Neousys Technology Inc.

Nuvo-7000 Series

User Manual

Revision 1.0

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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.

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Declaration of Conformity

FCC

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

CE

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

Copyright Notice

Disclaimer

Patents and Trademarks

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

- If the system is not going to be used for a long time, disconnect it from mains (power socket) to avoid transient over-voltage

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

About This Manual

This manual introduces Neousys Nuvo-7000 series features Intel® 8th-Gen Core™ i hexa-core 35W/ 65W LGA1151 processors.

The guide also demonstrates the system's installation procedures.

Applicable systems:

System	Description
Nuvo-7002E	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 2x GbE, 1-slot PCIe Cassette and MezIO interface
Nuvo-7002P	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 2x GbE, 1-slot PCI Cassette and MezIO interface
Nuvo-7002DE	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 2x GbE, 2-slot PCIe Cassette and MezIO interface
Nuvo-7006E	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, 1-slot PCIe Cassette and MezIO interface
Nuvo-7006P	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, 1-slot PCI Cassette and MezIO interface
Nuvo-7006DE	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, 2-slot PCIe Cassette and MezIO interface
Nuvo-7006E-PoE	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, 1-slot PCIe Cassette and MezIO interface, with optional IEEE 802.3at PoE+
Nuvo-7006P-PoE	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, 1-slot PCI Cassette and MezIO interface, with optional IEEE 802.3at PoE+
Nuvo-7006DE-PoE	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, 2-slot PCIe Cassette and MezIO interface, with optional IEEE 802.3at PoE+
Nuvo-7002LP	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 2x GbE, MezIO interface and low-profile chassis
Nuvo-7006LP	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, MezIO interface and low-profile chassis
Nuvo-7006LP-PoE	Intel® Coffee Lake 8th-Gen Core™ i fanless embedded controller with 6x GbE, MezIO interface and low-profile chassis, with optional IEEE 802.3at PoE+

Revision History

Version	Date	Description
1.0	Sep. 2018	Initial release

1   Introduction

The Neousys Nuvo-7000 series is one of the world's first industrial-grade embedded computers to utilize Intel's 8th Gen. Coffee Lake Core i processors.

The latest Intel Coffee Lake processors are available in quad (Core-i3) to hexa (Core-i5 and i7) core configurations offering significant performance boosts over previous 6th and 7th Gen Core i processors. The system is based on Intel's Q370 platform and supports up to 32GB of DDR4-2666 memory.

Nuvo-7000E/ P series

Nuvo-7000LP series   **Nuvo-7000DE series**

Nuvo-7000 series features multiple Neousys patented add-on technology options such as Cassette module, MezIOTM interface and supercapacitor-base power-backup solution for extra functionalities. Users can install off-the-shelf PCIe and PCI add-on card(s) into the expansion Cassette; select MezIO™ module for extra functions such as DIO, RS-232/ 422/ 485, GbE, USB3 or ignition power control; it is also compatible with PB-2500J, Neousys' patented supercapacitor-based power-backup solution.

Flexible and versatile for a variety of applications, Nuvo-7000 variants are available with different Cassette expansion options. With Neousys Nuvo-7000 series, you get a true rugged platform that can accommodate a single PCIe card (Nuvo-7000E series), dual PCIe cards (Nuvo-7000DE series) or a single PCI card (Nuvo-7000P series) according your application needs.

1.1   Product Specifications

1.1.1   Nuvo-7000E Specifications

Applicable systems: Nuvo-7002E/ 7006E/ 7006E-PoE

System Core	
Processor	8th-Generation Coffee Lake CPU (LGA1151 socket, 35W/65W TDP) - Intel® Core™ i7-8700/ i7-8700T - Intel® Core™ i5-8500/ i5-8500T - Intel® Core™ i3-8100/ i3-8100T - Intel® Pentium® G5400/ G5400T - Intel® Celeron® G4900/ G4900T
Chipset	Intel® Q370 Platform Controller Hub
Graphics	Integrated Intel® UHD Graphics 630
Memory	Up to 32 GB DDR4 2666/ 2400 SDRAM (two SODIMM slots)
AMT	Supports AMT 12.0
TPM	Supports TPM 2.0
I/O Interface	
Ethernet port	2x Gigabit Ethernet ports by I219 and I210 **(Nuvo-7002E)** 6x Gigabit Ethernet ports by I219 and 5x I210 **(Nuvo-7006E)**
PoE+	IEEE 802.3at PoE+ PSE for Port 3 ~ Port 6 **(Nuvo-7006E-PoE)** 100 W total power budget
USB	via Intel native XHCI controller 4x USB 3.1 Gen2 (10Gbps) ports 4x USB 3.1 Gen1 (5Gbps) ports
Video Port	1x VGA connector, supporting 1920 x 1200 resolution 1x DVI-D connector, supporting 1920 x 1200 resolution 1x DisplayPort connector, supporting 4096 x 2304 resolution
Serial Port	2x software-programmable RS-232/ 422/ 485 ports (COM1/ COM2) 2x RS-232 ports (COM3/ COM4)
Audio	1x 3.5 mm jack for mic-in and speaker-out
Storage Interface	
SATA HDD	2x internal SATA port for 2.5" HDD/ SSD installation, supporting RAID 0/ 1
M.2 NVMe	1x M.2 2280 M key NVMe socket (PCIe Gen3/ x4) for NVMe SSD or Intel® OptaneTM Memory installation
mSATA	1x full-size mSATA port (mux with mini-PCIe)

Internal Expansion Bus	
PCI Express Slot	1x PCIe x16 slot@Gen3, 8-lanes PCIe signals in Cassette module
Mini PCI-E	1x full-size mini PCI Express socket with internal SIM socket (mux with mSATA)
M.2	1x M.2 2242 B key socket with dual front-accessible SIM sockets supporting dual SIM mode with selected M.2 LTE module
Expandable I/O	1x MezIO^{TM} expansion port for Neousys MezIO^{TM} modules
Power Supply	
DC Input	1x 3-pin pluggable terminal block for 8~35VDC DC input
Remote Ctrl. & LED Output	1x 3-pin pluggable terminal block for remote control and PWR LED output
Mechanical	
Dimension	240 mm (W) x 225 mm (D) x 90 mm (H)
Weight	3.58 Kg (approx.)
Mounting	Wall-mounting (standard) or DIN-rail mounting (optional)
Environmental	
Operating Temperature	**With 35W CPU** -25°C ~ 70°C ** **With 65W CPU** -25°C ~ 70°C */** (configured as 35W TDP) -25°C ~ 50°C */** (configured as 65W TDP)
Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, MIL-STD-810G, Method 514.6, Category 4
Shock	Operating, MIL-STD-810G, Method 516.6, Procedure I, Table 516.6-II
EMC	CE/FCC Class A, according to EN 55032 & EN 55024

i7-8700 running at 65W mode, the highest operating temperature shall be limited to 50°C and thermal throttling may occur when sustained full-loading applied. Users can configure CPU power in BIOS to obtain higher operating temperature.

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

1.1.2 Nuvo-7000P Specifications

Applicable systems: Nuvo-7002P/ 7006P/ 7006P-PoE

System Core	
Processor	8th-Generation Coffee Lake CPU (LGA1151 socket, 35W/65W TDP) - Intel® Core™ i7-8700/ i7-8700T - Intel® Core™ i5-8500/ i5-8500T - Intel® Core™ i3-8100/ i3-8100T - Intel® Pentium® G5400/ G5400T - Intel® Celeron® G4900/ G4900T
Chipset	Intel® Q370 Platform Controller Hub
Graphics	Integrated Intel® UHD Graphics 630
Memory	Up to 32 GB DDR4 2666/ 2400 SDRAM (two SODIMM slots)
AMT	Supports AMT 12.0
TPM	Supports TPM 2.0
I/O Interface	
Ethernet port	2x Gigabit Ethernet ports by I219 and I210 **(Nuvo-7002P)** 6x Gigabit Ethernet ports by I219 and 5x I210 **(Nuvo-7006P)**
PoE+	IEEE 802.3at PoE+ PSE for Port 3 ~ Port 6 **(Nuvo-7006P-PoE)** 100 W total power budget
USB	via Intel native XHCI controller 4x USB 3.1 Gen2 (10Gbps) ports 4x USB 3.1 Gen1 (5Gbps) ports
Video Port	1x VGA connector, supporting 1920 x 1200 resolution 1x DVI-D connector, supporting 1920 x 1200 resolution 1x DisplayPort connector, supporting 4096 x 2304 resolution
Serial Port	2x software-programmable RS-232/ 422/ 485 ports (COM1/ COM2) 2x RS-232 ports (COM3/ COM4)
Audio	1x 3.5 mm jack for mic-in and speaker-out
Storage Interface	
SATA HDD	2x internal SATA port for 2.5" HDD/ SSD installation, supporting RAID 0/ 1
M.2 NVMe	1x M.2 2280 M key NVMe socket (PCIe Gen3/ x4) for NVMe SSD or Intel® Optane™ Memory installation
mSATA	1x full-size mSATA port (mux with mini-PCIe)
Internal Expansion Bus	
PCI Slot	1x PCI slot in Cassette

Mini PCI-E	1x full-size mini PCI Express socket with internal SIM socket (mux with mSATA)
M.2	1x M.2 2242 B key socket with dual front-accessible SIM sockets supporting dual SIM mode with selected M.2 LTE module
Expandable I/O	1x MezIO^{TM} expansion port for Neousys MezIO^{TM} modules
Power Supply	
DC Input	1x 3-pin pluggable terminal block for 8~35VDC DC input
Remote Ctrl. & LED Output	1x 3-pin pluggable terminal block for remote control and PWR LED output
Mechanical	
Dimension	240 mm (W) x 225 mm (D) x 90 mm (H)
Weight	3.58 Kg (approx.)
Mounting	Wall-mounting (standard) or DIN-rail mounting (optional)
Environmental	

Operating Temperature	**With 35W CPU**
	  -25°C ~ 70°C **
	With 65W CPU
	  -25°C ~ 70°C */** (configured as 35W TDP)
	  -25°C ~ 50°C */** (configured as 65W TDP)

Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, MIL-STD-810G, Method 514.6, Category 4
Shock	Operating, MIL-STD-810G, Method 516.6, Procedure I, Table 516.6-II
EMC	CE/FCC Class A, according to EN 55032 & EN 55024

* i7-8700 running at 65W mode, the highest operating temperature shall be limited to 50°C and thermal throttling may occur when sustained full-loading applied. Users can configure CPU power in BIOS to obtain higher operating temperature.

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

1.1.3 Nuvo-7000DE Specifications

System Core	
Processor	8th-Generation Coffee Lake CPU (LGA1151 socket, 35W/65W TDP) - Intel® Core™ i7-8700/ i7-8700T - Intel® Core™ i5-8500/ i5-8500T - Intel® Core™ i3-8100/ i3-8100T - Intel® Pentium® G5400/ G5400T - Intel® Celeron® G4900/ G4900T
Chipset	Intel® Q370 Platform Controller Hub
Graphics	Integrated Intel® UHD Graphics 630
Memory	Up to 32 GB DDR4 2666/ 2400 SDRAM (two SODIMM slots)
AMT	Supports AMT 12.0
TPM	Supports TPM 2.0
I/O Interface	
Ethernet port	2x Gigabit Ethernet ports by I219 and I210 **(Nuvo-7002DE)** 6x Gigabit Ethernet ports by I219 and 5x I210 **(Nuvo-7006DE)**
PoE+	IEEE 802.3at PoE+ PSE for Port 3 ~ Port 6 **(Nuvo-7006DE-PoE)** 100 W total power budget
USB	via Intel native XHCI controller 4x USB 3.1 Gen2 (10Gbps) ports 4x USB 3.1 Gen1 (5Gbps) ports
Video Port	1x VGA connector, supporting 1920 x 1200 resolution 1x DVI-D connector, supporting 1920 x 1200 resolution 1x DisplayPort connector, supporting 4096 x 2304 resolution
Serial Port	2x software-programmable RS-232/422/485 ports (COM1/COM2) 2x RS-232 ports (COM3/COM4)
Audio	1x 3.5 mm jack for mic-in and speaker-out
Storage Interface	
SATA HDD	2x internal SATA port for 2.5" HDD/ SSD installation, supporting RAID 0/1
M.2 NVMe	1x M.2 2280 M key NVMe socket (PCIe Gen3/ x4) for NVMe SSD or Intel® Optane™ Memory installation
mSATA	1x full-size mSATA port (mux with mini-PCIe)
Internal Expansion Bus	
PCI Express	2x PCIe x8 slot@Gen3, 4-lanes PCIe signals in Cassette
Mini PCI-E	1x full-size mini PCI Express socket with internal SIM socket (mux

	with mSATA)
M.2	1x M.2 2242 B key socket with dual front-accessible SIM sockets supporting dual SIM mode with selected M.2 LTE module
Expandable I/O	1x MezIO^{TM} expansion port for Neousys MezIO^{TM} modules
Power Supply	
DC Input	1x 3-pin pluggable terminal block for 8~35VDC DC input
Remote Ctrl. & Status Output	1x 3-pin pluggable terminal block for remote control and PWR LED output
Mechanical	
Dimension	240 mm (W) x 225 mm (D) x 110.5 mm (H)
Weight	3.7 Kg (approx.)
Mounting	Wall-mounting (standard) or DIN-rail mounting (optional)
Environmental	
Operating Temperature	**With 35W CPU** -25°C ~ 70°C ** **With 65W CPU** -25°C ~ 70°C */** (configured as 35W TDP) -25°C ~ 50°C */** (configured as 65W TDP)
Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, MIL-STD-810G, Method 514.6, Category 4
Shock	Operating, MIL-STD-810G, Method 516.6, Procedure I, Table 516.6-II
EMC	CE/FCC Class A, according to EN 55032 & EN 55024

For i7-8700 running at 65W mode, the highest operating temperature shall be limited to 50°C and thermal throttling may occur when sustained full-loading applied. Users can configure CPU power in BIOS to obtain higher operating temperature.

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

1.1.4 Nuvo-7000LP Specifications

Applicable systems: Nuvo-7002LP/ 7006LP/ 7006LP-PoE

| System Core	
Processor	8th-Generation Coffee Lake CPU (LGA1151 socket, 35W/65W TDP) - Intel® Core™ i7-8700/ i7-8700T - Intel® Core™ i5-8500/ i5-8500T - Intel® Core™ i3-8100/ i3-8100T - Intel® Pentium® G5400/ G5400T - Intel® Celeron® G4900/ G4900T
Chipset	Intel® Q370 Platform Controller Hub
Graphics	Integrated Intel® UHD Graphics 630
Memory	Up to 32 GB DDR4 2666/ 2400 SDRAM (two SODIMM slots)
AMT	Supports AMT 12.0
TPM	Supports TPM 2.0
I/O Interface	
Ethernet port	2x Gigabit Ethernet ports by I219 and I210 **(Nuvo-7002LP)** 6x Gigabit Ethernet ports by I219 and 5x I210 **(Nuvo-7006LP)**
PoE+	IEEE 802.3at PoE+ PSE for Port 3 ~ Port 6 **(Nuvo-7006LP-PoE)** 100 W total power budget
USB	via Intel native XHCI controller 4x USB 3.1 Gen2 (10Gbps) ports 4x USB 3.1 Gen1 (5Gbps) ports
Video Port	1x VGA connector, supporting 1920 x 1200 resolution 1x DVI-D connector, supporting 1920 x 1200 resolution 1x DisplayPort connector, supporting 4096 x 2304 resolution
Serial Port	2x software-programmable RS-232/ 422/ 485 ports (COM1/ COM2) 2x RS-232 ports (COM3/ COM4)
Audio	1x 3.5 mm jack for mic-in and speaker-out
Storage Interface	
SATA HDD	Supports RAID 0/ 1 1x front-accessible, hot-swappable 2.5" HDD/ SSD tray 1x internal SATA port for 2.5" HDD/ SSD installation
M.2 NVMe	1x M.2 2280 M key NVMe socket (PCIe Gen3/ x4) for NVMe SSD or Intel® Optane™ Memory installation
mSATA	1x full-size mSATA port (mux with mini-PCIe)
Internal Expansion Bus	

Mini PCI-E	1x full-size mini PCI Express socket with internal SIM socket (mux with mSATA)
M.2	1x M.2 2242 B key socket with dual front-accessible SIM sockets supporting dual SIM mode with selected M.2 LTE module
Expandable I/O	1x MezIO™ expansion port for Neousys MezIO™ modules
Power Supply	
DC Input	1x 3-pin pluggable terminal block for 8~35VDC DC input
Remote Ctrl. & LED Output	1x 3-pin pluggable terminal block for remote control and PWR LED output
Mechanical	
Dimension	240 mm (W) x 225 mm (D) x 79 mm (H)
Weight	3.1kg
Mounting	Wall-mounting (standard) or DIN-rail mounting (optional)
Environmental	
Operating Temperature	**With 35W CPU** -25°C ~ 70°C ** **With 65W CPU** -25°C ~ 70°C */** (configured as 35W TDP) -25°C ~ 50°C */** (configured as 65W TDP)
Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, MIL-STD-810G, Method 514.6, Category 4
Shock	Operating, MIL-STD-810G, Method 516.6, Procedure I, Table 516.6-II
EMC	CE/FCC Class A, according to EN 55032 & EN 55024

For i7-8700 running at 65W mode, the highest operating temperature shall be limited to 50°C and thermal throttling may occur when sustained full-loading applied. Users can configure CPU power in BIOS to obtain higher operating temperature.

* *For sub-zero operating temperature, a wide temperature HDD or Solid State Disk (SSD) is required.*
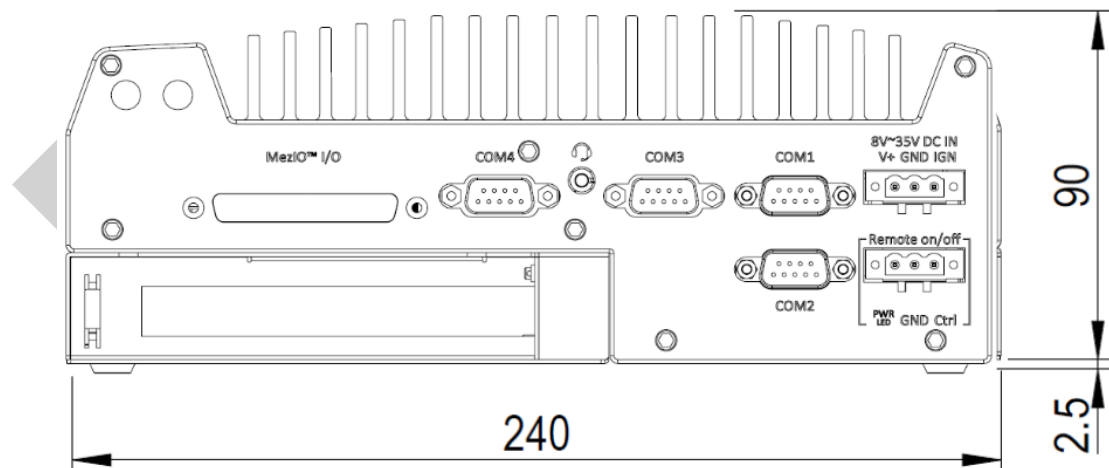
1.2 Nuvo-7000E/P Dimension

1.2.1 Nuvo-7000E/P Front Panel View
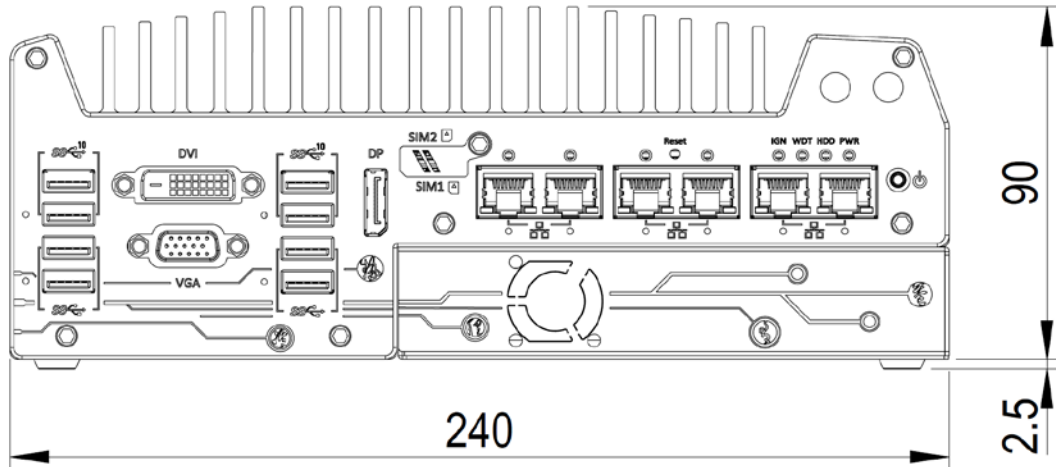
NOTE

All measurements are in millimeters (mm).

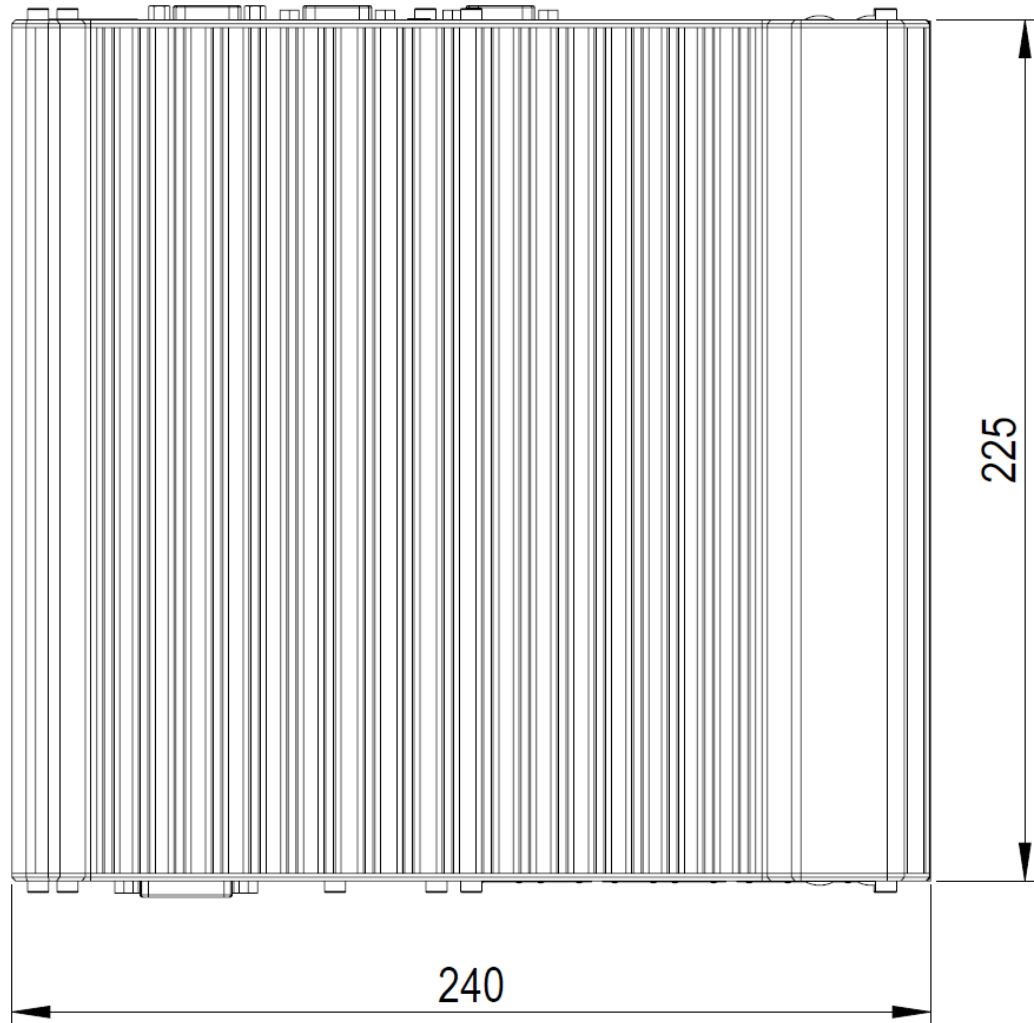*Applicable to Nuvo-7002E, Nuvo-7006E, Nuvo-7002P, Nuvo-7006P systems.*

1.2.2 Nuvo-7000E/P Rear Panel View

NOTE

All measurements are in millimeters (mm).

Applicable to Nuvo-7002E, Nuvo-7006E, Nuvo-7002P, Nuvo-7006P systems.
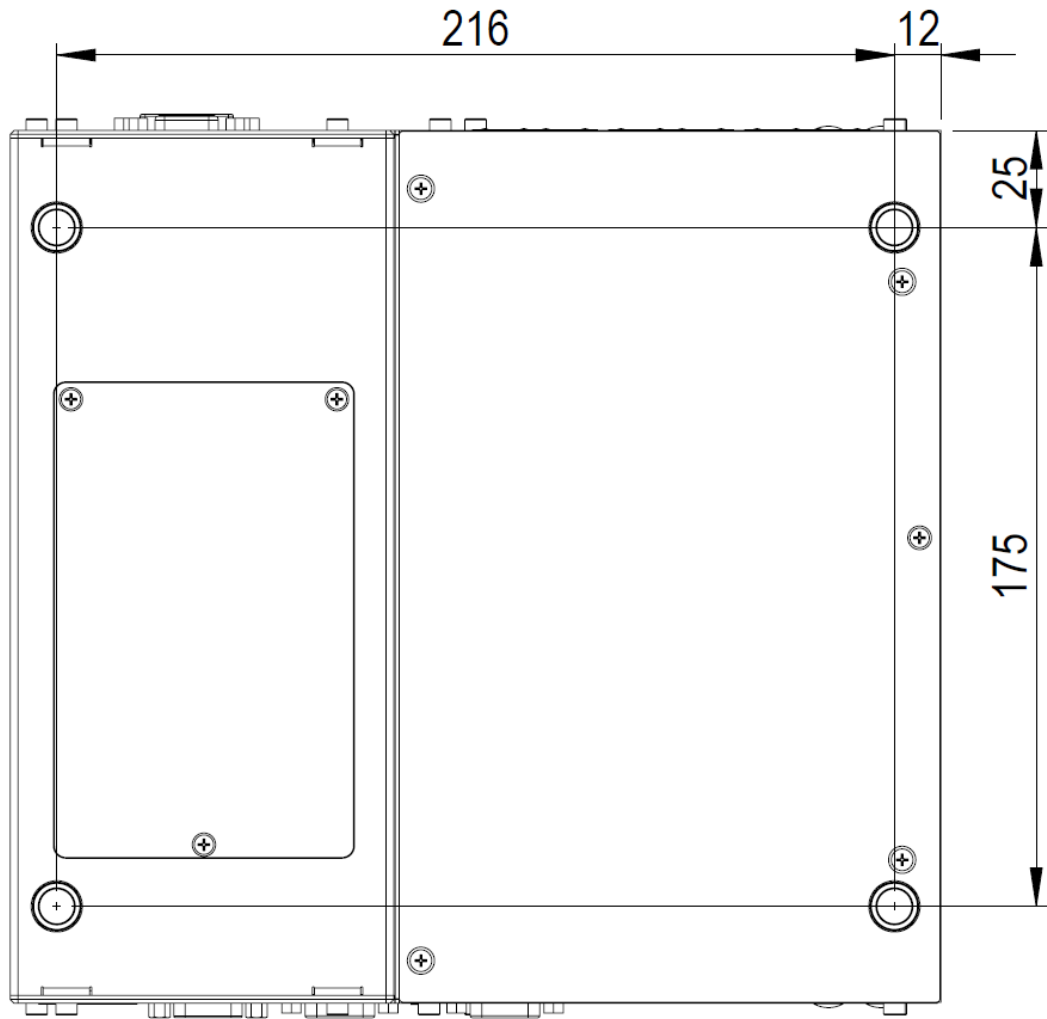
1.2.3 Nuvo-7000E/P Top View

> 📝 **NOTE**
>
> *All measurements are in millimeters (mm).*
>
> *Applicable to Nuvo-7002E, Nuvo-7006E, Nuvo-7002P, Nuvo-7006P systems.*
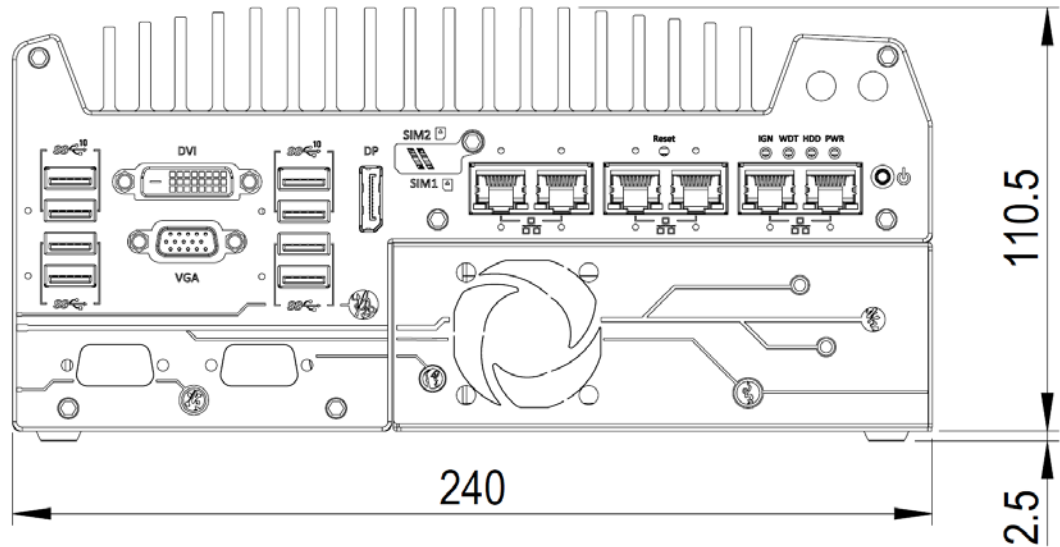
1.2.4 Nuvo-7000E/P Bottom View

> ✍ NOTE
>
> *All measurements are in millimeters (mm).*
>
> *Applicable to Nuvo-7002E, Nuvo-7006E, Nuvo-7002P, Nuvo-7006P systems.*
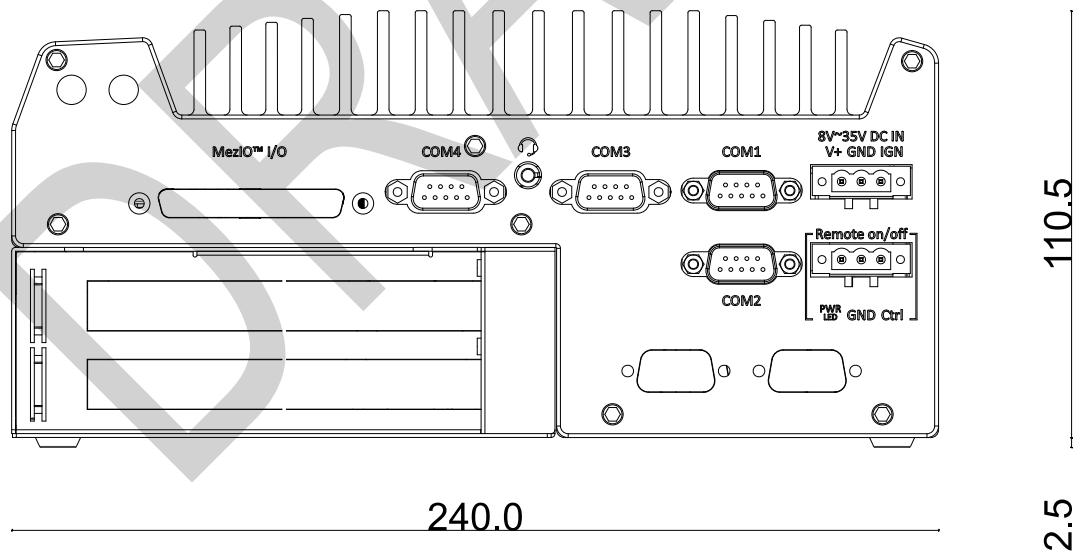
1.3 Nuvo-7000DE Dimension

1.3.1 Nuvo-7000DE Front Panel View

1.3.2 Nuvo-7000DE Rear Panel view

The numbers "2.5" represents the height of the rubber stands at 2.5mm.

