Neousys Technology Inc.

Nuvo-5608VR

User Manual

Rev. 1.0

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Declaration of Conformity

FCC

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

CE

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

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Safety Precautions

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

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 Technology Nuvo-5608VR fanless mobile surveillance system. The fanless systems support Intel 6th generation quad-core CPUs, IP cameras and massive storage capacity to provide exceptional performance for emerging intelligent surveillance/ security applications.

Revision History

Version	Date	Description
1.0	Nov. 2018	Initial release

1 Introduction

Nuvo-5608VR fanless mobile surveillance system is designed for real-time video analysis and streaming. It incorporates 6th-Gen Core™ i CPU, IP camera connectivity and massive storage capacity for emerging intelligent surveillance/ security applications.

1.1 Nuvo-5608VR Overview

Featuring eight IEEE 802.3at Gigabit PoE ports, Nuvo-5608VR is able to provide power and collect high-definition video streams from multiple IP cameras with just Ethernet cables! Its 6th-Gen Core™ i7 CPU is capable of processing real-time video analysis. In addition, Nuvo-5608VR can accommodate up to two 3.5" hard drives configured in RAID 0 or 1 to support more than 24TB storage capacity to store high-resolution video for over three months.

Nuvo-5608VR features two Neousys' patented technologies. One, a dedicated 3.5" HDD heat-spreader design for optimal thermal performance that ensures HDDs function flawlessly 24/7 in fanless conditions.

Two is Neousys' patented damping-bracket and four gaskets to achieve anti-vibration of at least 1 Grms. It can protect the system against vibration in a harsh environment and in-vehicle applications such as truck, bus, and railway.

As a fanless surveillance platform, Nuvo-5608VR has wide-range DC input from 8V to 35V and wide operating temperature from -25℃ to 70℃. Furthermore, Nuvo-5608VR provides rich functions for in-vehicle application, such as ignition power control, four full-size mPCIe sockets with SIM support and built-in CAN bus 2.0.

1.2 Nuvo-5608VR Specifications

1.2.1 Nuvo-5608VR Specification

System Platform	
Processor	Supports 6th-Gen Intel® Core™ i7/ i5/ i3 LGA1151 CPU ● Intel® Core™ i7-6700 (8M Cache,3.4/ 4.0 GHz, 65W TDP) ● Intel® Core™ i5-6500 (6M Cache, 3.2/ 3.6 GHz, 65W TDP) ● Intel® Core™ i3-6100 (3M Cache, 3.7 GHz, 51W TDP) ● Intel® Core™ i7-6700TE (8M Cache, 2.4/ 3.4 GHz, 35W TDP) ● Intel® Core™ i5-6500TE (6M Cache, 2.3/ 3.3 GHz, 35W TDP) ● Intel® Core™ i3-6100TE (4M Cache, 2.7 GHz, 35W TDP)
Chipset	Intel® Q170 Platform Controller Hub
Graphics	Integrated Intel® HD Graphics 530
Memory	2x 260-pin SO-DIMM sockets, up to 32 GB DDR4 2133 MHz SDRAM
AMT	Supports AMT 11.0
TPM	Supports TPM 2.0
I/O Interface	
Ethernet	2x Ethernet ports by Intel® I219 and I210
PoE+	8x IEEE 802.3at (25.5W) Gigabit PoE+ ports by Intel® I210, 120W total power budget*
Video Port	1x VGA supporting maximum 1920 x 1200 resolution 1x DVI-D supporting maximum 1920 x 1200 resolution 2x DisplayPort outputs, supporting maximum 4096 x 2304 resolution
USB	4x USB 3.0 ports via native xHCI controller 4x USB 2.0 ports
Serial Port	2x software-programmable RS-232/422/485 (COM1 & COM3) 1x RS-232 port (COM2)
CAN	1x CAN 2.0 port
Isolated DIO	4x isolated DI and 4x isolated DO
Audio	1x microphone-in and 1x speaker-out
Storage Interface	
SATA HDD	2x internal SATA port for 3.5” HDD installation (support RAID 0/1)
mSATA	1x full-size mSATA (mux with mPCIe)
Expansion Bus	
Mini PCI-E	1x full-size mPCIe socket with panel-accessible SIM socket 1x full-size mPCIe socket with internal SIM socket (mux. with mSATA) 2x full-size mPCIe sockets (USB signals only) with internal SIM sockets

Power Supply & Ignition Control	
DC Input	1x 3-pin pluggable terminal block for 8~35VDC DC input
Remote Ctrl. & Status Output	1x 10-pin (2x5) wafer connector for remote on/off control and status LED output
Max. Power Consumption	With Core™ i7-6700TE: 49.2W (2.05A@24V)* With Core™ i5-6500TE: 47.8W (1.99A@24V)* With Core™ i3-6100TE: 39.4W (1.64A@24V)*
Mechanical	
Dimension	240 mm (W) x 225 mm (D) x 98 mm (H)
Weight	3.5 kg (approx.)
Mounting	Neousys' patented damping bracket
Environmental	
Operating Temperature	-25°C ~ 70°C (with mSATA/SSD) ** -10°C ~ 60°C (with 3.5" HDD) **/***
Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, 1 Grms, 5-500 Hz, 3 Axes (w/ HDD and damping bracket installed, according to IEC60068-2-64)
Shock	Operating, 30 Grms, Half-sine 11 ms Duration (w/ HDD and damping bracket installed, according to IEC60068-2-27)
EMC	CE/FCC Class A, according to EN 55022 & EN 55024

* The total power budget for Nuvo-5608VR is related to the input voltage. 120W total budget is available with 24 VDC input. When 12 VDC input is applied, the total power budget is limited to 100W.

** Operating temperature is verified with 100% CPU loading and 100% HDD loading applied using Passmark® BurnInTest 8.0. For detail testing criteria, please contact Neousys Technology.

*** Depending on the HDD selected, users may encounter performance degradation in sequential disk write at low/high ambient temperature. No data integrity issue was observed at -10°C ~ 60°C operating temperature range.

NOTE

When running CPUs with greater than 35W TDP, the maximum operating temperature shall be limited to 50°C and thermal throttling may occur when sustained full-load is applied. Users can configure CPU power in BIOS to obtain higher operating temperature.

1.3 Isolated DIO Specifications

Isolated Digital Input	
No. of Channel	4-CH Isolated Digital Input Channels
Logic Level	Logic High: 5 to 24V Logic Low: 0 to 1.5V
Isolated Voltage	2500 Vrms
Input Resistance	1kΩ
Operation Mode	Polling I/O, Change-of-State Interrupt
Isolated Digital Output	
No. of Channel	4-CH Isolated Digital Output Channels
Sink Current (per channel)	100 mA (sustained loading) 250 mA (peak loading)
Isolated Voltage	2500 Vrms
Operation Mode	Polling, Change-of-State Interrupt
Output Type	Power MOSFET + Analog Device iCoupler®
Operation Mode	Polling I/O and Change-of-State interrupt for DI

1.4 Supported CPUs

Nuvo-5608VR accepts Intel® 6th Gen. i7/i5/i3 processor via the LGA1151 CPU socket. Nuvo-5608VR supports the following CPUs

- Intel® Core™ i7-6700 (8M Cache,3.4/ 4.0 GHz, 65W TDP)
- Intel® Core™ i5-6500 (6M Cache, 3.2/ 3.6 GHz, 65W TDP)
- Intel® Core™ i3-6100 (3M Cache, 3.7 GHz, 51W TDP)
- Intel® Core™ i7-6700TE (8M Cache, 2.4/ 3.4 GHz, 35W TDP)
- Intel® Core™ i5-6500TE (6M Cache, 2.3/ 3.3 GHz, 35W TDP)
- Intel® Core™ i3-6100TE (4M Cache, 2.7 GHz, 35W TDP)

Alternatively, you may also select a processor from Intel's Embedded solution "Products formerly Skylake" that utilizes LGA1151 CPU socket.

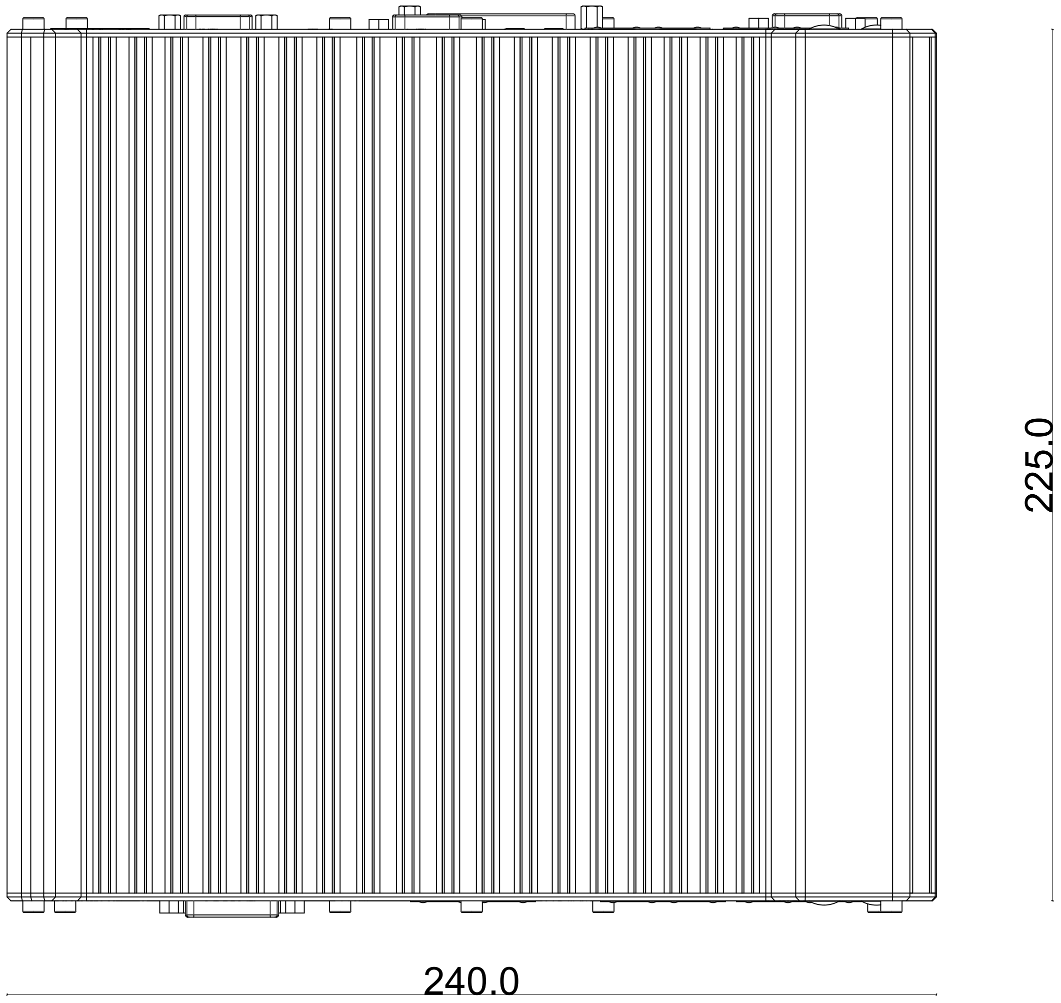
NOTE

Other processors may result in different overall system power consumption or generate excess heat. Avoid using CPUs not tested by Neousys Technology, as Neousys Technology may not be able toguarantee the system's stability and functionality under its designated working environment.

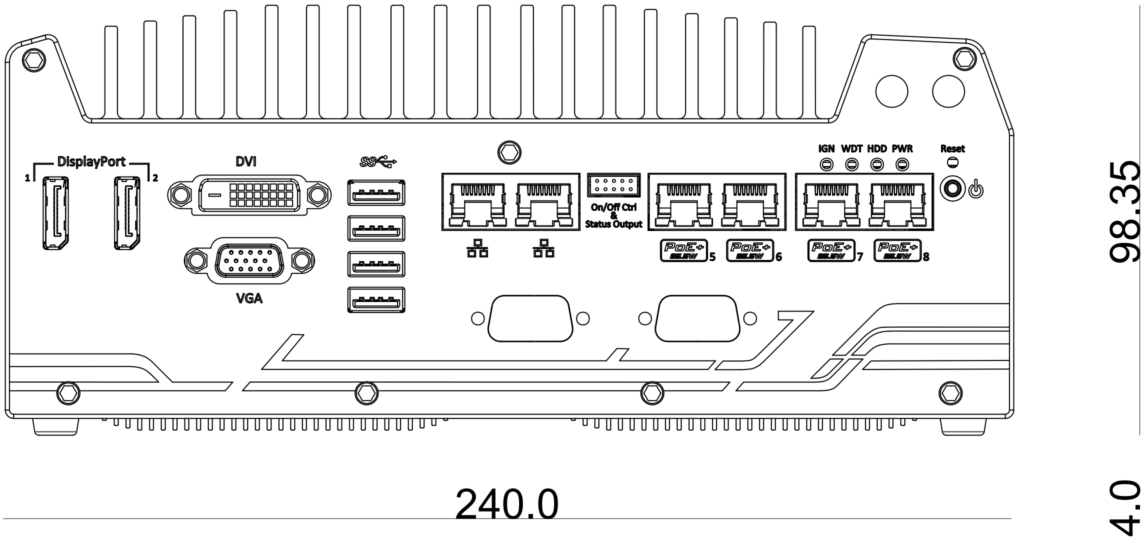
If in doubt, please contact Neousys technical support!

1.5 Dimension

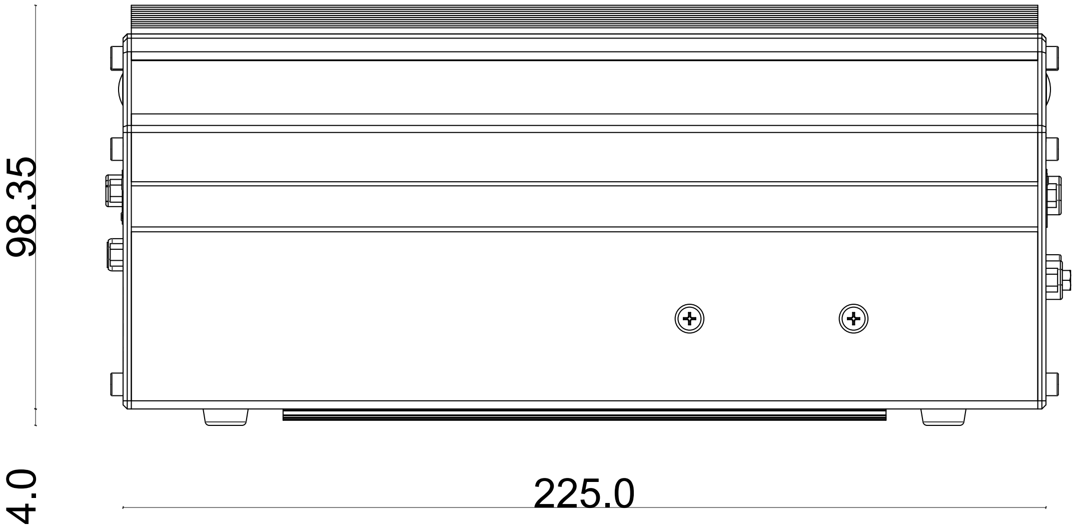
1.5.1 Superior View



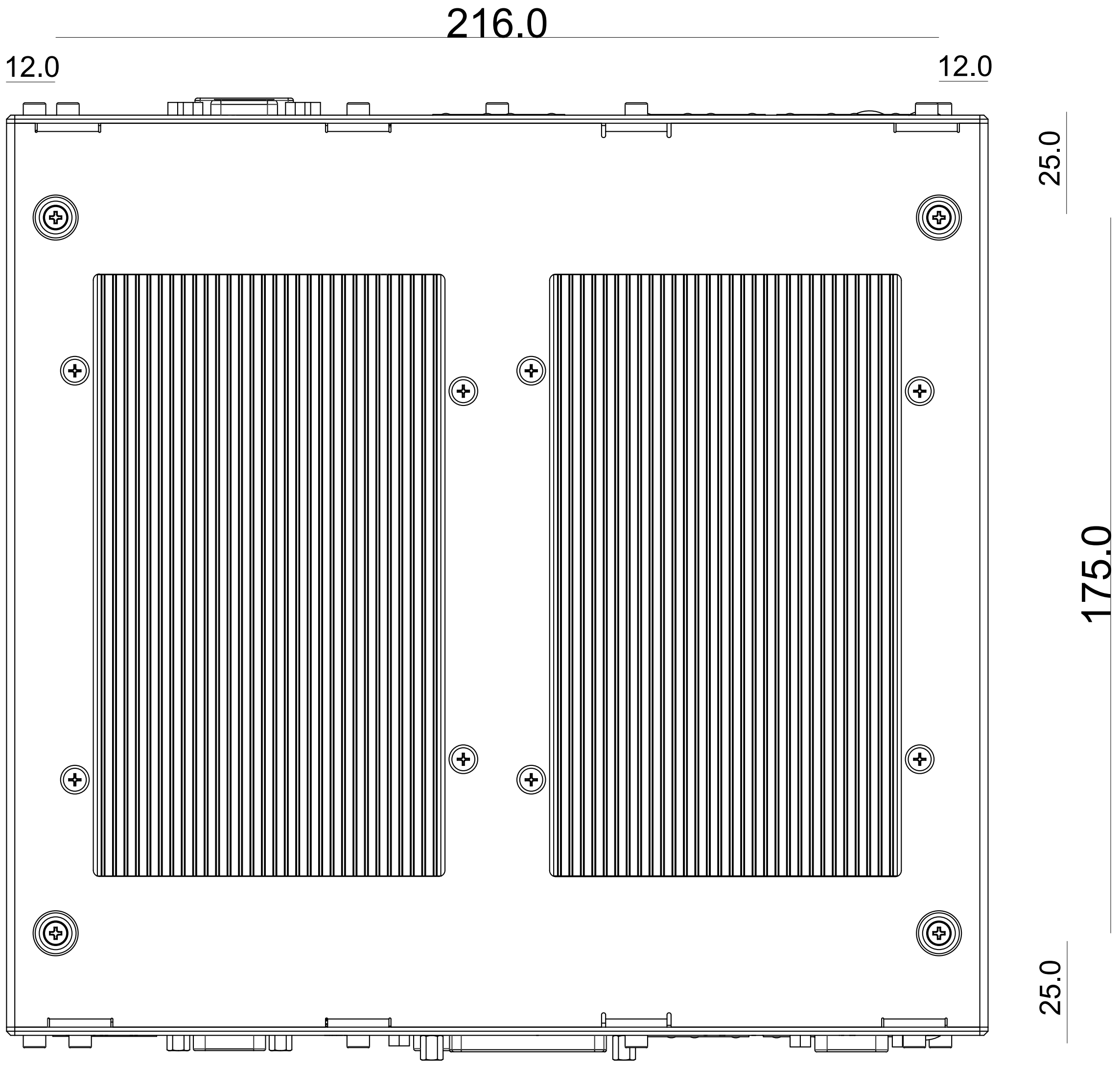
1.5.2 Front Panel View



1.5.3 Side View

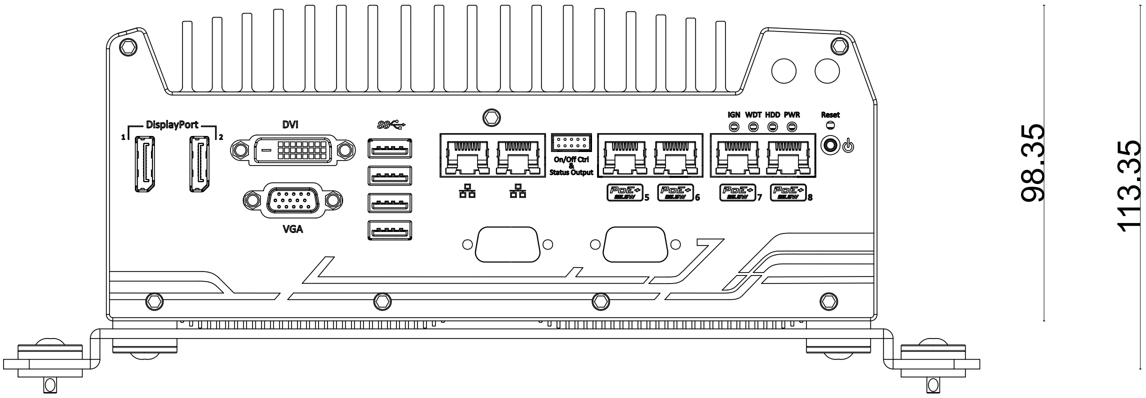


1.5.4 Bottom View

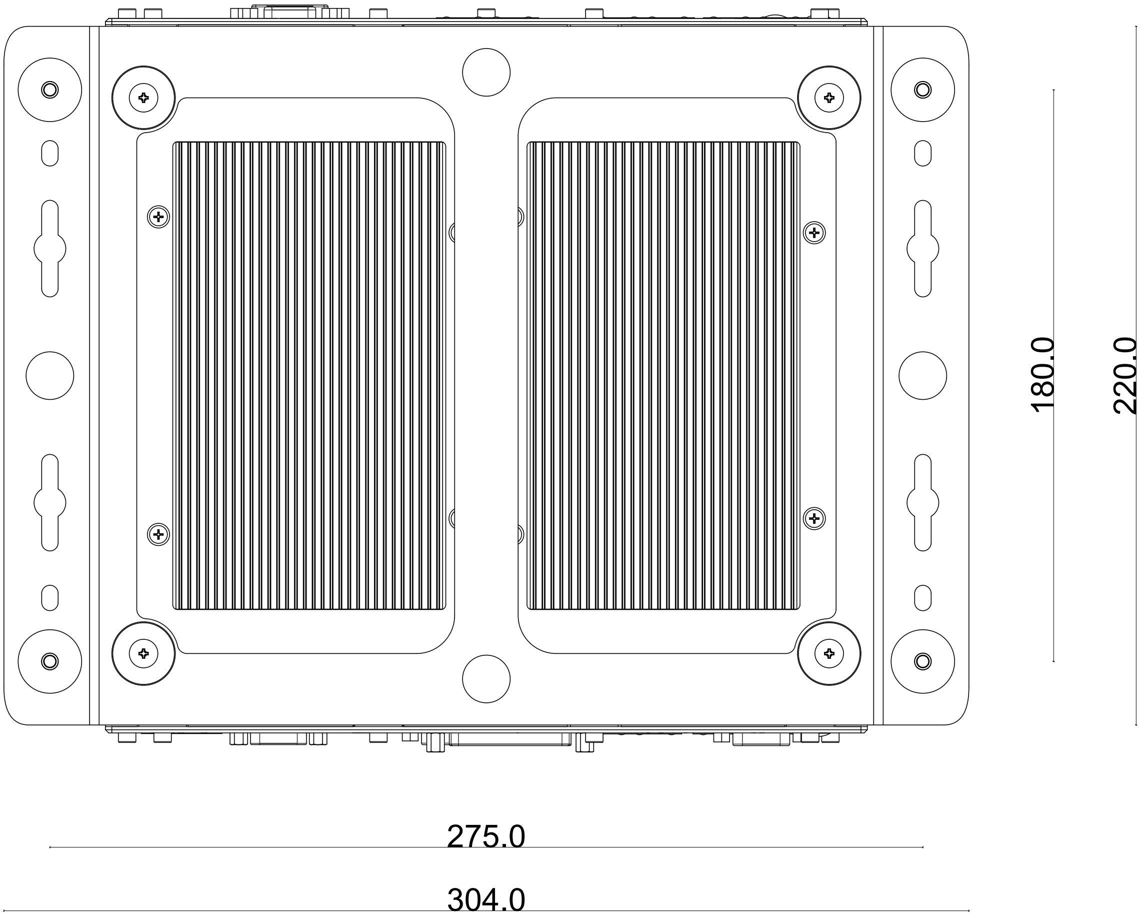


1.5.5 Dimensions with Mount Bracket/ Anti-vibration Grommet

Front Panel View



Bottom View



2 System Overview

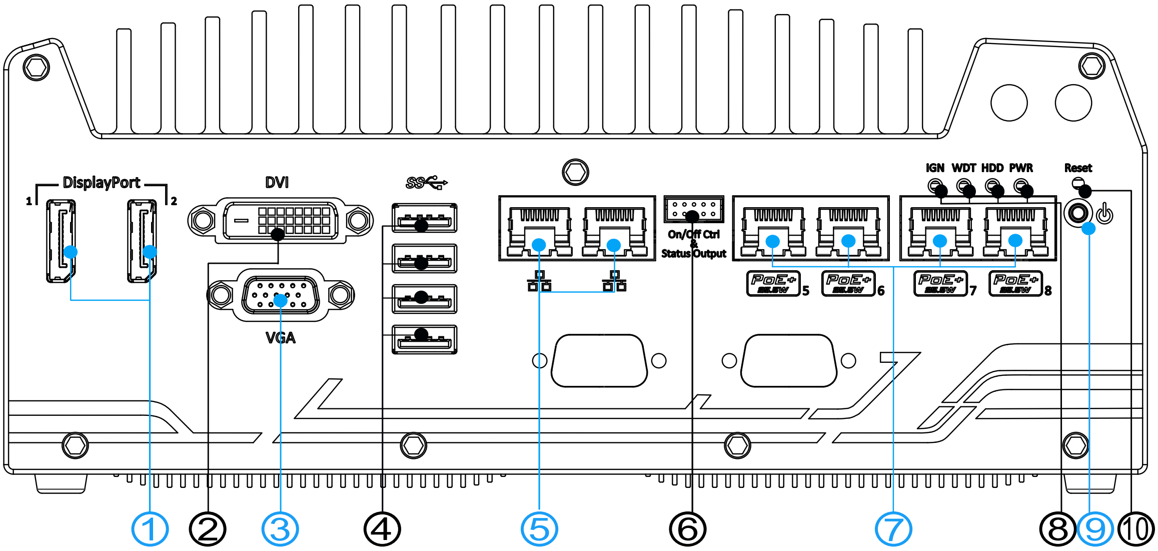
Upon receiving and unpacking your Nuvo-5608VR system, please check immediately if the package contains all the items listed in the following table. If any item(s) are missing or damaged, please contact your local dealer or Neousys Technology.

2.1 Nuvo-5608VR Packing List

System Pack	Nuvo-5608VR	Qty
1	Fanless in-vehicle controller / computer (If you ordered CPU/ RAM/ HDD, please verify these items)	1
2	Accessory box, which contains ● Neousys drivers &utility DVD ● Damping bracket (with shock-absorbing grommets) ● 3-pin power terminal block ● Screw pack	 1 1 1 1

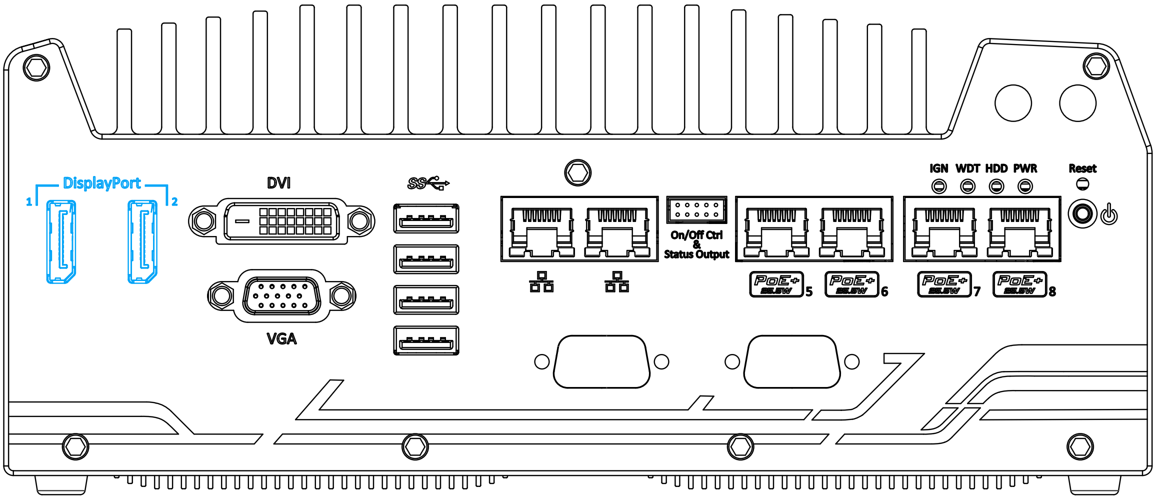
2.2 Nuvo-5608VR Front Panel

Neousys Nuvo-5608VR front panel offers plenty of I/O ports. Please refer to the following table.



No.	Item	Description
1	DisplayPort 1 & 2	Support display resolutions up to 4096 x 2304. Compatible with HDMI/ DVI via respective adapter/ cable (support resolution may vary).
2	DVI port	DVI-D output supports resolution up to 1920x1200@60Hz and is compatible with other digital connections via an adapter
3	VGA port	VGA output supports resolution up to 1920x1200@60Hz
4	USB 3.0 port	USB 3.0 port supports up to 5Gbit/s data transfer bandwidth.
5	GbE ports	Gigabit Ethernet ports offer fast network access.
6	On/ off control & status output	Allows for external switch extension when the system is placed inside a cabinet.
7	PoE+ GbE port	Power over Ethernet (PoE) port can provide both data connection and electric power to devices (eg. IP camera).
8	System status LEDs	Four system LEDs, Ignition control (IGN), Watchdog Timer (WDT), Hard Disk Drive (HDD) and Power (PWR).
9	Power button	Use this button to turn on or shutdown the system.
10	Reset button	Use this button to manually reset the system.

2.2.1 DisplayPort



The system has dual DisplayPort (DP) outputs which are digital display interfaces that mainly connect a video source and carry audio to a display device. When connecting a single DP, it can deliver up to 4096 x 2304 resolution and each port can deliver up to 2880 x 1800 resolution when both DPs are connected in conjunction. 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

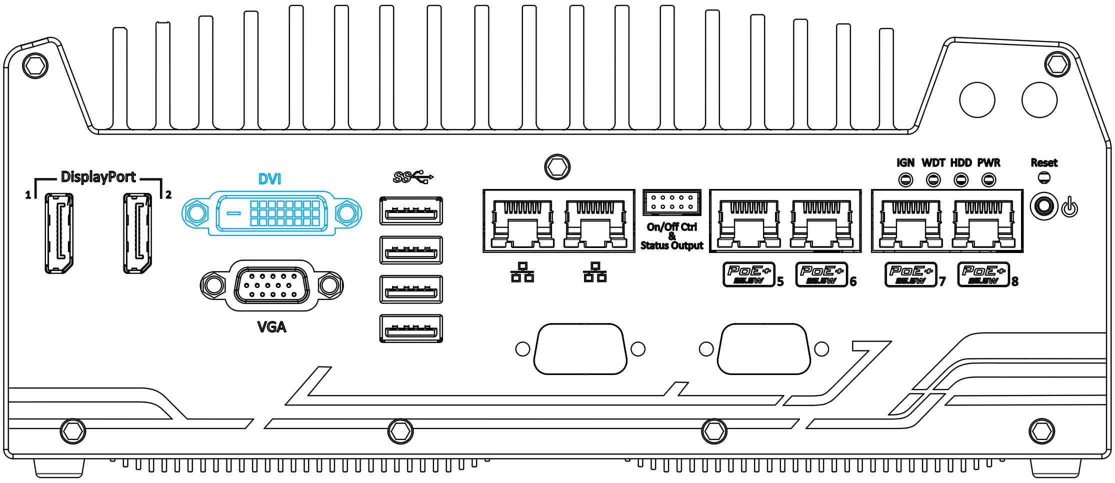
DP-to-DVI

The system supports triple independent display outputs in the following combination of VGA, DVI and DisplayPort. To support multiple display outputs and achieve best DVI output resolution in Windows, you need to install the corresponding graphics driver. Please refer to section OS Support and Driver Installation for details.

Triple Independent Display Configuration (resolution may be limited)

Active display 1	Active display 2	Active display 3
DisplayPort	DisplayPort	DVI or VGA
DisplayPort	DVI	VGA

2.2.2 DVI Port



DVI-D transmits graphics data in digital format and therefore can deliver better image quality at high resolution. The DVI connector on the front panel can either output DVI signals or other digital signals (via an adapter/ cable) depending on the display device connected. It supports resolutions up to 1920x1200@60Hz.

DVI to HDMI cable

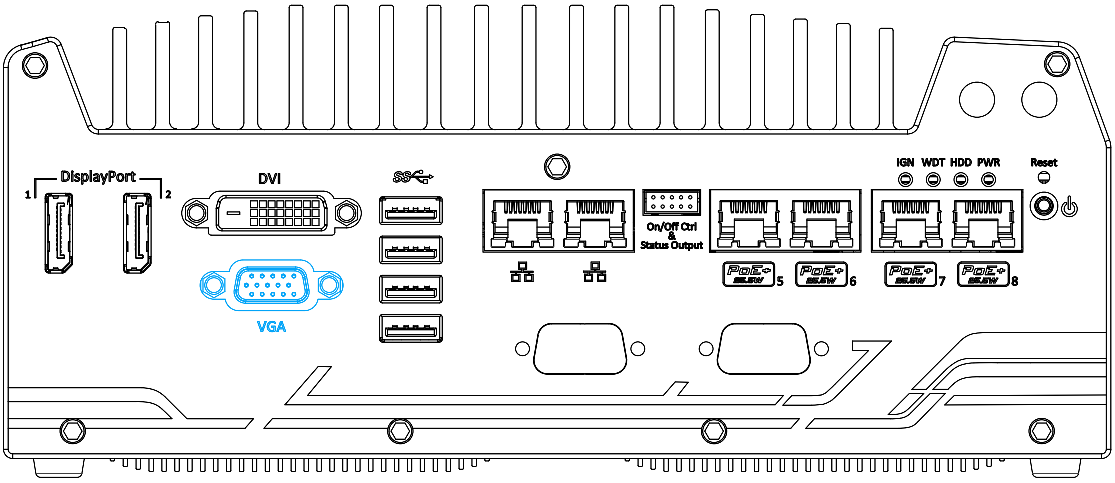
DVI-VGA adaptor

The system supports triple independent display outputs in the following combination of VGA, DVI and DisplayPort. To support multiple display outputs and achieve best DVI output resolution in Windows, you need to install the corresponding graphics driver. Please refer to section OS Support and Driver Installation for details.

Triple Independent Display Configuration (resolution may be limited)

Active display 1	Active display 2	Active display 3
DisplayPort	DisplayPort	DVI or VGA
DisplayPort	DVI	VGA

2.2.3 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 in the following combination of VGA, DVI and DisplayPort. To support multiple display outputs and achieve best DVI output resolution in Windows, you need to install the corresponding graphics driver. Please refer to section OS Support and Driver Installation for details.

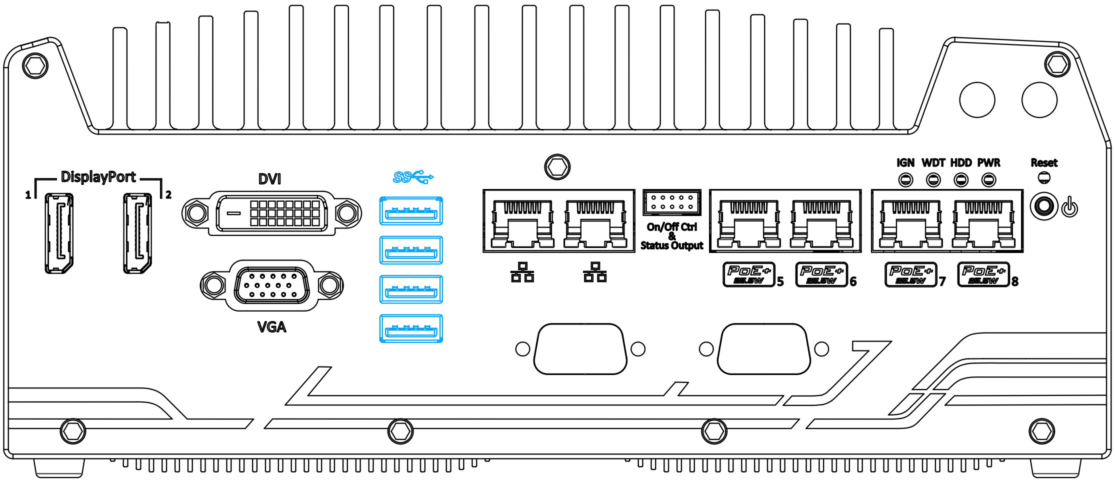
Triple Independent Display Configuration (resolution may be limited)

Active display 1	Active display 2	Active display 3
DisplayPort	DisplayPort	DVI or VGA
DisplayPort	DVI	VGA

NOTE

Please make sure your VGA cable includes SDA and SCL (DDC clock and data) signals for correct communication with the 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.

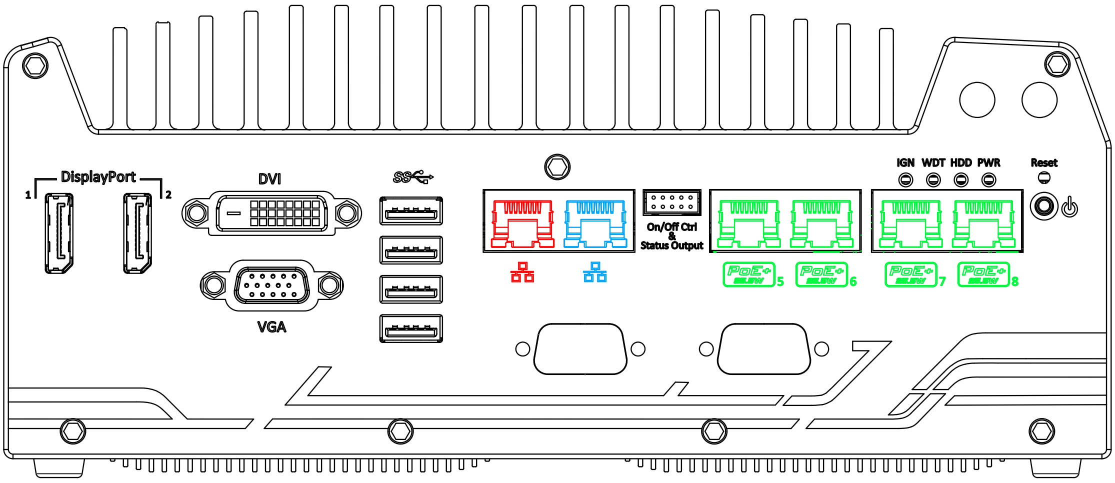
2.2.4 USB3.0 Port



The system offers four USB 3.0 (SuperSpeed USB) ports on its front panel. They are implemented via native xHCI (eXtensible Host Controller Interface) controller in Q170 chipset and are backward compatible with USB 2.0, USB 1.1 and USB 1.0 devices. Legacy USB support is also provided so you can use USB keyboard/mouse in DOS environment.

Due to the nature that xHCI driver is not included natively in Windows 7, you may encounter the issue of USB keyboard/mouse not working when installing Windows 7. Neousys offers a Windows-based batch file and a step-by-step guide to help you. Please refer to Appendix A Windows 7 Installation for information on installing Windows 7.

2.2.5 Ethernet Port / PoE+



The system offers two GbE ports (in **red** and **blue**) and four additional PoE (Power over Ethernet) ports marked in **green**on the front panel. The port marked in **blue** is implemented using Intel® I219-LMcontrollerthat supports Wake-on-LAN and isalso 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)

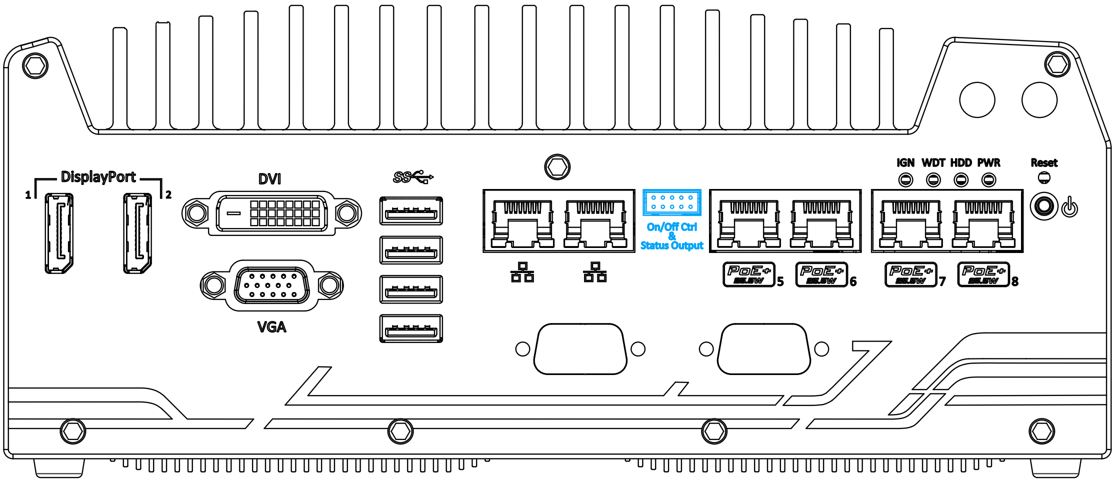
LED Color	Status	Description
Yellow	Off	Ethernet port is disconnected
	On	Ethernet port is connected and no data transmission
	Flashing	Ethernet port is connected and data is transmitting/receiving

Speed LED (Left)

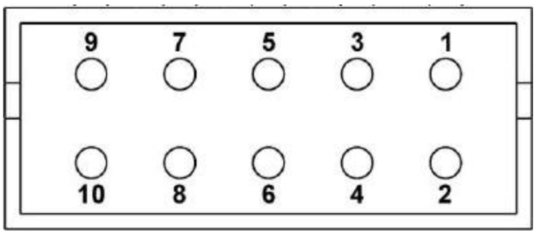
LED Color	Status	Description
Green or Orange	Off	10 Mbps
	Green	100 Mbps
	Orange	1000 Mbps

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

2.2.6 On/ Off Ctrl & Status Output



The “On/ Off Control Ctrl & Status Output” connection allows for the external switch and LED indicator extensionvia a 2x5 2.0mm pitch wafer connector. It is useful when the system is placed in a cabinet or a not easily accessed location.

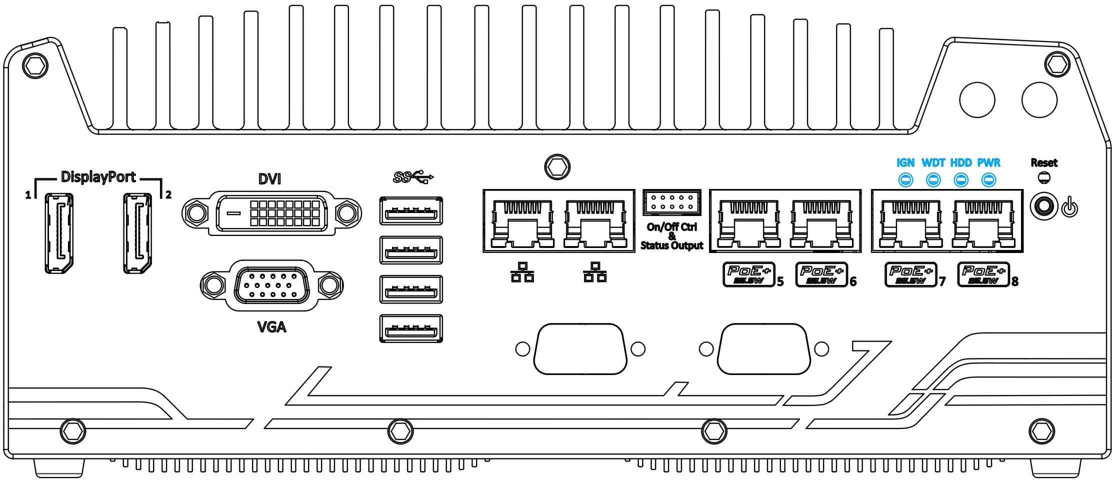


Pin#	Definition	Description
1	Ctrl+	**[Input]** Remote on/off control, connecting to an external switch to turn on/off the system (polarity is negligible).
2	Ctrl-	
3	Power+	**[Output]** System power indicator, on if the system is turned on, off if the system is turned off.
4	Power-	
5	HDD+	**[Output]**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

NOTE

Please make sure the polarity is correct when you connect the external LED indicator to the Status LED Output.

