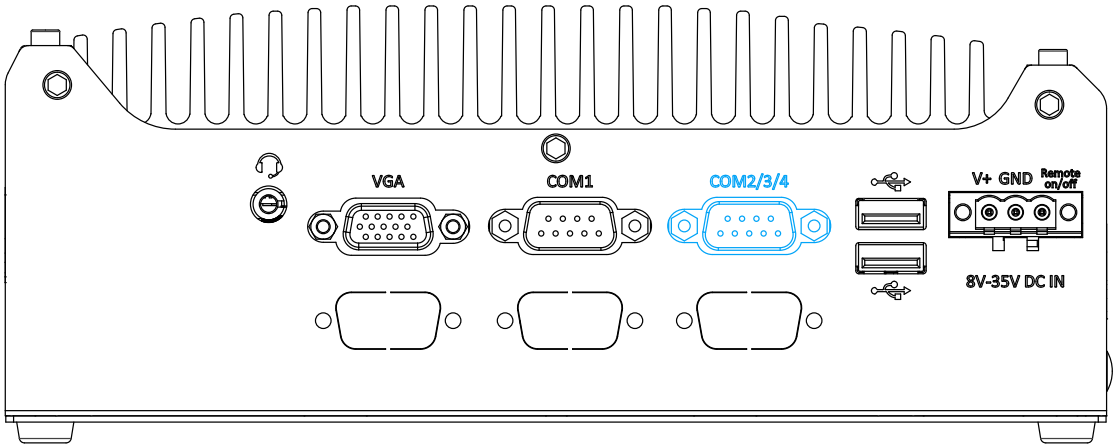


Implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 921600 bps baud rate, COM1 is a software-configurable RS-232/422/485 port via 9-pin D-Sub male connector. The operation mode, slew rate and termination of COM1 can be set in BIOS setup utility. The following table describes the pin definition of COM ports.

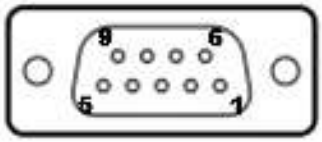


	COM1		
Pin#	**RS-232 Mode**	**RS-422 Mode**	**RS-485 Mode (Two-wire 485)**
1	DCD		
2	RX	422 TXD+	485 TXD+/RXD+
3	TX	422 RXD+	
4	DTR	422 RXD-	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS	422 TXD-	485 TXD-/RXD-
9	RI		

2.3.4 COM2/3/4 Port



Implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 921600 bps baud rate, the D-Sub male connector (COM2/ 3/ 4) can be configured in the BIOS as single RS-422/ 485 port (COM2) or three 3-wire RS-232 ports (COM2/COM3/COM4). Please refer to COM2/ 3/ 4 Port Configuration for configuring operation mode. An optional 1-to-3 Y-cable is available to connect three RS-232 devices.



COM2/ 3/ 4 Pin

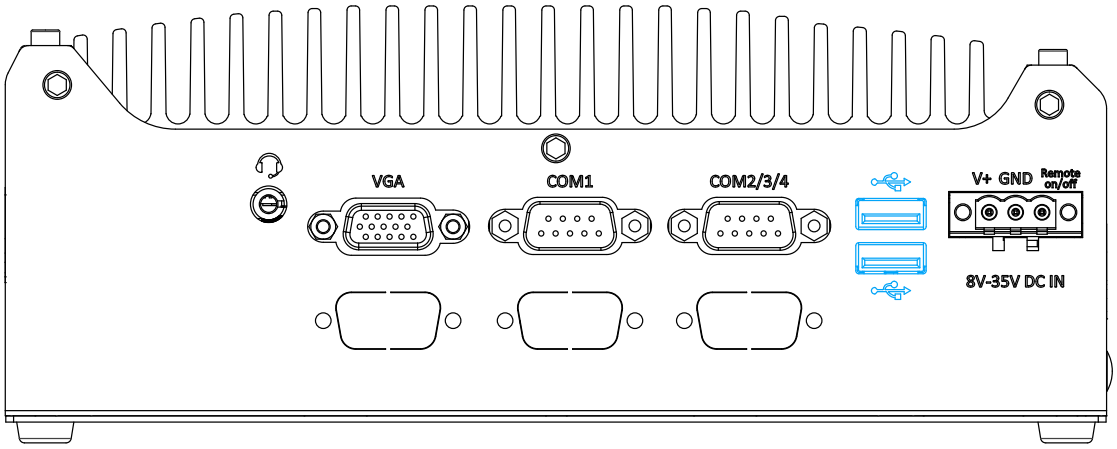
1-to-3 Y-cable

The following table describes the pin definition of the COM port

	3-port RS-232 COM2/ 3/ 4		
Pin#	**COM2**	**COM3**	**COM4**
1			
2	RX		
3	TX		
4		TX	
5	GND	GND	GND
6		RX	
7			TX
8			RX
9			

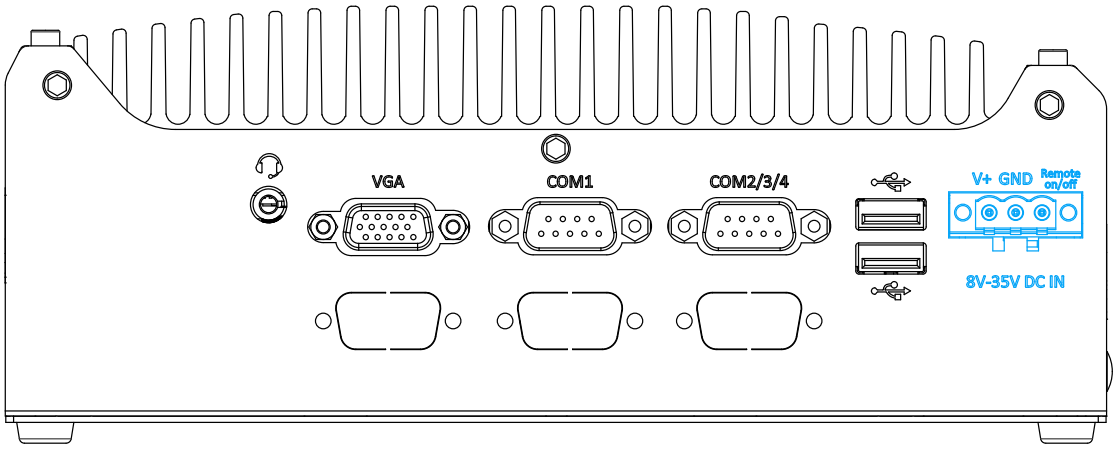
	Single port RS-422/ 485 COM2	
Pin#	RS-422	RS-485
1		
2	TxD+	TxD+/ RxD+
3	RxD+	
4	RxD-	
5	GND	GND
6		
7		
8	TxD-	TxD-/ RxD-
9		

2.3.5 USB2.0 Ports



The USB2.0 ports are implemented via native xHCI (eXtensible Host Controller Interface) in the Intel 600 chipset and are backward compatible with USB 1.1 and USB 1.0 devices. UEFI USB support is also provided so you can use USB keyboard/ mouse in UEFI shell environment. xHCI driver is supported natively in Windows 10, therefore you do not need to install xHCI driver to utilize USB functions.

2.3.6 3-pin Terminal Block DC Input with Remote On/ Off

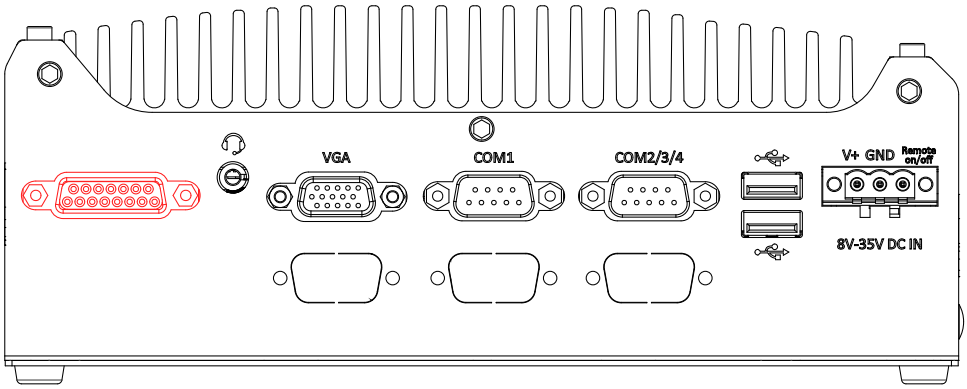


The system accepts a wide range of DC power input from 8 to 35V via a 3-pin pluggable terminal block, which is fit for field usage where DC power is usually provided. The screw clamping mechanism on the terminal block offers connection reliability when wiring DC power. The Remote On/ Off connection allows for external switch extension. It is useful when the system is placed in a cabinet or a not easily accessed location.

Symbol	Description
Remote on/off	Connecting to an external switch to turn on/off the system.
GND	Negative polarity (ground) of DC input
V+	Positive polarity of DC input

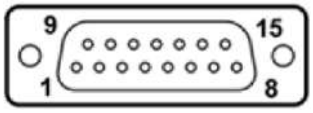
2.3.7 Rear Panel DIO Port (Nuvo-9505D Only)

The digital input (DI) and digital output (DO) function provides four digital input and four digital output on the rear panel of the system via DB15 female connector.



Isolated Digital Input

No. of Channel	4-CH Isolated Digital Input Channels
Logic Level	Logic High: 5 to 24V Logic Low: 0 to 1.5V
Isolated Voltage	2500 Vrms
Input Resistance	1kΩ
Operation Mode	Polling
Isolated Digital Output	
No. of Channel	4-CH Isolated Digital Output Channels
Sink Current (per channel)	500 mA
Isolated Voltage	1500 Vrms
Operation Mode	Polling



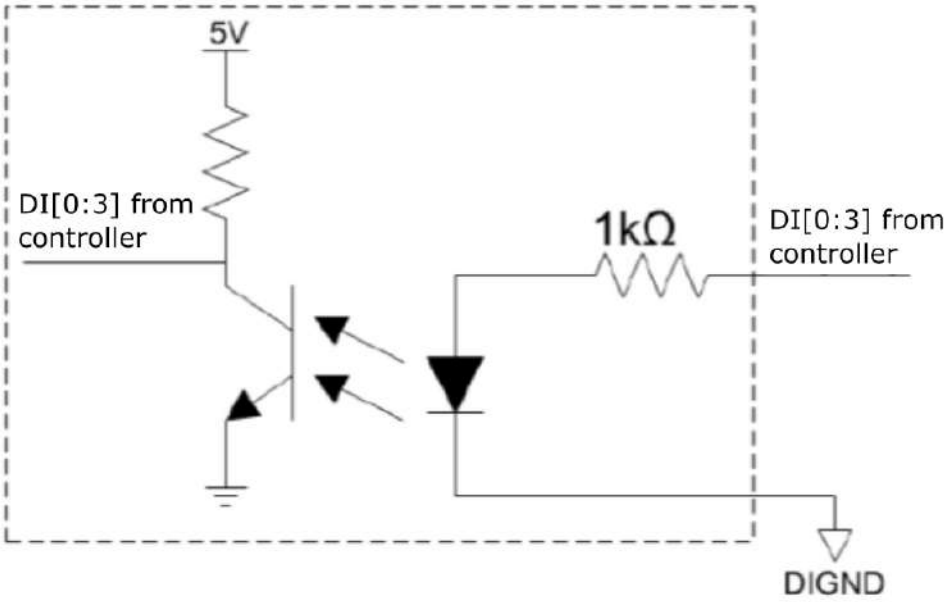
Pin Definition

Pin#	Pin Definition	Pin#	Pin Definition
1	DI_0	9	DI_GND
2	DI_1	10	DI_2
3	DI_GND	11	DI_3
4	DO_GND	12	DO_GND
5	DO_0	13	DO_2
6	DO_1	14	DO_3
7	DO_GND	15	-
8	VDD		

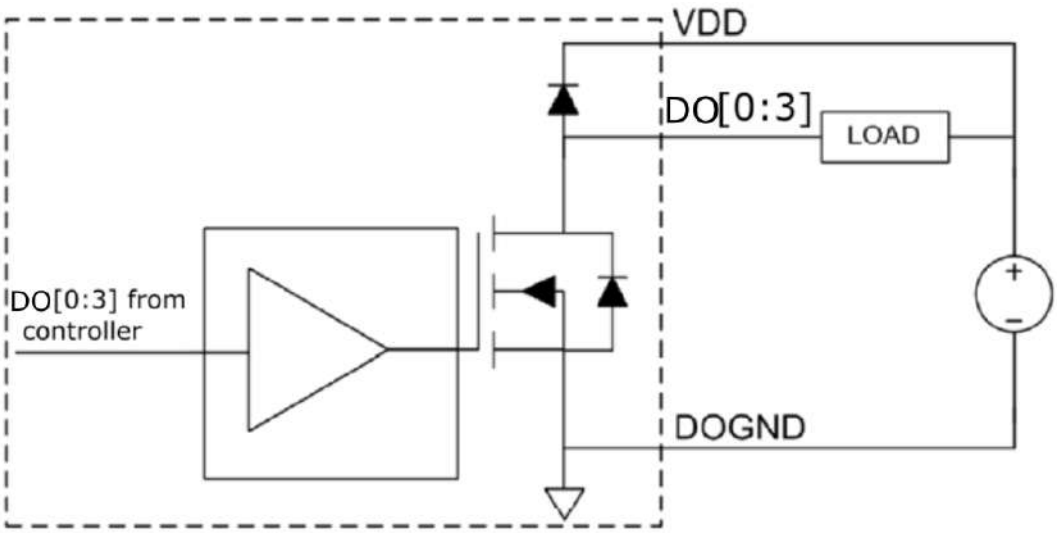
* When using DO0 ~ DO3, DOGND is the ground should be used.

Wiring for DIO

The digital input function is implemented using a photo-coupler with an internally series-connected 1kΩ resistor. You need to provide a voltage to specify the logic high/low state. The input voltage for logic high is 5~24V, and the input voltage for logic low is 0~1.5V.



The digital output function is implemented using Power MOSFET + Analog Device iCoupler® component. The DO channels are configured as NO (normally-open) configuration. When you turn on the system, all DO channels have a deterministic state of logic 0 (circuit disconnected from GND return). When logic 1 is specified, MOSFET is activated and GND return path is established. The digital output function on the system supports sinking current connection. The following diagrams are the suggested wiring for DO:



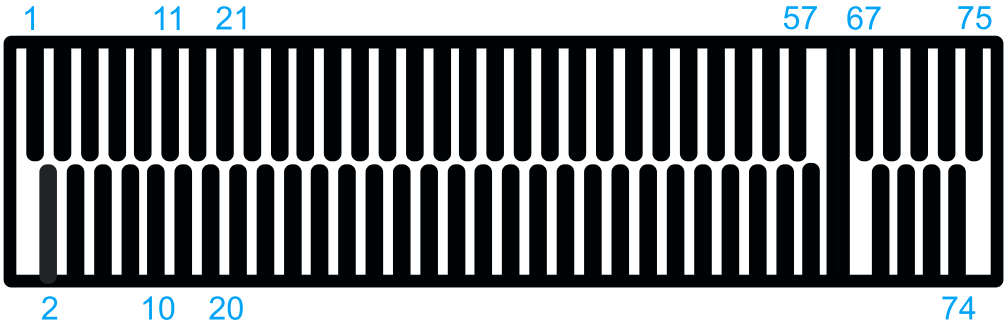
2.4 Internal I/O Functions

In addition to I/O connectors on the front panel, the system also provides internal on-board expansion slots. In this section, we'll illustrate these internal I/O functions.

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

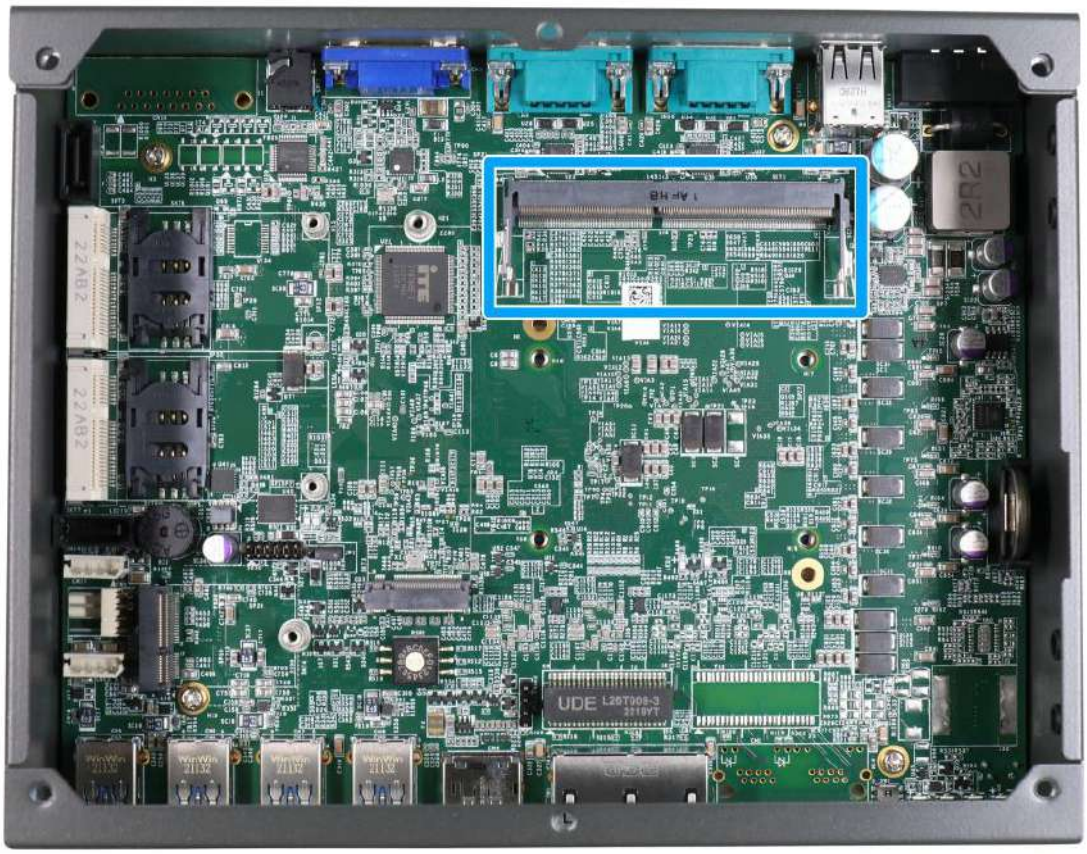
The system has a Gen4 x4 PCIe M.2 2280 slot for you to install an NVMe SSD. The M.2 NVMe SSD offers significantly better system performances when compared to a 2.5" SSD.

M.2 2280 M Key Pin Definition



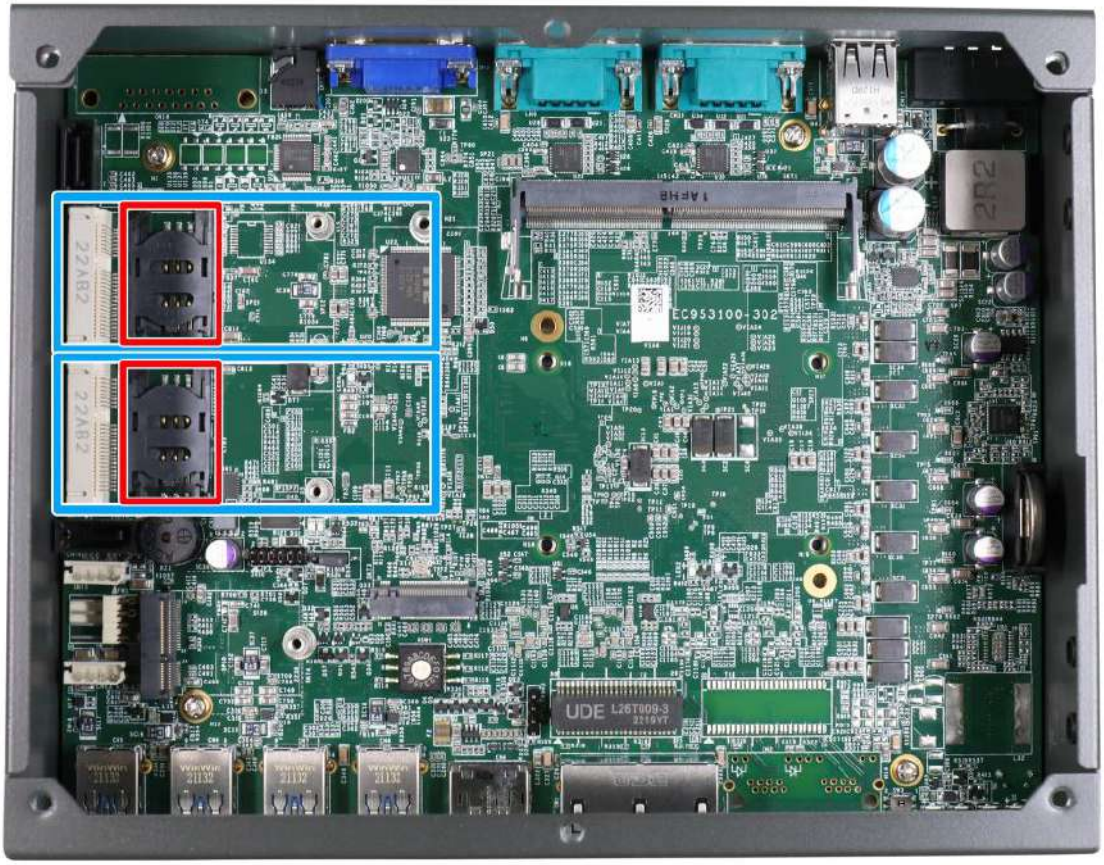
Pin #	Signal	Pin #	Signal
1	GND	**2**	+3V3
3	GND	**4**	+3V3
5	PERN3	**6**	-
7	PERP3	**8**	-
9	GND	**10**	DAS/DSS N
11	PETN3	**12**	+3V3
13	PETP3	**14**	+3V3
15	GND	**16**	+3V3
17	PERN2	**18**	+3V3
19	PERP2	**20**	-
21	GND	**22**	-
23	PETN2	**24**	-
25	PETP2	**26**	-
27	GND	**28**	-
29	PERN1	**30**	-
31	PERP1	**32**	-
33	GND	**34**	-
35	PETN1	**36**	-
37	PETP1	**38**	-
39	GND	**40**	-
41	PERn0	**42**	-
43	PERp0	**44**	-
45	GND	**46**	-
47	PETn0	**48**	-
49	PETp0	**50**	
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		

2.4.2 Single DRAM SO-DIMM Slot



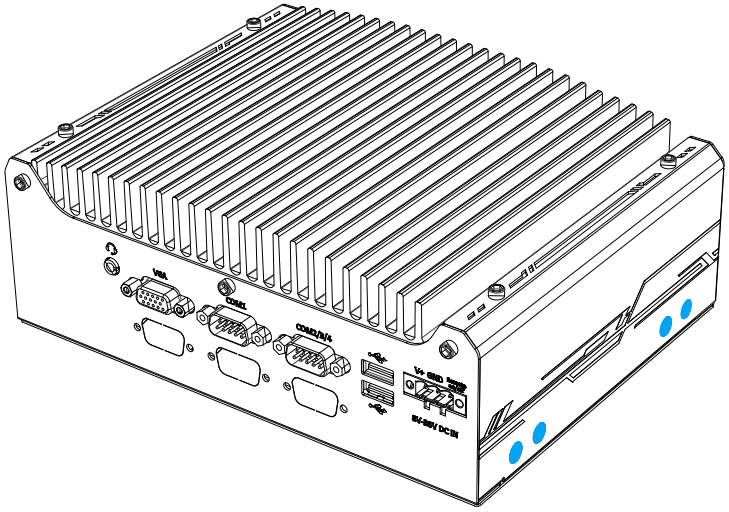
The system motherboard supports one 260-pin SODIMM socket for installing one DDR4-3200 memory module up to 32GB capacity.

