

**Neosys Technology Inc.**

**Nuvo-2400 Series**

***Multi-Expansion Slots***

***Intel® Bay Trail Fanless Industrial Computer***

**User's Manual**

**Rev. 1.1**

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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 his 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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# Chapter 1 Introduction

## 1.1 Overview

Nuvo-2400 is a fanless shoe-box IPC with 3 PCI/PCIe expansion slots. The expansion slots are provided for add-on cards, such as COM port cards and frame grabbers. Nuvo-2430 provides 3 PCI slots, while Nuvo-2421 provides one PCIe x4 slot with 1-lane PCI Express 2.0 signal and two PCI slots.



A convenient design of Nuvo-2400 facilitates the integration of both remote on/off switch and the system status indicators. Corresponding signals are reserved for buttons and LEDs outside of Nuvo-2400. And users can power on/off Nuvo-2400 externally. Furthermore, 8-channel digital input and 8-channel digital outputs are provided as an option of Nuvo-2400. All inputs and outputs are isolated and 24VDC-rated. This makes the DI/O compatible with many industrial sensors, indicators, coils and actuators.

Powered by Intel® Celeron® Bay Trail J1900 quad-core processor, Nuvo-2400 shows outstanding computing power and is even more power efficient compared to those with its predecessors. Nuvo-2400 supports dual independent displays, dual 2.5" SATA bays and dual gigabit LAN ports with teaming and PXE. These features, together with the 3 expansion slots, maximize the flexibility of Nuvo-2400 for even more generic applications.

# 1.2 Product Specification

## 1.2.1 Specification of Nuvo-2430

Table 1: Specification of Nuvo-2430

System Core	
Processor	Intel® Celeron® Bay Trail J1900 Quad-core processor (2.42GHz, 2MCache)
Graphic	Integrated Intel® HD graphics
Memory	1x 204-pin SO-DIMM Socket up to 8GB DDR3L-1333MHz SDRAM
Front-panel I/O Interface	
Ethernet	2x Gigabit Ethernet by Intel® Ethernet Controller I210
Video Port	1x DVI-I connector for VGA and DVI dual independent display outputs
Serial Port	2x BIOS-Configurable RS-232/422/485 (COM1 & COM2)
USB	1x USB3.0 and 3x USB2.0
Audio	1x Speaker-out and 1x Mic-in
Isolated DIO	Optional 8-CH DI and 8-CH DO (Polling Mode Only)
Power Input	1x 3-pin pluggable terminal block for DC input
Internal I/O Interface	
Serial Port	2x RS-232 (COM3 & COM4)
Parallel Port	1x Parallel Port
Remote Control & Status Output	1x 3-pin 2.0mm wafer connector for remote on/off control 1x 2x6-pin 2.0mm pin-header connector for status output
Storage Interface	
SATA 2.0	2x internal SATA ports for 2.5" HDD/SSD installation
Expansion Bus	
PCI	3x PCI slot with 33MHz, 32-bit PCI signal
Power Supply	
DC Input	8~25V DC
Max. Power Consumption	17.04W (0.71A@24V)*
Mechanical	
Dimension	139mm (W) x 160mm (H) x 225mm (D)
Weight	2.2Kg
Mounting	Wall-mount (Standard) or DIN-rail mount (Optional)

\* Maximal power consumption is measured with 100% CPU and 3D loading applied using Passmark® BurnInTest™ v8.0. No Ethernet connection and external PoE devices are connected.



Environmental	
Operating Temperature	-25°C ~ 70°C, 100% CPU loading
Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, 5 Grms, 5-500 Hz, 3 Axes (w/ SSD, w/o add-on card, according to IEC60068-2-64)
Shock	Operating, 50 Grms, Half-sine 11 ms Duration (w/ SSD, w/o add-on card, according to IEC60068-2-27)
EMC	CE/FCC Class A, according to EN 55022 & EN 55024