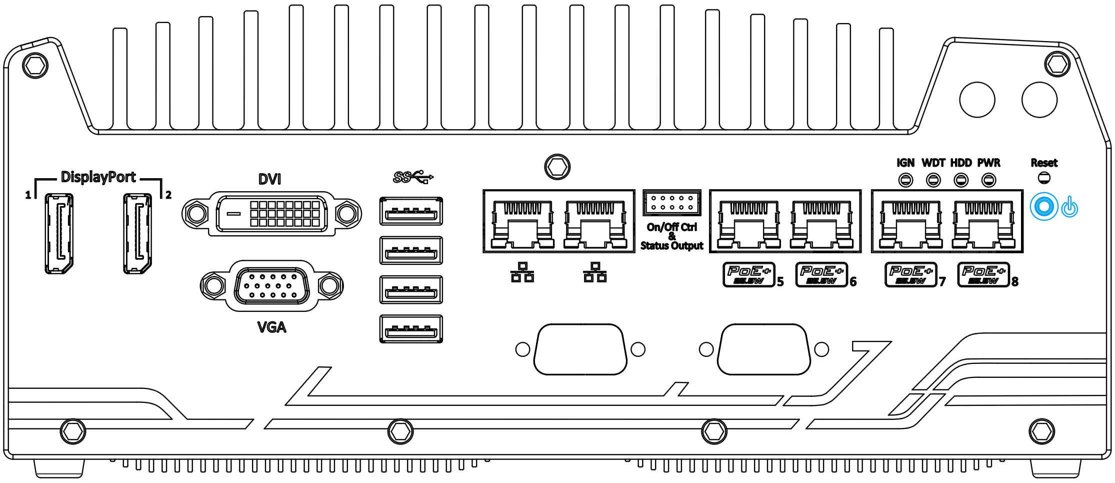
2.2.7 System Status LED



There are four LED indicators on the front panel: IGN, WDT, HDD and PWR. The descriptions of these four LEDs are listed in the following table.

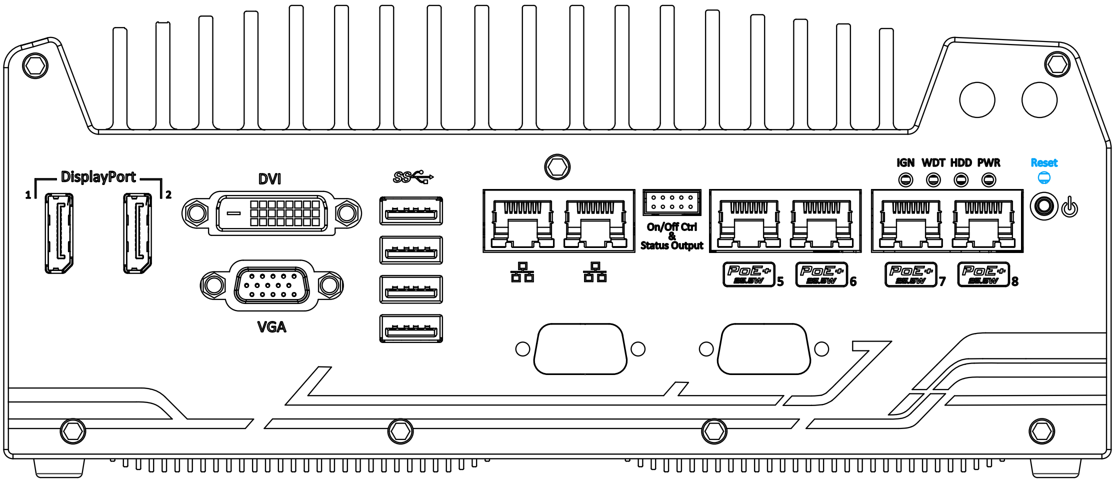
Indicator	Color	Description
IGN	Green	Ignition signal indicator, lid when IGN is high (12V/24V).
WDT	Yellow	Watchdog timer indicator, flashing when WDT is active
HDD	Red	Hard drive indicator, flashing when SATA drive is active
PWR	Green	Power indicator, lid when the system is on

2.2.8 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 turning off the system, there is a 5-second wait before you can power-on the system).

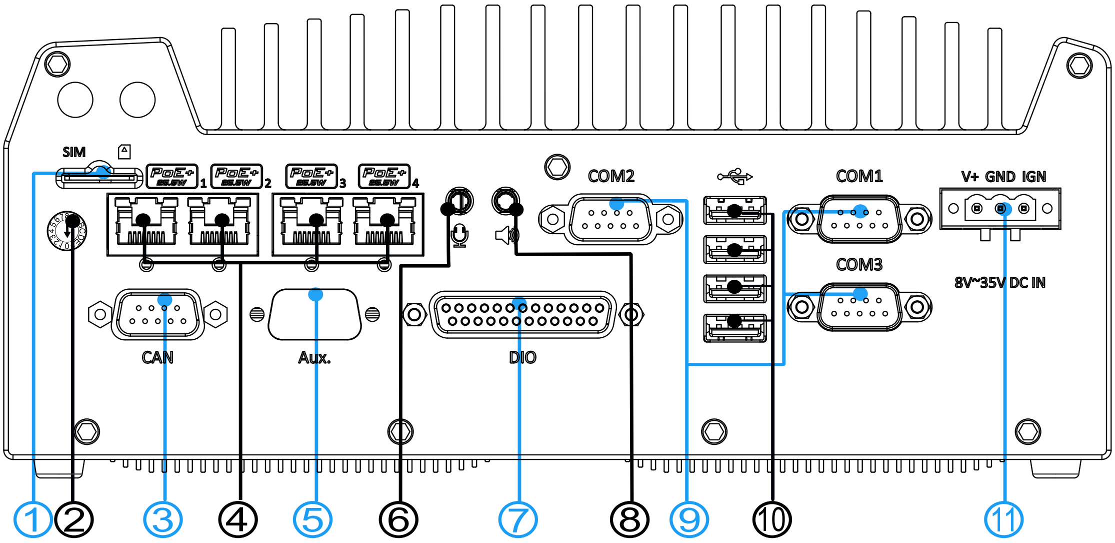
2.2.9 Reset Button



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

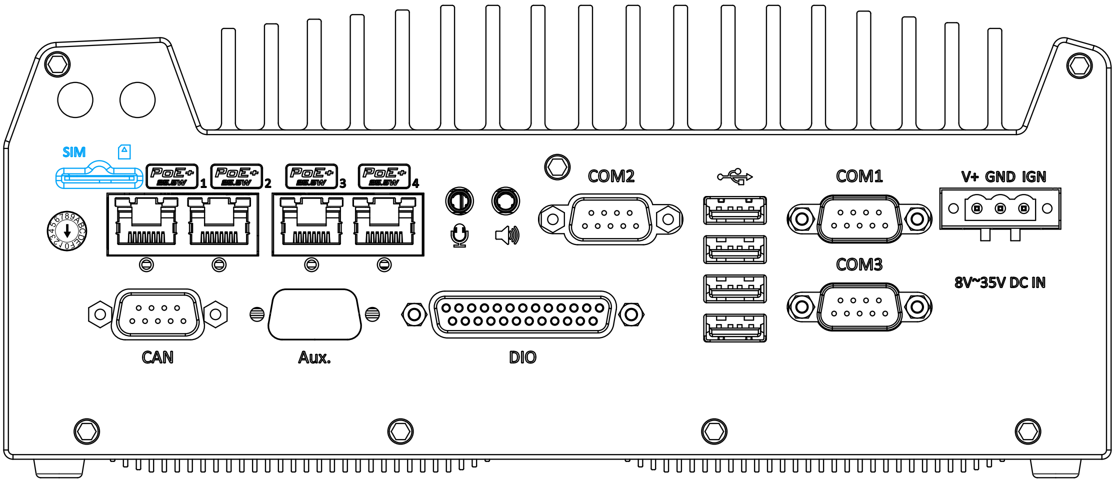
2.3 Nuvo-5608VR Rear Panel

Neousys Nuvo-5608VR offers additional expansion I/O ports on its rear panel.



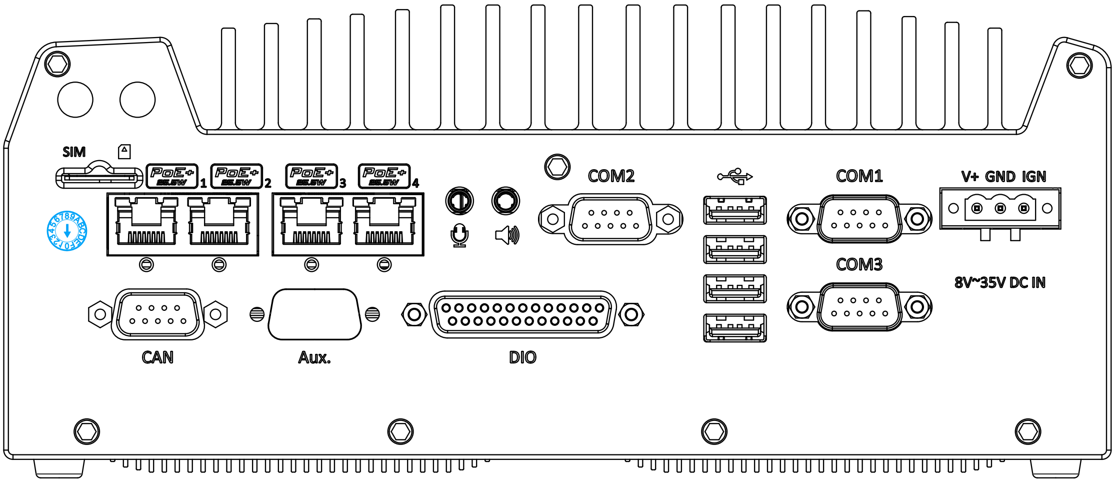
No.	Item	Description
1	SIM card slot	With a 3G/ 4G module installed, insert a SIM card to access the operator’s network.
2	Ignition control switch	The switch allows for the configuration of ignition power on/ off delay by adjusting the switch position.
3	CANbus port	Allows controller to communicate with other in-vehicle CAN device(s).
4	GbE PoE+ ports	The Power over Ethernet (PoE) port can provide both data connection and electric power to devices.
5	Aux	Reserved for the additional DB9 connector.
6	Microphone-in jack	Microphone-in jack for voice (microphone) input.
7	DIO	The DIO port provides 4x isolated digital input and 4x isolate output channels.
8	Speaker-out jack	Speaker-out jack for sound output.
9	COM ports	There are 3 COM ports for communicating with external devices.
10	USB 2.0	The USB 2.0 ports are backward with USB 1.1/ 1.0.
11	3-pin terminal block (DC/ ignition input)	Compatible with DC power input from 8~35V, the terminal block is also used for ignition signal input.

2.3.1 SIM Slot



On the rear panel, there is a panel-accessible SIM socket. By installing a 3G/ 4G module onto the internal mPCIe port, you can have Internet access via a telecom operator's network. The SIM socket is a push-push type. The push-push mechanism means the SIM card is push-to-install and push-to-retrieve. Please note that the SIM card must be inserted upside down (gold fingers facing upward).

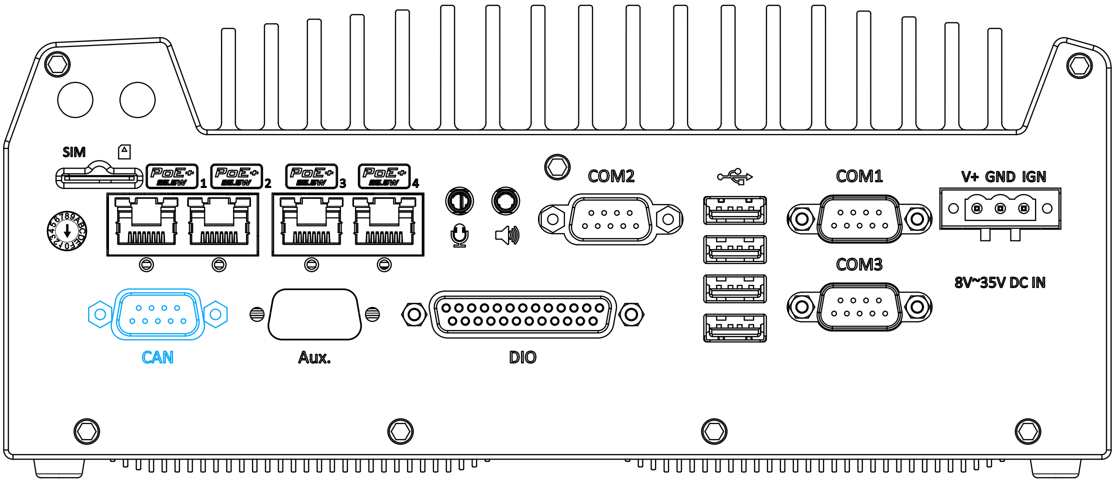
2.3.2 Ignition Control Switch



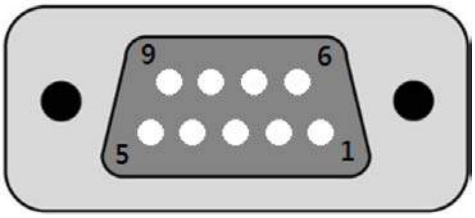
The ignition power control switch features multiple modes for pre and post ignition settings. Please refer to the section Ignition Power Control for details.

The ignition power control switch is located on the rear panel as shown. Please use a flathead screwdriver to adjust the position of the ignition power control switch.

2.3.3 CAN bus

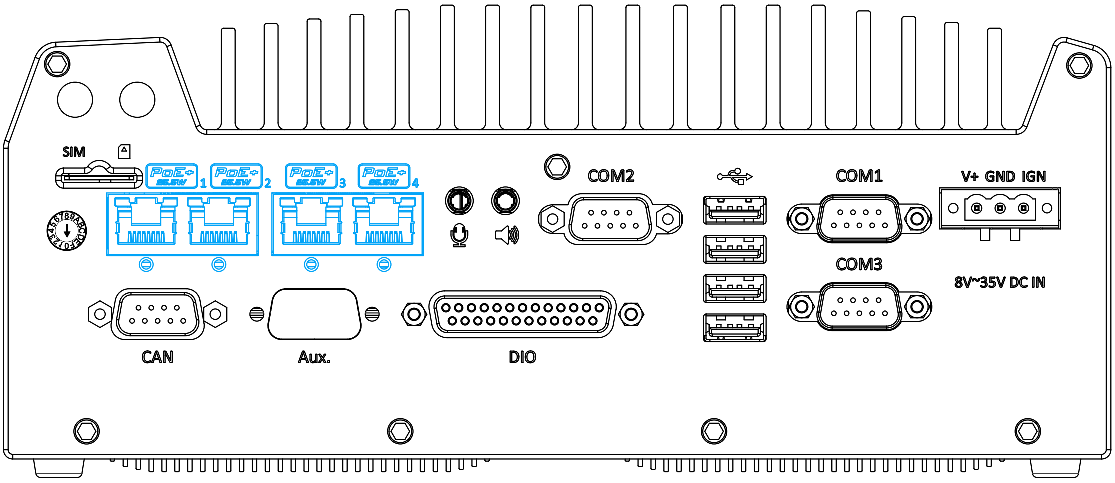


CAN bus is a robust industrial bus with a pair of differential signals and is commonly used in various industrial and in-vehicle applications. The system is equipped with a CAN bus DB9 port that is compatible with both industrial and in-vehicle applications. The CAN bus port supports CAN2.0A and CAN2.0B up to 1Mbps.



Pin No.	Definition	I/O	Description
1	GND	-	GND
2	Reserved	-	Reserved pin. Keep unconnected
3	CAN_H	I/O	CAN Bus High-level voltage
4	Reserved	-	Reserved pin. Keep unconnected
5	CAN_L	I/O	CAN Bus Low-level voltage
6	Reserved	-	Reserved pin. Keep unconnected
7	Reserved	-	Reserved pin. Keep unconnected
8	Reserved	-	Reserved pin. Keep unconnected
9	Reserved	-	Reserved pin. Keep unconnected

2.3.4 Ethernet Port/ PoE



Power over Ethernet (PoE) is an Ethernet technology that supplies electrical power along with data on a standard CAT-6 Ethernet cable. Acting as a Power Source Equipment (PSE), compliant with IEEE 802.3at standard, each port can deliver up to 25W of power to a Powered Device (PD), such as a PoE IP camera. PoE is able to automatically detect the device connected and determine whether to dispatch power thus it is also compatible with traditional Ethernet devices. Each port is linked to a dedicated PCI Express for maximum network performance. When plugged in, the Ethernet connection status and speed are shown on RJ45 LED indicators.

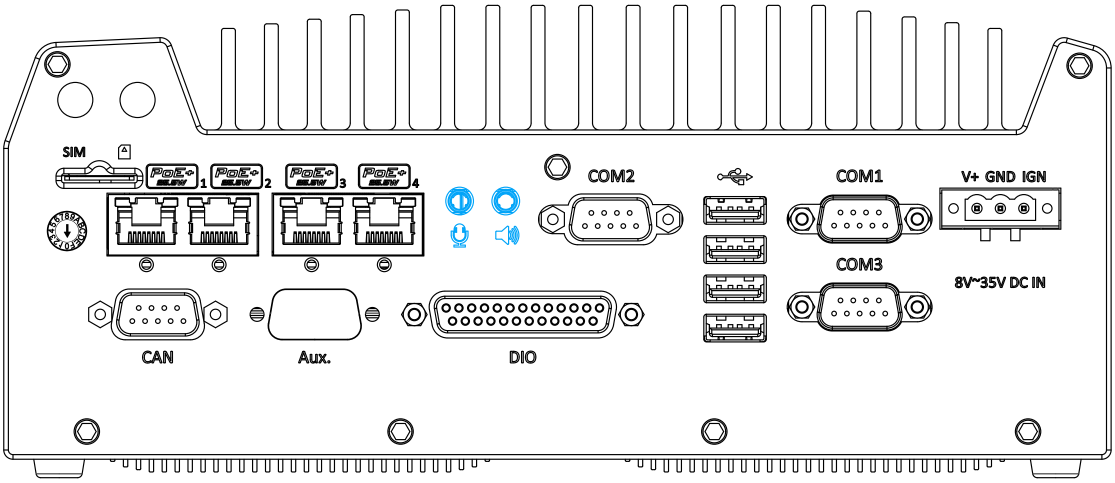
Active/Link LED

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

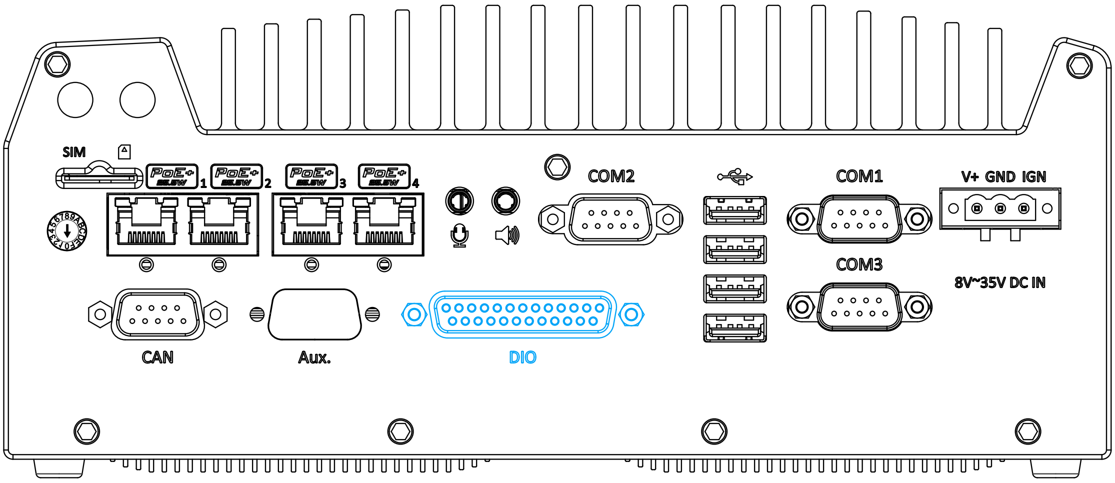
LED Color	Status	Description
Green or Orange	Off	10 Mbps
	Green	100 Mbps
	Orange	1000 Mbps

2.3.5 3.5mm Speaker-out / Microphone-in Jack

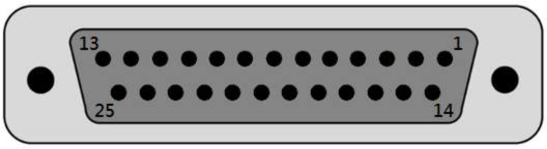


The system audio function uses Intel® High Definition Audio in Q170 chipset and Realtek ALC262 codec. There are two audio function jacks, the 🎙 port is used for microphone input, and the 🔊 port is used for speaker/ headphone output. To utilize the audio function in Windows, you need to install corresponding drivers for both Intel® Q170 chipset and Realtek ALC262 codec.

2.3.6 Digital Input/ Output



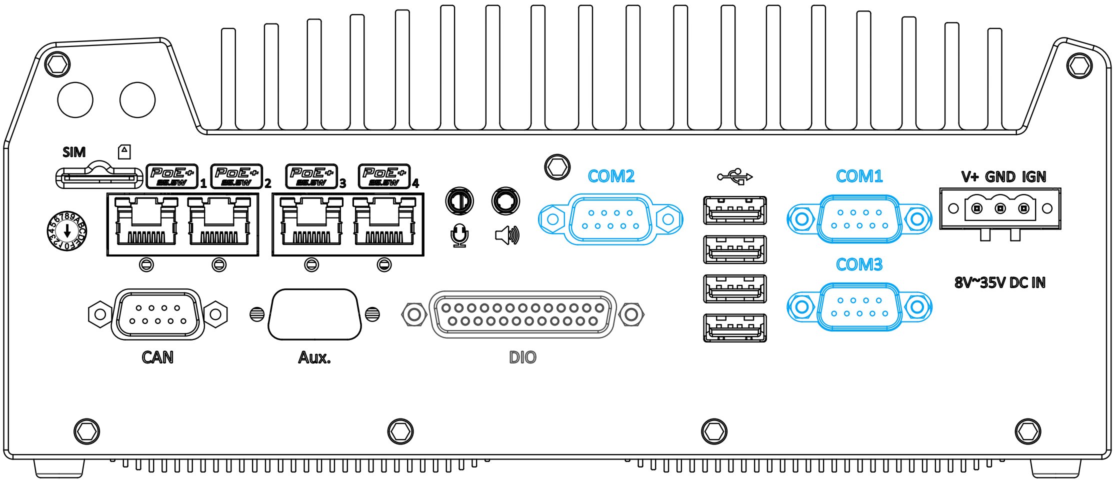
The system provides 4x isolated digital input channels and 4x isolated digital output channels. The DIO functions support polling mode I/O access and DI change-of-state interrupt. Please refer to Watchdog Timer & Isolated DIOfor information on wiring and programming the isolated DIO channels.



Pin No.	Definition	I/O	Description
1	ISO_DI3H	I	Digital input channel 3
2	ISO_DI2H	I	Digital input channel 2
3	ISO_DI1H	I	Digital input channel 1
4	ISO_DI0H	I	Digital input channel 0
5	Reserved	-	Reserved pin. Keep unconnected
6	Reserved	-	Reserved pin. Keep unconnected
7	ISO_DO3	O	Digital output channel 3
8	ISO_DO2	O	Digital output channel 2
9	ISO_DO1	O	Digital output channel 1
10	ISO_DO0	O	Digital output channel 0
11	VDD	-	DO voltage source input for inductive load
12	ISO5V	-	Isolated 5V power supply
13	Reserved	-	Reserved pin. Keep unconnected
14	ISO_DI3L	-	Digital input channel 3 GND
15	ISO_DI2L	-	Digital input channel 2 GND
16	ISO_DI1L	-	Digital input channel 1 GND
17	ISO_DI0L	-	Digital input channel 0 GND
18	Reserved	-	Reserved pin. Keep unconnected
19	Reserved	-	Reserved pin. Keep unconnected
20	DOGND	-	Digital output GND

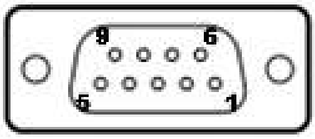
21	DOGND	-	Digital output GND
22	DOGND	-	Digital output GND
23	DOGND	-	Digital output GND
24	DOGND	-	Digital output GND
25	DOGND	-	Digital output GND

2.3.7 COM Ports



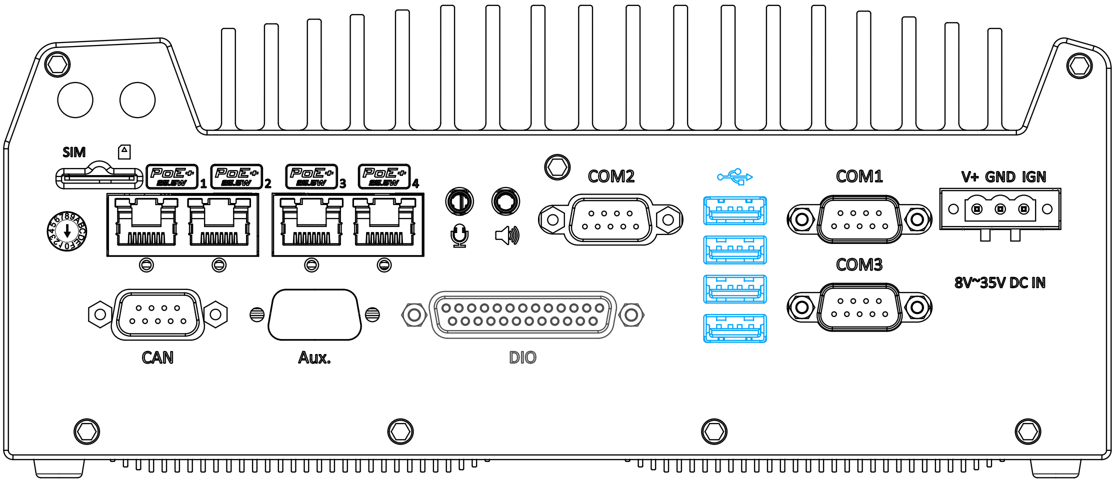
The system has three COM ports for communicating with external devices. COM1, COM2 and COM3 ports are located on the rear panel via 9-pin D-Sub male connectors. They are implemented using industrial-grade ITE8786 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate.

COM1 and COM3 are software-configurable RS-232/422/485 ports and COM2 is a standard 9-wire RS-232 port. The operation mode, slew rate and termination of COM1 and COM3 can be set in BIOS setup utility. The following table describes the pin definition of COM ports.



	COM1 / COM3			COM2
Pin#	**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

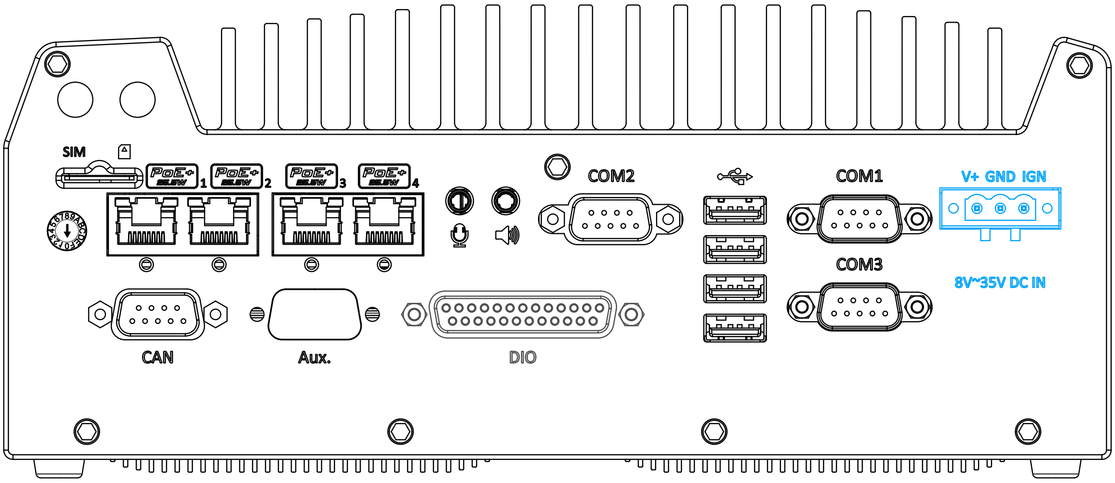
2.3.8 USB2.0 Ports



The USB2.0 ports are implemented via native xHCI (eXtensible Host Controller Interface) controller in Q170 chipset and are backward compatible with USB 1.1 and USB 1.0 devices. Legacy USB support is also provided so you can use USB keyboard/mouse in DOS environment.

Due to the nature that xHCI driver is not included natively in Windows 7, you may encounter USB keyboard/ mouse not working during Windows 7 installation. Neousys offers a Windows-based batch file and a step-by-step guide to help you. Please refer to Appendix A Windows 7 Installation for information.

2.3.9 3-Pin Terminal Block for DC and Ignition Input



The system allows an 8 to 35V DC power input from via a 3-pin pluggable terminal block. The screw clamping mechanism is a reliable way to wire DC power. In addition to DC power, this terminal block also accepts ignition signal input (IGN).

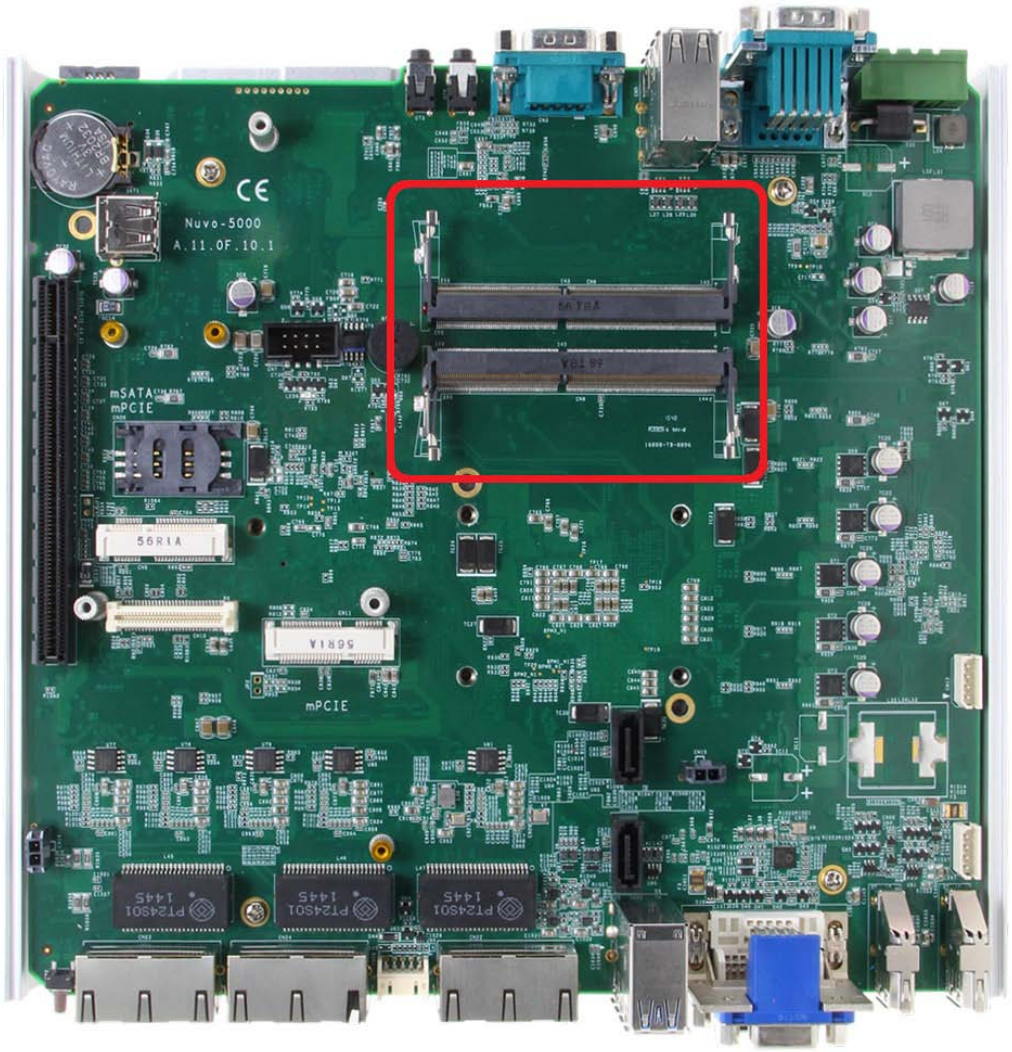
WARNING

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.

2.4 Internal I/O Components

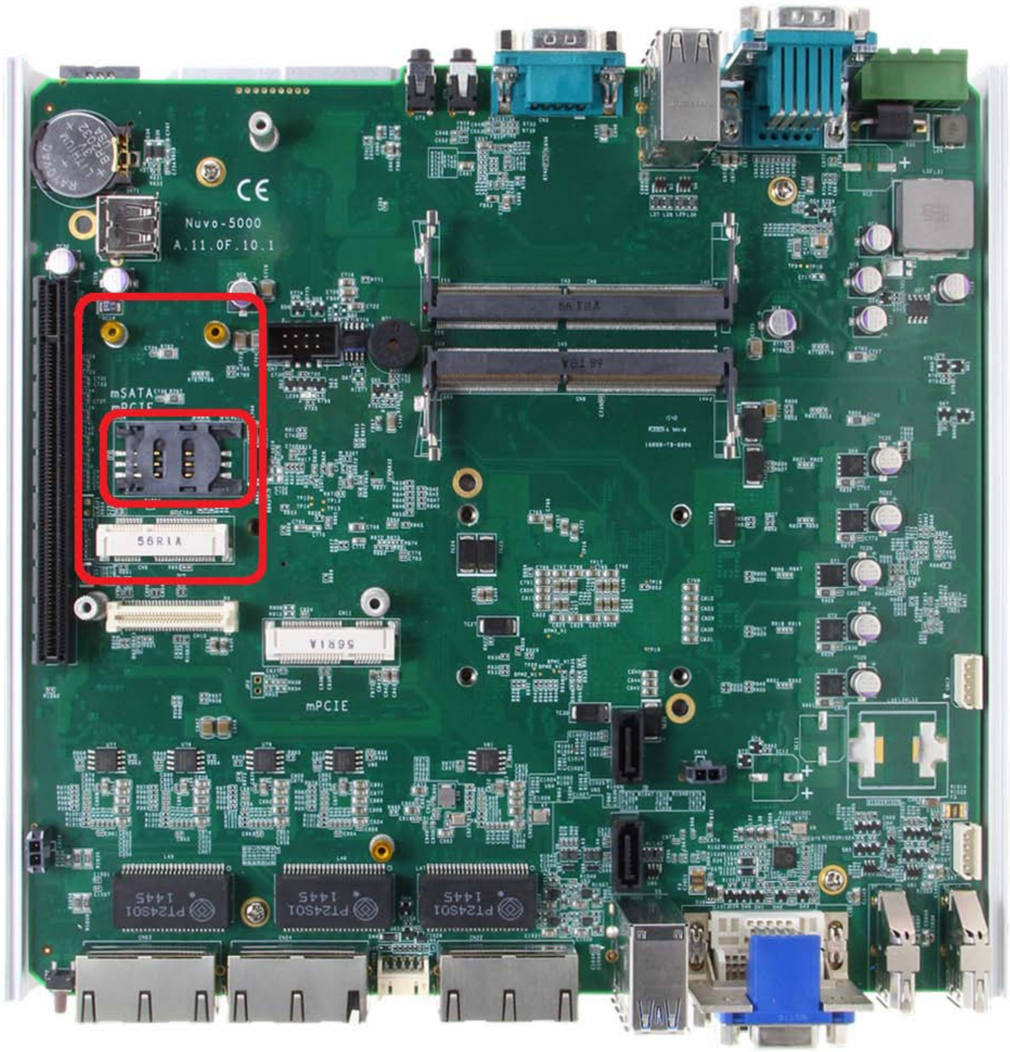
The internal components of Nuvo-5608VR include two SODIMM sockets, SATA ports, mSATA, mPCIe sockets and an internal USB port.

2.4.1 DDR4 SO-DIMM Slots



The system provides two 260-pin DDR4 memory SO-DIMM sockets. It can support up to 32GB maximum capacity by installing two 16GB DDR4 2133 MHz SODIMM modules.

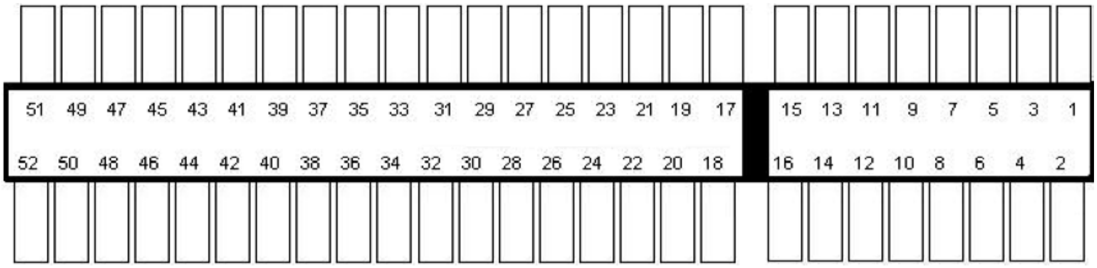
2.4.2 Dual Mode mSATA/ mPCIe socket



The system provides a dual mode mSATA/ mPCIe socket that is in compliance with mPCIe specification rev. 1.2. You can install either an mSATA SSD or mPCIe module into this socket andthe system will automatically detect and configure it to run PCIe or SATA signals. This mPCIe socket is designed with SIM card 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.

Dual mode mSATA/ mPCIe socket definition



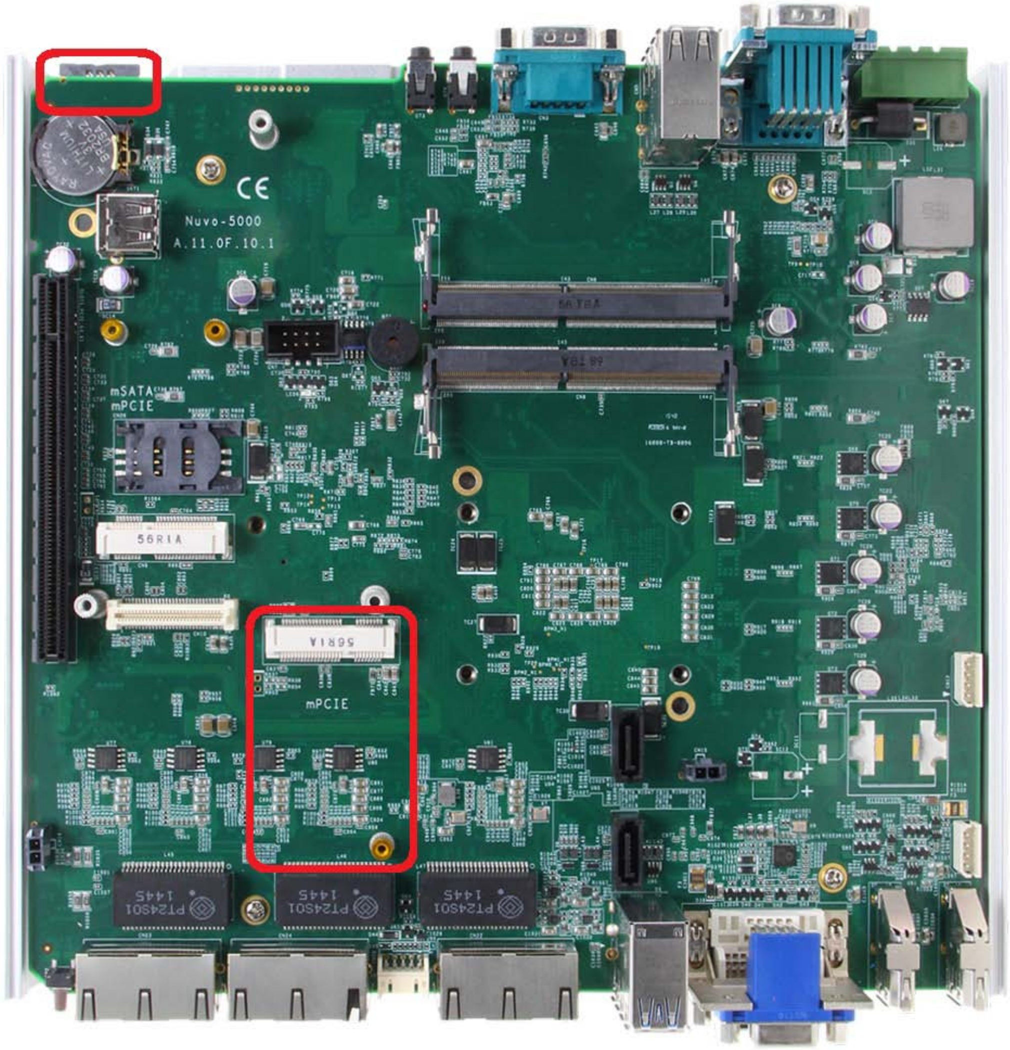
Pin	Signal (mPCIe)	Signal (mSATA)	Pin #	Signal (mPCIe)	Signal (mSATA)
1	WAKE#	-	2	+3.3Vaux	+3.3Vaux
3	COEX1	-	4	GND	GND
5	COEX2	-	6	+1.5V	+1.5V
7	CLKREQ#	-	8	UIM_PWR	-
9	GND	GND	10	UIM_DATA	-
11	REFCLK-	-	12	UIM_CLK	-
13	REFCLK+	-	14	UIM_RESET	-
15	GND	GND	16	UIM_VPP	-
Mechanical Key					
17	Reserved*	-	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 mPCIe 4G modules are not compliant to the standard mPCIe 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!

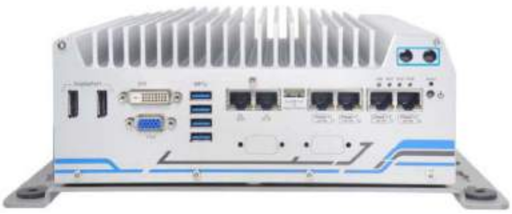
Installing an incompatible 4G module may damage the system or the module itself may be *damaged.*

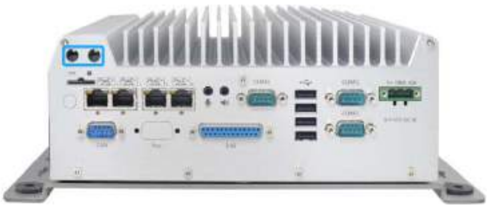
2.4.3 mPCIe Socket



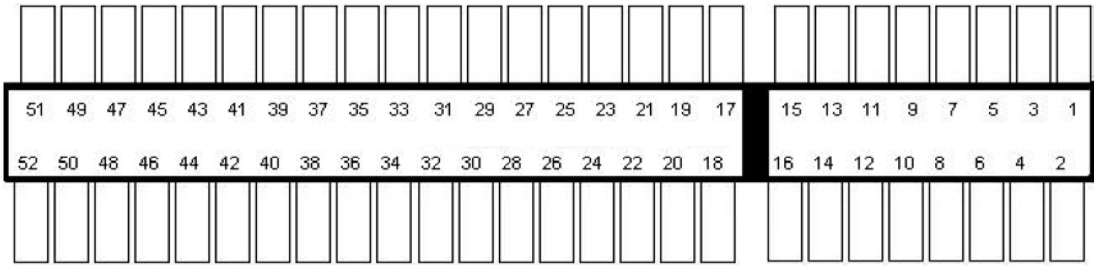
This mPCIe socket works in cooperation with the panel-accessible SIM slot. By installing a mPCIe module, you can add additional features to your system such as WIFI, GPS, CAN bus, analog frame grabber, etc. You can also install a 3G/ 4G module and SIM card for internet via your service provider's 3G/ 4G network.