2.4.3 mini-PCIe Slot & SIM Slot

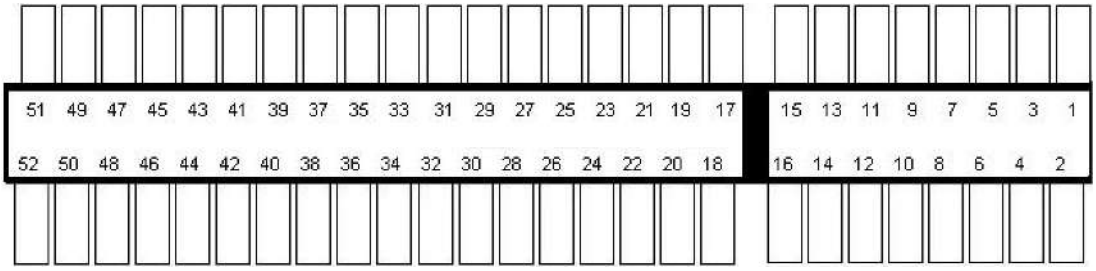


The system provides a mini-PCIe socket (indicated in **blue**) that is in compliance with mini-PCIe specification rev. 1.2. This mini-PCIe socket is designed with SIM card (slot indicated in **red**) support. With a SIM card installed, your system can access the internet via your network provider's 4G/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

For wireless (WiFi/ 4G/ 3G) communication, multiple SMA antenna apertures (indicated in **blue**) can be located on the side panel, shown below.



mini-PCIe slot definition

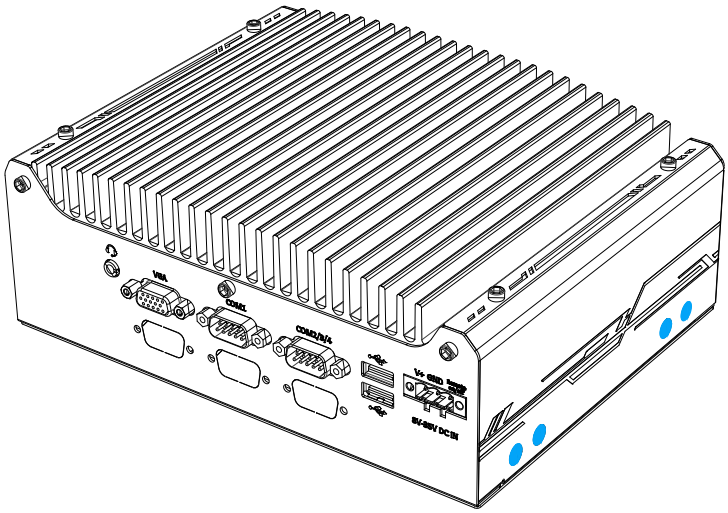


Pin #	Signal	Pin #	Signal
1	WAKE#	**2**	+3.3Vaux
3	COEX1	**4**	GND
5	COEX2	**6**	+1.5V
7	CLKREQ#	**8**	UIM_PWR
9	GND	**10**	UIM_DATA
11	REFCLK-	**12**	UIM_CLK
13	REFCLK+	**14**	UIM_RESET
15	GND	**16**	UIM_VPP
Mechanical Key			
17	Reserved* (UIM_C8)	**18**	GND
19	Reserved* (UIM_C4)	**20**	W_DISABLE#
21	GND	**22**	PERST#
23	PERn0	**24**	+3.3Vaux
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	+3.3Vaux	**40**	GND
41	+3.3Vaux	**42**	LED_WWAN#
43	GND	**44**	LED_WLAN#
45	Reserved	**46**	LED_WPAN#
47	Reserved	**48**	+1.5V
49	Reserved	**50**	GND
51	Reserved	**52**	+3.3Vaux

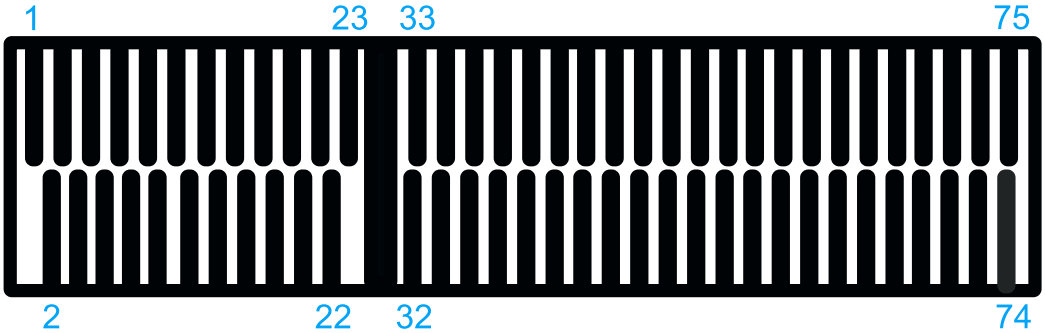
2.4.4 M.2 2230 E Key

The system has an M.2 2230 E key socket that offers PCIe Gen3 x1 and USB2.0 signal for WiFi 5/ 6 or Google TPU module installation.

For wireless (WiFi/ 4G/ 3G) communication, multiple SMA antenna apertures (indicated in **blue**) can be located on the side panel, shown below.



M.2 2230 E Key Pin Definition

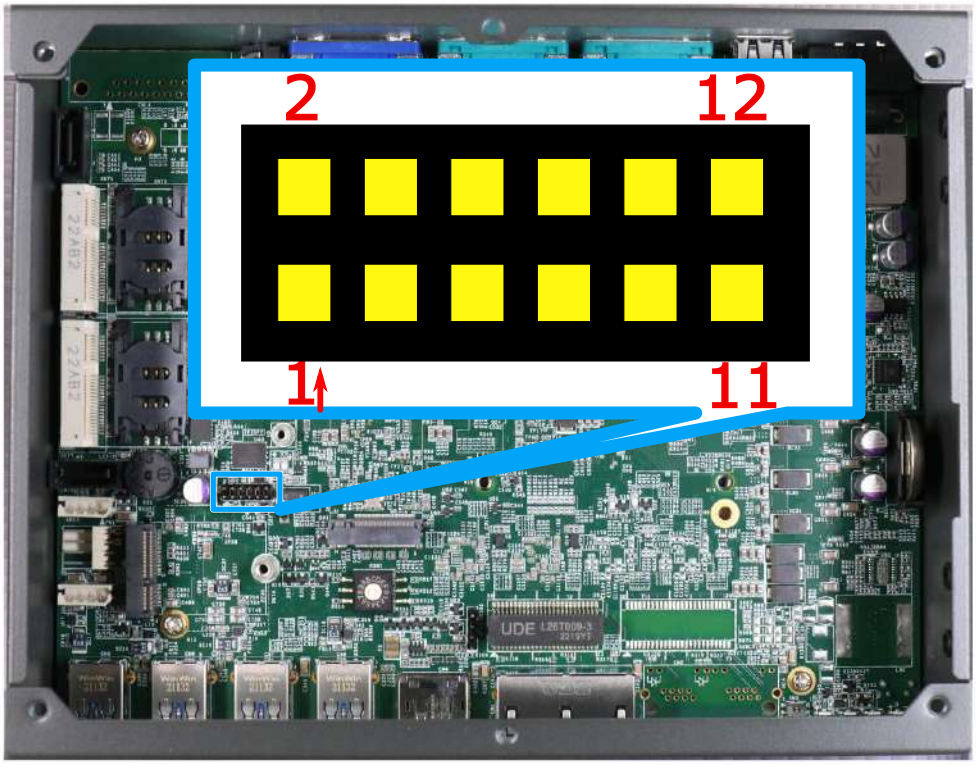


Pin #	Signal	Pin #	Signal
1	GND	**2**	+3V3
3	USB_D+	**4**	+3V3
5	USB_D-	**6**	
7	GND	**8**	
9		**10**	-
11		12	
13		**14**	
15		**16**	
17		**18**	GND
19		**20**	
21	-	**22**	-
23	-		
Mechanical Key			
33	GND	**32**	
35	PETP0	**34**	
37	PETN0	**36**	
39	GND	**38**	
41	PER P0	**40**	
43	PER N0	**42**	
45	GND	**44**	
47	REFCLK_P0	**46**	
49	REFCLK_N0	**48**	
51	GND	**50**	
53	CLKREQ#	**52**	PERST#
55		**54**	
57	GND	**56**	W_DISABLE#
59		**58**	
61		**60**	
63	GND	**62**	
65		**64**	
67		**66**	
69	GND	**68**	
71		**70**	
73		**72**	+3V3
75	GND	**74**	+3V3

2.4.5 SATA Port

The system provides two SATA ports which support Gen3, 6 Gb/s SATA signals. The SATA port is composed of a 7-pin SATA connector (indicated in **blue**) and a 4-pin power connector (indicated in **red**). A dedicated cable is shipped with the system to provide a standard 22-pin SATA connector to the installed device.

2.4.6 Status LED Output & Remote On/ Off Control



Pin#	Definition	Description
1	WDT_LED-	[Output] Watchdog timer indicator, flashing when Watchdog timer is active
2	WDT_LED+	
3	Standby Power-	[Output] Standby power indicator, on if DC power is applied and system is in S5 (standby) mode.
4	Standby Power+	
5	HDD-	[Output] Hard drive indicator, flashing when SATA hard drive is active.
6	HDD+	
7	Power-	[Output] System power indicator, on if system is turned on, off if system is turned off.
8	Power+	
9	Ctrl-	[Input] Remote on/off control, connects to an external switch to turn on/off the system (polarity is negligible).
10	Ctrl+	
11	IGN_LED-	[Output] Ignition control indicator, on if ignition control is on, off if ignition control is off.
12	IGN_LED+	

NOTE

Please make sure the polarity is correct when you connect the external LED

indicator to the Status LED Output.

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, the system needs to be disassembled. To disassemble the system enclosure, you need to remove screws on the I/O panel, removable and side panel.

1. On the COM port panel side, unscrew the three (3) screws shown below.

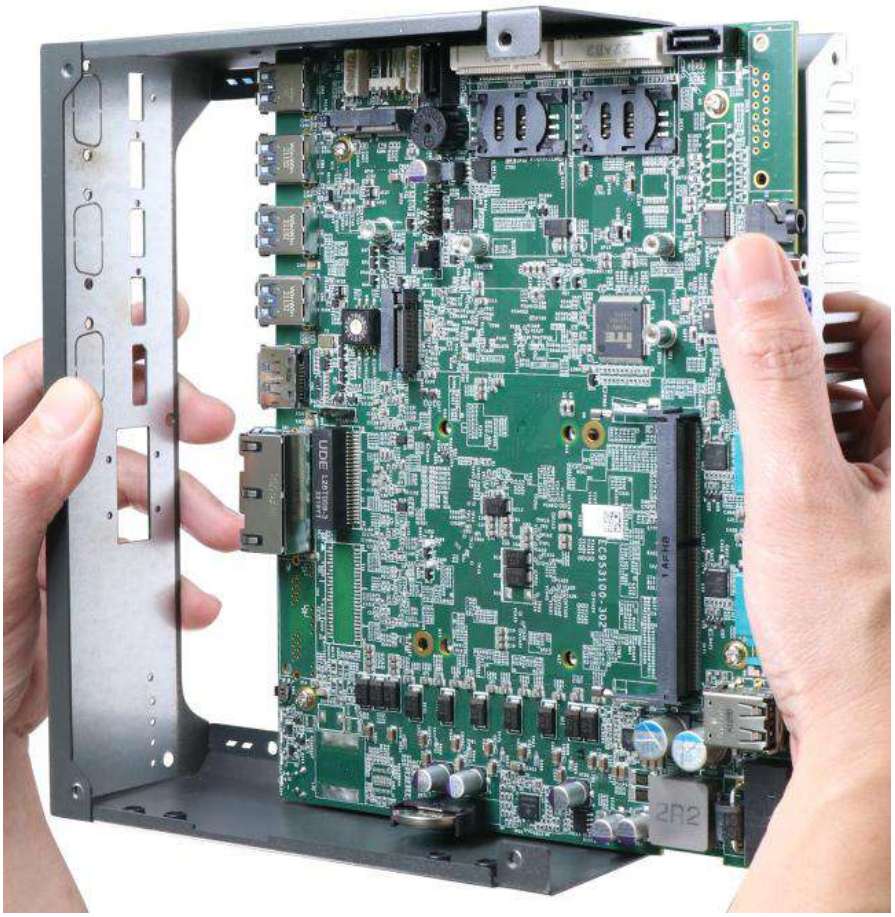
2. Unscrew the screw indicated on the panel shown below.

3. Unscrew the four (4) screws on top of the heatsink.

4. Unscrew the four (4) screws at the bottom of the system.

5. Gently lift and remove the bottom panel.

6. Gently slide the heatsink out of the enclosure.



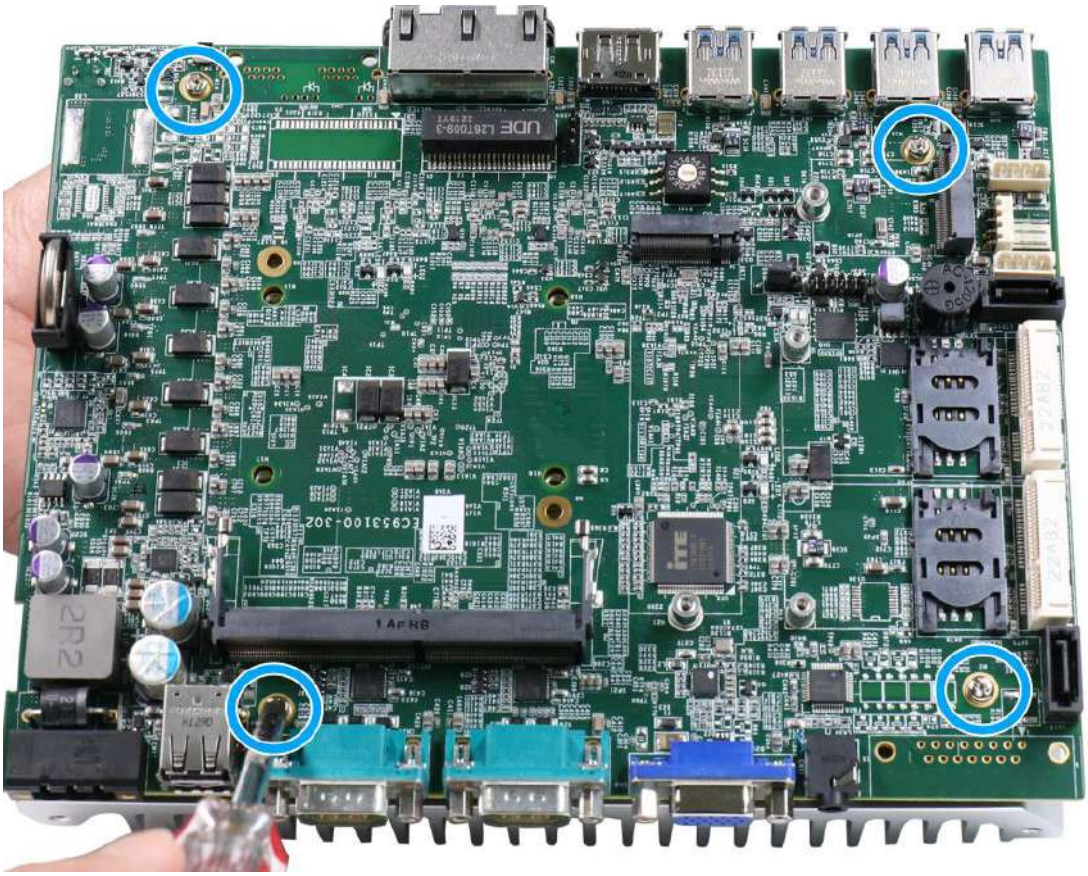
3.2 CPU Installation

3.2.1 CPU Installation for Barebone System

NOTE

DO NOT *remove the CPU from its container/ tray before it is ready to be installed.*

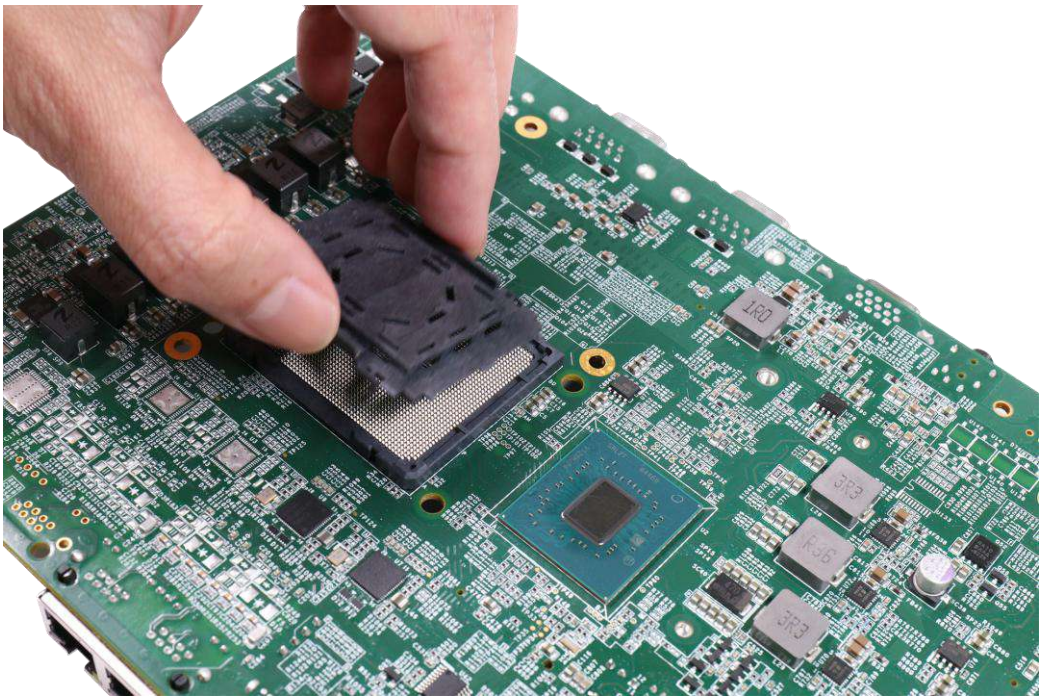
1. Please refer to the section Disassembling the System to gain access to the motherboard.
2. To install the CPU, you will need to separate the heatsink and the motherboard. To do so, please remove the screws indicated below.



3. Gently separate the motherboard from the heatsink. You'll see the CPU socket protective cover, place finger tips under sides for leverage and gently lift the cover.

WARNING

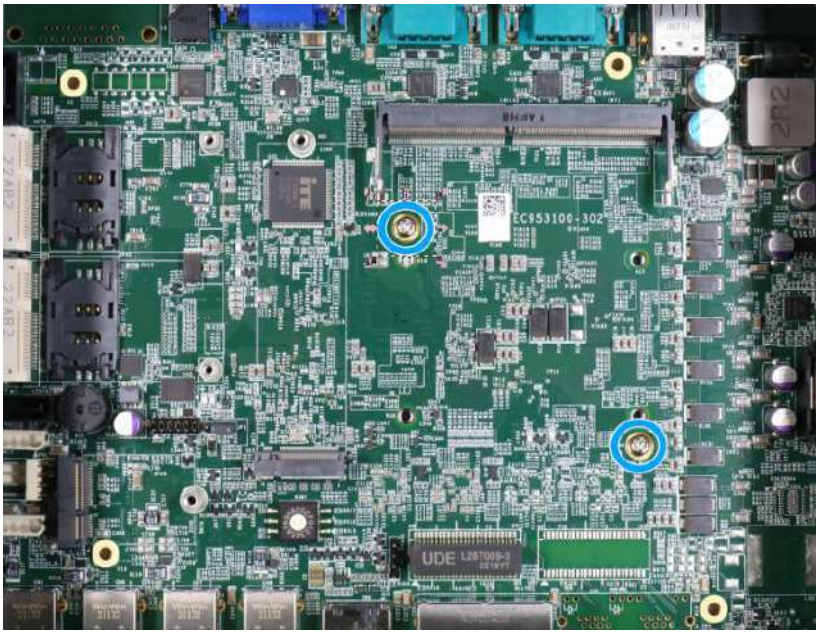
With the protective cover removed, please be careful when handling the motherboard. DO NOT touch the pins in the LGA socket!



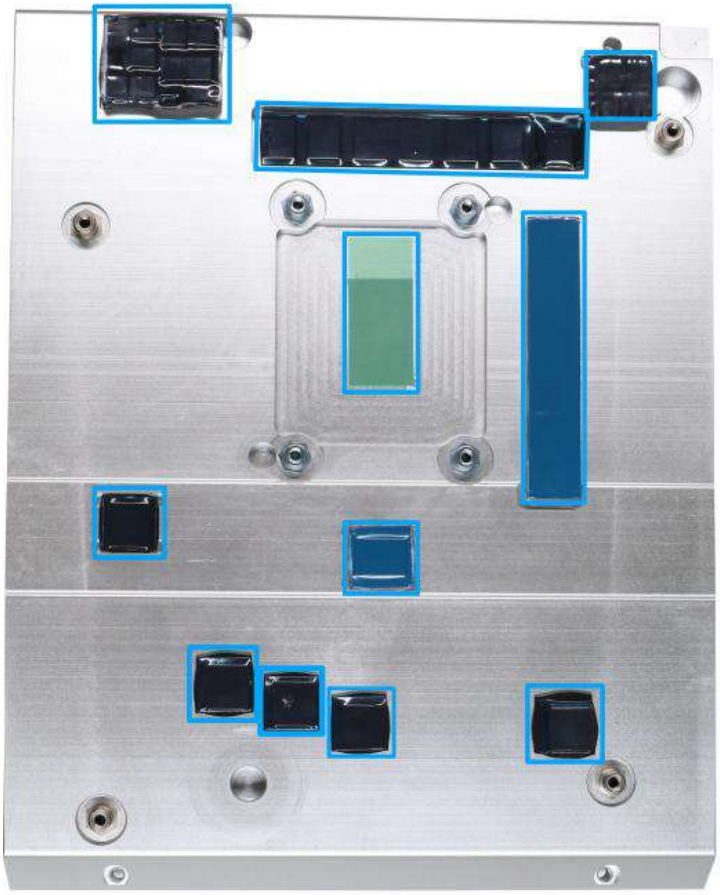
4. Remove the CPU from its container/ tray. Match the four notches on the side (indicated by the **blue arrows**) to the protrusions in the socket, gently lower the CPU into the socket. Pay attention to the seating orientation, notice there is a short side (indicated by **green lines**), and a long side (indicated by **red lines**).