1.3.3   Nuvo-7000DE Top View

225.0

240.0

1.3.4 Nuvo-7000DE Bottom View
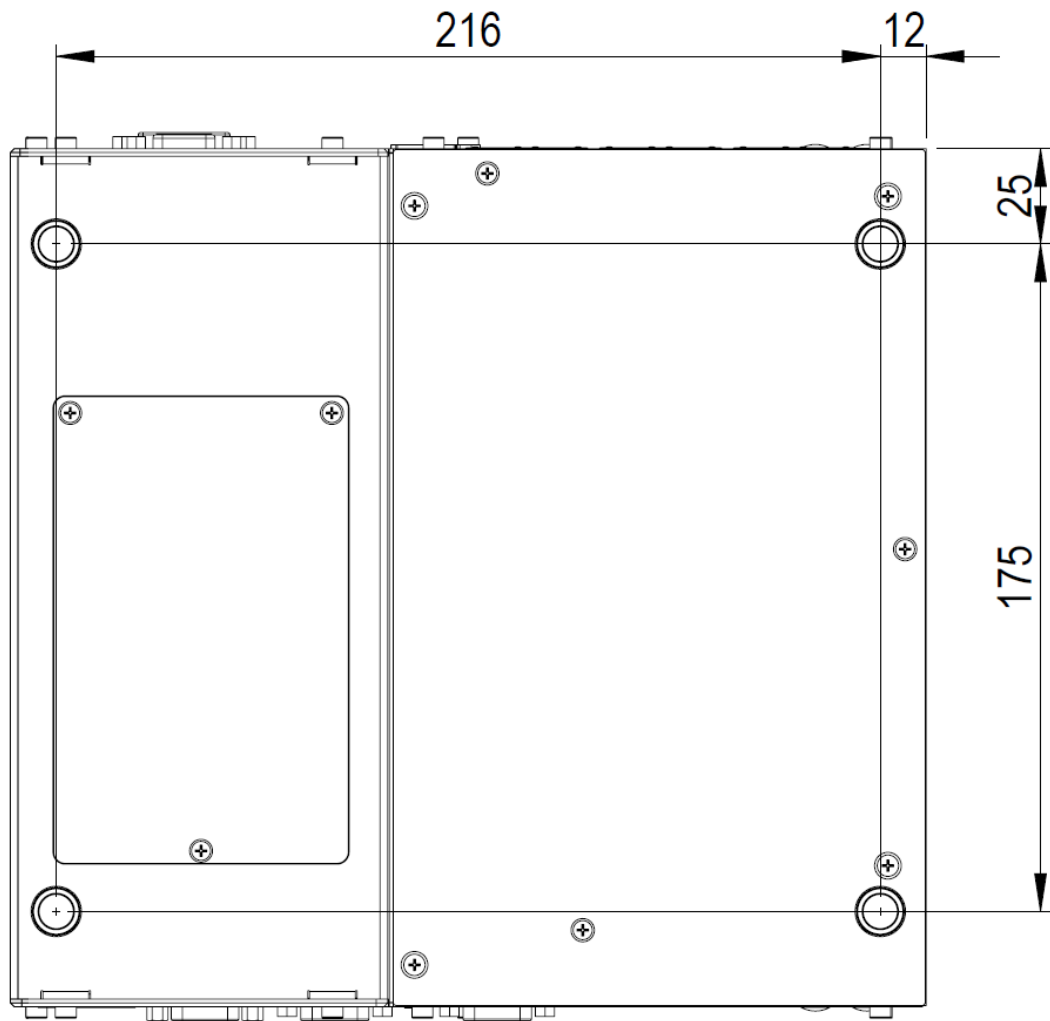
1.4 Nuvo-7000LP Dimension

1.4.1 Nuvo-7000LP Front Panel View

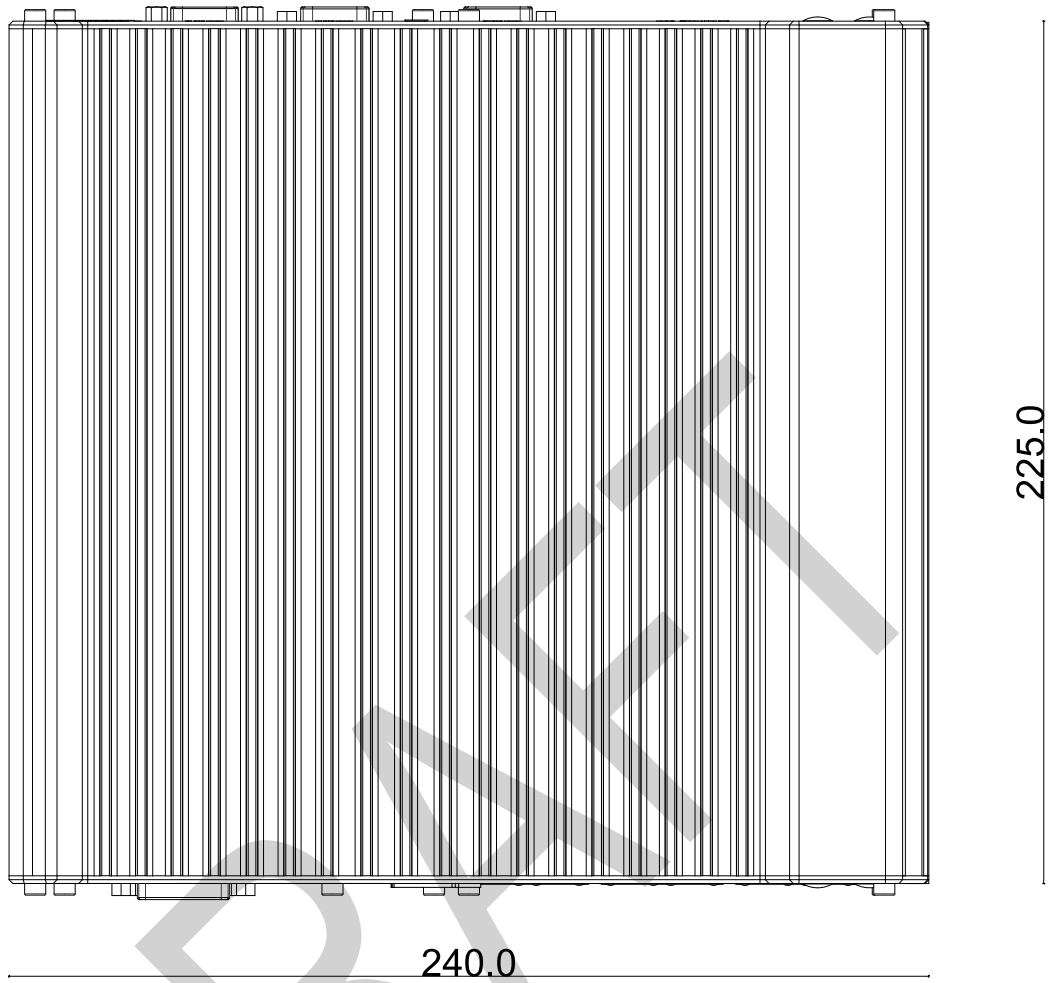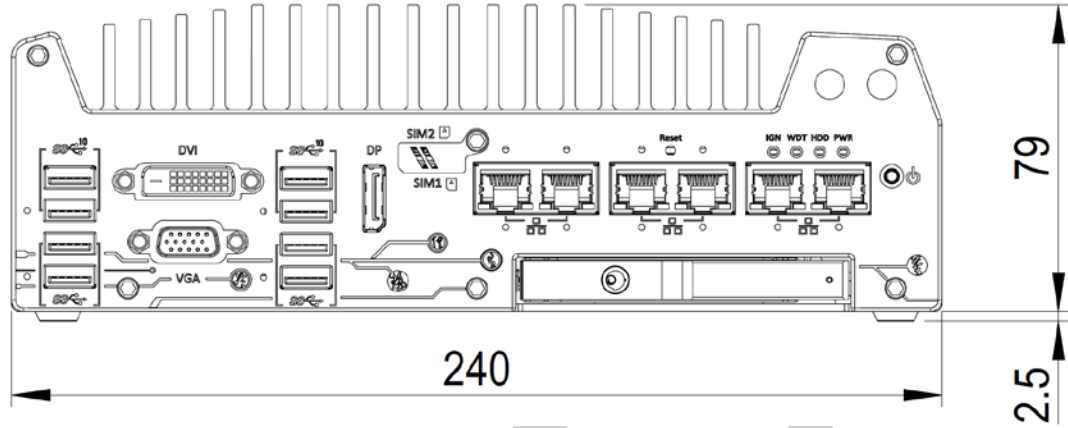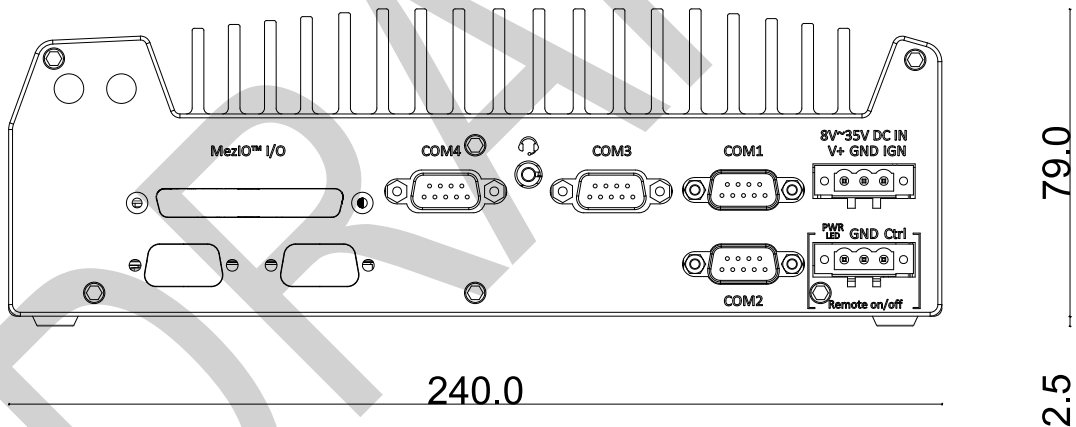### 1.4.2 Nuvo-7000LP Rear Panel View

The numbers "2.5" represents the height of the rubber stands at 2.5mm.

1.4.3 Nuvo-7000LP Top View

225.0

240.0
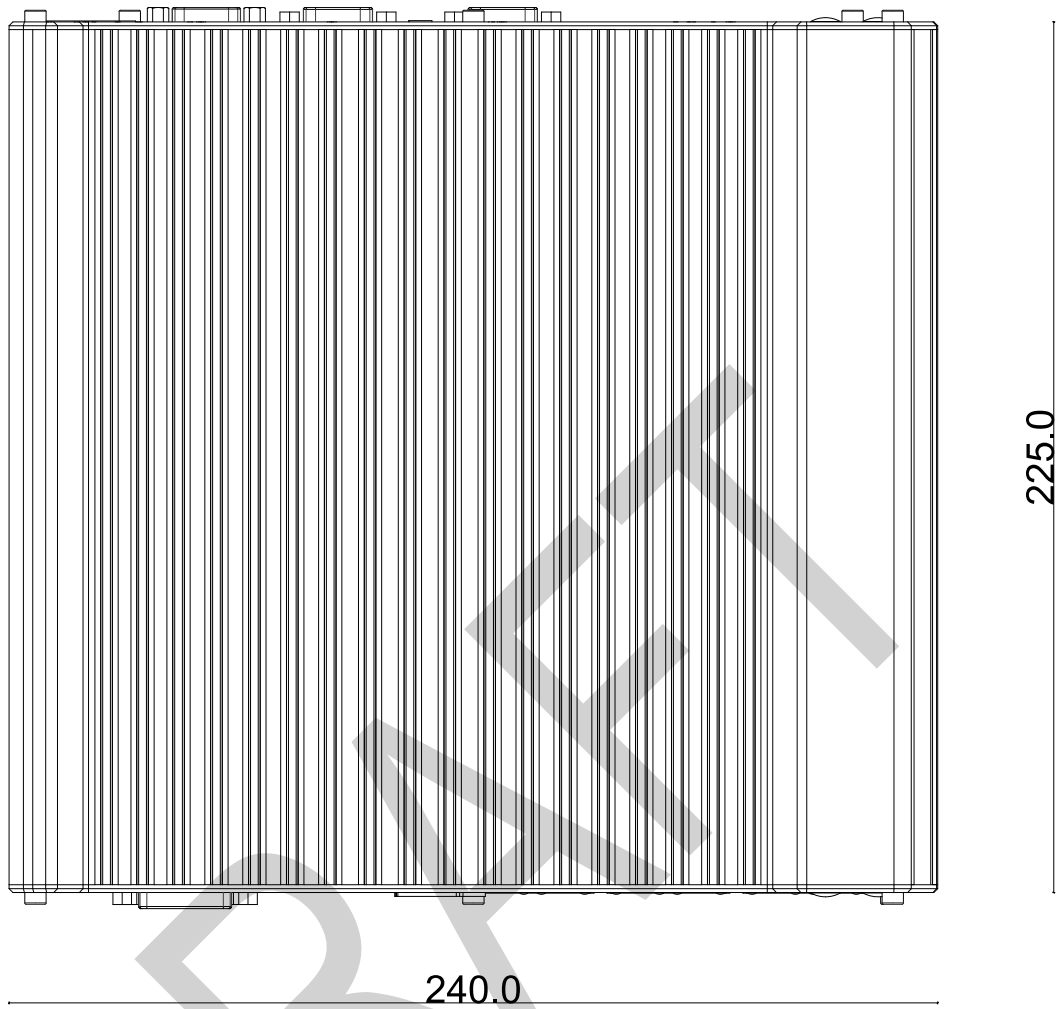
1.4.4   Nuvo-7000LP Bottom View
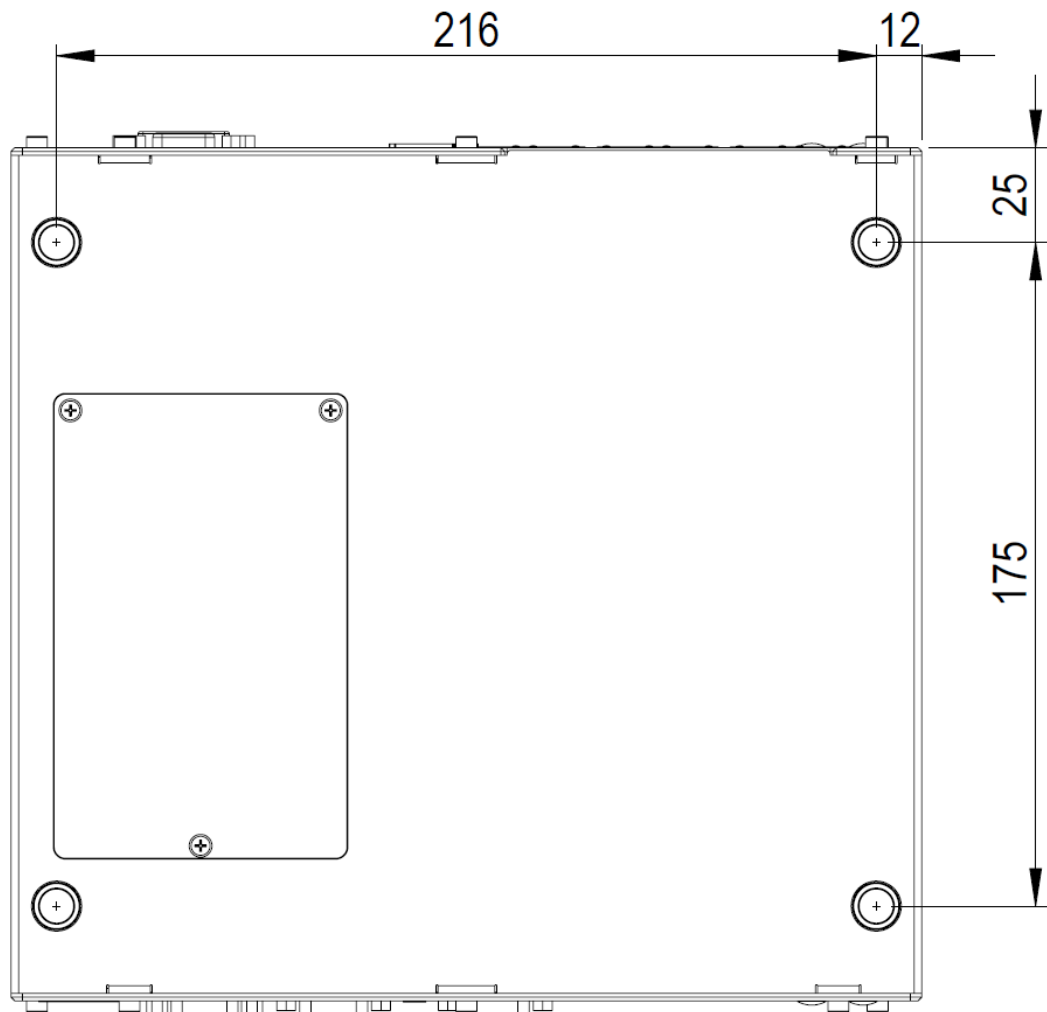
2   System Overview

Upon receiving and unpacking your Nuvo-7000 series system, please check immediately if the package contains all the items listed in the following table. If any item(s) are missing or damaged, please contact your local dealer or Neousys Technology.

2.1   Nuvo-7000 Series Packing List

System Pack	Nuvo-7000	Qty
1	Nuvo-7000 (If you ordered CPU/ RAM/ HDD, please verify these items)	1
2	Accessory box, which contains ● Neousys drivers & utilities DVD ● Wall-mount bracket ● 3-pin power terminal block ● Screw pack ● Key to 2.5" external HDD/ SSD slot (Nuvo-7000LP systems only)	1 2 2 8 1 1

2.2 Front Panel I/O

The Nuvo-7000 systems' front panel features the following external I/O connections.

> ✎ **NOTE**
>
> *For demonstration purposes, Nuvo-7000E/ P will be used in most illustrations. A dedicated illustration will be shown if the component is significantly different.*

Nuvo-7000E/ P / DE

Nuvo-7000LP
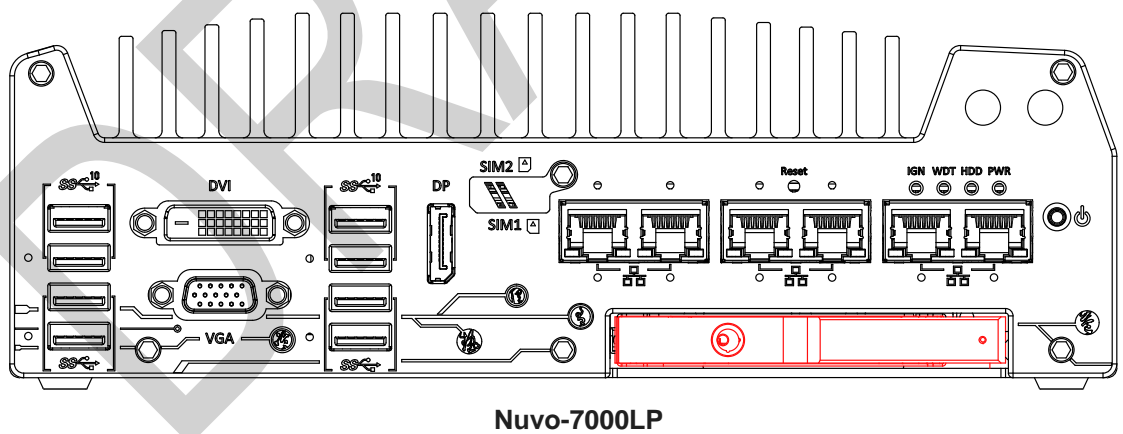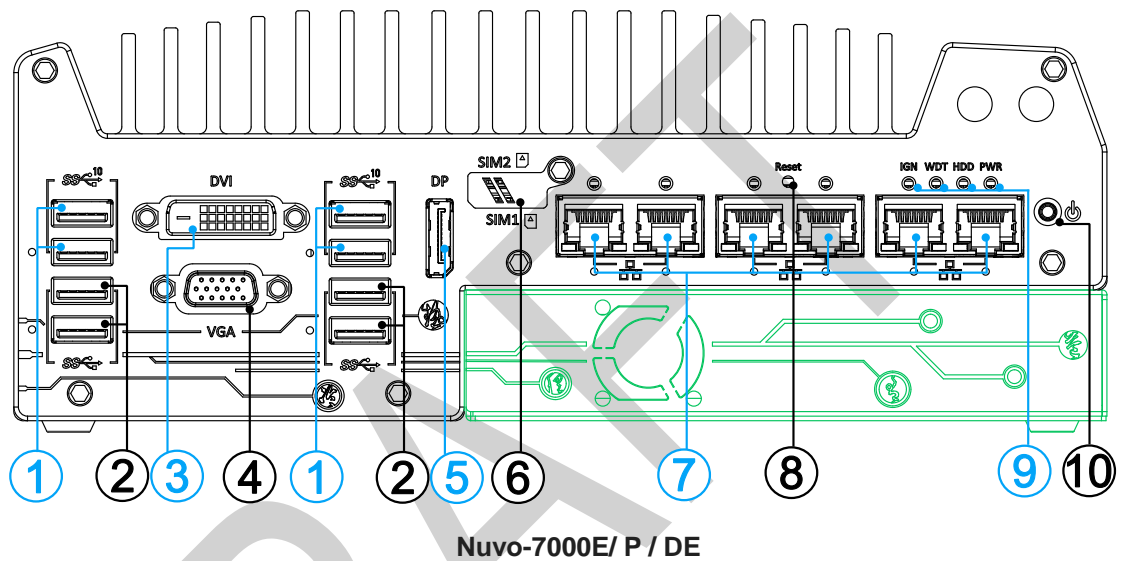
No.	Item	Description
1	USB3.1 Gen 2 port	USB3.1 Gen 2 port (Superspeed+) offers up to 10Gbps, twice the bandwidth over existing SuperSpeed USB3.1 Gen. 1 connection. It is also backwards compatible with USB3.0 and USB2.0
2	USB3.1 Gen 1 port	USB3.1 Gen 1 offers up to 5Gbps of data-throughput performance
3	DVI port	DVI-D output supports resolution up to 1920x1200@60Hz and is compatible with other digital connections via an adapter.

4	VGA port	VGA output supports resolution up to 1920x1200@60Hz
5	DisplayPort	Support display resolutions up to 4096 x 2304. Compatible with HDMI/ DVI via respective adapter/ cable (resolution may vary).
6	SIM 1 & 2	Install a 3G/ 4G module and insert a SIM card to access the operator's network.
7	PoE+ GbE port	2x Gigabit Ethernet ports by I219 and I210 (Nuvo-7002E/ P/ DE) 6x Gigabit Ethernet ports by I219 and 5x I210 (Nuvo-7006E/ P/ DE)
8	Reset button	Use this button to manual restart the system.
9	LED indicators	From left to right, the LEDs are IGN (ignition control), WDT (watchdog timer), HDD (hard disk drive) and PWR (system power).
10	Power button	Power over Ethernet (PoE) port can provide both data connection and electric power to devices, such as IP cameras (applicable to Nuvo-7006E/ P/ DE).
Area in Green	Cassette Enclosure	The cassette enclosure offers a separate compartment to manage thermal conditions and reduce installation complications of an add-on card.
Area in red	2.5" HDD/ SSD slot	The HDD expansion tray offer hot-swap ability.

2.2.1 USB3.1 Gen 2 Port
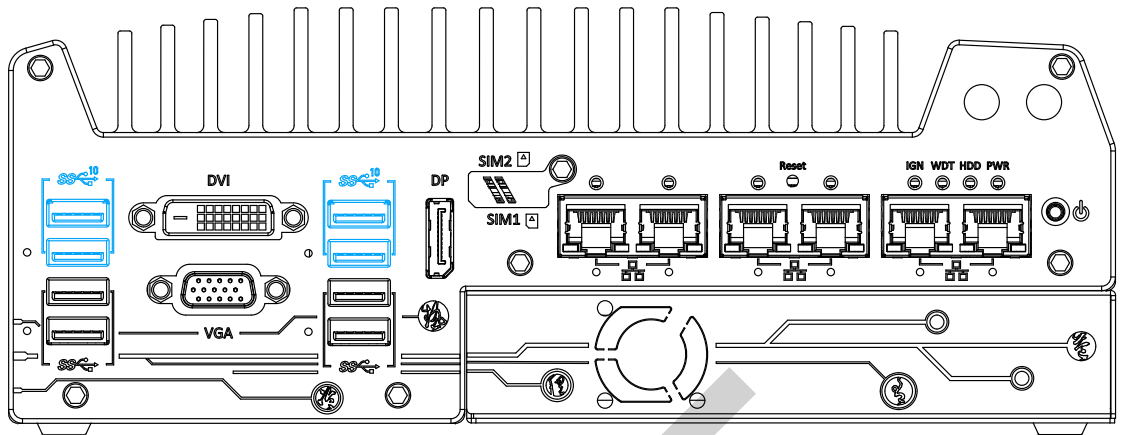
The system's USB 3.1 Gen 2 ports (10Gbps) are implemented via native xHCI (eXtensible Host Controller Interface) controller and are backward compatible with USB3.1 Gen.1 USB 2.0, USB 1.1 and USB 1.0 devices. Legacy USB is also supported so you can use USB keyboard/mouse in DOS environment

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

2.2.2 USB3.1 Gen 1 Port
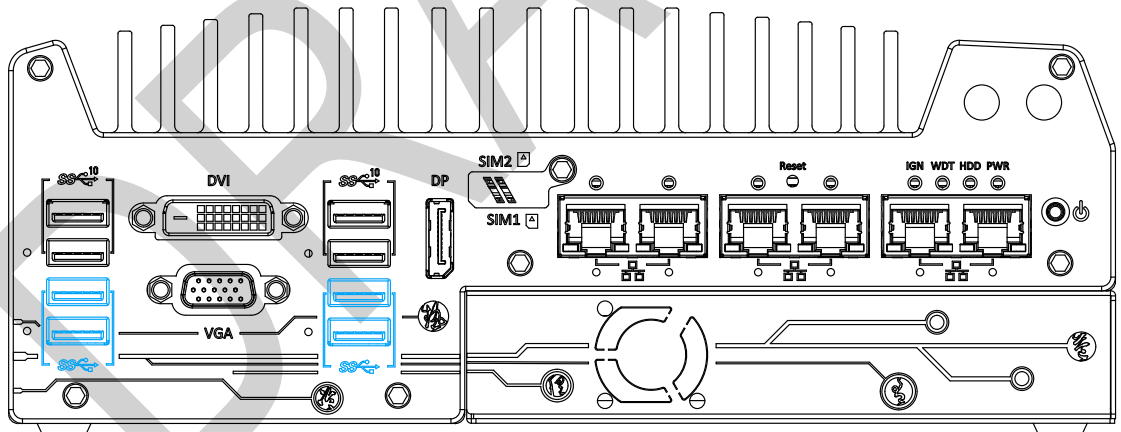
The system's USB 3.0 Gen 1 ports (5Gbps) are implemented via native xHCI (eXtensible Host Controller Interface) controller and are backward compatible with USB 2.0, USB 1.1 and USB 1.0 devices. Legacy USB is also supported so you can use USB keyboard/mouse in DOS environment

xHCI driver is supported natively in Windows 10, therefore you do not need to install xHCI driver in prior to utilize USB functions.
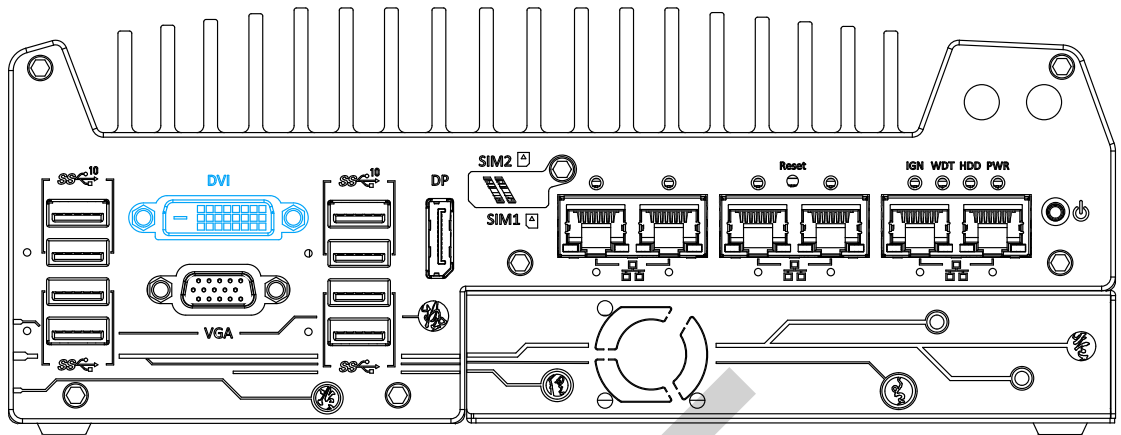
2.2.3 DVI Port

The system has a DVI connector on its I/O panel to support that supports independent display output. DVI transmits graphics data in digital format and therefore can deliver better image quality at high resolutions. For VGA monitor, Neousys offers a specialized DVI-to-VGA adapter as an accessory shipped with the system. This adapter supports VGA DDC signals and thus eliminates compatibility issues with VGA monitors. The DVI connector can output DVI or other digital signals via an adaptor or dedicated cable up to 1920 x 1200 resolution.

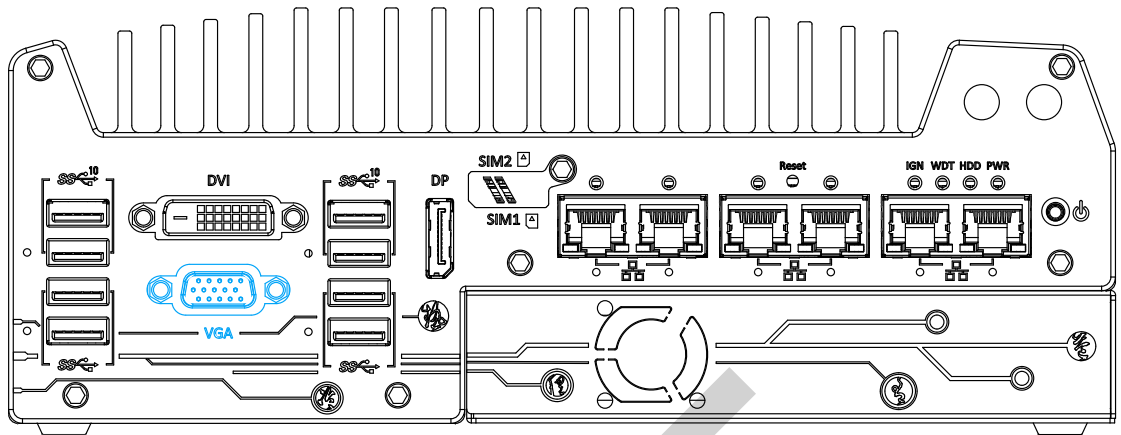**DVI to HDMI cable**   **DVI-VGA adaptor**

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

2.2.4 VGA Port

VGA connector is the most common video display connection. The VGA output supports up to 1920x1200@60Hz resolution. By default, the VGA output is set to "always-on". For users who want to use only digital display interface (eg. DVI or DP), the VGA Output setting can be disabled. To disable, press F2 upon system startup, go to "**Advanced** > **System Agent (SA) Configuration** > **Graphics Configuration** > **VGA Output** > [**Disable**].

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

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

2.2.5 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 2880 x 1800 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.

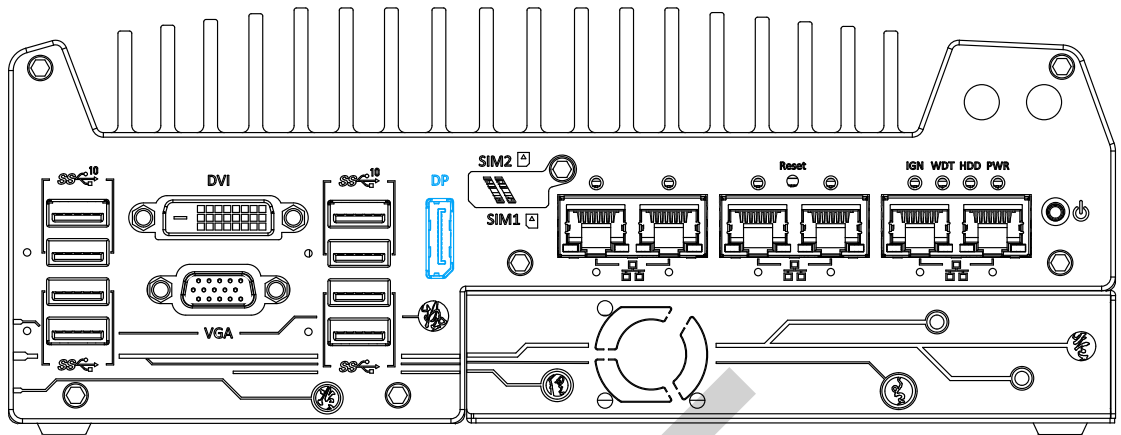**DP-to-HDMI**   **DP-to-DVI**

The system supports triple independent display outputs by connecting display devices to VGA, DVI and DisplayPort connection. To support multiple display outputs and achieve best DVI 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 Micro-SIM (3FF) 1 & 2 Slots
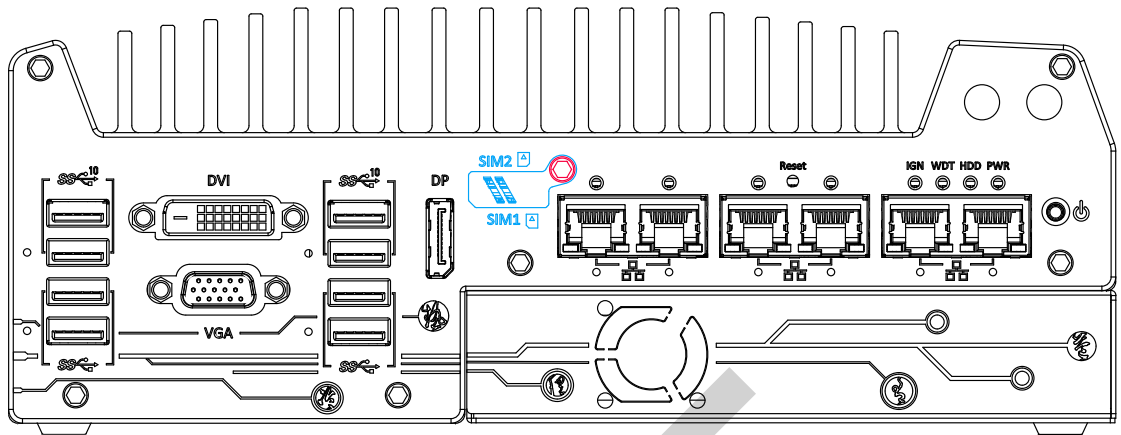
On the front panel, there are two panel-accessible Micro-SIM sockets. By installing 3G/4G modules onto the internal M.2 slot, you can access the internet via telecom operator's network. The Micro-SIM slots can be accessed by loosening the screw (indicated in **red**) that holds the Micro-SIM slot cover and Micro-SIM cards are secured into the sockets via push-push type mechanisms. The push-push mechanism means the SIM card is push-to-install and push-to-retrieve. Please note that the micro-SIM card must be inserted upside down (gold fingers facing upward).

2.2.7 Ethernet Port/ PoE+
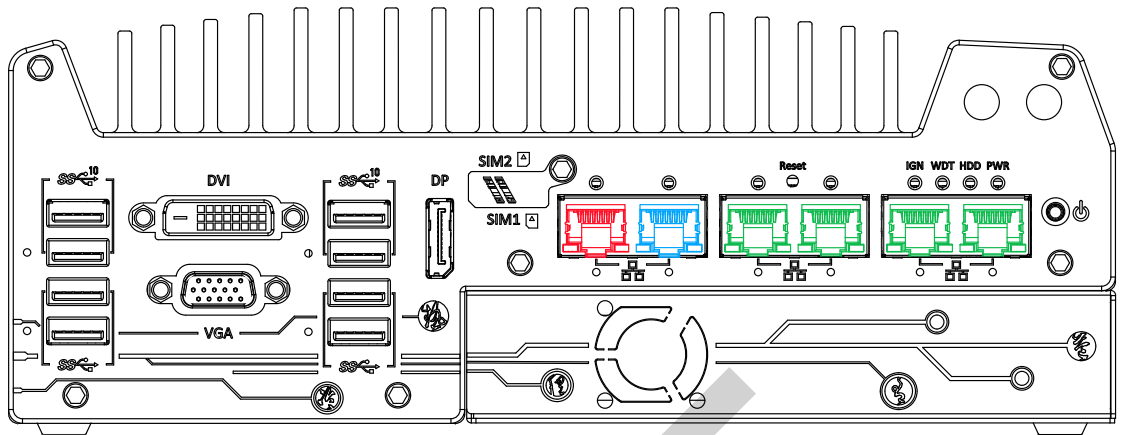
All Nuvo-7000 series systems offer two GbE ports (in **red** and **blue**) while Nuvo-7006E/ P/ DE systems have four additional PoE (Power over Ethernet) ports marked in **green** on the front panel. The port marked in **blue** is implemented using Intel® I219-LM controller that supports Wake-on-LAN and is also compatible with Intel® AMT (Active Management Technology) to support advanced features such as remote SOL desktop and remote on/ off control.

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

Each port has one dedicated PCI Express link for maximum network performance. Please refer to the table below for LED connection statuses.