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





mPCIe Pin Definition



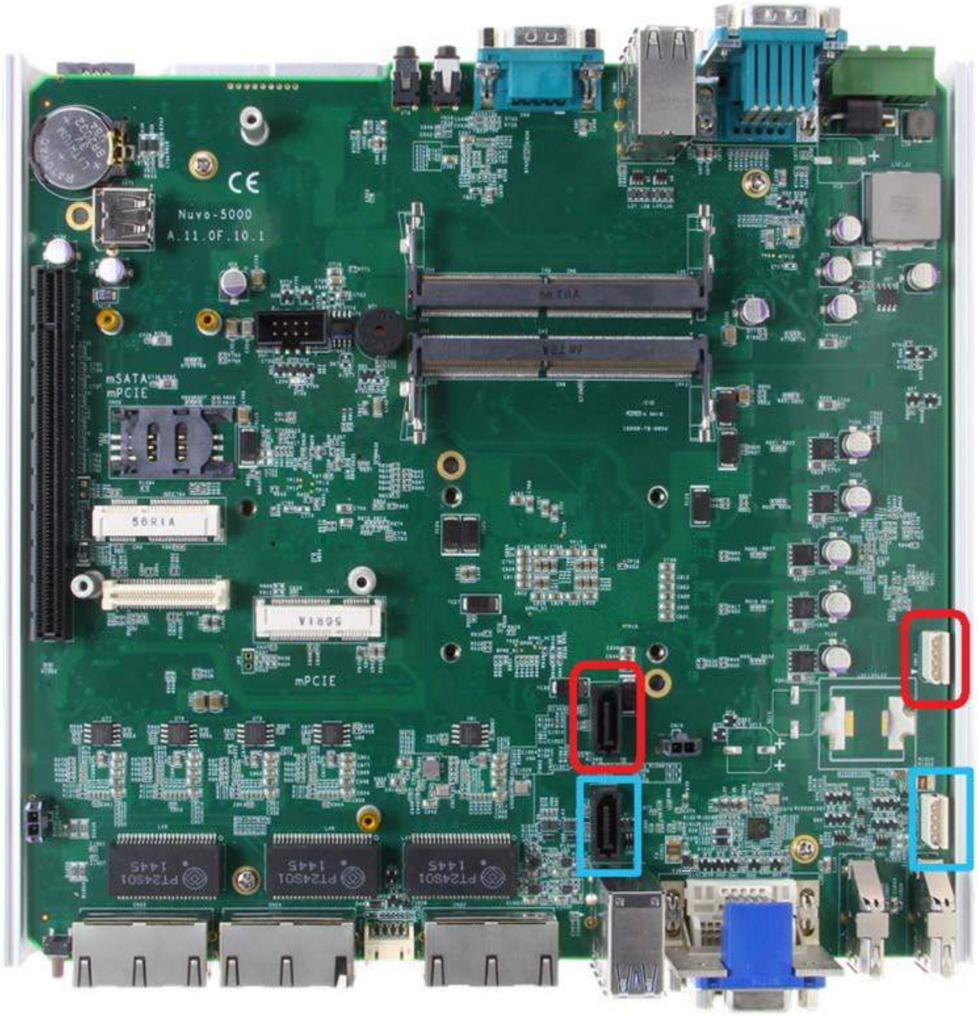
Pin #	Signal	Pin #	Signal
1	WAKE#	2	+3.3Vaux
3	COEX1	4	GND
5	COEX2	6	+1.5V
7	CLKREQ#	8	UIM_PWR
9	GND	10	UIM_DATA
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_RESET
15	GND	16	UIM_VPP
Mechanical Key			
17	Reserved* (UIM_C8)	18	GND
19	Reserved* (UIM_C4)	20	W_DISABLE#
21	GND	22	PERST#
23	PERn0	24	+3.3Vaux
25	PERp0	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PETn0	32	SMB_DATA
33	PETp0	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	+3.3Vaux	40	GND
41	+3.3Vaux	42	LED_WWAN#
43	GND	44	LED_WLAN#
45	Reserved	46	LED_WPAN#
47	Reserved	48	+1.5V
49	Reserved	50	GND
51	Reserved	52	+3.3Vaux

WARNING

Some off-the-shelf mPCIe 4G modules are not compliant to the standard mPCIe interface. They use 1.8V I/O signals instead of standard 3.3V I/O and may have signal conflict. Please consult Neousys for compatibility when in doubt!

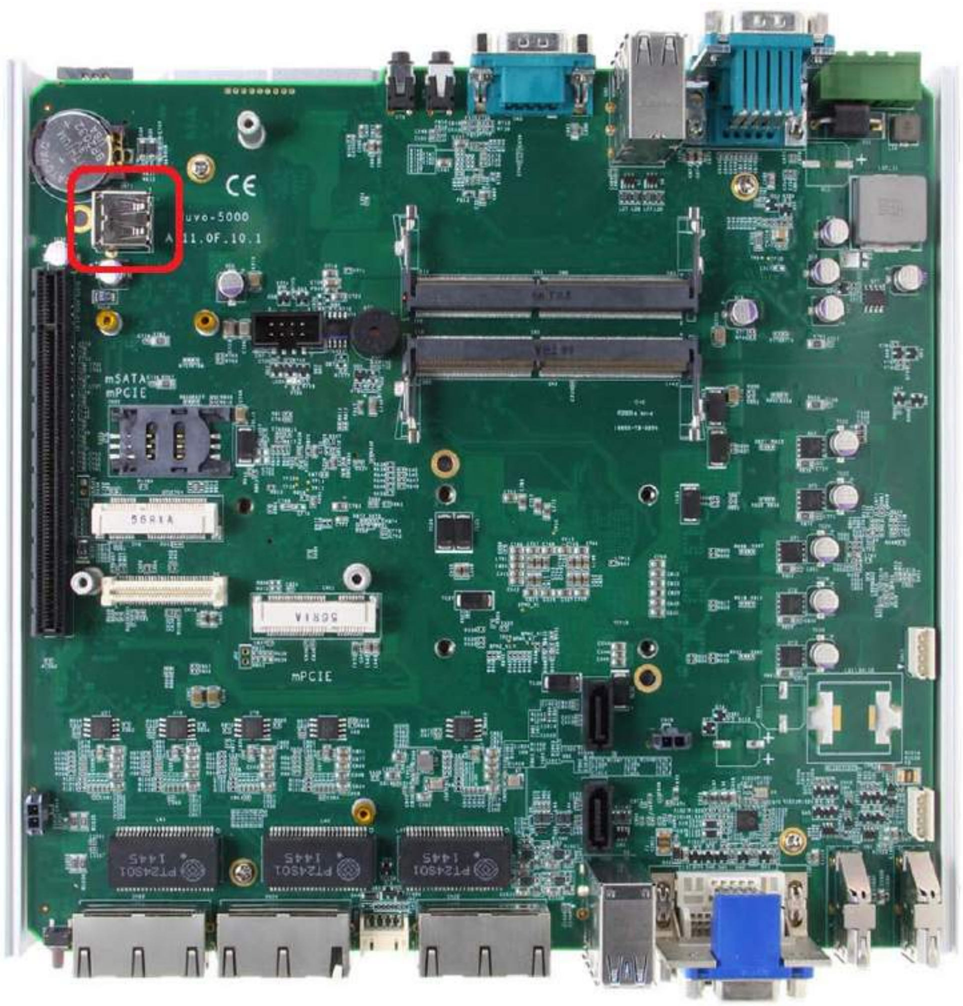
Installing an incompatible 4G module may damage the system or the module itself may be *damaged.*

2.4.4 SATA Ports



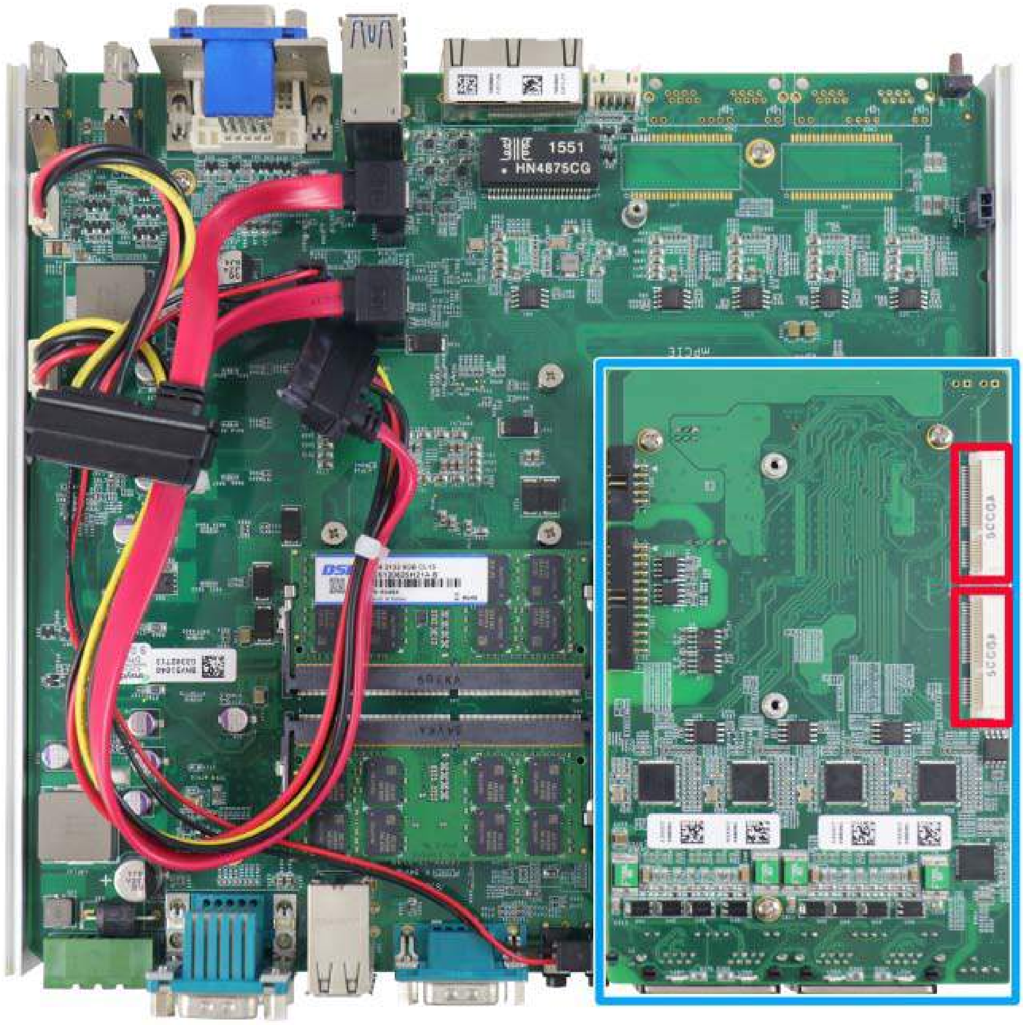
The system provides two SATA ports (indicated in **blue** and **red**) which support SATA-II (3 Gb/s), SATA-III (6 Gb/s) signals and the latest 3.5” hard drive storage capacities. Each SATA port features a 7-pin SATA connector and a 4-pin power connector. You may refer to the SATA Configuration section for SATA settings.

2.4.5 Internal USB Port



The system 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.

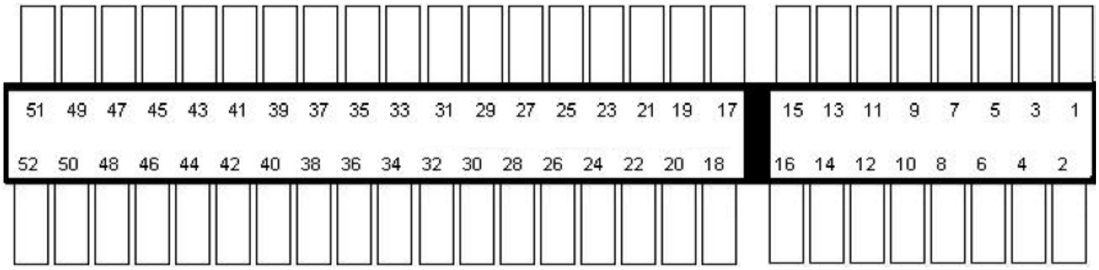
2.4.6 mPCIe Socket on MezIO^{TM}-V510



There are two additional full-size mPCIe sockets available on MezIO^{TM}-V50. They are implemented with USB signals only and have better compatibility with off-the-shelf 3G/ 4G mPCIe modules. For customers who want to install 3G/4G module(s), please take advantage of these two mPCIe sockets and the associated SIM slots.

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

MezIO^{TM}-V510 mPCIe Pin Definition



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

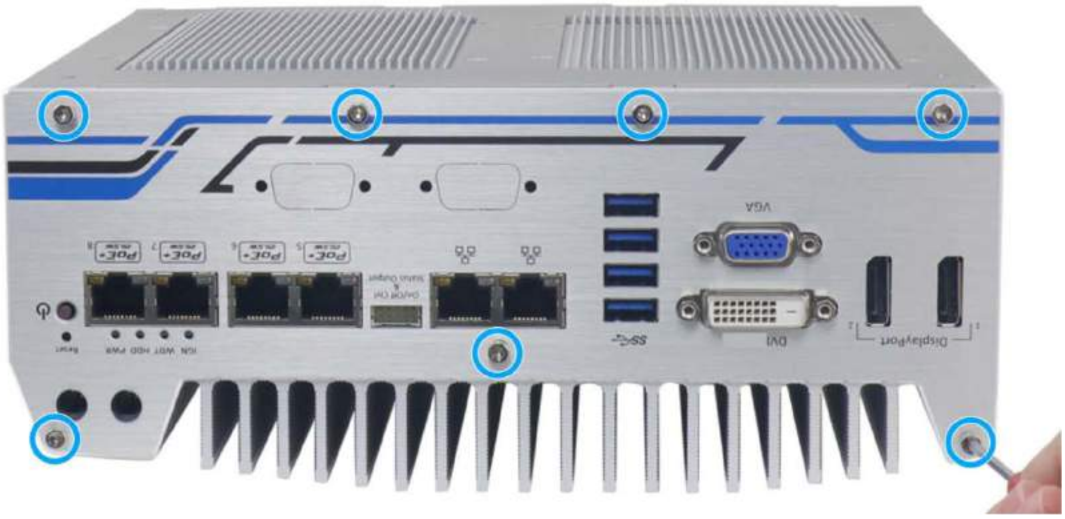
3 System Installation

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

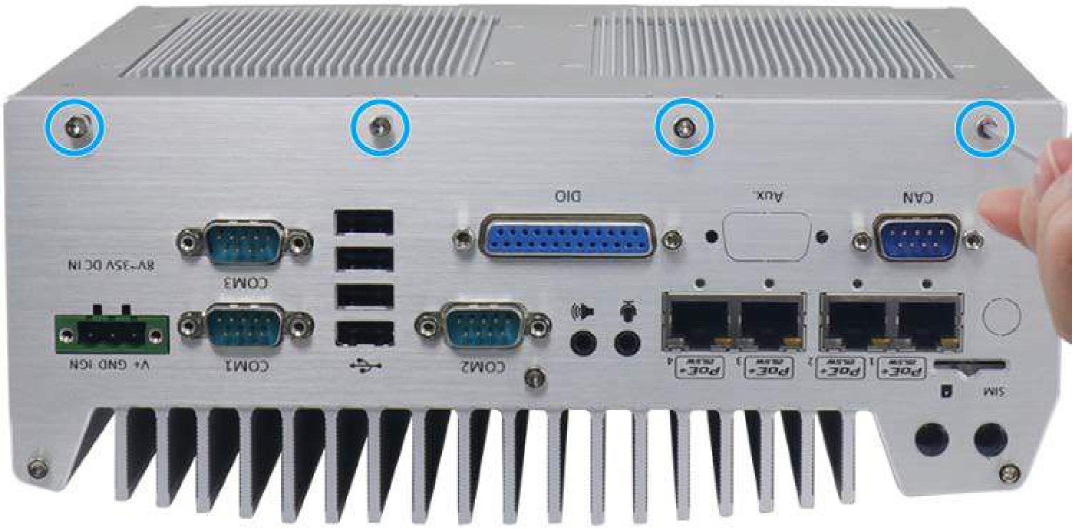
- It is recommended that only qualified service personnel should install and service this product to avoid injury or damage to the system.
- Please observe all ESD procedures at all times to avoid damaging the equipment.
- Before disassembling your system, please make sure the system has powered off,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

3.1 Disassembling the System Enclosure

1. Turn the system upsidedown, remove the seven (7) screws indicated on the front panel and remove the front panel.

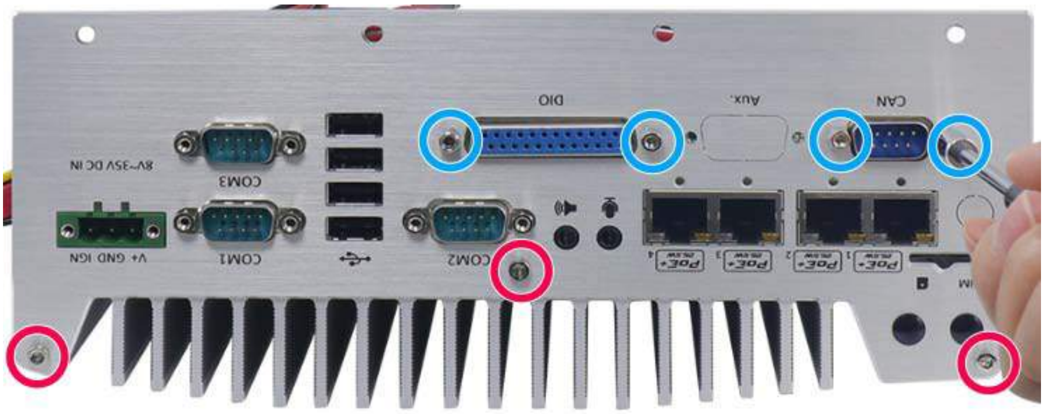


2. Unscrew the four(4) screws indicated on the rear panel.

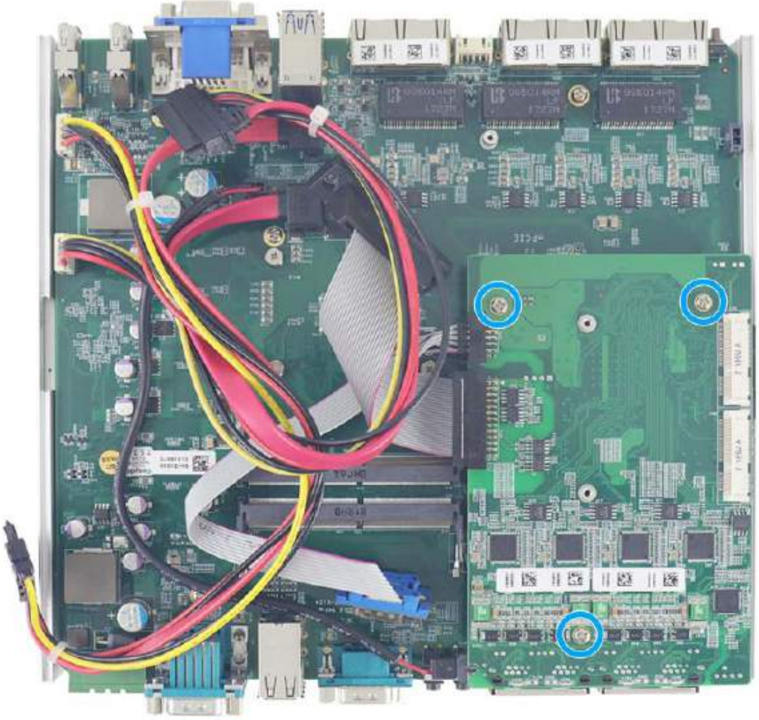


3. Gently lift the system's bottom panel.

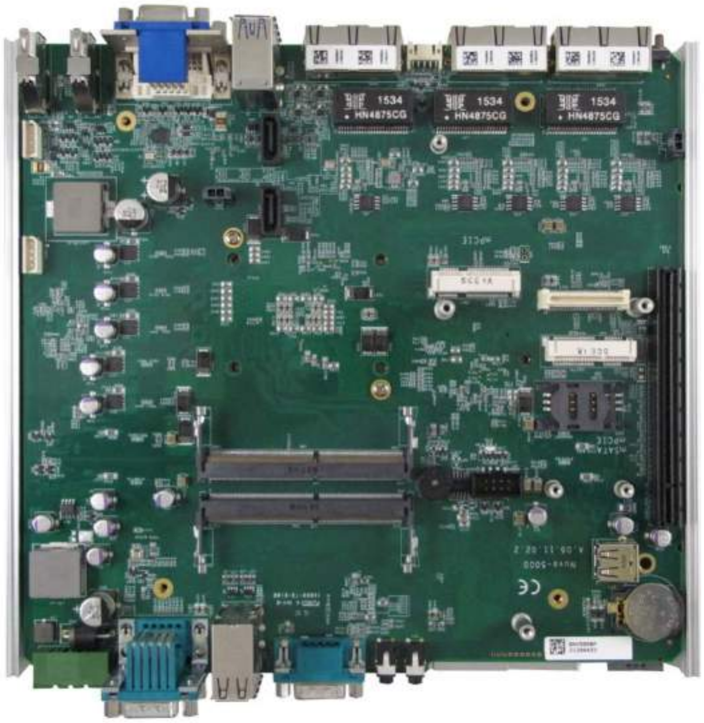
4. Remove the four (4) hex-bolts (indicated in **blue circles**), remove the three (3) screws (indicated in **red circles**) and remove the rear panel.



5. Detach the front/ rear panels and remove the three (3) screws on the MezIO^{TM} card (indicated in **blue circles**). Gently lift the MezIO^{TM} card to separate it from the motherboard.



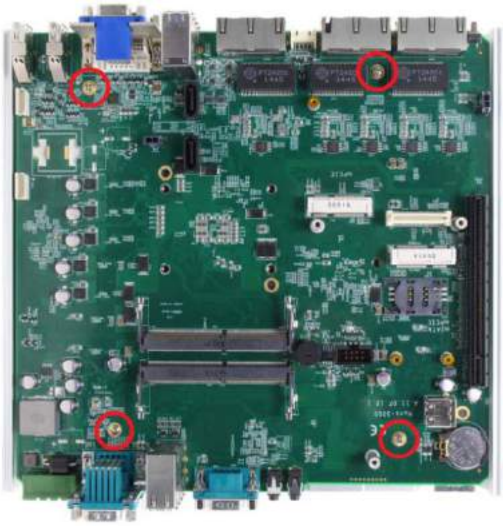
6. Once the front, rear panel, MezIO^{TM} card and bottom panel have been removed, the user has access to install most motherboard add-on components. For details, please refer to the installation section of each component.



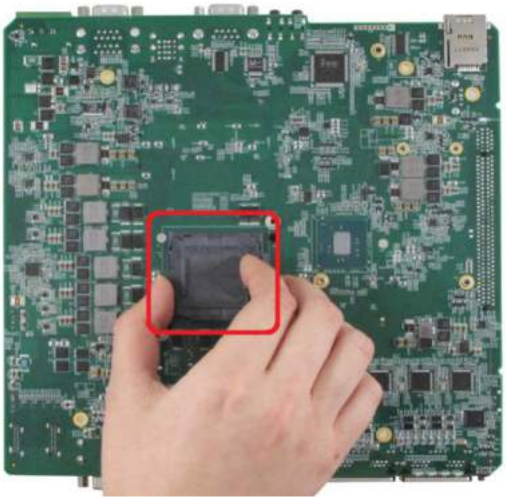
3.2 CPU Installation Procedure

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

2. To install a CPU into the system, remove the four (4) M3 P-head screws in the illustration below.



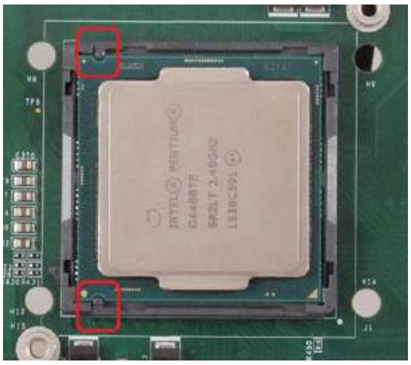
3. Gently lift and separate the motherboard from the heatsink and turn the motherboard upside-down. You'll see the CPU socket protective cover, place fingertips under the sign "REMOVE" for leverage. Gently lift the cover.



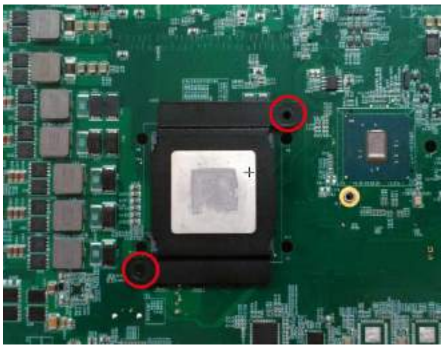
WARNING

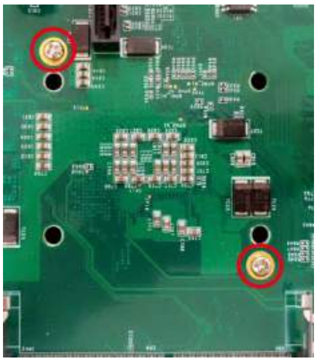
With the protective cover removed, please be careful when handling the motherboard. DO NOT touch the pins in the LGA socket!

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.



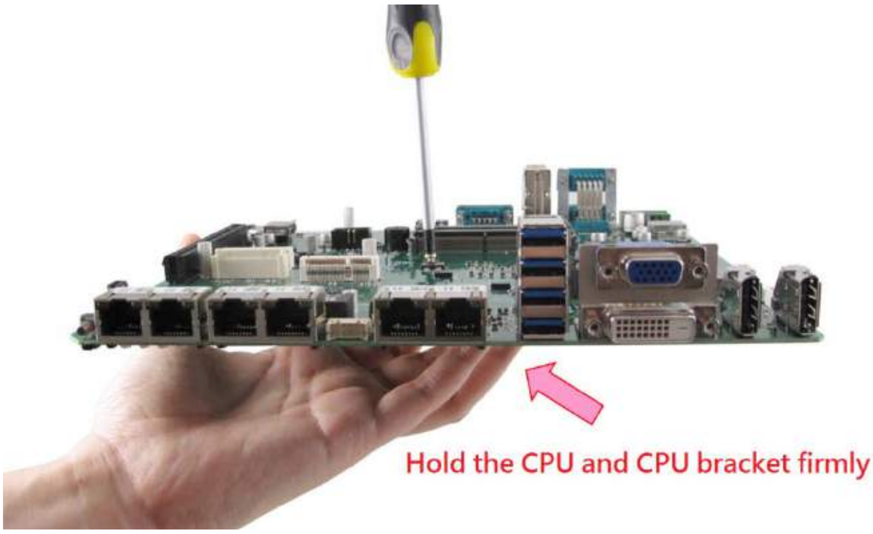
5. Locate the CPU retention bracket in the accessory box. Place the retention bracket on the CPU and hold it in place, turn the motherboard around and secure the bracket by tightening two (2) M3 P-head screws.





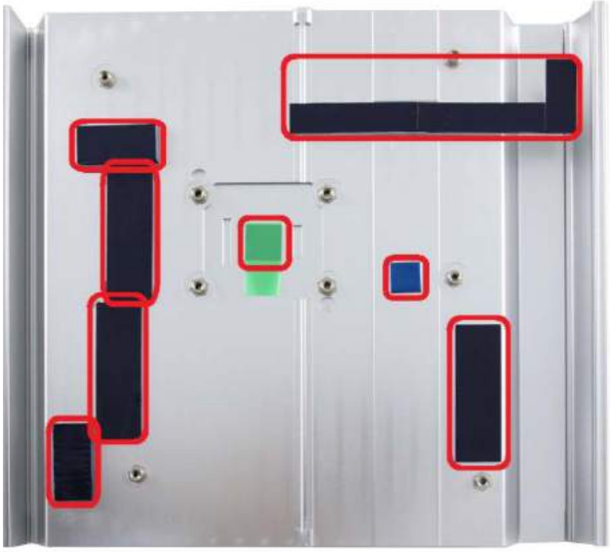
Retention bracket screw location

Secure two M3 P-head screws on the opposite side



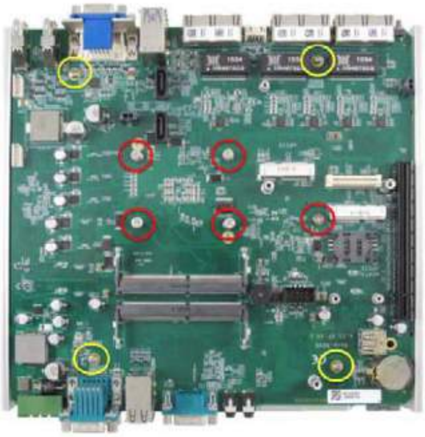
Hold bracket/ CPU in place along with the motherboard

6. Remove all thermal pad protective films pre-placed on the heatsink.

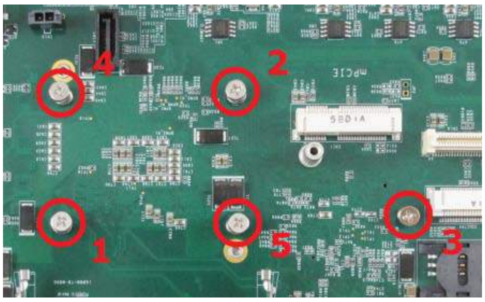


7. With the four (4) motherboard standoffs aligned (please refer to step 2), gently lower the motherboard onto the heatsink

8. Secure the four (4) M3P-head motherboard screws (indicated in yellow) and from the accessory box, five (5) M3 spring screws (indicated in red). Gradually tighten the five screws in the following order for even pressure.



Securing the motherboard



Secure five CPU/ heatsink spring screws in order

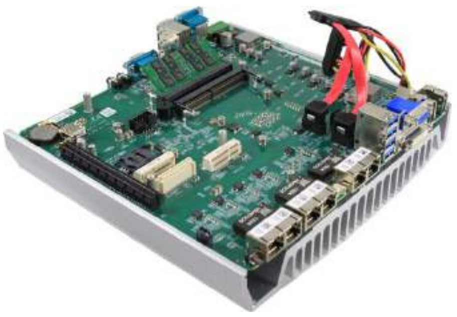
9. Reinstall the system enclosure and panel when done.

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

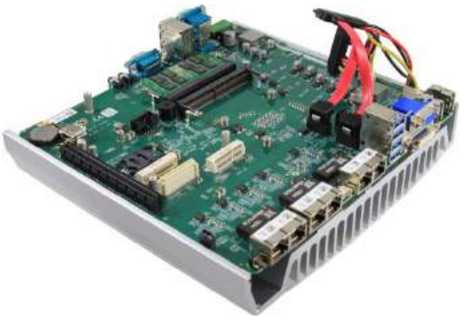
3.3 Memory Module Installation

There are two memory SO-DIMM slots on the motherboard that support a total maximum of 32GB DDR4-2133. Please follow the procedures below to replace or install the memory modules.

1. Disassemble the system enclosure according to steps described in section 3.1.
2. The SO-DIMM slots can be located once the bottom cover of the enclosure has been removed.
3. To install the memory module, insert gold fingers of the module into the slot at 45-degree angle, push down on the edge of the module and the clips on the side should clip the module into place.



Insert module at 45-degree angle



Press down ontheouter edge of the memory module

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

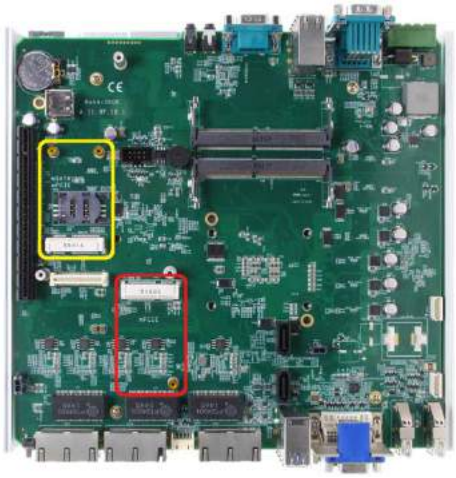
3.4 mPCIe Module Installation

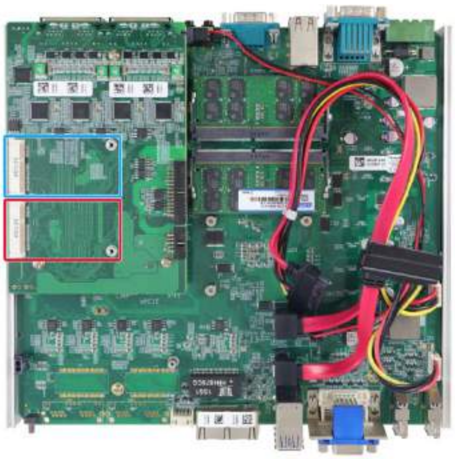
There are two full-size mPCIe sockets with SIM card support on the PCBA and another two on the MezIO™ module. It supports off-the-shelf mPCIe modules. Please refer to the following procedures on how to install a mPCIe module.

WARNING

It is recommended to install 4G SIM mPCIe modules onto the MezIO™ module's mPCIe socket to avoid signal conflict issues.

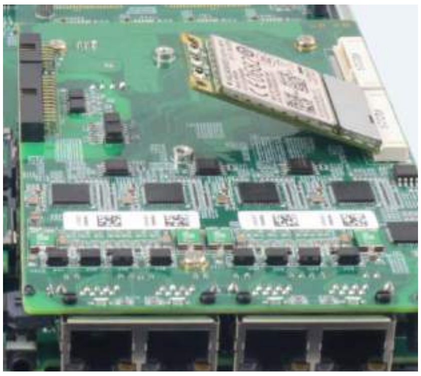
1. Disassemble the system enclosure according to steps described in section 3.1.
2. Location of the mPCIe sockets on the motherboard shown below. The SIM slot of the mPCIe socket (in **red**) is situated on the rear panel.

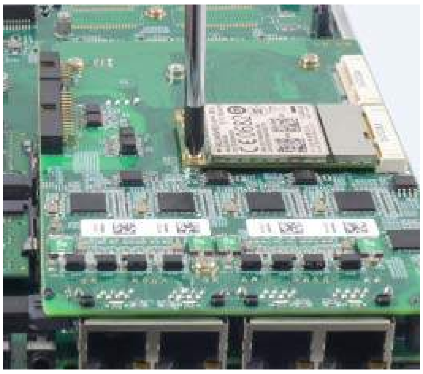




mPCIe on motherboard **mPCIe on MezIO Module**

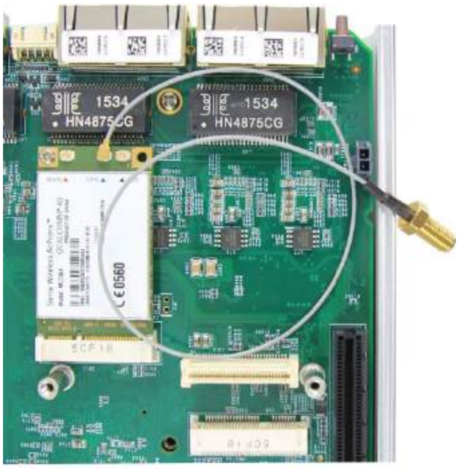
3. Inset the mPCIe module's gold finger on a 45-degree angle into the socket, gently press the module down and secure it with an M2.5 P-head screw.



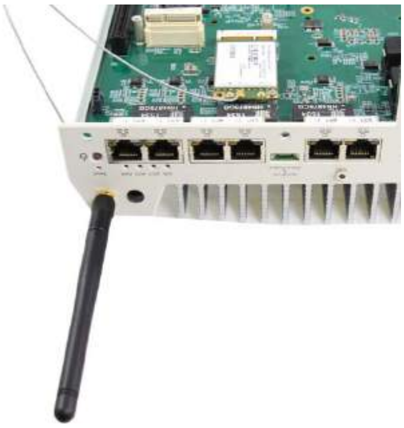


45-degree insertion angle **Secured with M2.5 P-head screw**

4. Clip on the IPEX-to-SMA cable to the module and attach the antenna onto the front or rear panel.

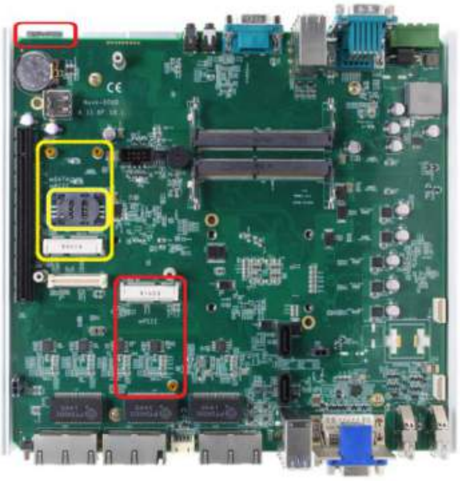


Clip on IPEX-to-SMA cable

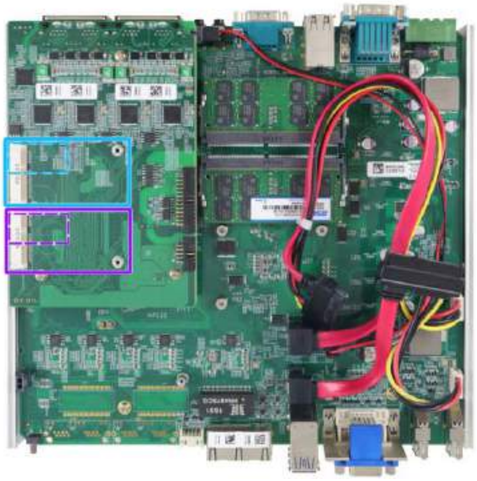


Attach antenna to panel

5. Insert the SIM card (if necessary) situated underneath the mPCIe slot on the MezIO^{TM} module.



SIM slots for onboard mPCIe modules



SIM slots for mPCIe sockets on MezIO modules(on the opposite side)

6. The mPCIe socket (in **red**) works in conjunction with the panel-accessible SIM slot on the rear panel, while other mPCIe sockets work with internal SIM slots. Insert the SIM upside down for 3G/ 4G access via your provider's network. Push the SIM card into the panel, make sure it clicks into the slot and is seated firmly (not protruding) in the slot.

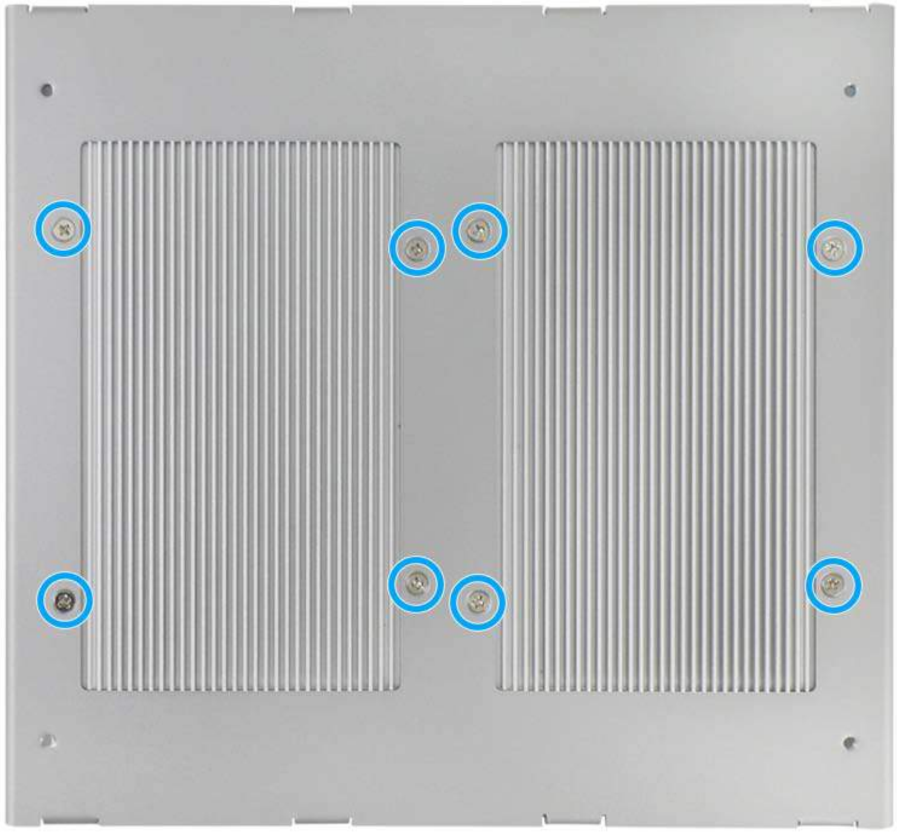
7. Reinstall the system enclosure and panel when done.

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

3.5 Installing 3.5” Hard Disk Drive

Nuvo-5608VR supports the installation of two 3.5” hard disk drives. To install the hard drives, please refer to the following instructions.

1. Disassemble the system enclosure according to steps described in section 3.1.
2. Remove the eight (8) screws indicated on the bottom panel to separate the two heatsinks.



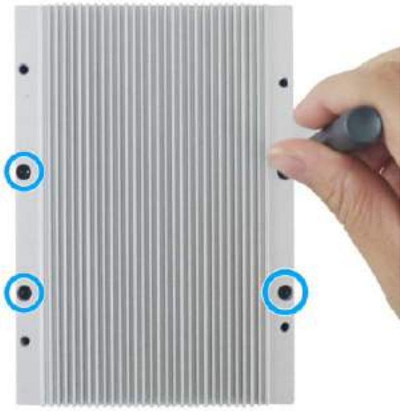
3. From the accessory box, attach the thermal conducting pad onto the bottom PCB board section of the hard drive and remove the plastic cover.

Attach thermal conducting pad

Remove plastic cover

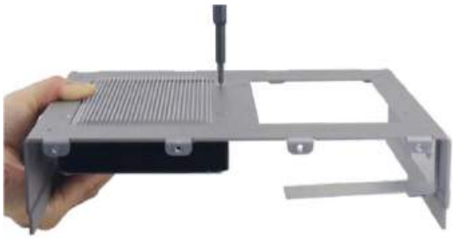
4. Place the separated hard drive heatsink onto the bottom of the hard drive and secure the hard drive to the heatsink with the supplied four (4) flathead screws.