5. Locate the CPU retention bracket (holder) from the accessory box. Place the retention bracket on the CPU and hold it in place. Make sure the indicator triangle engraved on the CPU's integrated heat spreader (HIS) and the triangle indicator on the retention bracket are positioned in the same corner (indicated by **blue circles**).

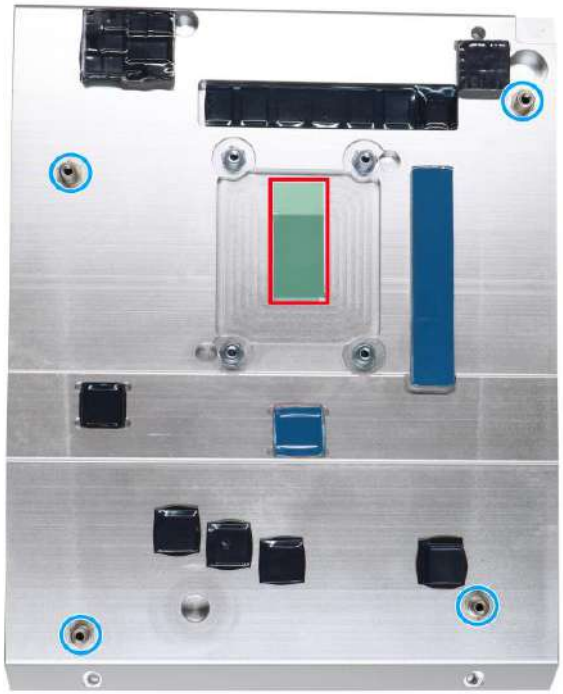
6. Turn the motherboard around while holding the CPU retention bracket in-place, and secure the bracket by tightening two M3 P-head screws on the other side of the motherboard.



7. Make sure all the thermal pad protective films have been removed.

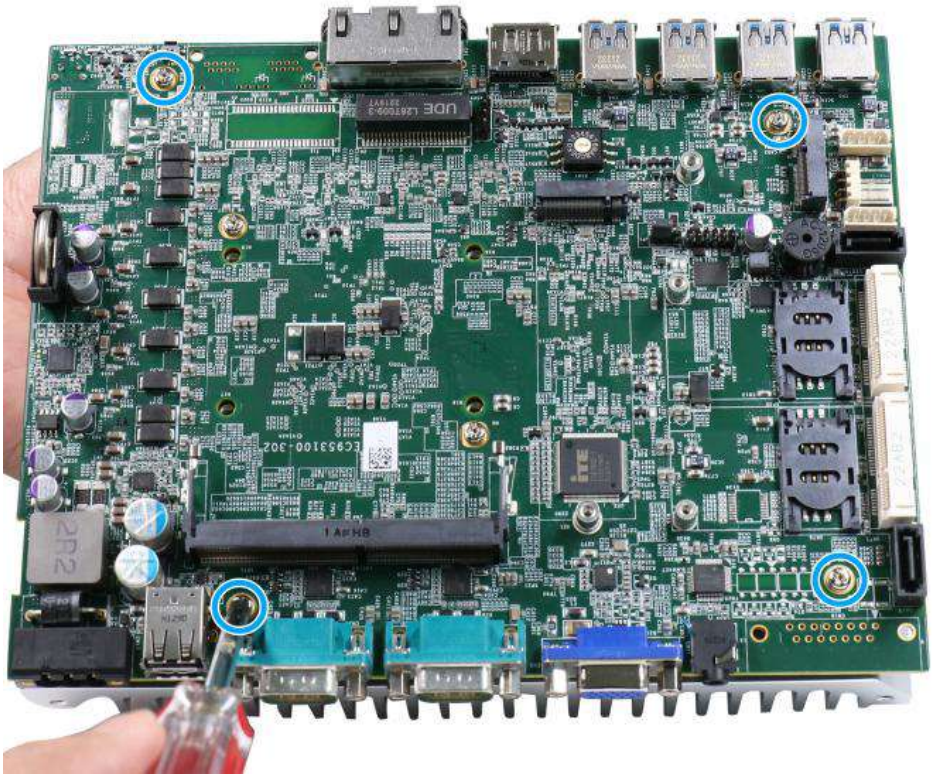


8. With the four motherboard standoffs aligned, gently lower the motherboard onto the heatsink and secure the four screws. Please remember to remove the protective film (indicated in **red**) on the CPU's thermal pad as well.

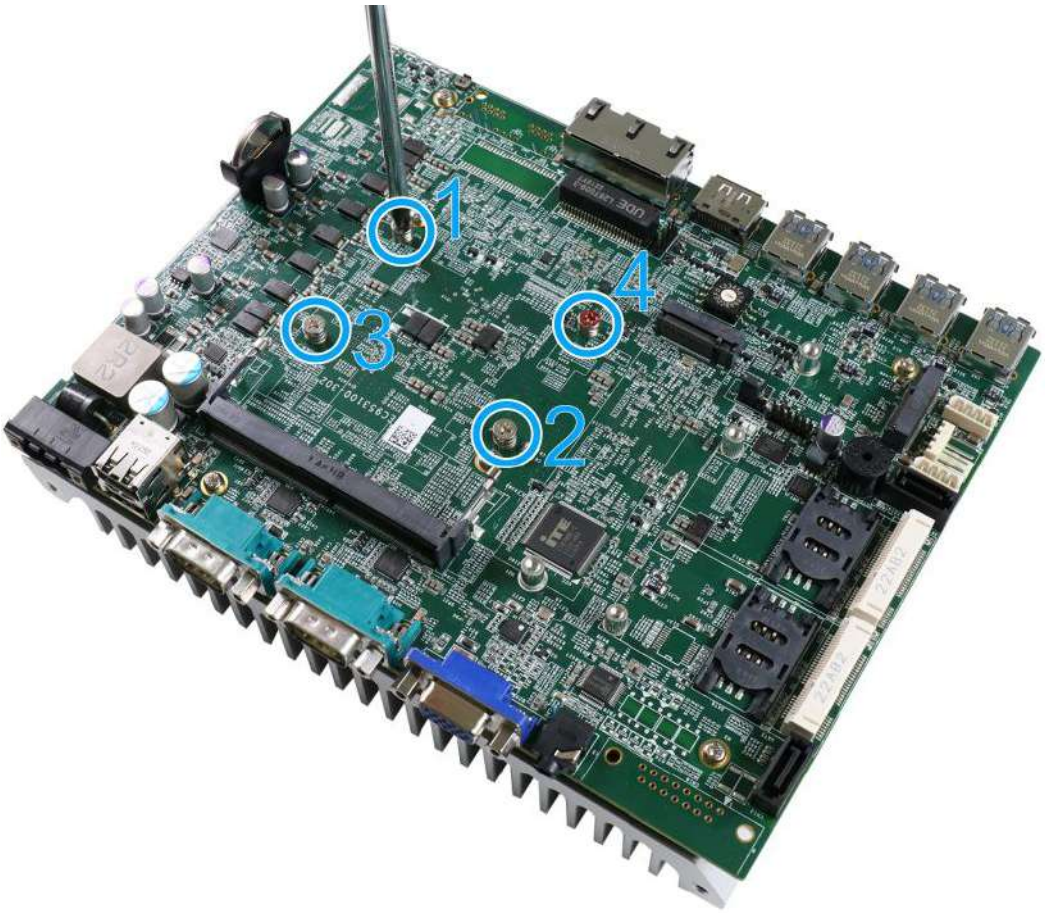


Four standoffs on the heatsink

9. Secure the four (4) M3 P-head motherboard screws (indicated in **blue**).



10. Use the four (4) M3 spring screws (indicated in **blue**) to secure the CPU area to the heatsink. Gradually tighten the four spring-screws in the following order for even pressure.



11. Reinstall the system enclosure and panel when done.

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

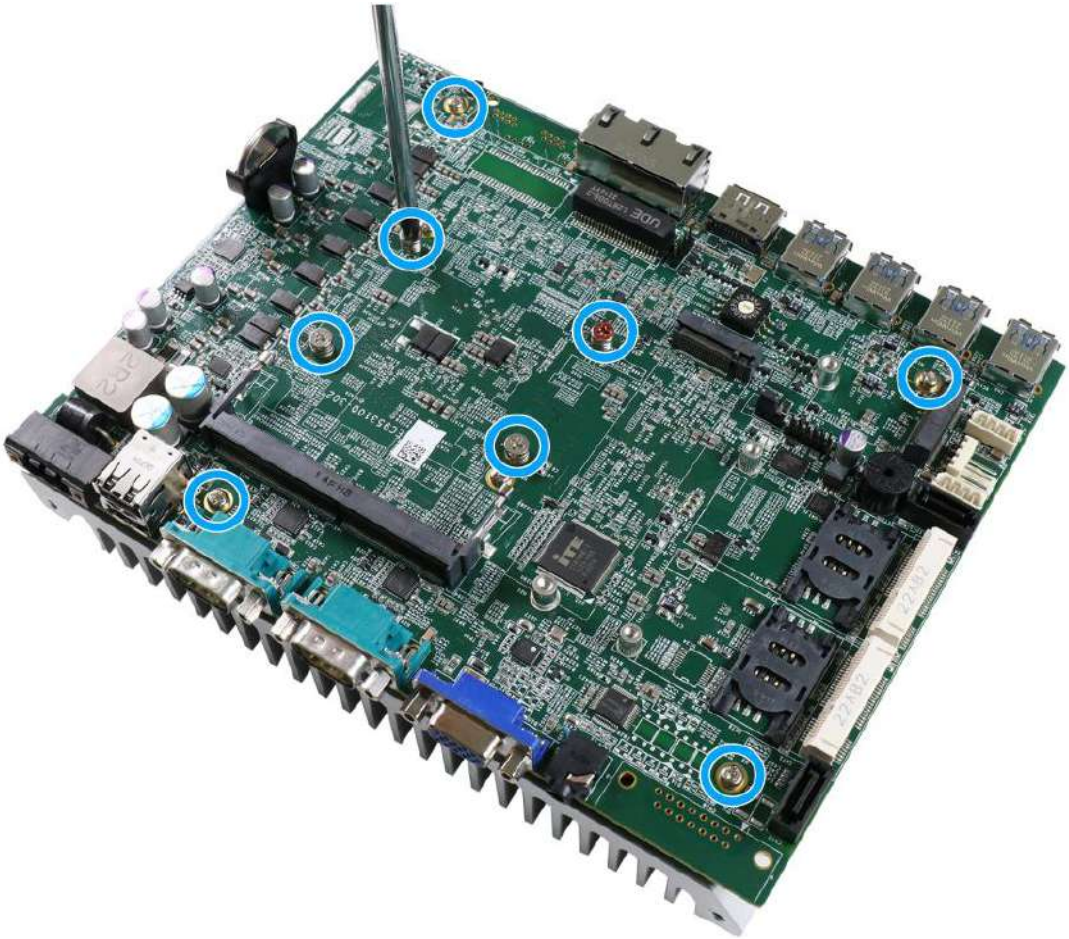
3.2.2 Remove and Replace the Existing CPU

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

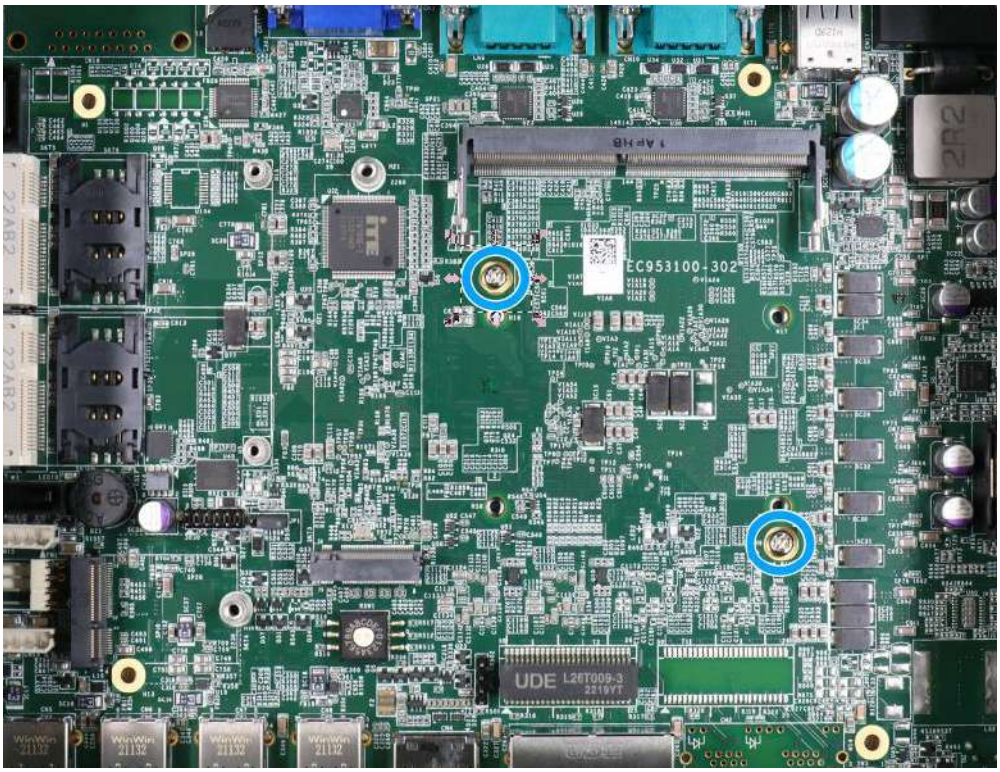
CPU socket.

2. To replace the existing CPU, you will need to separate the heatsink and the motherboard.

3. To do so, remove the eight screws indicated below.



4. Remove the screws indicated once you separate the heatsink from the motherboard to remove the CPU holder.



5. At this point, the CPU and retention bracket may be stuck onto the heatsink (due to the thermal pad). Please use a plastic pry tool and gentle separate the CPU/ holder from the heatsink.

WARNING

With the heatsink, CPU, and retention bracket removed, please be careful when handling the motherboard. DO NOT touch the pins in the LGA socket!

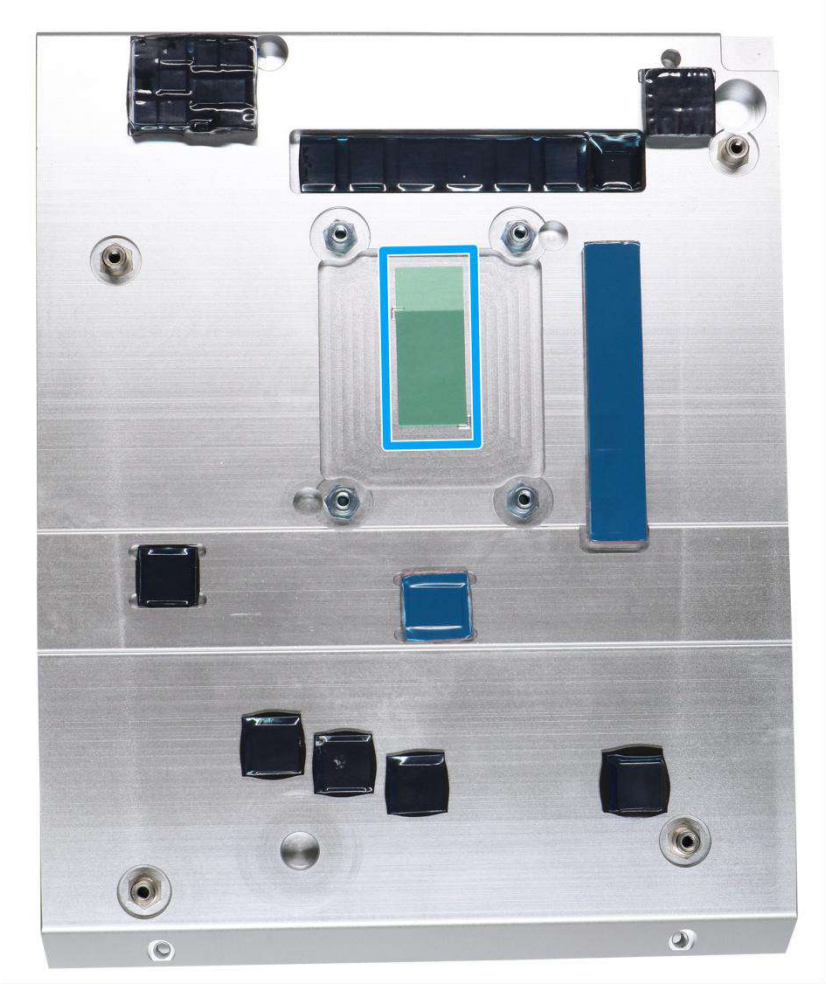
6. Gently separate the CPU from the retention bracket, and clean off any thermal pad residues on the retention bracket.

CPU retention bracket (holder)

WARNING

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

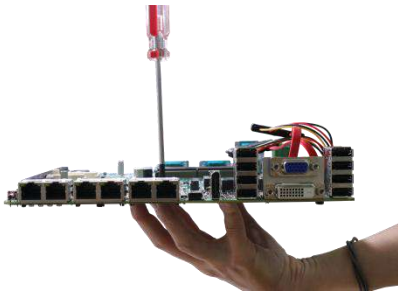
7. Place a new CPU thermal pad (indicated in **blue**) onto the motherboard for the new CPU.



8. Remove and clean off any thermal pad residues around the socket/ motherboard. Gently place the new CPU into the socket by matching the four notches (indicated by **blues arrows**) on the side to the protrusions in the socket. Pay attention to the seating orientation, notice there is a short side (indicated by **green lines**), and a long side (indicated by **red lines**).

9. Make sure all thermal pad residues have been cleaned on both sides of the retention bracket. Place the CPU retention bracket (holder) on top of the CPU and hold it in place. Make sure the indicator triangle engraved on the CPU's integrated heat spreader (HIS) and the triangle indicator on the retention bracket are positioned in the same corner (indicated by **blue circles**).

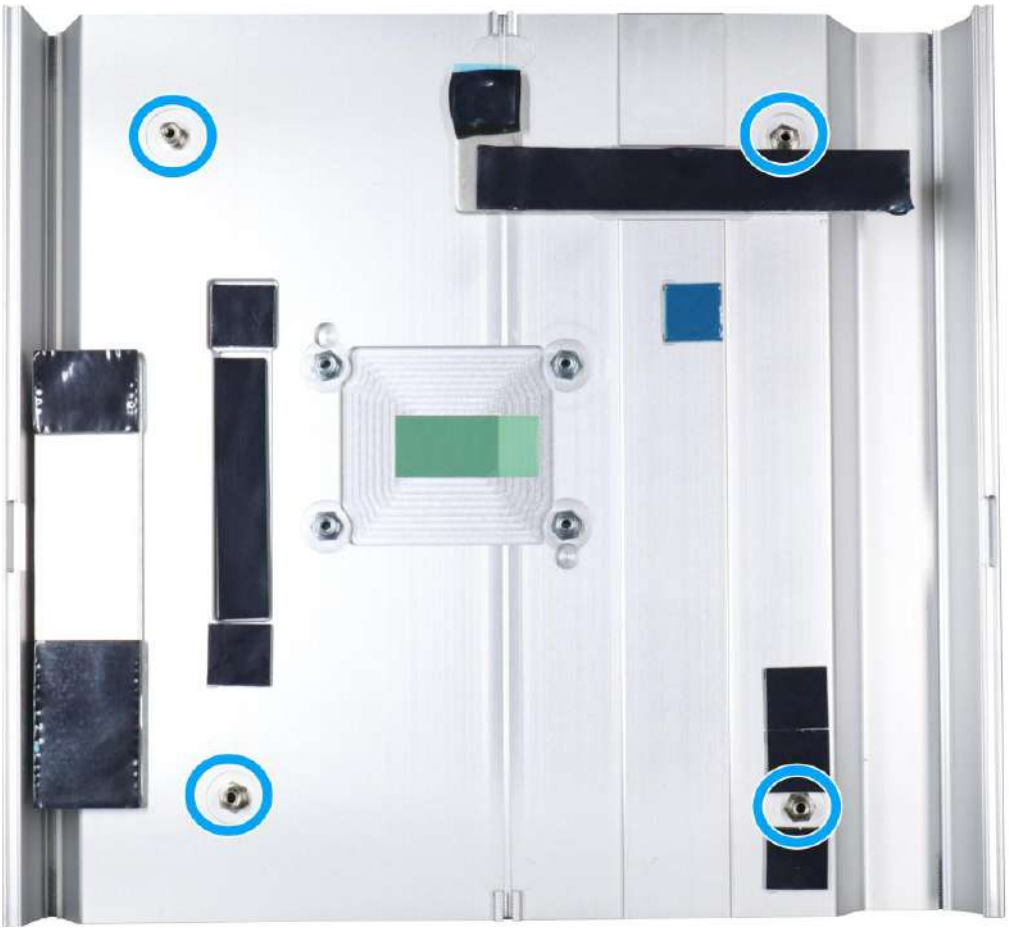
10. Turn the motherboard around and secure the bracket by tightening two M3 P-head screws.



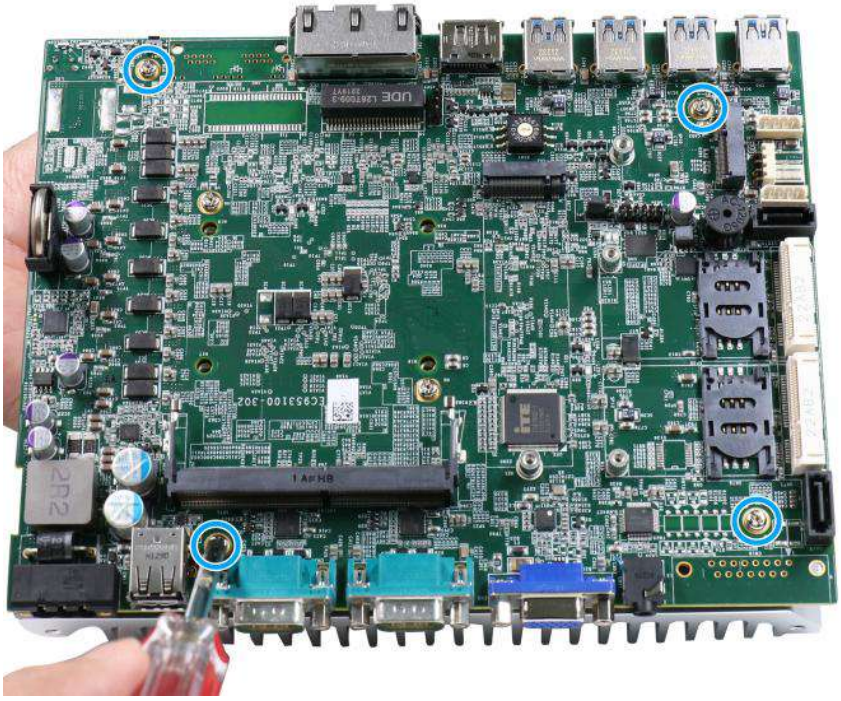
Hold CPU bracket firmly and turn the motherboard around

Secure two M3 P-head screws

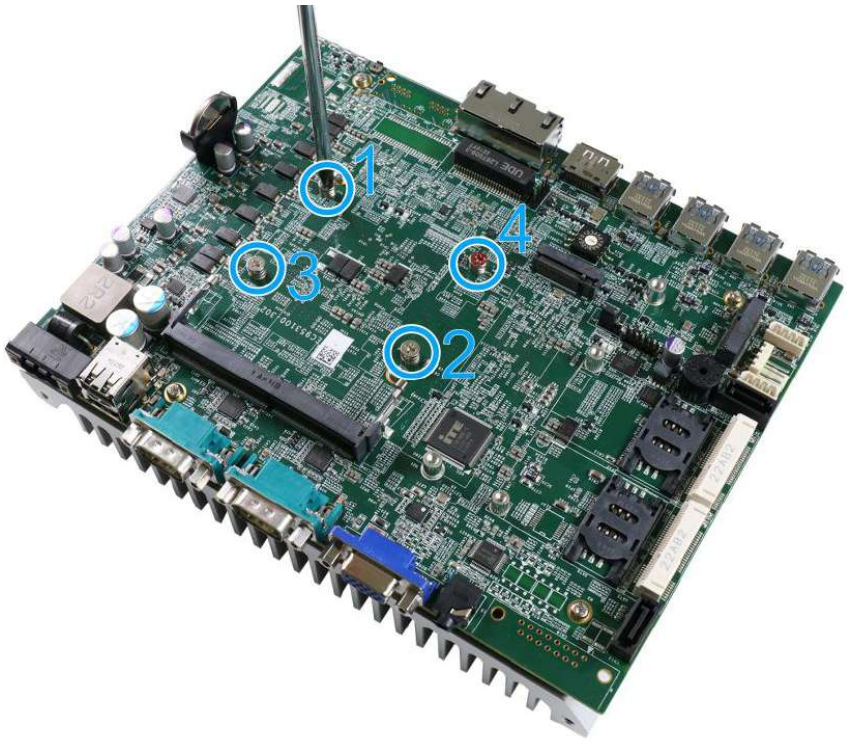
11. Align the motherboard to the four standoffs on the heatsink, gently lower the motherboard onto the heatsink.