Active/Link LED (Right)

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

Speed LED (Left)

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

To utilize the GbE port in Windows, you need to install corresponding driver for Intel® I210-IT/ I219-LM GbE controller.

Reset

2.2.10 Power Button

The power button is a non-latched switch for ATX mode on/ off operation. To turn on the system, press the power button and the PWR LED should light-up green. To turn off the system, issuing a shutdown command in OS is preferred, or you can simply press the power button. To force shutdown when the system freezes, press and hold the power button for 5 seconds. Please note that there is a 5-second interval between on/off operations (i.e. once the system is turned off, there is a 5-second wait before you can power-on the system).
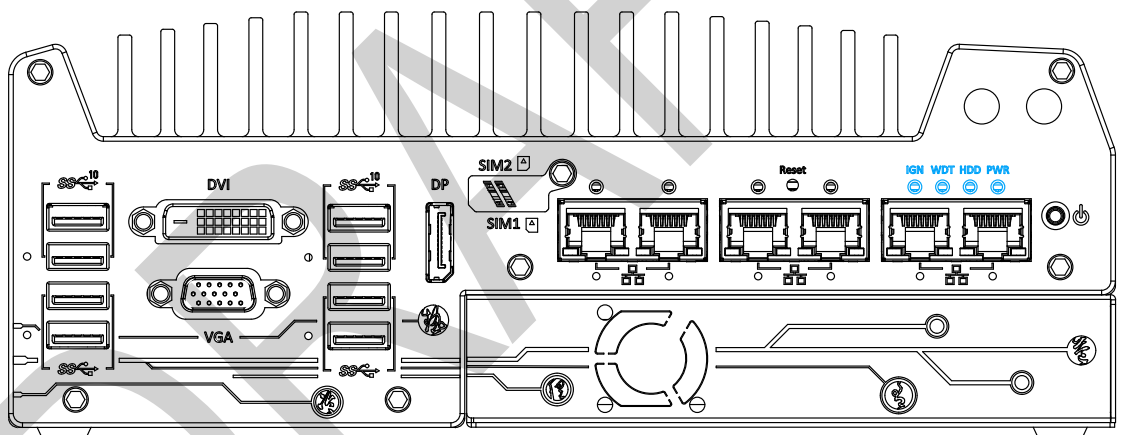
2.2.11 Hot-swappable 2.5" HDD/ SSD Slot (Nuvo-7000LP Series Only)
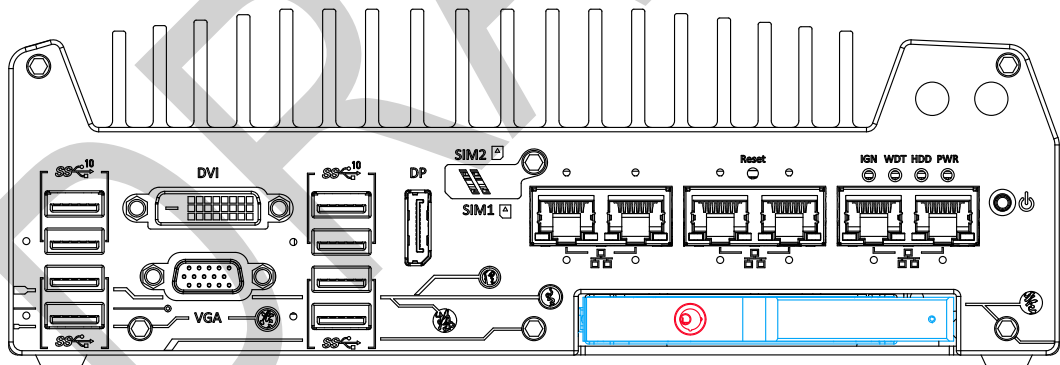
The Nuvo-7000LP series supports an external 2.5" HDD/ SSD via a hot-swappable slot. Designed for easy access, the HDD/ SSD slot is secured by a lock (indicated in **red**)and it supports RAID modes 0/ 1 configuration by combining with the internal HDD/ SSD drive for OS installation (coupled with the internal HDD). To set up RAID, please refer to RAID Volume Configuration section for details.

2.2.12 Cassette Module
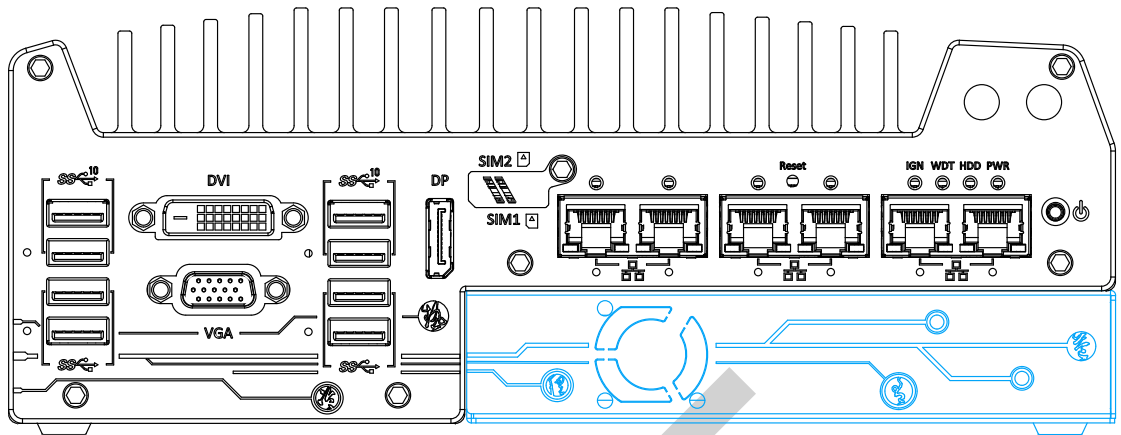
Neousys' patented expansion Cassette (R.O.C. Patent No. M456527) provides a separated compartment to accommodate an add-on card. It effectively manages thermal conditions of both the system and the add-on card. The modular concept brought by Cassette module also reduces the complexity of installing and replacing an add-on card in the fanless controller.

The Cassette module incorporates an innovative mechanical design to effectively deal with the heat generated by GPU. This patented architecture (R.O.C. Patent No. M534371) creates a sealed wind tunnel to bring in cold air to the GPU and expels hot air via a system fan. The design offers the system extreme stability and reliability.

Expansion configuration / System	Expansion slot(s)
Nuvo-7000E series	Single PCI Express slot
Nuvo-7000P series	Single PCI slot
Nuvo-7000DE series	Dual PCI Express slots

2.3 Rear Panel I/O
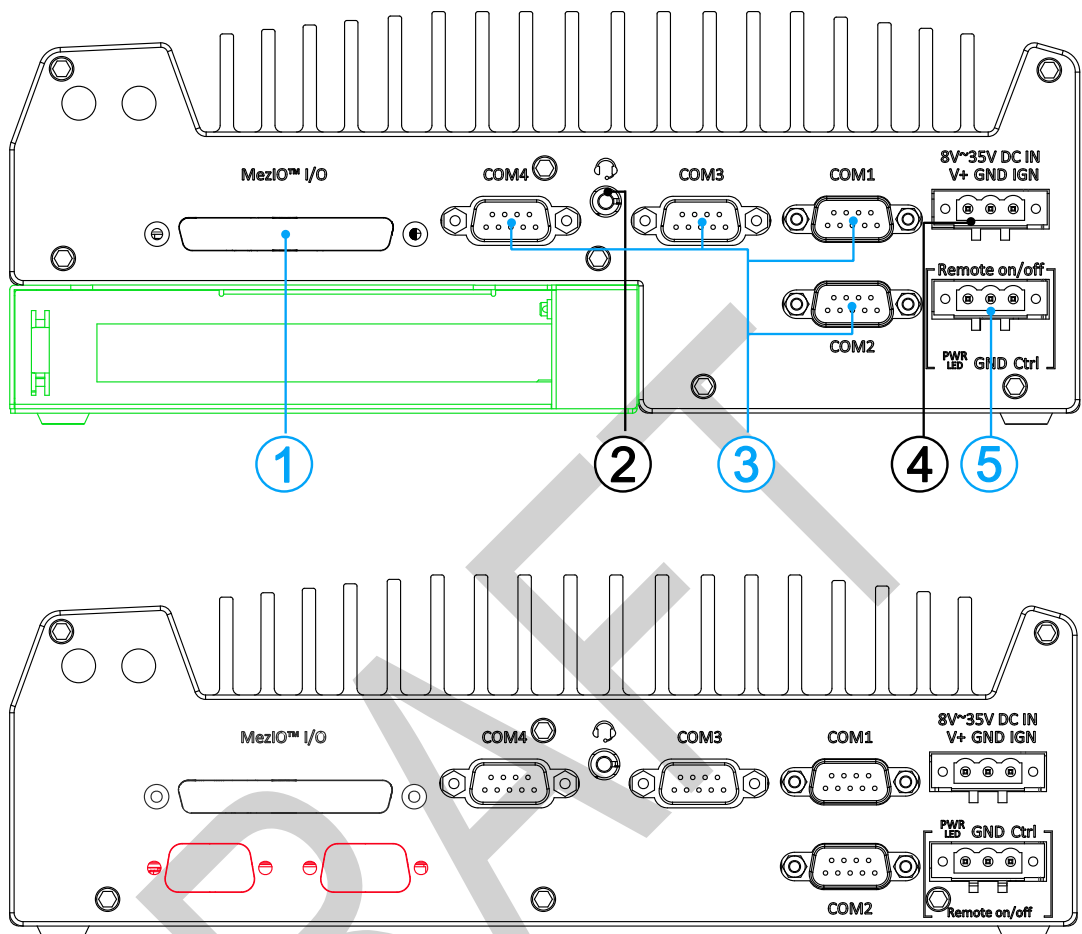
Nuvo-7000LP

The Nuvo-7000 rear panel features MezIO^{TM} port, four (4) COM ports, 3-pin terminal and 3-pin on/ off control. The Cassette module can be located at the bottom of the enclosure. The connectors of the installed PCI or PCIe card within the Cassette module can be accessed from this side of the panel.

No.	Item	Description
1	MezIO^{TM} I/O	Reserved for MezIO^{TM} I/O connector. Connector may vary depending on your choice of MezIO^{TM}.
2	4-Pole 3.5mm headphone/ microphone jack	The 4-pole 3.5mm jack accepts microphone voice input and headphone speaker sound output.
3	COM ports 1-4	The four COM ports offer communication with external devices.
4	3-pin terminal	Compatible with DC power input from 8~35V, the terminal

	block (DC/ ignition input)	block is also used for ignition signal input.
5	3-pin Remote on/ off control	Allows for external switch extension when the system is placed inside a cabinet.
Area in green	Cassette Enclosure	The cassette enclosure offers a separate compartment to manage thermal conditions and reduce installation complications of an add-on card.
Area in red	Reserved port opening/ cover	The area indicated in red on the rear panel of Nuvo-7000LP series feature reserved port opening/ cover for additional COM ports.

2.3.1　4-Pole 3.5mm Headphone/ Microphone Jack
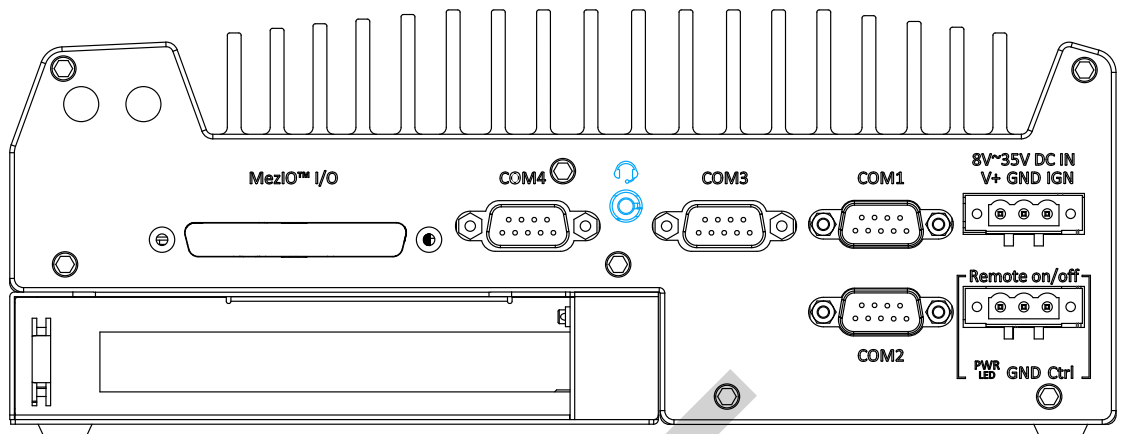
The system audio function uses high definition audio Realtek ALC262 codec on Intel®

Q370 chipset. 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 for both Intel® Q370 chipset and Realtek ALC262 codec.

2.3.2 COM Ports
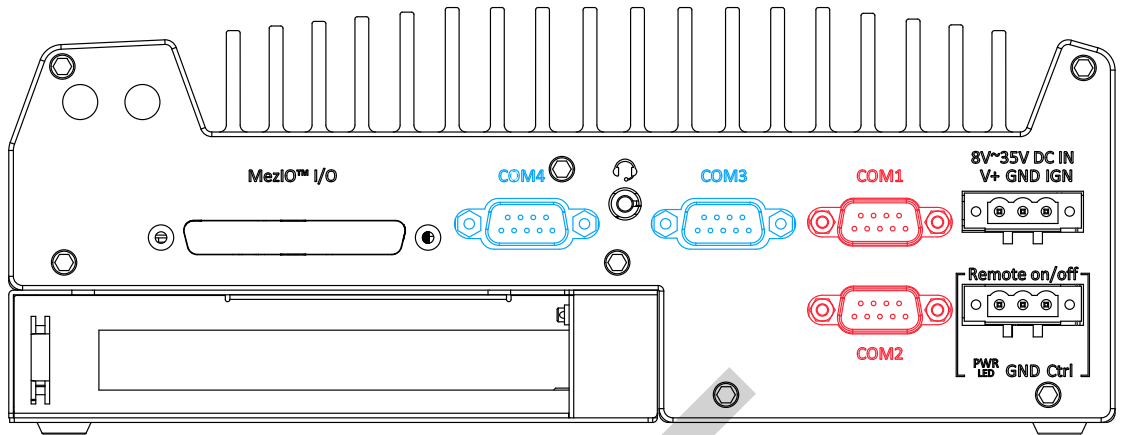
The system provides four COM ports for communicating with external devices. These COM ports are implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate.

COM1 and COM2 (in **red**) are software-configurable RS-232/422/485 ports. COM3 and COM4 (in **blue**) are standard 9-wire RS-232 ports. The operation mode of COM1 and COM2 can be set in BIOS setup utility. The following table describes the pin definition of COM ports.

COM Port Pin Definition
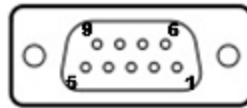
Pin#	COM1 & COM2			COM3 & COM4
	RS-232 Mode	RS-422 Mode	RS-485 Mode (Two-wire 485)	RS-232 Mode
1	DCD			DCD
2	RX	422 TXD+	485 TXD+/RXD+	RX
3	TX	422 RXD+		TX
4	DTR	422 RXD-		DTR
5	GND	GND	GND	GND
6	DSR			DSR
7	RTS			RTS
8	CTS	422 TXD-	485 TXD-/RXD-	CTS
9	RI			RI

2.3.3 3-Pin Terminal Block for DC and Ignition Input
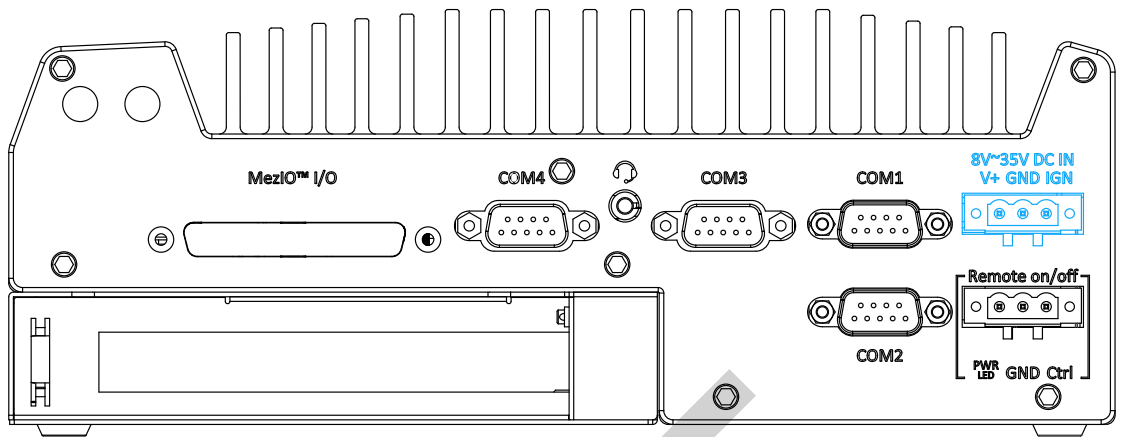
The system accepts a wide range of DC power input from 8 to 35V via a 3-pin pluggable terminal block, which is fit for field usage where DC power is usually provided. The screw clamping mechanism on the terminal block offers connection reliability when wiring DC power.

In addition to DC power input, this terminal block can also accept ignition signal input (IGN) when ignition control module (eg. MezIO-V20) is installed for in-vehicle applications.

> ⚠ **WARNING**
>
> *Please make sure the voltage of DC power is correct before you connect it to the system. Supplying a voltage over 35V will damage the system.*

2.3.4 3-Pin Remote On/ Off
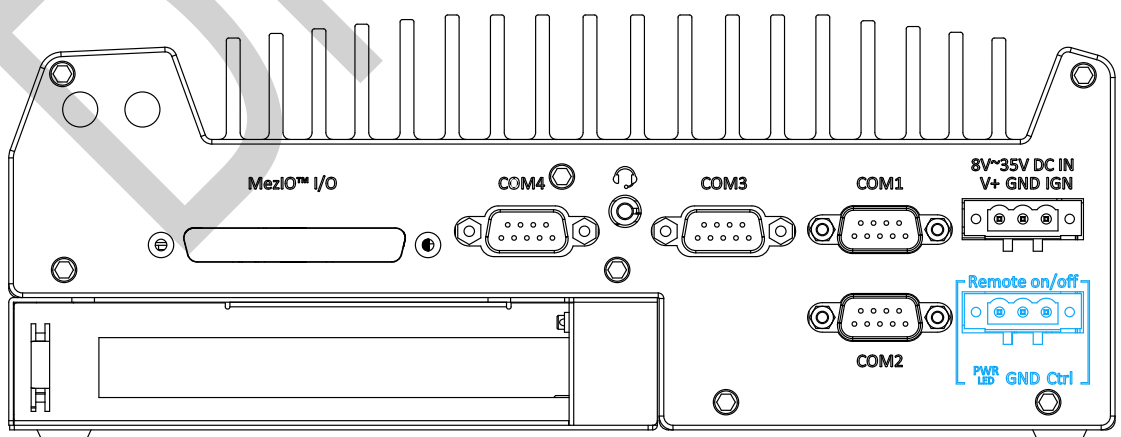
The "Remote On/ Off" 3-pin connection allows for external switch extension. It is useful when the system is placed in a cabinet or a not easily accessed location.

2.4 Internal I/O Functions

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

2.4.1 Dual DRAM SODIMM Slot
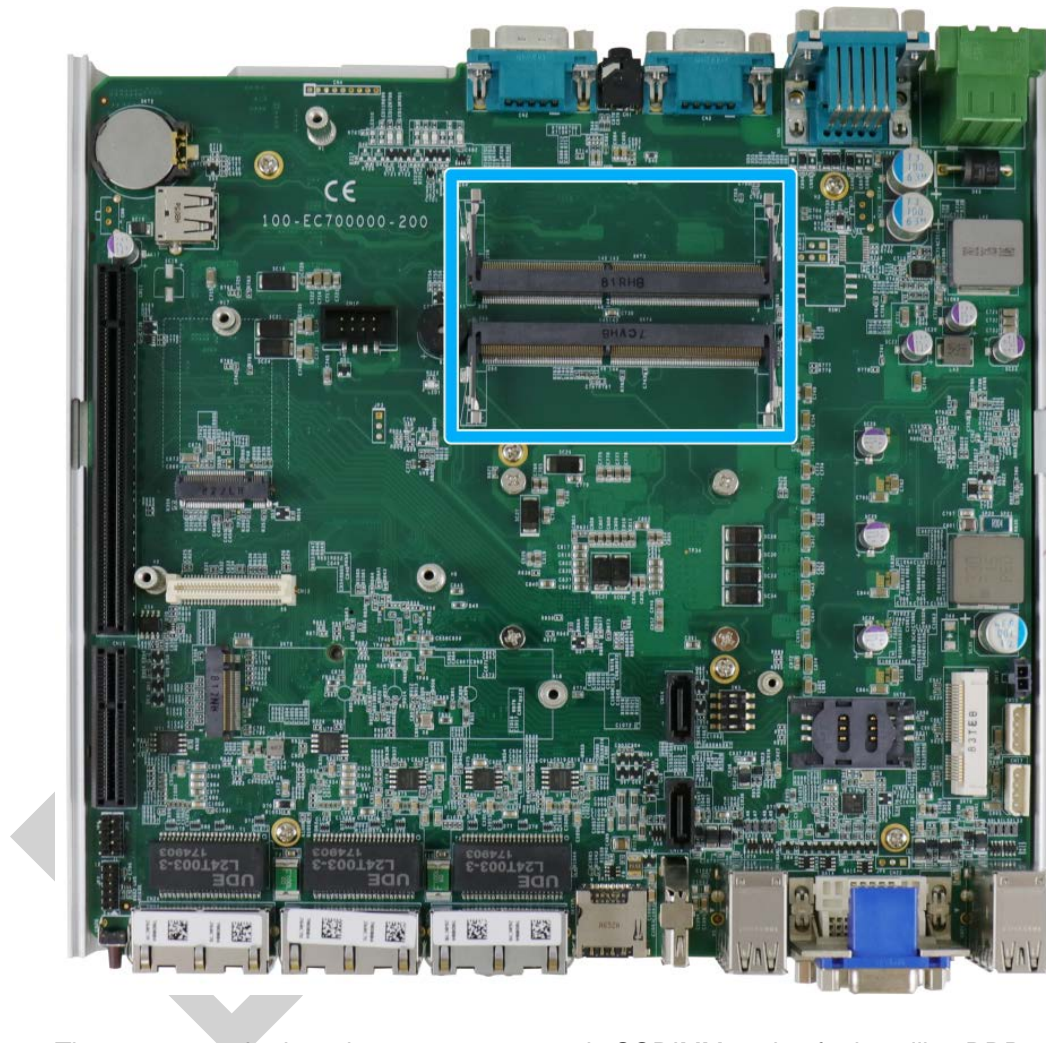
The system motherboard supports two 260-pin SODIMM socket for installing DDR4 memory module up to 32GB. Each slot supports single module DDR4 2666MHz SODIMM up to 16GB capacity.

> ✎ **NOTE**
>
> *When changes are made to DRAM module(s), such as additionally install or remove and reinstall (into the same/ different slot, it will result in an approximately 20-second delay when booting up for the first time after such change(s).*

2.4.2 Dual Mode mSATA/ mini-PCIe Socket & Pin Definition
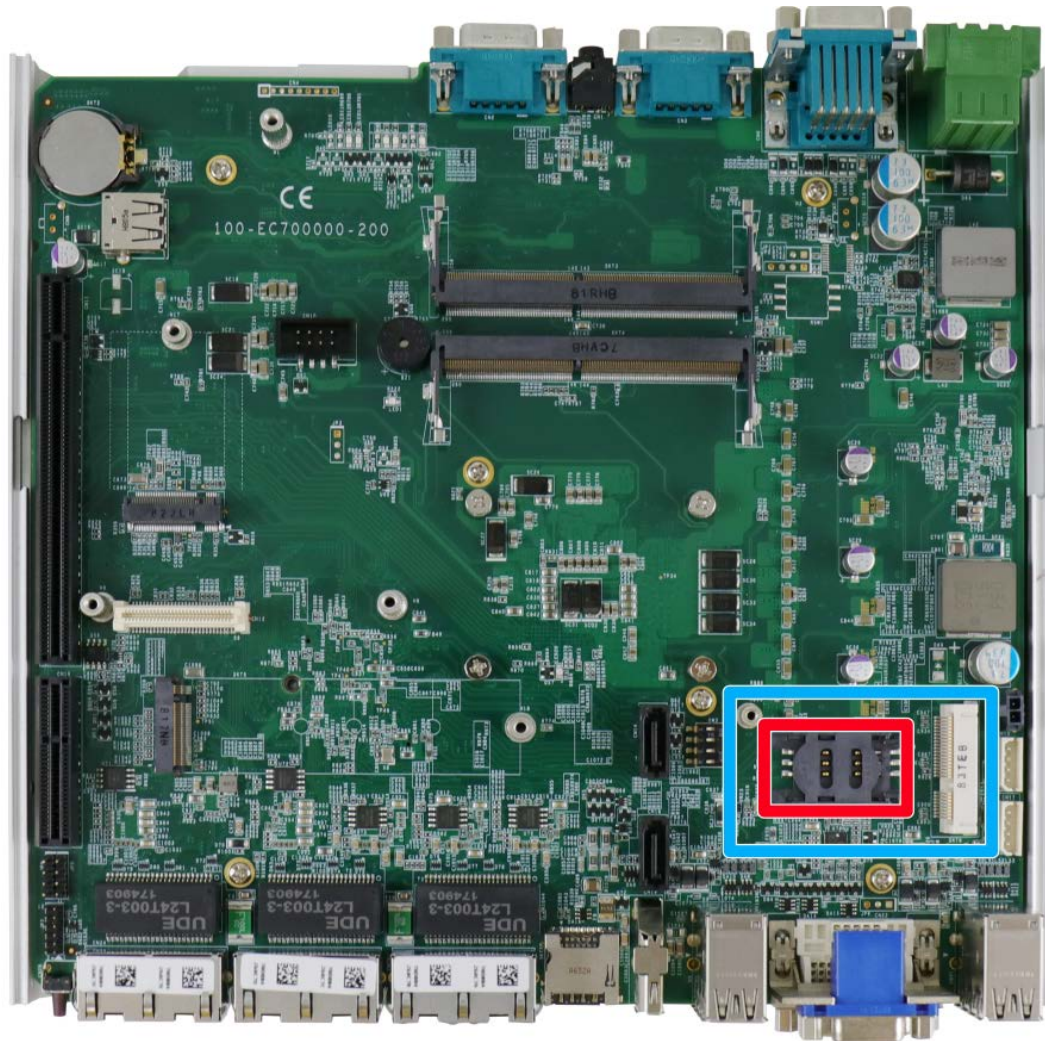
The system provides a dual mode mSATA/ mini-PCIe socket (indicated in **blue**) that is in compliance with mini-PCIe specification rev. 1.2. You can install either an mSATA SSD or mini-PCIe module into this socket and the system will automatically detect and configure it to run PCIe or SATA signals. 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 3G/ 4G network.

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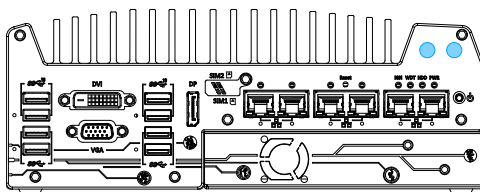
Front panel antennae opening
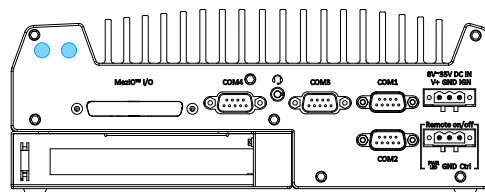
Rear panel antennae opening

Dual mode mSATA/ mini-PCIe socket definition
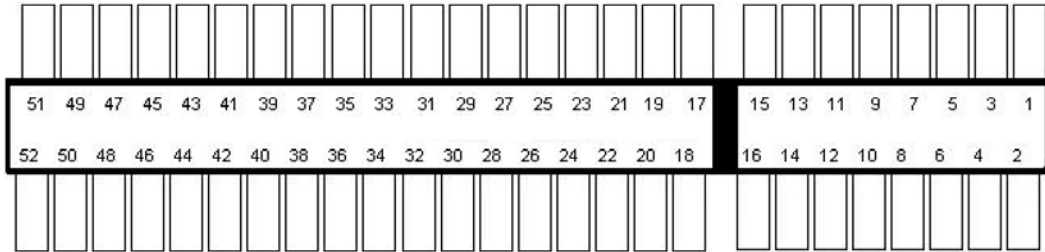
Pin	Signal (mPCIe)	Signal (mSATA)	Pin #	Signal (mPCIe)	Signal (mSATA)
1	WAKE#	-	2	+3.3Vaux	+3.3Vaux
3	COEX1	-	4	GND	GND
5	COEX2	-	6	+1.5V	+1.5V
7	CLKREQ#	-	8	UIM_PWR	-
9	GND	GND	10	UIM_DATA	-
11	REFCLK-	-	12	UIM_CLK	-
13	REFCLK+	-	14	UIM_RESET	-
15	GND	GND	16	UIM_VPP	-
Mechanical Key					
17	Reserved*	-	18	GND	GND
19	Reserved*	-	20	W_DISABLE#	-
21	GND	GND	22	PERST#	-
23	PERn0	SATA_Rxp	24	+3.3Vaux	+3.3Vaux
25	PERp0	SATA_Rxn	26	GND	GND
27	GND	GND	28	+1.5V	+1.5V
29	GND	GND	30	SMB_CLK	SMB_CLK
31	PETn0	SATA_Txn	32	SMB_DATA	SMB_DATA
33	PETp0	SATA_Txp	34	GND	GND
35	GND	GND	36	USB_D-	-
37	GND	GND	38	USB_D+	-
39	+3.3Vaux	+3.3Vaux	40	GND	GND
41	+3.3Vaux	+3.3Vaux	42	LED_WWAN#	-
43	GND	-	44	LED_WLAN#	-
45	Reserved	-	46	LED_WPAN#	-
47	Reserved	-	48	+1.5V	+1.5V
49	Reserved	-	50	GND	GND
51	Reserved	-	52	+3.3Vaux	+3.3Vaux

⚠ WARNING

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

2.4.3 M.2 2242 (B Key), Pin Definition & Mini-SIM Card Slot
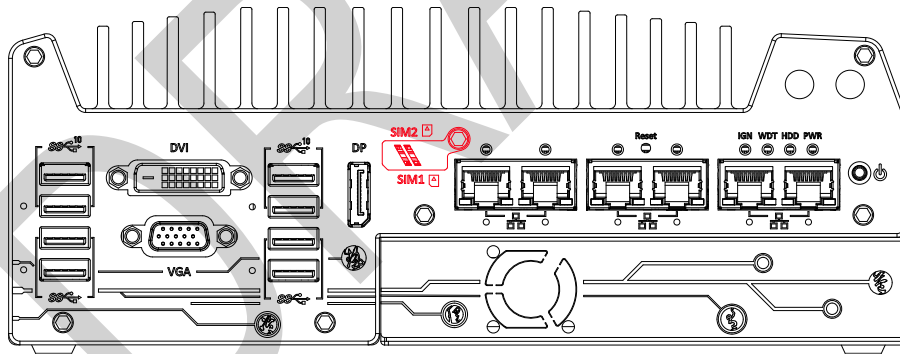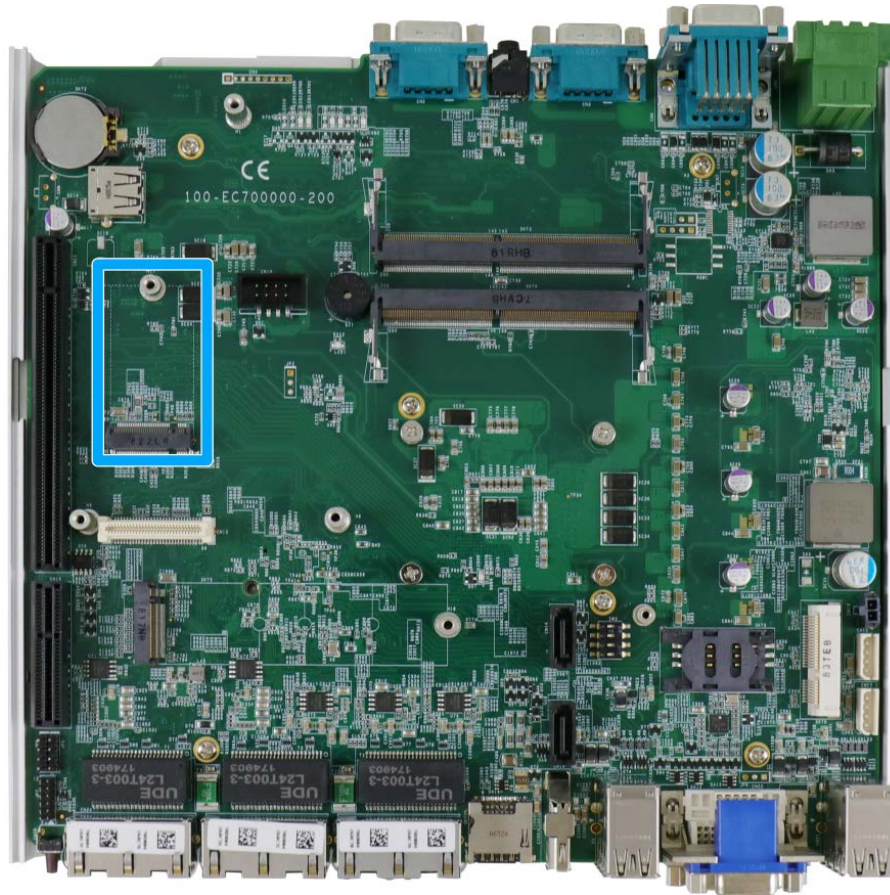
The system has an M.2 2242 slot (indicated in **blue**) that works with dual SIM slots (4G + 3G) on the front panel (indicated in **red**). By installing a 3G or 4G M.2 module and SIM card, you can access the internet via the provider's network.