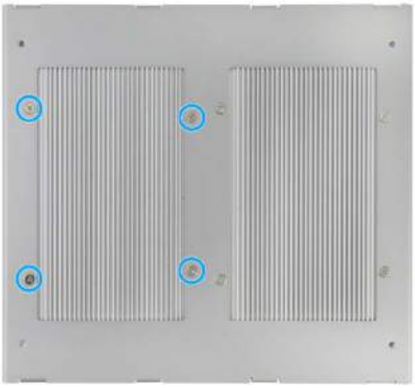
Place heatsink on the bottom of the hard drive



Secure with flathead screws

5. Both heatsinks and hard drives are attached to the bottom panel by securing four (4) screws.

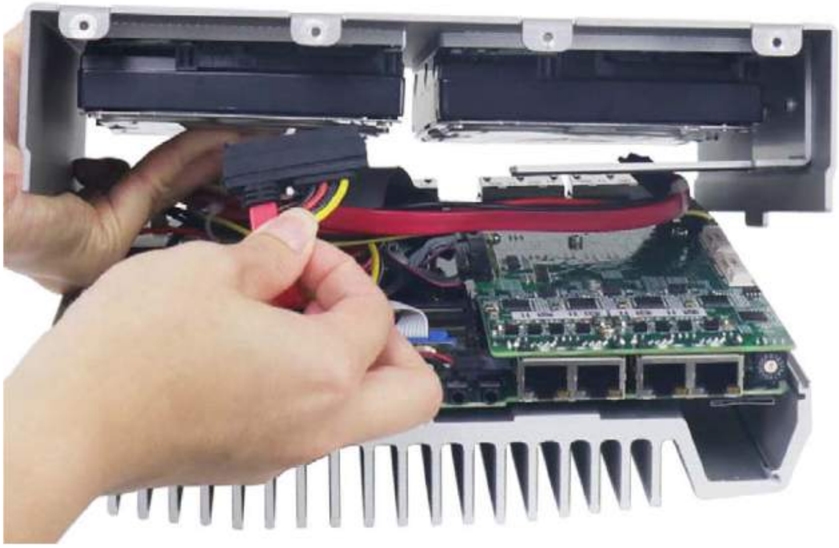




Attaching heatsink/ HDD **Secured using four (4) screws**

6. Repeat steps 1~5 to install and attach the other heatsink and hard drive.

7. Connect the SATA cable and power supply cable to the hard drives before reinstalling the bottom panel.

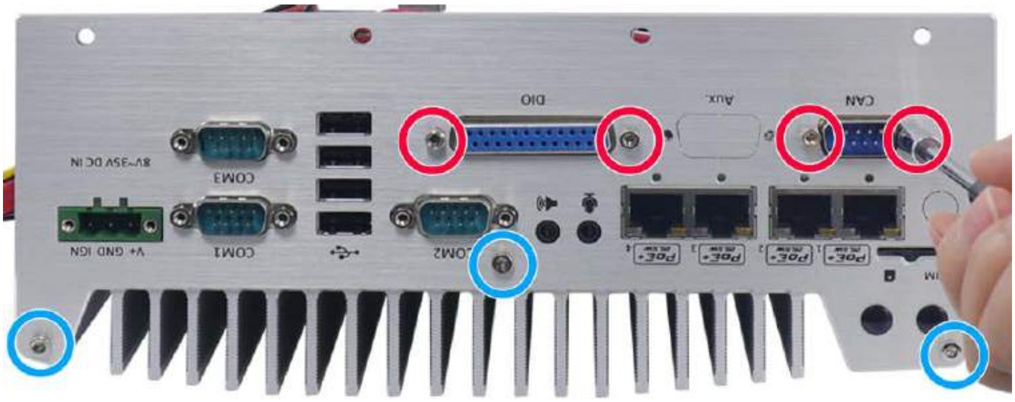


8. Reinstall the system enclosure and panel when done.

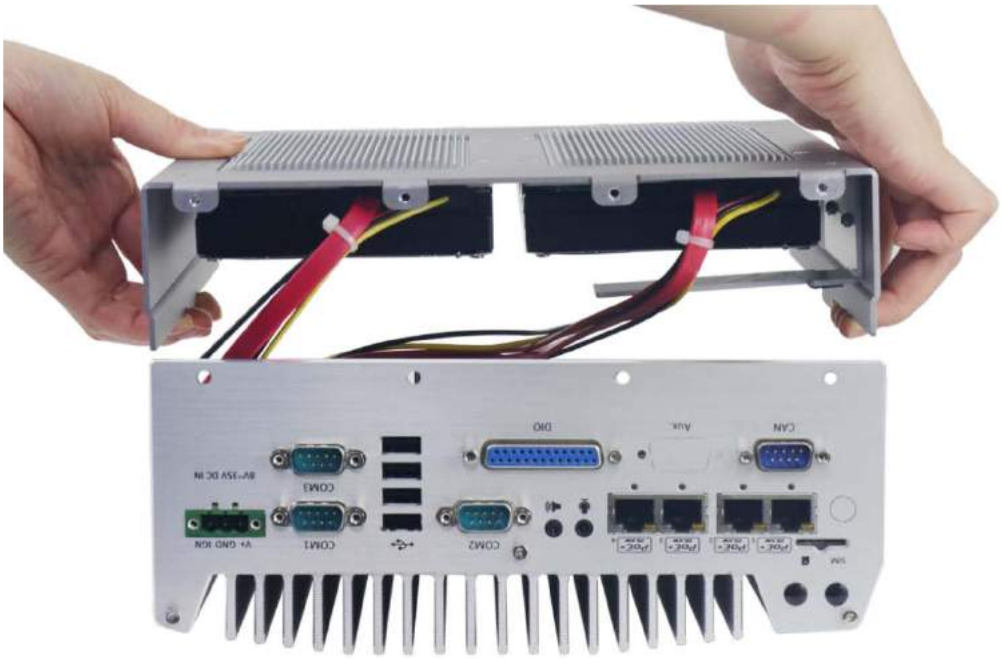
3.6 Reinstalling the System Enclosure

Once you have installed or replace the component(s), to reinstall the enclosure, please refer to the following procedure:

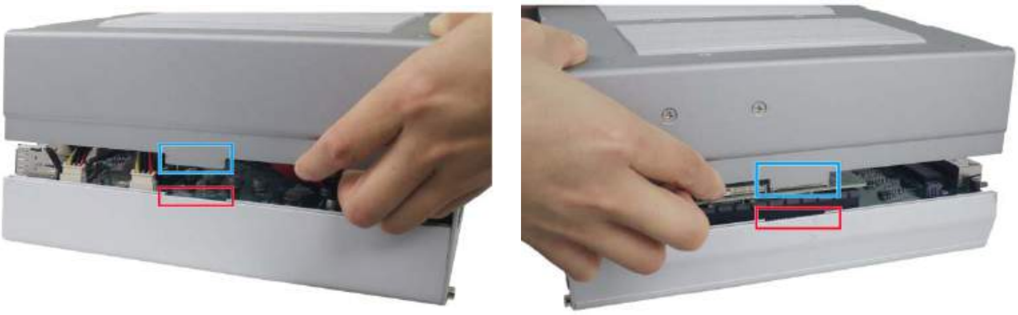
1. Reinstall the rear panel by securing the three (3) screws (indicated in **blue circles**) and secure CAN/ DIO port connectors using four (4) hex bolt screws. (indicated in **red circles**).



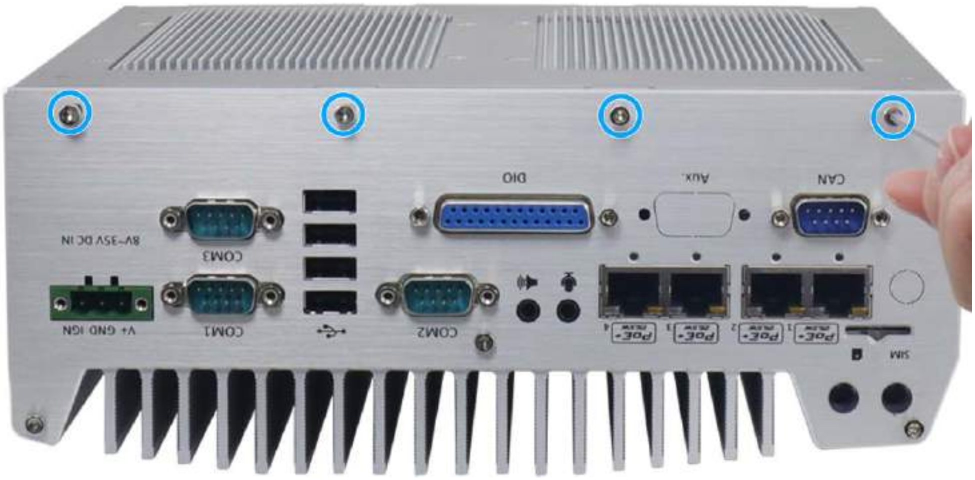
2. Connect the SATA/ power cables to the hard drives and gently lower the bottom panel.



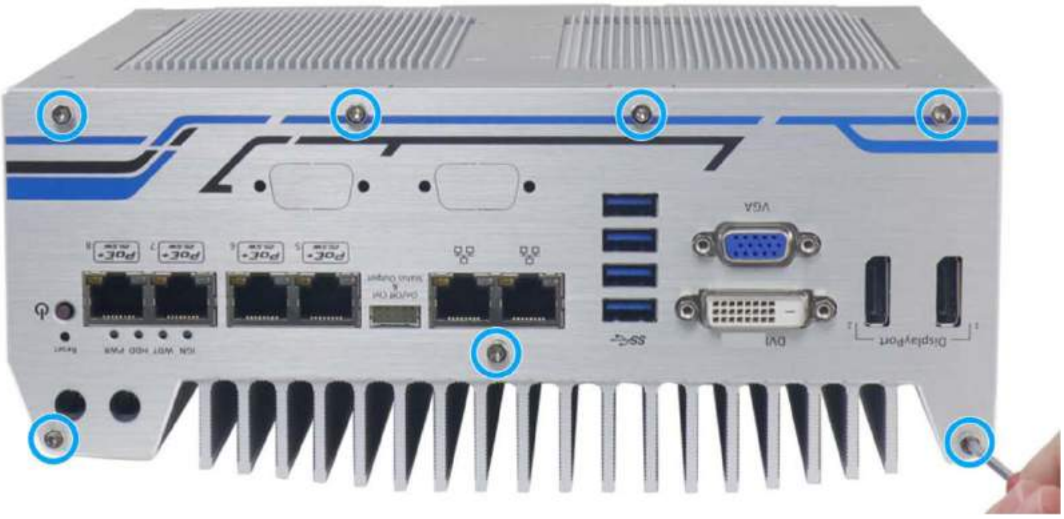
3. Gently lower the bottom panel while making sure both side’s protrusions (indicated in **blue**) meet the notches (indicated in **red**).



4. Secure the four (4) screws on the rear panel.



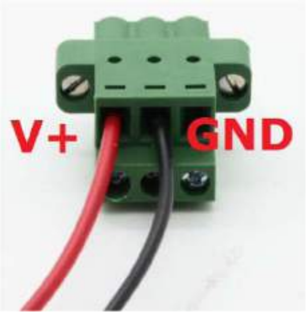
5. Attach the front panel and secure the seven (7) screws to complete the installation.



3.7 DC Power Connection

The system uses a 3-pin pluggable terminal block to accept 8~35V DC power input. It is a reliable, convenient and easy method to directly wire cables to the DC power connector. The pluggable terminal block is also used to accept ignition signal To connect DC power via the 3-pin pluggable terminal block, please refer to the procedures described below.

1. Before connecting the cables, please make sure the DC power supply is unplugged!
2. Take the 3-pin pluggable terminal block out of the accessory box. The terminal block fits the wires with a gauge of 12~24 AWG.
3. Carefully identify the positive and negative contacts of your DC power supply and the pluggable terminal block. The polarities between DC power supply and terminal block must be positive (+) to positive (+) and ground (GND) to ground (GND).
4. Insert the wires to the matching pluggable terminal block contacts and tighten clamping screws using a Philips screwdriver.
5. Plug in the terminal plug into the 3-pin pluggable terminal block on the system enclosure and secure the plug using a flat-head screwdriver.



WARNING

The system accepts 8~35 VDC when using the terminal block for DC input. Please make sure the voltage and polarity of DC power are correct before you connect and power on the system. Supplying a voltage over 35V or incorrect polarity will damage the system!

3.8 Wall Mount/ Anti-Vibration Bracket Installation

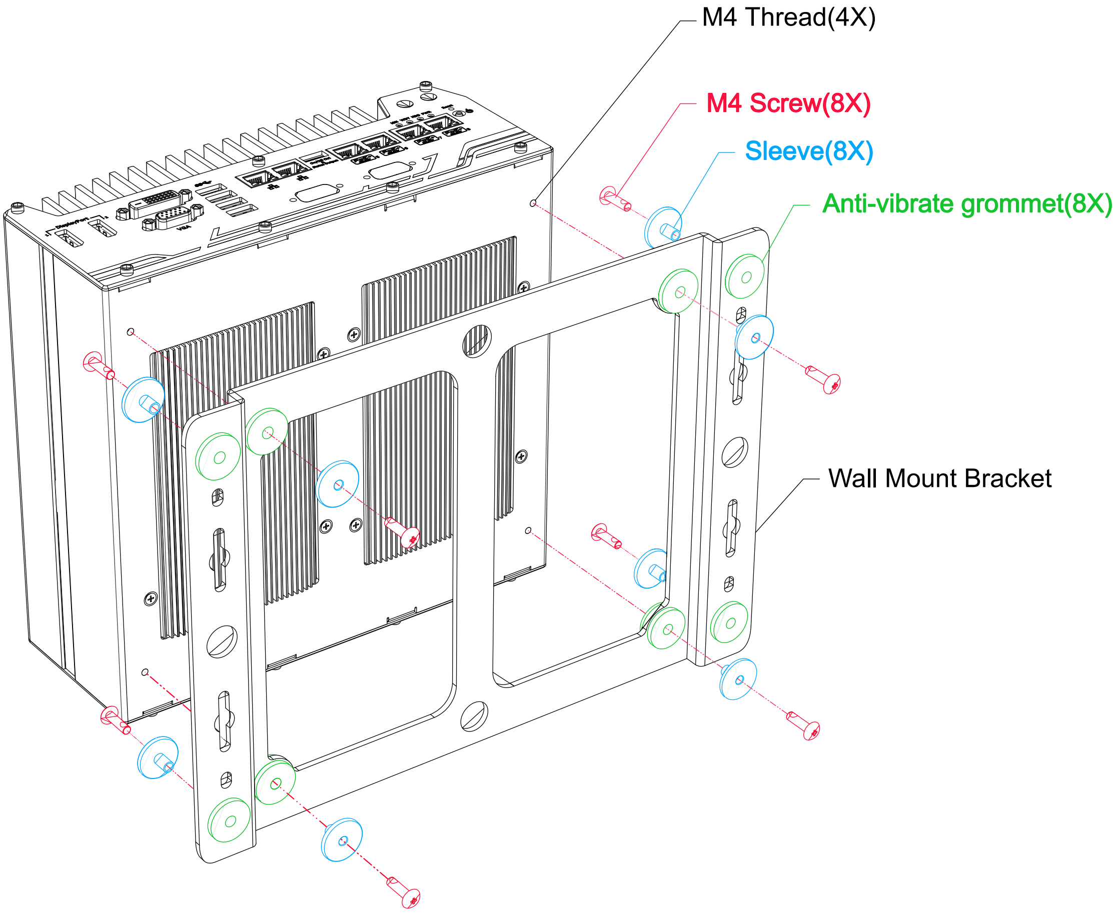
Nuvo-5608VR is shipped with dedicated wall mount/ anti-vibration for in-vehicle installation. The patented wall mount anti-vibration damping bracket offers superior vibration resistance (operating, 1 Grms, 5-500 Hz, 3 Axes w/ HDD and damping bracket installed, according to IEC60068-2-64). To install the bracket, please refer to the following installation procedure.

NOTE

1. *You will need to remove the four (4) rubber stands at the bottom of the enclosure if they have been attached.*
2. *Make sure the bracket is mounted on a flat surface.*
3. *The system's heat dissipation efficiency is at its best when heatsink fins are positioned horizontally.*

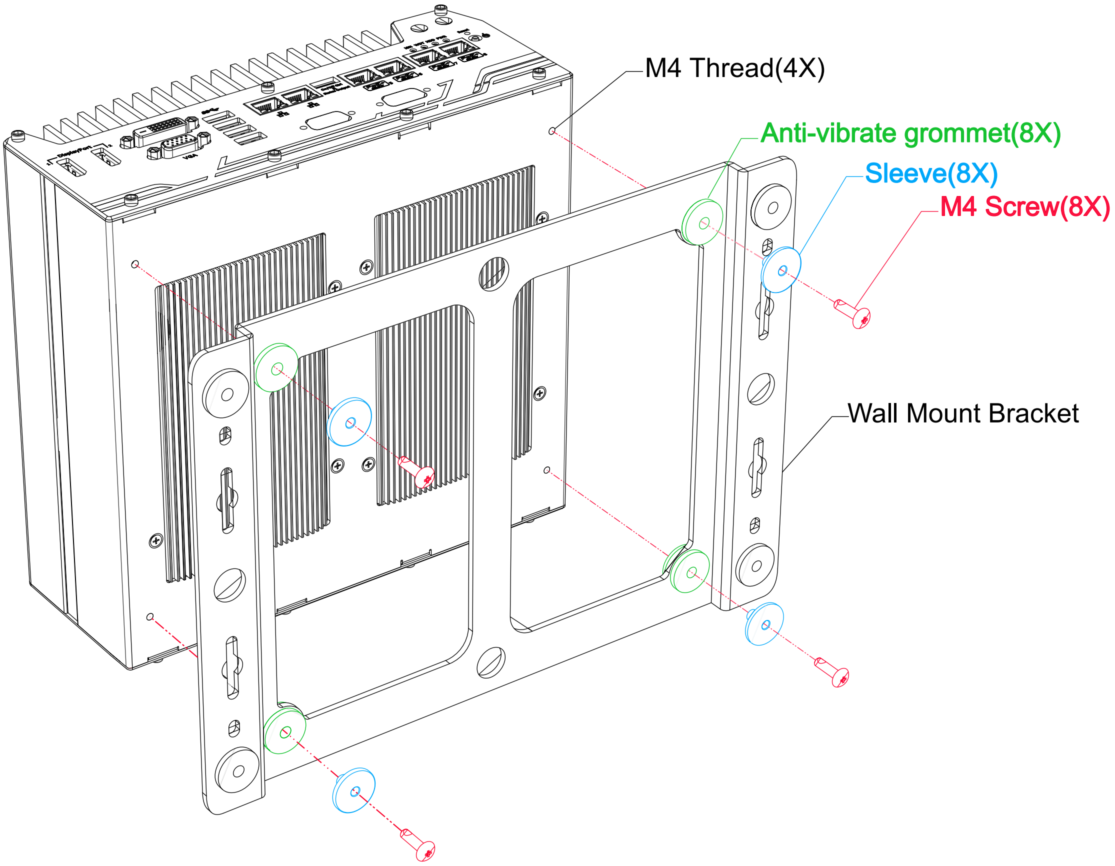
3.8.1 Wall Mount Anti-vibration Bracket Exploded View

There are eight (8) **M4 screws**, eight (8) **sleeves**and eight (8)**anti-vibration grommets** (pre-installed).



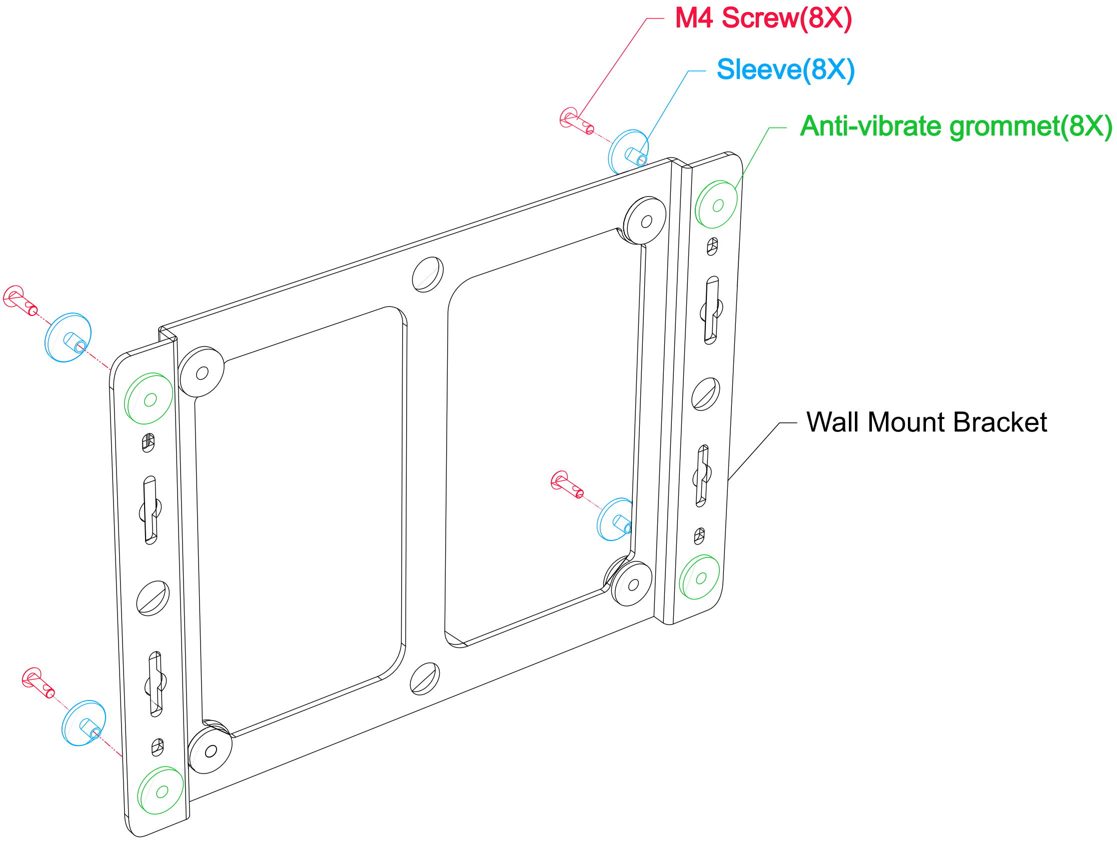
3.8.2 System &Wall Mount Anti-vibration Bracket Installation

Secure the bracket by seating an **M4 screw**ina **sleeve** before it is inserted into an **anti-vibration grommet** (pre-installed). Fasten the M4 screws to four M4 threads.



3.8.3 Wall Mount Anti-vibration Bracket Installation

For demonstration purposes, the system enclosure has been removed in the following illustration to show how to secure the bracket onto a flat surface. The same rule applies where you must seat an**M4 screw** in a **sleeve** before it is inserted into an **anti-vibration grommet** (pre-installed).



3.9 Powering On the System

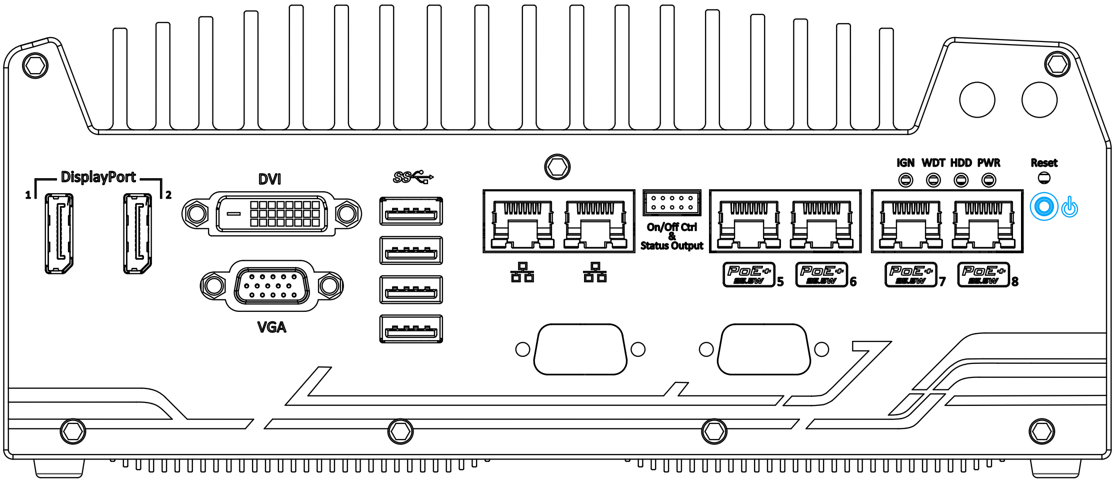
There are four methods to power on the system

- Using the ignition signal input
- Pressing the power button
- Via an external non-latched switch
- Sending a LAN packet via Ethernet (Wake-on-LAN)

Powering on using the ignition power control is described in a designated section. We will describe the other three processes involved in this section

3.9.1 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 the 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.

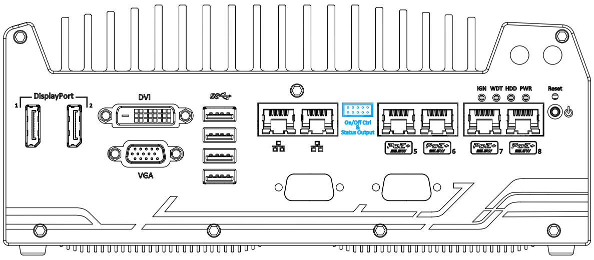


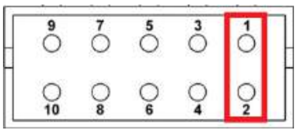
3.9.2 Powering On Using External Non-latched Switch

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 an "On/ Off Control Ctrl & Status Output" connection (a 2x5, 2.0mm pitch wafer connector) 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/ offthe system using an external non-latched switch (ATX-mode), please follow the steps described below.

1. Acquire a non-latched switch with a 2x5, 2.0mm pitch wafer terminal and the switch must be connected to pin#1 and pin #2 (polarity is negligible).

2. Connect the wafer terminal to the "On/Off Control Ctrl & Status Output" connector on the system



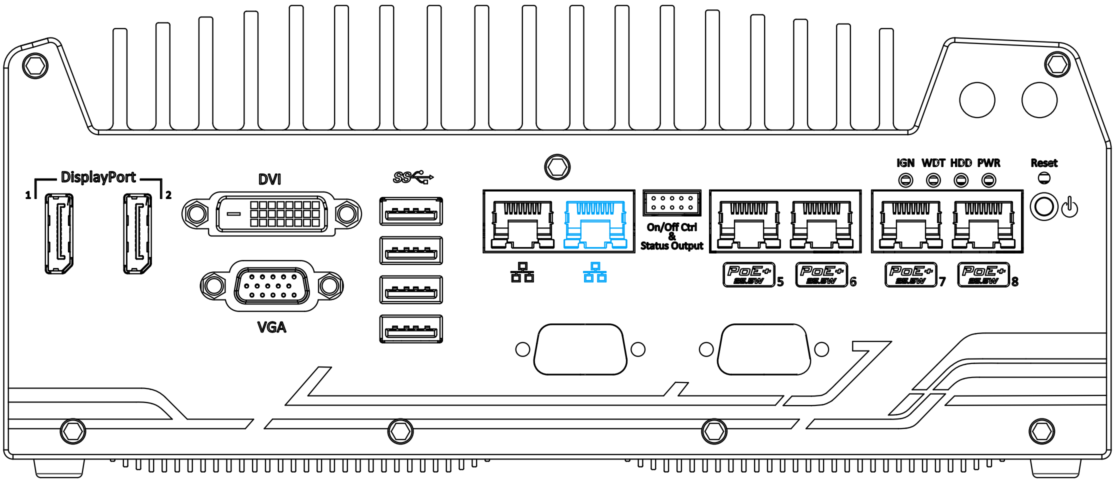


On/Off Control Ctrl & Status Output **Pin #1 and Pin #2**

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 the 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.

3.9.3 Powering On Using Wake-on-LAN

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

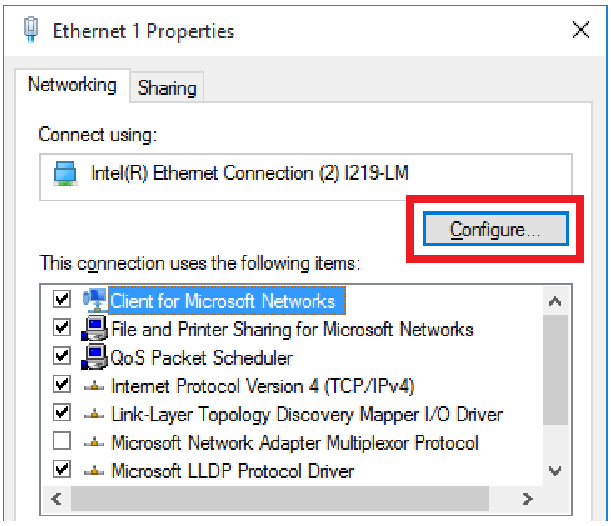


NOTE

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 following 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 systemtoboot 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...**



Ethernet 1 Properties

Networking | Sharing

Connect using:

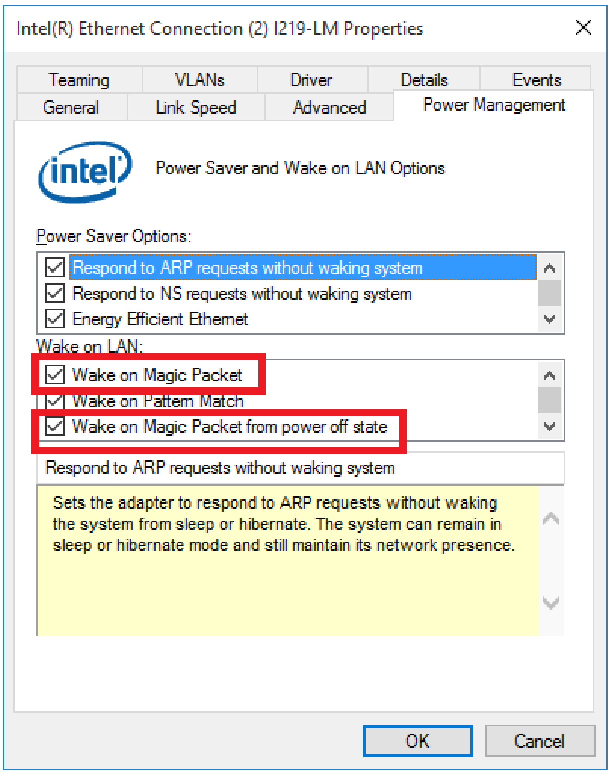
Intel(R) Ethernet Connection (2) I219-LM

Configure...

This connection uses the following items:

- ☑ Client for Microsoft Networks
- ☑ File and Printer Sharing for Microsoft Networks
- ☑ QoS Packet Scheduler
- ☑ Internet Protocol Version 4 (TCP/IPv4)
- ☑ Link-Layer Topology Discovery Mapper I/O Driver
- ☐ Microsoft Network Adapter Multiplexor Protocol
- ☑ Microsoft LLDP Protocol Driver

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



Intel(R) Ethernet Connection (2) I219-LM Properties

Power Saver Options:

☑ Respond to ARP requests without waking system
☑ Respond to NS requests without waking system
☑ Energy Efficient Ethernet

Wake on LAN:

☑ Wake on Magic Packet
☑ Wake on Pattern Match
☑ Wake on Magic Packet from power off state

Respond to ARP requests without waking system

Sets the adapter to respond to ARP requests without waking the system from sleep or hibernate. The system can remain in sleep or hibernate mode and still maintain its network presence.

Magic Packet

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

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

DESTINATION SOURCE MISC

FF FFFFFFFFFF

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

MISC CRC

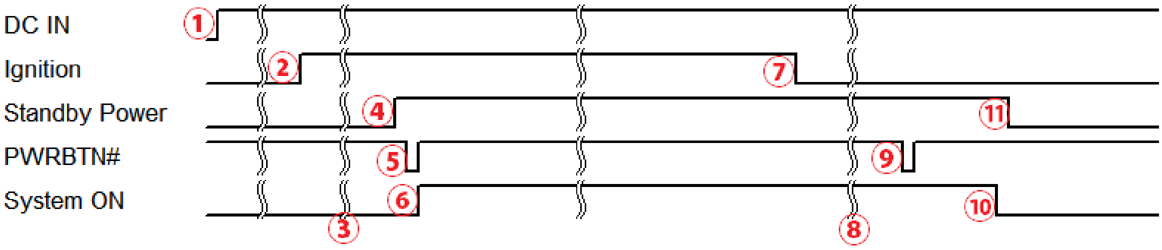
There are some free tools available on Internet that can be used to send a magic packet. Please refer to the following link to understand more about Magic Packet.

3.10 Ignition Power Control

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

3.10.1 Principles of Ignition Power Control

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



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

3.10.2 Additional Features of Ignition Power Control

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

1. **Low battery detection**

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

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

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

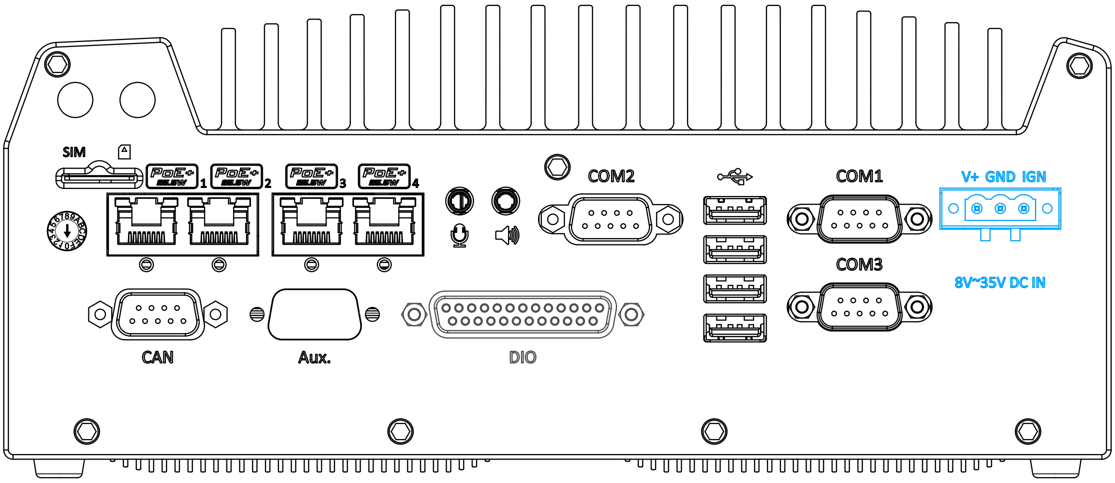
3. **System hard-off**

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

4. **Smart off-delay**

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

3.10.3 Wiring Ignition Signal



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

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

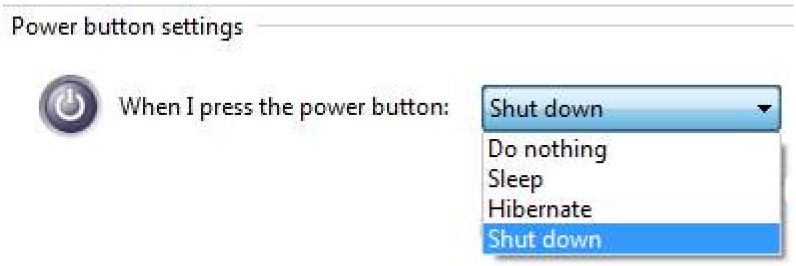
WARNING

Please make sure your DC power source and IGN signal share the same ground.

IGN input accepts 8~35VDC. Supply a voltage higher than 35VDC may damage the system.

3.10.4 Configure your Windows system

When applying ignition power control to your system, please make sure you’ve configured your Windows system to initiate a shutdown process when pressing the power button. By default, Windows 7/ 8/ 10 goes to sleep (S3) mode when the power button is pressed. As sleep (S3) is not a complete shutdown behavior, the ignition control function does not recognize the finish of a normal shut down process and thus users will encounter a system hard-off (power cut-off after 10 minutes). Please configure “When I press the power button” to “Shut down” in your Windows system settings.



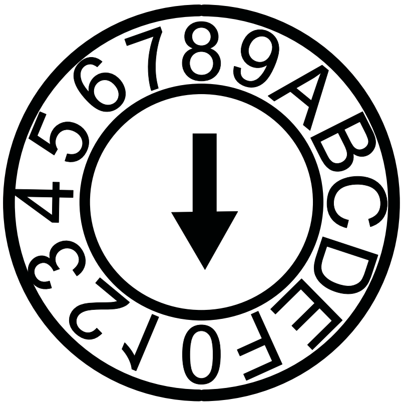
Power button settings

When I press the power button: Shut down

3.10.5 Operation Modes of Ignition Power Control

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

The ignition control module is also BIOS-configurable. When rotary switch is set to mode 15 (0xF), the ignition power control is set to execute according to parameters configured in BIOS setup menu, which allows the richer combination of power-on/ power-off delay and more detailed control parameters.



- **Mode 0**

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

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

- **Mode 1**

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

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

- **Mode 2**

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

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

- **Mode 3 ~ Mode 12**

Mode 3 ~ Mode 12 have various power-on delay and power-off delay. Each mode supports a hard-off timeout of 10 minutes.

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

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

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

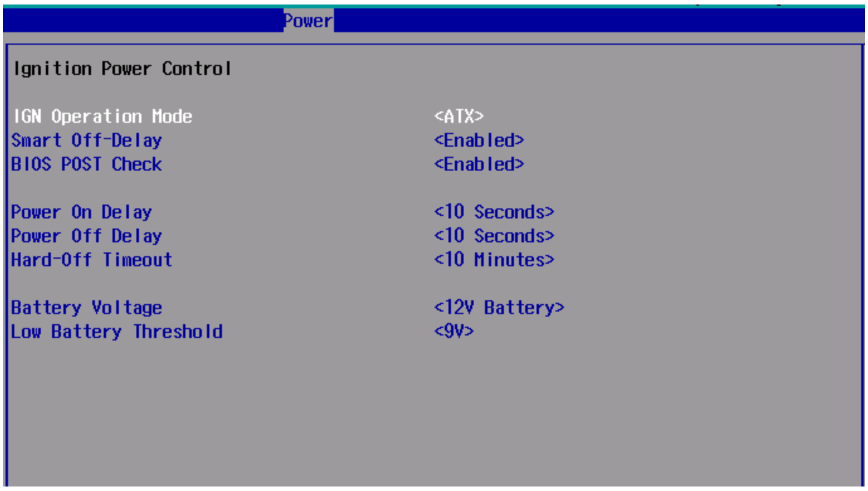
Mode	Power-on Delay	Power-off Delay	Hard-off Timeout
13 (D)	30 seconds	2 hours	10 minutes
14 (E)	3 minutes	2 hours	10 minutes

- **Mode 15 (F)**

The ignition control module is implemented to support BIOS-configurable ignition parameters. When the rotary switch is set to 15 (0xF), users can configure ignition parameters in BIOS setup menu.

To configure ignition parameters in BIOS, please follow the steps below.

1. Make sure you have set the rotary switch to position 15 (0xF).
2. When system boots up, press F2 to enter BIOS setup menu.
3. Go to **[Power]→[Ignition Power Control]**.



```
Power

Ignition Power Control

IGN Operation Mode                          <ATX>
Smart Off-Delay                             <Enabled>
BIOS POST Check                             <Enabled>

Power On Delay                              <10 Seconds>
Power Off Delay                             <10 Seconds>
Hard-Off Timeout                            <10 Minutes>

Battery Voltage                             <12V Battery>
Low Battery Threshold                       <9V>
```

4. You can configure parameters for ignition power control according to your application.

[IGN Operation Mode]

ATX	ATX mode without power-on and power-off delay. Same operation as rotary switch set to 0.
AUTO-ON	Automatically turns on the system when DC power is applied. Same operation as rotary switch set to 1.
IGN	Ignition power control mode. Ignition control is executed according to the specified parameters.

[Smart Off-Delay]

Enabled	If the system is manually shutdown during the power-off delay period, ignition control module will cut off system power in prior to expiration of power-off delay to save battery power.
Disabled	Ignition control module cut off system power only after power-off delay expired.

[BIOS POST Check]

Enabled	This option secures a boot-to-OS operation. If the system is failed to boot to OS (e.g. disk failure or no bootable device) within 60 seconds, ignition control module will cut off system power and retry another power on cycle.
Disabled	BIOS POST check is skipped.

[Power On Delay]

This setting specifies the power-on delay duration. Once the IGN signal goes active and sustains for the duration of the power-on delay, ignition control module turns on system power and boot up the system.

[Power Off Delay]

This settingspecifies the power-off delay duration. Once the IGN signal goes inactive and sustains for the duration of the power-off delay, ignition control module performs system shutdown (soft-off) and then cut off system power.

[Hard-off Timeout]

This settingspecifies system hard-off timeout. Once system failed to normally shutdown via a soft-off operation due to system/application halts (e.g. Windows BSOD), ignition control module can compulsively cut off system power after the given hard-off timeout.

[Battery Voltage]

This settingspecifies the battery voltage of the vehicle where System VTC is deployed. Typically it’s 12 VDC for sedan and 24 VDC for bus/truck.

[Low Battery Threshold]

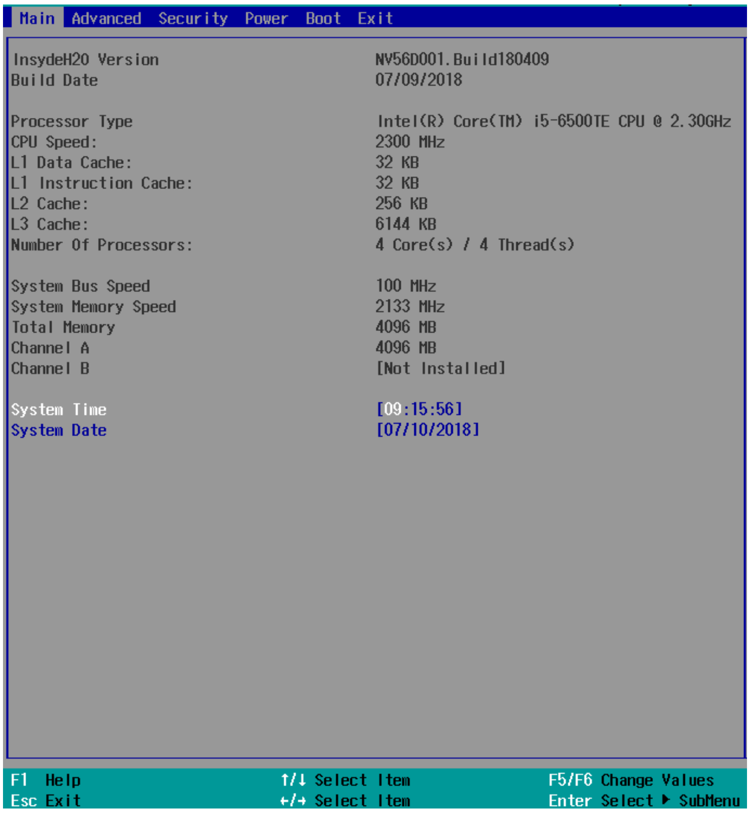
When the system is running, ignition control module continuously monitors the battery voltage. Once the battery voltage is lower than the specified threshold, it performs system shutdown (soft-off) and cut off system power to prevent battery drain-out. You should specify the low battery threshold according to the given battery voltage.

Press F10 to “Save Changes and Exit”. The ignition control module will be reset and operate according to parameters configured in the BIOS setup menu.

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).



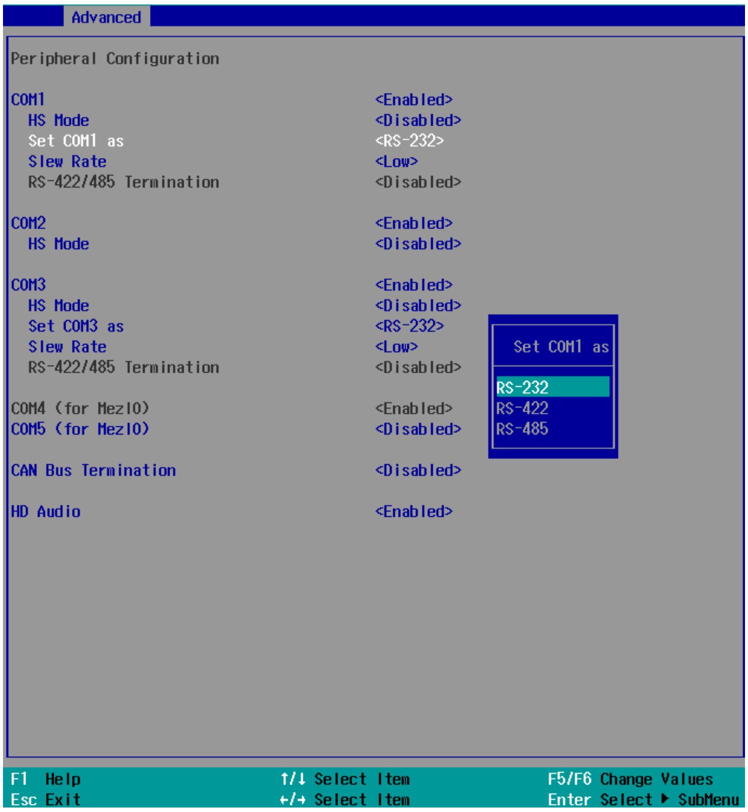
```
InsydeH20 Version              NV56D001.Build180409
Build Date                     07/09/2018

Processor Type                 Intel(R) Core(TM) i5-6500TE CPU @ 2.30GHz
CPU Speed:                     2300 MHz
L1 Data Cache:                 32 KB
L1 Instruction Cache:          32 KB
L2 Cache:                      256 KB
L3 Cache:                      6144 KB
Number Of Processors:          4 Core(s) / 4 Thread(s)

System Bus Speed               100 MHz
System Memory Speed            2133 MHz
Total Memory                   4096 MB
Channel A                      4096 MB
Channel B                      [Not Installed]

System Time                    [09:15:56]
System Date                    [07/10/2018]

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.

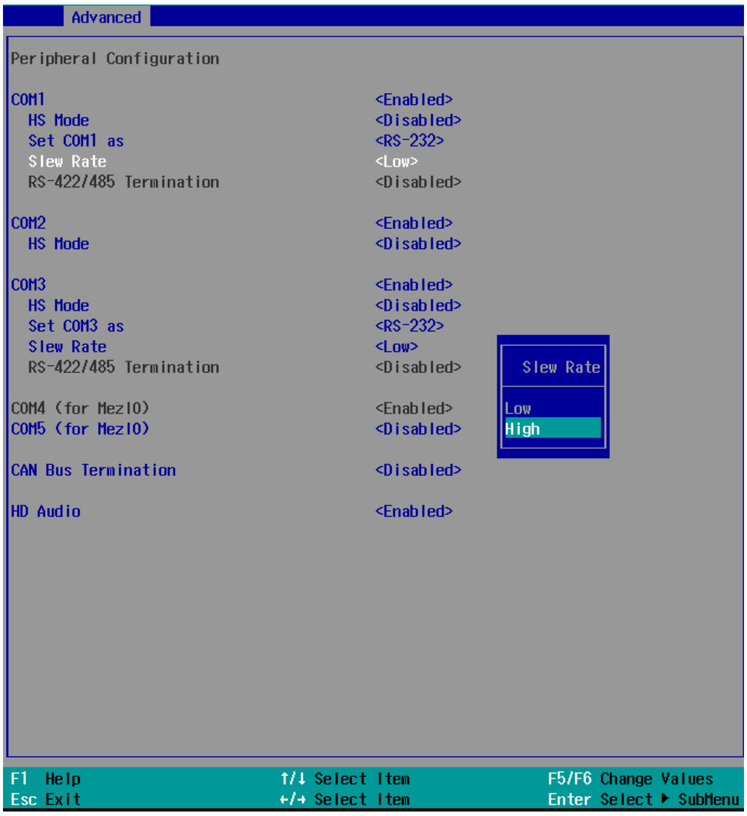
4.1.1 COM1 & COM3 Operating Mode

COM1 and COM3ports support RS-232 (full-duplex), RS-422 (full-duplex) and RS-485 (half-duplex) mode. You can set the COM1/COM3 operating mode via BIOS settings.