12. Secure the four (4) M3 P-head motherboard screws (indicated in **blue**).



12. Once the motherboard has been installed, you're ready to secure the four screws that help the heatsink apply pressure to the CPU/ chipset die. You'll want to apply even pressure to the corners by gradually tightening each screw. Please refer to the recommended order when tightening the screws.



13. Reinstall the system panels and enclosure when done.

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

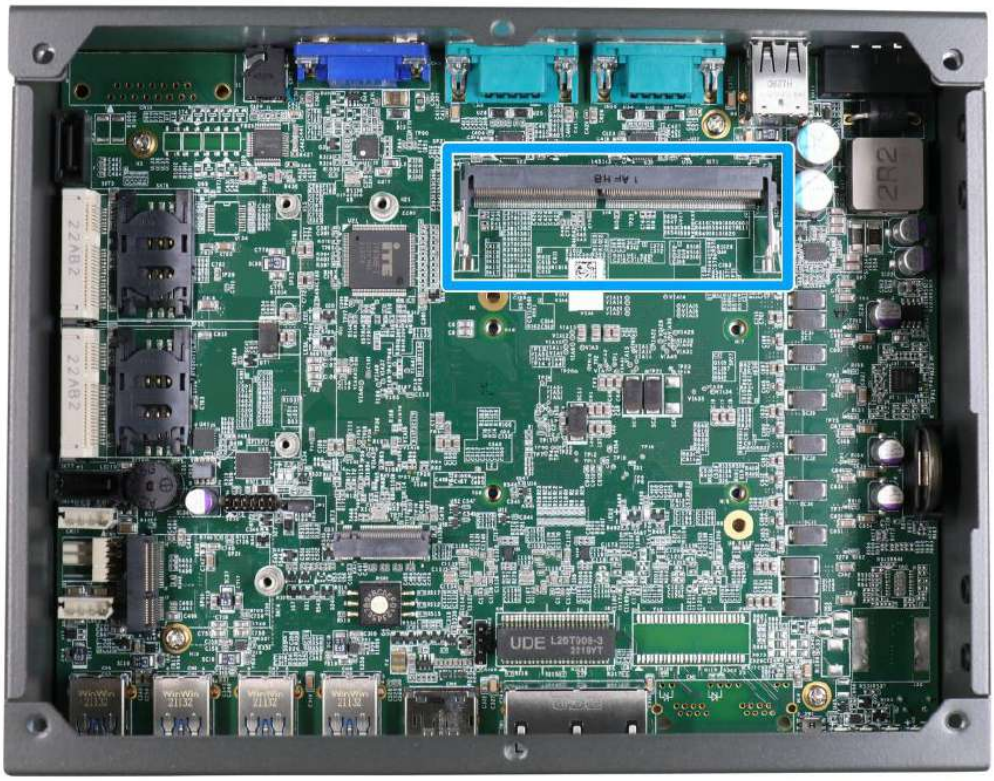
3.3 DDR4 SO-DIMM Installation

There is a single memory SO-DIMM slot on the motherboard that supports up to non-ECC 32GB DDR4-3200. Please follow the procedures below to replace or install the memory modules.

1. Power off the system, disconnect all cables, and turn the system upside down. Remove the four (4) screws at the bottom of the system.

2. Gently lift and remove the bottom panel to access to memory slot.

3. Locate the SODIMM memory module slot on the motherboard.

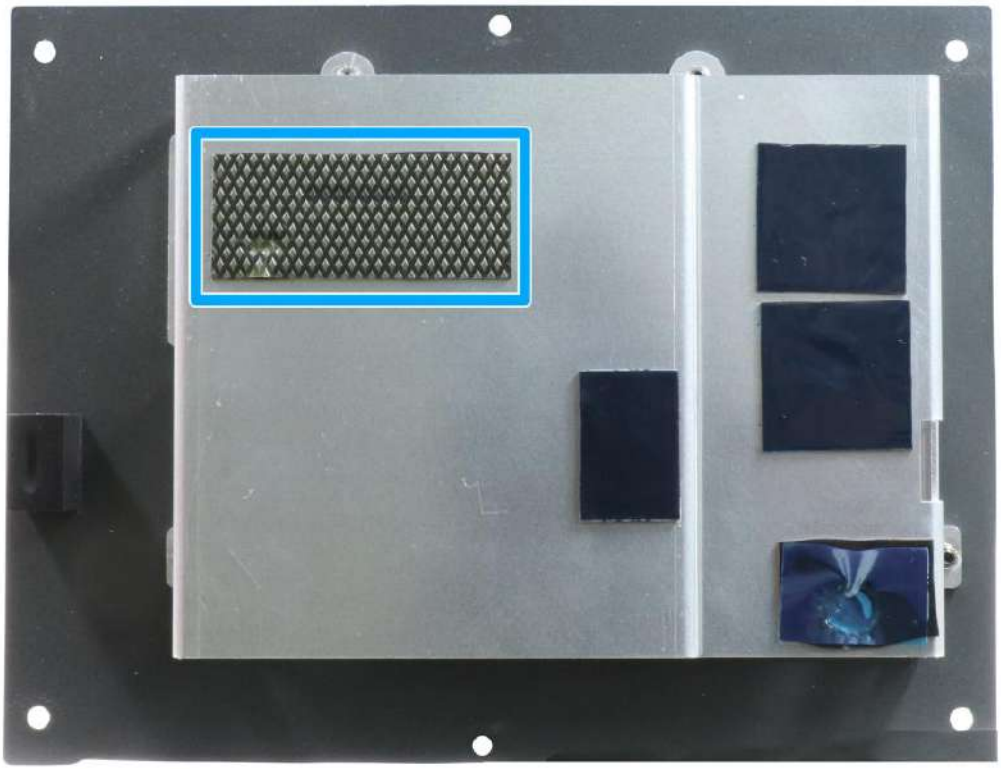


4. To install the memory module, insert gold fingers of the module into the slot at 45 degree angle, push down on the edge of the module and the clips on the side should clip the module into position.

Insert module into slot

Press module down to clip into position

5. Before reinstalling the enclosure, please make sure the protective film on the thermal pad (located on the hard drive bracket) has been removed so it can properly make contact with the DRAM module.



6. Reinstall the system enclosure and panel when done.

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

3.4 M.2 2280 SSD Installation

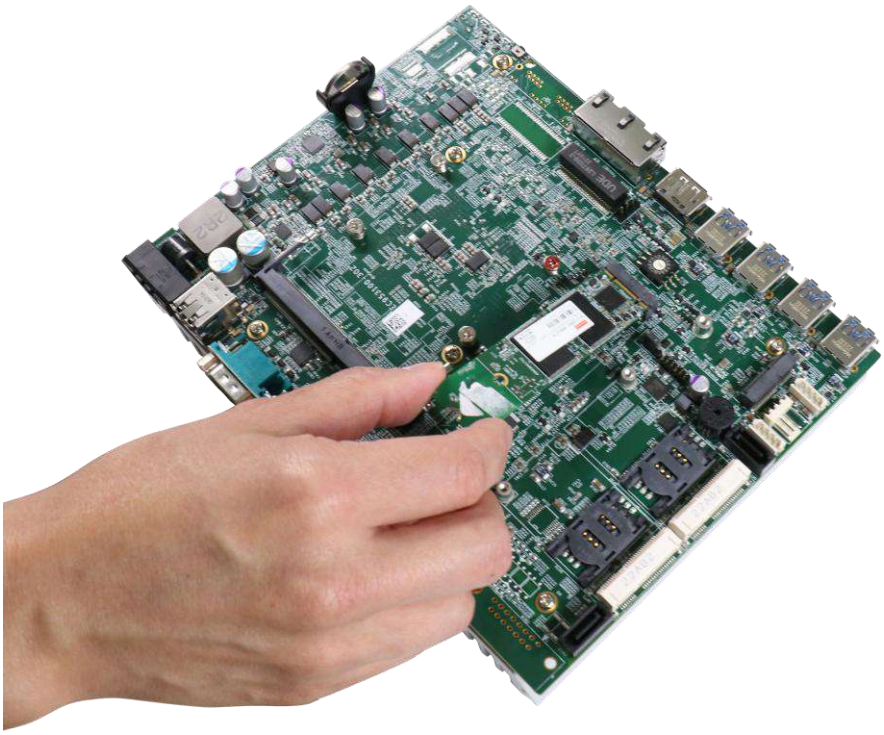
The system has an M.2 2280 slot for you to install an M.2 PCIe Gen4x4 SSD for fast read and write performance. For installation, please refer to the following instructions.

1. Power off the system, disconnect all cables, and turn the system upside down. Remove the four (4) screws at the bottom of the system.

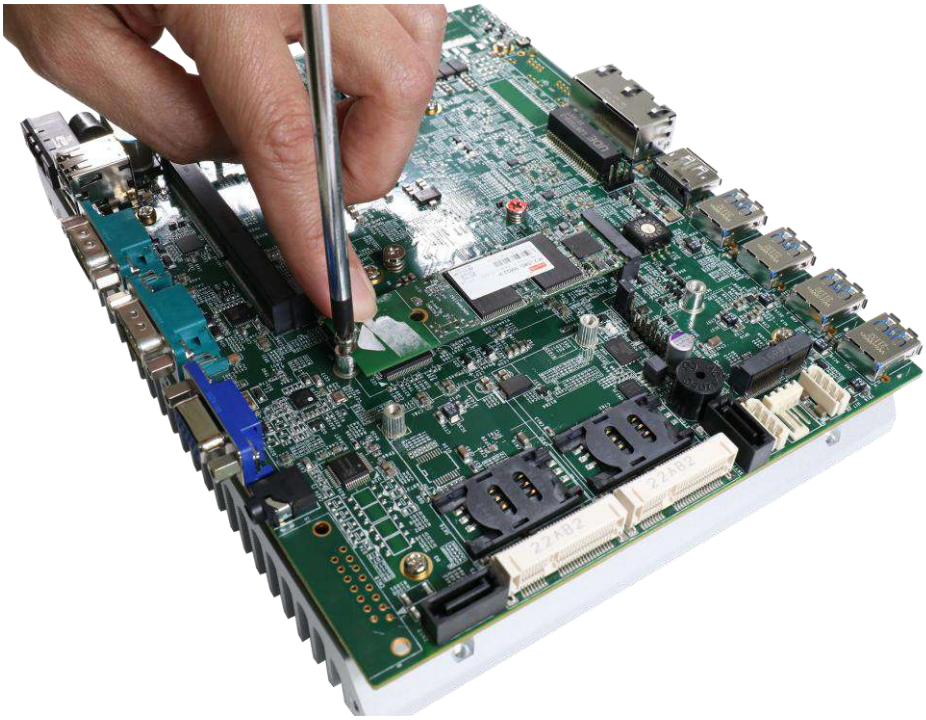
2. Gently lift and remove the bottom panel to access to internal expansion slots.

3. Locate the M.2 2280 slot on the motherboard.

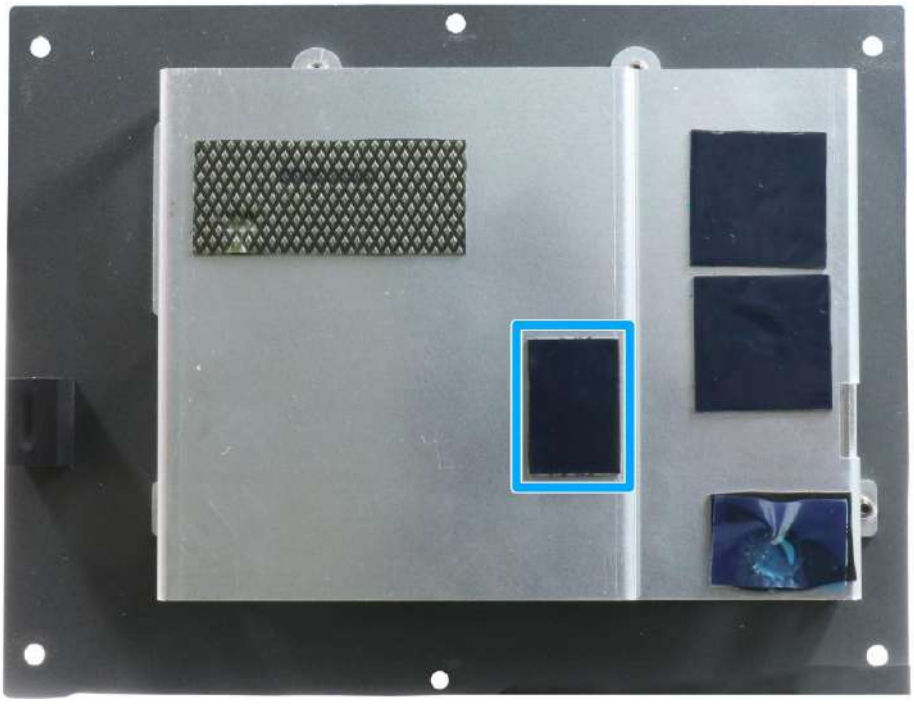
4. Insert the module on a 45 degree angle.



5. Gently press down and secure the module with an M3 P-head screw.



6. Before reinstalling the enclosure, please make sure the protective film on the thermal pad (located on the hard drive bracket) has been removed so it can properly make contact with the M.2 2280 module.



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

3.5 E Key M.2 2230 Module Installation

The system has an E key M.2 2230 slot (indicated in **blue**) for installing a WiFi 5/ 6 module or a Google Edge TPU module. For installation, please refer to the following instructions.

1. Power off the system, disconnect all cables, and turn the system upside down. Remove the four (4) screws at the bottom of the system.

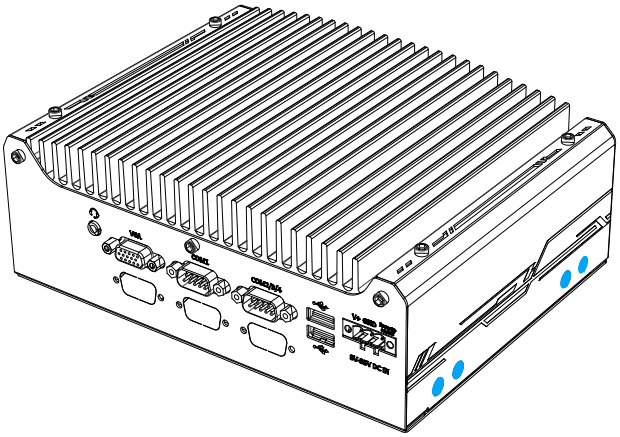
2. Gently lift and remove the bottom panel to access to internal expansion slots.

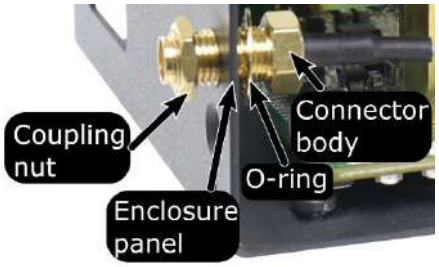
3. Locate the E key M.2 2230 slot on the motherboard.

4. Insert the M.2 module on a 45 degree angle into the M.2 slot, and secure with a screw.

5. Clip on the IPEX-to-SMA cable to the module (please refer to the module's user manual on antennae cable connection)

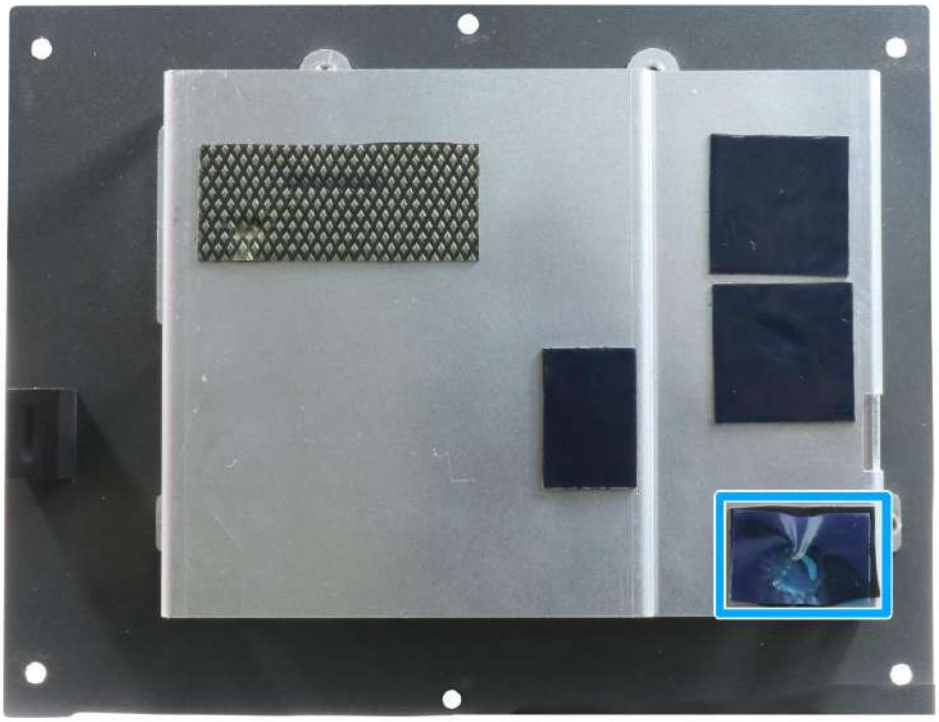
6. Secure the antenna to the enclosure panel.





Antenna openings on the side **Secure antenna connector**

7. Before reinstalling the enclosure, please make sure the protective film on the thermal pad (located on the hard drive bracket) has been removed so it can properly make contact with the M.2 2230 module.



8. Reinstall the system enclosure, panel and attach the external antenna.

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

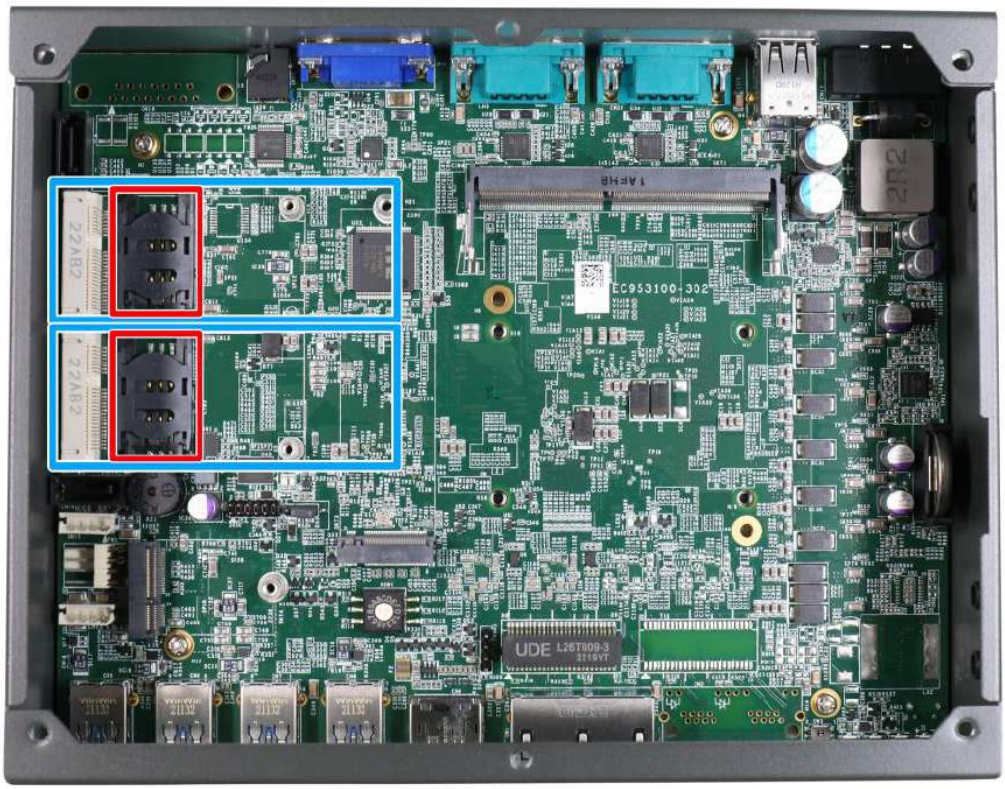
3.6 mini-PCIe Module Installation

The system has two mini-PCIe slots to install a wireless 4G mini-PCIe module with corresponding SIM sockets. To install, please refer to the following instructions.

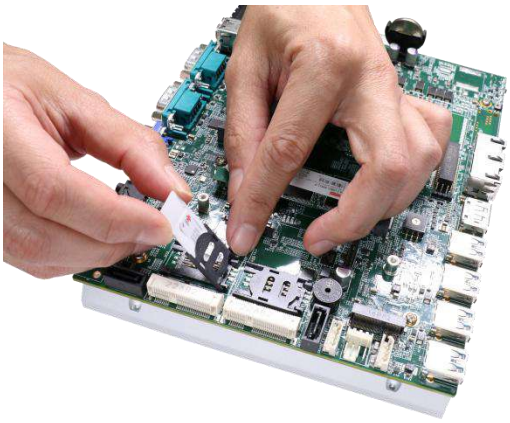
1. Power off the system, disconnect all cables, and turn the system upside down. Remove the four (4) screws at the bottom of the system.