## 1.2.2 Specification of Nuvo-2421

Table 2: Specification of Nuvo-2421

System Core	
Processor	Intel® Celeron® Bay Trail J1900 Quad-core processor (2.42GHz, 2MCache)
Graphic	Integrated Intel® HD graphics
Memory	1x 204-pin SO-DIMM Socket up to 8GB DDR3L-1333MHz SDRAM
Front-panel I/O Interface	
Ethernet	2x Gigabit Ethernet by Intel® Ethernet Controller I210
Video Port	1x DVI-I connector for VGA and DVI dual independent display outputs
Serial Port	2x BIOS-Configurable RS-232/422/485 (COM1 & COM2)
USB	1x USB3.0 and 3x USB2.0
Audio	1x Speaker-out and 1x Mic-in
Isolated DIO	Optional 8-CH DI and 8-CH DO (Polling Mode Only)
Power Input	1x 3-pin pluggable terminal block for DC input
Internal I/O Interface	
Serial Port	2x RS-232 (COM3 & COM4)
Parallel Port	1x Parallel Port
Remote Control & Status Output	1x 3-pin 2.0mm wafer connector for remote on/off control 1x 2x6-pin 2.0mm pin-header connector for status output
Storage Interface	
SATA 2.0	2x internal SATA ports for 2.5" HDD/SSD installation
Expansion Bus	
PCI	2x PCI slot with 33MHz, 32-bit PCI signal
PCI Express	1x PCI Express x4 slot with 1-lane Gen2 PCI Express signal
Power Supply	
DC Input	8~25V DC
Max. Power Consumption	17.04W (0.71A@24V)*
Mechanical	
Dimension	139mm (W) x 160mm (H) x 225mm (D)
Weight	2.2Kg
Mounting	Wall-mount (Standard) or DIN-rail mount (Optional)

\* Maximal power consumption is measured with 100% CPU and 3D loading applied using Passmark® BurnInTest™ v8.0. No Ethernet connection and external PoE devices are connected.



Environmental	
Operating Temperature	-25°C ~ 70°C, 100% CPU loading
Storage Temperature	-40°C ~85°C
Humidity	10%~90% , non-condensing
Vibration	Operating, 5 Grms, 5-500 Hz, 3 Axes (w/ SSD, w/o add-on card, according to IEC60068-2-64)
Shock	Operating, 50 Grms, Half-sine 11 ms Duration (w/ SSD, w/o add-on card, according to IEC60068-2-27)
EMC	CE/FCC Class A, according to EN 55022 & EN 55024

### 1.2.3 Specification of DI/O

DI/O is available as an option on Nuvo-2400. The following table lists the specification of DI/O

Table 3: Specification of digital inputs and outputs

Item	Specification	
DI	Port Number	8
	Wiring Type	Sink type
	Interface	Unipolar photo-coupler
	Isolation	3750 Vrms
	Rated Input Voltage	24VDC
	Max. Input Voltage	24VDC
	Logic High Voltage	5~24V
	Logic Low Voltage	0~1.5V
DO	Port Number	8
	Wiring Type	Sink type
	Interface	MOSFET, open drain
	Rated Driving Voltage	24VDC
	Max. Driving Voltage	30VDC
	Rated Driving Current	200mA
	Peak Driving Current	1A
	On Time	<2 $\mu$ s
	Off Time	<0.3 $\mu$ s

# Chapter 2 Getting to know your Nuvo-2400

## 2.1 Unpack your Nuvo-2400

When you receive the package of Nuvo-2400 Series, please check immediately if the package contains all the items listed in the following table. If any item is missing or damaged, please contact your local dealer or Neosys Technology Inc. for further assistance.

Table 4: Packing List of Nuvo-2430 and Nuvo-2421

Item	Description	Qty
1	<b>Nuvo-2400 Nuvo-2400</b> (According to the configuration you order, your system may contain DDR3L module or SATA HDD. Please verify these items if necessary.)	1
2	Accessory box, which contains	
	1. HDD bracket for SATA connector #1	1
	2. SATA cable for SATA connector #2	1
	3. Wall-mounting bracket	2
	4. Neosys Drivers & Utilities DVD	1
	5. M3 F-Head Screw	11
	6. 3-pin pluggable terminal block	1

# Chapter 3 I/O Interface

## 3.1 Front-panel I/O Interface

### 3.1.1 Power Button



Figure 1: Power Button

The power button is a non-latched switch for ATX mode on/off operation. To turn on the Nuvo-2400, press the power button and the PWR LED is lighted up. To turn off the Nuvo-2400 you can either issue a shutdown command in OS, or just simply press the power button. In case of system halts, you can press and hold the power button for 5 seconds to compulsorily shut down the system. Please note that a 5 seconds interval is kept by the system between two on/off operations (i.e. once turning off the system, you shall wait for 5 seconds to initiate another power-on operation).