```
        Advanced

Peripheral Configuration

COM1                                     <Enabled>
  HS Mode                                <Disabled>
  Set COM1 as                            <RS-232>
  Slew Rate                              <Low>
  RS-422/485 Termination                 <Disabled>

COM2                                     <Enabled>
  HS Mode                                <Disabled>

COM3                                     <Enabled>
  HS Mode                                <Disabled>
  Set COM3 as                            <RS-232>
  Slew Rate                              <Low>
  RS-422/485 Termination                 <Disabled>

COM4 (for MezIO)                         <Enabled>
COM5 (for MezIO)                         <Disabled>

CAN Bus Termination                      <Disabled>

HD Audio                                 <Enabled>

        Set COM1 as
        RS-232
        RS-422
        RS-485

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

Another option in BIOS called “*Slew Rate*” defines how sharp the rising/falling edge is for the output signal of COM1/COM3. For long-distance RS-422/ 485 transmission, you may set the “*Slew Rate*” option as “High” to improve signal quality.



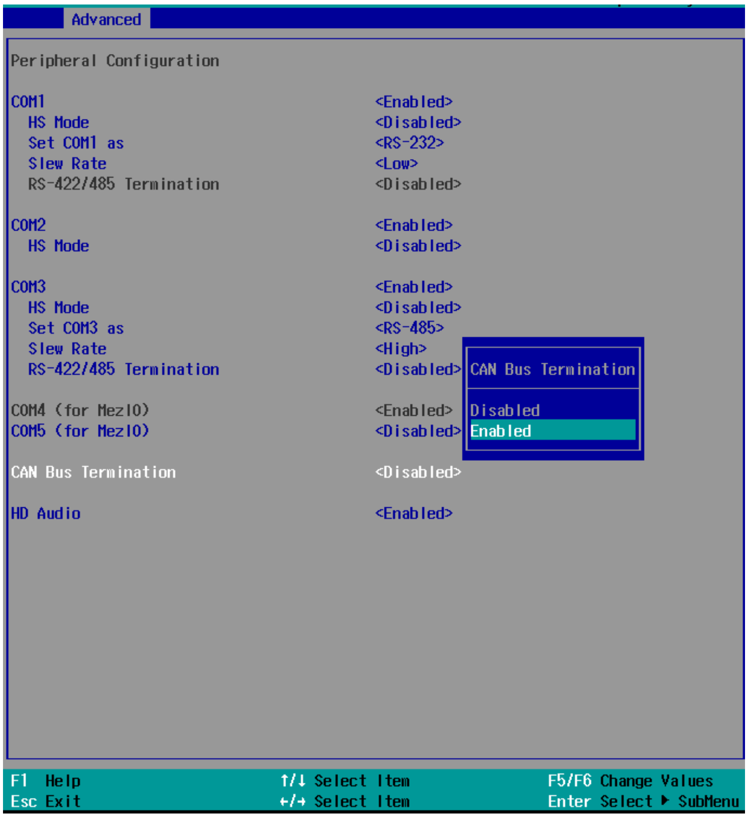
```
     Advanced

Peripheral Configuration

COM1                                      <Enabled>
  HS Mode                                 <Disabled>
  Set COM1 as                             <RS-232>
  Slew Rate                               <Low>
  RS-422/485 Termination                  <Disabled>

COM2                                      <Enabled>
  HS Mode                                 <Disabled>

COM3                                      <Enabled>
  HS Mode                                 <Disabled>
  Set COM3 as                             <RS-232>
  Slew Rate                               <Low>
  RS-422/485 Termination                  <Disabled>     Slew Rate

COM4 (for MezIO)                          <Enabled>      Low
COM5 (for MezIO)                          <Disabled>     High

CAN Bus Termination                       <Disabled>

HD Audio                                  <Enabled>

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

To set COM port operating mode:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Advanced] > [Peripheral Configuration]**.
3. Highlight the COM port you wish to set and press Enter to bring up setting options. Use up/ down arrow to highlight your selection and press Enter.
4. Repeat step 2 to set other COM ports.
5. Press F10 to “Exit Saving Changes”.

4.1.2 CAN bus Termination

The CAN bus is a communication bus running at differential signal pair and it must be terminated. The system features built-in termination to suppress signal reflection. You should enable the built-in CAN Bus Termination if no external resistor is added to the connection.



```
Advanced

Peripheral Configuration

COM1                                      <Enabled>
  HS Mode                                 <Disabled>
  Set COM1 as                             <RS-232>
  Slew Rate                               <Low>
  RS-422/485 Termination                  <Disabled>

COM2                                      <Enabled>
  HS Mode                                 <Disabled>

COM3                                      <Enabled>
  HS Mode                                 <Disabled>
  Set COM3 as                             <RS-485>
  Slew Rate                               <High>
  RS-422/485 Termination                  <Disabled>  CAN Bus Termination

COM4 (for MezIO)                          <Enabled>   Disabled
COM5 (for MezIO)                          <Disabled>  Enabled

CAN Bus Termination                       <Disabled>

HD Audio                                  <Enabled>

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

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

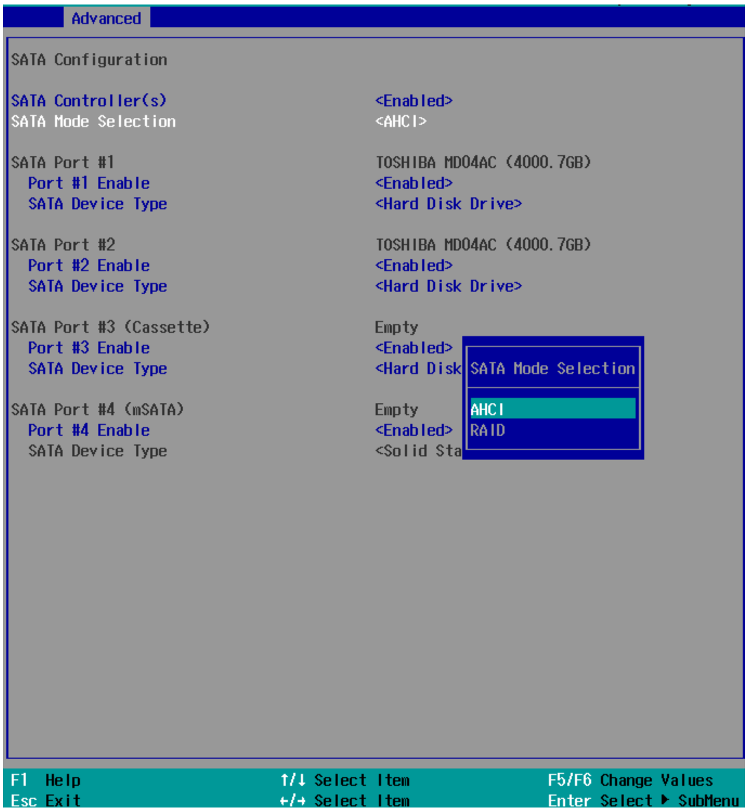
2. Go to **[Advanced] > [Peripheral Configuration]**.

3. Highlight CAN bus Termination and press Enter to bring up options, Disabled/ Enabled, use up/ down arrow to highlight your selection and press Enter.

4. Press F10 to “Exit Saving Changes”.

4.1.3 SATA Configuration

The system SATA controller supports two (2) operating modes: **AHCI** and **RAID** mode. **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. **RAID** mode provides redundant data storage (RAID 1) or a higher throughput (RAID 0). The system features built-in hardware RAID. No additional H/W or driver is needed to use RAID function.



```
Advanced

SATA Configuration

SATA Controller(s)                          <Enabled>
SATA Mode Selection                         <AHCI>

SATA Port #1                                TOSHIBA MD04AC (4000.7GB)
  Port #1 Enable                            <Enabled>
  SATA Device Type                          <Hard Disk Drive>

SATA Port #2                                TOSHIBA MD04AC (4000.7GB)
  Port #2 Enable                            <Enabled>
  SATA Device Type                          <Hard Disk Drive>

SATA Port #3 (Cassette)                     Empty
  Port #3 Enable                            <Enabled>
  SATA Device Type                          <Hard Disk

SATA Port #4 (mSATA)                        Empty
  Port #4 Enable                            <Enabled>
  SATA Device Type                          <Solid Sta

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

Recommended SATA controller mode settings:

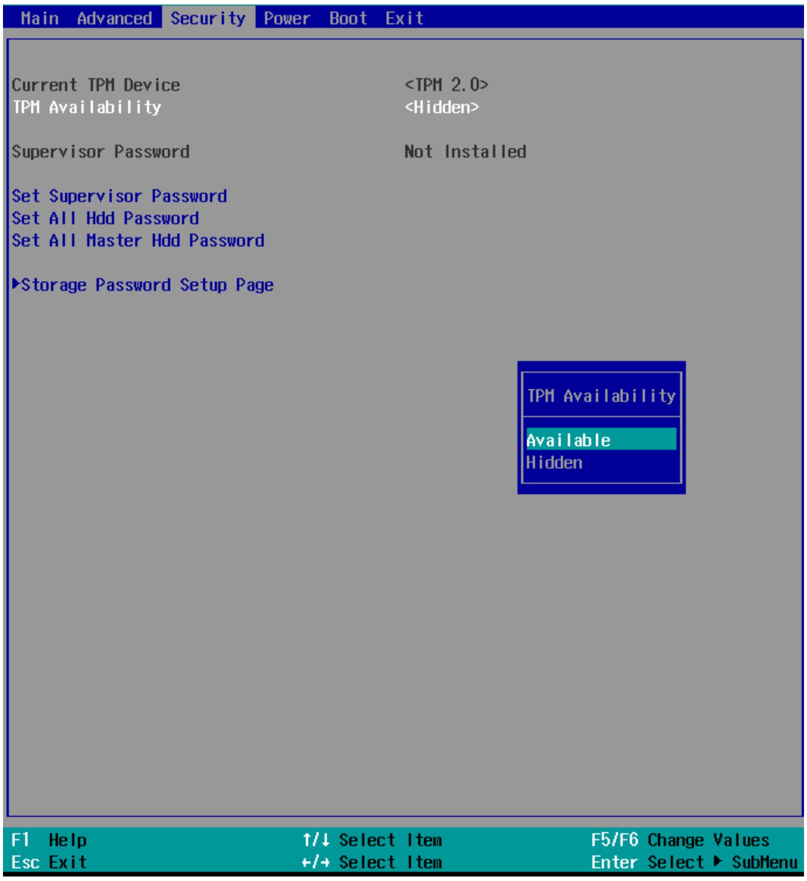
- If you're using Windows Vista, Windows 7/ 8/ 10, or Linux kernel 2.6.19 or later, you can select **AHCI** mode for better performance.
- If you're installing two HDD/SSD for data striping (RAID 0) or data mirroring (RAID 1), you can select **RAID** mode to utilize built-in RAID. For details on how to create a RAID volume, please refer to the section, RAID Volume Configuration.

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 port you wish to set and press Enter to bring up setting options. Use up/ down arrow to highlight your selection and press Enter.
4. Repeat step 3 to set other SATA ports.
5. Press F10 to "Exit Saving Changes".

4.1.4 TPM Availability

Trusted Platform Module (TPM) is a hardware-based cryptoprocessor to secure hardware by integrating cryptographic keys into devices. The system is designed with on-board TPM 2.0 module. As TPM 2.0 requires 64-bit Windows 7/8/10 with UEFI boot mode, it is disabled 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.



```
Main  Advanced  Security  Power  Boot  Exit

Current TPM Device                        <TPM 2.0>
TPM Availability                          <Hidden>

Supervisor Password                       Not Installed

Set Supervisor Password
Set All Hdd Password
Set All Master Hdd Password

▶Storage Password Setup Page

                                                        TPM Availability

                                                        Available
                                                        Hidden

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

To enable TMP availability:

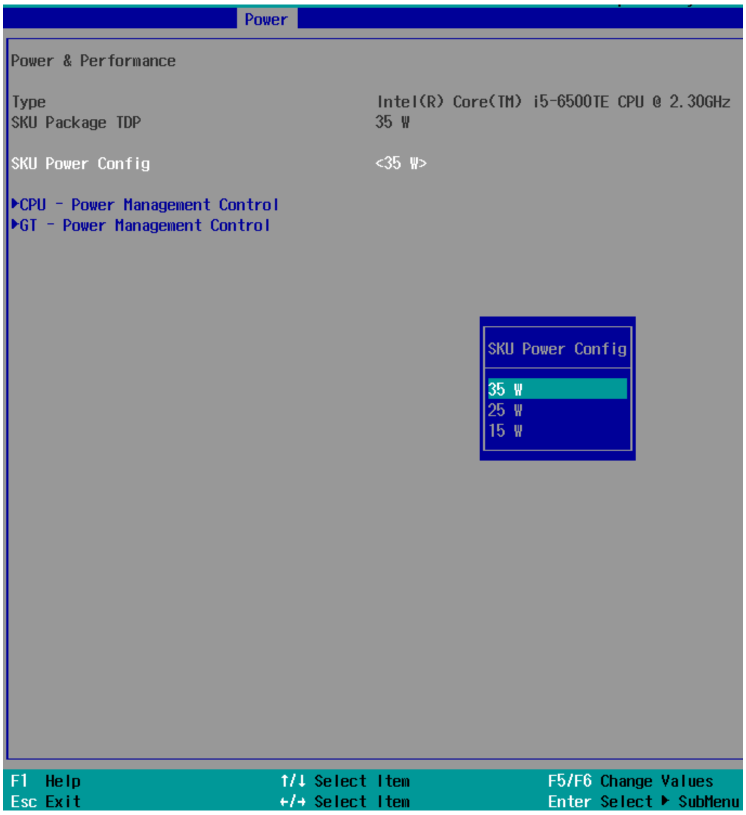
1. When system boots up, press F2 to enter BIOS setup utility.

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

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

4.1.5 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 to obtain more computing power. This feature gives you the flexibility of CPU selection and great balance between computing power and operating temperature range.



```
                              Power

Power & Performance

Type                                      Intel(R) Core(TM) i5-6500TE CPU @ 2.30GHz
SKU Package TDP                           35 W

SKU Power Config                          <35 W>

▶CPU - Power Management Control
▶GT - Power Management Control

                                                       SKU Power Config

                                                       35 W
                                                       25 W
                                                       15 W

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

Here is our suggestion regarding specifying SKU power for system with 65W/ 54W/ 51W CPUs.

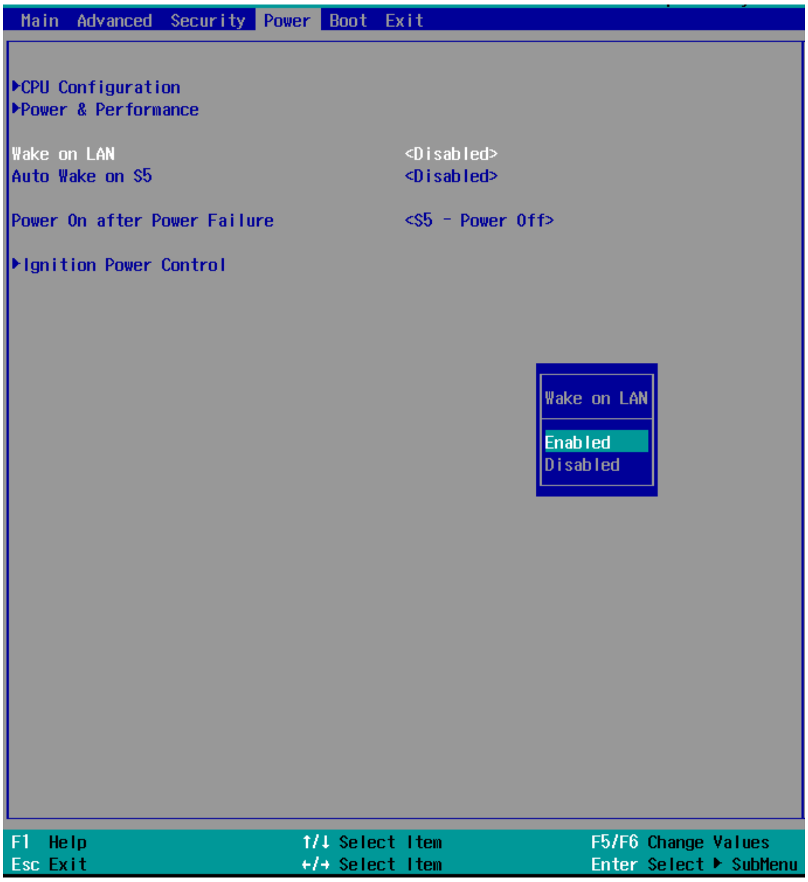
- For a system running at up to 70°C ambient, specify SKU power to 35 W.
- For a system running at up to 60°C ambient, specify SKU power to 45 W.
- For a system running at up to 50°C ambient, specify SKU power to Max. TDP.

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]**.
3. Select a proper value of SKU power limit for **[SKU Power Config]** option.
4. Press F10 to “Exit Saving Changes.

4.1.6 Wake on LAN Option

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



```
 Main  Advanced  Security  Power  Boot  Exit

▸CPU Configuration
▸Power & Performance

Wake on LAN                                <Disabled>
Auto Wake on S5                            <Disabled>

Power On after Power Failure               <S5 - Power Off>

▸Ignition Power Control

                                                          Wake on LAN

                                                          Enabled
                                                          Disabled

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

To enable/disable “Wake on LAN” option:

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

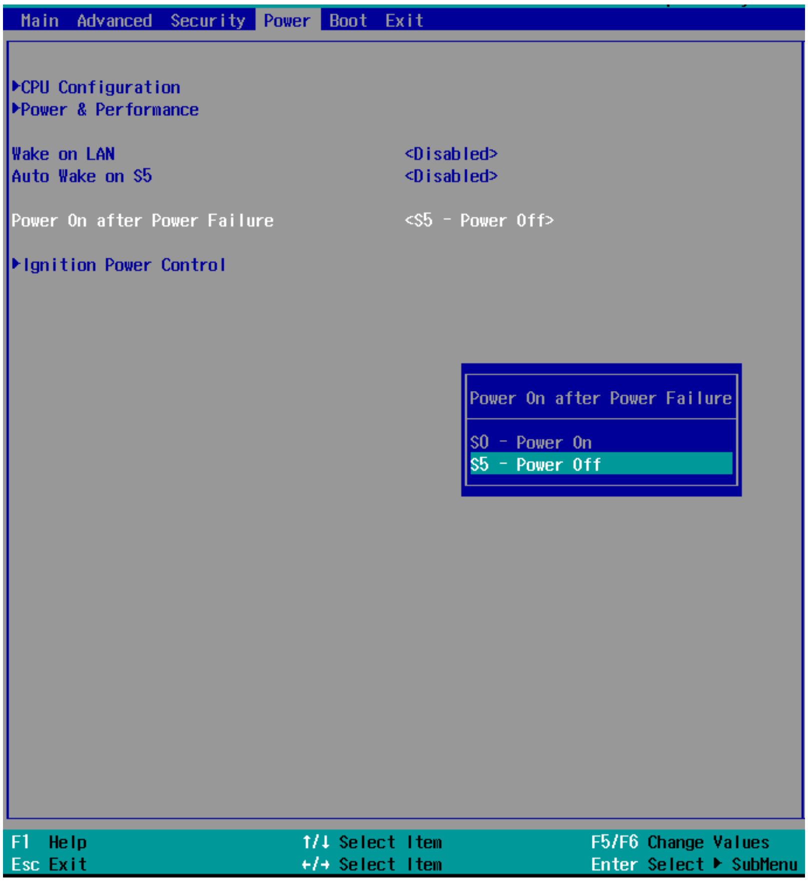
2. Go to **[Power]>[Wake on LAN]**.

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.

4.1.7 Power On after Power Failure Option

This option defines the behavior of systemwhen DC power is supplied.



```
 Main  Advanced  Security  Power  Boot  Exit

▶CPU Configuration
▶Power & Performance

Wake on LAN                                 <Disabled>
Auto Wake on S5                             <Disabled>

Power On after Power Failure                <S5 - Power Off>

▶Ignition Power Control

                                  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”

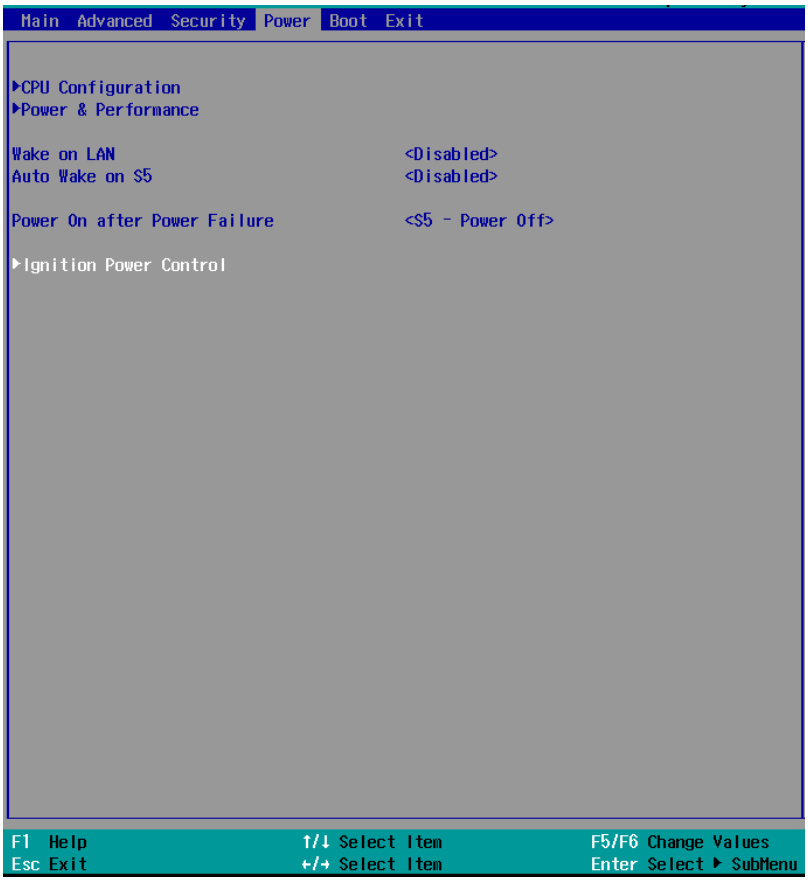
4.1.8 Ignition Power Control

The system has built-in ignition power control. The ignition power control module for in-vehicle applications is an MCU-based implementation that monitors the ignition signal and reacts to turn on/ off the system according to predefined on/ off delay. Its built-in algorithm supports other features such as ultra-low power standby, battery-low protection, system hard-off, etc.

To enable “Ignition Power Control”:

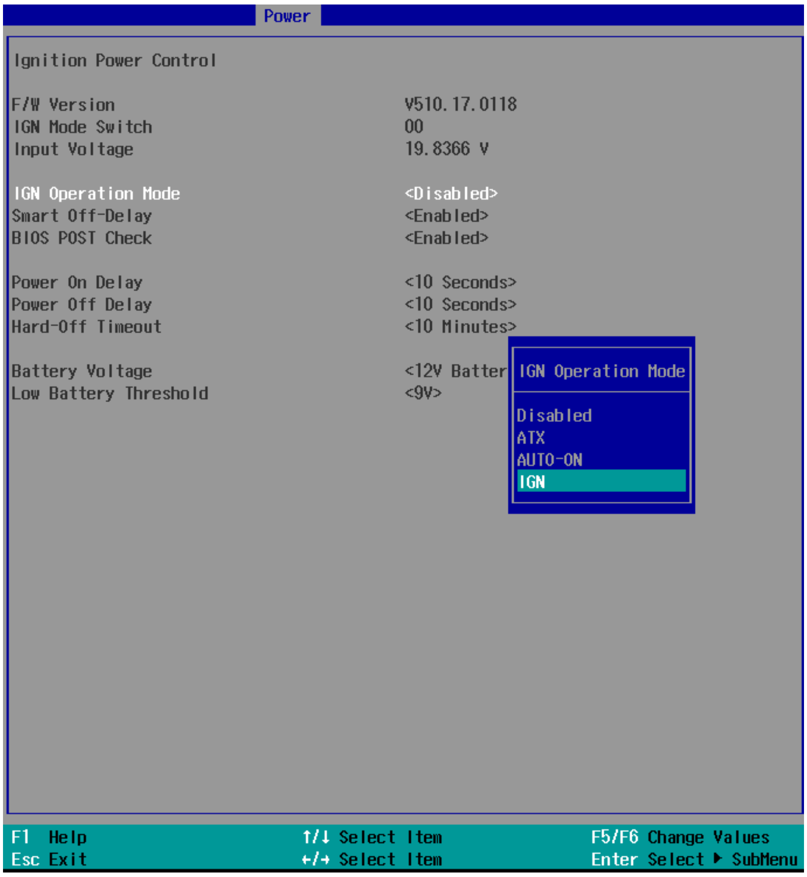
1. When system boots up, press F2 to enter BIOS setup utility.

2. Go to **[Power]**>**[Ignition Power Control]** and press Enter to access the sub-menu.



```
▸CPU Configuration
▸Power & Performance

Wake on LAN                                <Disabled>
Auto Wake on S5                            <Disabled>

Power On after Power Failure               <S5 - Power Off>

▸Ignition Power Control
```

3. In the sub-menu, highlight IGN Operation Mode, press Enter and highlight **ATX**, **AUTO-ON** or **IGN** and press Enter. Once an operation mode has been selected, you'll gain access to ignition power control settings.

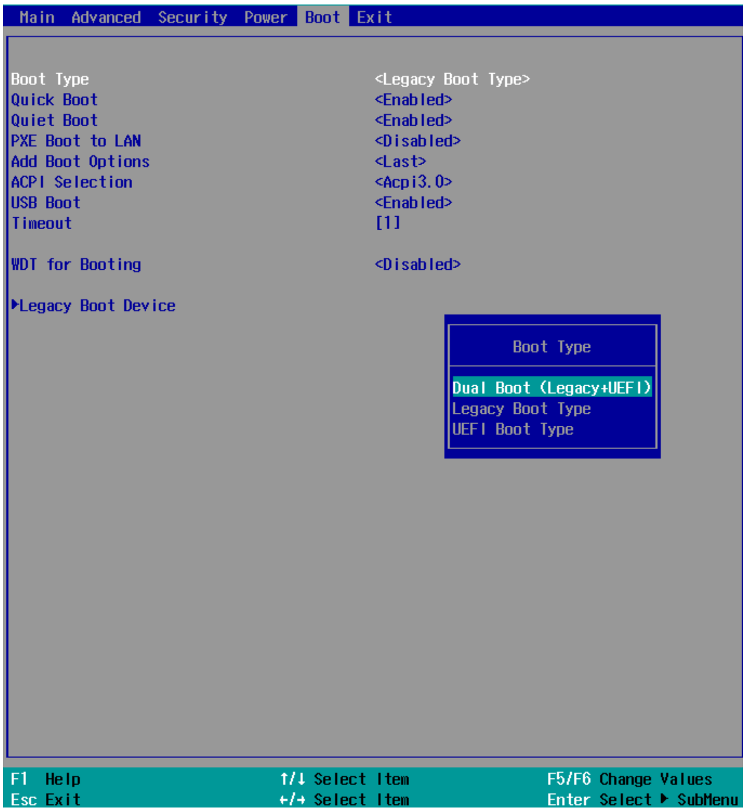


```
                              Power
Ignition Power Control

F/W Version                               V510.17.0118
IGN Mode Switch                           00
Input Voltage                             19.8366 V

IGN Operation Mode                        <Disabled>
Smart Off-Delay                           <Enabled>
BIOS POST Check                           <Enabled>

Power On Delay                            <10 Seconds>
Power Off Delay                           <10 Seconds>
Hard-Off Timeout                          <10 Minutes>

Battery Voltage                           <12V Batter│IGN Operation Mode│
Low Battery Threshold                     <9V>       │                  │
                                                     │Disabled          │
                                                     │ATX               │
                                                     │AUTO-ON           │
                                                     │IGN               │

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

4. Press F10 to "Exit Saving Changes.

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 the 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.



```
Boot Type                                   <Legacy Boot Type>
Quick Boot                                  <Enabled>
Quiet Boot                                  <Enabled>
PXE Boot to LAN                             <Disabled>
Add Boot Options                            <Last>
ACPI Selection                              <Acpi3.0>
USB Boot                                    <Enabled>
Timeout                                     [1]

WDT for Booting                             <Disabled>

▶Legacy Boot Device
```

It is recommended that:

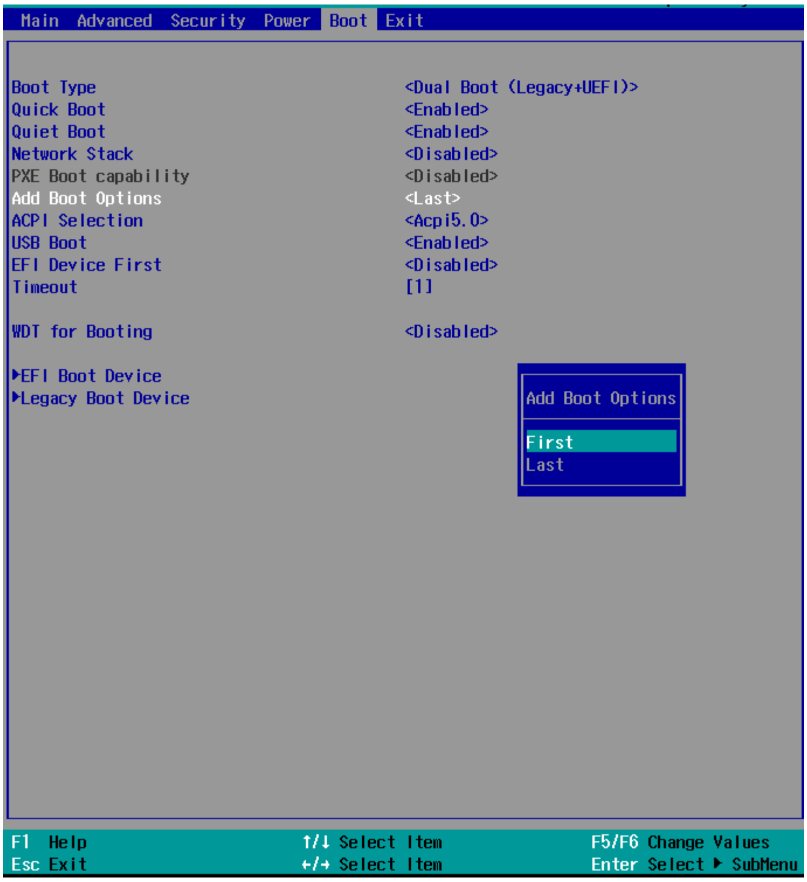
- If you need greater than 2TB disk partition or want to use TPM 2.0 function, you shall choose UEFI boot mode and install operating system accordingly.
- Otherwise, you can choose Legacy boot mode for most cases.
- If you are unsure, please select the dual boot option (Legacy+UEFI).

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 Boot Option for Newly Added Device

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



```
 Main  Advanced  Security  Power  Boot  Exit

Boot Type                                 <Dual Boot (Legacy+UEFI)>
Quick Boot                                <Enabled>
Quiet Boot                                <Enabled>
Network Stack                             <Disabled>
PXE Boot capability                       <Disabled>
Add Boot Options                          <Last>
ACPI Selection                            <Acpi5.0>
USB Boot                                  <Enabled>
EFI Device First                          <Disabled>
Timeout                                   [1]

WDT for Booting                           <Disabled>

▶EFI Boot Device
▶Legacy Boot Device                                   Add Boot Options
                                                      First
                                                      Last

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

To set Add Boot Options:

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

2. Go to **[Boot]**>**[Add Boot Options]**, press Enter to bring up options, First or Last.

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

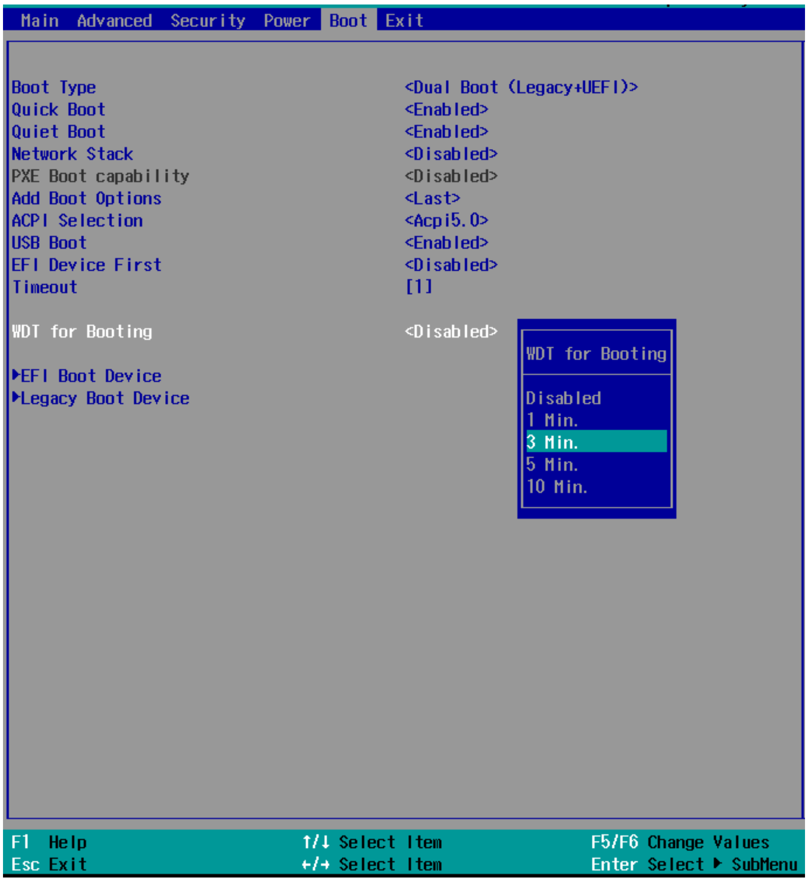
4.1.11 Watchdog Timer for Booting

The system BIOS has a useful feature which allows users to use the watchdog timer to ensure a successful boot process. You can specify the timeout value for watchdog timer. Once the watchdog timer expires, BIOS issues a reset command to initiate another boot process. You can also set the behavior of how to stop the watchdog timer. There are two options in the BIOS menu, “**Automatically after POST**” and “**Manually after Entering OS**”. When “**Automatically after POST**” is selected, the BIOS automatically stop the watchdog timer after POST (Power-On Self Test) OK. When “**Manually after Entering OS**” is selected, it’s user’s liability to stop the watchdog timer when entering OS. This guarantees the system can always boot to 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.

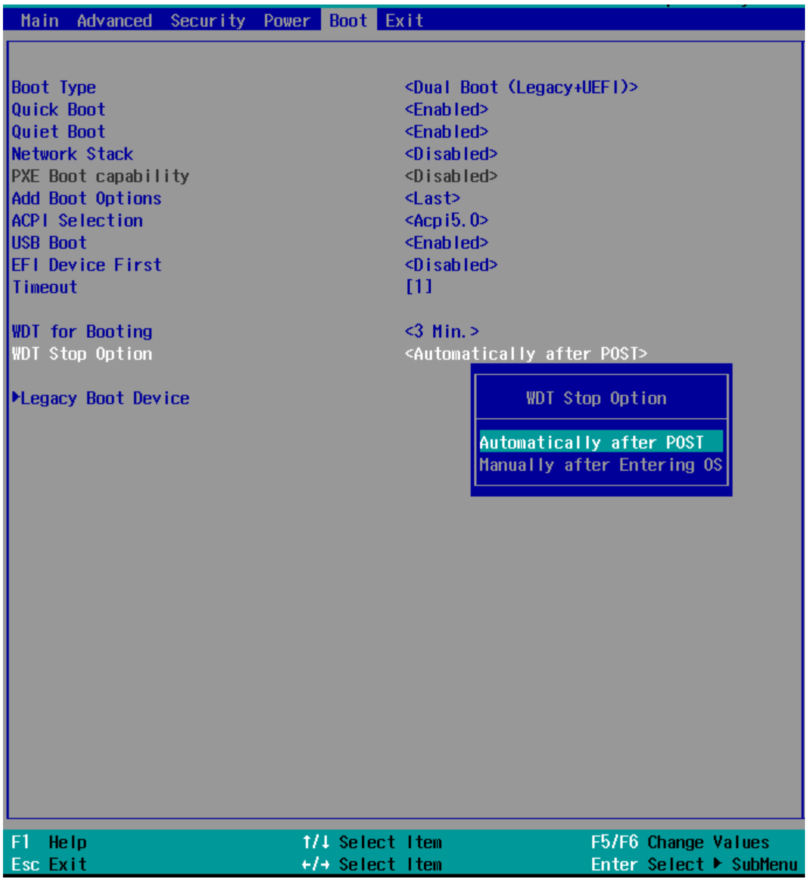
2. Go to **[Boot] >[WDT for Booting]**menu.



```
Boot Type                                 <Dual Boot (Legacy+UEFI)>
Quick Boot                                <Enabled>
Quiet Boot                                <Enabled>
Network Stack                             <Disabled>
PXE Boot capability                       <Disabled>
Add Boot Options                          <Last>
ACPI Selection                            <Acpi5.0>
USB Boot                                  <Enabled>
EFI Device First                          <Disabled>
Timeout                                   [1]

WDT for Booting                           <Disabled>

▸EFI Boot Device
▸Legacy Boot Device

WDT for Booting
Disabled
1 Min.
3 Min.
5 Min.
10 Min.
```

3. Disable or select timeout value and press Enter.

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

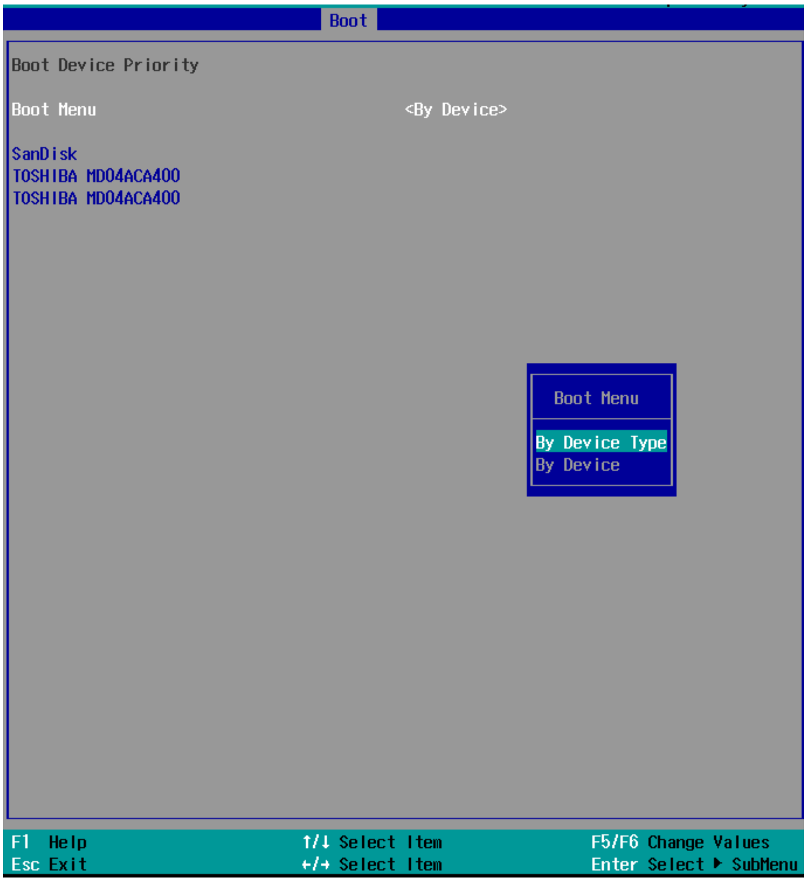


```
 Main  Advanced  Security  Power  Boot  Exit

Boot Type                                   <Dual Boot (Legacy+UEFI)>
Quick Boot                                  <Enabled>
Quiet Boot                                  <Enabled>
Network Stack                               <Disabled>
PXE Boot capability                         <Disabled>
Add Boot Options                            <Last>
ACPI Selection                              <Acpi5.0>
USB Boot                                    <Enabled>
EFI Device First                            <Disabled>
Timeout                                     [1]

WDT for Booting                             <3 Min.>
WDT Stop Option                             <Automatically after POST>

▶Legacy Boot Device                              WDT Stop Option

                                             Automatically after POST
                                             Manually after Entering OS

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

5. Press F10 to “Exit Saving Changes.

4.1.12 Selecting Legacy/ UEFI Boot Device

When multiple bootable devices are connected (e.g. HDD, mSATA, USB flash disk, USB DVD-drive), you may need to select one of them as the boot device. There are two ways to select the device. You can either, press F12 when the system boots up to go to Boot Manager and then select one of the devices, or select the boot device in BIOS settings.



```
                                   Boot

Boot Device Priority

Boot Menu                                        <By Device>

SanDisk
TOSHIBA MD04ACA400
TOSHIBA MD04ACA400

                                                       Boot Menu

                                                     By Device Type
                                                     By Device

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

To set the boot order for devices in UEFI Boot Device:

1. When system boots up, press F2 to enter BIOS setup utility
2. Go to **[Boot] > [Legacy Boot Device]**
3. Highlight the device you wish to make boot order changes to and press F5/ F6 or +/ - to change device boot order.

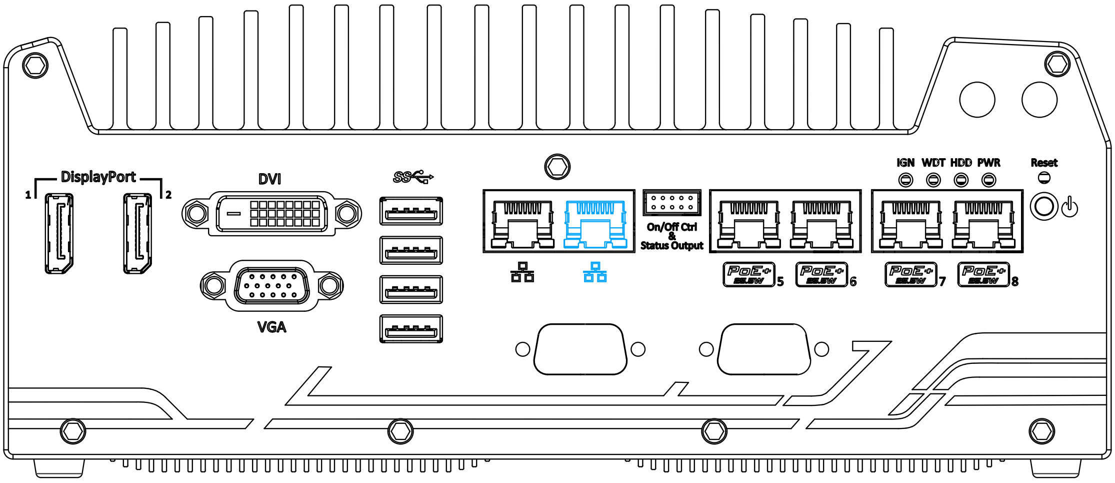
To select boot order for devices in Legacy Boot Device:

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 or device category you wish to make boot order changes to and press F5/ F6 or +/ - to change device boot order.
4. Press F10 to “Exit Saving Changes.

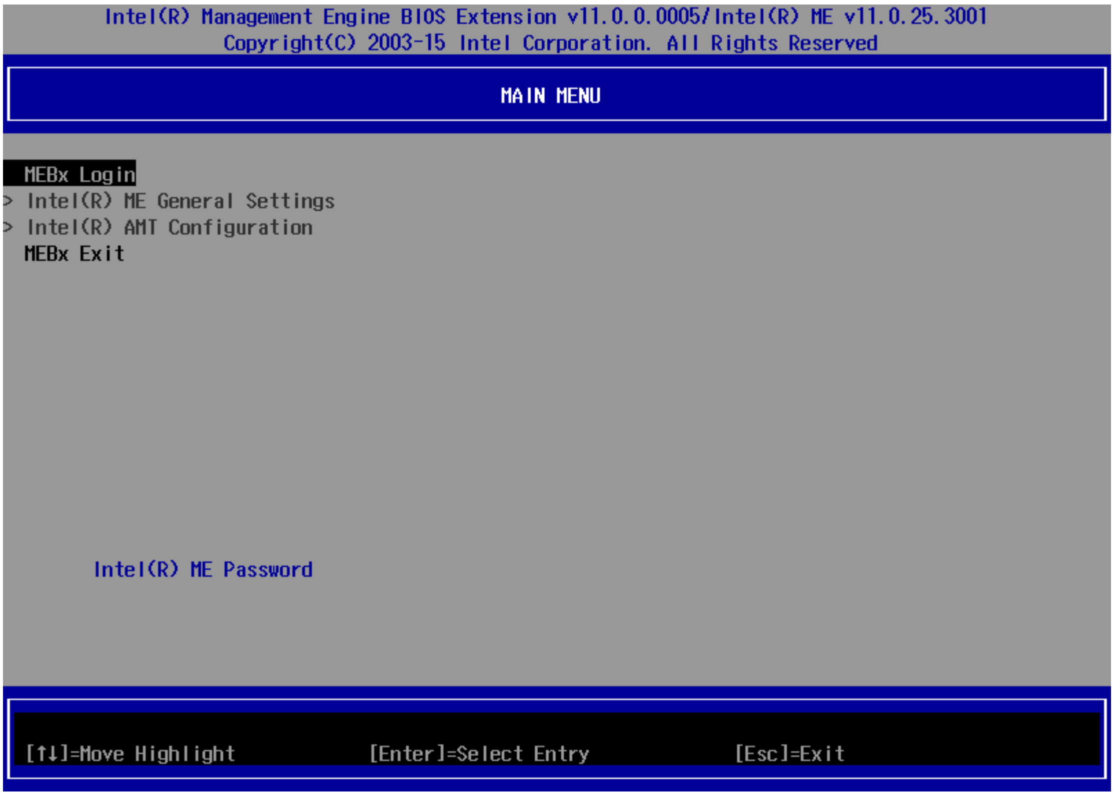
4.2 AMT Configuration

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 AMT to control the system, you need to configure AMT password and network settings.

1. Make sure you have connected the proper Ethernet port(via I219-LM).



2. When the system boots up, press F10 to enter the MEBx configuration menu.