2. Gently lift and remove the bottom panel to access to internal expansion slots.

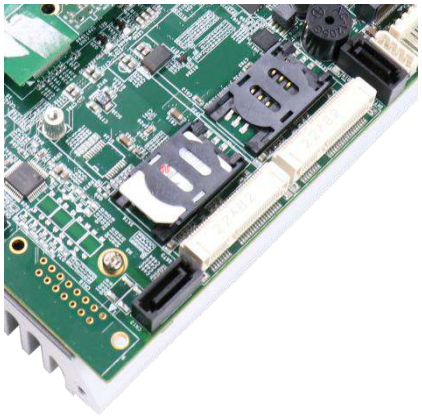
3. Locate the mini-PCIe slots (in **blue**) and SIM slots (in **red**) on the motherboard.



4. 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 towards the motherboard), shut the SIM holder and slide it to lock the SIM card in-place.

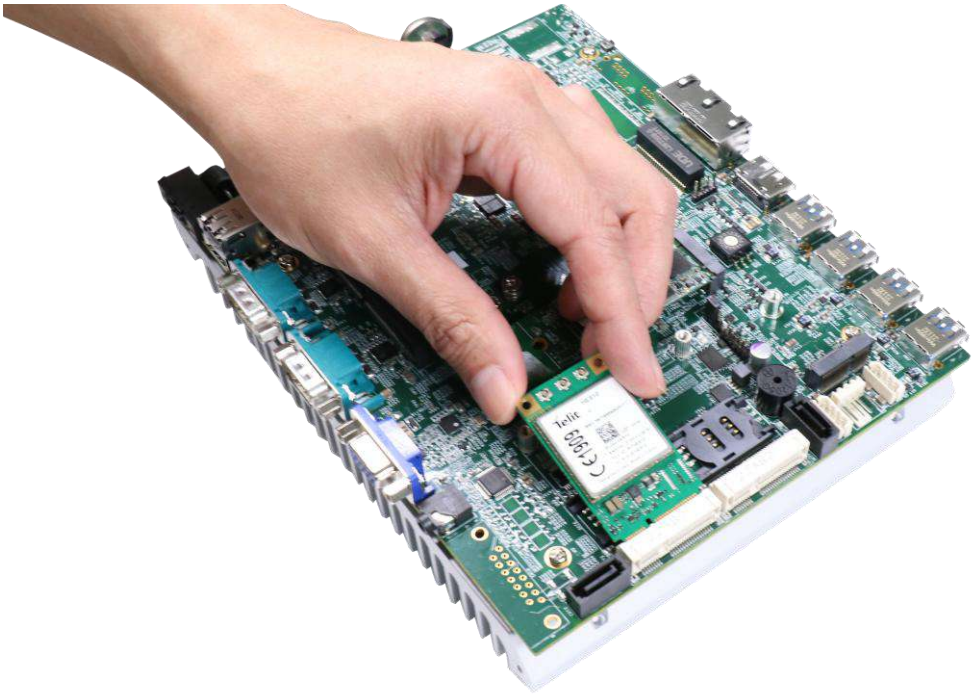


Insert SIM with pins facing the motherboard

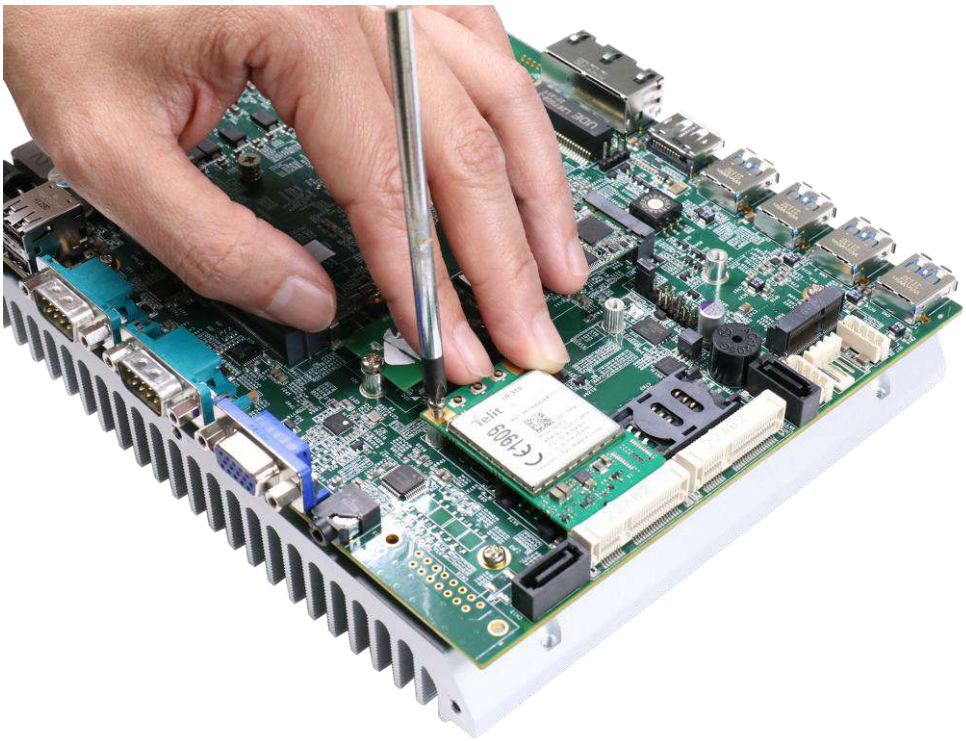


Clip the SIM card into place

5. Insert the mini-PCIe module into the slot on a 45 degree angle.

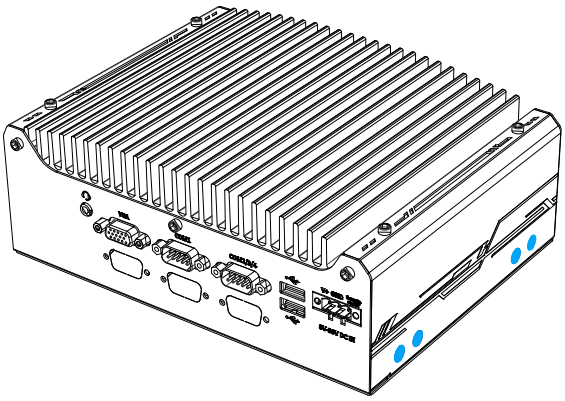


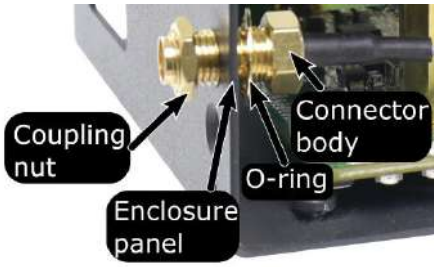
6. Gently press down and secure the module with two M2.5 P-head screws



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

8. Secure antenna to side panel

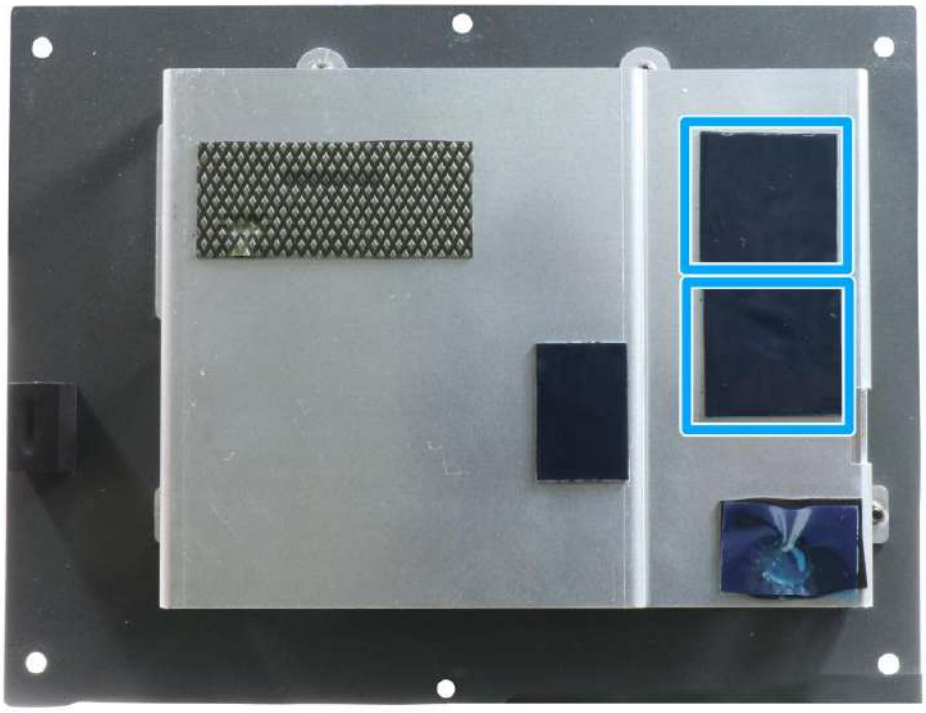




Antenna openings on the side **Secure antenna connector**

9. Repeat steps 1 to 7 to install the other mini-PCIe module if needed.

10. Before reinstalling the enclosure, please make sure the protective film on the thermal pad (located on the hard drive bracket) has been removed so it can properly make contact with the mini-PCIe module.



11. Reinstall the system enclosure, panel and external antenna.

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

3.7 HDD/ SSD Installation

The system has two SATA ports, but due to installation space restrictions, only one 2.5” HDD/ SSD or a 3.5” HDD can be installed into the system. To install, please refer to the following instructions:

3.7.1 2.5” HDD/ SSD Installation

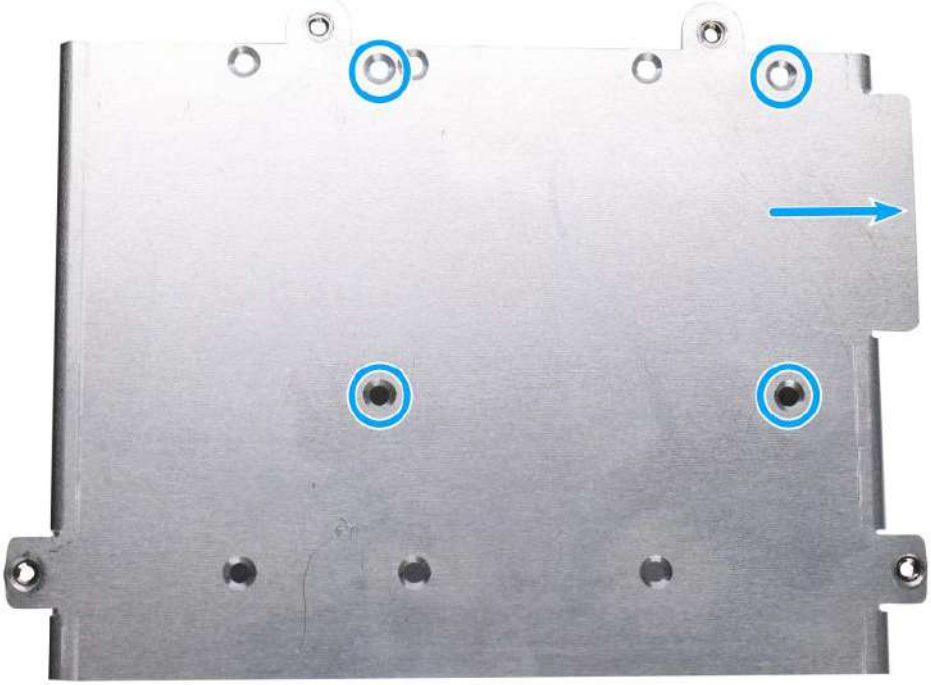
1. Power off the system, disconnect all cables, and turn the system upside down. Remove the four (4) screws at the bottom of the system.

2. Gently lift and remove the bottom panel to access the hard drive cage and SATA/ power connectors on the motherboard.

3. Identify the 7-pin SATA connectors (indicated in **blue**) and 4-pin power connectors (indicated in **red**) on the motherboard.

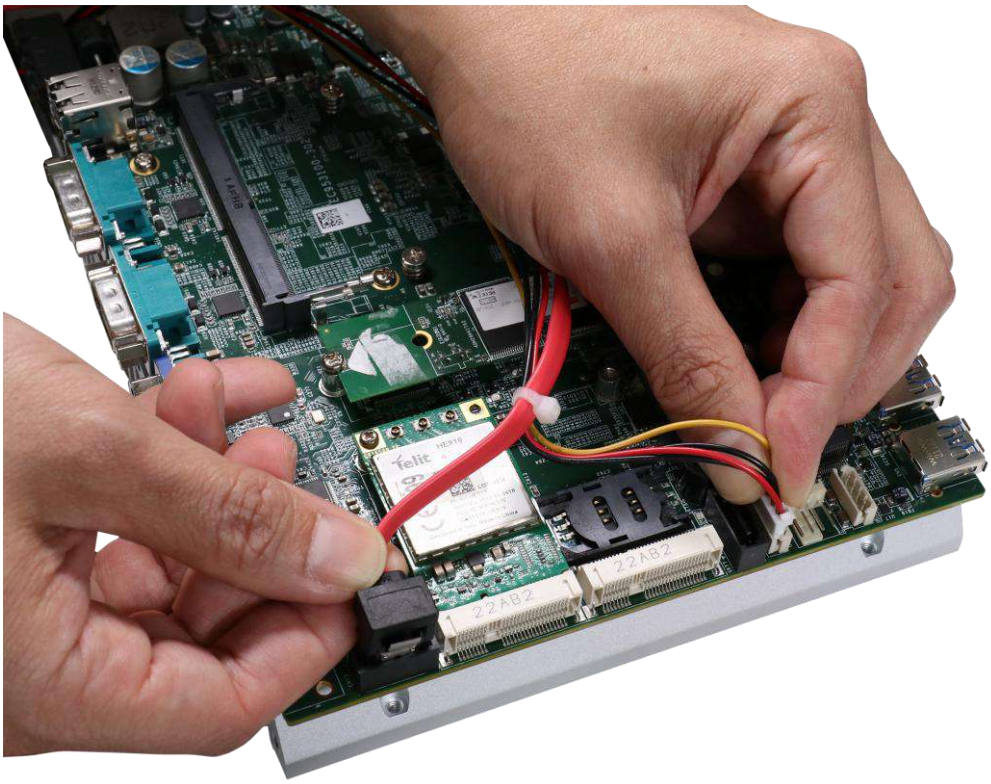
4. The hard drive installation cage is secured onto the bottom panel of the system. Separate the cage from the panel by removing the screws indicated in **blue**.

5. The screw holes to secure the 2.5” HDD/ SSD are indicated by **blue circles**. Please note the hard drive installation orientation by making sure the SATA connector is in the same direction as the **blue arrow**.



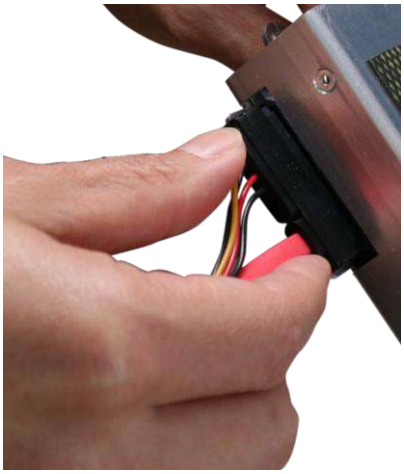
6. Secure 2.5” HDD/ SSD on the HDD/SSD bracket with 4 M3 flat-head screws.

7. Connect the SATA/ power cables if they are not already connected.



8. Re-secure the hard drive cage onto the bottom panel.

9. Connect the SATA/power connector onto the hard drive connector.



10. Reinstall the system enclosure and panel when done.

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

3.7.2 3.5” HDD Installation

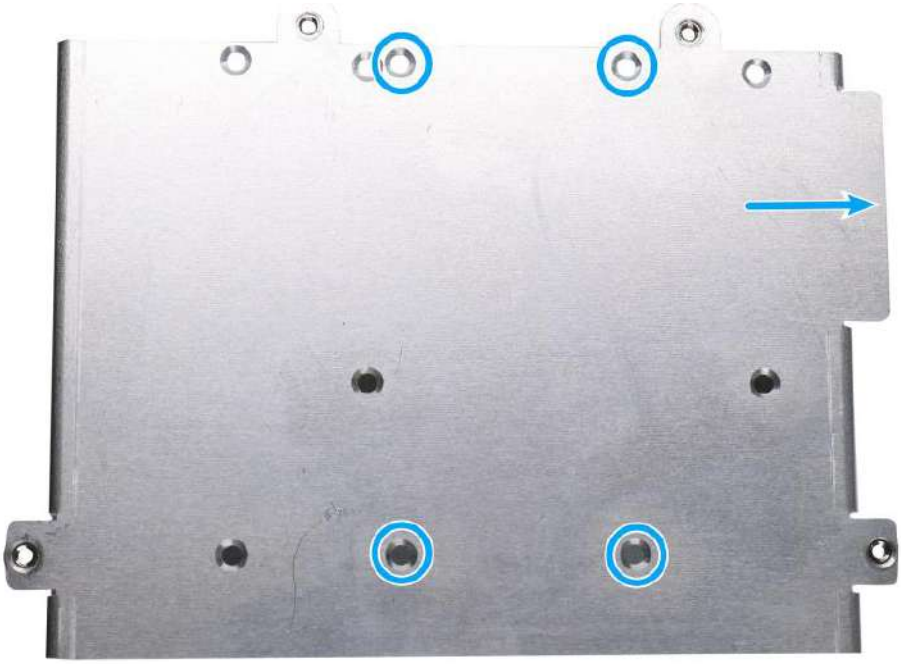
1. Power off the system, disconnect all cables, and turn the system upside down. Remove the four (4) screws at the bottom of the system.

2. Gently lift and remove the bottom panel to access the hard drive cage and SATA/ power connectors on the motherboard.

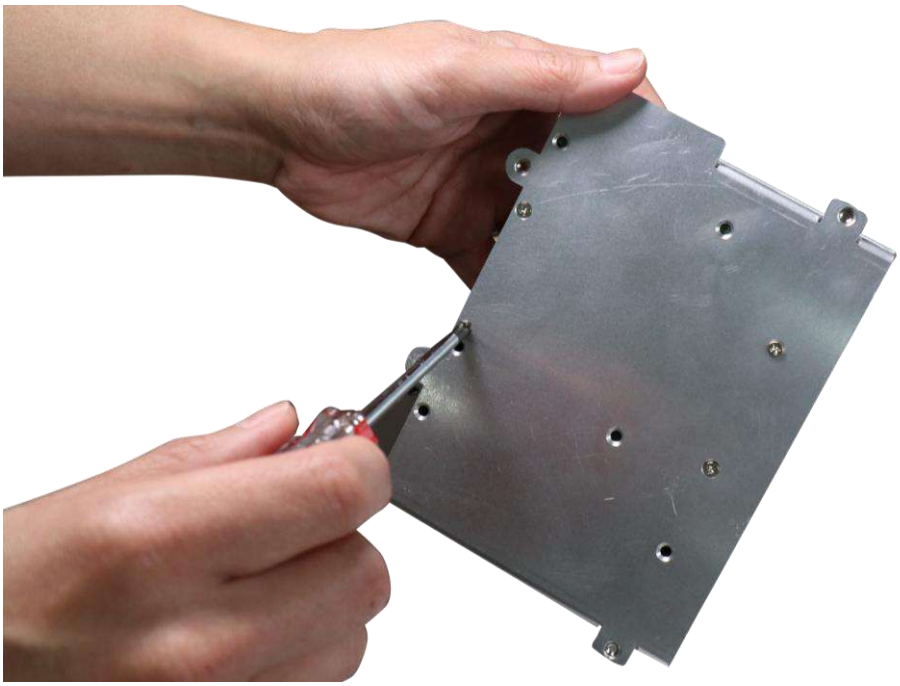
3. Identify the 7-pin SATA connectors (indicated in **blue**) and 4-pin power connectors (indicated in **red**) on the motherboard.

4. The hard drive installation cage is secured onto the bottom panel of the system. Separate the cage from the panel by removing the screws indicated in **blue**.

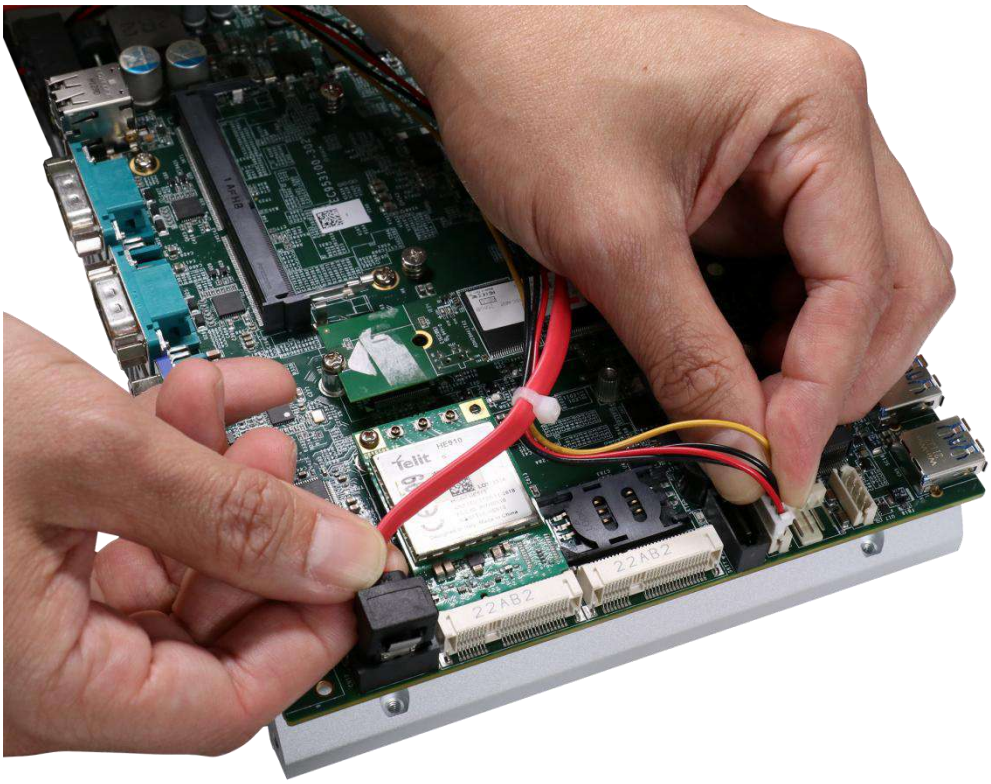
5. The screw holes to secure the 3.5” HDD are indicated by **blue circles**. Please note the hard drive installation orientation by making sure the SATA connector is in the same direction as the **blue arrow**.