## 3.1.2 Reset Button



Figure 2: Reset Button

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

### 3.1.3 LED Indicators



Figure 3: LED Indicators

There are three LED indicators on the front panel of Nuvo-2400 Series. The following table describes the indicators.

Table 5: Definition of Nuvo-2400 LED indicators

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

### 3.1.4 Gigabit Ethernet Ports



Figure 4: Gigabit Ethernet Ports

Nuvo-2400 Series offers 2 Gigabit Ethernet ports using Intel® Ethernet Controller I210. When plugging in the Ethernet cable, you can tell the Ethernet status and speed from the LED indicators on the RJ45 connector. The following tables provide the definition of the LEDs.

Table 6: Gigabit Ethernet 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

Table 7: Gigabit Ethernet Speed LED

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

### 3.1.5 DVI-I



Figure 5: DVI-I connector

Nuvo-2400 Series has a DVI-I connector. This connector provides DVI/HDMI and VGA display outputs. The DVI/HDMI output can be either DVI signals or HDMI signal depending on the display device connected and support the resolution up to 2560 x 1600, and the VGA output supports the resolution up to 2560 x 1600. For VGA monitor, Neosys offers a dedicated DVI-to-VGA adapter as an accessory shipped with the product. This adapter supports VGA DDC signals and thus eliminates compatibility issues with VGA monitors. Or you can use a DVI-I to VGA+DVI-D Y-cable to support two independent display outputs.

### 3.1.6 Software-programmable COM Ports



Figure 6: Software-programmable COM ports

Nuvo-2400 Series provides two software-selectable COM ports for communicating with external devices. Each port supports RS-232/422/485, and the operation mode of each port can be set in BIOS setup utility. COM ports are implemented using industrial-grade ITE 8783 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate. The following table describes the pin definition of two software-selectable COM ports.

Table 8: Pin definition of COM1 & COM2

Pin No.	COM1 / COM2		
	RS-232 Mode	RS-422 Mode	RS-485 Mode (Two-wire 485)
1	DCD		
2	RX	422 TXD+	485 TXD+/RXD+
3	TX	422 RXD+	
4	DTR	422 RXD-	
5	GND	GND	GND
6	DSR		
7	RTS		
8	CTS	422 TXD-	485 TXD-/RXD-
9	RI		

### 3.1.7 USB Connectors



Figure 7: USB2.0 connectors (left) and USB3.0 connector (right)

There are totally 1 USB3.0 port and 3 USB2.0 ports on Nuvo-2400 Series. By BIOS default, one USB 3.0 port is operated in xHCI (eXtensible Host Control Interface) mode and is compatible to USB 3.0, USB 2.0, USB 1.1 and USB 1.0 devices. Legacy USB support on the port is provided only when **[xHCI Mode]** option in BIOS is configured as **[Smart Auto]**. Nuvo-2400 Series also provides three USB 2.0 ports. By BIOS default, the USB 2.0 ports are operated in EHCI (Enhanced Host Control Interface) mode and are compatible with USB 2.0, USB 1.1 and USB 1.0 devices. Legacy USB support is provided so you can use USB keyboard/mouse in DOS environment.

### 3.1.8 Speaker-out and Mic-in Jacks



Figure 8: Mic-in and speaker-out

Nuvo-2400 Series provides audio functions using Intel HD Audio and Realtek ALC262 Codec. There are two audio jacks. The pink one is used for microphone input, and the green one is for speaker output. To utilize the microphone input function in Windows, you need to install corresponding drivers for both Intel HD Audio and Realtek ALC262 Codec. Please refer to the section “[Driver Installation](#)”.

### 3.1.9 DC Input



Figure 9: DC-input connector

Nuvo-2400 Series features a pluggable terminal block for direct DC wiring. The 3-pin pluggable terminal block is fit for field usage where DC power is usually provided. It accepts a wide range of DC power input from 8~25V DC. And the screw clamping connection of terminal block gives a very reliable way for wiring the DC power. The following table describes the pin definition of the DC Input Connector.