```
Intel(R) Management Engine BIOS Extension v11.0.0.0005/Intel(R) ME v11.0.25.3001
Copyright(C) 2003-15 Intel Corporation. All Rights Reserved

MAIN MENU

 MEBx Login
> Intel(R) ME General Settings
> Intel(R) AMT Configuration
 MEBx Exit

Intel(R) ME Password

[↑↓]=Move Highlight          [Enter]=Select Entry          [Esc]=Exit
```

3. Highlight MEBx Login and press Enter, a prompt will appear asking for a password. The default password is “admin”. For further MEBx configuration details, please refer to Intel® MEBX User Guide.

4.3 RAID Volume Configuration (Legacy Mode)

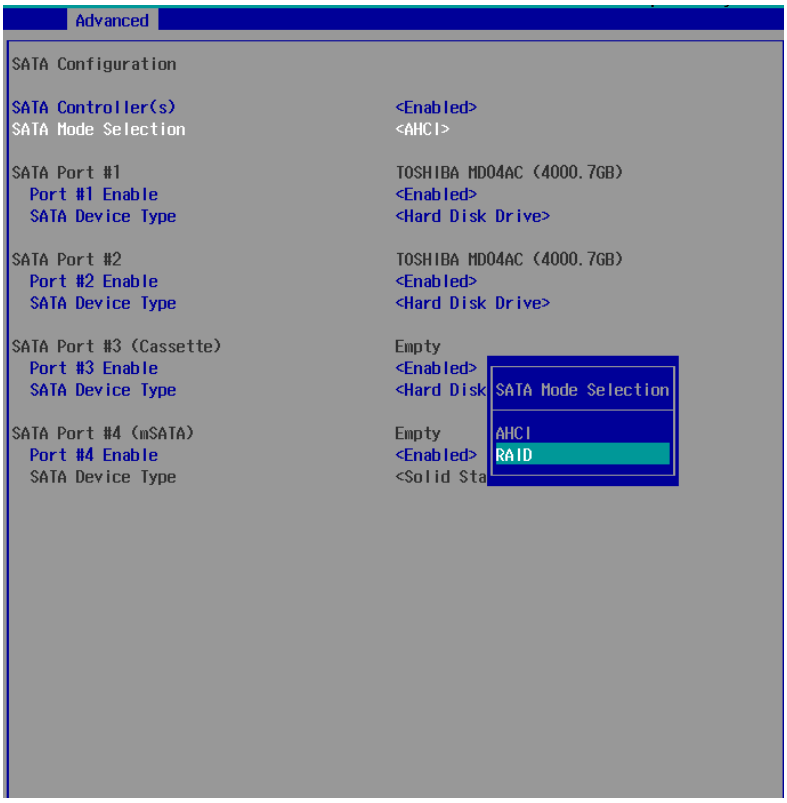
To set up a RAID 0 or 1 volume in Legacy mode, you need to have at least two hard drives installed. The system supports RAID configurations in RAID 0 (striping) or RAID 1 (mirror) mode. Users can select the configuration that best suit their needs with RAID 0 (striping) mode offering better hard drive read/ write performances while RAID 1 (mirror) offers better data security.

WARNING

Please make sure the hard drive data have been backed up before you create or modify RAID volume(s) as the process may cause irreversible data deletion. When creating a RAID volume, it is also recommended to use hard drives from the same batch (same brand, model, capacity, rpm rate, etc. to avoid performance or capacity allocation issues).

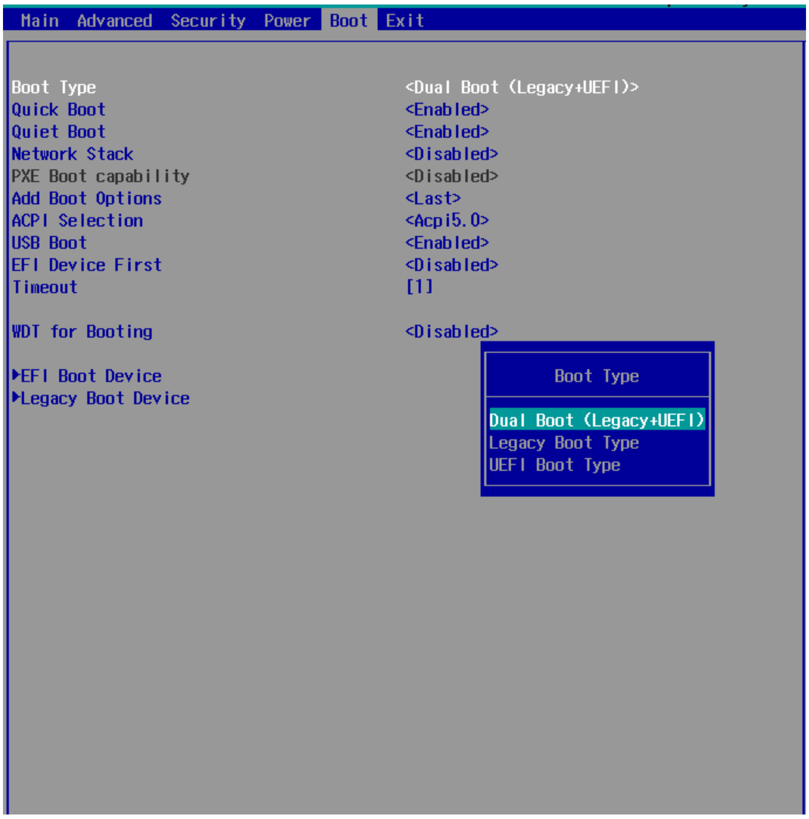
To enable RAID functionality in legacy mode:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Advanced] > [SATA Configuration]**.
3. Go to **[SATA Mode Selection],** highlight **[RAID]** and press Enter to enable the RAID setting.



```
        Advanced
SATA Configuration

SATA Controller(s)                        <Enabled>
SATA Mode Selection                       <AHCI>

SATA Port #1                              TOSHIBA MD04AC (4000.7GB)
  Port #1 Enable                          <Enabled>
  SATA Device Type                        <Hard Disk Drive>

SATA Port #2                              TOSHIBA MD04AC (4000.7GB)
  Port #2 Enable                          <Enabled>
  SATA Device Type                        <Hard Disk Drive>

SATA Port #3 (Cassette)                   Empty
  Port #3 Enable                          <Enabled>
  SATA Device Type                        <Hard Disk

SATA Port #4 (mSATA)                      Empty
  Port #4 Enable                          <Enabled>
  SATA Device Type                        <Solid Sta

                                                    SATA Mode Selection
                                                    AHCI
                                                    RAID
```

4. Go to **[Boot]**, highlight **[Legacy Boot Type]**and press Enter to set boot type.

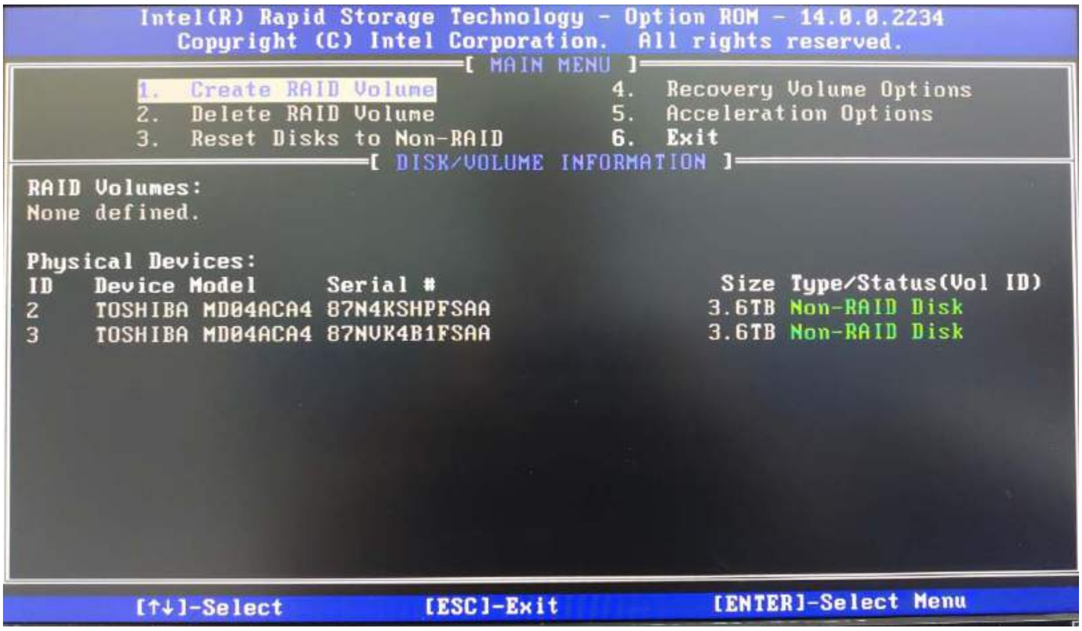


```
 Main  Advanced  Security  Power  Boot  Exit

Boot Type                                  <Dual Boot (Legacy+UEFI)>
Quick Boot                                 <Enabled>
Quiet Boot                                 <Enabled>
Network Stack                              <Disabled>
PXE Boot capability                        <Disabled>
Add Boot Options                           <Last>
ACPI Selection                             <Acpi5.0>
USB Boot                                   <Enabled>
EFI Device First                           <Disabled>
Timeout                                    [1]

WDT for Booting                            <Disabled>

▸EFI Boot Device                                 Boot Type
▸Legacy Boot Device
                                           Dual Boot (Legacy+UEFI)
                                           Legacy Boot Type
                                           UEFI Boot Type
```

5. Press F10 to "Exit Saving Changes" and reboot the system.

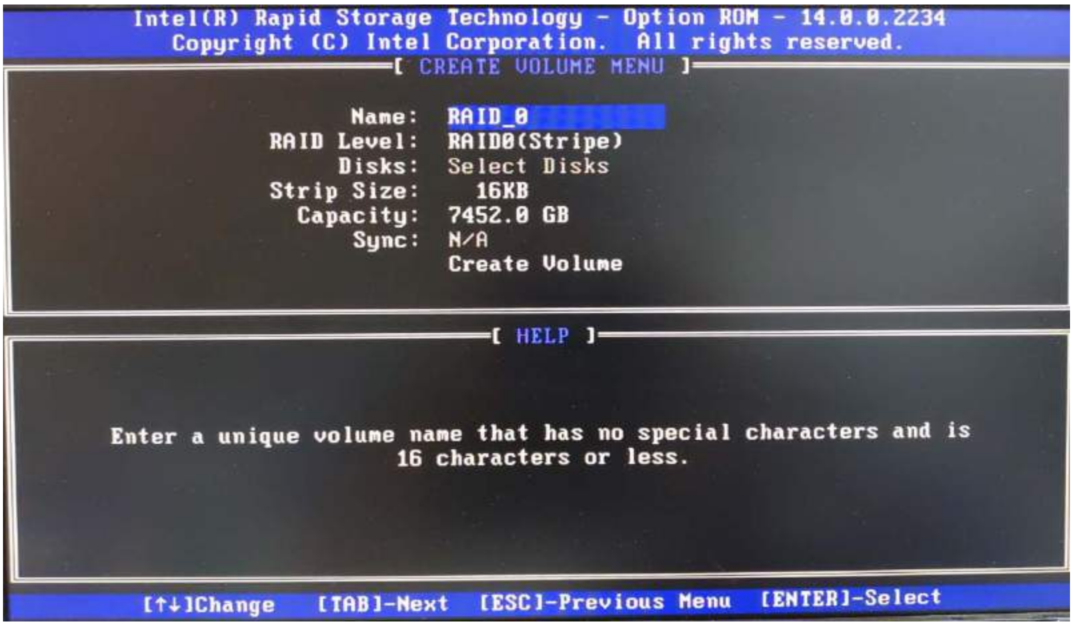
6. When the system reboots, press **[Ctrl + I]** to enter the Configuration Utility**.**

7. Once you're in the Configuration Utility, highlight **[Create RAID Volume]** and press Enter.



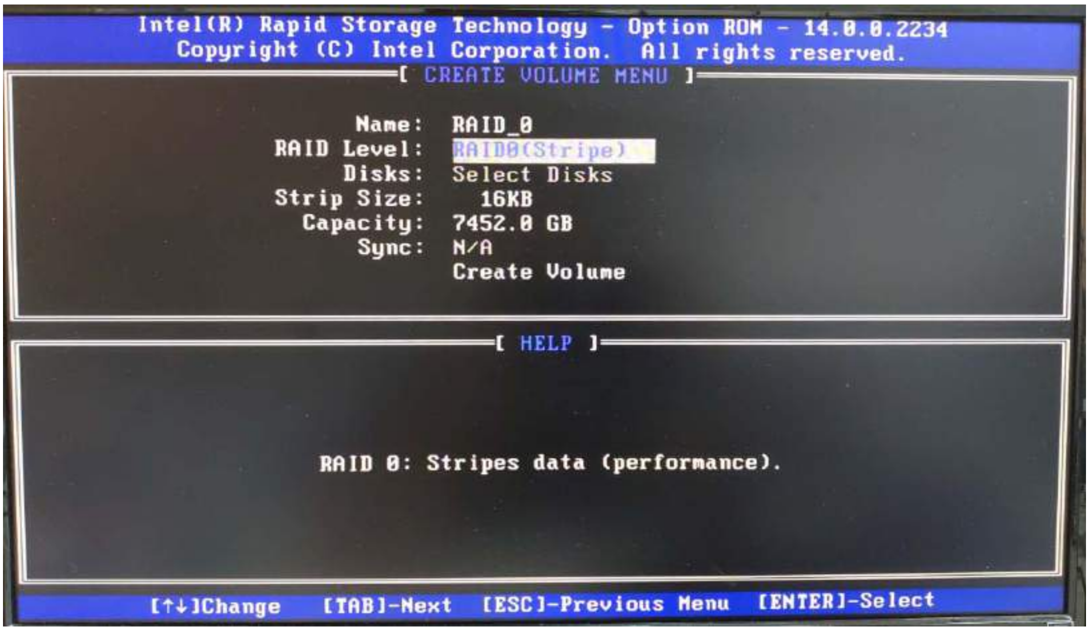
```
     Intel(R) Rapid Storage Technology - Option ROM - 14.8.0.2234
        Copyright (C) Intel Corporation.  All rights reserved.
                            [ MAIN MENU ]
          1.  Create RAID Volume              4.  Recovery Volume Options
          2.  Delete RAID Volume              5.  Acceleration Options
          3.  Reset Disks to Non-RAID         6.  Exit
                      [ DISK/VOLUME INFORMATION ]
RAID Volumes:
None defined.

Physical Devices:
ID   Device Model     Serial #                      Size  Type/Status(Vol ID)
2    TOSHIBA MD04ACA4 87N4KSHPFSAA                 3.6TB Non-RAID Disk
3    TOSHIBA MD04ACA4 87NVK4B1FSAA                 3.6TB Non-RAID Disk

         [↑↓]-Select           [ESC]-Exit           [ENTER]-Select Menu
```

8. The following screen allows you to enter the **Name** of the RAID volume you wish to create. Enter a name and press Enter to access the **RAID Level** setting.



```
     Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
          Copyright (C) Intel Corporation.  All rights reserved.
                       [ CREATE VOLUME MENU ]

                        Name:  RAID_0
                  RAID Level:  RAID0(Stripe)
                       Disks:  Select Disks
                  Strip Size:    16KB
                    Capacity:  7452.0 GB
                        Sync:  N/A
                               Create Volume

                              [ HELP ]

   Enter a unique volume name that has no special characters and is
                        16 characters or less.

  [↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

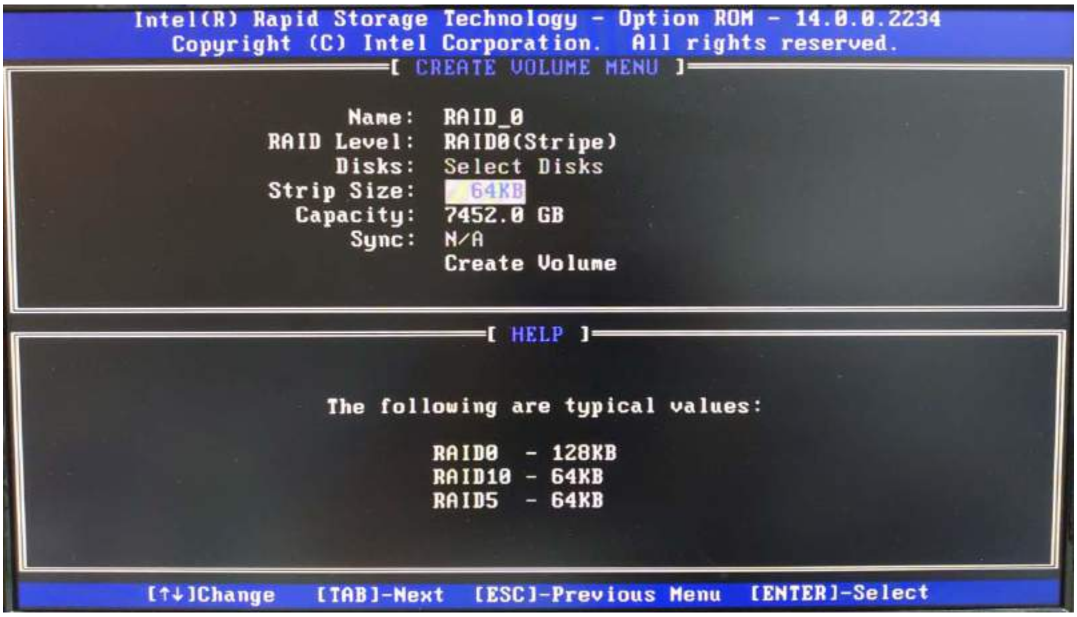
9. For **RAID Level**, use the up and down arrow key to select between **RAID0 (Stripe)** and **RAID1 (Mirror)** settings. Select a RAID mode and press Enter to access **Stripe Size** setting.



```
     Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
          Copyright (C) Intel Corporation.  All rights reserved.
                       [ CREATE VOLUME MENU ]

                        Name:  RAID_0
                  RAID Level:  RAID0(Stripe)
                       Disks:  Select Disks
                  Strip Size:    16KB
                    Capacity:  7452.0 GB
                        Sync:  N/A
                               Create Volume

                              [ HELP ]

                 RAID 0: Stripes data (performance).

  [↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

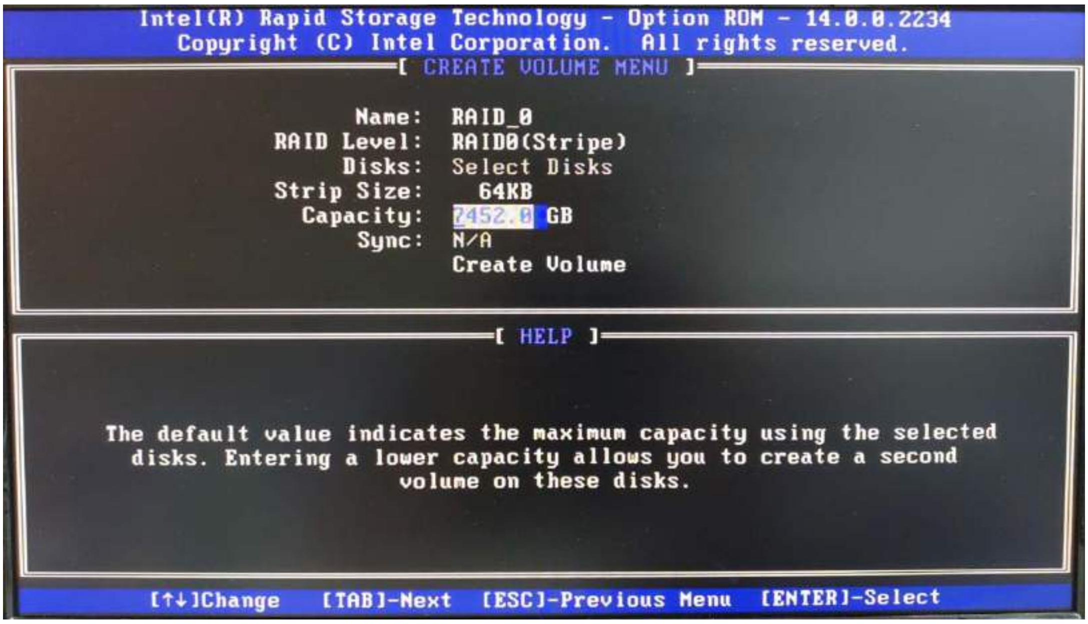
10. For **Stripe Size**, use the up and down arrow key to select between 4KB, 8KB, 16KB, 32KB, 64KB, 128KB for your RAID volume stripe size and press Enter to access the **Capacity** setting.

    *RAID1(Mirror) does not offer Stripe Size options.



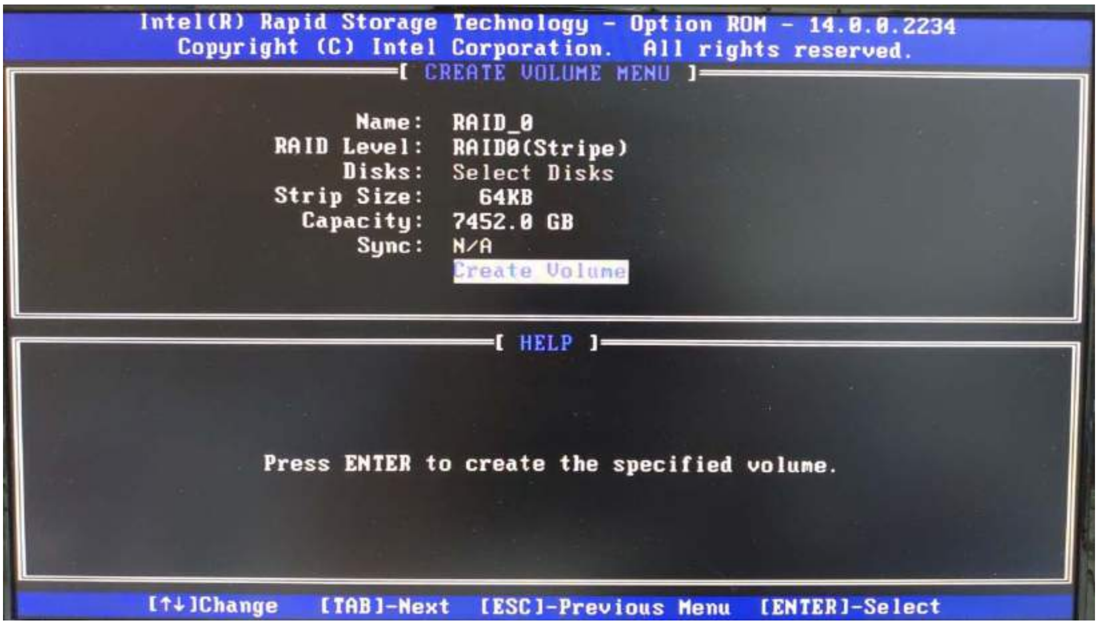
```
Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
     Copyright (C) Intel Corporation.  All rights reserved.
                    [ CREATE VOLUME MENU ]

                       Name:  RAID_0
                 RAID Level:  RAID0(Stripe)
                      Disks:  Select Disks
                 Strip Size:    64KB
                   Capacity:  7452.0 GB
                       Sync:  N/A
                              Create Volume

                           [ HELP ]

              The following are typical values:

                     RAID0  - 128KB
                     RAID10 - 64KB
                     RAID5  - 64KB

[↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

11. You may enter the RAID volume capacity you wish to create at this step and press Enter to complete your RAID settings. By default, if you do not enter a capacity (leaving it blank), the full storage capacity will be applied. Once you have entered a capacity, press Enter to confirm.



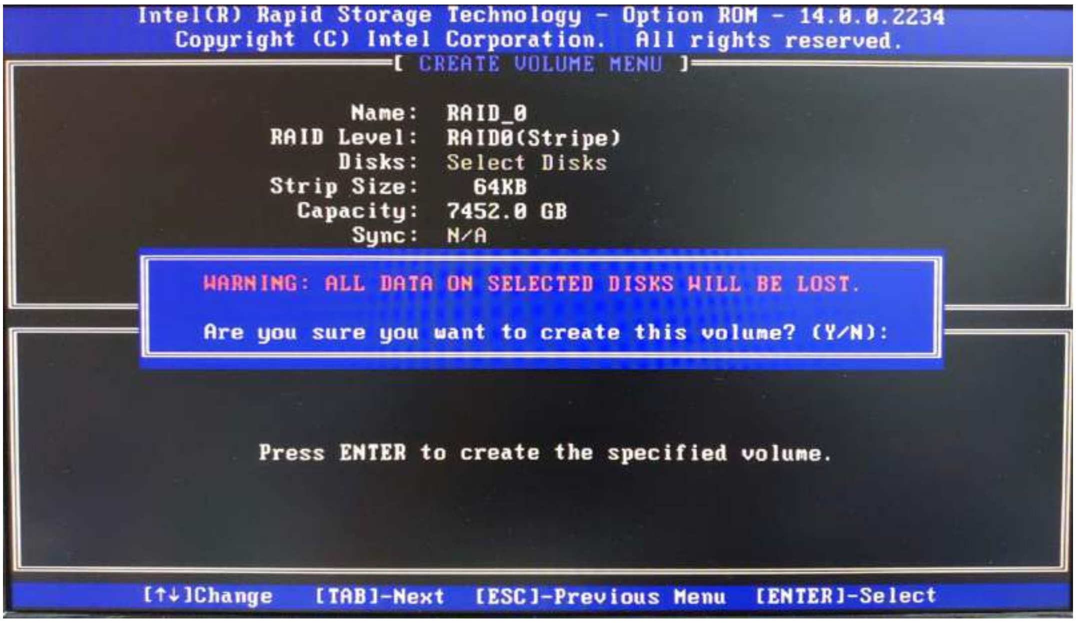
```
Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
     Copyright (C) Intel Corporation.  All rights reserved.
                    [ CREATE VOLUME MENU ]

                       Name:  RAID_0
                 RAID Level:  RAID0(Stripe)
                      Disks:  Select Disks
                 Strip Size:    64KB
                   Capacity:  7452.0 GB
                       Sync:  N/A
                              Create Volume

                           [ HELP ]

  The default value indicates the maximum capacity using the selected
     disks. Entering a lower capacity allows you to create a second
                       volume on these disks.

[↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

12. Reviewed your settings and if you wish to change any setting(s), you will need to press [ESC] and start again from **Step 6**.If all settings are correct and you wish to continue, with "**Create Volume**" highlighted, press Enter to begin creating the RAID volume.



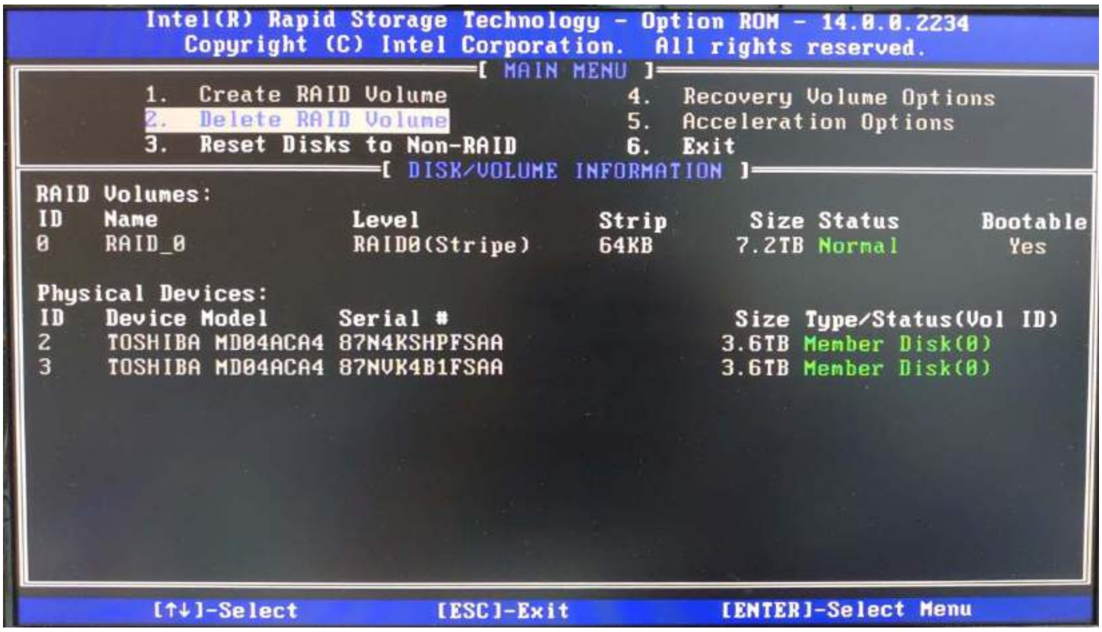
```
Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
Copyright (C) Intel Corporation.  All rights reserved.
[ CREATE VOLUME MENU ]

         Name:  RAID_0
   RAID Level:  RAID0(Stripe)
        Disks:  Select Disks
   Strip Size:    64KB
     Capacity:  7452.0 GB
         Sync:  N/A
                Create Volume

[ HELP ]

Press ENTER to create the specified volume.

[↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

13. A data deletion warning will appear, press "Y" to continue and "N" to stop the volume creation process.



```
Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
Copyright (C) Intel Corporation.  All rights reserved.
[ CREATE VOLUME MENU ]

         Name:  RAID_0
   RAID Level:  RAID0(Stripe)
        Disks:  Select Disks
   Strip Size:    64KB
     Capacity:  7452.0 GB
         Sync:  N/A

WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.

Are you sure you want to create this volume? (Y/N):

Press ENTER to create the specified volume.

[↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

14. Once the RAID volume has been created, the configuration utility will bring you back to the main screen showing the RAID volume and their member disks.



```
      Intel(R) Rapid Storage Technology - Option ROM - 14.0.0.2234
          Copyright (C) Intel Corporation.  All rights reserved.
=====================[ MAIN MENU ]=====================
         1.  Create RAID Volume                4.  Recovery Volume Options
         2.  Delete RAID Volume                5.  Acceleration Options
         3.  Reset Disks to Non-RAID           6.  Exit
=================[ DISK/VOLUME INFORMATION ]=================
RAID Volumes:
ID   Name              Level            Strip     Size  Status     Bootable
0    RAID_0            RAID0(Stripe)    64KB     7.2TB  Normal       Yes

Physical Devices:
ID   Device Model     Serial #                   Size  Type/Status(Vol ID)
2    TOSHIBA MD04ACA4 87N4KSHPFSAA              3.6TB  Member Disk(0)
3    TOSHIBA MD04ACA4 87NVK4B1FSAA              3.6TB  Member Disk(0)

      [↑↓]-Select            [ESC]-Exit            [ENTER]-Select Menu
```

15. The above process was to create a RAID-0 volume. If you wish to create a RAID-1 volume, please perform steps 5 to 12 in this section and select RAID-1 during step 8.

4.4 RAID Volume Configuration (UEFI Mode)

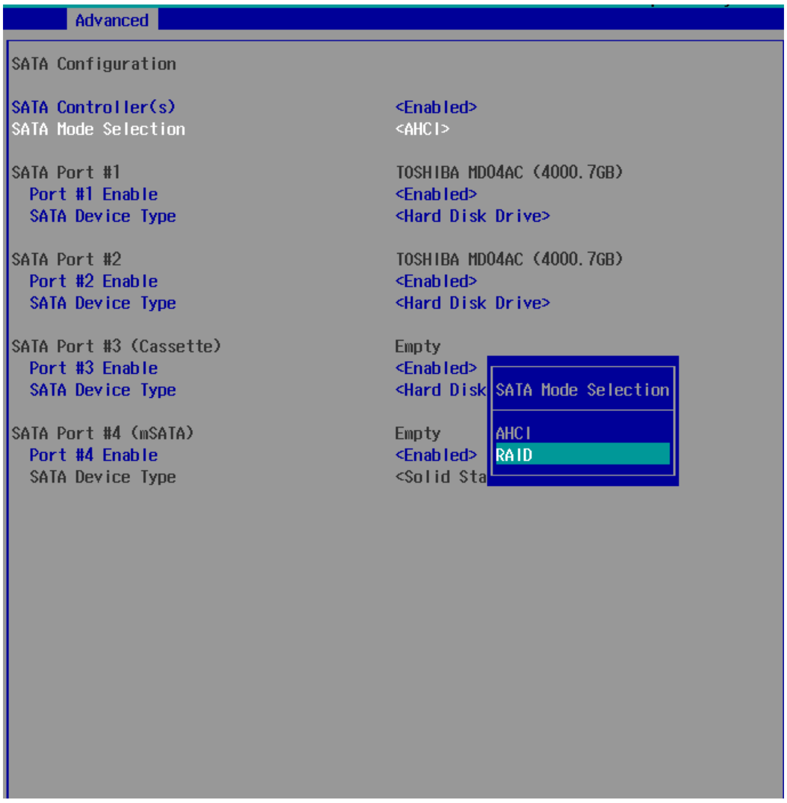
To set up a RAID 0 or 1 volume in UEFI mode, you need to have at least two hard drives installed. The system supports RAID configurations in RAID 0 (striping) or RAID 1 (mirror) mode. Users can select the configuration that best suit their needs with RAID 0 (striping) mode offering better hard drive read/ write performances while RAID 1 (mirror) offers better data security.

WARNING

Please make sure the hard drive data have been backed up before you create or modify RAID volume(s) as the process may cause irreversible data deletion. When creating a RAID volume, it is also recommended to use hard drives from the same batch (same brand, model, capacity, rpm rate, etc.).

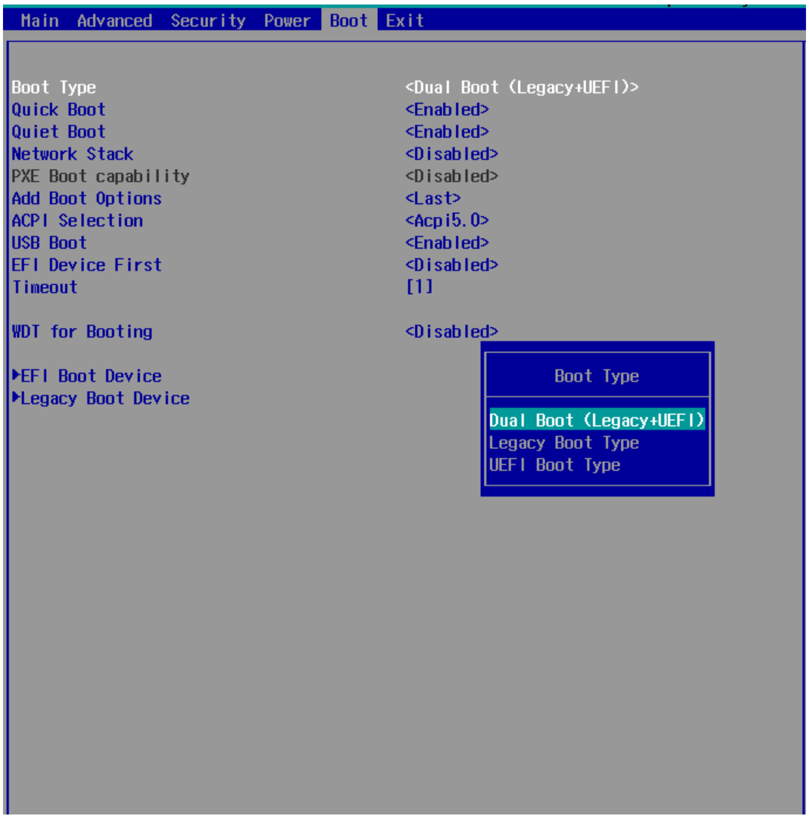
To enable RAID functionality in legacy mode:

1. When system boots up, press F2 to enter BIOS setup utility.
2. Go to **[Advanced] > [SATA Configuration]**.
3. Go to **[SATA Mode Selection],** highlight **[RAID]** and press Enter to enable the RAID setting.



```
 Advanced

SATA Configuration

SATA Controller(s)                          <Enabled>
SATA Mode Selection                         <AHCI>

SATA Port #1                                TOSHIBA MD04AC (4000.7GB)
  Port #1 Enable                            <Enabled>
  SATA Device Type                          <Hard Disk Drive>

SATA Port #2                                TOSHIBA MD04AC (4000.7GB)
  Port #2 Enable                            <Enabled>
  SATA Device Type                          <Hard Disk Drive>

SATA Port #3 (Cassette)                     Empty
  Port #3 Enable                            <Enabled>
  SATA Device Type                          <Hard Disk SATA Mode Selection

SATA Port #4 (mSATA)                        Empty     AHCI
  Port #4 Enable                            <Enabled> RAID
  SATA Device Type                          <Solid Sta
```

4. Go to **[Boot]**, highlight **[UEFI Boot Type]** and press Enter to set boot type.

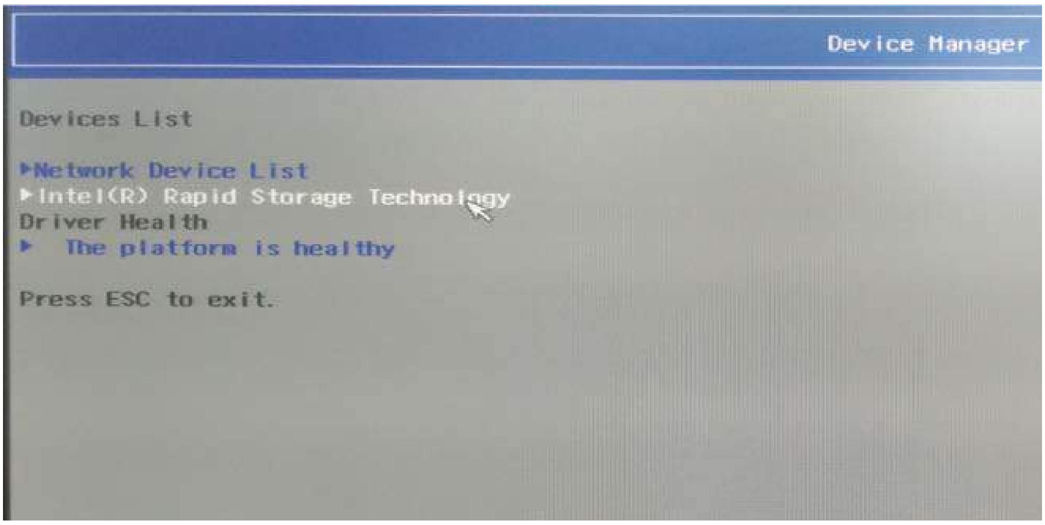


```
Boot Type                                   <Dual Boot (Legacy+UEFI)>
Quick Boot                                  <Enabled>
Quiet Boot                                  <Enabled>
Network Stack                               <Disabled>
PXE Boot capability                         <Disabled>
Add Boot Options                            <Last>
ACPI Selection                              <Acpi5.0>
USB Boot                                    <Enabled>
EFI Device First                            <Disabled>
Timeout                                     [1]

WDT for Booting                             <Disabled>

▸EFI Boot Device
▸Legacy Boot Device
```

5. Press F10 to “Exit Saving Changes” and reboot the system.

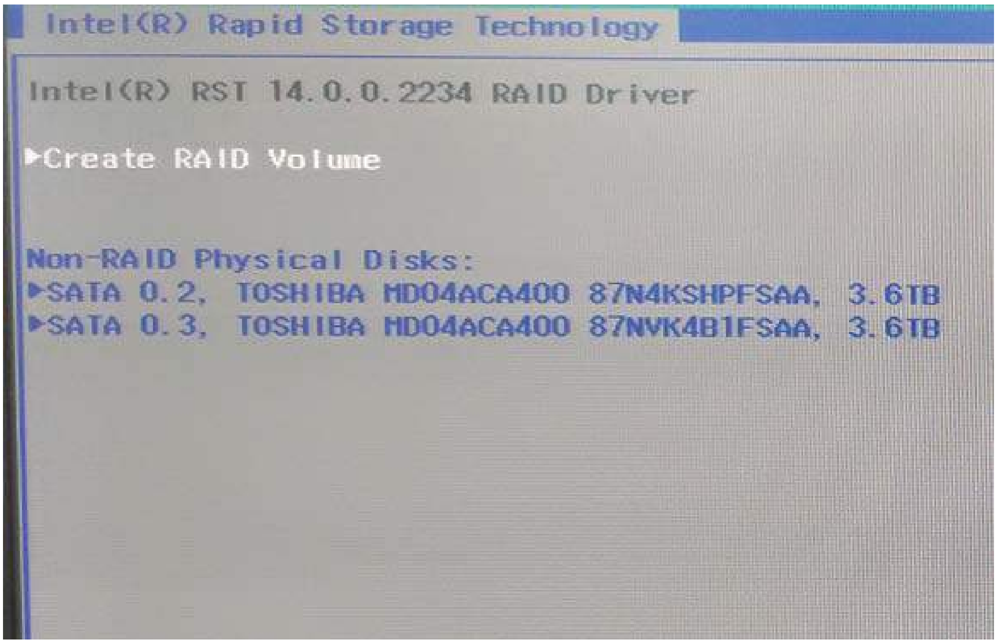
6. When the system reboots, press **[F3]** to enter the Configuration Utility**.**

7. Once you’re in the Configuration Utility, double-click on **[Intel® Rapid Storage Technology]**.



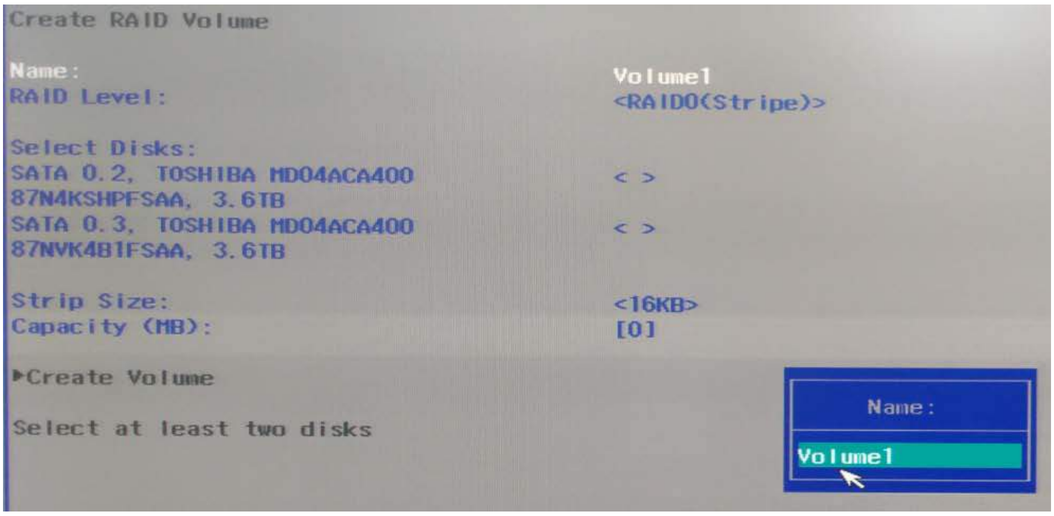
```
Devices List

▸Network Device List
▸Intel(R) Rapid Storage Technology
Driver Health
▸  The platform is healthy

Press ESC to exit.
```

8. The following screen shows Non-RAID physical disks and the option “**Create RAID Volume**”. Double click on “**Create RAID Volume**” to begin creating your RAID volume.



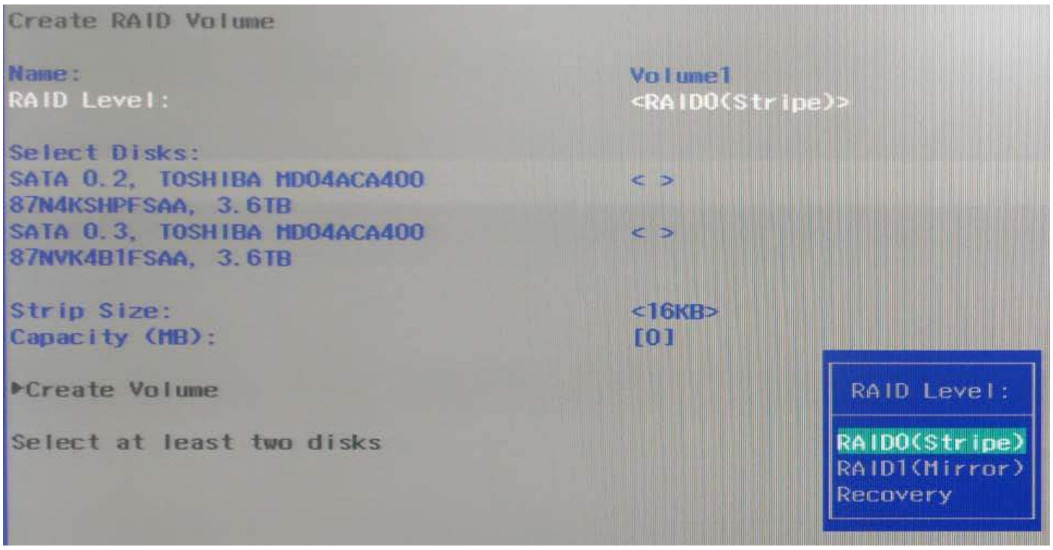
```
Intel(R) Rapid Storage Technology

Intel(R) RST 14.0.0.2234 RAID Driver

▶Create RAID Volume


Non-RAID Physical Disks:
▶SATA 0.2, TOSHIBA MD04ACA400 87N4KSHPFSAA, 3.6TB
▶SATA 0.3, TOSHIBA MD04ACA400 87NVK4B1FSAA, 3.6TB
```

9. Enter a name for your RAID volume and select RAID level.