6. Secure 3.5” HDD on the HDD/SSD bracket with 4 M3 flat-head screws.

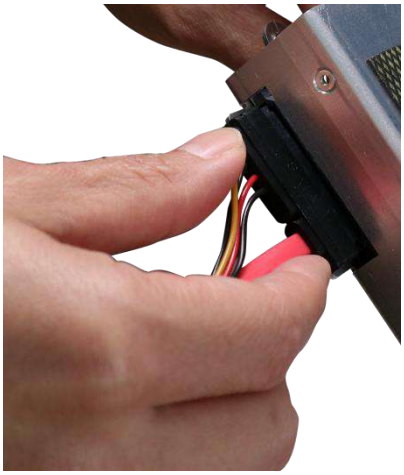


7. Connect the SATA/ power cables if they are not already connected.



8. Re-secure the hard drive cage onto the bottom panel.

9. Connect the SATA/power connector onto the hard drive connector.



10. Reinstall the system enclosure and panel when done.

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

3.8 Installing the System Enclosure

To reinstall the system enclosure, please follow the steps below:

1. Gently slide the heatsink into the enclosure.

2. Secure the heatsink onto enclosure by securing screws indicated on the heatsink.

3. Attach the Ethernet/DP/ USB panel and secure with the screw indicated.

4. Attach the VGA/ COM/ 3-pin panel and secure with the screws indicated.

5. Place the four rubber stand and secure the four (4) screws at the bottom of the system panel.

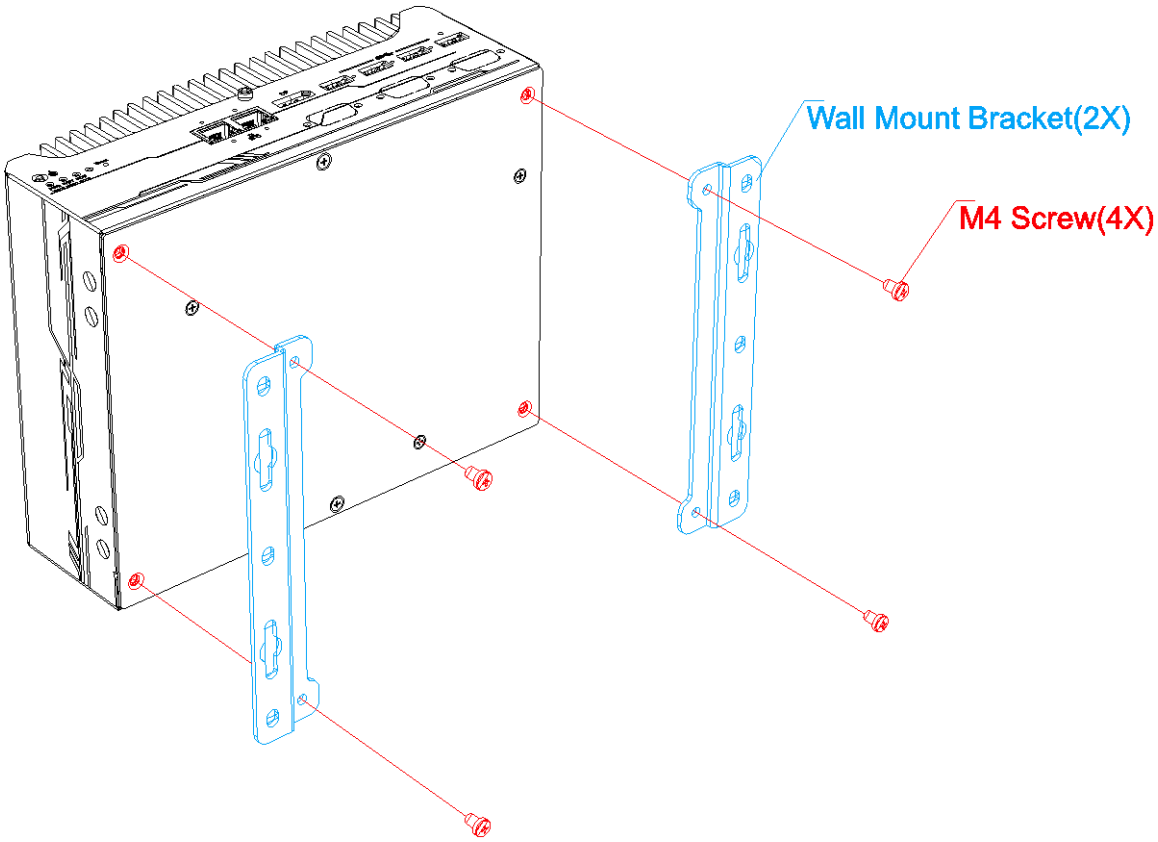
3.9 Mounting Nuvo-9501 Series

Neousys provides versatile mounting methods for Nuvo-9501 series systems. You can use the optional wall-mounting brackets to mount it on the wall. There is also an optional DIN-rail mounting kit to mount it on a DIN-rail. To mount your Nuvo-9501 controller, please refer to the instructions listed below.

3.9.1 Wall Mount Installation (Optional)

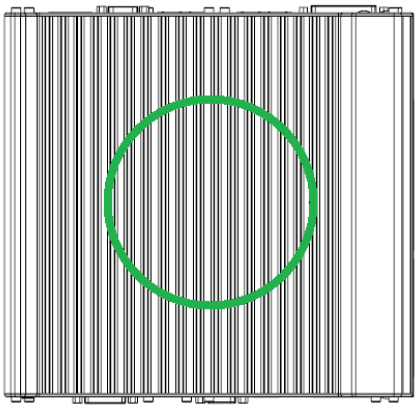
The optional wall-mount brackets allow Nuvo-9501 series systems to be mounted for operation. Please refer to the following steps to mount your Nuvo-9501 controller on a flat surface.

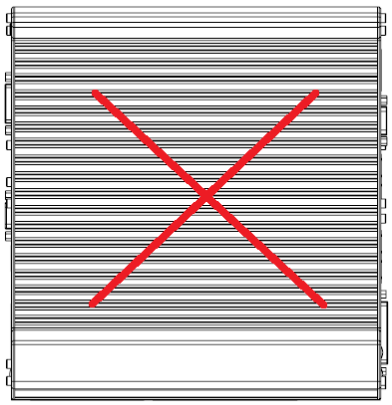
1. Fix the wall mount brackets (indicated in **blue**) to the system enclosure using M4 screws (indicated in **red**).



2. Place the system on a flat surface portion of the wall and secure it with four (4) M4 screws.

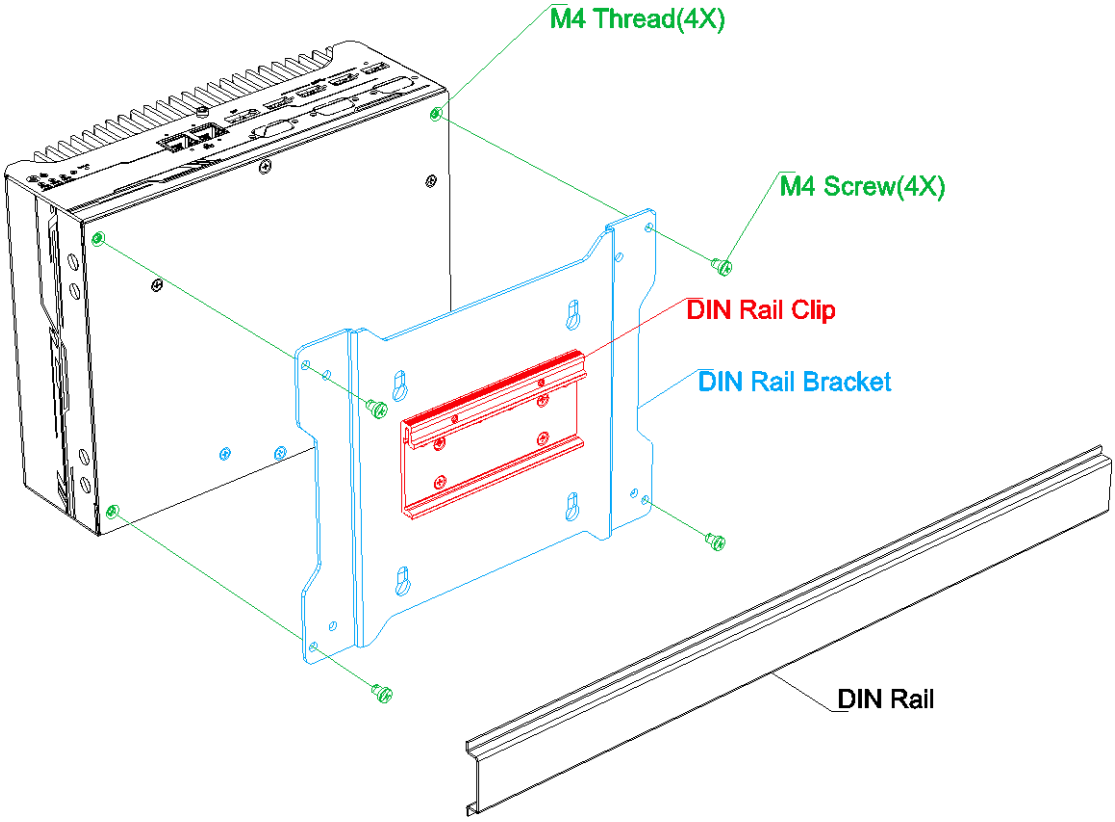
3. When wall mounting, place the heatsink fins perpendicular to the ground for better heat dissipation efficiency.





3.9.2 DIN Rail Installation (Optional)

The system also has an optional DIN-rail mounting kit. The kit includes a bracket (in **blue**) and a DIN-rail mounting clip (in **red**). By fixing the clip to the bracket using four M4 flat-head screws and fixing the bracket assembly to the system four M4 screws (in **green**), complete the installation by clipping the system onto the DIN rail. This option may be useful if you want to deploy it inside an equipment cabinet where DIN rail is available.



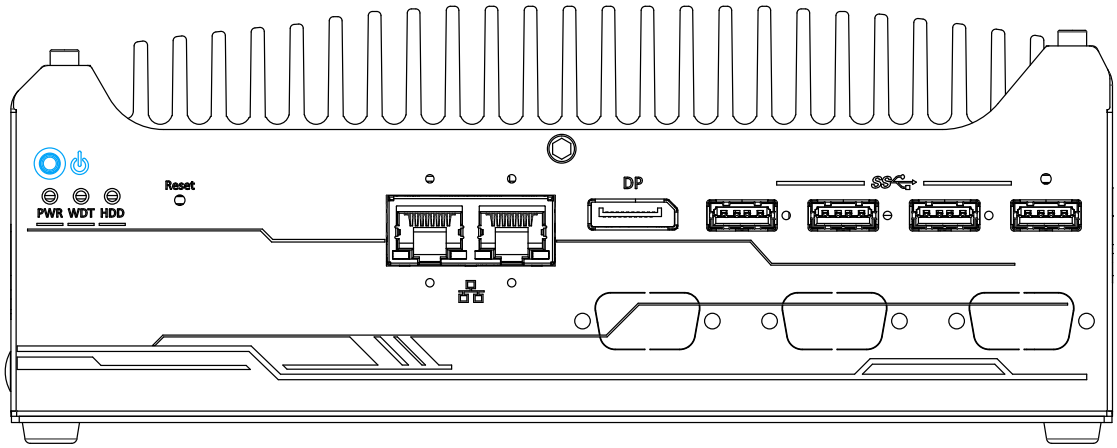
3.10 Powering On the System

There are various methods to power on the system

- Pressing the power button
- Using an external non-latched switch by connecting to the remote on/ off plug
- Sending a LAN packet via Ethernet (Wake-on-LAN)
- System always on

3.10.1 Powering On Using the Power Button

This is the simplest way to turn on your system. The power button 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.

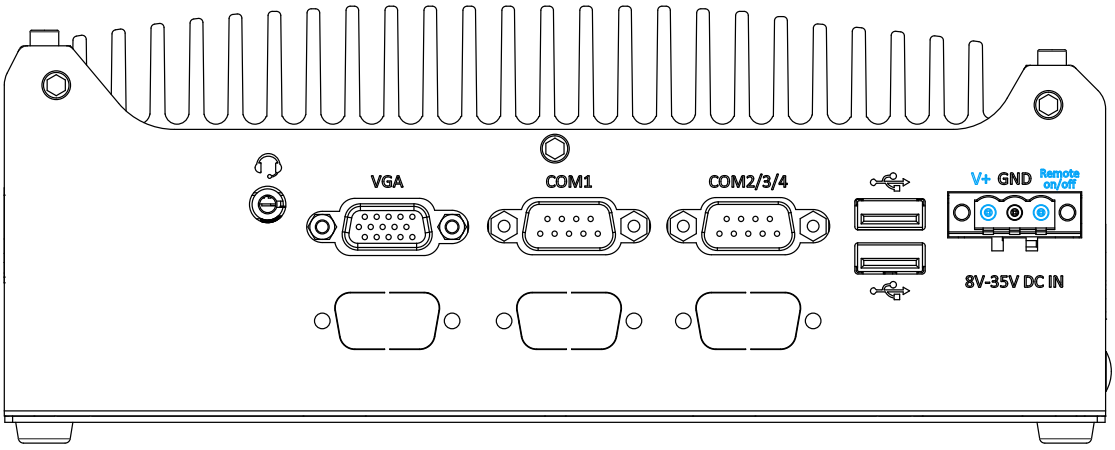


3.10.2 Powering On Using External Non-latched Switch (Remote On/ Off)

If your application demands the system to be placed inside a cabinet, you may use an external non-latched switch to power on/ off the system. The system's 3-pin power connector offers "Remote On/ Off" functionality by connecting a non-latched switch, and acts as the ATX-mode power on/off control switch. The external non-latched switch acts exactly the same as the power button on the front panel. To setup and power on/ off the system using an external non-latched switch (ATX-mode), please follow the steps described below.

1. Acquire a non-latched switch and connect it to the Remote on/off and V+ pins on the 3-pin power connector.

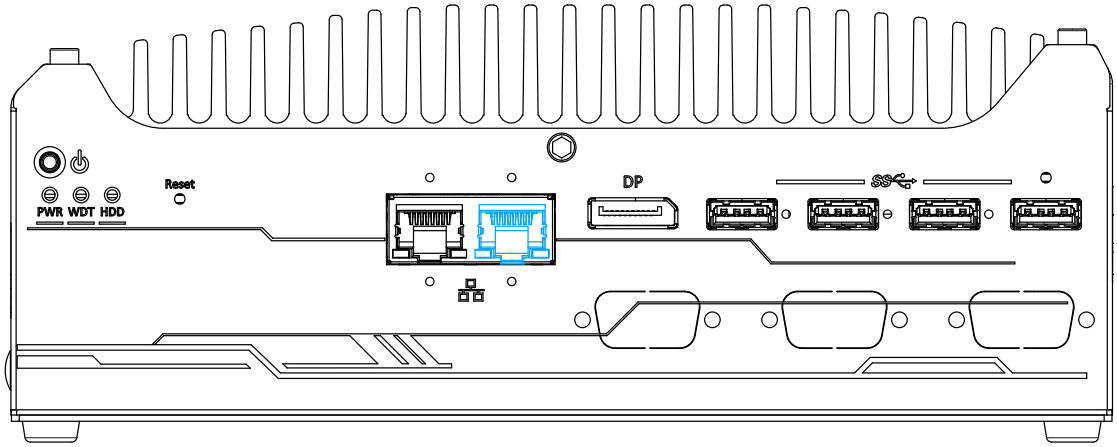
2. Press the power button on the non-latched switch to short the Remote on/off and V+ pins. Hold for at least one second and release the button.



3. When the system is powered on, you may press and hold the power button (for at least one second) on the non-latched switch to turn off the system, or to execute a pre-defined action.

3.10.3 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.

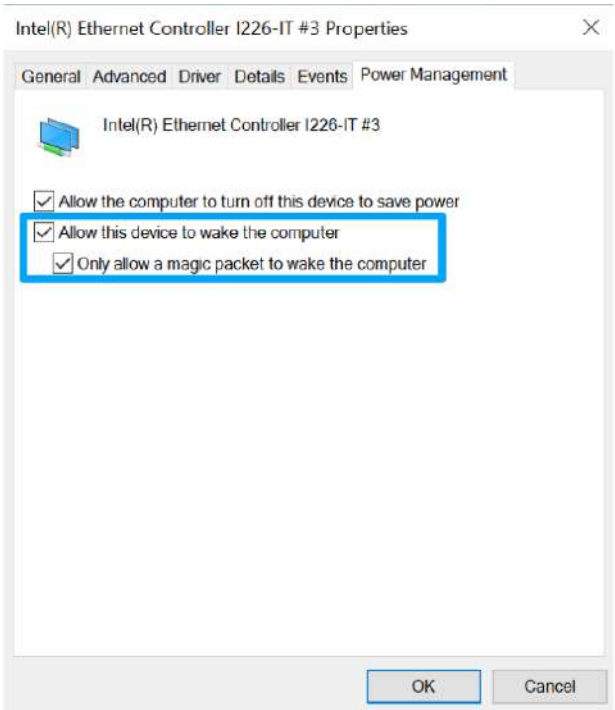


NOTE

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

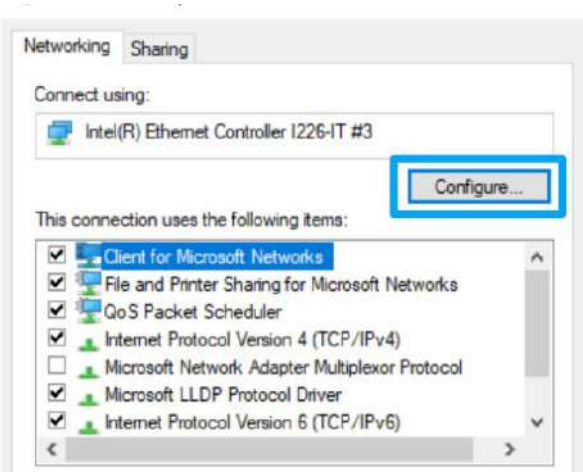


Windows system, press "**Windows key + E**", right-click on "**Network**>**Properties**>**Change adapter settings**". Locate and double-click on the adapter Intel® I226 Gigabit Network Connection, click on **Configure.**

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 FF FF FF FF FF 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 FF FF FF FF FF

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

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

MISC CRC

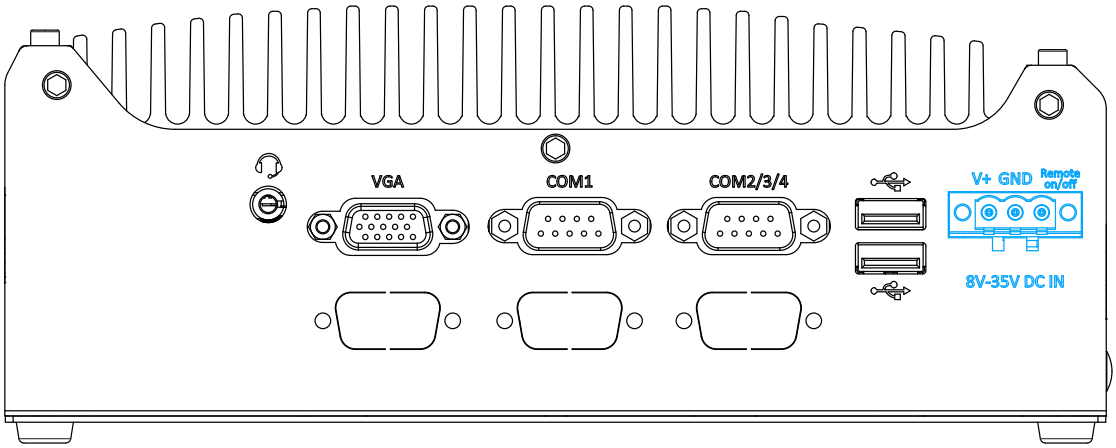
There are some free tools available on Internet that can be used to send a magic packet. Please refer to the following link to understand more about Magic Packet.

3.10.4 System Always On

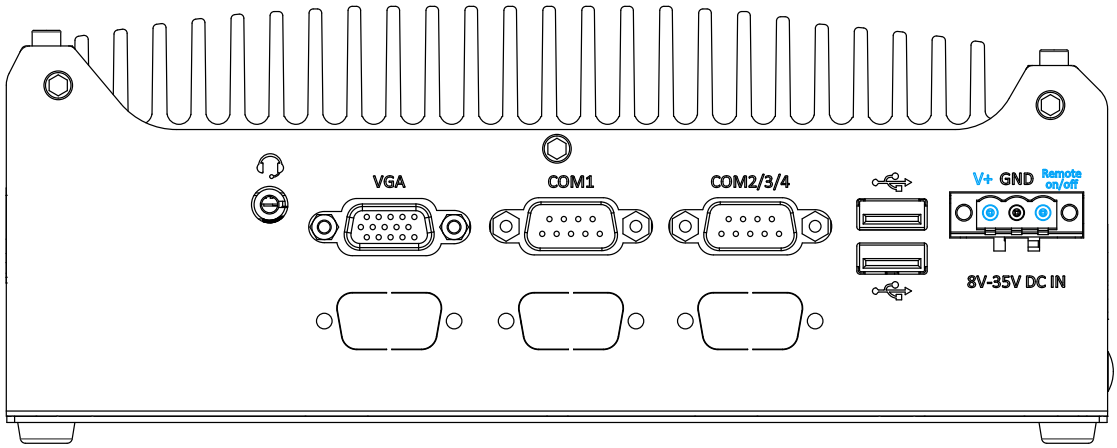
The system has an “Always On” feature to ensure when deployed in hard to access locations, such as in a cabinet, roadside, etc., should the system power off due to an unforeseen reason, it will detect the power off status and automatically trigger the power on mechanism to ensure the system is always operational.

To enable to the system Always On function, please refer to the following instruction:

1. Locate the 3-pin terminal connector on the system.



2. Simply short the **V+** pin and the **Remote on/off pin**, and power-on the system to activate the Always On function.

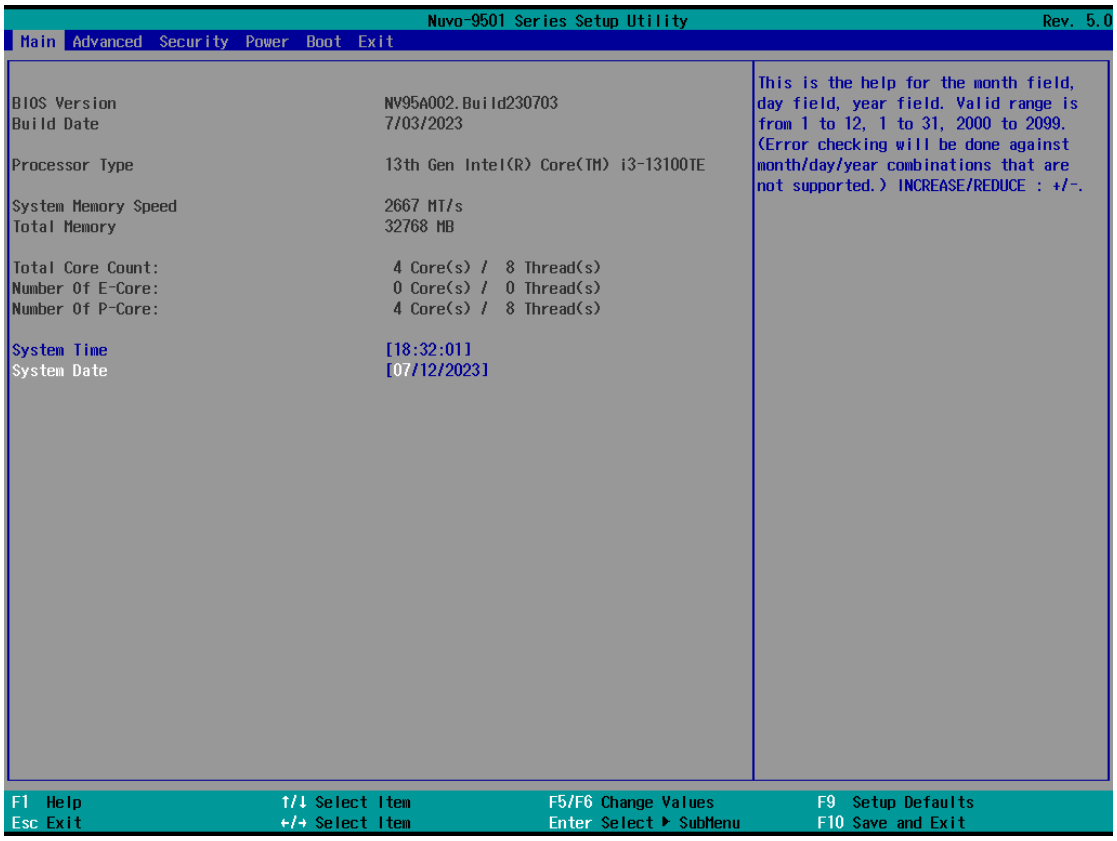


3. Once the pins are shorted, when the system is in shutdown state (S5), the system will detect this status and automatically reboot in 5 seconds.