Table 9: Pin definition of DC input connector

Pin No.	Name	Description
1	V+	Positive polarity of DC power input (8 ~ 25V).
2	GND	Negative polarity of DC power input
3	-	Reserved

### 3.1.10 Isolated DI/O



Figure 10: Isolated DI/O connector

Nuvo-2400 Series offers an option of on-board 3750 Vrms isolated DIO for extending application range. This option provides 8 channels of isolated digital input and 8 channels of isolated digital output via a 25-pin D-sub connector. The following table shows the pin definition of the DI/O connector.

Table 10: Pin definition of DI/O connector

Pin#	Pin Definition	Pin#	Pin Definition
1	VDD	14	ISO_5V
2	DO_GND	15	DO_0
3	DO_6	16	DO_1
4	DO_7	17	DO_GND
5	DO_GND	18	DO_2
6	DO_4	19	DO_3
7	DO_5	20	DO_GND
8	DI_GND	21	DI_0
9	DI_4	22	DI_1
10	DI_5	23	DI_GND
11	DI_GND	24	DI_2
12	DI_6	25	DI_3
13	DI_7		

The following figure shows the pin numbering of the isolated D/I/O connector.

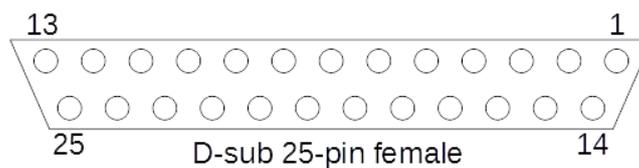


Figure 11: Pin numbering of the isolated DI/O connector

## 3.2 Internal I/O Interface

### 3.2.1 COM Ports

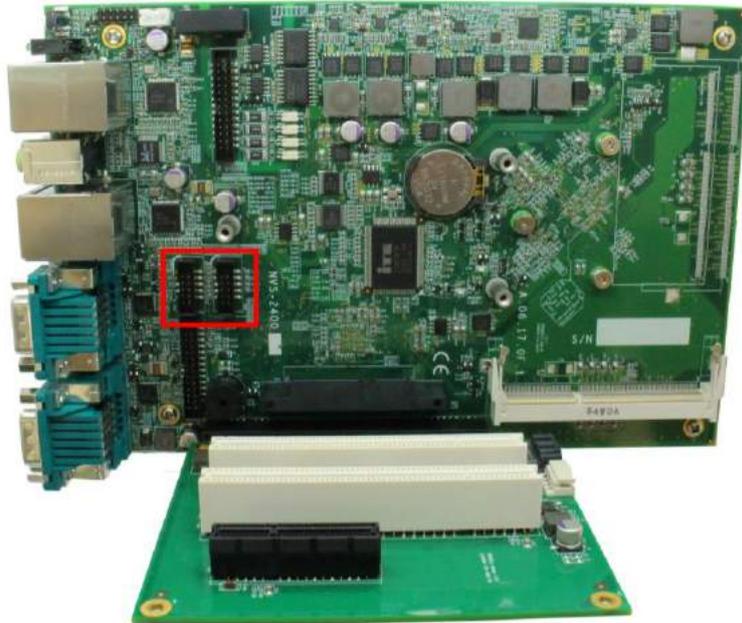


Figure 12: Internal COM ports

Nuvo-2400 Series provides two COM ports for communicating with external devices. Each port supports RS-232 only. COM ports are implemented using industrial-grade ITE 8783 Super IO chip (-40 to 85°C) and provide up to 115200 bps baud rate. The following table describes the pin definition of two COM ports.