```
Create RAID Volume

Name:                                  Volume1
RAID Level:                            <RAID0(Stripe)>

Select Disks:
SATA 0.2, TOSHIBA MD04ACA400           < >
87N4KSHPFSAA, 3.6TB
SATA 0.3, TOSHIBA MD04ACA400           < >
87NVK4B1FSAA, 3.6TB

Strip Size:                            <16KB>
Capacity (MB):                         [0]

▶Create Volume

Select at least two disks
```

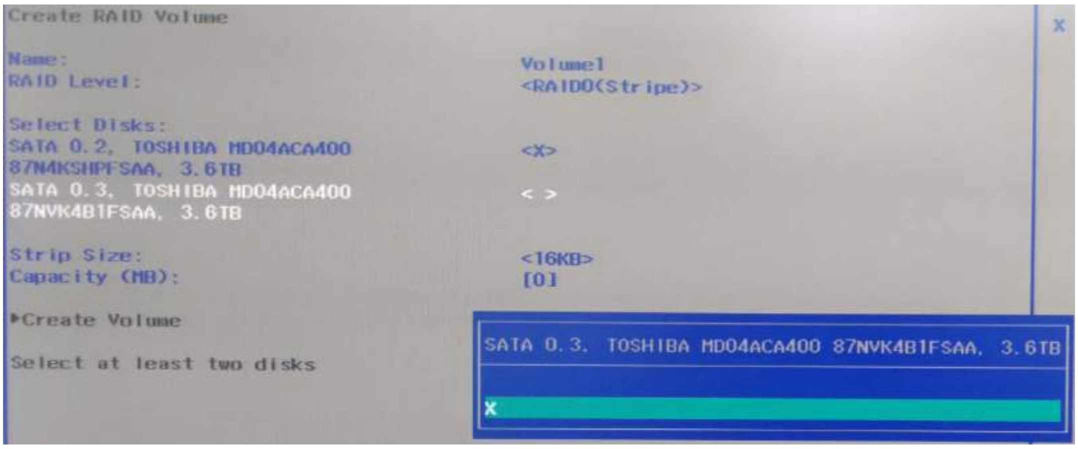
Enter a name for the RAID volume



```
Create RAID Volume

Name:                                  Volume1
RAID Level:                            <RAID0(Stripe)>

Select Disks:
SATA 0.2, TOSHIBA MD04ACA400           < >
87N4KSHPFSAA, 3.6TB
SATA 0.3, TOSHIBA MD04ACA400           < >
87NVK4B1FSAA, 3.6TB

Strip Size:                            <16KB>
Capacity (MB):                         [0]

▶Create Volume

Select at least two disks
```

Select a RAID level

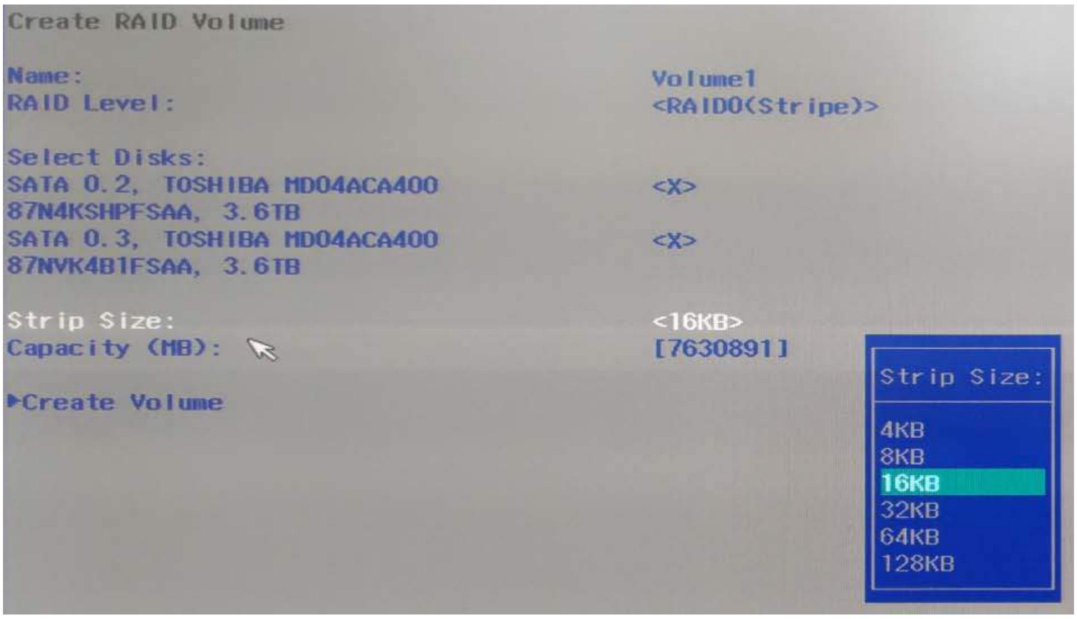
10. Select the disk drives for your RAID volume by double-clicking on a drive and click on “x” or press Enter to confirm the selection.



```
Create RAID Volume                                                      x

Name:                                     Volume1
RAID Level:                               <RAID0(Stripe)>

Select Disks:
SATA 0.2, TOSHIBA MD04ACA400              <X>
87N4KSHPFSAA, 3.6TB
SATA 0.3, TOSHIBA MD04ACA400              < >
87NVK4B1FSAA, 3.6TB

Strip Size:                               <16KB>
Capacity (MB):                            [0]

▶Create Volume
                                   SATA 0.3, TOSHIBA MD04ACA400 87NVK4B1FSAA, 3.6TB
Select at least two disks
                                   X
```

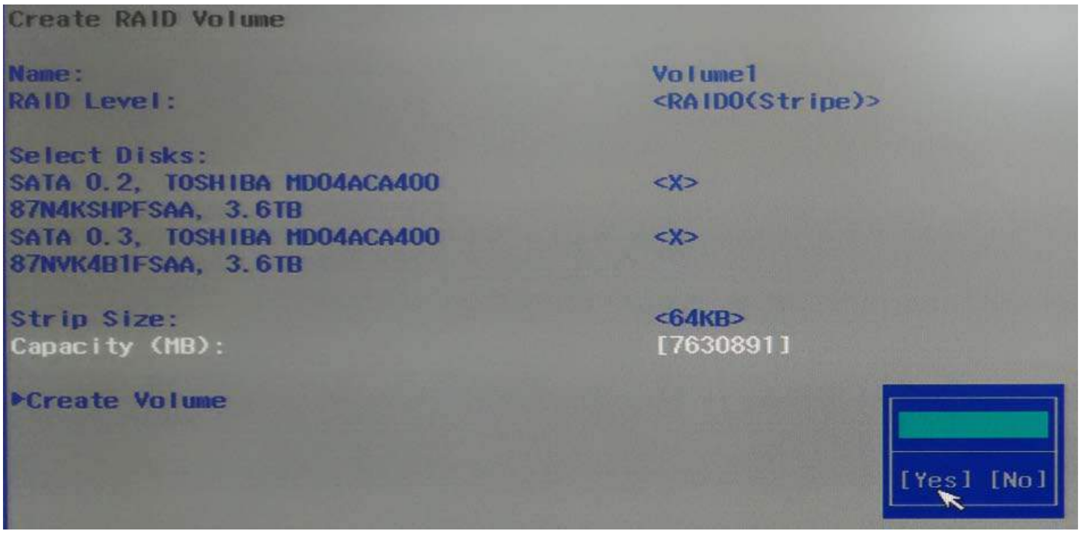
11. Set up the stripe size you would like to configure for your RAID volume. Available stripe sizes are 4KB, 8KB, 16KB, 32KB, 64KB, 128KB, use the up and down arrow keys to highlight and press Enter to confirm the selection.

*RAID1(Mirror) does not offer Stripe Size options.



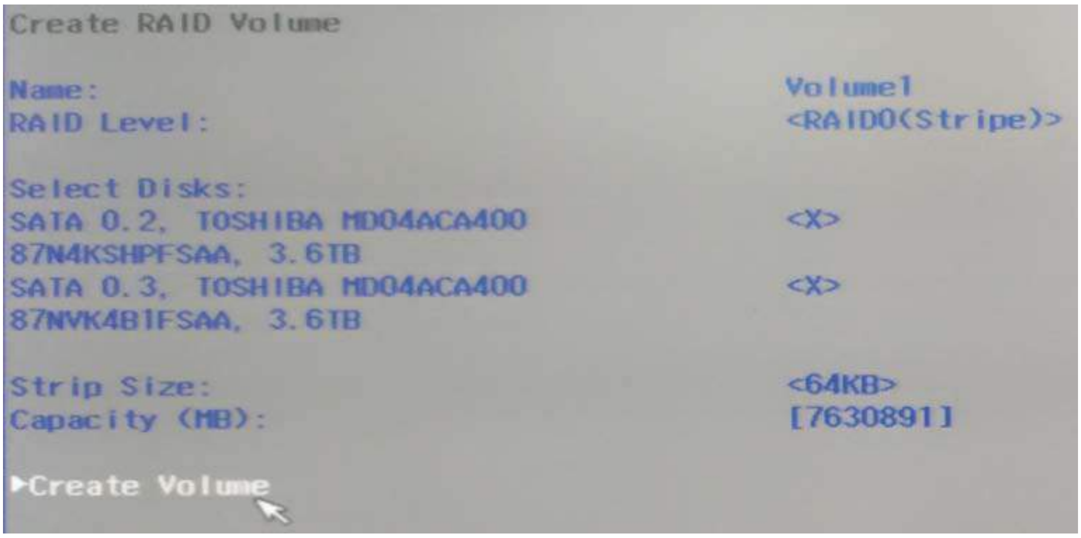
```
Create RAID Volume

Name:                                     Volume1
RAID Level:                               <RAID0(Stripe)>

Select Disks:
SATA 0.2, TOSHIBA MD04ACA400              <X>
87N4KSHPFSAA, 3.6TB
SATA 0.3, TOSHIBA MD04ACA400              <X>
87NVK4B1FSAA, 3.6TB

Strip Size:                               <16KB>
Capacity (MB):                            [7630891]     Strip Size:

▶Create Volume                                          4KB
                                                        8KB
                                                        16KB
                                                        32KB
                                                        64KB
                                                        128KB
```

12. You may enter the RAID volume capacity you wish to create at this step. By default, if you do not enter a capacity (leaving it blank), the full storage capacity will be applied. Once you have entered a capacity, press Enter to confirm.



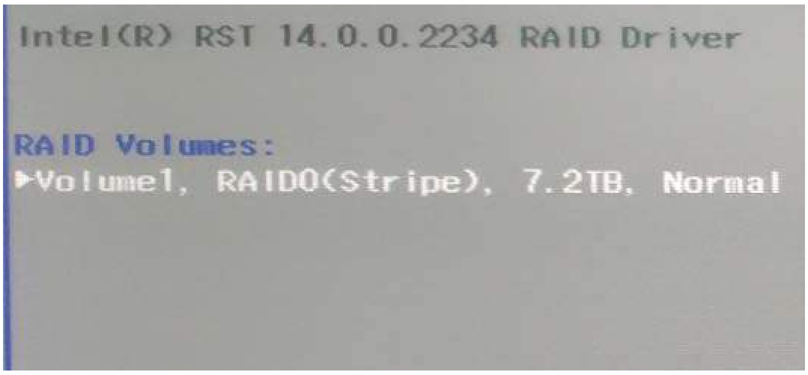
```
Create RAID Volume

Name:                                          Volume1
RAID Level:                                    <RAID0(Stripe)>

Select Disks:
SATA 0.2, TOSHIBA MD04ACA400                   <X>
87N4KSHPFSAA, 3.6TB
SATA 0.3, TOSHIBA MD04ACA400                   <X>
87NVK4B1FSAA, 3.6TB

Strip Size:                                    <64KB>
Capacity (MB):                                 [7630891]

▸Create Volume
                                                          [Yes] [No]
```

13. Double click or highlight and press Enter on “**Create Volume**” to begin creating your RAID volume base on the settings you just configured.



```
Create RAID Volume

Name:                                          Volume1
RAID Level:                                    <RAID0(Stripe)>

Select Disks:
SATA 0.2, TOSHIBA MD04ACA400                   <X>
87N4KSHPFSAA, 3.6TB
SATA 0.3, TOSHIBA MD04ACA400                   <X>
87NVK4B1FSAA, 3.6TB

Strip Size:                                    <64KB>
Capacity (MB):                                 [7630891]

▸Create Volume
```

14. A summary and status of the RAID volume will be shown when it is successfully created.



```
Intel(R) RST 14.0.0.2234 RAID Driver

RAID Volumes:
▶Volume1, RAID0(Stripe), 7.2TB, Normal
```

15. Press F10 to save and Esc to exit the Intel® Rapid Storage Technology configuration page.

NOTE

The above process was to create a RAID-0 volume. If you wish to create a RAID-1 volume, please perform steps 6 to 14 in this section and select RAID-1 during step 9.

5 OS Supportand Driver Installation

5.1 Operating System Compatibility

Nuvo-5608VR supports most operating system developed for Intel® x86 architecture. The following list contains operating systems tested by Neousys Technology.

- Microsoft Window 7 (x86*/ x64*)
- Microsoft Window 8 (x64)
- Microsoft Window 10 (x64)
- Microsoft Embedded Standard 7
- CentOS 7
- Debian 8.7**
- Fedora 24**
- OpenSUSE 42.1**
- Ubuntu 14.04.4 LTS and 16.04 LTS**

NOTE

** Due to XHCI driver is not included natively in Windows 7, you may encounter Keyboard/ mouse issues when installing Windows 7. Neousys offers a Windows-based batch file and step-by-step installation guide.*

*** 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!*

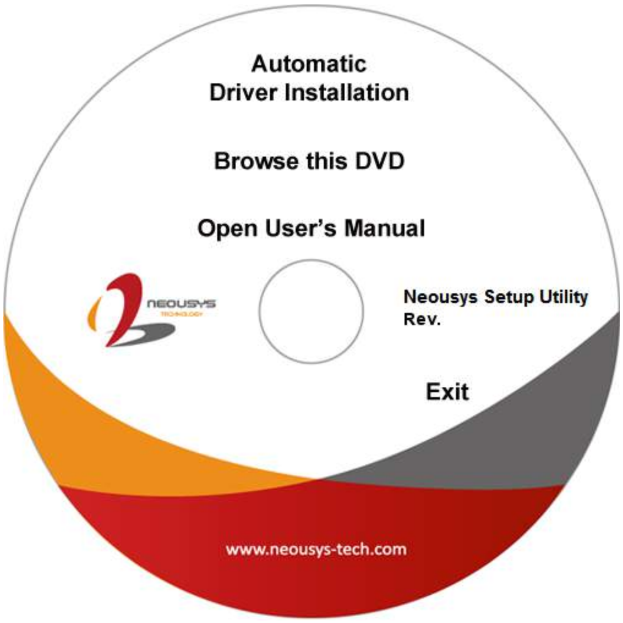
**** Please contact Neousys Technology if your operating system of choice is not on the list.*

5.2 Install DriversAutomatically

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 your 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.



2. 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.

5.3 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.

5.3.1 For Windows 7 (x86)

The recommended driver installation sequence is

1. Chipset driver (x:\Driver_Pool\Chipset_10_Series\Win_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver_Pool\Graphics_6th_i7\Win_7_32\Setup.exe)
3. Audio driver (x:\Driver_Pool\Audio_ALC262\Win_ALL_32\Setup.exe)
4. LAN driver (x:\Driver_Pool\GbE_I210_I350\Win_ALL_32\APPS\PROSETDX\Win32\DxSetup.exe)
5. ME driver (x:\Driver_Pool\ME_10_Series\Win_ALL_AMT\SetupME.exe)

5.3.2 For Windows 7 (x64)

The recommended driver installation sequence is

1. Chipset driver (x:\Driver_Pool\Chipset_10_Series\Win_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver_Pool\Graphics_6th_i7\Win_7_8_10_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\Winx64\DxSetup.exe)
5. TPM 2.0 driver (x:\Driver_Pool\TPM2\Win7_64\Windows6.1-KB2920188-v7-x64.msu)
6. ME driver (x:\Driver_Pool\ME_10_Series\Win_ALL_AMT\SetupME.exe)

5.3.3 For Windows 8/8.1/ 10(x64)

The recommended driver installation sequence is

1. Chipset driver (x:\Driver_Pool\Chipset_10_Series\Win_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver_Pool\Graphics_6th_i7\Win_7_8_10_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\Winx64\DxSetup.exe)
5. ME driver (x:\Driver_Pool\ME_10_Series\Win_ALL_AMT\SetupME.exe)

5.4 Install WDT_DIO Driver Package

Neousys provides a driver package which contains function APIs for watchdog timer, digital I/ O, per-port PoE power on/off control and other platform-related functions. You should install the driver package (WDT_DIO_Setup.exe) in prior to use these functions.

NOTE

Please install WDT_DIO_Setup_v2.2.8.3 or later versions.

5.4.1 For Windows 7 (x86)

Please execute the driver setup program in the following directory.

x:\Driver_Pool\WDT_DIO\XP_Win7_8_32\WDT_DIO_Setup_v2.2.8.3.exe

5.4.2 For Windows 7/8/10 (x64)

Please execute the driver setup program in the following directory.

x:\Driver_Pool\WDT_DIO\Win7_8_64\WDT_DIO_Setup_v2.2.8.3(x64).exe

5.4.3 For Windows 7/8/10 (WOW64)

Please execute the driver setup program in the following directory.

x:\Driver_Pool\WDT_DIO\Win7_8_WOW64\WDT_DIO_Setup_v2.2.8.3(wow64).exe

Appendix A Windows 7 Installation

xHCI Driver Support in Microsoft OS

Intel Skylake platform removed EHCI controller and supports USB 2.0 and USB 3.0 connectivity only through its xHCI controller. For **Windows 8/ 8.1** and **Windows10**, xHCI controller is natively supported and therefore no issue is anticipated. To install Windows 8/ 8.1/ 10, please follow the recommended installation procedure by Microsoft. However, **Windows 7** does not natively support xHCI thus the xHCI driver needs to be manually patched in order to support both USB storage device and USB keyboard/mouse during the OS installation process.

If you would like to install Windows 7, the simplest way is to create a USB thumb drive with Windows 7 installation files and Intel xHCI driver included. Please follow instructions in the following sections to install Windows 7 on your system.

Please refer to the following procedures to create an installation flash drive to aid in smooth installation of Windows 7.

User Provided Items For Windows 7 Installation

Before we proceed with the creation of USB flash drive for installation, please make sure you have the following items.

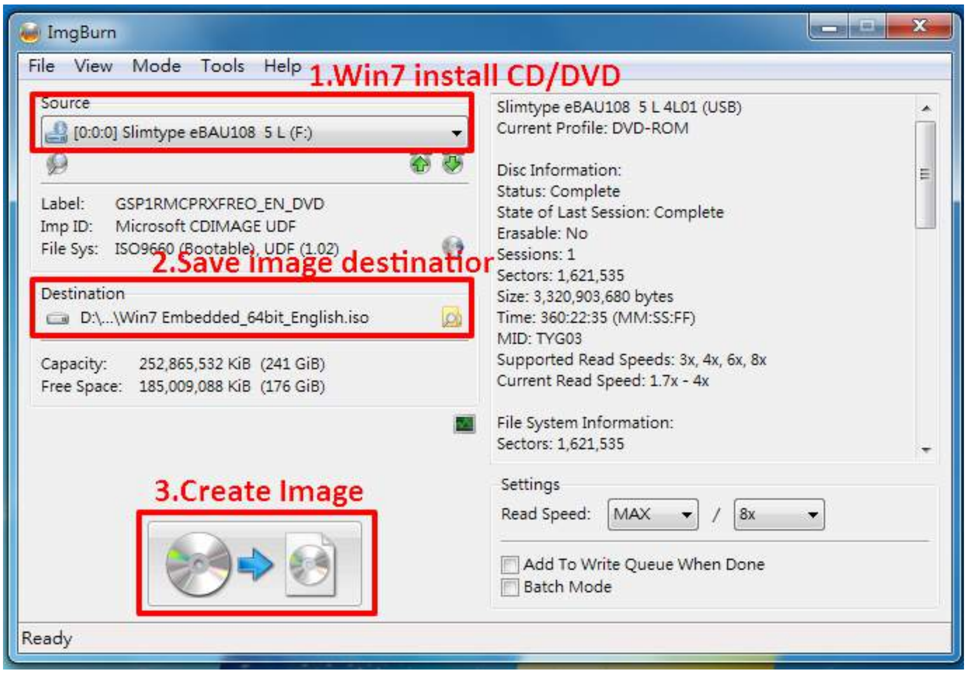
1. Windows 7 original installation DVD
2. USB thumb drive with at least 4 GB capacity
3. Software utility to create ISO image from DVD, e.g.
   - ImgBurn (http://www.imgburn.com)
   - Nero (http://www.nero.com)
4. Software utility to create bootable USB drive from ISO file, e.g.
   - Microsoft Windows USB/DVD Download Tool (https://www.microsoft.com/en-us/download/windows-usb-dvd-download-tool)
   - ISO to USB (http://www.isotousb.com)
5. You should have at least 10 GB disk space on your local drive.

Creating Windows 7 Installation USB Flash Drive

Once you have all the “user provided items”, please follow the steps below to create a Windows 7 Installation USB flash drive.

Step 1 - Create .ISO File From Windows 7 DVD

The first step is to create a .iso file from the Windows 7 DVD. Here we use ImgBurn (http://www.imgburn.com) to create the .iso file and save it to local drive.



1.Win7 install CD/DVD

Source
[0:0:0] Slimtype eBAU108 5 L (F:)

Label: GSP1RMCPRXFREO_EN_DVD
Imp ID: Microsoft CDIMAGE UDF
File Sys: ISO9660 (Bootable), UDF (1.02)

2.Save image destination

Destination
D:\...\Win7 Embedded_64bit_English.iso

Capacity: 252,865,532 KiB (241 GiB)
Free Space: 185,009,088 KiB (176 GiB)

Slimtype eBAU108 5 L 4L01 (USB)
Current Profile: DVD-ROM

Disc Information:
Status: Complete
State of Last Session: Complete
Erasable: No
Sessions: 1
Sectors: 1,621,535
Size: 3,320,903,680 bytes
Time: 360:22:35 (MM:SS:FF)
MID: TYG03
Supported Read Speeds: 3x, 4x, 6x, 8x
Current Read Speed: 1.7x - 4x

File System Information:
Sectors: 1,621,535

3.Create Image

Settings
Read Speed: MAX / 8x

□ Add To Write Queue When Done
□ Batch Mode

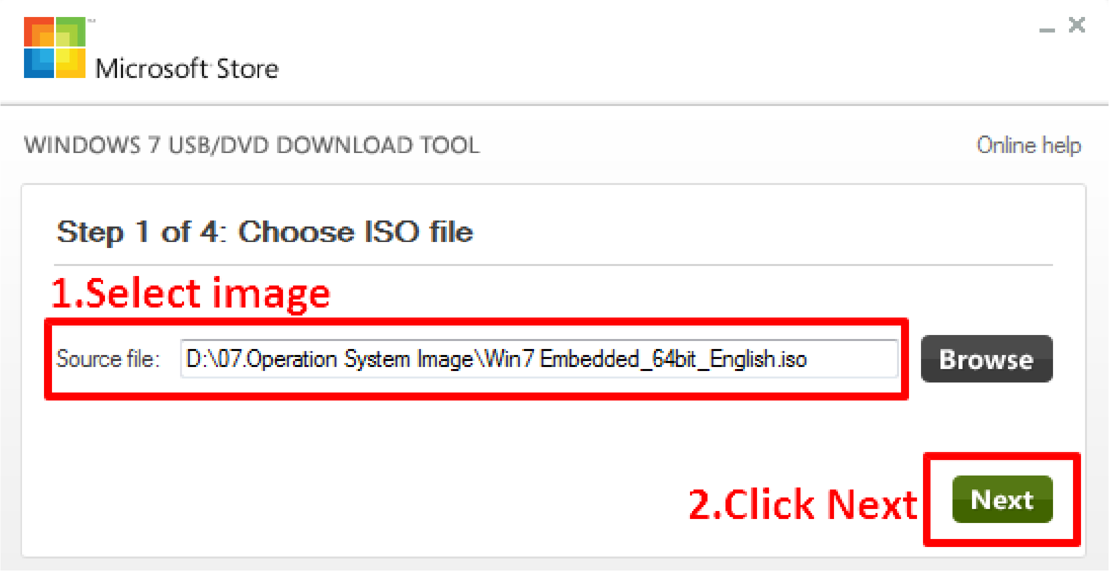
Ready

Step 2 - Create USB Flash Drive Installer From .ISO

The next step is to create a bootable USB flash drive using the .iso file created in step 1. Here we use Microsoft Windows USB/DVD Download Tool to create the USB flash drive (https://www.microsoft.com/en-us/download/windows-usb-dvd-download-tool). Please note that the content of USB flash drive will be destroyed.

1. Right-click on the '**Windows 7 USB DVD Download Tool**' and select '**Run as administrator**'.

2. Follow the instructions below to create the USB flash drive installer.

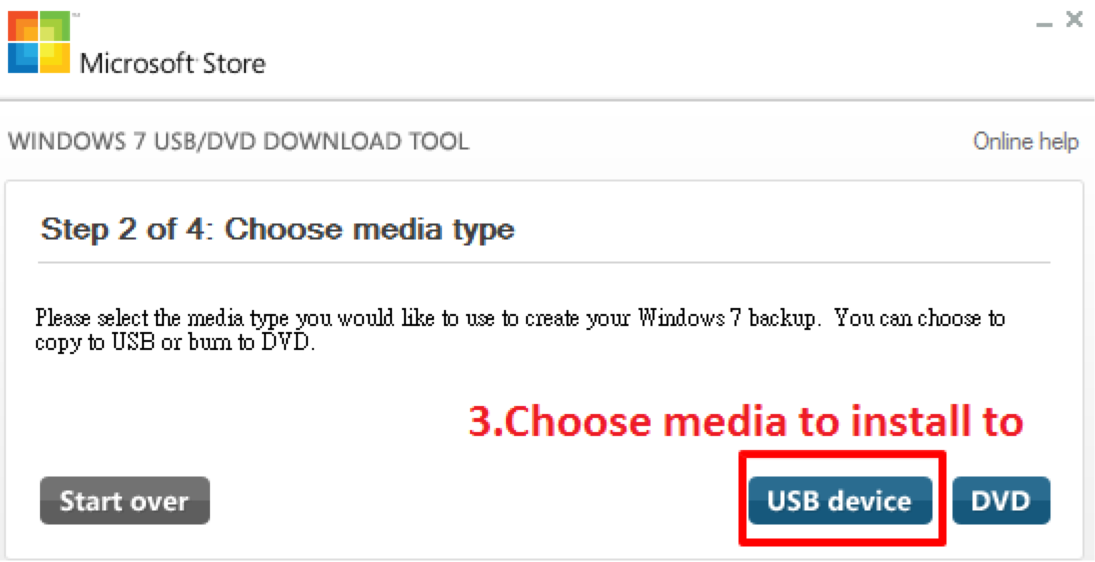


Step 1 of 4: Choose ISO file

1.Select image

Source file: D:\07.Operation System Image\Win7 Embedded_64bit_English.iso

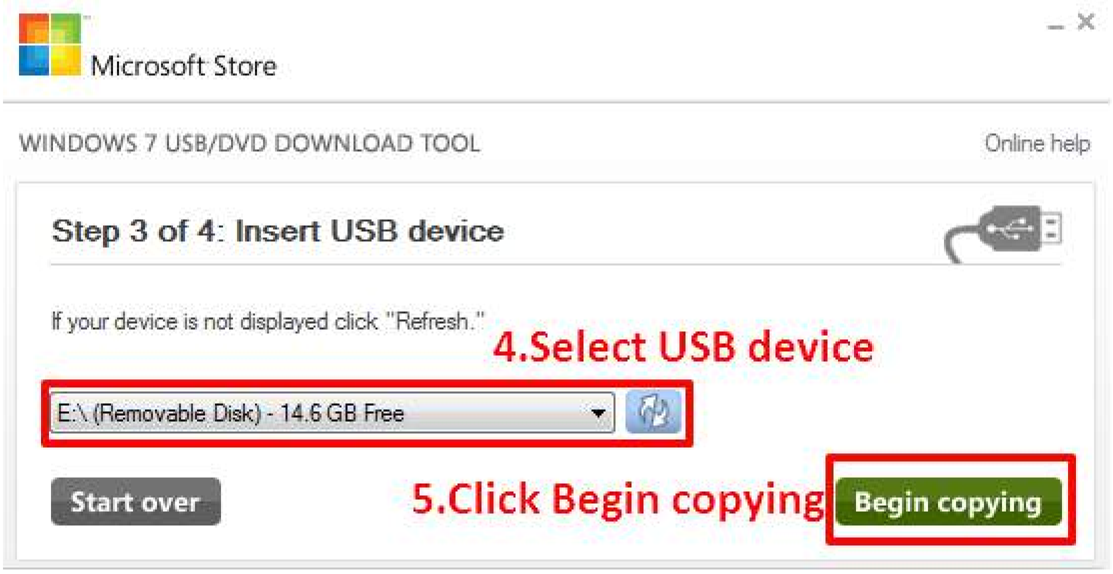
2.Click Next



Step 2 of 4: Choose media type

Please select the media type you would like to use to create your Windows 7 backup. You can choose to copy to USB or burn to DVD.

3.Choose media to install to



WINDOWS 7 USB/DVD DOWNLOAD TOOL

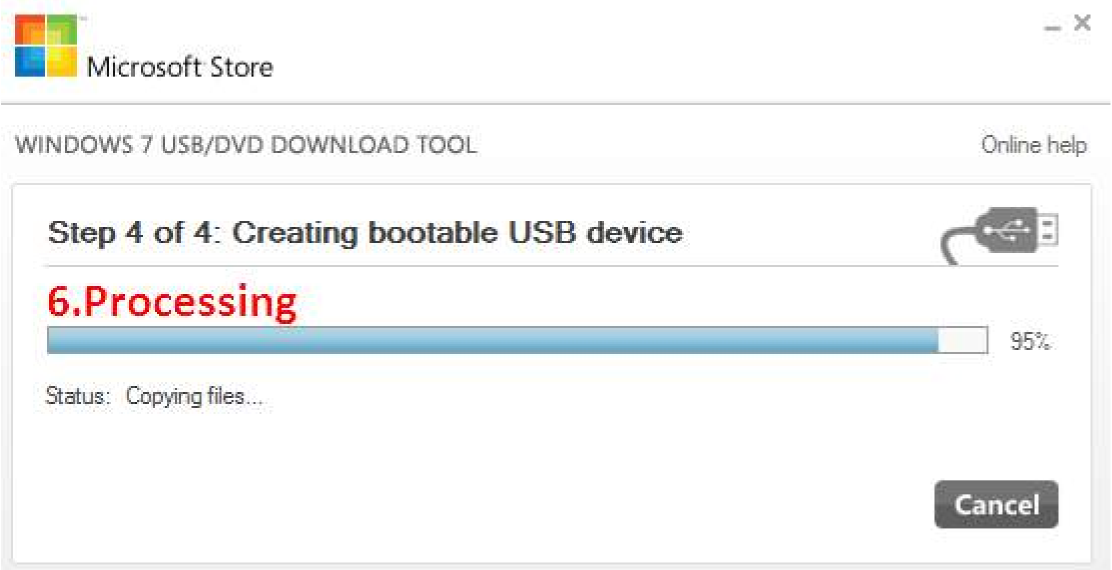
Step 3 of 4: Insert USB device

If your device is not displayed click "Refresh."

E:\ (Removable Disk) - 14.6 GB Free

4.Select USB device

5.Click Begin copying



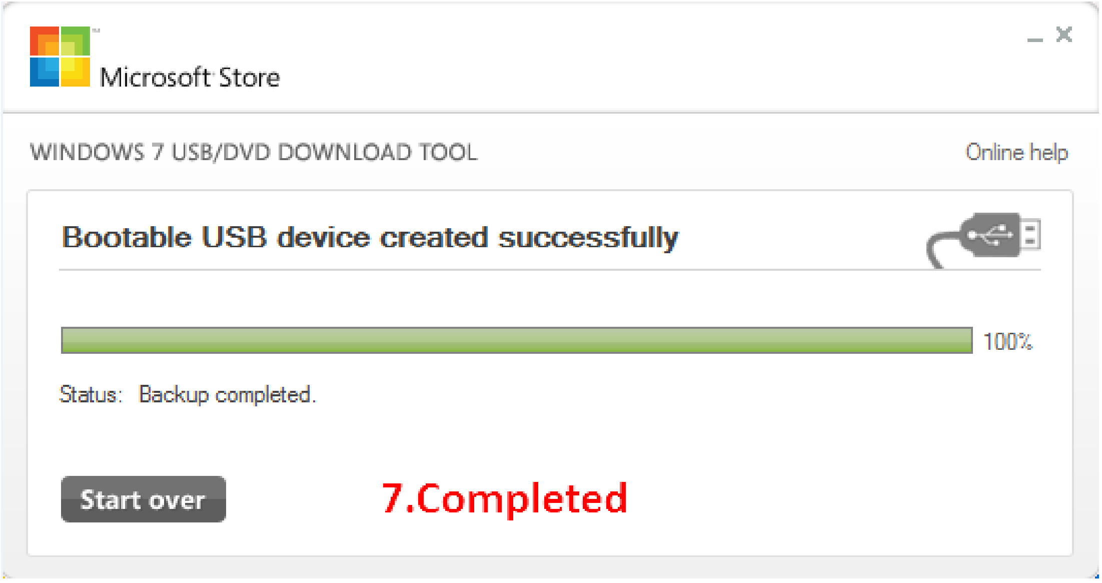
WINDOWS 7 USB/DVD DOWNLOAD TOOL

Step 4 of 4: Creating bootable USB device

6.Processing

95%

Status: Copying files...



WINDOWS 7 USB/DVD DOWNLOAD TOOL

Bootable USB device created successfully

100%

Status: Backup completed.

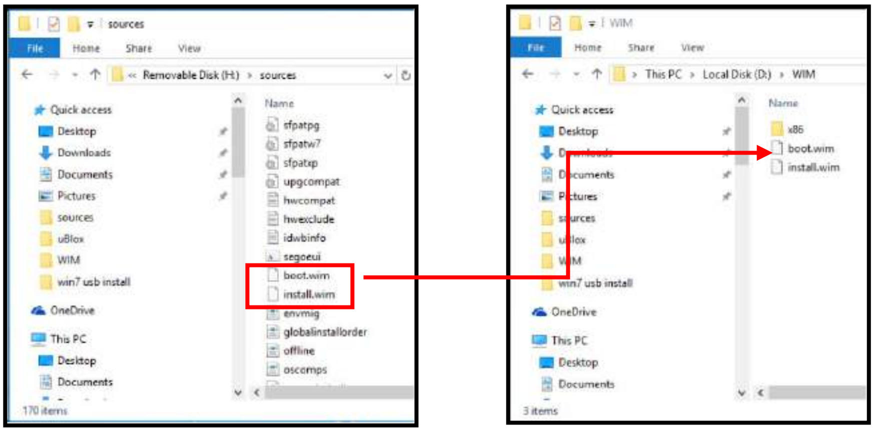
7.Completed

Step 3 - Create Folder and Copy Files for Patching Process

In this step, we need to create a working folder on your local drive and copy necessary files to it. Please follow the steps below.

1. Create a temporary working folder on your local drive. Here we use D:\WIM as an example.
2. Create another folder under D:\WIM for Intel xHCI driver files. Here we use \x86 for Win7 32-bit and \x64 for Win7 64-bit.
3. Copy xHCI driver files to the corresponding folder. You can find the driver files from Neousys Driver DVD.
   - For Win7 32-bit, copy all files from x:\Driver_Pool\USB3_10_Series\Win7_ALL\x86 to D:\WIM\x86
   - For Win7 64-bit, copy all files from x:\Driver_Pool\USB3_10_Series\Win7_ALL\x64 to D:\WIM\x64

   (where x: denotes the drive of your DVD drive)
4. Copy **install.wim** and **boot.wim** from \sources folder of your USB flash drive to D:\WIM.

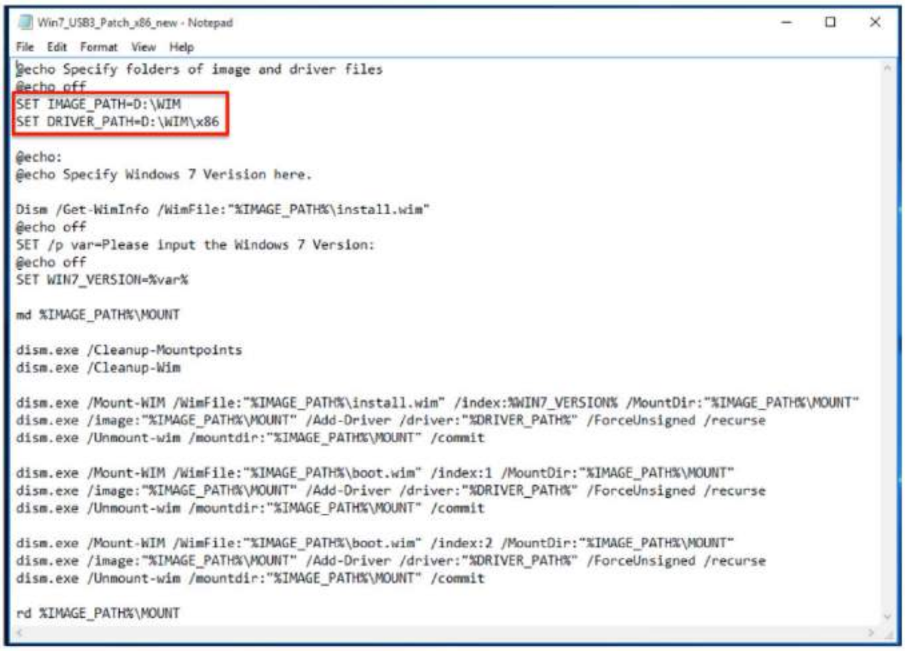


5. On the created USB drive, locate the folder “x:\Driver_Pool\USB3_10_Series\Win7_ALL”, copy the batch file (**Win7_USB3_Patch_x86.bat** or **Win7_USB3_Patch_x64.bat**) to the working folder “D:\WIM”.

Step 4 - Execute .bat File to Patch .wim Files

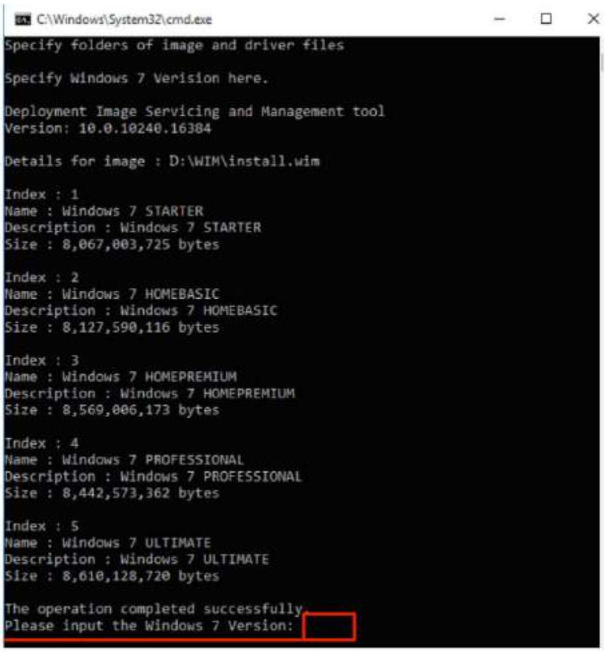
To support xHCI for Windows 7 installation, both install.wim and boot.wim need to be patched to include xHCI driver files. Neousys offers Windows-based batch files (**Win7_USB3_Patch_x86.bat** for Windows 7 32-bit and **Win7_USB3_Patch_x64.bat** for Windows 7 64-bit) to simplify this process.

1. Before executing the batch file, please make sure folders specified in the batch file are identical to your working folders.
   SET IMAGE_PATH=D:\WIM
   SET DRIVER_PATH=D:\WIM\x86
   SET DRIVER_PATH=D:\WIM\x64



```
@echo Specify folders of image and driver files
@echo off
SET IMAGE_PATH=D:\WIM
SET DRIVER_PATH=D:\WIM\x86

@echo:
@echo Specify Windows 7 Verision here.