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).

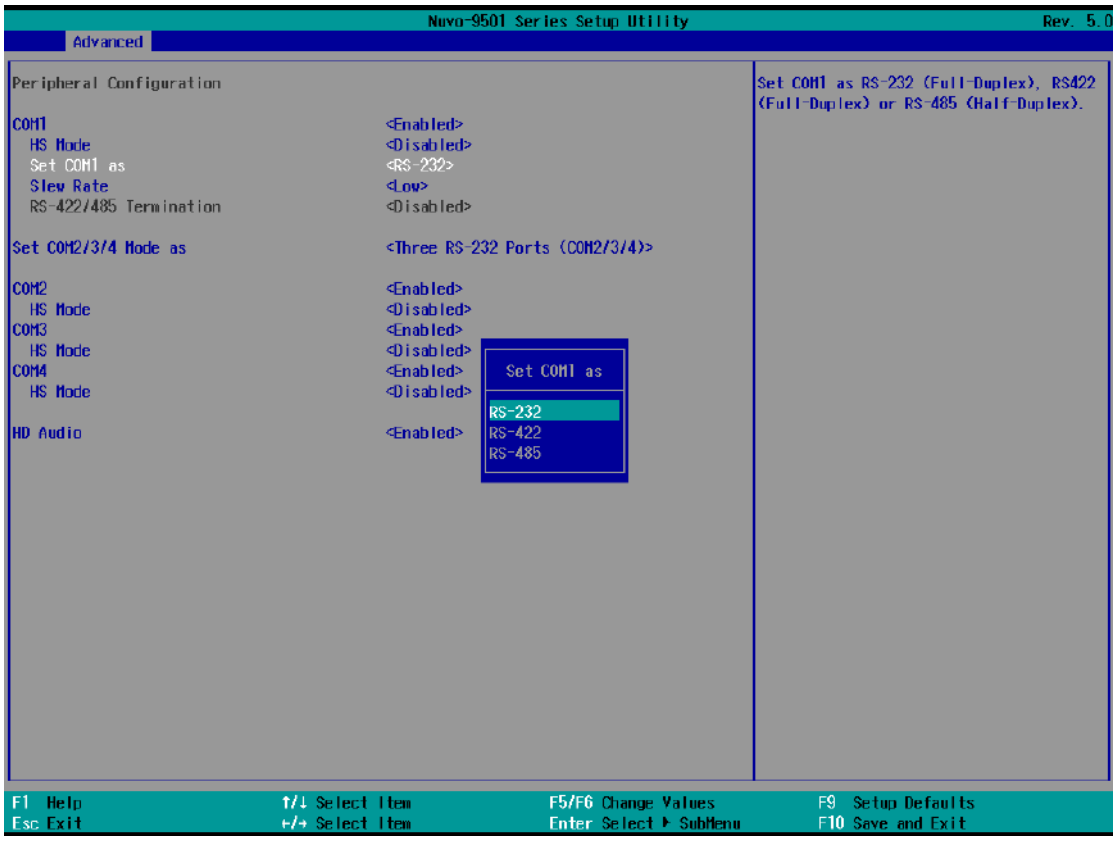


NOTE

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

4.1.1 COM Port Configuration

The system's COM1 port 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.

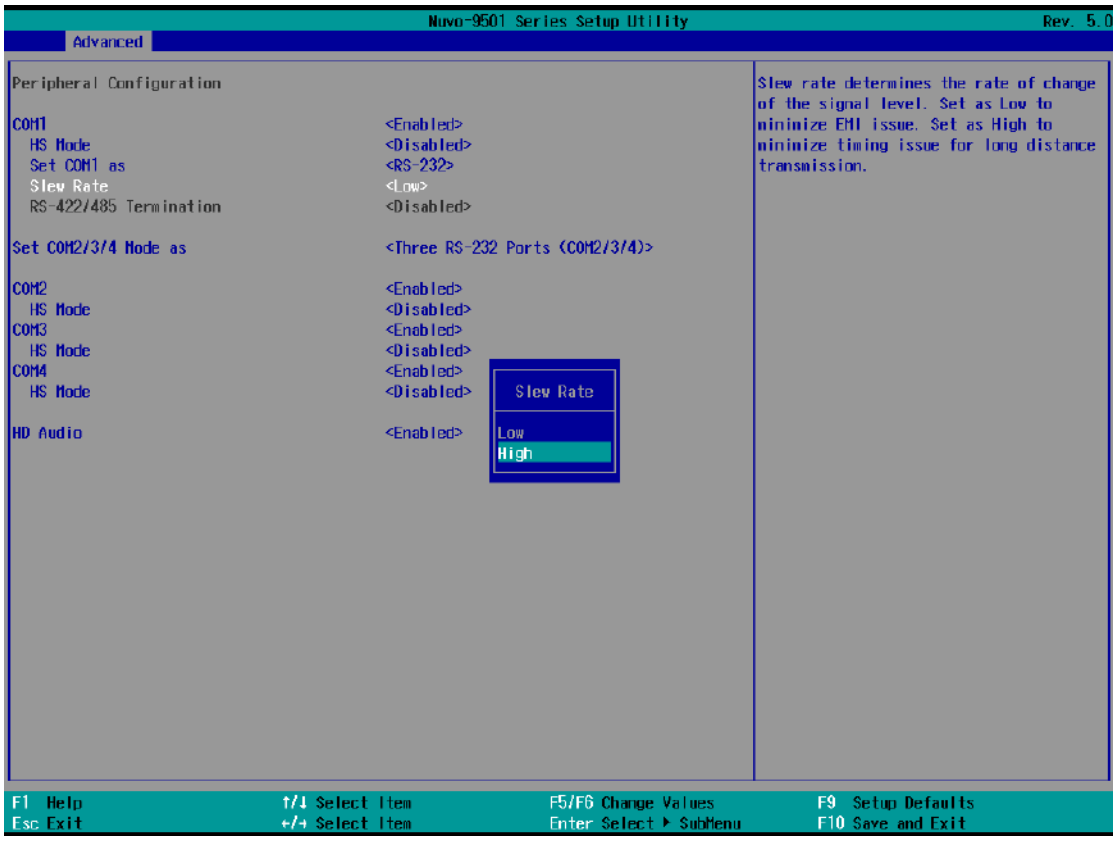


To set COM port operating mode:

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 Slew Rate

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 Slew rate:

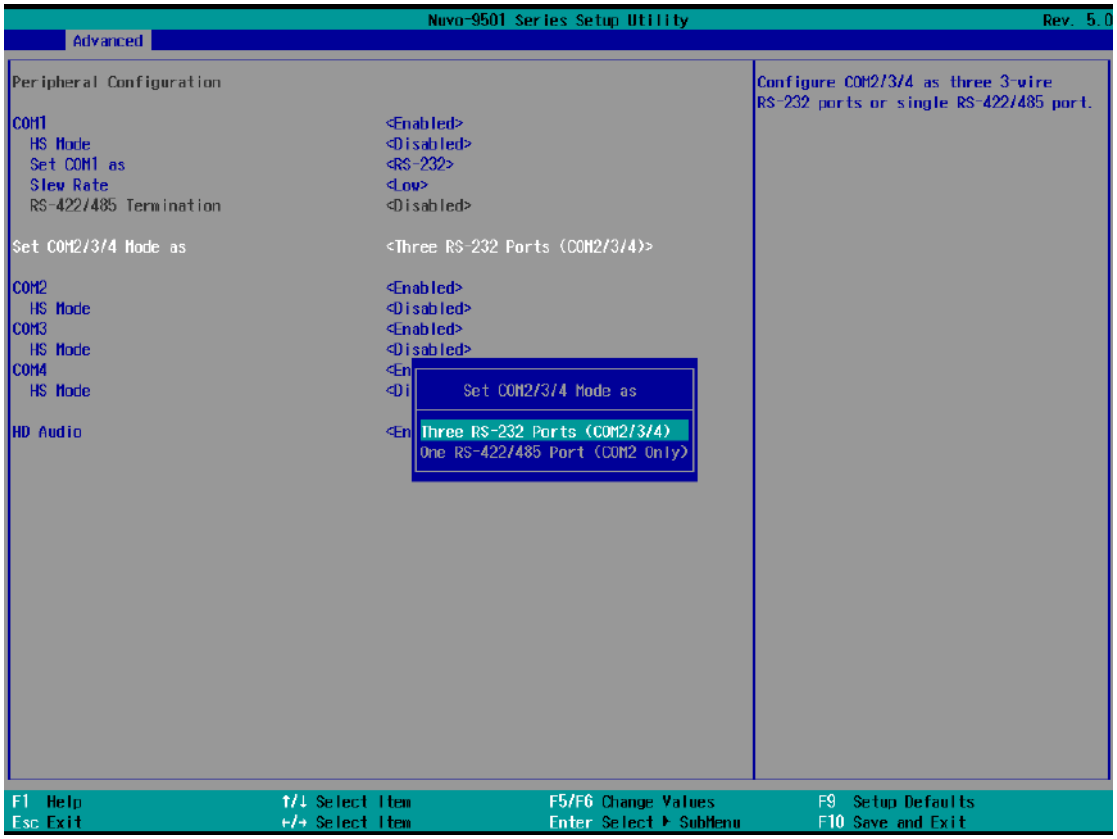
1. Press **F2**when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced]** → **[Peripheral Configuration]**.
3. Select and highlight the COM port > **[Slew Rate].**
4. Set it to the desired mode **[Low]** or **[High]** and press Enter.
5. Once set, press **F10** to save setting and exit.

4.1.3 COM2/3/4 Port Configuration

The system's COM2/ 3/ 4 ports support RS-232 (full-duplex) while COM2 also supports RS-422 (full-duplex) and RS-485 (half-duplex) mode. The operating mode can be configured via the BIOS. Another option in BIOS called "*Slew Rate*" defines how sharp the rising/falling edge is for the output signal. 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).

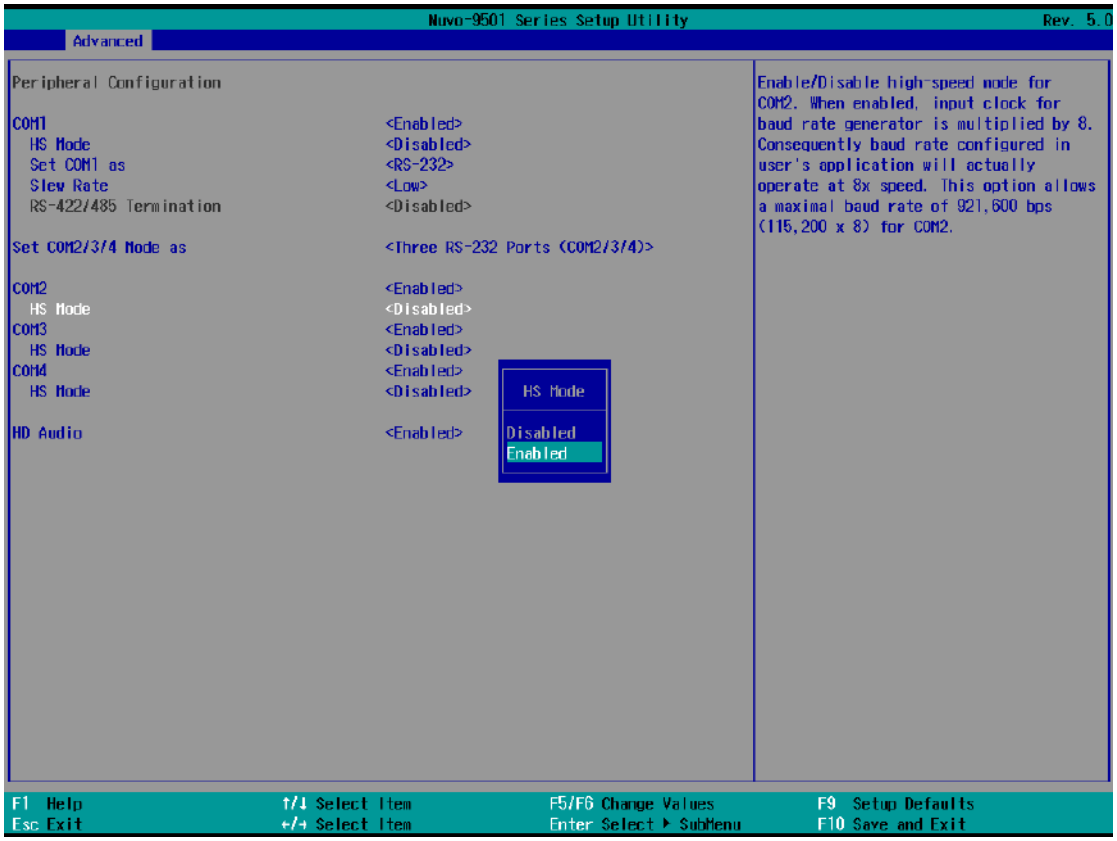
To set COM2/ 3/ 4 operating mode:

1. Press **F2** when the system boots up to enter the BIOS setup utility.
2. Go to **[Advanced]** → **[Peripheral Configuration]**.
3. Set the **[Set COM2/ 3/ 4 Mode as]** option to the desired mode.
4. Once set, press **F10** to save setting and exit.



4.1.4 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 (COM2 used as an example).

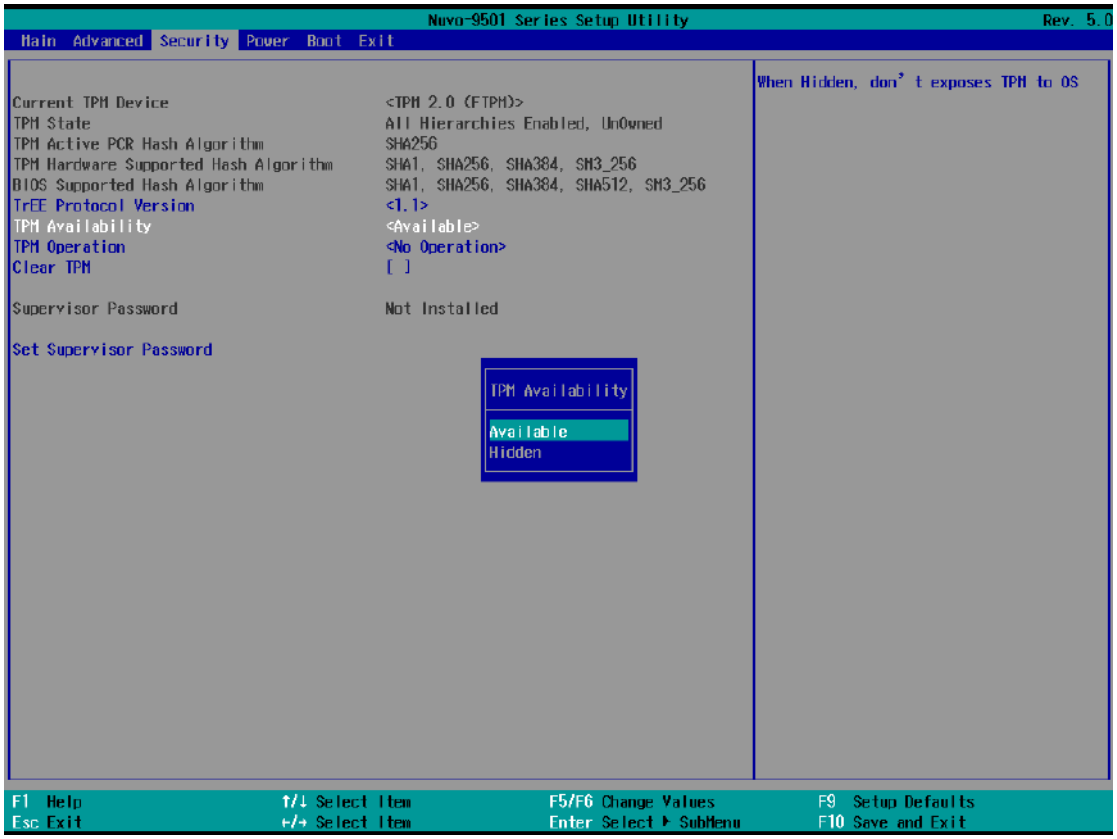


To set COM port high speed mode:

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.

4.1.5 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 firmware TPM 2.0 in BIOS. As fTPM 2.0 requires 64-bit Windows 10 with UEFI boot mode, it is enabled in BIOS by default.

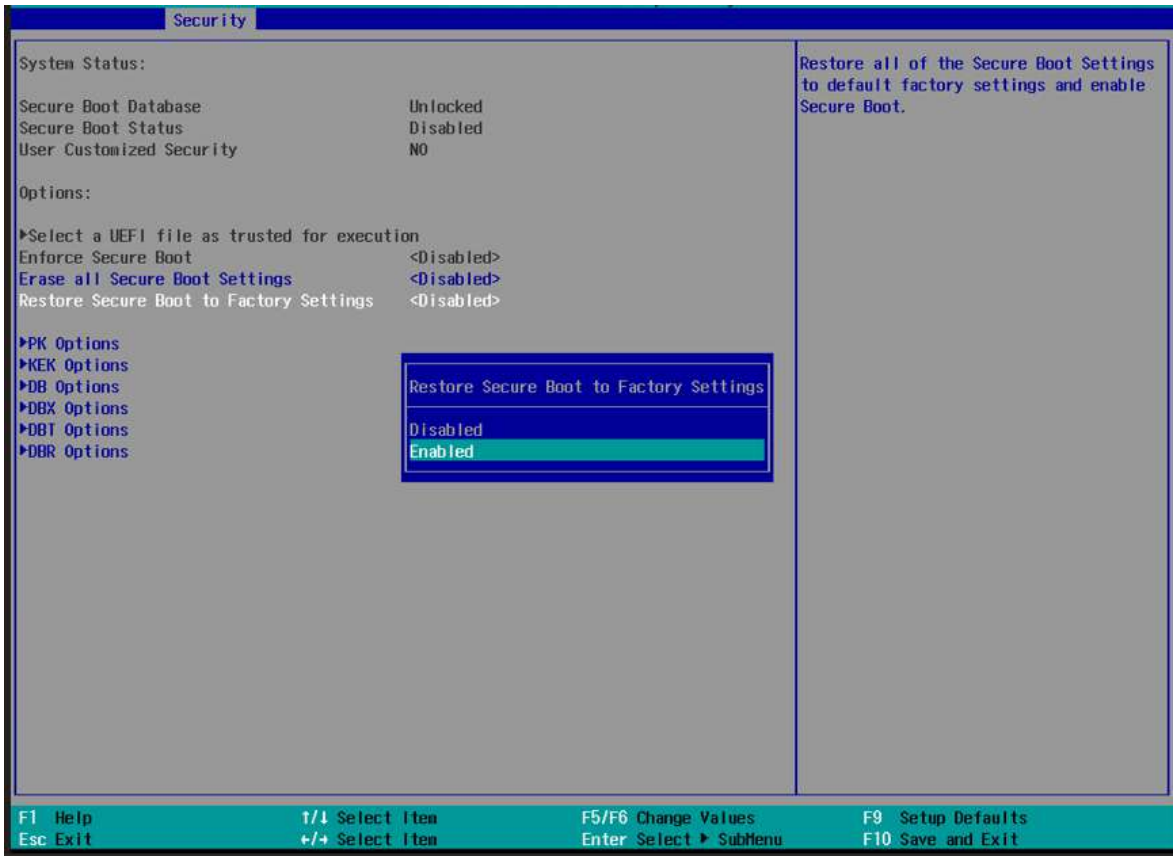


To enable TPM availability:

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”.

4.1.6 Secure Boot

The setting restores the Secure Boot configuration to its default factory settings, including the original platform keys, key-exchange keys, and allowed/forbidden signature databases. This can be used to recover the system's standard Secure Boot configuration after custom keys or settings have been applied.

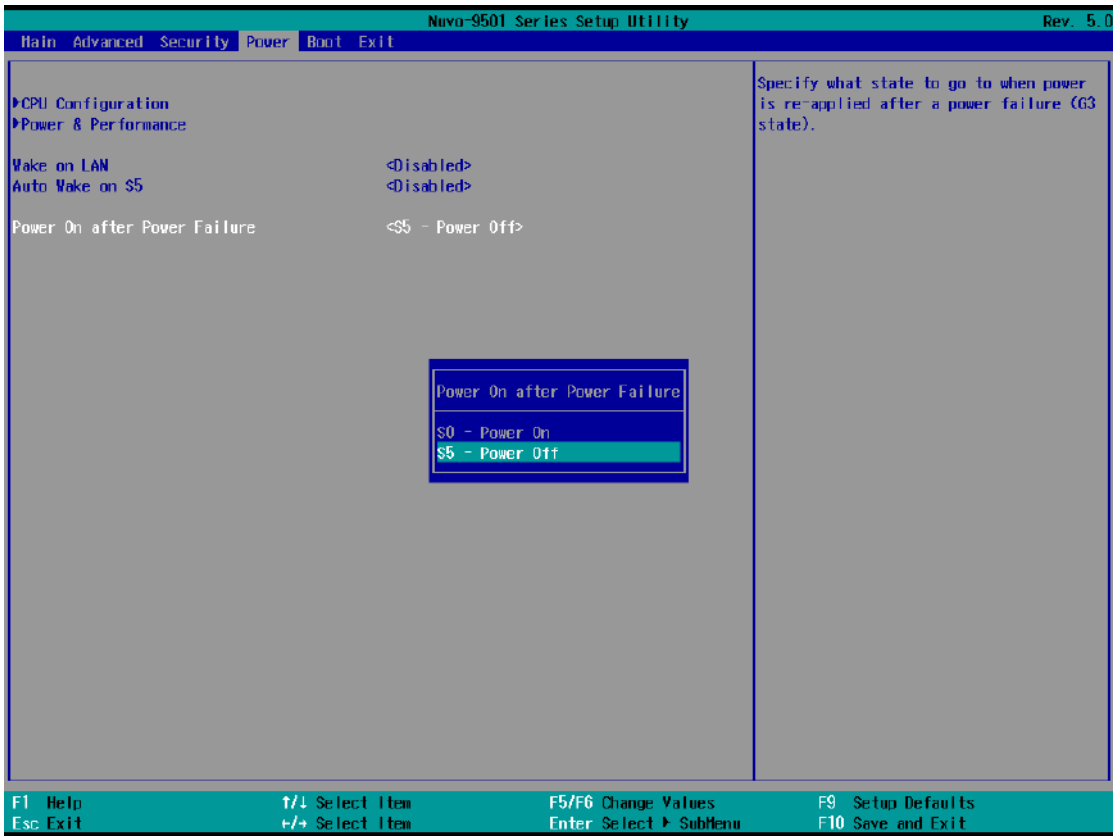


To enable/ disable "PoE Power Enable" option:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to [Security] > [Administer Security Boot] > [Restore Secure Boot to Factory Settings].
3. Press ENTER to bring up setting options, scroll to the setting (Enabled/ Disabled) you desire and press ENTER to set.