For wireless 3G/ 4G, SMA antenna apertures are located on front/ rear panels.
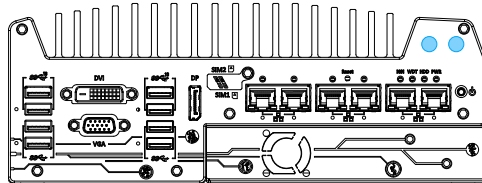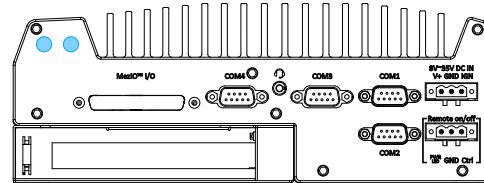
Front panel antennae opening   **Rear panel antennae opening**

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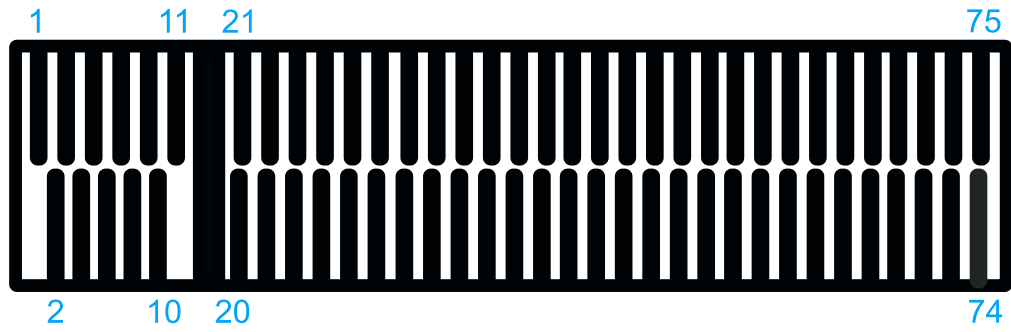
Pin #	Signal	Pin #	Signal
1	-	2	+3V3
3	GND	4	+3V3
5	GND	6	FULL_CARD_POWER_OFF_N
7	USB_D+	8	W_DISABLE_N
9	USB_D-	10	-
11	GND		
Mechanical Key			
21	-	20	-
23	-	22	-
25	-	24	-
27	GND	26	-
29	USB3.0-RX-	28	-
31	USB3.0-RX+	30	UIM1-RESET
33	GND	32	UIM1-CLK
35	USB3.0-TX-	34	UIM1-DATA
37	USB3.0-TX+	36	UIM1-PWR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

2.4.4   SATA Ports
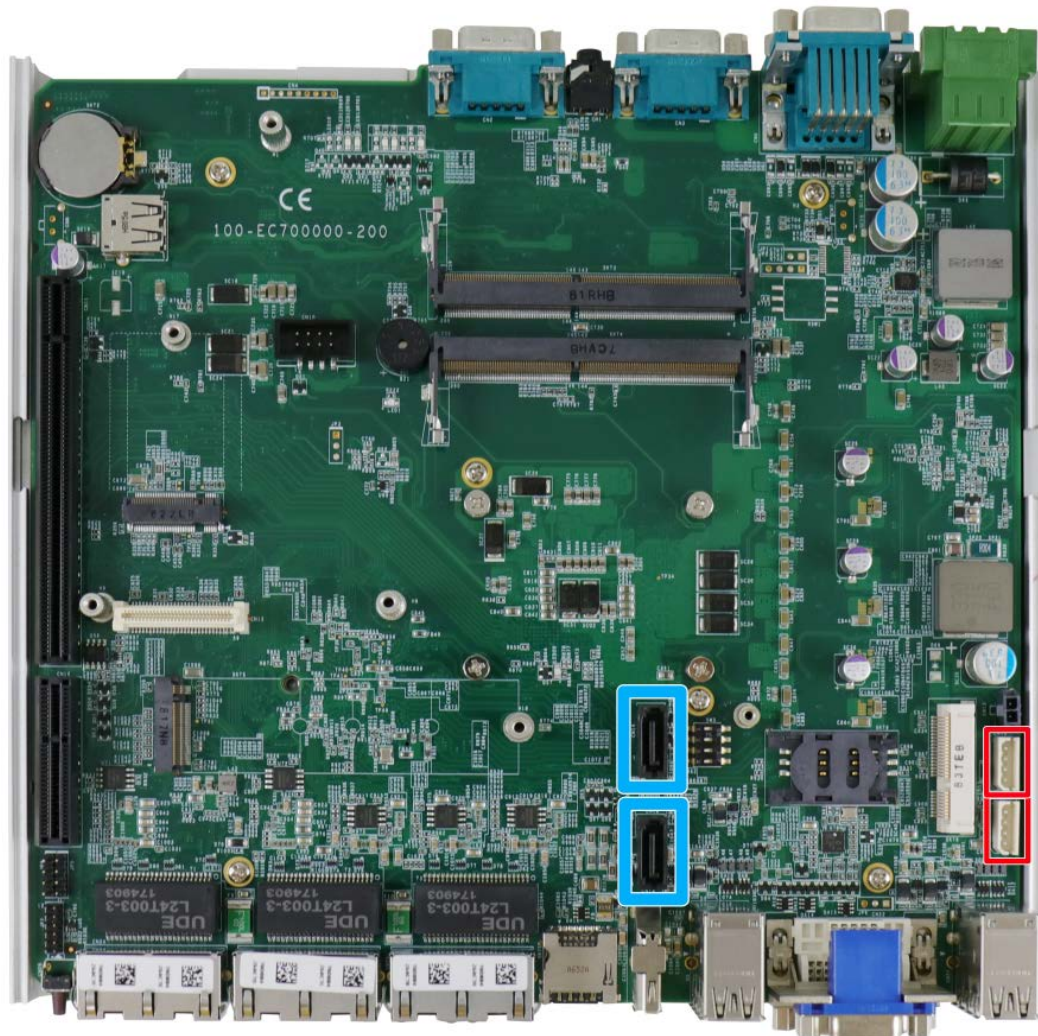
The system provides two SATA ports which support Gen3, 6 Gb/s SATA signals. Each SATA port (indicated in **blue**) features a 7-pin SATA connector and a 4-pin power connector.

The power connector (indicated in **red**) accommodates a 2.5" HDD/ SSD in internal HDD bracket. Standard 22-pin SATA connectors are provided with the system. You may refer to the SATA Configuration section for SATA settings.

2.4.5 Dip Switch
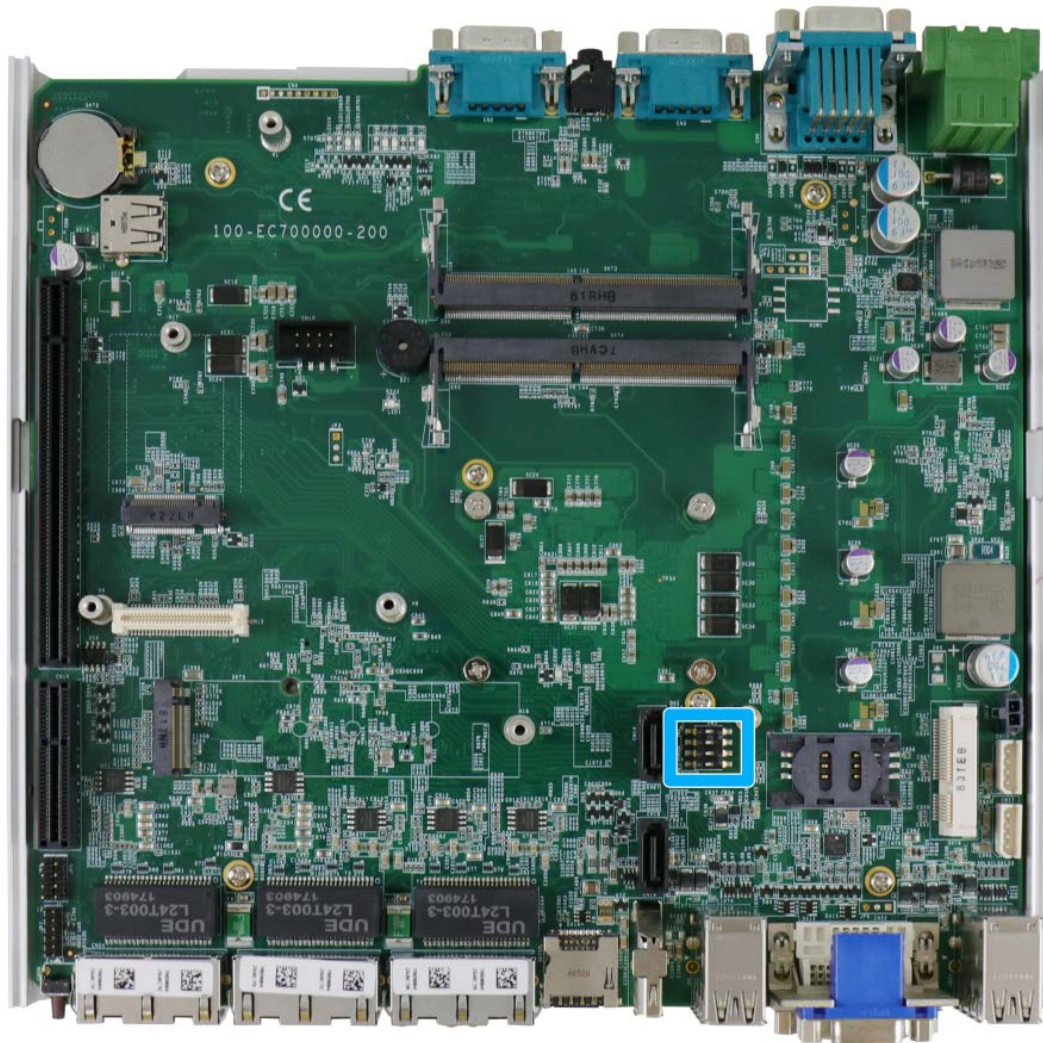
There is a dip switch (indicated in **blue**) on the motherboard and it is responsible for PCIe lane configuration. They should be set to default for you system out of the factory so you need not configure them. The table below shows the system default dip switch settings for reference purposes.

Dip switch / System	Dip switch 1	Dip switch 2	Dip switch 3	Dip switch 4
Nuvo-7000E	Off	Off	Off	Off
Nuvo-7000P	Off	Off	Off	Off
Nuvo-7000LP	Off	Off	Off	Off
Nuvo-7000DE	Off	On	Off	Off

2.4.6　Internal USB 2.0 Port
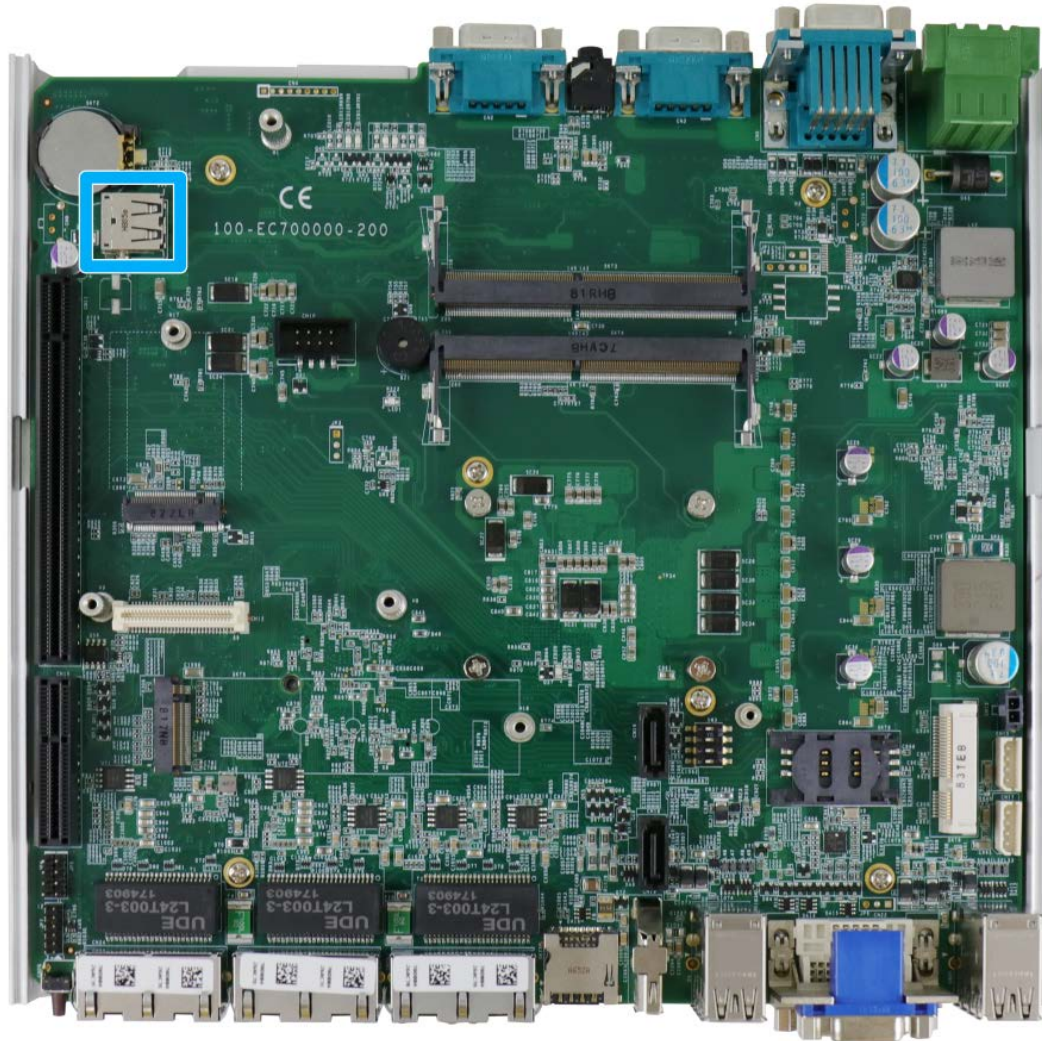
The system's motherboard has an internal USB2.0 port on the PCBA. You can utilize this USB port to connect a USB protection dongle inside the chassis of the system.

2.4.7　M.2 2280 (M Key) Slot for NVMe SSD or Optane^{TM} Memory
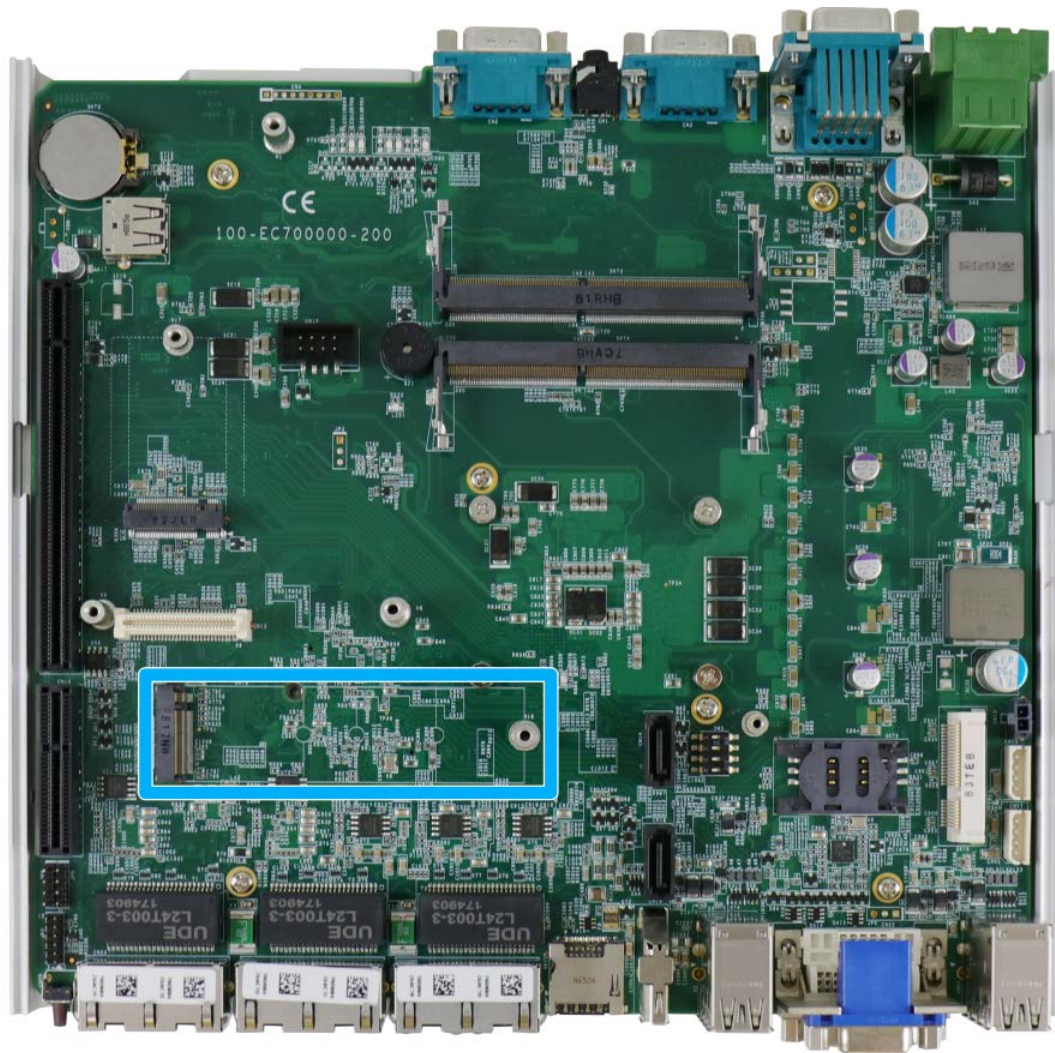
The system has an x4 PCIe M.2 2280 slot for you to install an NVMe SSD for the ultimate performance or an Intel® Optane^{TM} memory to accelerate the read/ write performances of traditional hard disk drive. An NVMe SSD offers exceptional performance over 2.5" SSDs while Intel® Optane^{TM} memory can dramatically boost your traditional hard disk drive's read/ write performances.

M.2 (M Key) Slot Pin Definition
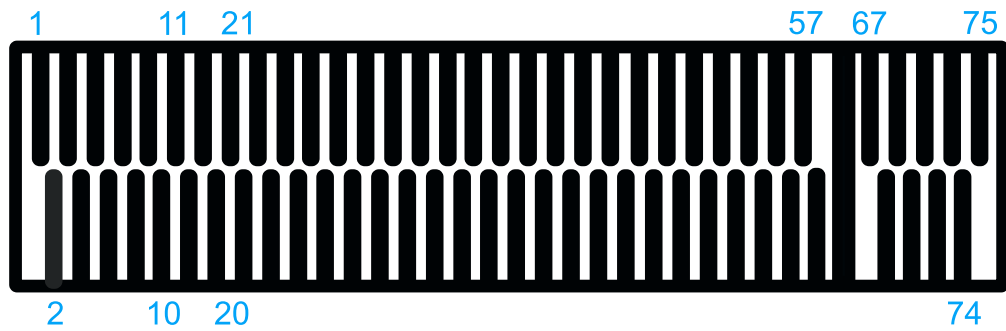
Pin #	Signal	Pin #	Signal
1	GND	2	+3V3
3	GND	4	+3V3
5	PERN3	6	-
7	PERP3	8	-
9	GND	10	DAS/DSS_N
11	PETN3	12	+3V3
13	PETP3	14	+3V3
15	GND	16	+3V3
17	PERN2	18	+3V3
19	PERP2	20	-
21	GND	22	-
23	PETN2	24	-
25	PETP2	26	-
27	GND	28	-
29	PERN1	30	-
31	PERP1	32	-
33	GND	34	-
35	PETN1	36	-
37	PETP1	38	-
39	GND	40	-
41	PERN0	42	-
43	PERP0	44	-
45	GND	46	-
47	PETN0	48	-
49	PETP0	50	PERST_N
51	GND	52	-
53	REFCLKN	54	-
55	REFCLKP	56	-
57	GND	58	-
Mechanical Key			
67	-	68	SUSCLK
69	PEDET	70	+3V3
71	GND	72	+3V3
73	GND	74	+3V3
75	GND		

2.4.8   MezIO^{TM} Interface & Pin Definition

MezIO^{TM} is an innovative interface designed for integrating application-oriented I/O functions into an embedded system. It offers computer signals, power rails and control signals via a high-speed connector. MezIO^{TM} is also mechanically reliable benefited from its 3-point mounted mezzanine structure. A MezIO^{TM} module can leverage these signals to implement comprehensive I/O functions.

The system incorporates MezIO^{TM} interface and universal mechanical design to accommodate Neousys' standard MezIO^{TM} modules. For customers who want to develop their own MezIO^{TM} module, Neousys provides MezIO^{TM} design documents on a NDA basis. Please contact Neousys for further information.

MezIO^{TM} Interface Pin Definition

MezIO^{TM} interface leverages FCI BERGSTAK® board-to-board connector to provide interconnectivity of high-speed signals. The receptacle part on the PCBA is FCI 61082-063402LF while the plug part on the MezIO^{TM} module is FCI 61083-064402LF. Please refer to the following table for signal definition of its 60-pos connector.
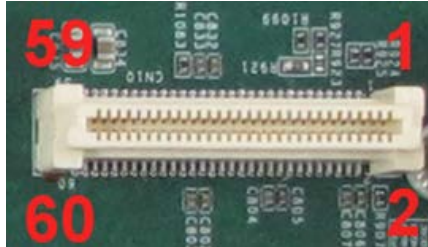
Function Description	Signal	Pin#	Pin#	Signal	Function Description
Reserved	Reserved	1	2	PCIE_TXP_0	PCIe data pair
Reserved	Reserved	3	4	PCIE_TXN_0	PCIe data pair
Reserved	Reserved	5	6	GND	Ground
Reserved	Reserved	7	8	PCIE_RXP_0	PCIe data pair
System S4 signal	SLP_S4#	9	10	PCIE_RXN_0	PCIe data pair
Ground	GND	11	12	CLK100_P_0	PCIe clock pair
Reserved	Reserved	13	14	CLK100_N_0	PCIe clock pair
Ground	GND	15	16	GND	Ground
Reserved	UID_LED	17	18	PCIE_TXP_1	PCIe data pair
Platform reset	PLT_RST#	19	20	PCIE_TXN_1	PCIe data pair
USB data pair	USBP5_N	21	22	PCIE_RXP_1	PCIe data pair
USB data pair	USBP5_P	23	24	PCIE_RXN_1	PCIe data pair
Ground	GND	25	26	GND	Ground
SMB bus	SMB_DATA	27	28	CLK100_P_1	PCIe clock pair
SMB bus	SMB_CLK	29	30	CLK100_N_1	PCIe clock pair
N/C	N/C	31	32	GND	Ground
N/C	N/C	33	34	N/C	N/C
Ground	GND	35	36	N/C	N/C
N/C	N/C	37	38	GND	Ground
N/C	N/C	39	40	N/C	N/C
Power button signal	PWRBTN#	41	42	N/C	N/C
Reserved	Reserved	43	44	RXD4	SIO COM4
PCH GPIO	GPIO_RISER3	45	46	TXD4	SIO COM4
PCH GPIO	GPIO_RISER2	47	48	RXD5	SIO COM5
PCH GPIO	GPIO_RISER1	49	50	TXD5	SIO COM5
Ground	GND	51	52	GND	Ground
3.3V power	P3V3	53	54	P1V8	1.8V power
3.3V power	P3V3	55	56	GND	Ground
5V power	P5V	57	58	P12V	12V power
5V power	P5V	59	60	P12V	12V power

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 the Cassette module and screws on both I/O panels.

1. Remove the four screws at the bottom of the Cassette module..

> 📝 **NOTE**
>
> *Not applicable to Nuvo-7000LP systems.*

2. Gently wiggle and separate the Cassette module from the system.

> 📝 **NOTE**
>
> *Not applicable to Nuvo-7000LP systems.*

3. On the front I/O panel, remove the hexa-screws indicated below.

Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

4. Remove the front I/O panel.
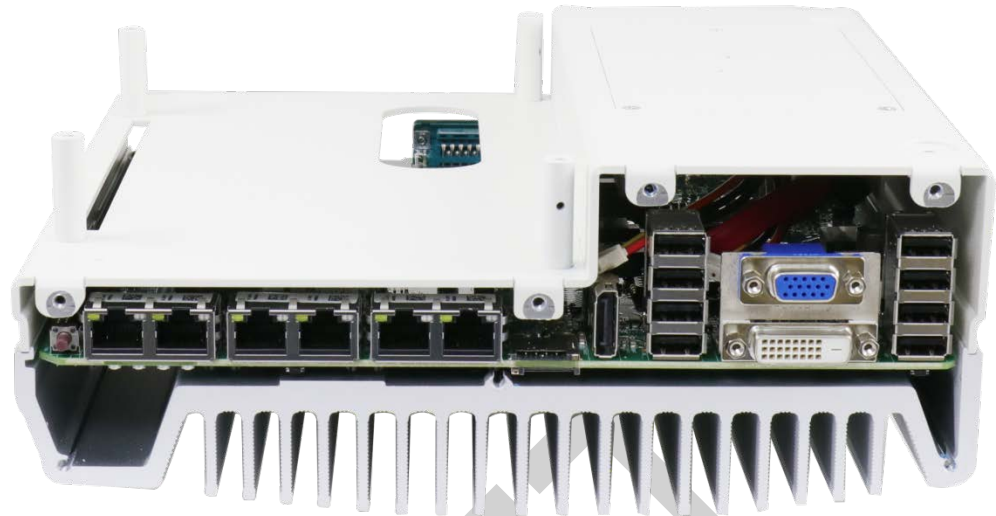
Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

5. One the rear I/O panel, remove the hexa-screws indicated below.

Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

6. Remove the rear I/O panel.

Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

7.   Gently lift the system's bottom panel.
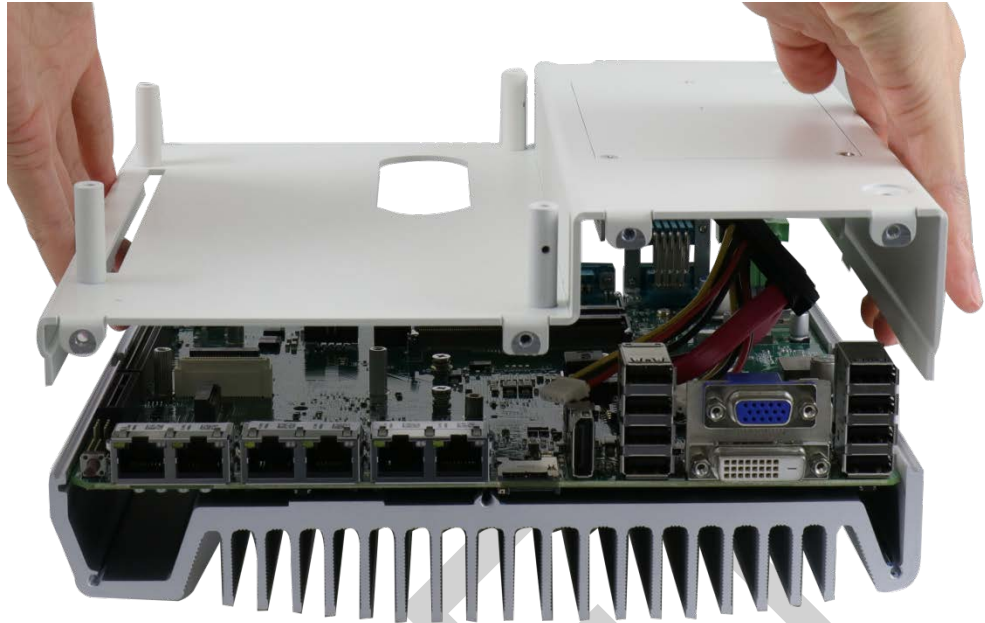
Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

✎ **NOTE**

For Nuvo-7000LP systems, please disengage the 22-pin SATA cable connected to the 2.5" hot swappable tray before removing the bottom panel.

8. Once the bottom panel has been removed, you should have access to the system's internal I/O interfaces.
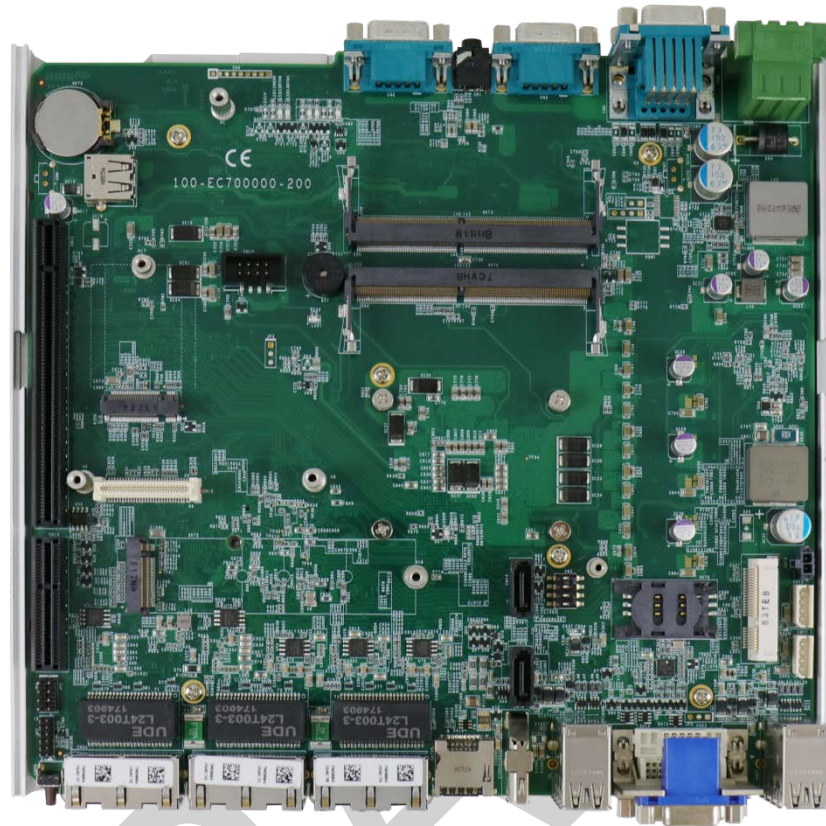
3.2 Installing Internal Components

✍ NOTE

For demonstration purposes, Nuvo-7000E/ P will be used in most illustrations. A dedicated illustration will be shown if the component is significantly different.

3.2.1 CPU Installation Procedure

1. To install the CPU, you will need to separate the heatsink and the motherboard.

2. To do so, remove the nine screws indicated below.
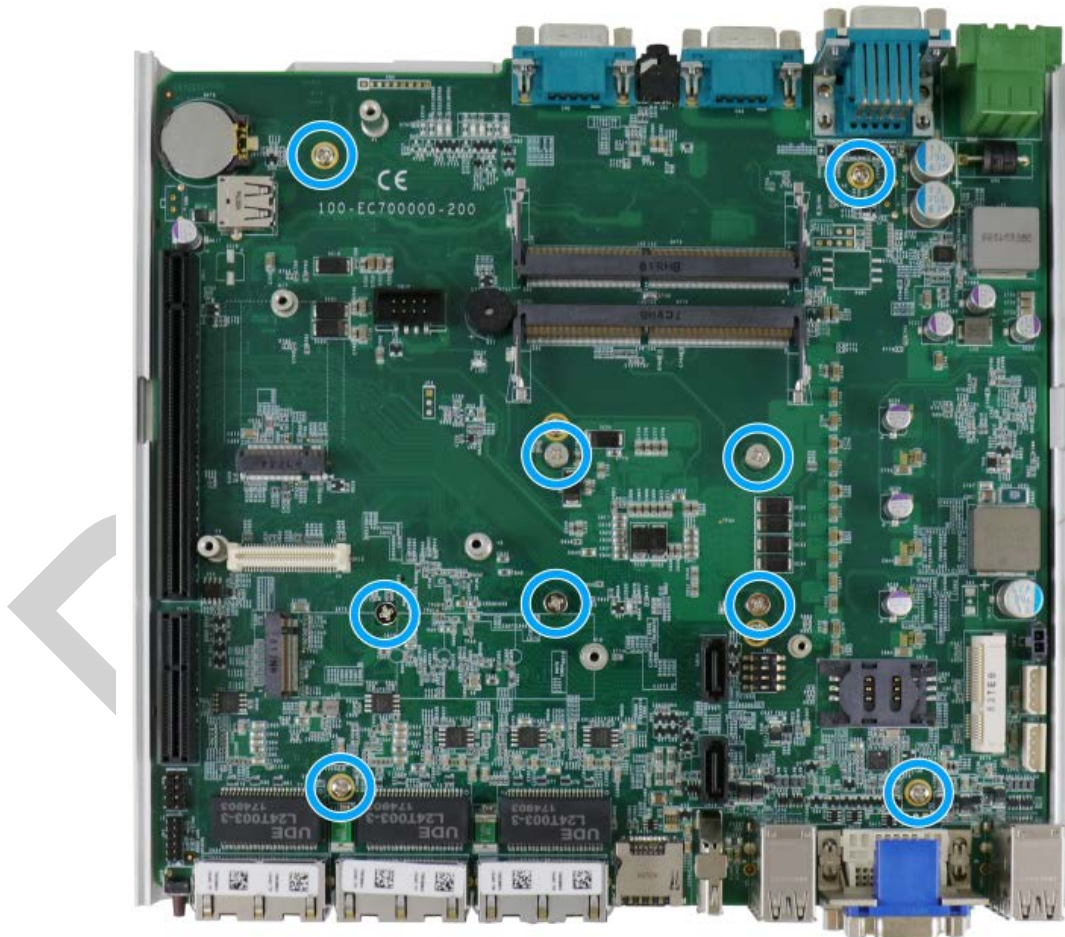
3.   Gently separate the motherboard from the heatsink, you'll see the CPU socket protective cover, place finger tips underneath the sign "REMOVE" for leverage and gently lift the cover.
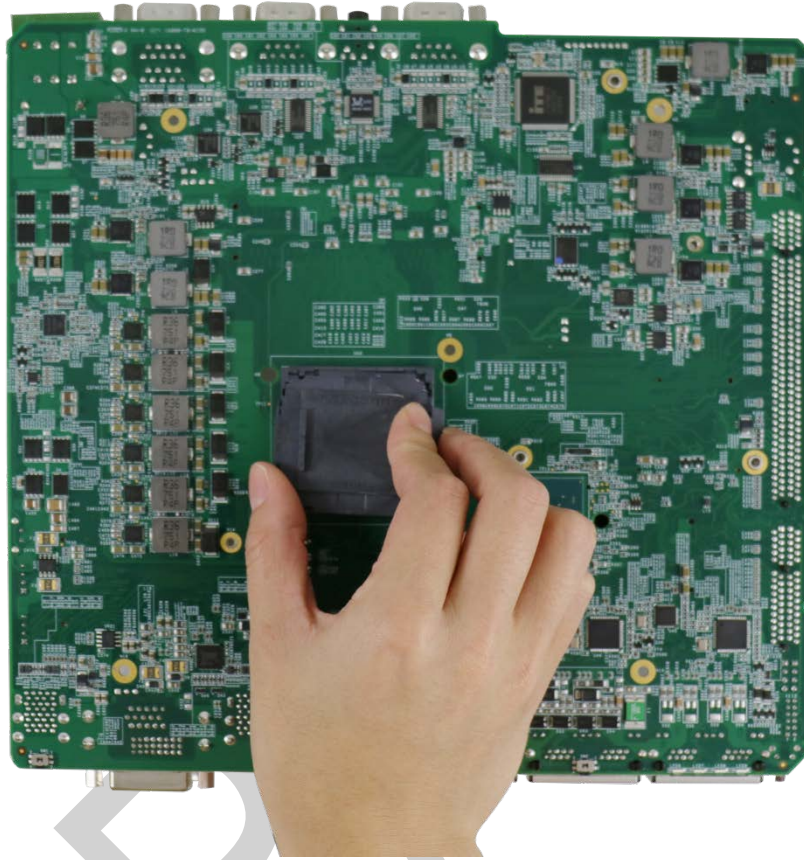
> ⚠ **WARNING**
>
> *With the protective cover removed, please be careful when handling the motherboard. DO NOT touch the pins in the LGA socket!*

4. Remove the CPU from its container/ tray. Match the two notches on the side to the protrusions in the socket, gently lower the CPU into the socket.