Dism /Get-WimInfo /WimFile:"%IMAGE_PATH%\install.wim"
@echo off
SET /p var=Please input the Windows 7 Version:
@echo off
SET WIN7_VERSION=%var%

md %IMAGE_PATH%\MOUNT

dism.exe /Cleanup-Mountpoints
dism.exe /Cleanup-Wim

dism.exe /Mount-WIM /WimFile:"%IMAGE_PATH%\install.wim" /index:%WIN7_VERSION% /MountDir:"%IMAGE_PATH%\MOUNT"
dism.exe /image:"%IMAGE_PATH%\MOUNT" /Add-Driver /driver:"%DRIVER_PATH%" /ForceUnsigned /recurse
dism.exe /Unmount-wim /mountdir:"%IMAGE_PATH%\MOUNT" /commit

dism.exe /Mount-WIM /WimFile:"%IMAGE_PATH%\boot.wim" /index:1 /MountDir:"%IMAGE_PATH%\MOUNT"
dism.exe /image:"%IMAGE_PATH%\MOUNT" /Add-Driver /driver:"%DRIVER_PATH%" /ForceUnsigned /recurse
dism.exe /Unmount-wim /mountdir:"%IMAGE_PATH%\MOUNT" /commit

dism.exe /Mount-WIM /WimFile:"%IMAGE_PATH%\boot.wim" /index:2 /MountDir:"%IMAGE_PATH%\MOUNT"
dism.exe /image:"%IMAGE_PATH%\MOUNT" /Add-Driver /driver:"%DRIVER_PATH%" /ForceUnsigned /recurse
dism.exe /Unmount-wim /mountdir:"%IMAGE_PATH%\MOUNT" /commit

rd %IMAGE_PATH%\MOUNT
```

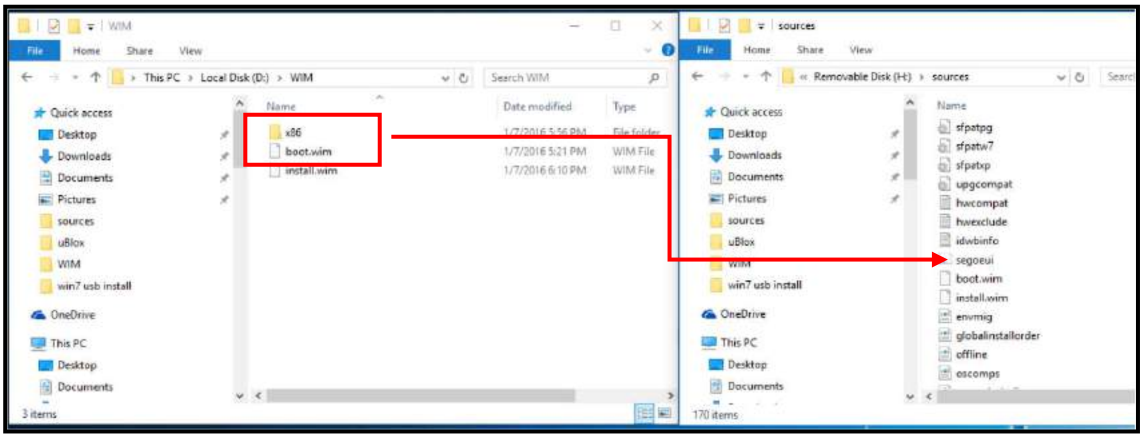
2. Right click on the batch file, select “Run as administrator” and click on “Yes” to continue. A menu of various Windows 7 version options will appear, please enter the corresponding index number for your Windows 7 version and press Enter.



```
Specify folders of image and driver files

Specify Windows 7 Verision here.

Deployment Image Servicing and Management tool
Version: 10.0.10240.16384

Details for image : D:\WIM\install.wim

Index : 1
Name : Windows 7 STARTER
Description : Windows 7 STARTER
Size : 8,067,003,725 bytes

Index : 2
Name : Windows 7 HOMEBASIC
Description : Windows 7 HOMEBASIC
Size : 8,127,590,116 bytes

Index : 3
Name : Windows 7 HOMEPREMIUM
Description : Windows 7 HOMEPREMIUM
Size : 8,569,006,173 bytes

Index : 4
Name : Windows 7 PROFESSIONAL
Description : Windows 7 PROFESSIONAL
Size : 8,442,573,362 bytes

Index : 5
Name : Windows 7 ULTIMATE
Description : Windows 7 ULTIMATE
Size : 8,610,128,720 bytes

The operation completed successfully.
Please input the Windows 7 Version:
```

3. This will automatically patch both install.wim and boot.wim to include xHCI drivers. The patch process may take a few minutes to complete.

4. Once the patch process has finished, please copy the patched “install.wim” and “boot.wim” files from your local drive to the USB flash drives’ \sources folder. A prompt may appear asking if you want to overwrite existing files, please click “Yes” and continue.



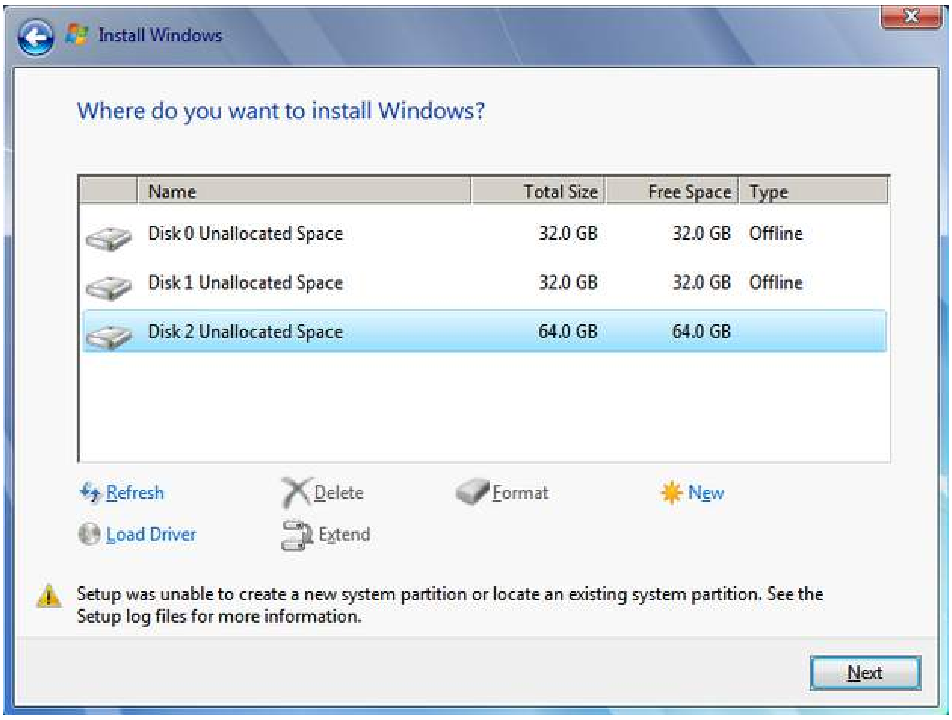
Step 5 - Install Windows 7 Using USB Flash Drive Installer

Now you can use the USB flash drive to install Windows 7 on your system.

1. Plug the USB flash drive to USB port.
2. Power on the system and press F12 to select USB flash drive as boot device.
3. Follow regular installation process to install Windows 7 on your system. The xHCI driver is included in the newly-installed system.

NOTE

If it appears a warning message of "Setup was unable to create a new system partition or locate an existing system partition", please unplug and re-plug the USB flash drive, click 'Refresh' and try again.



Install Windows

Where do you want to install Windows?

Name	Total Size	Free Space	Type
Disk 0 Unallocated Space	32.0 GB	32.0 GB	Offline
Disk 1 Unallocated Space	32.0 GB	32.0 GB	Offline
Disk 2 Unallocated Space	64.0 GB	64.0 GB	

Setup was unable to create a new system partition or locate an existing system partition. See the Setup log files for more information.

Appendix B Using WDT& DIO

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

In this section, we'll illustrate how to use the function library provided by Neousys to program WDT functions. Currently, WDT driver library supports Windows 7/8.1/10 32-bit and 64-bit versions. For other OS support, please contact Neousys Technology for further information.

Installing WDT_DIO Library

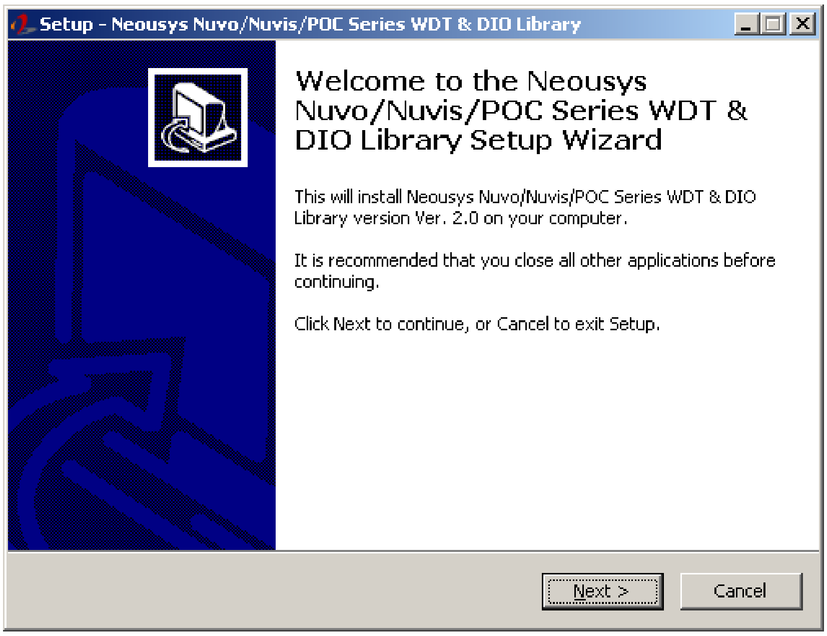
The WDT_DIO function library is delivered in the form of a setup package named **WDT_DIO_Setup.exe**. Prior to programming WDT, you should execute the setup program and install the WDT library. Please use the following WDT_DIO_Setup packages according to your operating system and application.

- For Windows 7/8.1/10 32-bit OS, please install WDT_DIO_Setup_v2.2.8.3.exe or later version.
- For Windows 7/8.1/10 64-bit OS with 64-bit application (x64 mode), please install WDT_DIO_Setup_v2.2.8.3(x64).exe or later version.
- For Windows 7/8.1/10 64-bit OS with 32-bit application (WOW64 mode), please install WDT_DIO_Setup_v2.2.8.3(wow64).exe or later version.

WDT and DIO Library Installation

Tosetup WDT & DIO Library, please follow instructions below.

1. Execute **WDT_DIO_Setup.2.2.8.3.exe**and the following dialog appears.



Setup - Neousys Nuvo/Nuvis/POC Series WDT & DIO Library

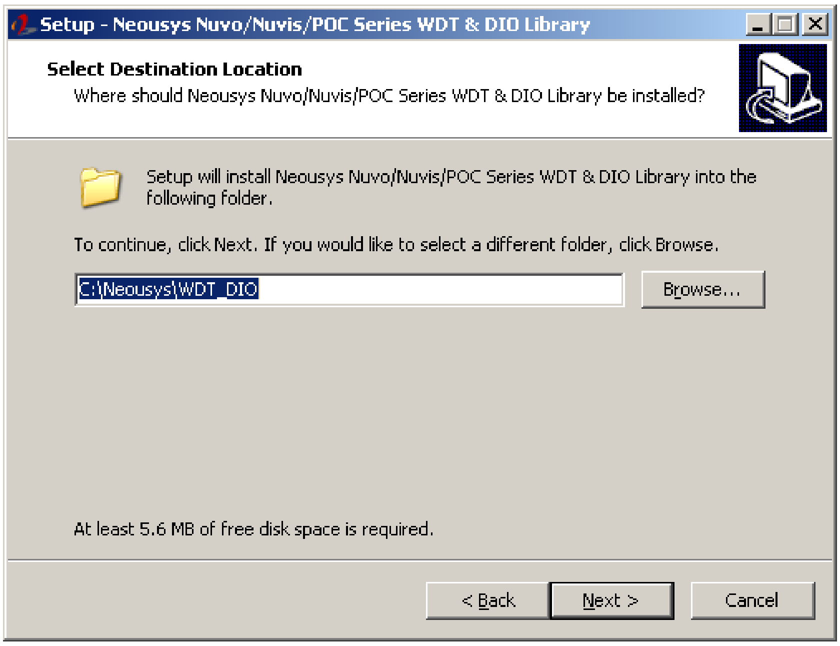
Welcome to the Neousys Nuvo/Nuvis/POC Series WDT & DIO Library Setup Wizard

This will install Neousys Nuvo/Nuvis/POC Series WDT & DIO Library version Ver. 2.0 on your computer.

It is recommended that you close all other applications before continuing.

Click Next to continue, or Cancel to exit Setup.

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



Setup - Neousys Nuvo/Nuvis/POC Series WDT & DIO Library

Select Destination Location

Where should Neousys Nuvo/Nuvis/POC Series WDT & DIO Library be installed?

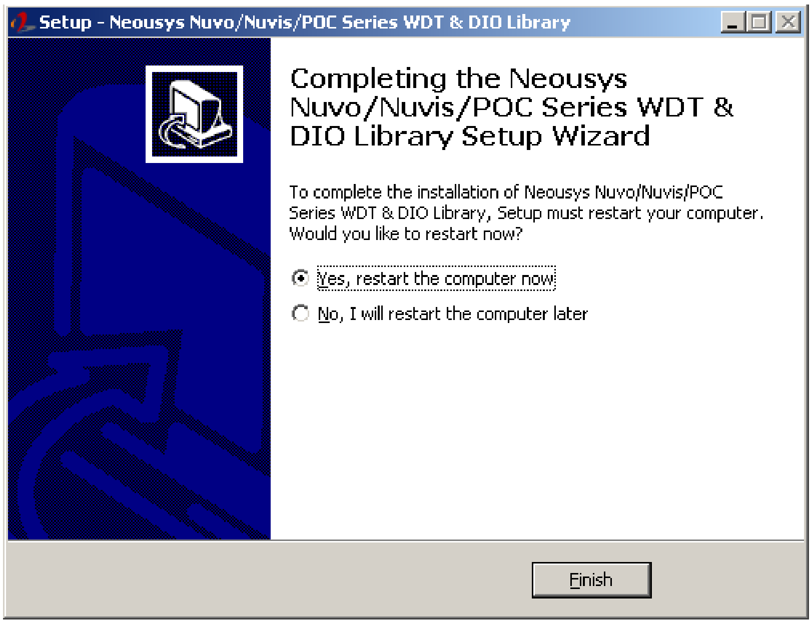
Setup will install Neousys Nuvo/Nuvis/POC Series WDT & DIO Library into the following folder.

To continue, click Next. If you would like to select a different folder, click Browse.

C:\Neousys\WDT_DIO

At least 5.6 MB of free disk space is required.

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.



Setup - Neousys Nuvo/Nuvis/POC Series WDT & DIO Library

Completing the Neousys Nuvo/Nuvis/POC Series WDT & DIO Library Setup Wizard

To complete the installation of Neousys Nuvo/Nuvis/POC Series WDT & DIO Library, Setup must restart your computer. Would you like to restart now?

● Yes, restart the computer now

○ No, I will restart the computer later

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

Header File:	\Include
Library File:	\Lib
Function Reference:	\Manual
Sample Code:	\Sample\WDT_Demo (Demo for Watchdog Timer) \Sample\DIO_Demo (Demo for DIO Control) \Sample\COS_Demo (Demo for change-of-state DI) \Sample\CAN_Demo (Demo for CAN bus manipulation) \Sample\IGN_Demo (Demo for ignition status manipulation) \Sample\POE_Demo (Demo for PoE per-port on/off control)

□□

WDT Function Reference

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 the 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().IfResetWDT() 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()

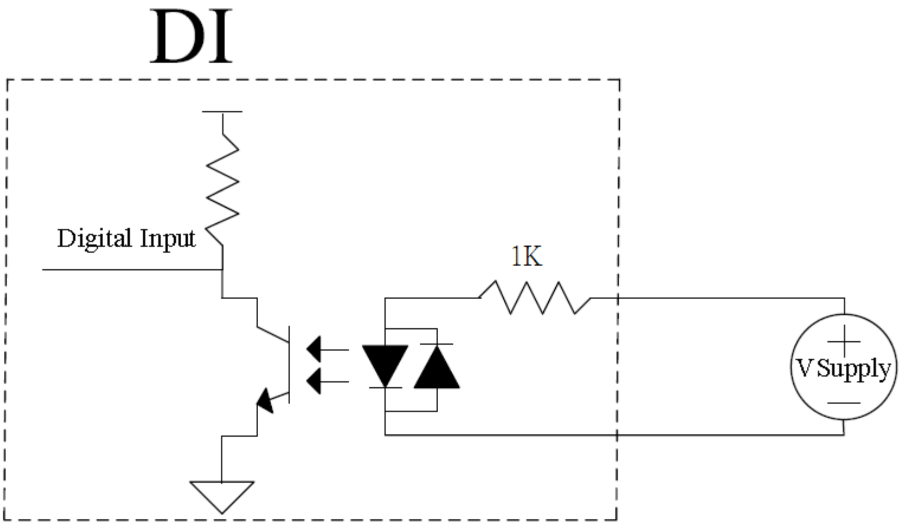
StopWDT

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()

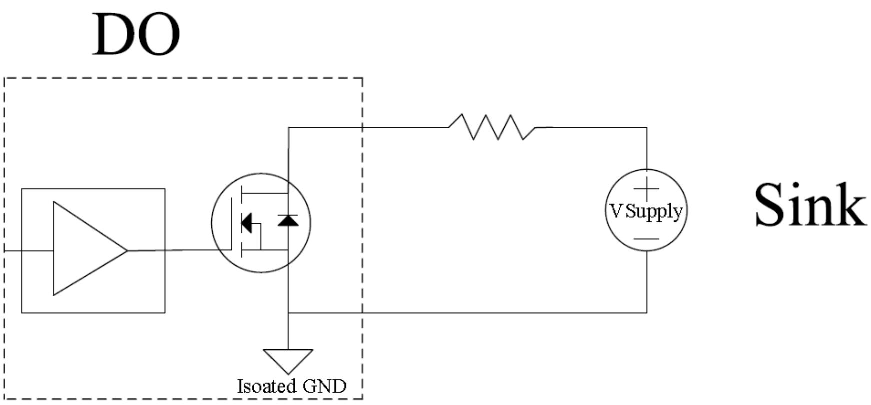
Using DIO Function

Wiring for DIO

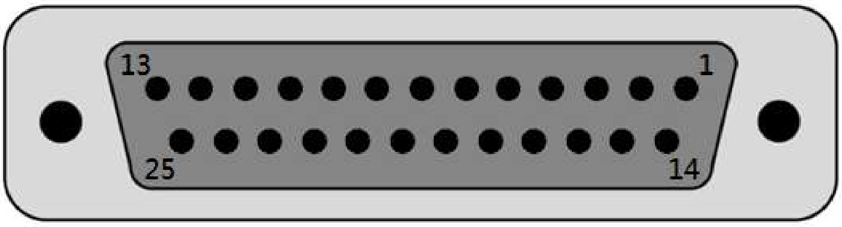
The digital input function of the systemis implemented using a photo-coupler with an internally series-connected 1kΩ resistor. You need to provide a voltage to specify the logic high/low state. The input voltage for logic high is 5~24V, and the input voltage for logic low is 0~1.5V.



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



DIO Pin Definition



Pin No.	Definition	I/O	Description
1	ISO_DI3H	I	Digital input channel 3
2	ISO_DI2H	I	Digital input channel 2
3	ISO_DI1H	I	Digital input channel 1
4	ISO_DI0H	I	Digital input channel 0
5	Reserved	-	Reserved pin. Keep unconnected
6	Reserved	-	Reserved pin. Keep unconnected
7	ISO_DO3	O	Digital output channel 3
8	ISO_DO2	O	Digital output channel 2
9	ISO_DO1	O	Digital output channel 1
10	ISO_DO0	O	Digital output channel 0
11	VDD	-	DO voltage source input for inductive load
12	ISO5V	-	Isolated 5V power supply
13	Reserved	-	Reserved pin. Keep unconnected
14	ISO_DI3L	-	Digital input channel 3 GND
15	ISO_DI2L	-	Digital input channel 2 GND
16	ISO_DI1L	-	Digital input channel 1 GND
17	ISO_DI0L	-	Digital input channel 0 GND
18	Reserved	-	Reserved pin. Keep unconnected
19	Reserved	-	Reserved pin. Keep unconnected
20	DOGND	-	Digital output GND
21	DOGND	-	Digital output GND
22	DOGND	-	Digital output GND
23	DOGND	-	Digital output GND
24	DOGND	-	Digital output GND
25	DOGND	-	Digital output GND

DIO Function Reference

InitDIO

Syntax	BOOL InitDIO(void);
Description:	Initialize the DIO function. You should always invoke InitDIO() before write/read any DIO port/channel.
Parameter	None
Return Value	**TRUE:** Successfully initialized **FALSE:** Failed to initialize
Usage	BOOL bRet = InitWDT()

DIReadLine

Syntax	BOOL DIReadLine(BYTE ch);
Description:	Read a single channel of isolated digital input.
Parameter	*ch* BYTE value specifies the DI channel to be read. *ch* should be a value of 0 ~ 3.
Return Value	The status (TRUE or FALSE) of the specified DI channel.

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

DIReadPort

Syntax	WORD DIReadPort(void);
Description:	Read the entire isolated digital input port (4 channels).
Parameter	None
Return Value	The status (TRUE or FALSE) of the specified DI channel.
Usage	WORD DIPortValue = DIReadPort ();

DOWriteLine

Syntax	void DOWriteLine(BYTE ch, BOOL value);
Description:	Write a single channel of isolated digital output.
Parameter	*ch* BYTE value specifies the DO channel to be written. *ch* should be a value of 0 ~ 3. *value* BOOL value (TRUE or FALSE) specifies the status of DO channel.
Return Value	None

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

DOWritePort

Syntax	void DOWritePort(WORD value);
Description:	Write the entire isolated digital output port (4 channels).
Parameter	*value* WORD value specifies the status of the DO port. *value* should be a value of 0~15.
Return Value	None
Usage	WORD DOPortValue=0x0C; //1100b DOWritePort(DOPortValue); //write DO port as 1100b

DOWriteLineChecked

Syntax	void DOWriteLineChecked(BYTE ch, BOOL value);
Description:	Write a single channel of isolated digital output and read-back the value of DO register. Note that this function is not returned until the DO register is checked and identical to the written value.
Parameter	*ch* BYTE value specifies the DO channel to be written. *ch* should be a value of 0 ~ 3. *value* BOOL value (TRUE or FALSE) specifies the status of DO channel.
Return Value	None

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

DOWritePortChecked

Syntax	void DOWritePortChecked(WORD value);
Description:	Write the entire isolated digital output port (8 channels) and check it has been done. Note that this function is not returned until the write value has been checked the same with the device registry.
Parameter	*value* WORD value specifies the status of the DO port. *value* should be a value of 0~15.
Return Value	None
Usage	WORD DOPortValue=0x0C; //1100b DOWritePortChecked(DOPortValue); //write DO port as 1100b

COS Function Reference

SetupDICOS

Syntax	BOOL SetupDICOS(COS_INT_SETUP *lpSetup, DWORD cbSetup);
Description	Setup Digital-Input(DI) Change-of-State(COS) interrupt parameters.
Parameter	***lpSetup*[in]** A pointer to a **COS_INT_SETUP** structure that contains the COS configuration information for the DI device. This data structure contains the following variables: ***portMask*** WORD value specifies the interrupt mask for corresponding channel(s). ***edgeMode*** WORD value specifies that interrupt is generated when level change (set to 0) or on rising/falling edge (set to 1) for the corresponding channel(s). ***edgeType*** WORD value specifies that interrupt is generated on rising edge (set to 0) or falling (set to 1) edge for corresponding channel(s). This value is neglected if *edgeMode* is set to 0 for the corresponding channel(s). ***cbSetup*[in]** The length of the structure, in bytes. The caller must set this member to size of (COS_INT_SETUP).
Return Value	**TRUE** if setup successes **FALSE** if setup failed

Usage	COS_INT_SETUP setup;
	memset(&setup, 0, sizeof(setup));
	setup.portMask = 0x0f; // enable ch.0~3
	setup.edgeMode = 0; // level
	setup.edgeType = 0x00; // Lo/Hi
	BOOL bRet = SetupDICOS(&setup, sizeof(setup));

RegisterCallbackDICOS

Syntax	BOOL RegisterCallbackDICOS(COS_INT_CALLBACK callback);
Description:	Registers a callback function, which is called when the DICOS interrupt occurred.
Parameter	***callback* [in]** Specifies the callback function. The prototype for this function is descripted as follow. void __stdcallcallback_func(COS_INT_CALLBACK_ARG* arg);
Return Value	**TRUE** if setup successes, **FALSE** if setup failed.

Usage	void __stdcallcallback_func(COS_INT_CALLBACK_ARG* arg)
	{
	printf("data=0x%02x, flag=0x%02x, seq=%02d\n",
	  arg->portData, arg->intrFlag, arg->intrSeq);
	}
	BOOL bRet = RegisterCallbackDICOS(callback_func);

StartDICOS

Syntax	BOOL StartDICOS(void);
Description	Start DI Change-of-State interrupt
Parameter	None
Return Value	**TRUE** if start procedure successes **FALSE** if start procedure failed
Usage	BOOL bRet = StartDICOS();

StopDICOS

Syntax	BOOL StopDICOS(void);
Description	Stop DI Change-of-State interrupt
Parameter	None
Return Value	**TRUE** if stop procedure successes **FALSE** if stop procedure failed
Usage	BOOL bRet = StopDICOS();

DI COS Example

```
#include <stdio.h>
#include <stdlib.h>
#include <windows.h>
#include "WDT_DIO.h"

//Step 0,      define a Change-of-State Interrupt callback function
void __stdcallcallback_function(COS_INT_CALLBACK_ARG* arg)
{
        printf("data=0x%02x, flag=0x%02x, seq=%02d\n",
    arg->portData, arg->intrFlag, arg->intrSeq);
}

int main(intargc, char* argv[])
{
  //Step 1, initialize DIO library by invoking InitDIO()
if ( ! InitDIO() )
        {
printf("InitDIO --> FAILED\n");
return -1;
        }
printf("InitDIO --> PASSED\n");

  //Step 2, setup Change-of-State Interrupt mask and level/edge mode
        COS_INT_SETUP    setup;
```

```
memset(&setup, 0, sizeof(setup));

setup.portMask = 0x0f;        // 00001111b, enable ch.0~3
setup.edgeMode = 0x00;    // generate interrupt on level change
setup.edgeType = 0x00;      // rising/falling edge, only effective when edgeMode = 1

if ( ! SetupDICOS(&setup, sizeof(setup)) )
    {
printf("SetupDICOS --> FAILED\n");
return -2;
    }
printf("SetupDICOS --> PASSED\n");

 //Step 3, register the callback function
if ( ! RegisterCallbackDICOS(callback_function) )
    {
printf("RegisterCallbackDICOS --> FAILED\n");
return -3;
    }
printf("RegisterCallbackDICOS --> PASSED\n");

 //Step 4, start the DI Change-of-State Interrupt
if ( ! StartDICOS() )
    {
printf("StartDICOS --> FAILED\n");
return -4;
    }
printf("StartDICOS --> PASSED\n");

printf("\npress any key to stop...\n");
system("pause >nul");

 //Step 5, stop the DI Change-of-State Interrupt operation
if ( ! StopDICOS() )
    {
printf("StopDICOS --> FAILED\n");
return -5;
```

```
    }
printf("StopDICOS --> PASSED\n");


printf("\npress any key to exit...\n");
system("pause >nul");
return 0;

}
```

Appendix C CAN bus Function

Users can configure the CAN Bus, as well as get access to the bus, via APIs included in the WDT_DIO driver package. This section provides API functions, parameters and definitions for users to create their own software applications.

CAN Bus Function Reference

CAN_RegisterReceived

Syntax	BOOL CAN_RegisterReceived(DWORD idx, void (__stdcall *pfnHandler)(CAN_MSG *lpMsg, DWORD cbMsg));
Description	Registers a callback function. It is called when the CAN controller has received a message object
Parameter	*idx* [in] Specifies the index of CAN bus controllers. Currently, there is only one CAN bus controller. *pfnHandler* [in] Specifies the callback function. The prototype for this function is described as follow. void __stdcall CAN0_Received(CAN_MSG *lpMsg, DWORD cbMsg);
Return Value	**TRUE** if registration successes **FALSE** if registration failed

Usage	void __stdcall CAN0_Received(CAN_MSG *lpMsg, DWORD cbMsg)
	{
	  printf("%08x, %d, %02x %02x %02x %02x %02x %02x %02x %02x\r\n", lpMsg->id, lpMsg->len, lpMsg->data[0], lpMsg->data[1], lpMsg->data[2], lpMsg->data[3], lpMsg->data[4], lpMsg->data[5], lpMsg->data[6], lpMsg->data[7]);
	}
	
	void main(intargc, char *argv[])
	{
	  if (! CAN_RegisterReceived(0, AN0_Received))

```
{
  printf("CAN_RegisterReceivedisFAILED !\r\n");
  }
}
```

CAN_RegisterStatus

Syntax	BOOL CAN_RegisterStatus(DWORD idx, void (__stdcall *pfnHandler)(DWORD status));
Description	Registers a callback function, which is called when the CAN controller has received a status interrupt.
Parameter	idx [in] Specifies the index of CAN bus controllers. Currently, there is only one CAN bus controller. pfnHandler [in] Specifies the callback function. The prototype for this function is described as follow. void __stdcall CAN0_Status(DWORD status);
Return Value	**TRUE** if registration successes **FALSE** if registration failed

Usage	void __stdcall CAN0_Status(DWORD status)
	{
	  printf("%08x\r\n", status);
	}
	void main(intargc, char *argv[])
	{
	  if (! CAN_RegisterStatus(0, CAN0_Status))
	{
	  printf("CAN_RegisterStatus is FAILED !\r\n");
	}
	}

CAN_Setup

Syntax	BOOL CAN_Setup(DWORD idx, CAN_SETUP *lpSetup, DWORD cbSetup);
Description	Setup timing correlation of trigger source input (DI) and pulse target output (DO) for Deterministic Trigger Fan-Out function.
Parameter	*idx* [in] Specifies the index of CAN bus controllers. Currently, there is only one CAN bus controller. *lpSetup* [in] A pointer to a CAN_SETUP structure that contains the CAN-Bus configuration. This data structure contains the following variables: *Bitrate* DWORD value specifies the bit rate of the specified CAN controller. *recvConfig* DWORD value specifies the received message configuration. *recvId* DWORD value specifies the received identity number. *recvMask* DWORD value specifies the mask for received identity number. *cbSetup* [in] The length of the structure, in bytes. The caller must set this member to the size of (CAN_SETUP).
Return Value	**TRUE** if setup successes, **FALSE** if setup failed.
Usage	

CAN_Start

Syntax	BOOL CAN_Start(DWORD idx);
Description	Start CAN Bus transmit and receive operation.
Parameter	*idx* [in] Specifies the index of CAN bus controllers. Currently, there is only one CAN bus controller.
Return Value	**TRUE** if start procedure successes **FALSE** if start procedure failed
Usage	BOOL bRet = CAN_Start(0);

CAN_Stop

Syntax	BOOL CAN_Stop(DWORD idx);
Description	Stop CAN Bus controller operation.
Parameter	*idx* [in] Specifies the index of CAN bus controllers. Currently, there is only one CAN bus controller.
Return Value	**TRUE** if stop procedure successes **FALSE** if stop procedure failed
Usage	BOOL bRet = CAN_Stop(0);

CAN_Send

Syntax

BOOL CAN_Send(DWORD idx , CAN_MSG *lpMsg, DWORD cbMsg);

Description

Put message object into CAN Bus controller.

Parameter

idx [in]

Specifies the index of CAN bus controllers. Currently, there is only one CAN bus controller.

lpMsg [in]

A pointer to a CAN_MSG structure that contains the CAN-Bus message object. This data structure contains the following variables:.

id

DWORD value specifies the identity number of the message object.

flags

WORD value specifies the status or configuration of the message object.

extra

BYTE value specifies nothing but is reserved.

len

BYTE value specifies the length of the message object.

data

BYTE array specifies the data of the message object.

cbMsg [in]

The length of the structure, in bytes. The caller must set this member to the size of (CAN_MSG).

Return Value

TRUE if stop procedure successes

FALSE if stop procedure failed

Usage

```
void main(intargc, char *argv[])
{
  CAN_MSG    canMsg;
  memset(&canMsg, 0, sizeof(canMag));
  if ( ! CAN_Send(0, &canMsg, sizeof(canMsg)) )
{
    printf("CAN_Send is FAILED !\r\n");
}
}
```

Appendix D Ignition Control Function

The system supports ignition control. This is a hardware functionality and control by the on-boardmicro controller. However, the following APIs enable users to check the status and configuration. Therefore, actions in users' software applications are possible according to different ignition status.

Ignition Control Function Reference

IGN_GetState

Syntax	BOOL IGN_GetState(DWORD *lpState);
Description	Get current ignition input status
Parameter	*lpState* [in] pointer to DWORD value which represents the state of ignition input.
Return Value	**TRUE** if stop procedure successes **FALSE** if stop procedure failed

Usage	void main(intargc, char *argv[])
	{
	  DWORD state;
	  state = 0;
	  if (! IGN_GetState(&state))
	  {
	  printf("IGN_GetState is FAILED !\r\n");
	  }
	}

IGN_GetBatteryVoltage

Syntax	BOOL IGN_GetBatteryVoltage(double *lpVoltage);
Description	Get current DC input voltage
Parameter	*lpVoltage* [in] pointer to double value which represents the input voltage.
Return Value	**TRUE** if procedure successful **FALSE** if procedure failed

Usage	void main(intargc, char *argv[])
	{
	  double voltage;
	  voltage = 0;
	  if (! IGN_GetBatteryVoltage(&voltage))
	  {
	    printf("IGN_GetBatteryVoltage is FAILED !\r\n");
	  }
	}

IGN_GetSetting

Syntax	BOOL IGN_GetSetting(IGN_SETTING *lpSetting, DWORD cbSetting);
Description	Get ignition BIOS setting information
Parameter	*lpSetting*[in] A pointer to an**IGN_SETTING** structure that contains the ignition setting from BIOS. This data structure contains the following variables: *mode* BYTE value specifies the operation mode of the ignition controller. (0: atx, 1: at, 2~7: ignition mode) *batteryType* BYTE value specifies the battery type. (0: 12v, 1: 24v) *isSmartOff* BYTE value specifies the smart off function is enabled or not. (0: disabled, 1: enabled) *isPostCheck* BYTE value specifies the post check function is enabled or not. (0: disabled, 1: enabled) *onDelay* DWORD value specifies the delay count in seconds until ignition controller turn on the machine. *offDelay* DWORD value specifies the delay count in seconds until ignition controller turn off the machine. *hardOffTimeout* DWORD value specifies the limit count in seconds while ignition controller could not turn off the machine. *lowVolThreshold* DOUBLE precision floating point number specifies the low voltage limit then ignition controller will turn off the machine.
Return Value	**TRUE** if procedure successful **FALSE** if procedure failed

Usage	int main(intargc, char *argv[])
	{
	  IGN_SETTING setting;
	  memset(&setting, 0, sizeof(setting));
	  if (! IGN_GetSetting(&setting, sizeof(setting)))

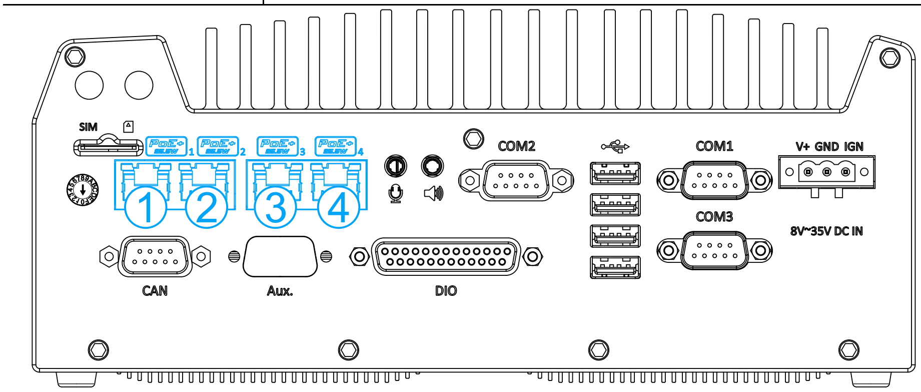
```
  {
    printf("IGN_GetSetting is FAILED !\r\n");
    return -1;
  }
  return 0;
}
```

Appendix E PoE On/ Off Control

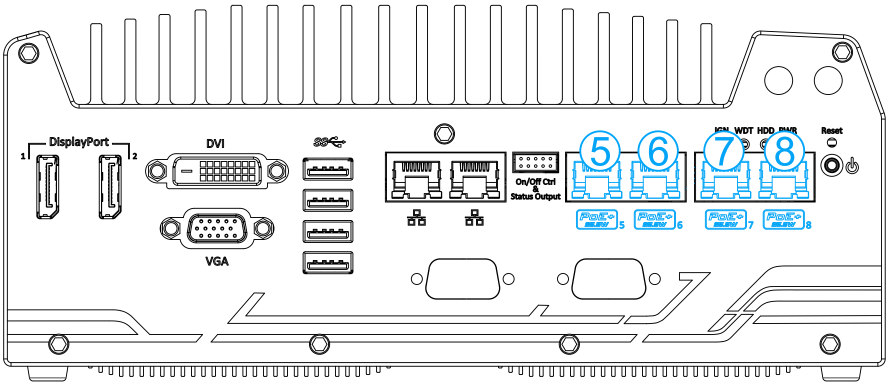
Nuvo-5608VRoffers 802.3at PoE+ ports allow users manually turn on or off the power supply of each PoE port. This can be useful in power device (PD) fault-recovery or power reset. The APIs are part of Neousys WDT_DIO driver package. Please follow the instructions in Appendix B Watchdog Timer & Isolated DIO for installation before programming PoE on/ off control function.

GetStatusPoEPort

Syntax	BYTE GetStatusPoEPort (Byte port);
Description	Get current on/ off status of designated PoE port.
Parameter	*port* BYTE value specifies the index of PoE port. Please refer to the following illustration, *port* value should be 1 ~ 8
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



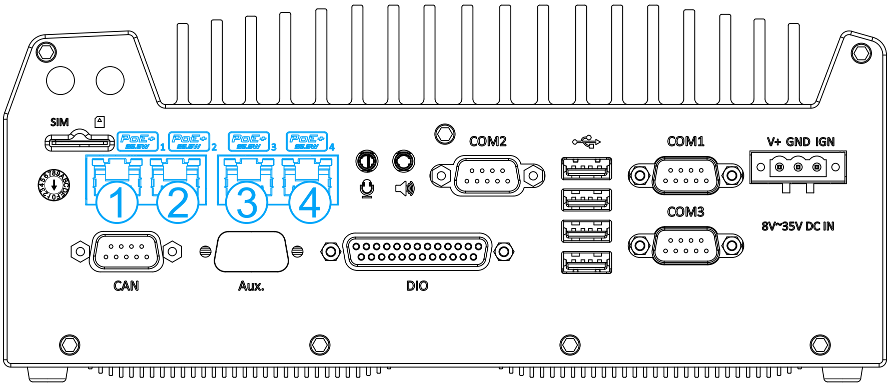
PoE ports 1/ 2/ 3/ 4 are on the rear panel



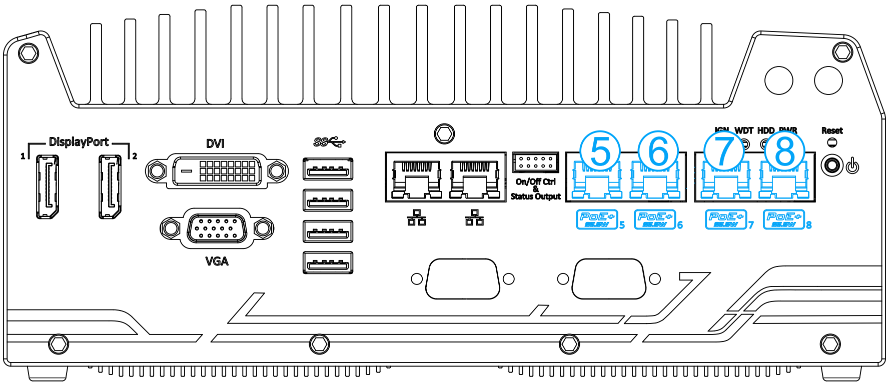
PoE ports 5/ 6/ 7/ 8 are on the front panel

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* value should be 1 ~ 8
Return Value	**TRUE** if enabled success **FALSE** if fail to enable.
Usage	BOOL bRet = EnablePoEPort (1); //Turn on PoE Port#1



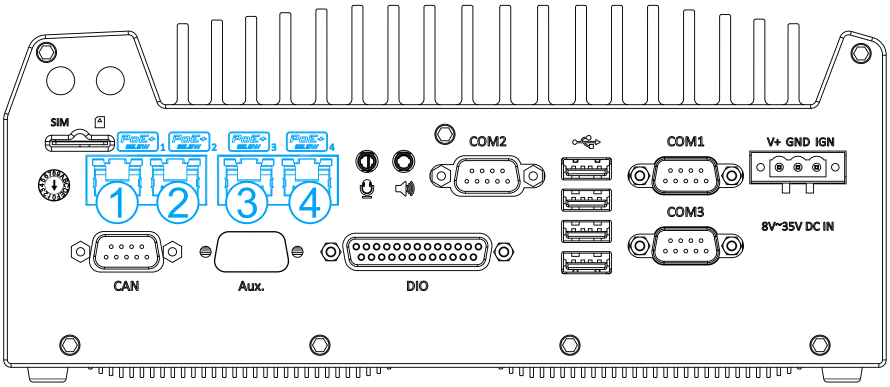
PoE ports 1/ 2/ 3/ 4 are on the rear panel



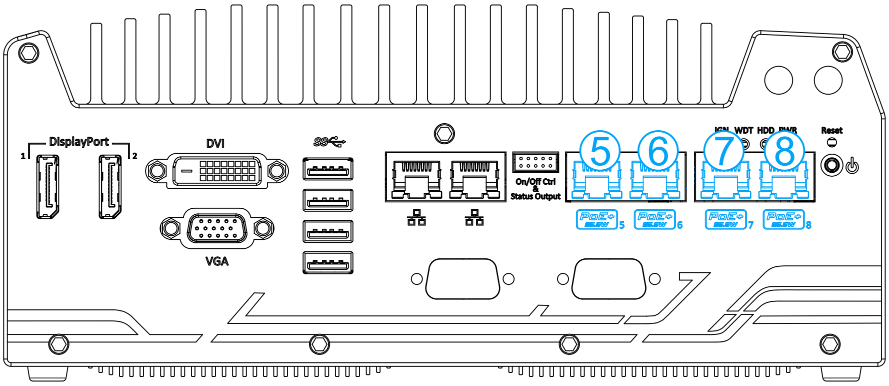
PoE ports 5/ 6/ 7/ 8 are on the front panel

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* value should be 1 ~ 8
Return Value	**TRUE** if disabled success **FALSE** if fail to disable
Usage	BOOL bRet = DisablePoEPort (1); //Turn off PoE Port#1



PoE ports 1/ 2/ 3/ 4 are on the back panel



PoE ports 5/ 6/ 7/ 8 are on the front panel