4.1.7 Power On After Power Failure Option

This option defines the behavior of system 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”.

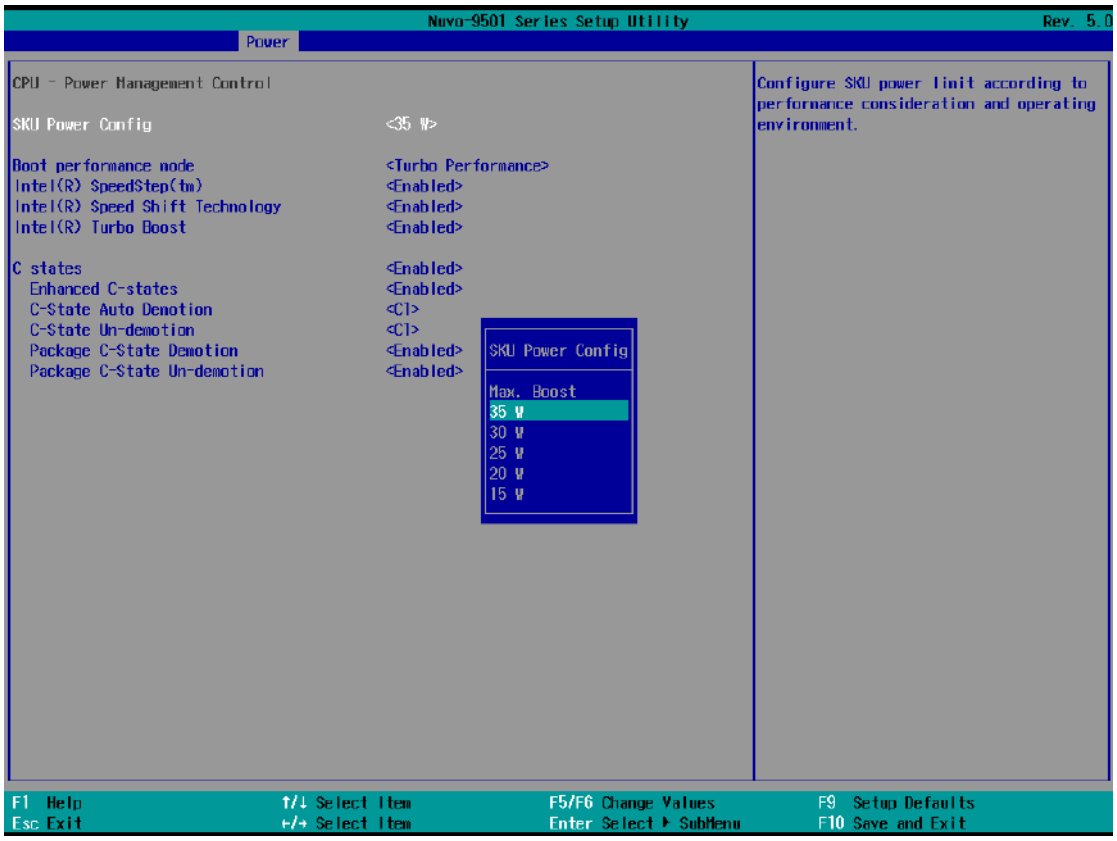
4.1.8 Power & Performance (CPU SKU Power Configuration)

The system supports a unique feature, "**SKU Power Config**" is implemented in BIOS to allow users to specify user-defined SKU power limit. Although the system is designed to have best thermal performance with CPUs of 35W TDP, you can install a 65W CPU and limit its SKU power to 35W to obtain more computing power. This feature gives you the flexibility of CPU selection and great balance between computing power and operating temperature range.

To configure the CPU SKU power limit:

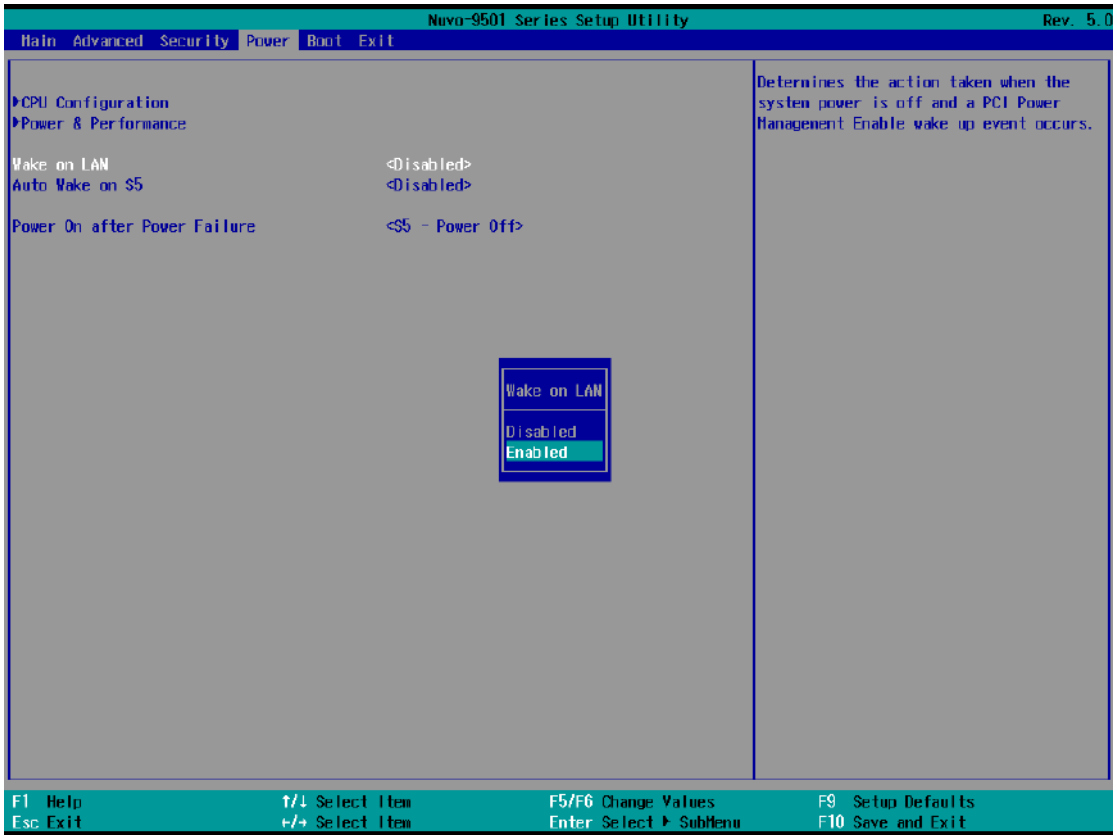
1. When the system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Power]** → **[Power & Performance]**.

Select a proper value of SKU power limit for **[SKU Power Config]** option.



4.1.9 Wake on LAN Option

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

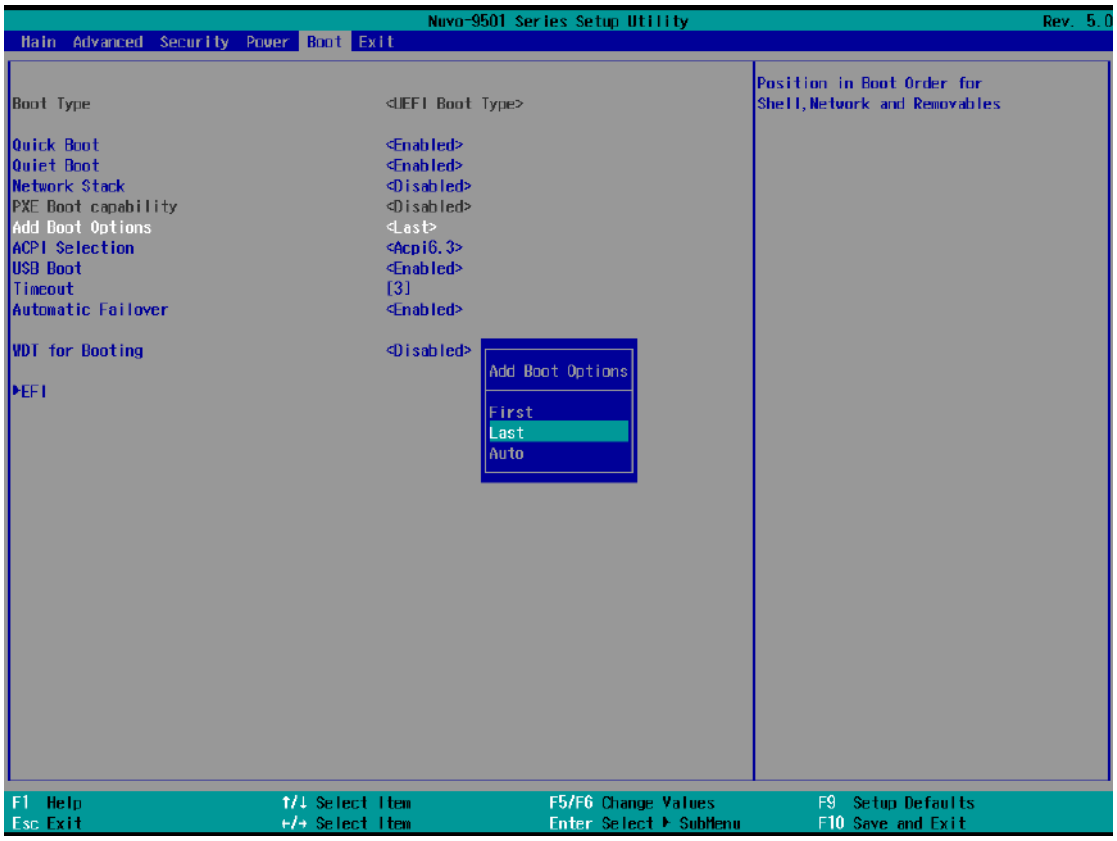


To enable/disable “Wake on LAN” option:

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.

4.1.10 Add Boot Options

The Add Boot Options dedicates the boot sequence order of a newly added device (eg. USB flash drive). The setting allows you to set the newly added device to boot first or as the last device on the list.



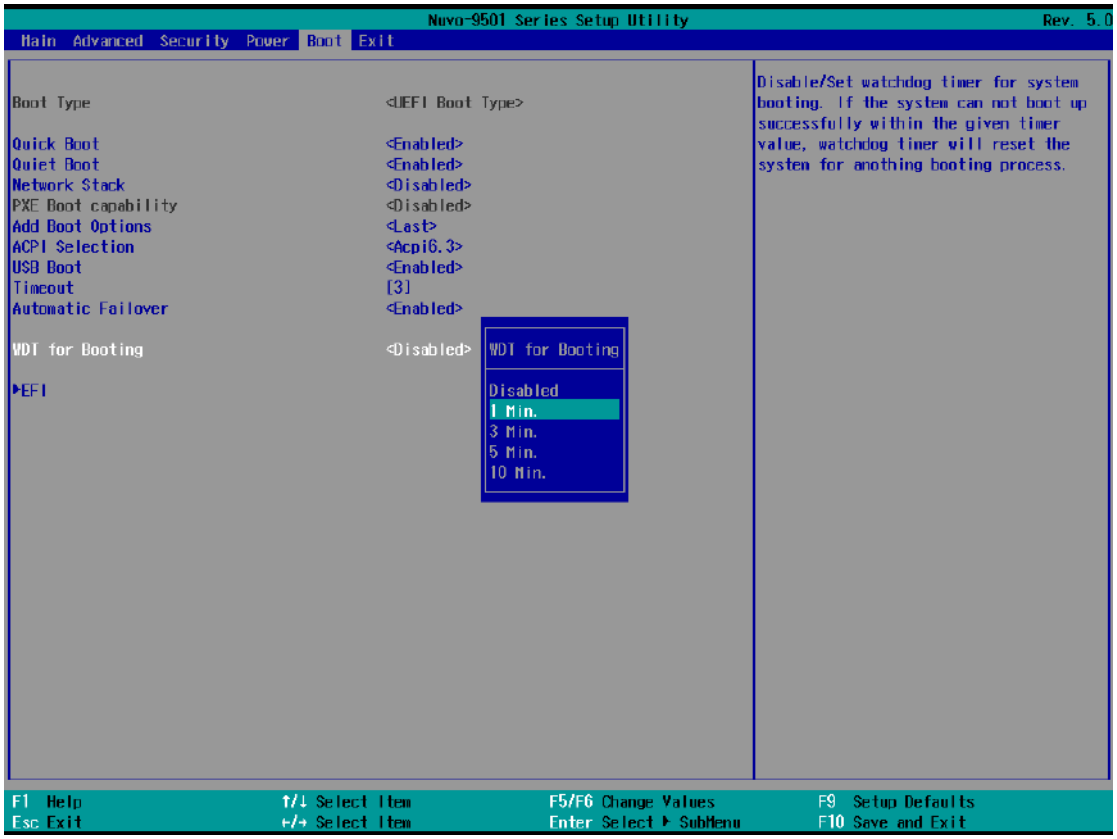
To set Add Boot Options:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to [Boot] > [Add Boot Option], press Enter to bring up options, First or Last.
3. Highlight your selection and press Enter, press F10 to “Exit Saving Changes”.

4.1.11 Watchdog Timer for Booting

The Watchdog timer setting in the BIOS ensures a successful system boot by specifying a timeout value. If the Watchdog timer is not stopped and expires, the BIOS will issues a reset command to initiate another boot 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 stop the watchdog timer after POST (Power-On Self Test) OK. When "**Manually after Entering OS**" is selected, it's user's liability to stop the watchdog timer when entering OS. This guarantees the system can always boot into OS, otherwise another booting process will be initiated.

For information about programming watchdog timer, please refer to **Appendix A 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.

5 OS Support and Driver Installation

5.1 Operating System Compatibility

The system supports most operating system developed for Intel® x86 architecture. The following list contains operating systems that have been tested by Neousys Technology.

- Microsoft Windows 10 LTSC 2021 (x64)
- Microsoft Windows 11 LTSC
- Ubuntu 22.04.2 LTS, 24.04 LTS or other distribution with kernel version ≥ 5.19 */**

NOTE

**For Linux system, user may need to manually compile and install the driver for Intel graphics or I226 GbE controller if the driver is not embedded in kernel. You can visit Intel website for further information.*

***For distributions, graphics driver may not be completely implemented in its kernel. You may encounter restrictions when using these features, such as dual independent display. 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.

5.2.1 Install Drivers Automatically

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_v2.3.2.0 or later versions.

Please refer to this link to download WDT_DIO.

Appendix A Using WDT & DIO

Watchdog Timer

The watchdog timer (WDT) function ensures reliable system operation. The WDT is a hardware mechanism to reset the system if the watchdog timer expires. Users can start the WDT and keep 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 platforms. For other OS support, please contact Neousys Technology for further information.

Isolated DIO (Nuvo-9505D Only)

The system also features isolated digital I/O is available for extended range of applications. Nuvo-9505D features 4x DI channels and 4x DO channels via a DSub-15 connector. The digital I/O supports standard polling mode I/O access so users' program can read or write DIO channel(s) using the function library.

WDT and DIO Library Installation

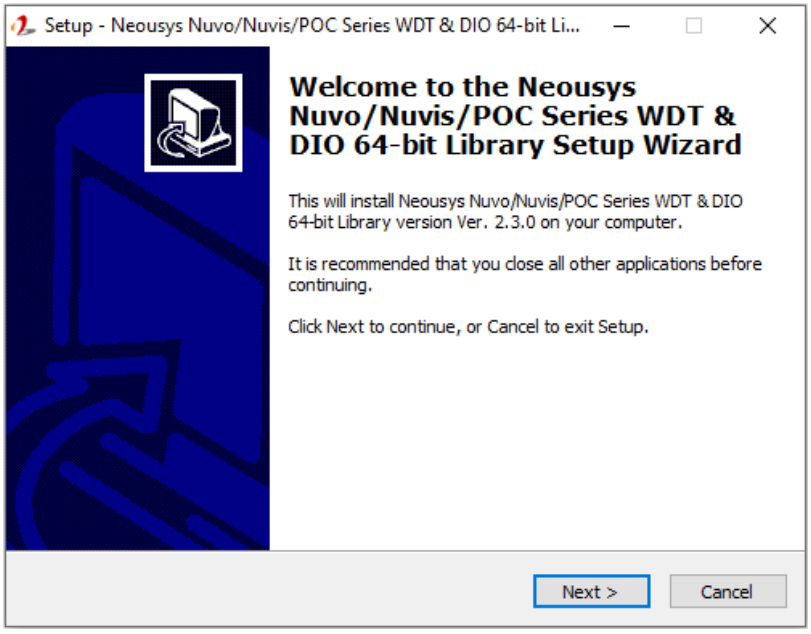
Installing WDT_DIO Library

The WDT_DIO function library is delivered in the form of a setup package named **WDT_DIO_Setup.exe**. Prior to programming 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.

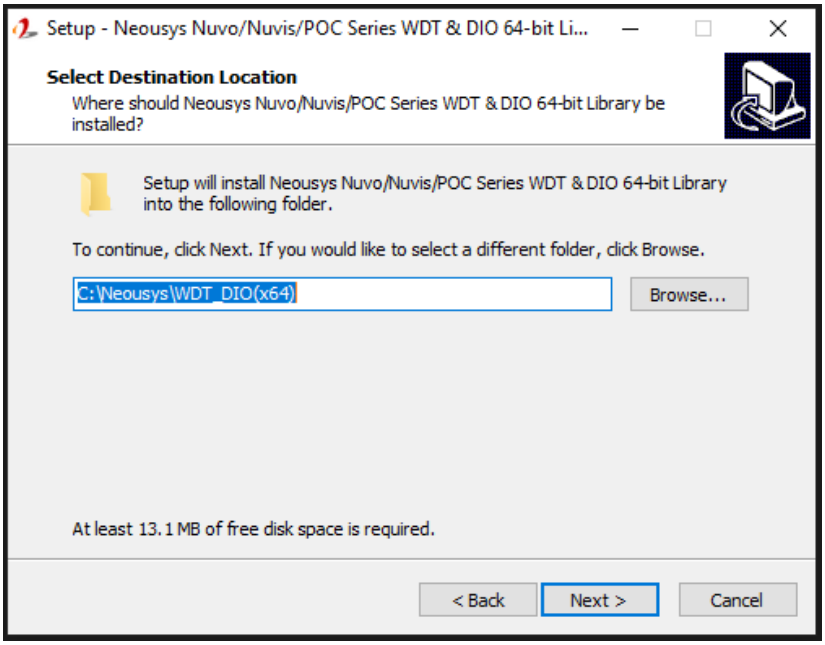
- For or Windows 10 64-bit OS with 64-bit application (x64 mode), please install WDT_DIO_Setup_v2.3.2.0 (x64).exe or later version.
- For Windows 10 64-bit OS with 32-bit application (WOW64 mode), please install WDT_DIO_Setup_v2.3.2.0 (wow64).exe or later version.

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

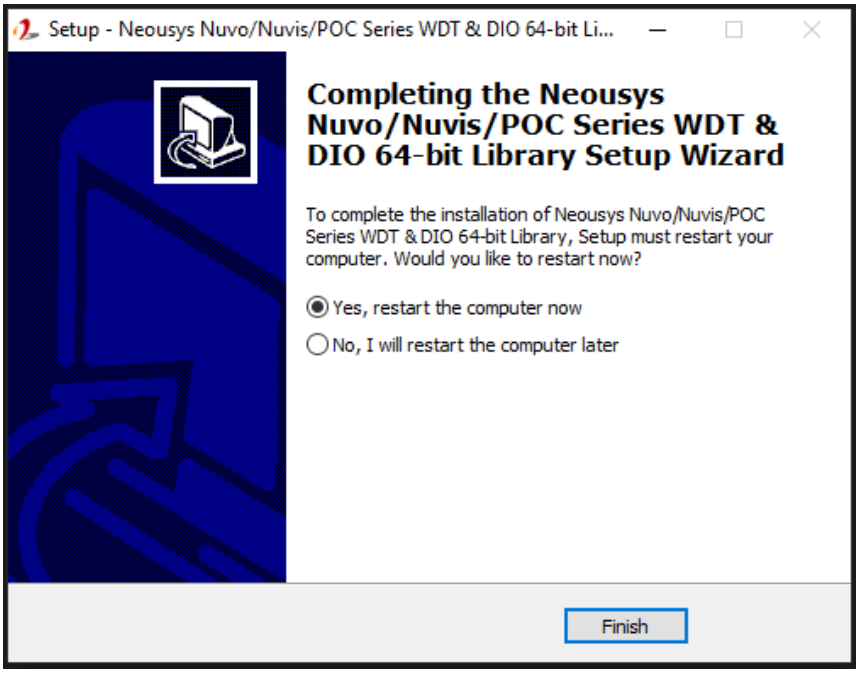
1. Execute **WDT_DIO_Setup.2.3.2.0.exe**. and the following dialog appears.



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) \Sample\ DIO_Demo (Demo for Polling I/O)

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()

DIO Functions

InitDIO

Syntax	BOOL InitDIO(void);
Description	Initialize the DIO function. You should always invoke InitDIO() before write/read any DIO port/channel.
Parameter	None
Return Value	Returns TRUE if initialization successes, FALSE if initialization failed.
Usage	BOOL bRet = InitWDT()

DIReadLine

Syntax	BOOL DIReadLine(BYTE ch);
Description	Read a single channel of isolated digital input.
Parameter	***ch*** BYTE value specifies the DI channel to be read. C*h* should be a value of 0 ~ 7.
Return Value	The status (TRUE or FALSE) of the specified DI channel.

Usage	BYTE ch=3; //DI channel #3
	
	BOOL DIChValue = DIReadLine(ch); //read DI channel #3

DIReadPort

Syntax	WORD DIReadPort(void);
Description	Read the entire isolated digital input port (8 channels).
Parameter	None
Return Value	A WORD value (0~255) indicates the status of DI port (8 DI channels).
Usage	WORD DIPortValue = DIReadPort ();

DOWriteLine

Syntax	void DOWriteLine(BYTE ch, BOOL value);
Description	Write a single channel of isolated digital output.
Parameter	***ch*** BYTE value specifies the DO channel to be written. C*h* should be a value of 0 ~ 7. ***value*** BOOL value (TRUE or FALSE) specifies the status of DO channel.
Return Value	None

Usage	BYTE ch=3; //DI channel #3
	BOOL DOChValue=TRUE;
	
	DOWriteLine(ch, DOChValue); //write DO channel #3 as TRUE

DOWritePort

Syntax	void DOWritePort(WORD value);
Description	Write the entire isolated digital output port (8 channels).
Parameter	***value*** WORD value specifies the status of the DO port. V*alue* should be a value of 0~255.
Return Value	None
Usage	WORD DOPortValue=0XFF; //11111111b DOWritePort(DOPortValue); //write DO port as 11111111b