5. Locate the CPU retention bracket from the accessory box. Place the retention bracket on the CPU and hold it in place.

6. Turn the motherboard around and secure the bracket by tightening two M3 P-head screws.
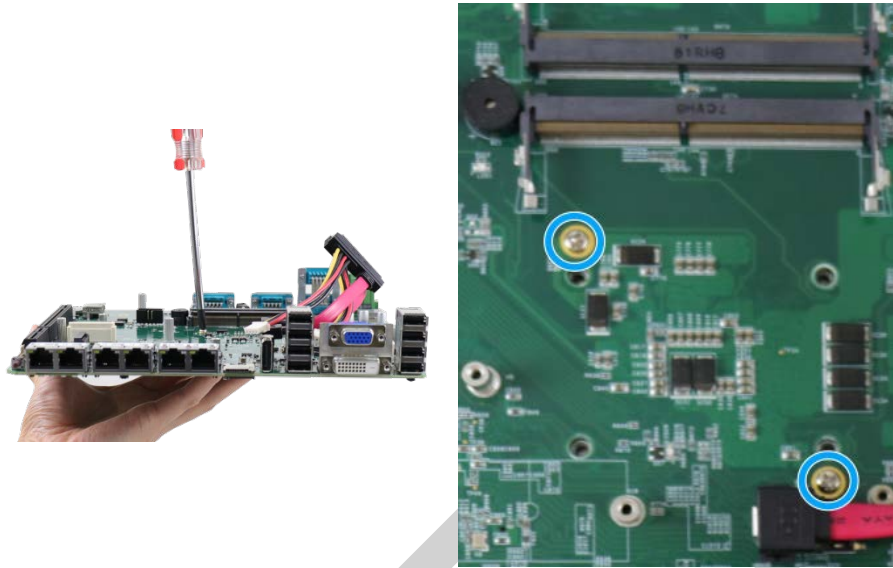
Hold CPU bracket firmly and turn the motherboard around

Secure two M3 P-head screws

7. Remove all thermal pads' protective films on the heatsink.
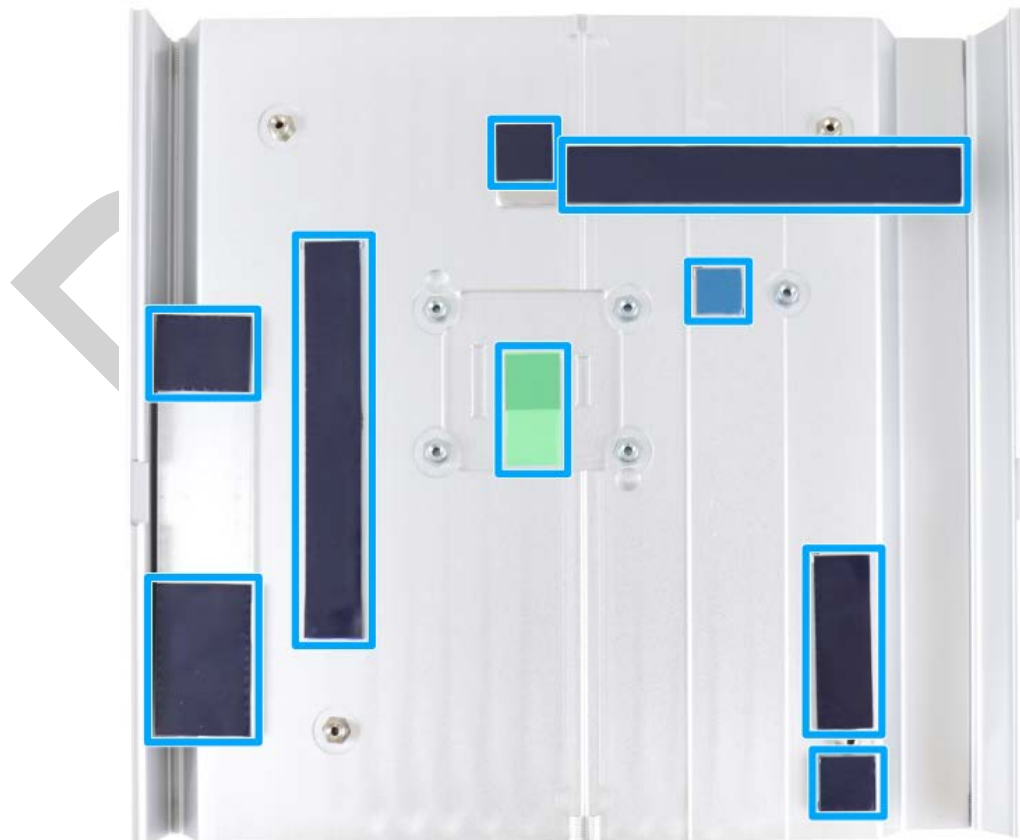
8. With the four motherboard standoffs aligned, gently lower the motherboard onto the heatsink and secure the four screws.
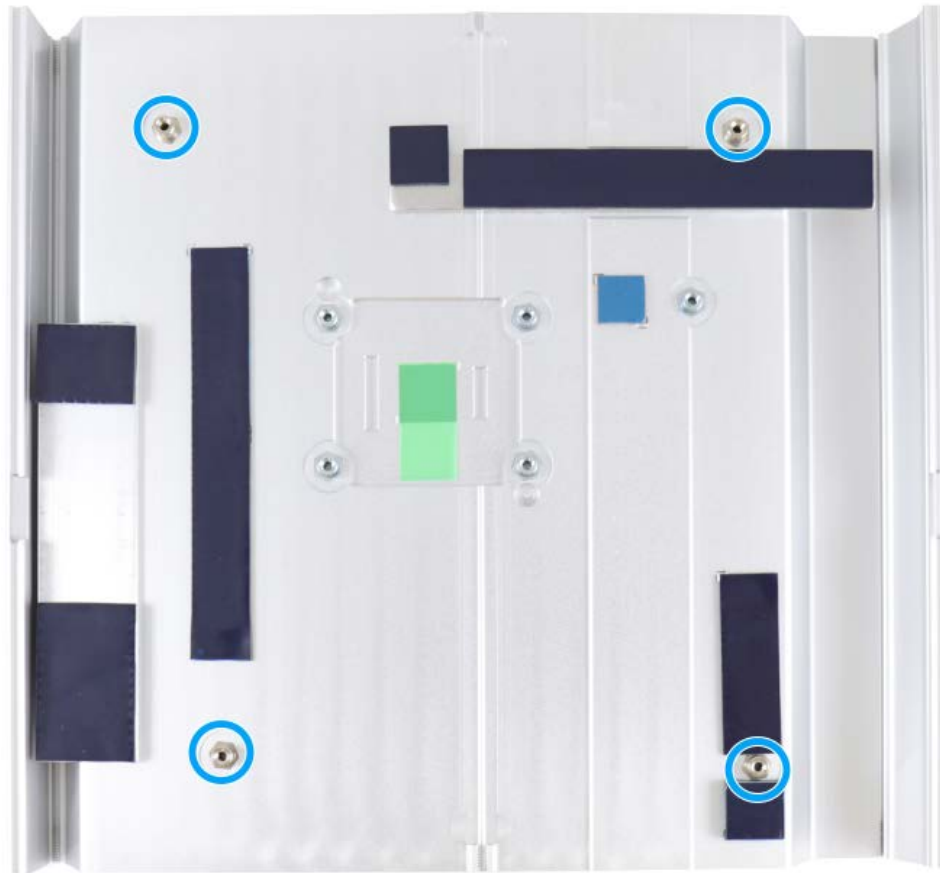
9. Once the motherboard has been installed, you're ready to secure the five screws that help the heatsink apply pressure to the CPU/ chipset die. You'll want to apply even pressure to the corners by gradually tightening each screw. Please refer to the recommended order when tightening the screws.
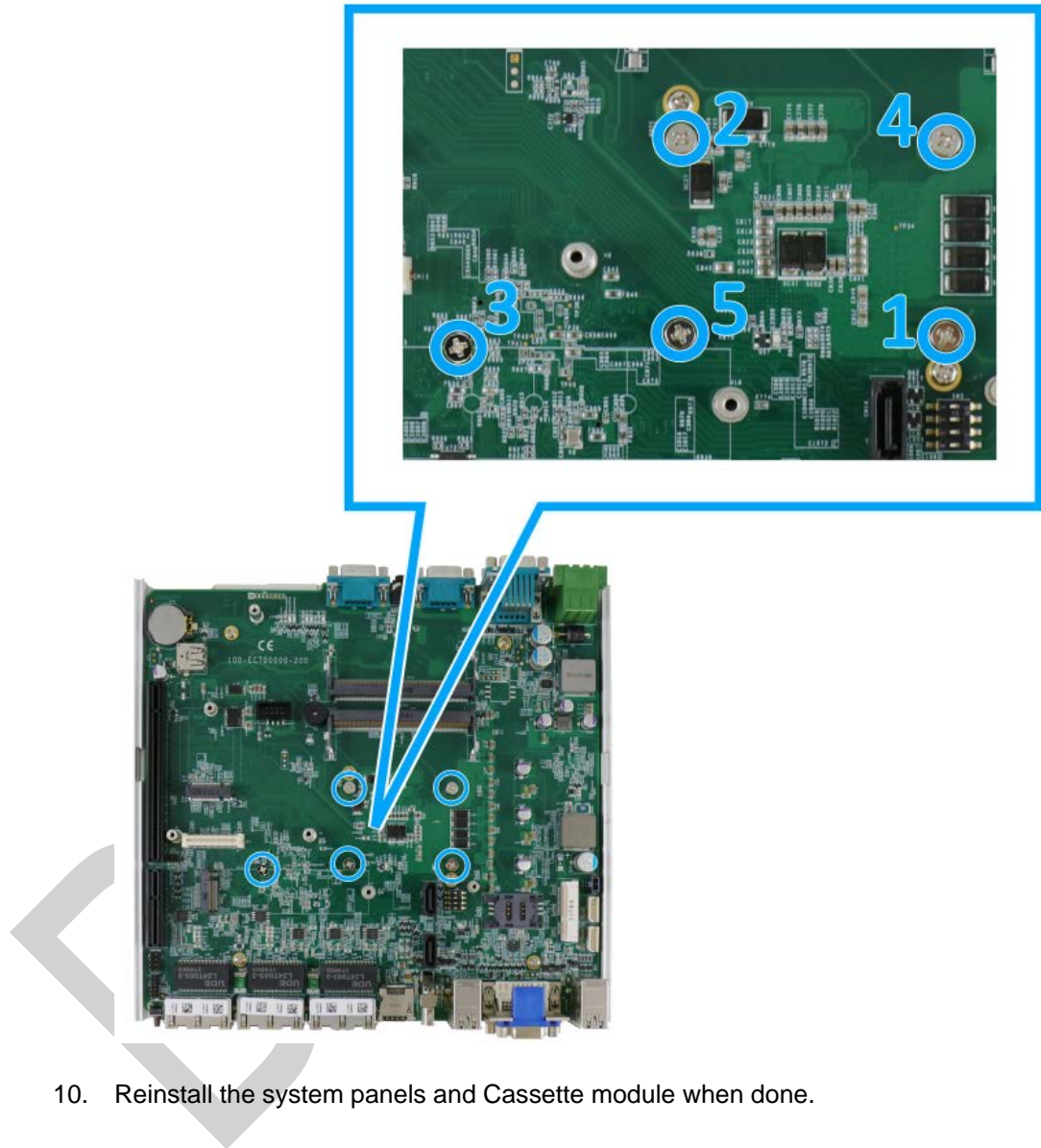
10. Reinstall the system panels and Cassette module when done.

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

3.2.2   DDR4 SO-DIMM Installation

There are two SO-DIMM memory slots (indicated in **blue**) on the motherboard that supports a total maximum of 32GB DDR4-2666. Please follow the procedures below to replace or install the memory modules.

1. Please refer to the section "<u>Disassembling the System</u>".

2. Locate the SODIMM memory module slots on the motherboard.

3. To install the memory module, insert gold fingers into the slot at 45-degree angle, push down on the memory module to clip the module into position.

4. Push the memory module down until it is clipped-in.

5. Repeat steps 3 and 4 to install the other module.

6. Reinstall the system enclosure and panel when done.

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

3.2.3 mPCIe Module, Mini-SIM (2FF) Card and Antennae Installation

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

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

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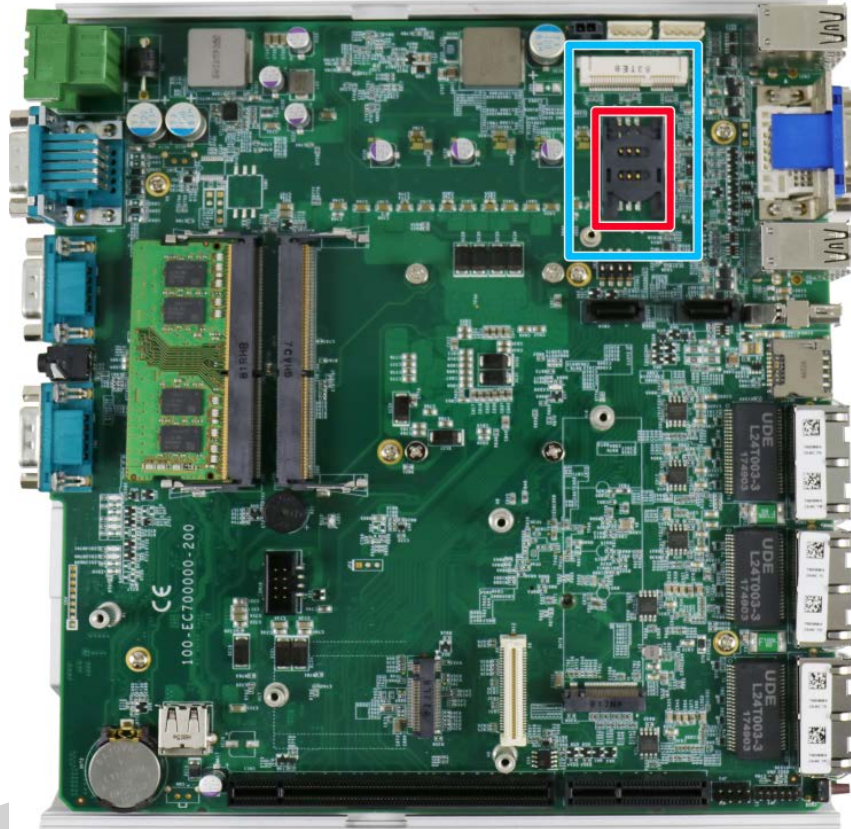
3.   Before installing the mPCIe module, you need to insert the Mini-SIM card. Slide the SIM slot holder and lift the SIM card holder. Insert the Mini-SIM card (pins facing up), shut the SIM holder and slide it to lock the SIM card in-place.
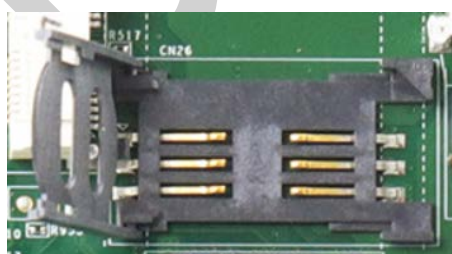
Slide and lift SIM card holder

Insert Mini-SIM card with pins facing up

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

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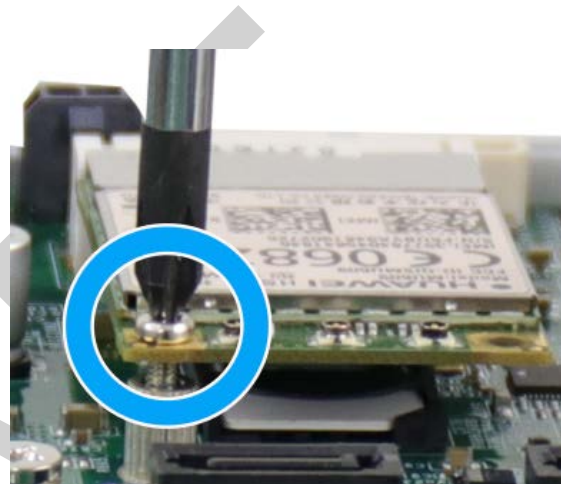
Insert on 45 degree angle　　　**Secure the module**

6. Clip on the IPEZ-to-SMA cable to the module and secure the antenna to the rear panel. Please refer to the module's manual for clip-on connection.
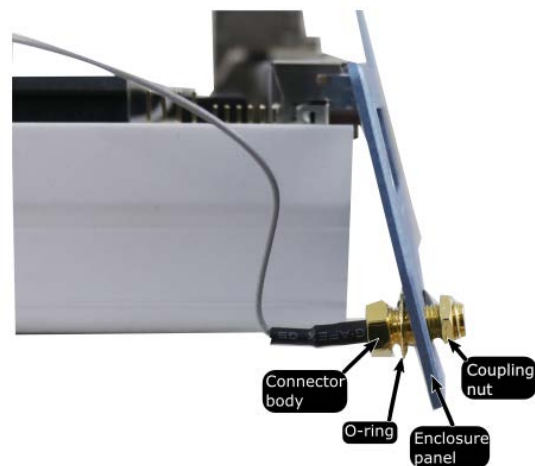
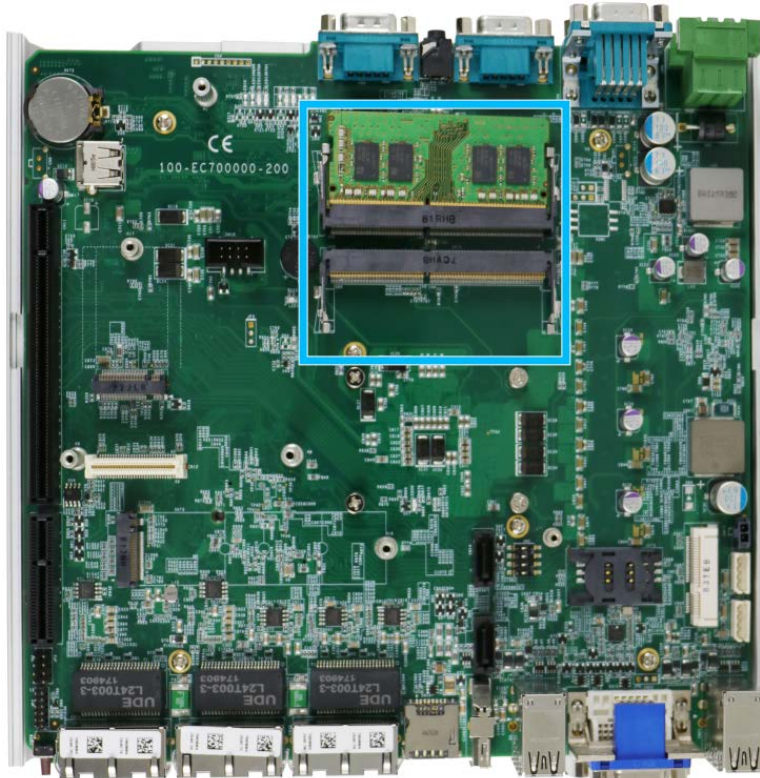**Clip on IPEZ-to-SMA cable**　　　**Secure antenna to rear panel**

7. Reinstall the system enclosure and panel when done.

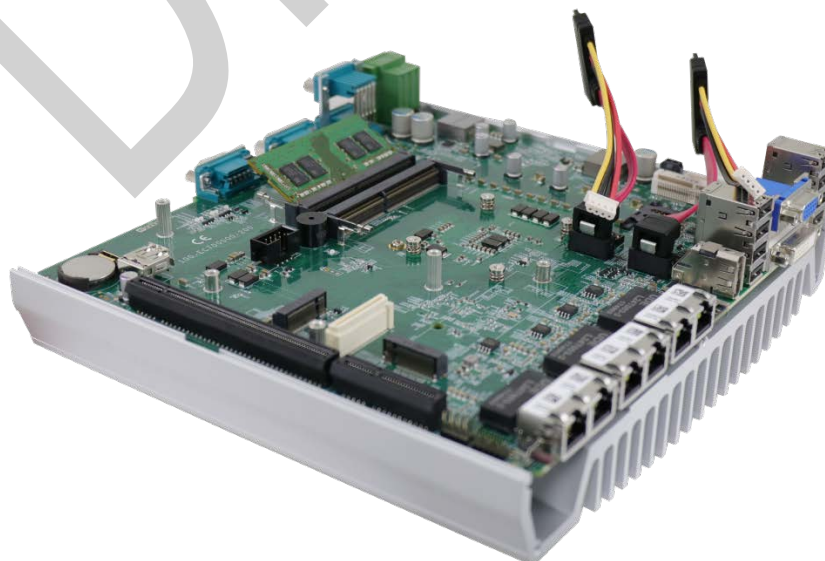8. If you need to install other components, please refer to respective sections.

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

The system has a mini-PCIe slot (indicated in **blue**) for installing 3G/ 4G or a WiFi module that can be coupled with dual Micro-SIM card slots (indicated in **red**). For installation, please refer to the following instructions.

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

2. Locate the M.2 2242 (B Key) and SIM card slots on the motherboard.
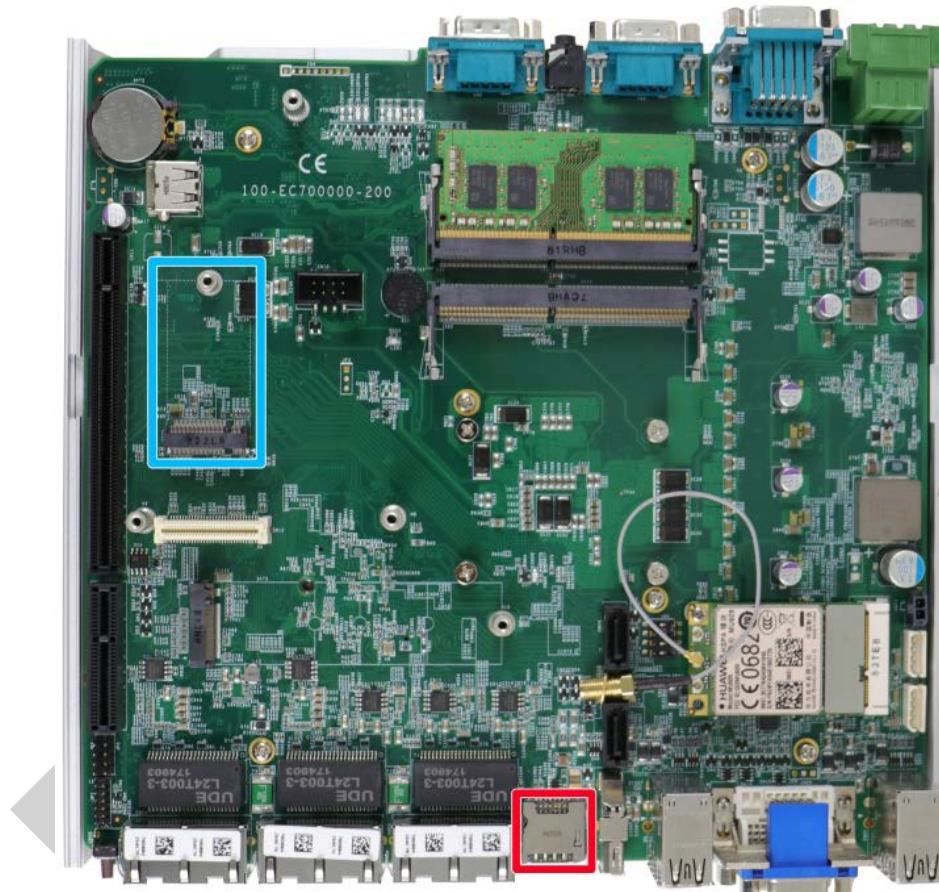
3. Insert the module on a 45 degree angle.

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

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

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

6. With the motherboard exposed, the SIM card is inserted with the gold fingers facing downward. If you are inserting the SIM card with the system upright (heatsink fins upwards), the gold fingers should be facing upward. The SIM socket is a push-push type. The push-push mechanism means the SIM card is push-to-install and push-to-retrieve

7. Reinstall the system enclosure and panel when done.

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

3.2.5 M.2 2280 NVMe SSD or Intel® Optane™ Memory Installation
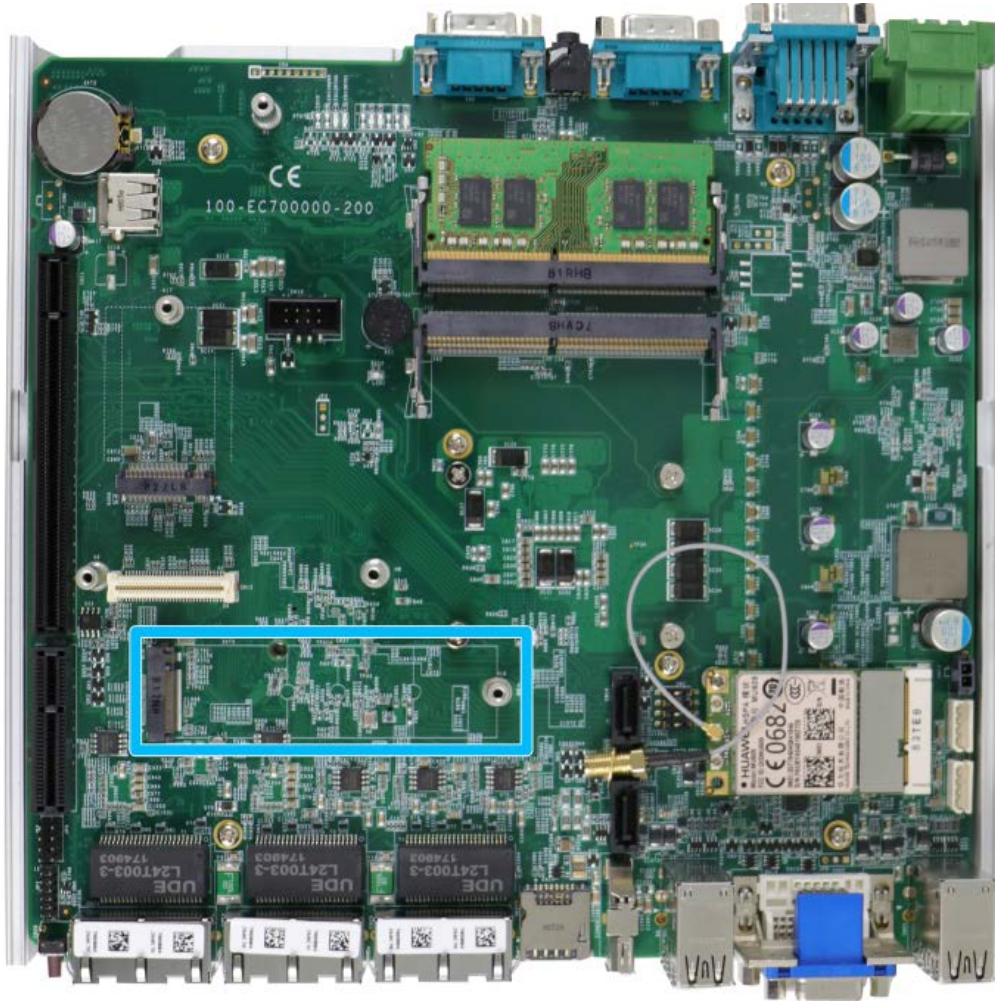
The system has an x4 PCIe M.2 2280 slot for you to install an NVMe SSD for the ultimate performance or an Intel® Optane™ memory to accelerate the read/ write performances of traditional hard disk drive. An NVMe SSD offers exceptional performance over 2.5" SSDs while Intel® Optane™ memory can dramatically boost your traditional hard disk drive's read/ write performances. For installation, please refer to the following instructions.

1. Please refer to the section "Disassembling the System", you may not need to completely dismantle the system to gain access to the mini-PCIe slot.

2. Insert the module on a 45 degree angle.

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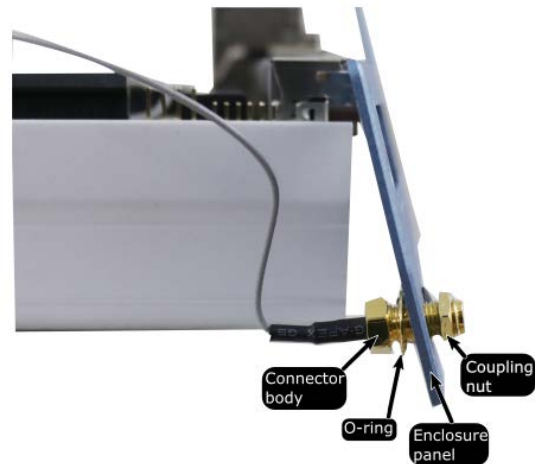

4. Reinstall the system enclosure and panel when done.

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

6. Please refer to the section Intel® Optane™ Memory BIOS Setup and Driver Installation for traditional hard drive acceleration.

3.2.6 MezIO^{TM} Module Installation
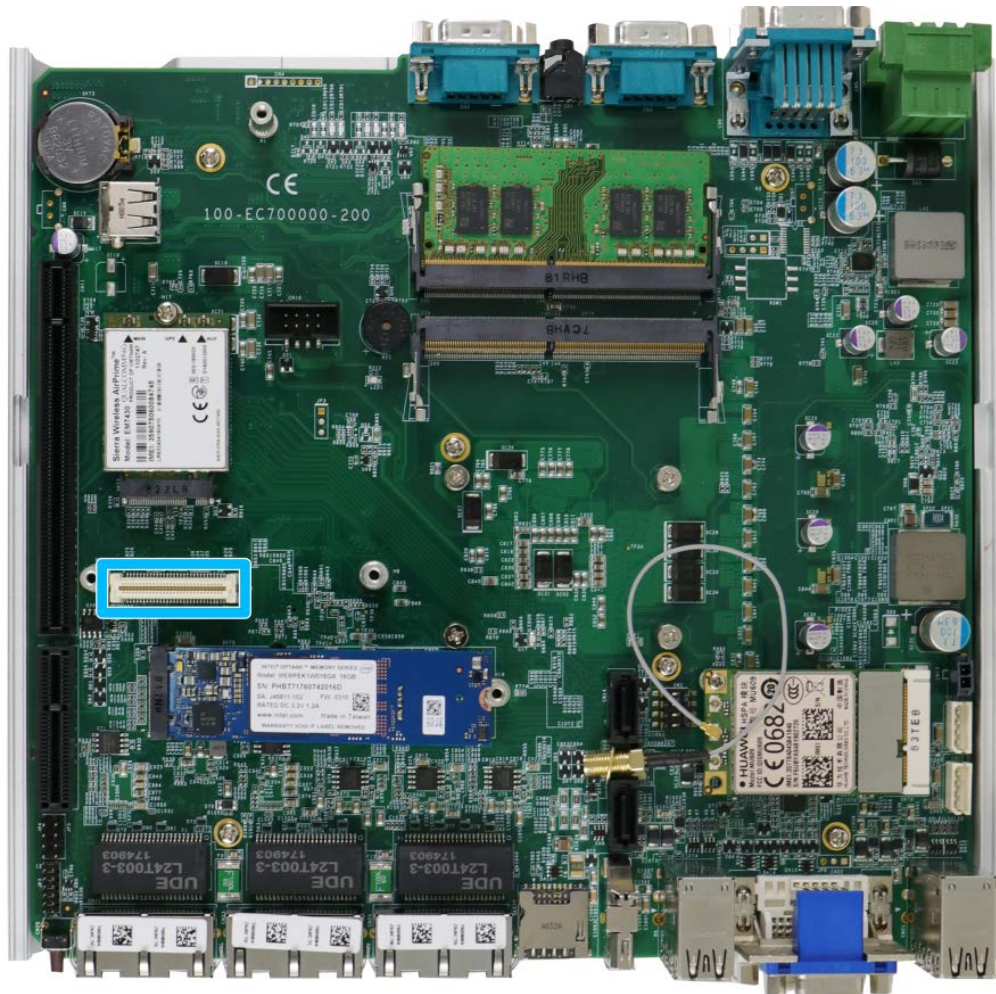
MezIO^{TM} is an innovative interface designed for integrating application-oriented I/O functions into an embedded system. It offers computer signals, power rails and control signals via a high-speed connector. MezIO^{TM} is also mechanically reliable benefited from its 3-point mounted mezzanine structure. A MezIO^{TM} module can leverage these signals to implement comprehensive I/O functions.

The system incorporates MezIO^{TM} interface and universal mechanical design to accommodate Neousys' standard MezIO^{TM} modules. For customers who want to develop their own MezIO^{TM} module, Neousys provides MezIO^{TM} design documents on a NDA basis. Please contact Neousys for further information.

1. Please refer to the section "Disassembling the System", you may not need to completely dismantle the system to gain access to the MezIO^{TM} interface.