Table 11: Pin definition of COM3 & COM4

Pin#	COM3 / COM4
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

### 3.2.2 Parallel Port

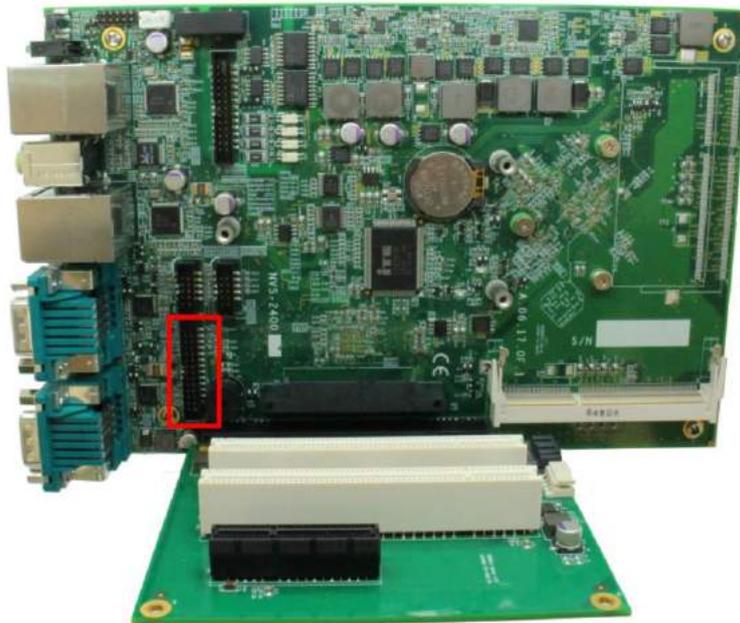


Figure 13: Internal parallel port

Nuvo-2400 Series provides one parallel port for connecting a printing device. The parallel port is implemented using industrial-grade ITE 8783 Super IO chip (-40 to 85°C) and has pin-out via a 2x13, 2.0mm pitch box header. For users who need to connect a printing device via a standard a 25-pin D-sub connector, Neosys Technology Inc. provides an optional panel/cable kit to expose one a 25-pin D-sub (parallel) and one a 9-pin D-sub (COM port). The following table describes the pin definition of the parallel port.

Table 12: Pin definition of parallel port

Pin No	Definition	Pin No	Definition	Pin No	Definition	Pin No	Definition
1	Strobe	8	Data6	14	Linefeed	20	Ground
2	Data0	9	Data7	15	Error	21	Ground
3	Data1	10	Ack	16	Reset	22	Ground
4	Data2	11	Busy	17	Select-Print	23	Ground
5	Data3	12	Paper-Out	18	Ground	24	NC
6	Data4	13	Select	19	Ground	25	NC
7	Data5						

The following figure shows the pin numbering of the optional panel/cable kit of the parallel port.

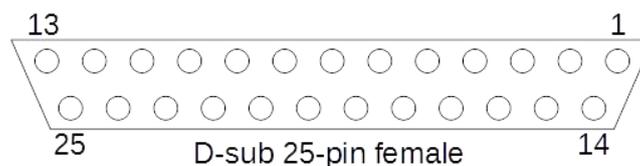


Figure 14: Pin numbering of the panel/cable kit of parallel port

### 3.2.3 DDR3L SODIMM Socket



Figure 15: DDR3L SODIMM socket

Nuvo-2400 Series provides one 204-pin SODIMM socket for memory installation. It supports a maximal 8GB capacity by installing one low-voltage 1.35V DDR3L-1333 SODIMM modules. For information of installing DDR3L memory modules, please refer to the section “*Install an DDR3L SO-DIMM Module*”.

**NOTE** *Installing incorrect memory module might damage the system or result in system failure. Please make sure you're installing a 1.35V DDR3L SODIMM module.*