2.   The MezIO module is secured by the three stand-mounts indicated in the illustration below.
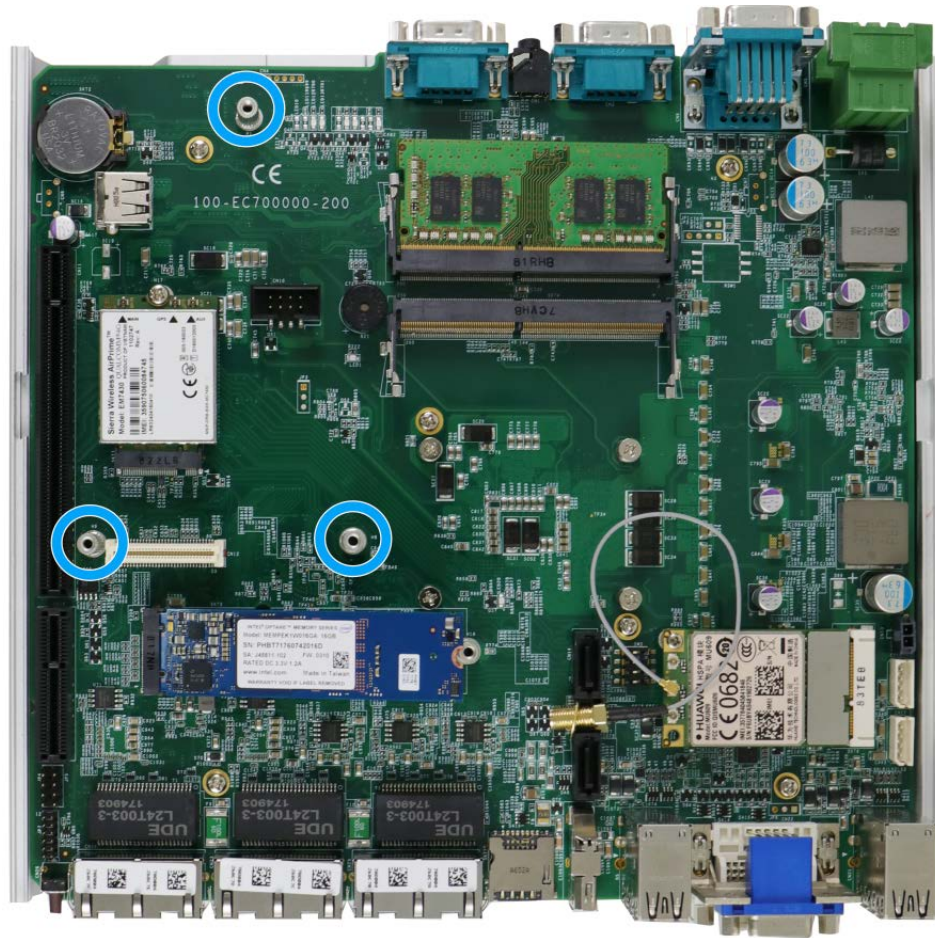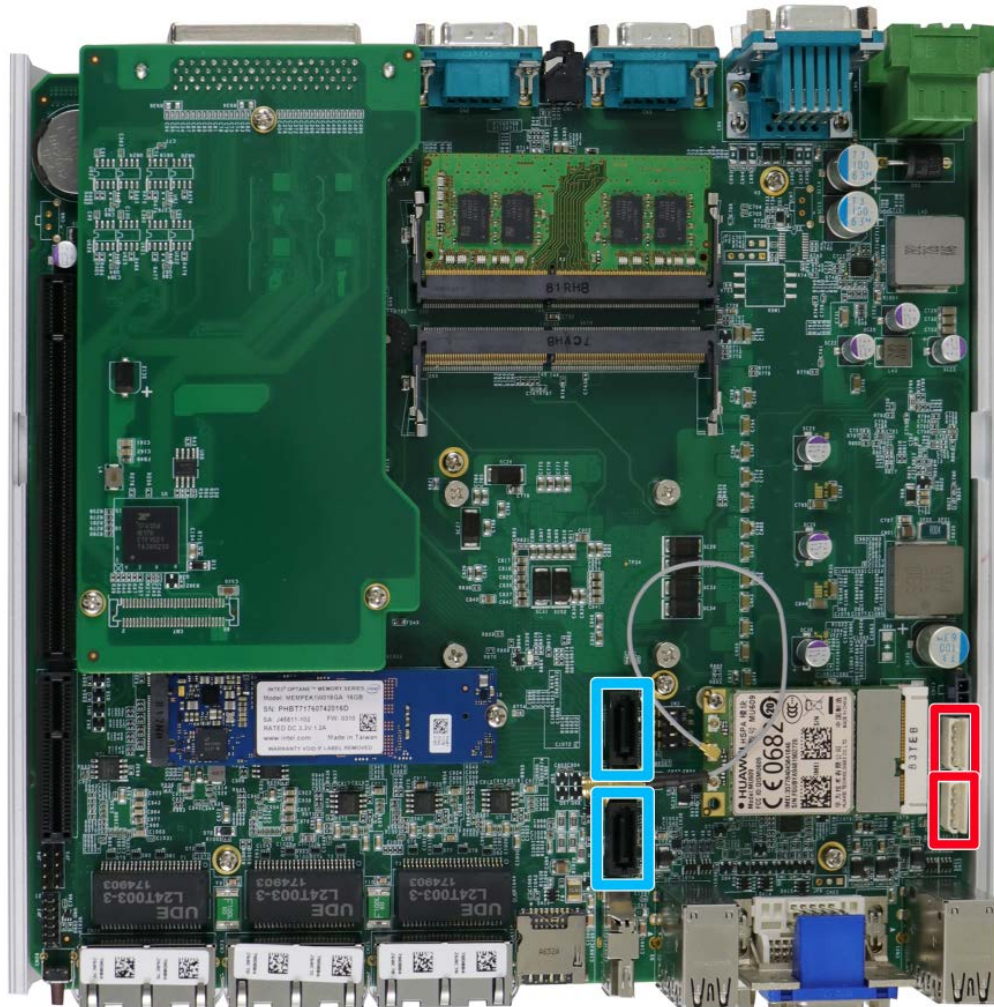
3. Gently lower the MezIO^{TM} module onto the three stand-mounts while matching the MezIO interface. Secure the module using three screws supplied.
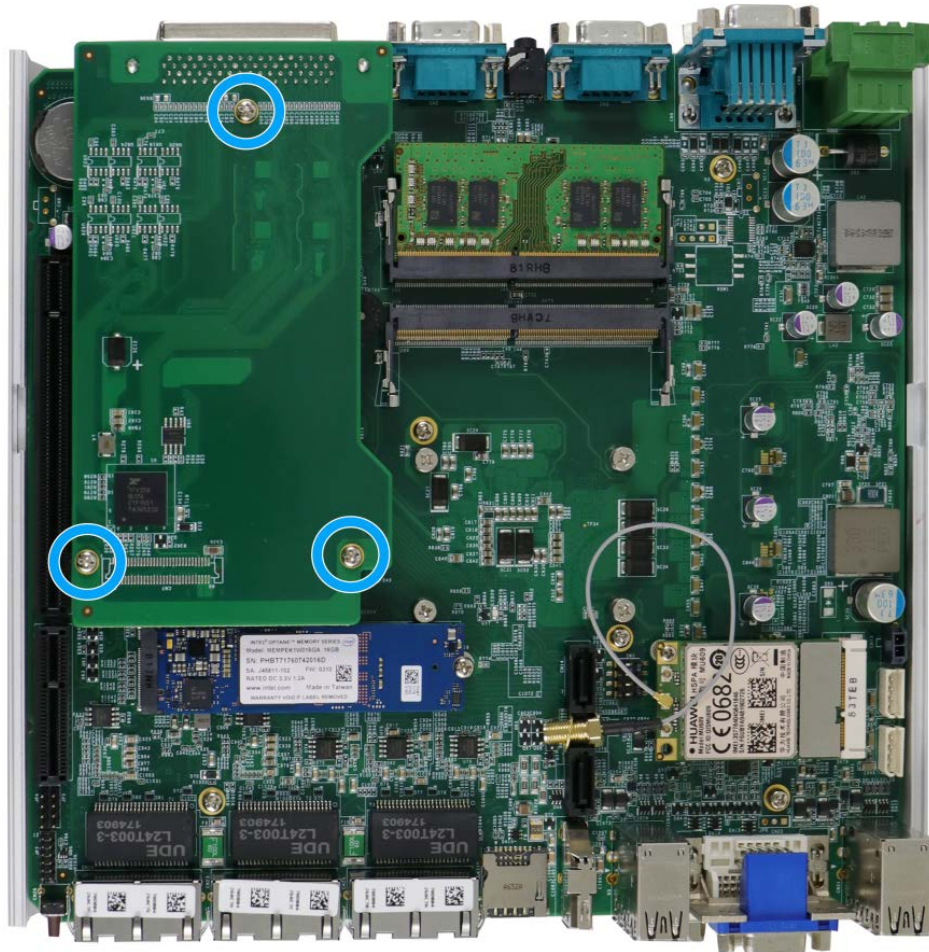
4. [Reinstall the system enclosure](#) and panel when done.

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

3.2.7 HDD/ SSD Installation (Nuvo-7000E/ P/ DE Systems)

The system has two SATA ports (indicated in **blue)** and two four pin power connectors (indicated in **red**). The SATA and power cables should already be connected on the motherboard so users only need to install the HDD/ SSD. Please refer to the following instructions on how to install 2.5" SATA HDD/ SSD.

1. Turn the system upside-down and remove the three screws indicated in the illustration below and lift the tray out of the system.

2. Remove the protective film covering the HDD/ SSD thermal pad. Place the HDD/ SSD (with labels facing up) and match the SATA connector end to the side with the single screw hole (indicated in **blue**), secure the HDD/ SSD with the supplied flathead screws (4 per drive).

3. At the tray opening, you should be able to locate the 22-pin SATA cable, connect it to the installed HDD/ SSD.

4. Gently put the tray back into the system with the connector side being inserted into the system first and secure the tray with three screws.

Reinsert the tray   **Securing the tray**

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

3.2.8 HDD/ SSD Installation (Nuvo-7000LP Systems Only)

The system has two SATA ports (indicated in **blue)** and two four pin power connectors (indicated in **red**). The SATA and power cables should already be connected on the motherboard so users only need to install the HDD/ SSD. A 2.5" SATA HDD/ SSD can be installed to the internal tray or the front hot-swappable tray.

To install a HDD/ SSD to the internal tray please perform the following procedure:

1. Please turn the system upside-down and remove the screws indicated.

2. Take the tray out of the system, and remove the protective film covering the thermal pad.
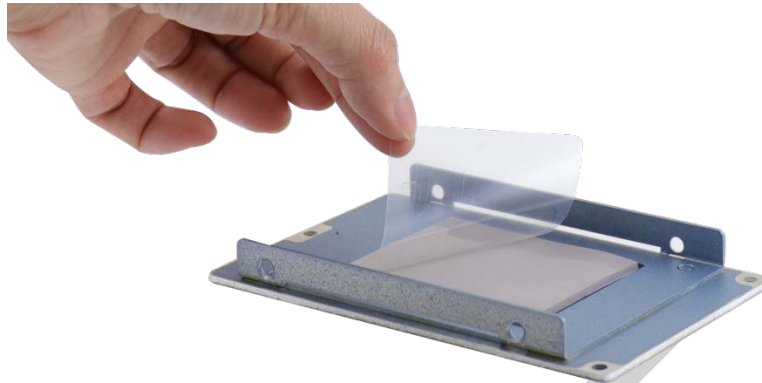
3. Place the HDD/ SSD onto the tray with the label side facing upward and the SATA connector facing the side with two screw holes. Secure with flathead screws (two on each side).

4. Insert the connector end first, of the installed HDD/ SSD and tray into the system.

5. Secure using the three screws that were removed earlier.

3.2.9 HDD/ SSD Installation to Hot Swappable Tray (Nuvo-700LP Systems Only)

The system features a 2.5" external hot-swappable HDD/ SSD slot. It coincides with the internal drive and can be configured into RAID 0 or 1 storage. To install HDD/ SSD into the 2.5" external hot-swappable slot, please refer to the following procedure:

1. Pull the handle on the 2.5" external hot-swappable slot to open it.

Pull handle   **Open slot door**

2. With the label side facing upward, insert the SATA connector side of the 2.5" HDD/ SSD into the slot first. You may feel resistance when the SATA connectors meet, push it firmly until the 2.5" HDD/ SSD is fully inserted into the slot.

3. Push the handle into the 2.5" slot until it snaps into position. A key is provided (in accessory box) to lock the external slot.

Key in accessory box   **2.5" HDD/ SSD slot lock**

3.2.10 PCIe/ PCI Card Installation into Cassette Module (Nuvo-7000E/ P/ DE Only)

> 📝 **NOTE**
>
> *Nuvo-7000E/ P and Nuvo-7000DE systems' Cassette module share the exact same screw locations and removal procedure, therefore a Nuvo-7000E/ P will be used for demonstration.*
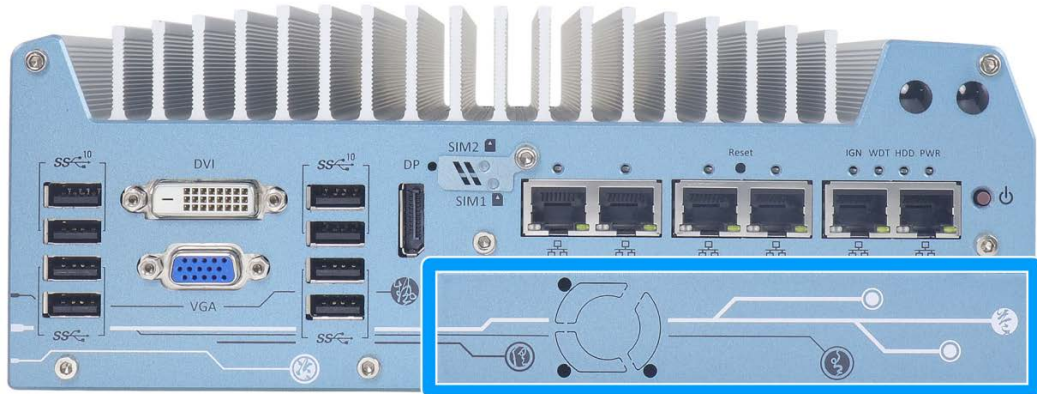
The Cassette module provides a separated compartment to accommodate add-on card(s). It compartmentalizes the heat generated and effectively manages thermal conditions of both the system and add-on card(s). The modular design reduces the complexity of installing and replacing add-on card(s) in the fanless controller. In addition, the mechanical design creates a sealed wind tunnel to bring in cold air to the GPU and expels hot air via a system fan to offer the system extreme stability and reliability.

To install a PCIe/ PCI card into the Cassette module, please refer to the following procedure:

1. Turn the system upside-down and remove the four screws.

2. Gently wiggle the Cassette module and separate it from the system enclosure.

3. Remove the screw to open the Cassette cover.

4. Remove the bezel cover (indicated in **blue circle**) and insert the card into the PCIe/ PCI slot while making sure the bezel is properly inserted into the notch and the card is secured in place with screw.

Remove bezel cover

Make sure the card is inserted into the notch and secured with a screw

Nuvo-7000DE systems have two PCIe slots in the Cassette module

Make sure both cards are inserted into their notches and secured with screws.

5. Secure the screw indicated in the **blue circle**.

6. Gently lower the Cassette module back onto the system enclosure and secure the module onto the system enclosure by securing the following screws.

3.3　Installing the System Enclosure

1.　To reinstall the system enclosure, place the bottom panel on top of the motherboard while making sure both sides are inserted into the heatsink (indicated in **blue**).

Nuvo-7000E/ P/ DE systems
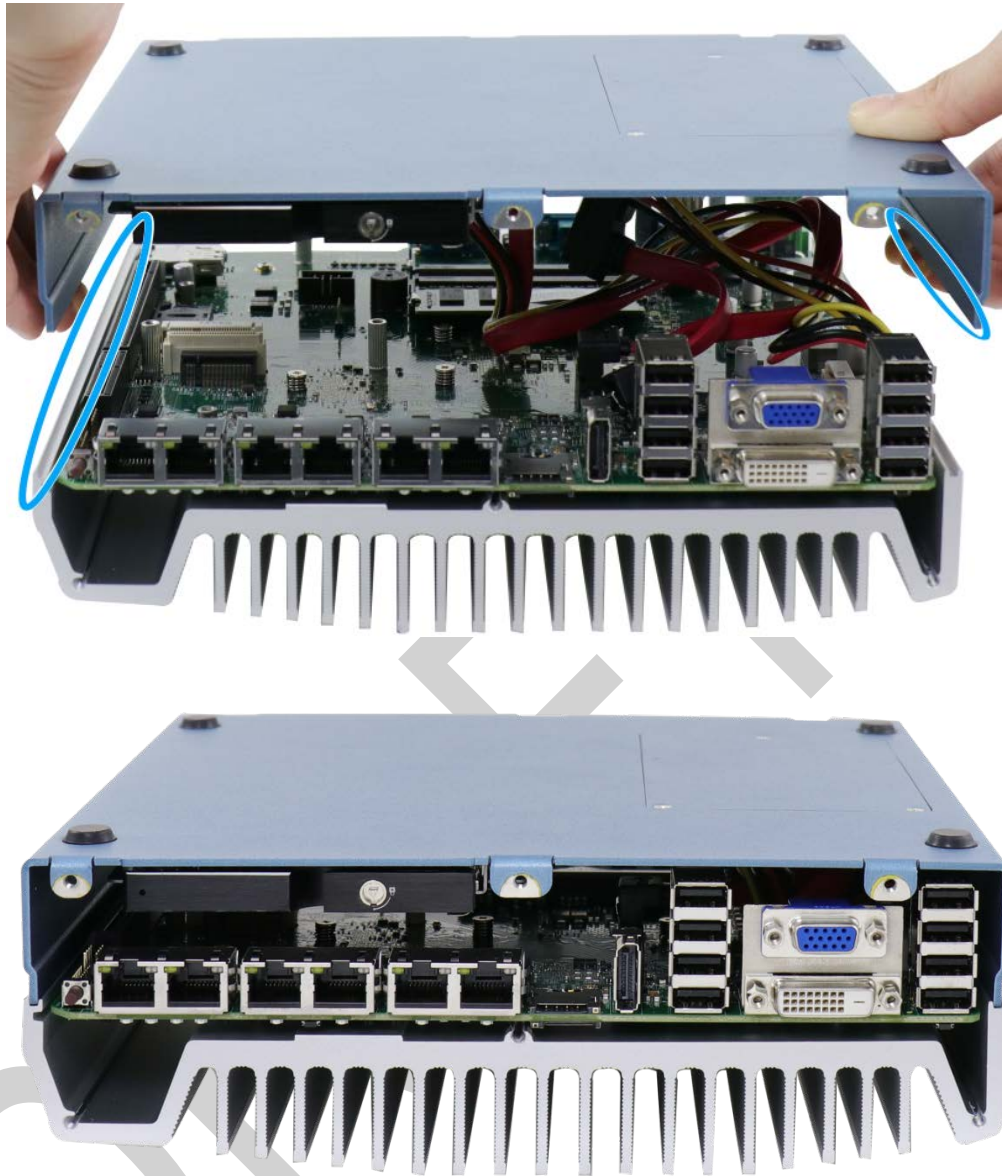
Nuvo-7000LP systems

✎ **NOTE**

For Nuvo-7000LP systems, please connect the 22-pin SATA cable connected to the 2.5" hot swappable tray before installing the bottom panel.

2. Install the front panel and secure screws indicated in **blue**.

Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

3. Install the rear panel and secure screws indicated in **blue**.

Nuvo-7000E/ P/ DE systems

Nuvo-7000LP systems

4. Install the Cassette module and secure screws indicated in **blue**.

> ✎ **NOTE**
>
> *Not applicable to Nuvo-7000LP systems.*

3.4 Wall Mount Bracket/ DIN-rail Installation

Nuvo-7000 series ships with dedicated wall mount and DIN-rail (optional).

✎ **NOTE**

You will need to remove the four (4) rubber stands at the bottom of the enclosure if they have been attached.

3.4.1 Wall Mount Bracket Installation

To install the system as a wall mount device, please refer to the following instructions.

1. Take out the two wall mount brackets and four (4) M4 screws out of the accessory box. Fix the wall mount brackets to the system enclosure using M4 screws.
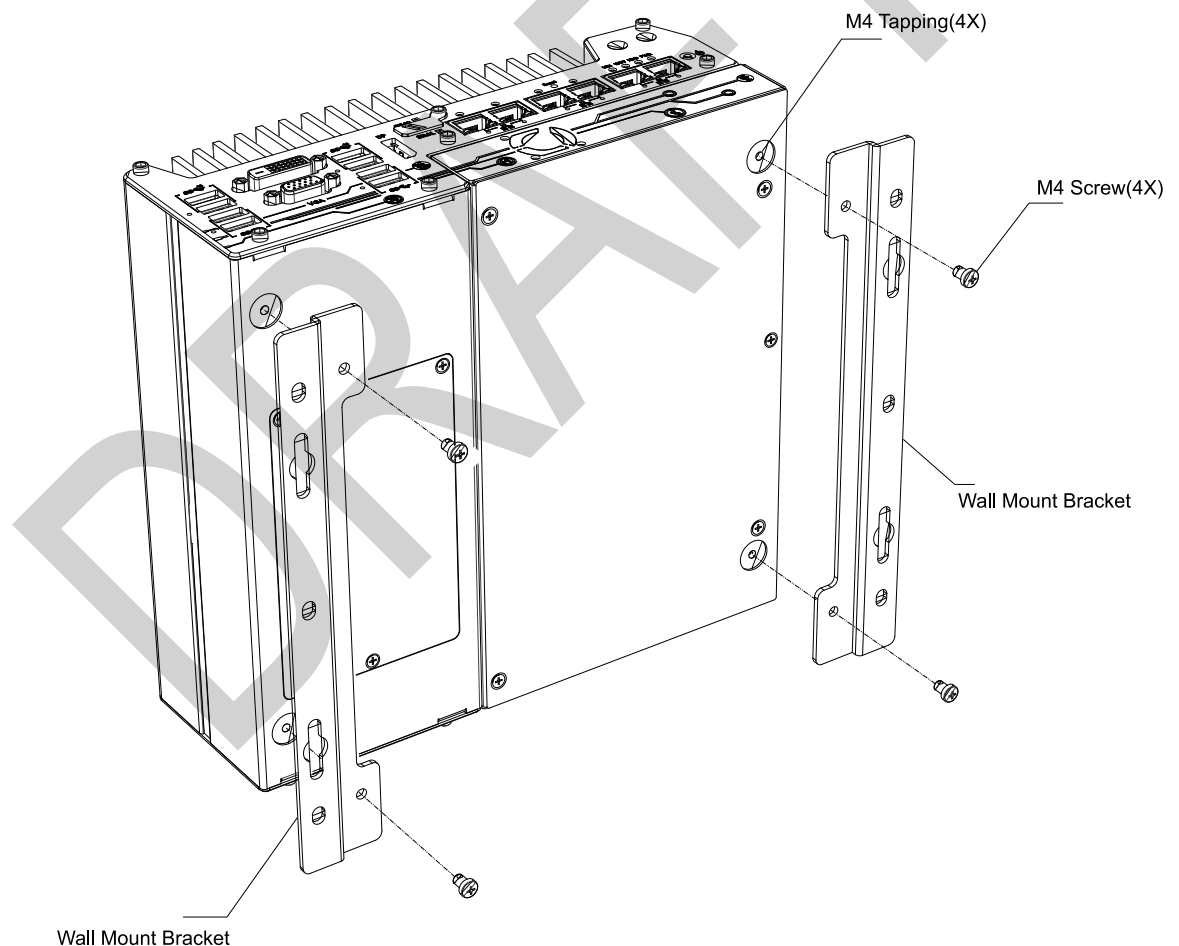
2. Place the system on a flat surface portion of the wall and secure it with four (4) M4 pan screws.

3.4.2 DIN-rail Installation (Optional)

The system also comes with an optional DIN-rail mounting kit. The kit includes a bracket and a DIN-rail mounting clip. By fixing the clip to the bracket using four M4 flat-head screws and fixing the bracket assembly to the system four M4 screws, 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.
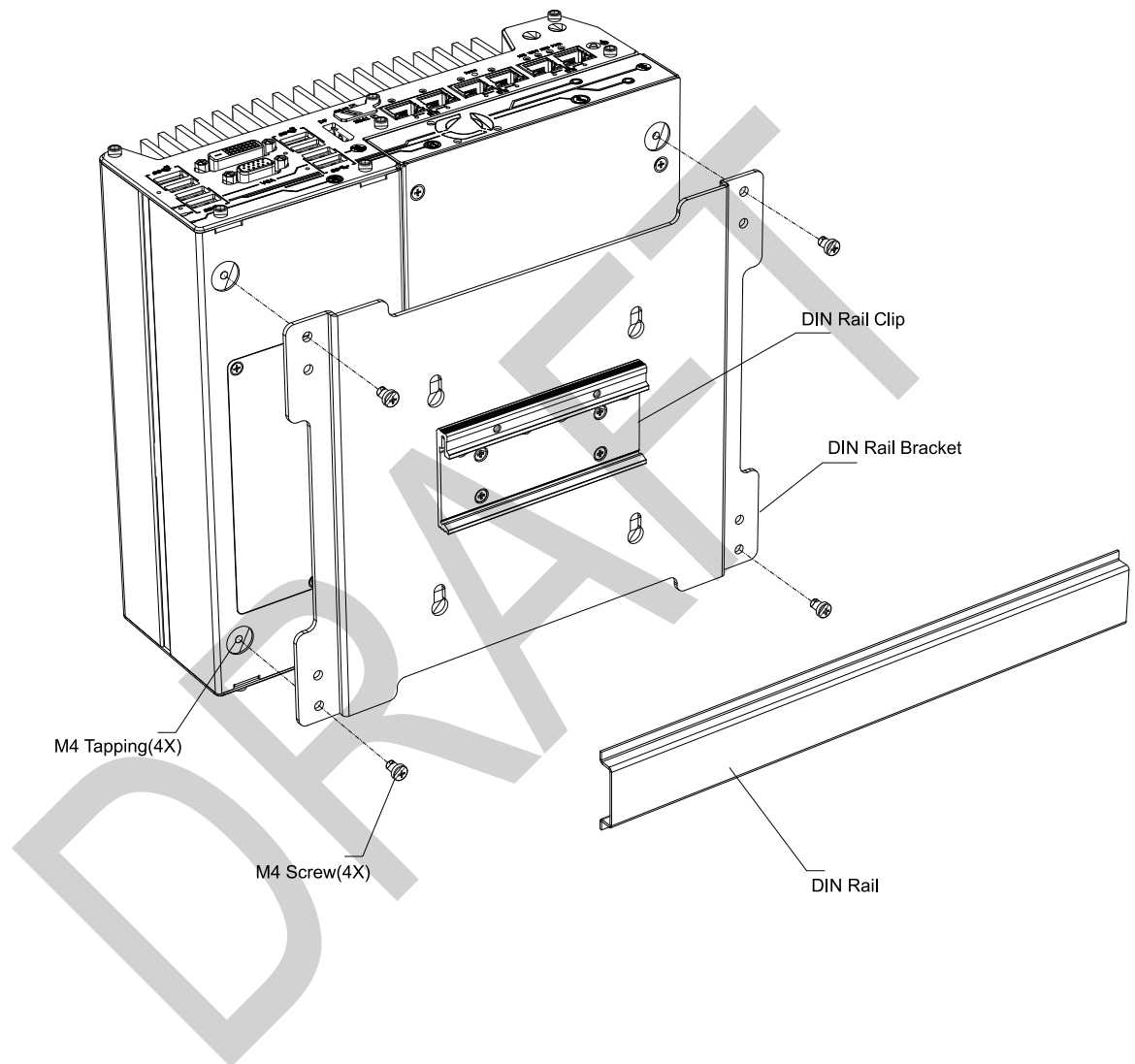
3.5   Powering On the System

There are three 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)

3.5.1   Powering On Using the Power Button

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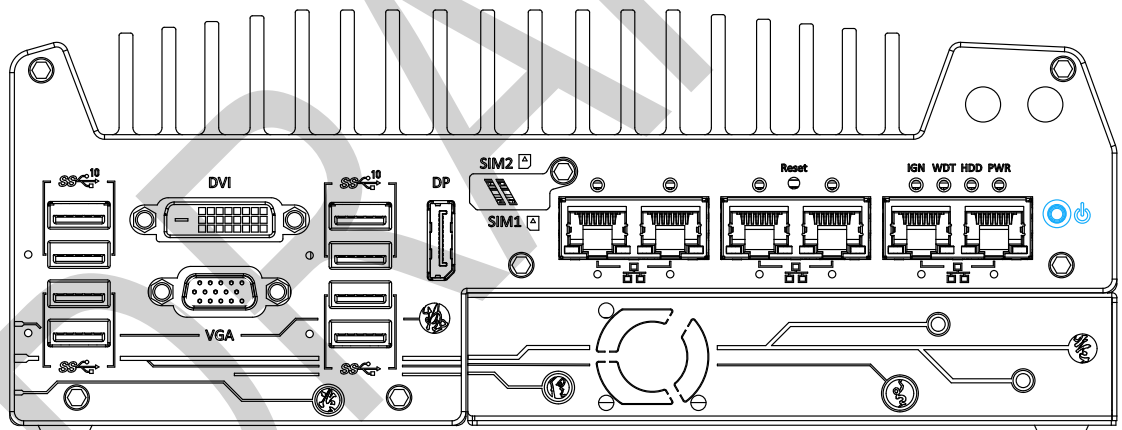
3.5.2 Powering On Using External Non-latched Switch

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 provides a 3-pin "Remote On/ Off" plug for 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 with 3-pin plug.

2. Connect the non-latched switch to the Remote On/ Off plug.
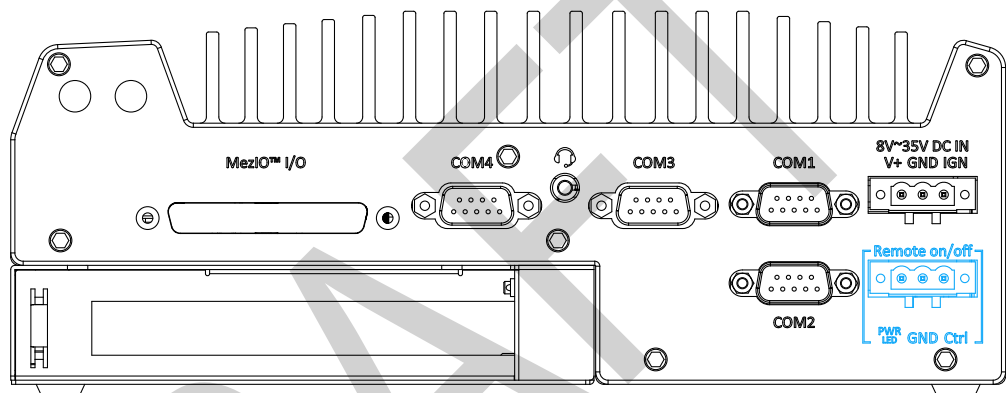
3. With DC power connected, pushing the power button will turn on the system and the PWR LED indicator will light up. Pushing the button when system is on will turn off the system. If your operating system supports ATX power mode (i.e. Microsoft Windows or Linux), pushing the power button while the system is in operation will result in a pre-defined system behavior, such as shutdown or hibernation.

3.5.3 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.
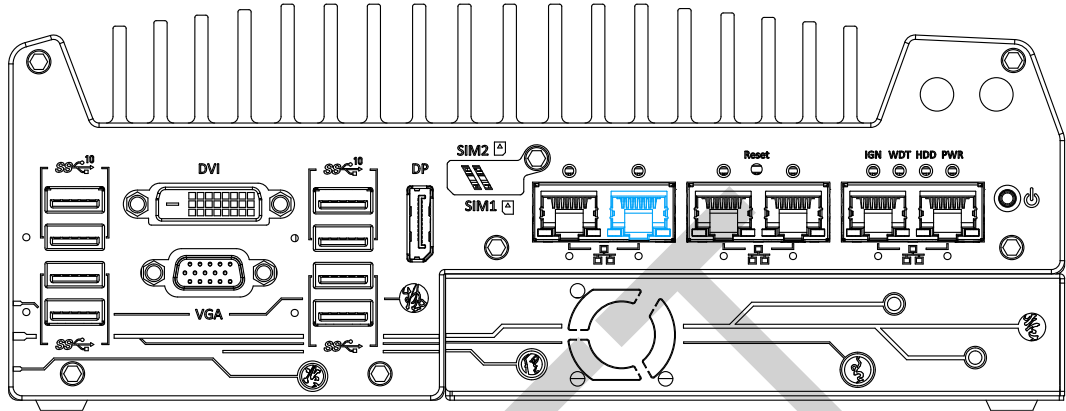
✎ **NOTE**

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® I219 Gigabit Network Connection, click on **Configure...**
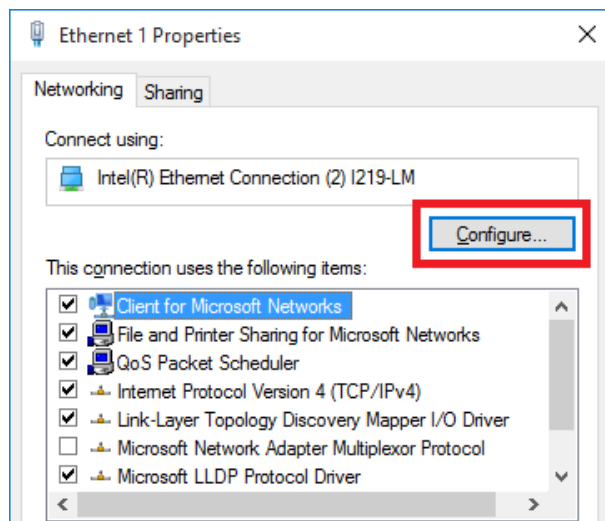
5. Click on the **Power Management** tab and check the following options. Click on OK when done.
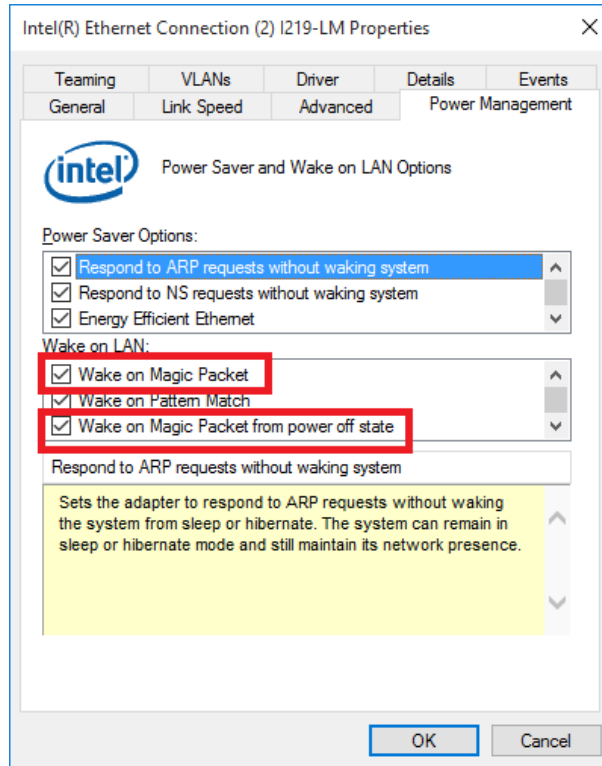
Magic Packet

The magic packet is a broadcast frame containing anywhere within its payload 6 bytes of all 255 (FF 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

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.

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).

```
 Main  Advanced  Security  Power  Boot  Exit

InsydeH2O Version                NV7KA001.Build180705
Build Date                       07/18/2018

Processor Type                   Intel(R) Core(TM) i3-8100T CPU @ 3.10GHz
System Bus Speed                 100 MHz
System Memory Speed              2400 MHz
Cache RAM                        1024 KB
Total Memory                     16384 MB

System Time                      [04:22:43]
System Date                      [07/16/2018]




F1  Help           ↑/↓ Select Item        F5/F6 Change Values
Esc Exit           ←/→ Select Item        Enter Select ▶ SubMenu
```

✎ NOTE

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

4.1.1 COM Port Configuration

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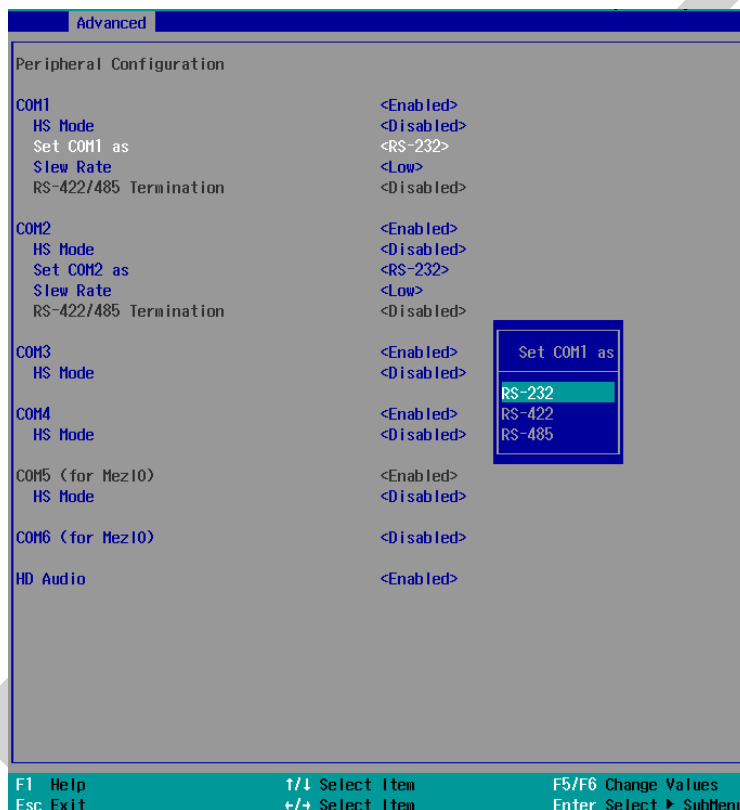
To set COM port operating mode:

1. Press **F2** when the system boots up to enter the BIOS setup utility.

2. Go to **[Advanced]** □ **[Peripheral Configuration]**.

3. Set the **[Set COM1 Mode as]** option to the desired mode.

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

4.1.2 SATA Configuration

The SATA controller of your system supports two (2) operating modes: **AHCI** and **Intel RST Premium With Intel Optane System Acceleration mode**. The **AHCI** mode, which exposes SATA's advanced capabilities such as hot swapping and native command queuing, is supported in several later version of operating systems. The **Intel RST Premium With Intel Optane System Acceleration** mode allows the user to greatly accelerate SATA hard drive read/ write speeds by installing an Optane memory into the M.2 slot. Please refer to the section "**Intel RST Premium With Intel Optane System Acceleration"** for details.
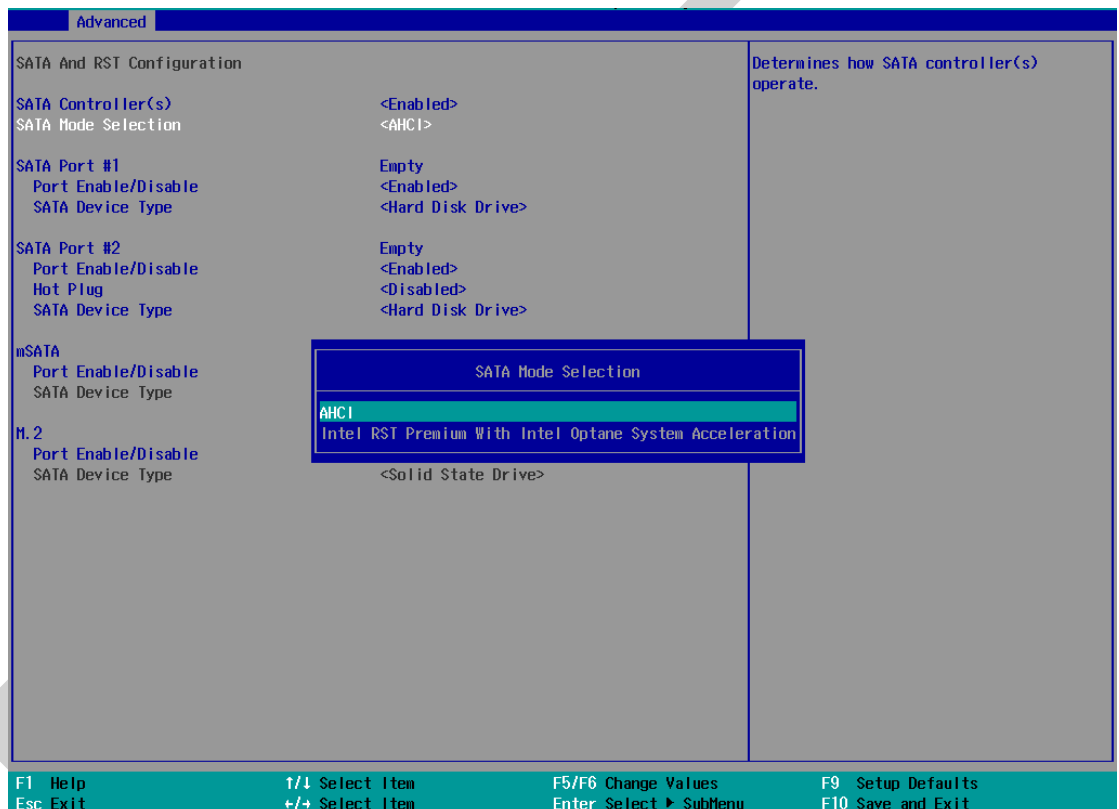
Recommended SATA controller mode settings:

- If you're using Windows Vista, Windows 7/ 8/ 10, or Linux kernel 2.6.19 or later, you can select **AHCI** mode for better performance.

- If you are looking for faster hard drive read/ write performance, please install an SSD (M.2, mPCIe, SATA) or install an Intel Optane memory for hard drive acceleration.

To set SATA controller mode:

1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Advanced]** > **[SATA Configuration]**.

3. Highlight the SATA, mSATA or M.2 port you wish to set and press Enter to bring up setting options. Scroll to and highlight the setting you wish to set and press Enter.

4. Repeat step 3 to set other SATA ports.

5. Press F10 to "Exit Saving Changes".

4.1.3 TPM Availability

Trusted Platform Module (TPM) is a hardware-based cryptoprocessor to secure hardware by integrating cryptographic keys into devices. The system is designed with on-board TPM 2.0 module. As TPM 2.0 requires 64-bit Windows 7/ 8/ 10 with UEFI boot mode, it is disable in BIOS by default. For customers who want to utilize TPM feature, you will need to enable TPM in BIOS as well as install Windows with UEFI mode.

To enable TMP availability:

1.   When system boots up, press F2 to enter BIOS setup utility.

2.   Go to **[Security] > [TPM Availability]**, press Enter to bring up Options, Available/ Hidden.

3.   Highlight your selection, press Enter and press F10 to "Exit Saving Changes".

4.1.4   Auto Wake on S5

Users can specify the S5 state reaction of the system in the event of a power failure.

```
 Main  Advanced  Security  Power  Boot  Exit

▶CPU Configuration
▶Power & Performance

PoE Enable                          <Enabled>
Wake on LAN Enable                  <Disabled>
Auto Wake on S5                     <By Every Day>
  Wake on S5 Time                   [00:00:00]

Power On after Power Failure        <S5 - Power Off>




                                          Auto Wake on S5

                                          Disabled
                                          By Every Day
                                          By Day of Month







F1   Help                  ↑/↓ Select Item          F5/F6 Change Values
Esc  Exit                  ←/→ Select Item          Enter Select ▶ SubMenu
```

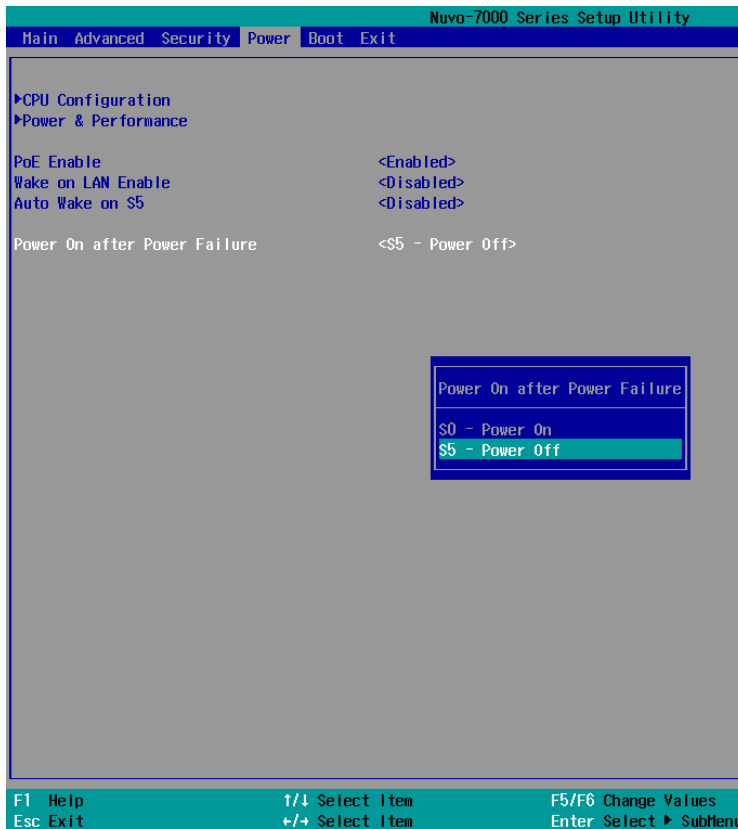| Value	Option	Description
Auto Wake on S5	Disabled	The system does not turn on when operating in state S5.
	By Every Day	The system turns on each day when operating in state S5. Specify the time of day.
	By Day of Month	The system turns on each month when operating in state S5. Specify the day and time.

Highlight your selection, press Enter and press F10 to "Exit Saving Changes".

4.1.5 Power On After Power Failure Option

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

```
                            Nuvo-7000 Series Setup Utility
  Main  Advanced  Security  Power  Boot  Exit

 ▶CPU Configuration
 ▶Power & Performance

 PoE Enable                          <Enabled>
 Wake on LAN Enable                  <Disabled>
 Auto Wake on S5                     <Disabled>

 Power On after Power Failure        <S5 - Power Off>


                                        ┌──────────────────────────────┐
                                        │ Power On after Power Failure  │
                                        │                              │
                                        │ S0 - Power On                │
                                        │ S5 - Power Off               │
                                        └──────────────────────────────┘












 F1  Help              ↑/↓ Select Item         F5/F6 Change Values
 Esc Exit              ←/→ Select Item         Enter Select ▶ SubMenu
```

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".

4.1.6   Power & Performance (CPU SKU Power Configuration)

The system supports various 6th-Gen Skylake LGA1151 CPUs. 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 (to35W) 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.

4.1.7 Wake on LAN Option

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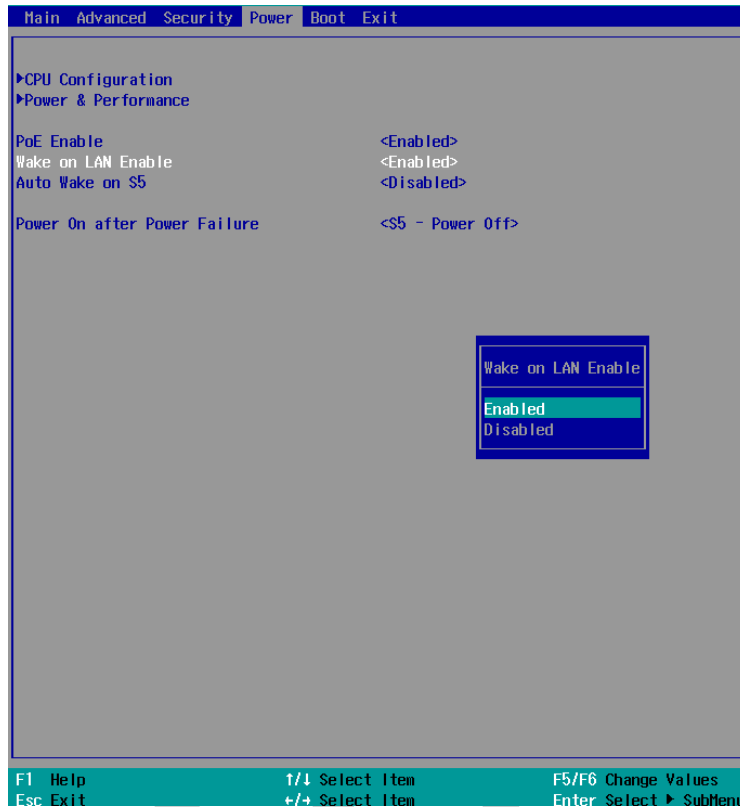
To enable/disable "Wake on LAN" option:

1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Power] > [Wake on LAN]**.

3. Press Enter to bring up setting options, scroll to the setting you desire and press Enter to set.

4. Press F10 to "Exit Saving Changes.

4.1.8 Boot Menu

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

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

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

4.1.9 Boot Type (Legacy/ UEFI)

The system supports both Legacy and Unified Extensible Firmware Interface (UEFI) boot modes. UEFI is a specification proposed by Intel to define a software interface between operating system and platform firmware. Most modern operating systems, such as Windows 7/8/10 and Linux support both Legacy and UEFI boot modes. The Legacy boot mode uses MBR partition for disk and VBIOS for video initialization, the UEFI boot mode uses GPT partition which supports greater than 2TB partition size and GOP driver for faster video initialization.

It is recommended that:

- If you need greater than 2TB disk partition or want to use TPM 2.0 function, you shall choose UEFI boot mode and install operating system accordingly.

- You may choose Legacy boot mode if the installed HDD/ SSD capacities are under 2TB

To configure Boot Type:

1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Boot] > [Boot Type]**, press Enter to bring up options, Dual Boot (Legacy+UEFI), Legacy Boot Type, UEFI Boot Type.

3. Highlight your selection and press Enter.

4. Press F10 to "Exit Saving Changes".

4.1.10 Position New Boot Device

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

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

1. Press **F2** when the system boots up to enter the BIOS setup utility.

2. Go to **[Boot] > [Add Boot Options]** menu.

3. Select **[First]** or **[Last]** for your newly-added boot device and press Enter.
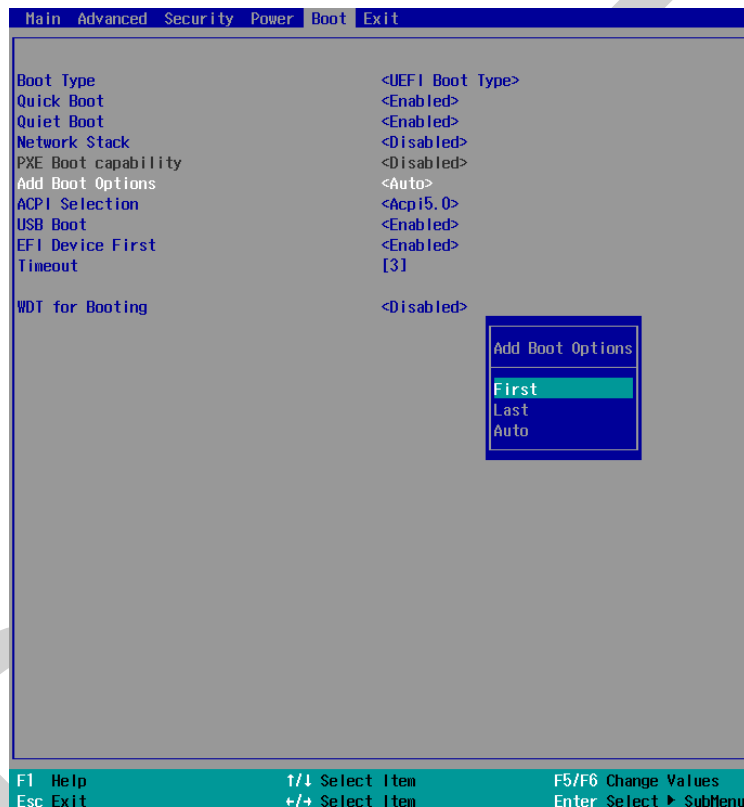
4. Once set, press **F10** to save setting and exit.

4.1.11 Watchdog Timer for Booting

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

To set the watchdog timer for boot in BIOS:

1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Boot]** menu.

3. Disable or select timeout value for **[WDT for Booting]** option.

4. Once you give a timeout value, the **[WDT Stop Option]** option appears. You can select *"Automatically after POST"* or *"Manually after Entering OS"*.

5. Press F10 to "Exit Saving Changes.

4.1.12 Legacy/ UEFI Boot Device

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


To set boot order for devices in UEFI Boot Device:

1.   When system boots up, press F2 to enter BIOS setup utility

2.   Go to **[Boot] > [UEFI Boot Device]**

3.   Highlight the device you wish to make boot order changes to and press F5/ F6 or +/ - to change device boot order.

To select boot order for devices in Legacy Boot Device:

1.   When system boots up, press F2 to enter BIOS setup utility

2.   Go to **[Boot] > [Legacy Boot Device]**, you can choose the type of device to list by selecting "By Device or By Device Type".

3.   Highlight the device you wish to make boot order changes to and press F5/ F6 or +/ - to change device boot order.

4.2   AMT Configuration

Intel® AMT (Active Management Technology) is a hardware-based technology for remotely managing target PCs via Ethernet connection. The system supports AMT function via its Ethernet port implemented with Intel I219-LM. Prior to using the AMT function to remotely control the system, you need to configure AMT password and network settings.

1.   Connect Ethernet cable to I219-LM Ethernet port (indicated in **blue**).
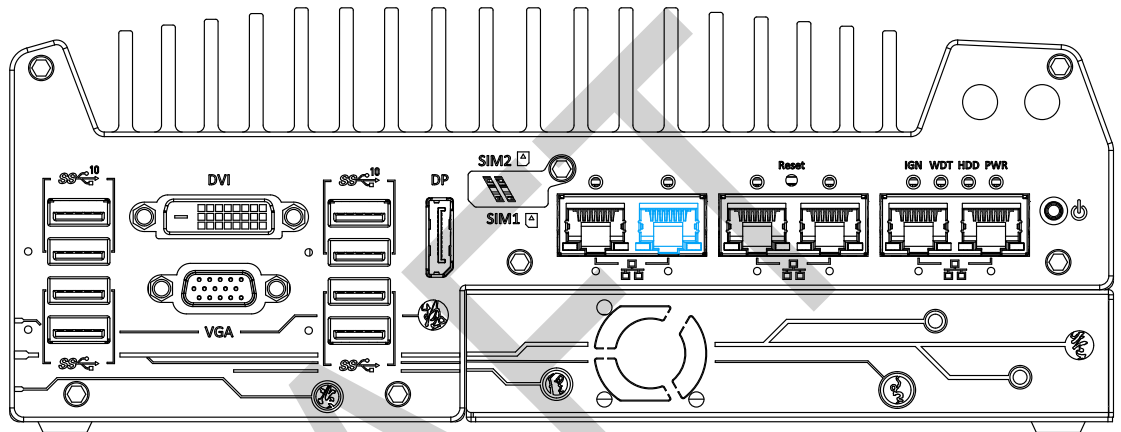
2.   When the system boots up, press F10 to enter the MEBx configuration menu.
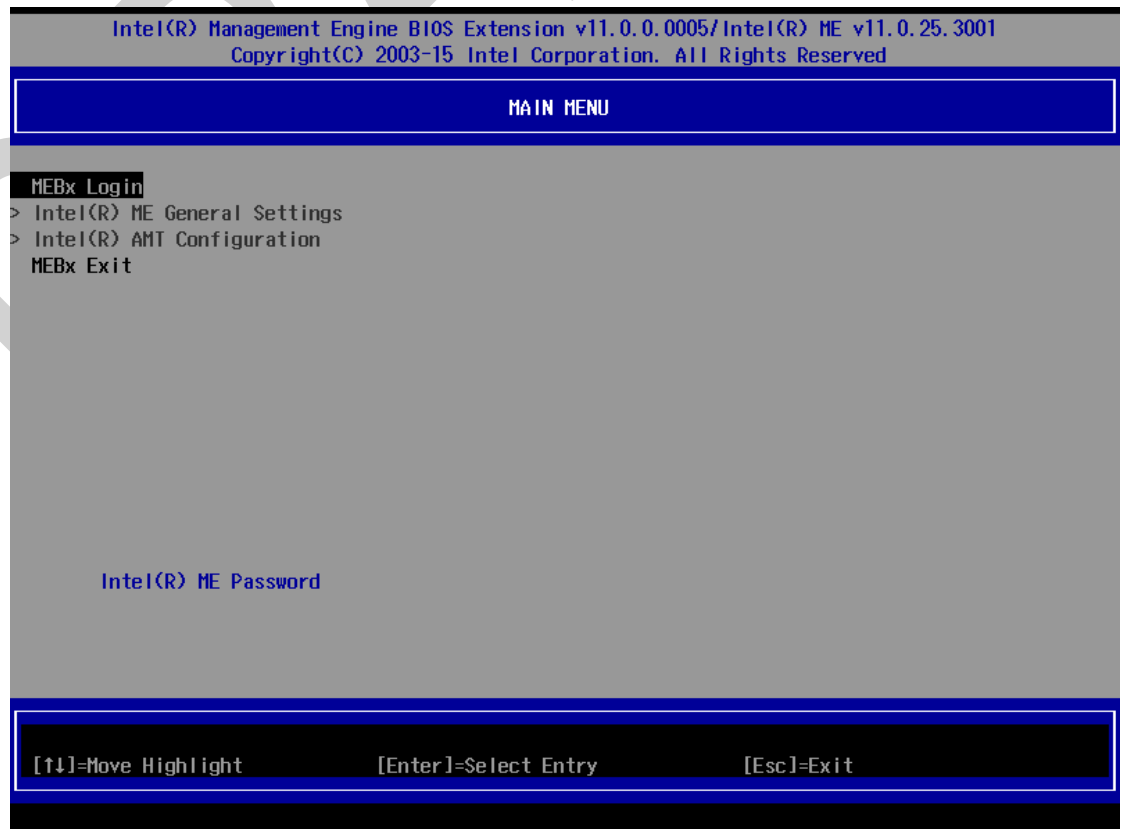
3. Highlight MEBx Login and press Enter, a prompt will appear asking for password. The default password is "admin". For further MEBx configuration details, please refer to Intel® MEBX User Guide.

4.3 RAID Configuration

The system supports RAID 0 or 1options. To utilize the RAID function, the minimum
HDDs/ SSDs must be installed for the following RAID configurations:

**RAID 0:**   Two HDDs or SSDs

RAID 1:   Two HDDs or SSDs

📝 **NOTE**

*It is recommended that the HDDs/ SSDs used are of the same model, same
capacity, rpm, etc. to avoid compatibility or performance bottleneck.*

To set up RAID configuration, you need to pre-configure the SATA mode setting in the
BIOS. Please refer to the following steps:

1. When system boots up, press **F2** to enter BIOS setup utility.

2. Go to **[Advanced] > [SATA Mode Selection]** and press ENTER.
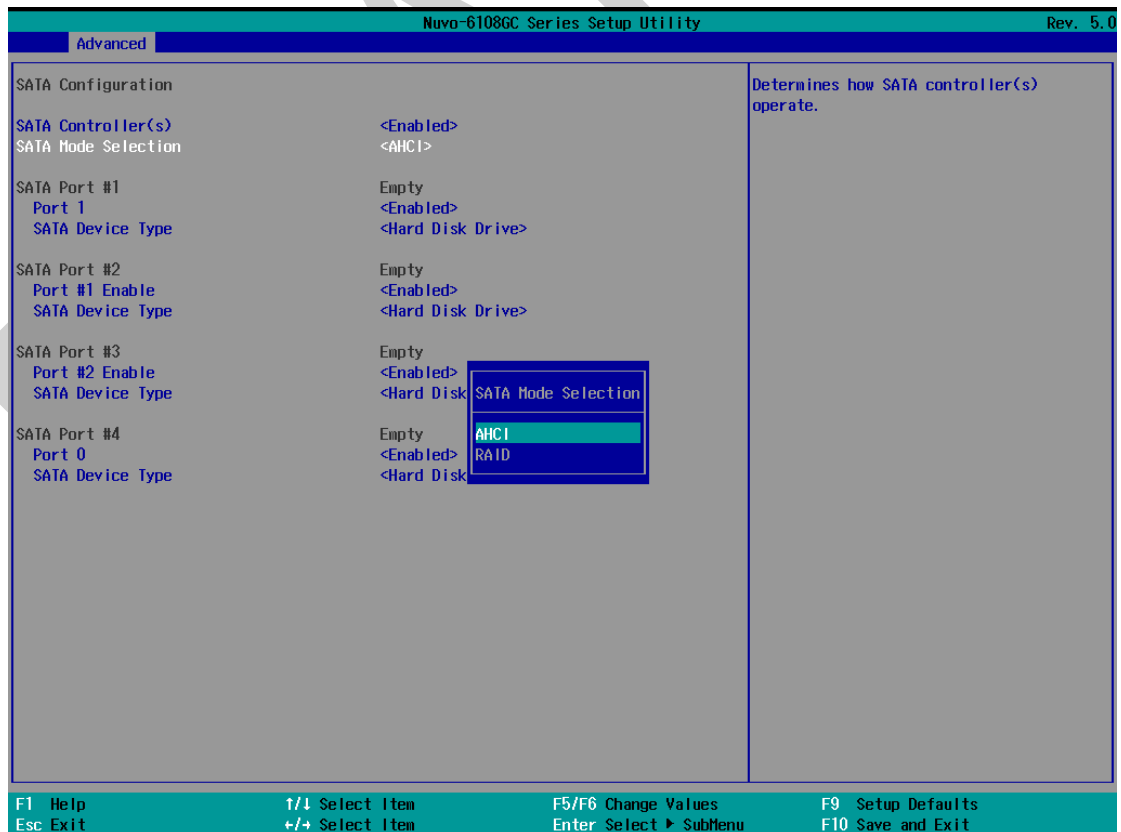
3. Highlight "**RAID**" and press ENTER to make your selection.

4. Press **F10** to Save and exit the BIOS.

5. Upon reboot, press "**Ctrl + I**" to enter the RAID configuration utility

Please refer to the on screen RAID MENU options and instructions for configuration.

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 the operating systems which have been tested by Neousys Technology.

- Microsoft Window 8 (x64)

- Microsoft Window 10 (x64)

- CentOS 7

- Debian 8.7**

- Fedora 24**

- OpenSUSE 42.1**

- Ubuntu 14.04.4 LTS and 16.04 LTS**

> ✍ **NOTE**
>
> *For Linux system, user may need to manually compile and install the driver for Intel graphics or I210 GbE controller if the driver is not embedded in kernel. You can visit Intel website for further information.*
>
> ** *For distributions, graphics driver and RAID function may not be completely implemented in its kernel. You may encounter restrictions when using these features, such as triple independent display and RAID. For optimum operation, it is the users' responsibility to manually check for new drivers and upgrades!*

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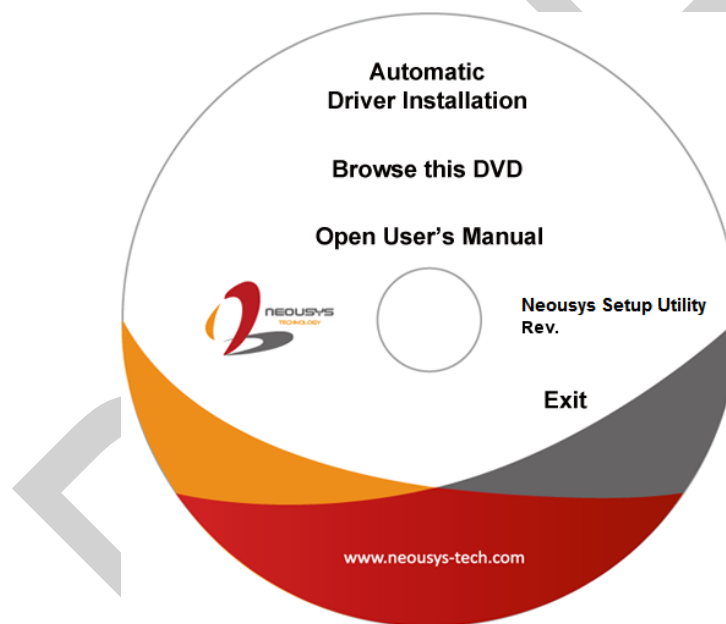
5.2   Driver Installation

The system comes with a "Drivers & Utilities" DVD that offers "one-click" driver installation process. It automatically detects your Windows operating system and installs all necessary drivers for you system with a single click.

5.2.1   Install Drivers Automatically

The system comes with a "Drivers & Utilities" DVD that offers "one-click" driver installation process. It automatically detects your Windows operating system and installs all necessary drivers for you system with a single click.

To install drivers automatically, please refer to the following procedures.

1.   Insert the "Drivers & Utilities" DVD into a USB DVD-drive connect to your system. A setup utility launches and the following dialog appears.

Click on **"Automatic Driver Installation"** and the setup utility will automatically detect your Windows operating system and install all necessary drivers. The installation process takes about 6~8 minutes depending on your Windows version. Once driver installation is done, the setup utility reboots your Windows and you may begin using your system.

5.2.2   Install Drivers Manually

You can also manually install each driver for the system. Please note when installing drivers manually, you need to install the drivers in the following sequence mentioned below.

Windows 10 (x64)

The recommended driver installation sequence is

1.   Chipset driver (x:\Driver_Pool\Chipset_10_APL\Win_ALL\SetupChipset.exe)

2.   Graphics driver (x:\Driver_Pool\Graphics_SKL_APL\Win_7_8_10_APL_64\Setup.exe)

3.   Audio driver (x:\Driver_Pool\Audio_ALC262\Win_ALL_64\Setup.exe)

4.   LAN driver (x:\Driver_Pool\GbE_I210_I350\Win_ALL_64\APPS\PROSETDX\Win10_x64\DxSetup.exe)

5.   ME driver (x:\Driver_Pool\ME_10_Series\Win_ALL_AMT\SetupME.exe)

5.3 Driver Installation for Watchdog Timer Control

Neousys provides a driver package which contain function APIs for Watchdog Timer control function. You should install the driver package (WDT_DIO_Setup.exe) in prior to use these functions. Please note that you must install WDT_DIO_Setup_v2.2.8.x or later versions.

Windows 10 (x64)

Please execute the driver setup program in the following directory.

x:\Driver_Pool\WDT_DIO\Win7_8_64\WDT_DIO_Setup_v2.2.8.x(x64).exe

Windows 10 (WOW64)

Please execute the driver setup program in the following directory.

x:\Driver_Pool\WDT_DIO\Win7_8_WOW64\WDT_DIO_Setup_v2.2.8.x(wow64).exe

5.4 Intel® Optane™ Memory BIOS Setup and Driver Installation

The system is compatible with Intel® Rapid Storage Technology that supports the installation of Intel® Optane™ memory to significantly boost traditional hard disk drive read and write performances. Intel® Optane™ memory is Intel® RST's latest system acceleration solution featuring a dual-media/ disk combination (ultrafast media for file and block caching + slow media for storage capacity) that is presented to the host OS as a single SSD. The ultrafast media utilizes PCIe NVMe SSDs that are based on Intel® Optane™ technology with read speed of up to 3000Mb/ sec and write speed of up to 2000Mb/ sec.

To setup Intel® Optane memory, please perform the following steps:

1. Press the power button to startup your system (please restart if your system is already up and running) and press F2 to enter BIOS.

2. Go to "Advanced > SATA And RST Configuration".

3. Go to "SATA Mode Selection", press the Enter key to bring up options, select "Intel
    RST Premium With Intel Optane System Acceleration" and press the Enter key to
    select the option.
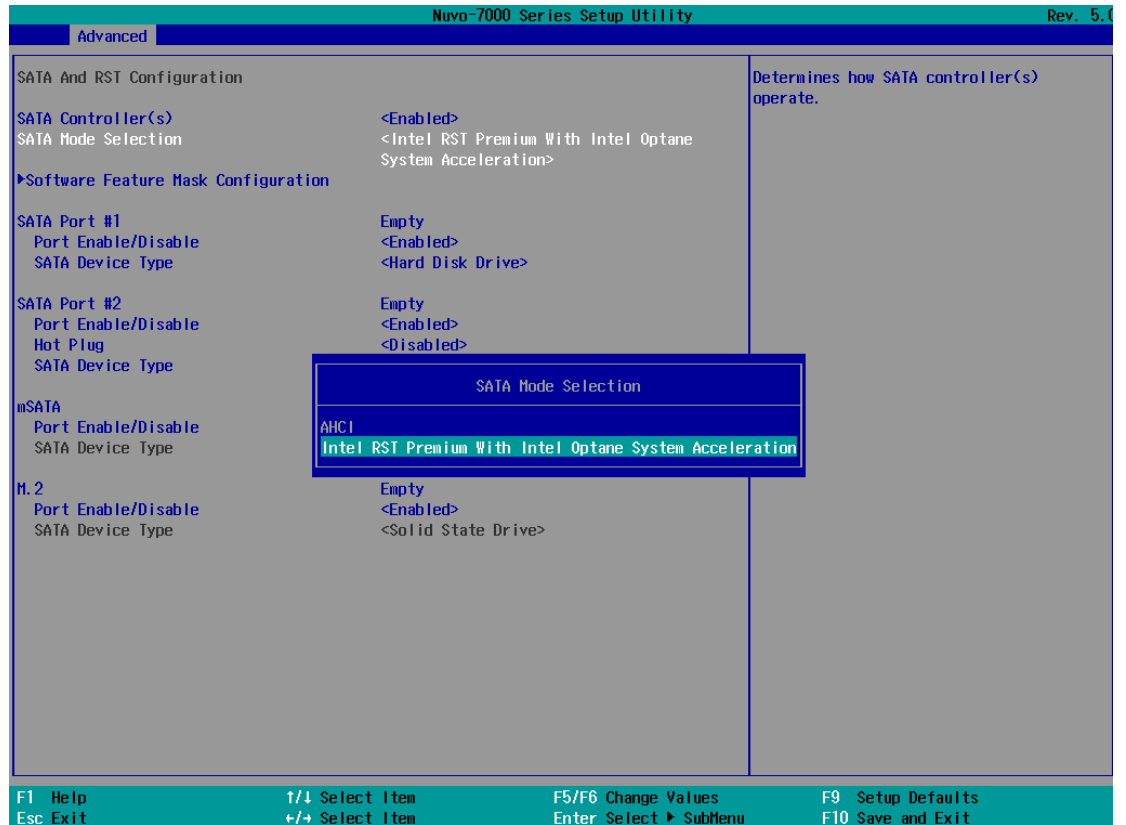
4. Go to "M.2 2280 NVMe Storage Device" and press the Enter key to bring up the selection, select "RST Controlled" and press the Enter key to select the option.
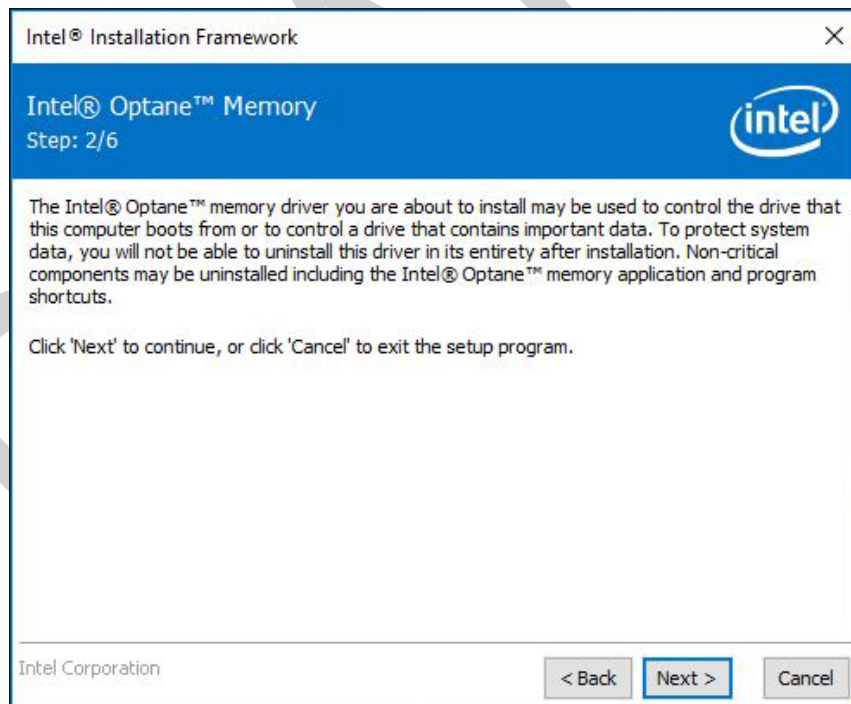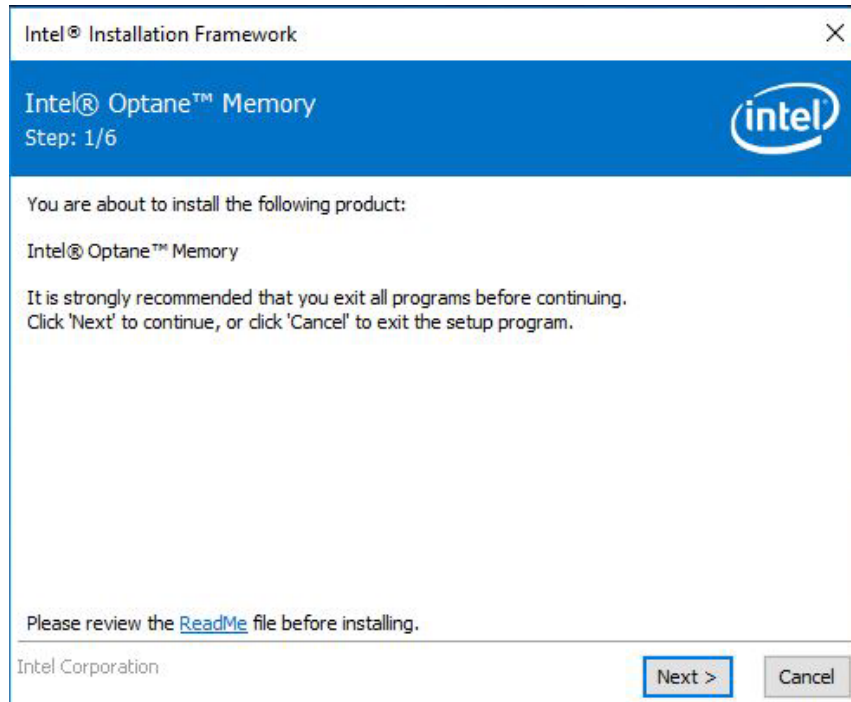

5. Press F10 to save and exit, and allow the system to boot into Windows.

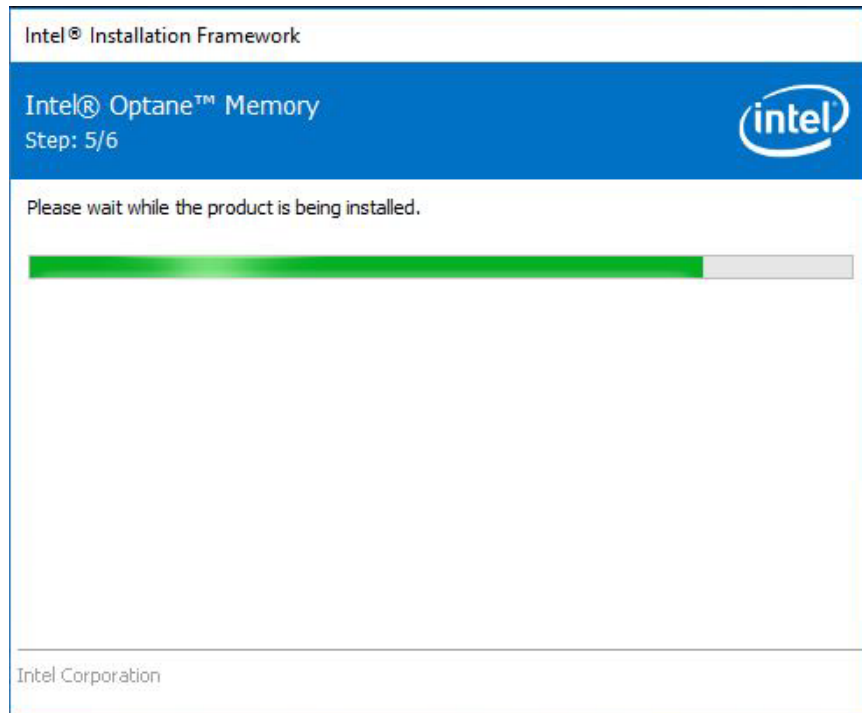6. In Windows, download Intel® RST driver if you don't already have it on hand. Right-click on the SetupOptaneMemory.exe and left-click on "Run as administrator" to execute the setup file.

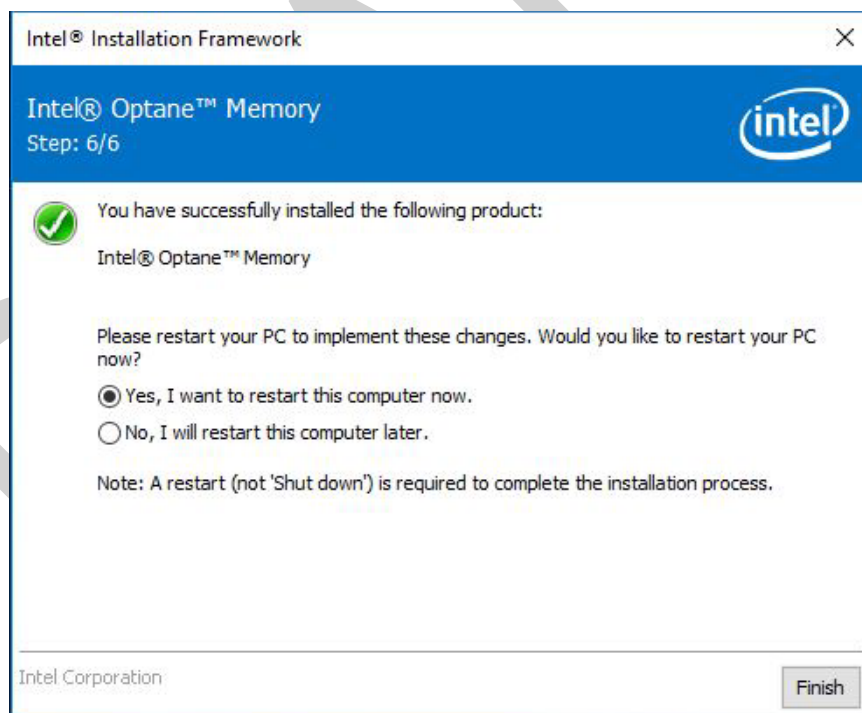7. Follow the 6 step setup procedure as instructed.

8.   Check the "I accept the terms in the License Agreement" box and click on "Next >"
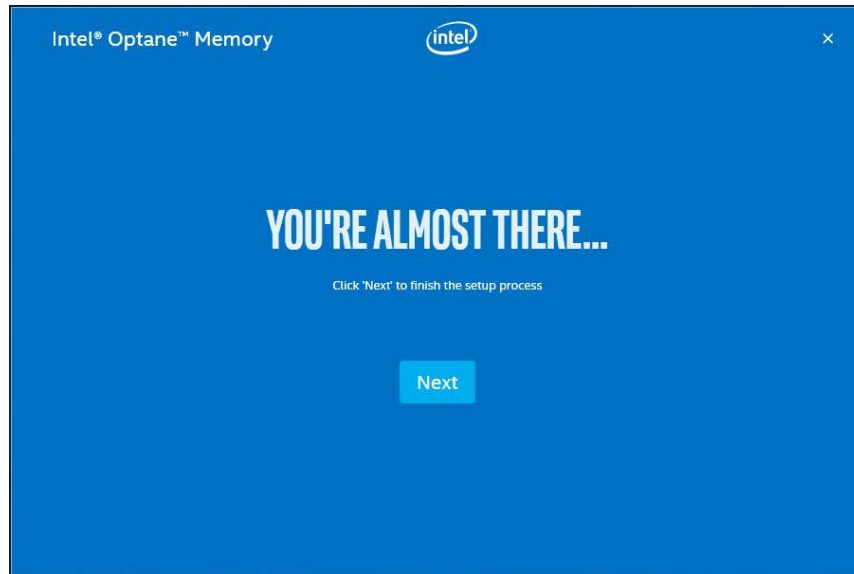   to continue the installation process.
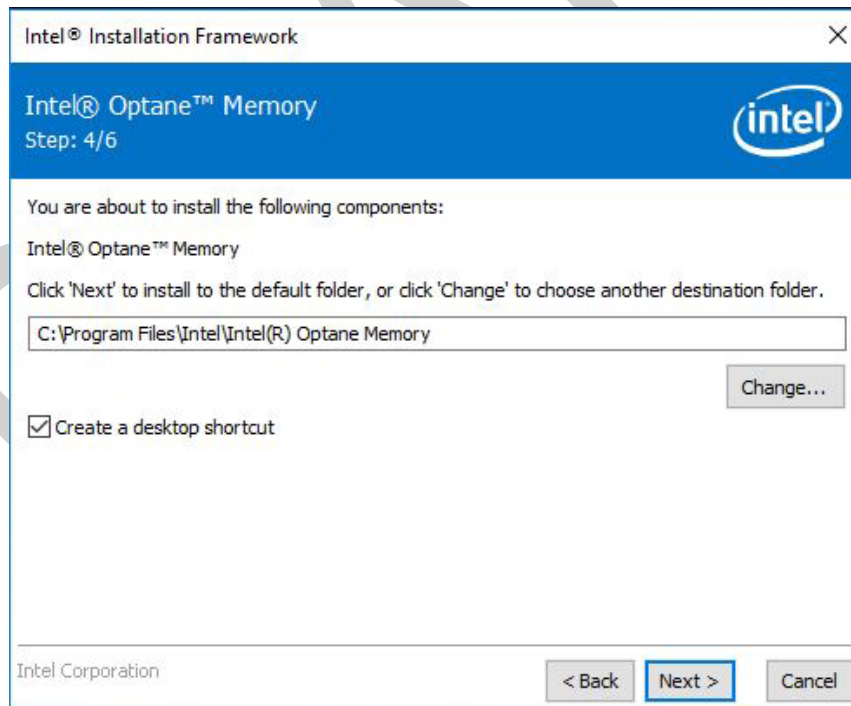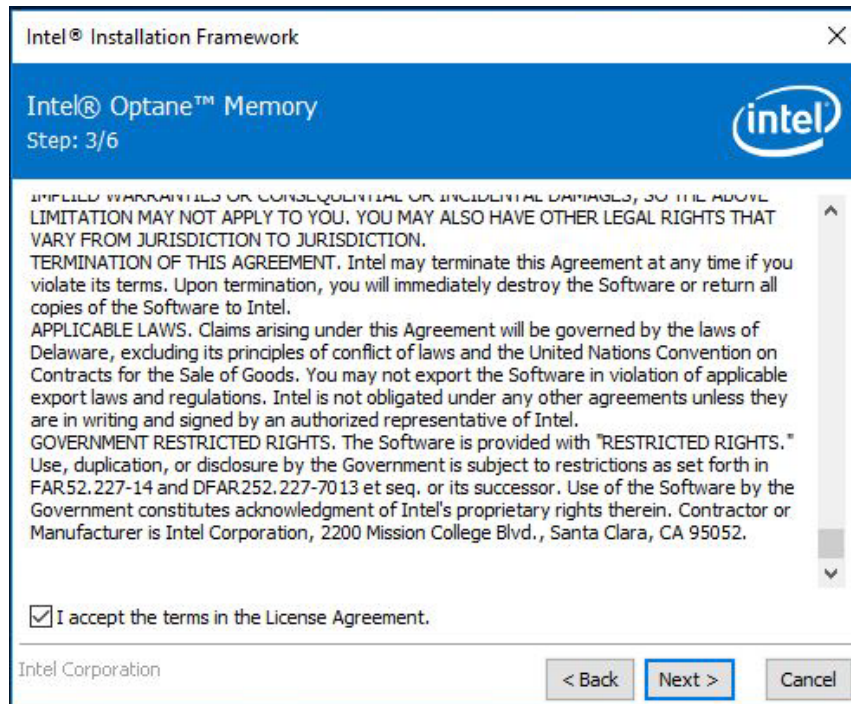
9.   When done, click on "Finish" and restart the system.

10. Upon system restart, the following initialization screen will appear. Click on Next to continue.

11. In the Setup section, you will see your Intel® Optane™ memory drive and compatible drive(s) that can be accelerated. Click on the downward arrow to bring up a selection of drives to be accelerated. Click on "Enable" when ready.
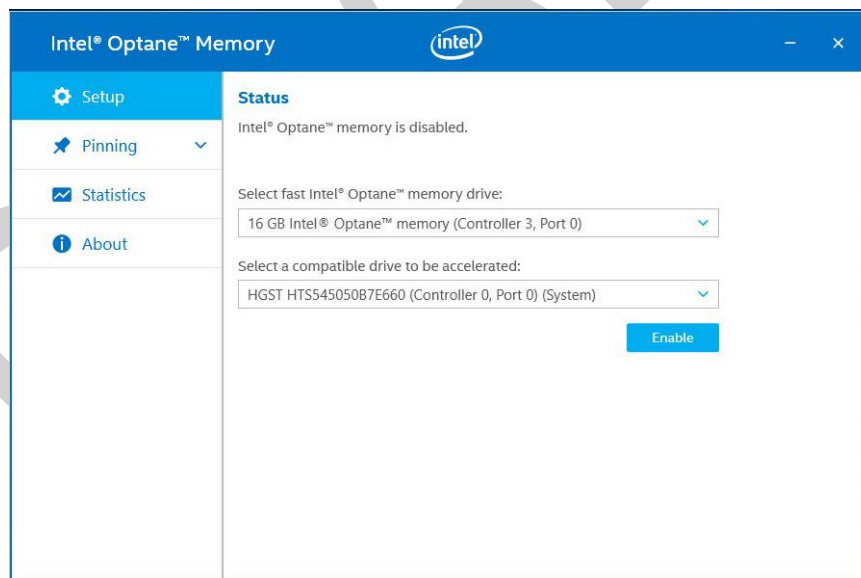
12. The data backup warning will appear, please backup any data you may have stored on your Intel® Optane™ memory module before proceeding. Check the box "Erase all data on Intel® Optane™ memory module" and click on Continue.
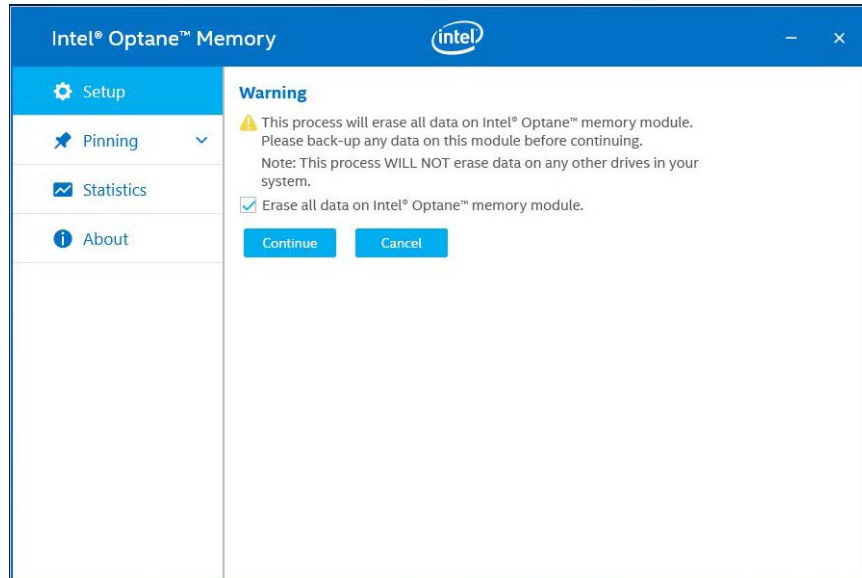
13. When the Intel® Optane™ memory module has been enabled, the installation window and a notification window at the bottom right corner will prompt you to restart the system.
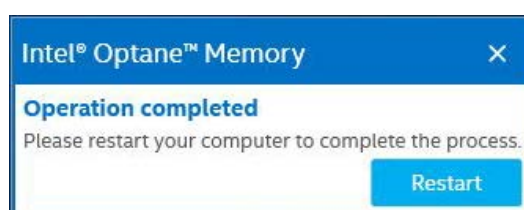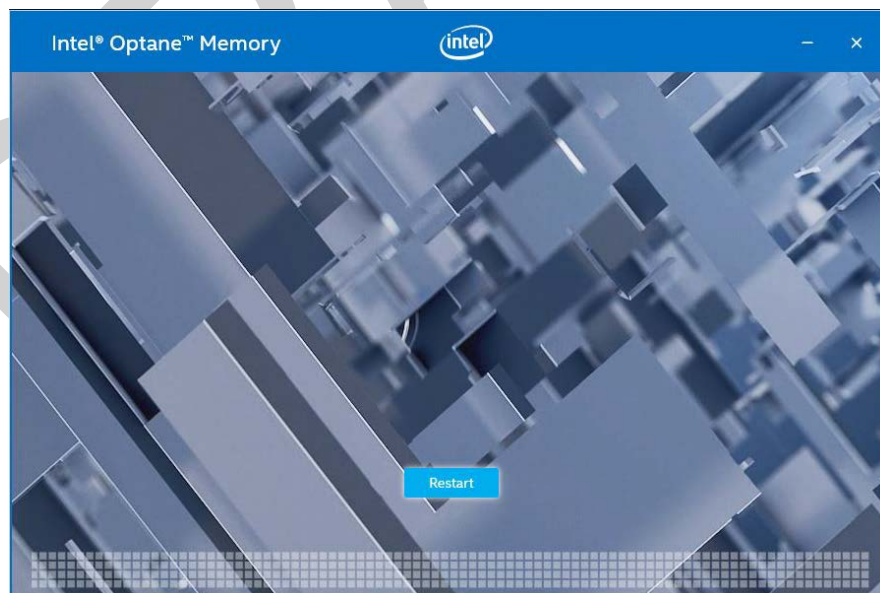
14. Upon system restart, a successful enablement message will appear to indicate the Intel® Optane™ memory module has been enable successfully.
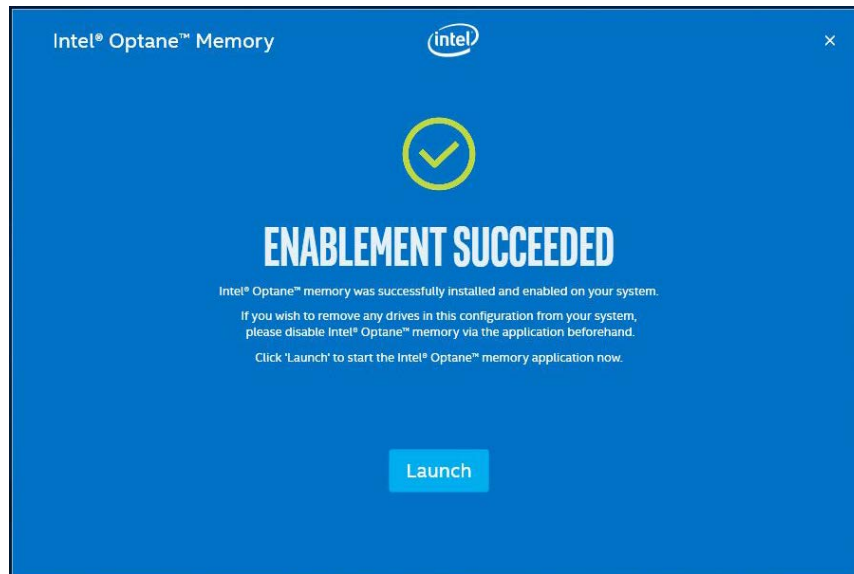
15. Once enabled, the RST software Setup section should show your configuration information.
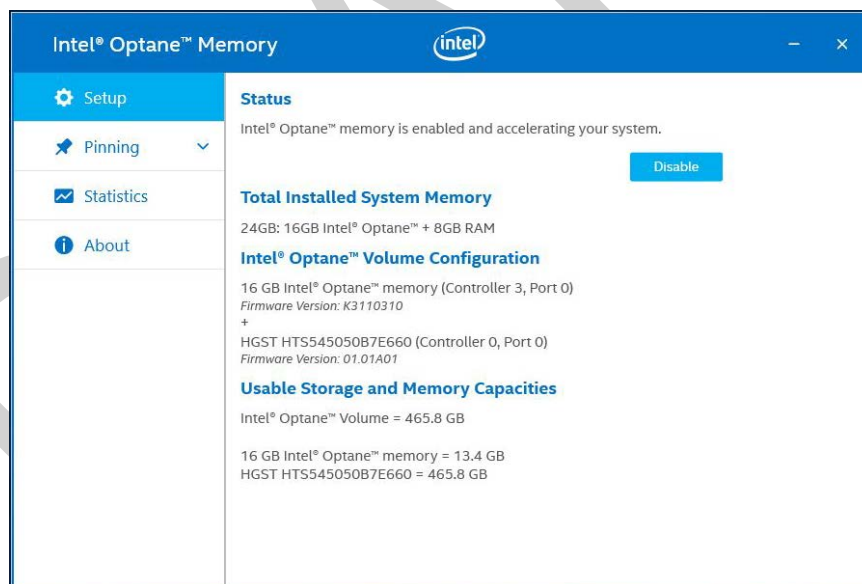
Appendix A Using WDT & DIO

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

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

Installing WDT_DIO Library

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

- For Windows 10 64-bit OS with 64-bit application (x64 mode), please install WDT_DIO_Setup_v2.2.8.x(x64).exe or later version.

- For Windows 10 64-bit OS with 32-bit application (WOW64 mode), please install WDT_DIO_Setup_v2.2.8.x(wow64).exe or later version.

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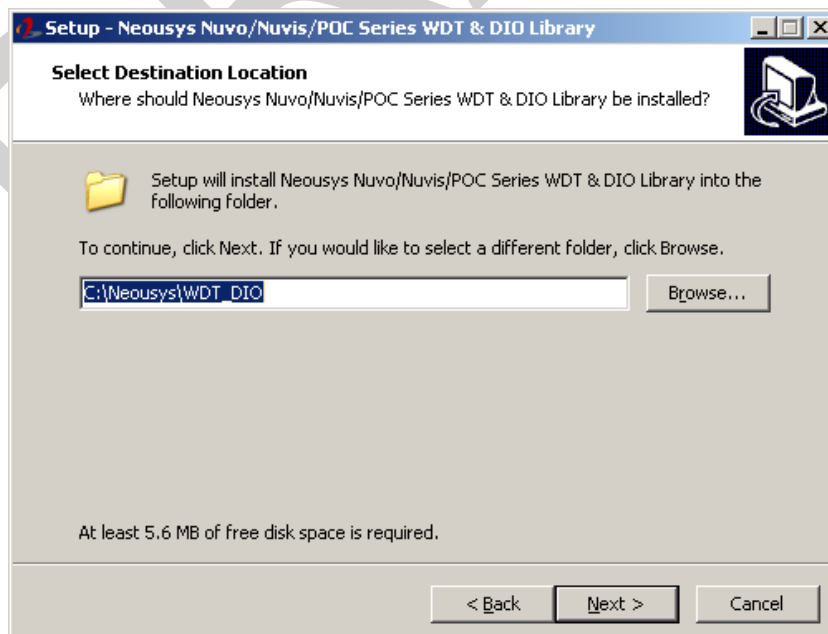
To setup WDT & DIO Library, please follow instructions below.

1. Execute **WDT_DIO_Setup.2.2.8.x.exe**. and the following dialog appears.
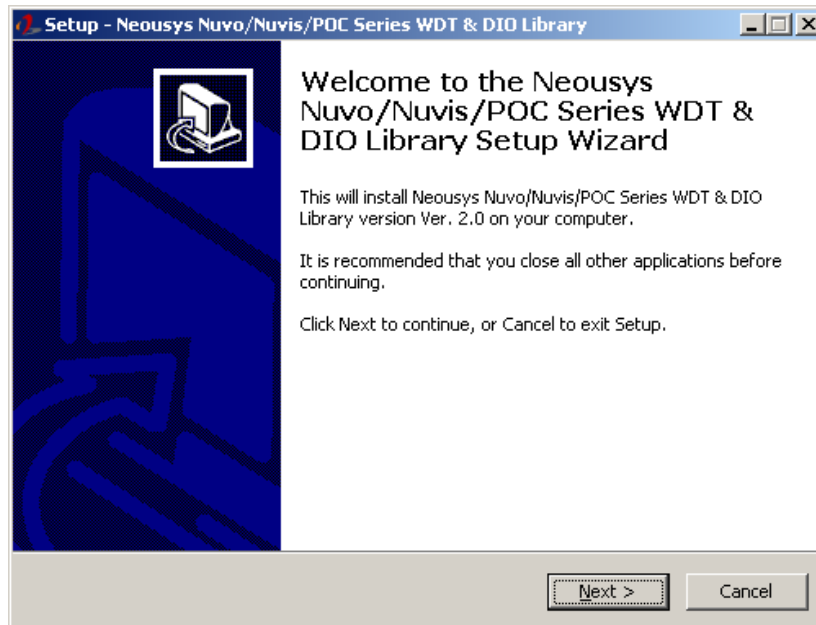
2. Click "Next >" and specify the directory of installing related files. The default directory is *C:\Neousys\WDT_DIO*.

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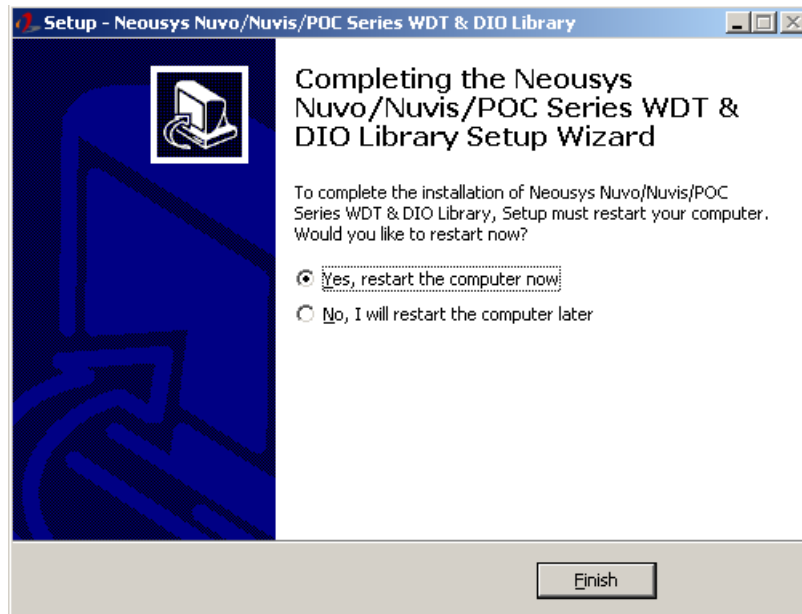
4. When programming your WDT or DIO program, the related files are located in

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

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WDT Functions

InitWDT

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

SetWDT

Syntax	BOOL SetWDT(WORD tick, BYTE unit);
Description	Set timeout value and unit for watchdog timer. When InitWDT() is invoked, a default timeout value of 255 seconds is assigned.

Parameter	*tick*
	        WORD value (1 ~ 65535) to indicate timeout ticks.
	unit
	        BYTE value (0 or 1) to indicate unit of timeout ticks.
	        0 : unit is minute
	        1: unit is second

Return Value	If value of unit is correct (0 or 1), this function returns TRUE, otherwise FALSE.

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

StartWDT

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

ResetWDT

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

StopWDT

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

Appendix B PoE On/ Off Control

Nuvo-7000series offer 802.3at PoE+ ports and users are allowed to manually turn on or off the power supply of each PoE port. This can be useful in power device (PD) fault-recovery or power reset. The APIs are part of Neousys WDT_DIO driver package. Please follow the instructions in Appendix A Watchdog Timer & Isolated DIO for installation before programming PoE on/off control function.

✎ **NOTE**

Nuvo-7000E/P series will be shown in illustrations for demonstration purposes.

## GetStatusPoEPort

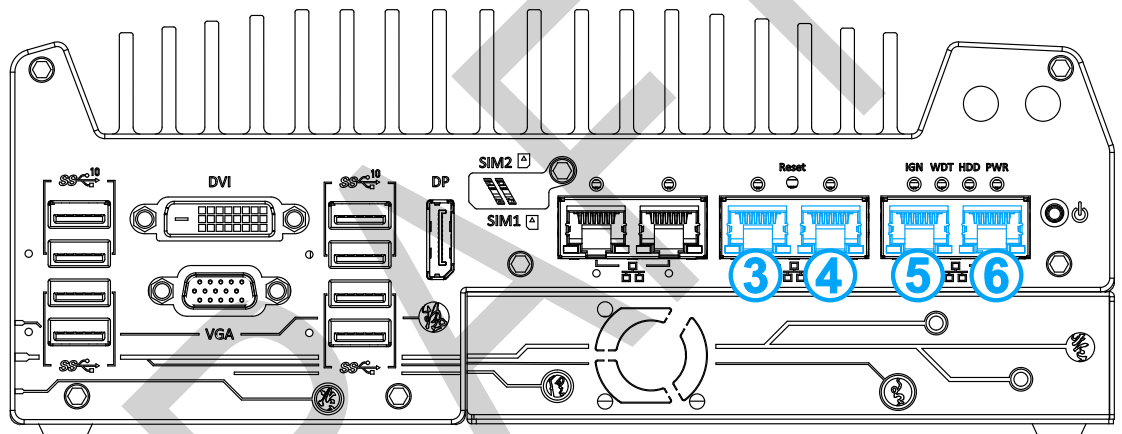|	
Syntax	BYTE GetStatusPoEPort (Byte port);
Description	Get current on/off status of designated PoE port.
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* should be a value of 3 ~ 6
Return Value	BYTE value indicating PoE on/off status 0 if port is disabled (off) 1 if port is enabled (on)
Usage	BYTE bEnabled = GetStatusPoEPort (1); //Get on/off status of PoE Port#1
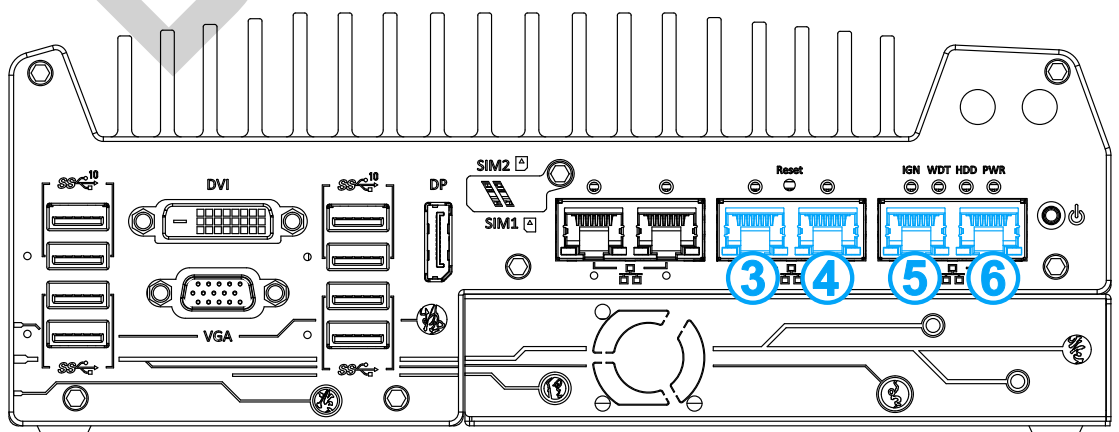
PoE+ ports on the front panel.

EnablePoEPort

Syntax	BOOL EnablePoEPort (BYTE port);
Description	Turn on PoE power of designated PoE port.
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* should be a value of 3 ~ 6
Return Value	**TRUE** if enabled success **FALSE** if fail to enable.
Usage	BOOL bRet = EnablePoEPort (1); //Turn on PoE Port#1
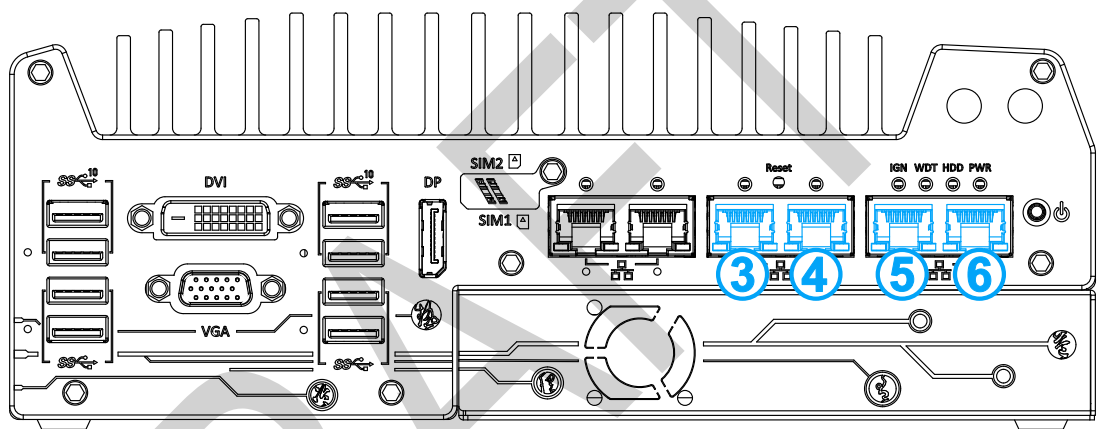
PoE+ ports on the front panel.

DisablePoEPort

Syntax	BOOL DisablePoEPort (BYTE port);
Description	Turn off PoE power of designated PoE port
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* should be a value of 3 ~ 6
Return Value	**TRUE** if disabled success **FALSE** if fail to disable
Usage	BOOL bRet = DisablePoEPort (1); //Turn off PoE Port#1

PoE+ ports on the front panel