### 3.2.4 SATA Connector #1

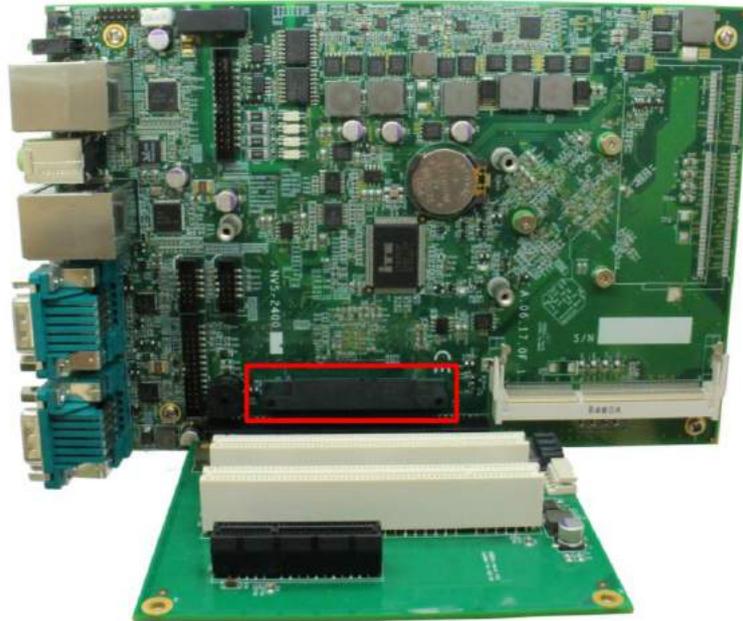


Figure 16: SATA connector #1

Nuvo-2400 provides two SATA ports to accommodate two 2.5" SATA hard drives in its chassis. The first SATA connector is located on the SBC via a 22-pin SATA connector. With the HDD bracket shipped with Nuvo-2400, you can directly mount a 2.5" HDD or SSD to this port. For information of installing a HDD/SSD to SATA port #1, please refer to the section "*Install an 2.5" HDD/SSD on SATA Connector #1*".

### 3.2.5 SATA Connector #2



Figure 17: SATA connector #2

Nuvo-2400 provides two SATA ports to accommodate two 2.5" SATA hard drives in its chassis. The second SATA port is located on the backplane via a 7-pin SATA connector plus a 4-pin power connector. A dedicated cable is shipped with Nuvo-2400 for connecting the second 2.5" HDD/SSD. The second HDD bracket is located on the bottom side of the chassis. For information of installing a HDD/SSD to SATA connector #2, please refer to the section "*Install an 2.5" HDD/SSD on SATA Connector #2*" for detail.

### 3.2.6 Remote Status Output

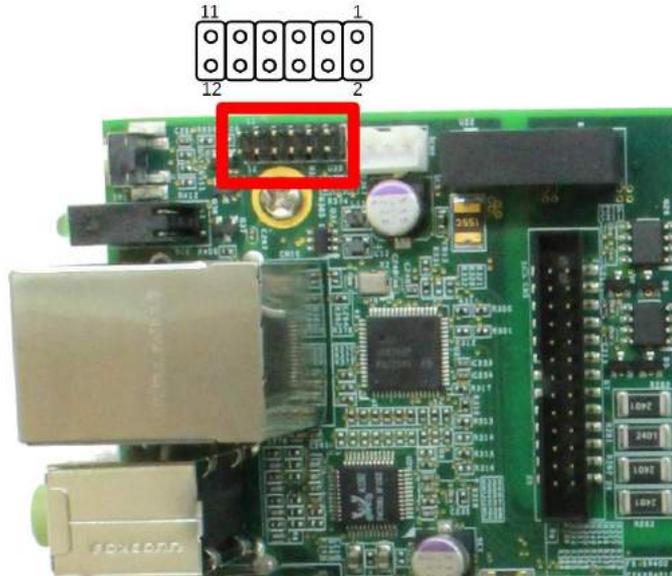


Figure 18: Remote status output connector

For an application which places Nuvo-2400 Series inside a cabinet, it's useful to output the system status to external LED indicators so that users can check how the system's running. Nuvo-2400 Series provides a 2x6-pin 2.0mm pin-header connector, for PWR LED, SATA LED, LAN ACT LED, WDT LED & reset button. The status LED output has a built-in series-resistor and provides 10mA current to directly drive the external LED indicators. System reset control is also provided so you can use an external non-latched switch to reset the system. The following table describes the pin definition of the status LED output.

Table 13: Pin definition of remote control connector

Pin#	Definition	Description
1	Power+	System power indicator, on if system is turned on, off if system is turned off.
2	Power-	
3	HDD+	Hard drive indicator, flashing when SATA hard drive is active.
4	HDD-	
5	reserved	
6		
7	LAN+	LAN indicator, flashing when Ethernet port is connected and data is transmitting/receiving
8	LAN-	
9	WDT+	Watchdog timer indicator, flashing when watchdog timer is started.
10	WDT-	
11	Reset+	System reset control. You can connect these two pins to a non-latch switch to reset the system.
12	Reset-	

## 3.2.7 Remote On/off Control

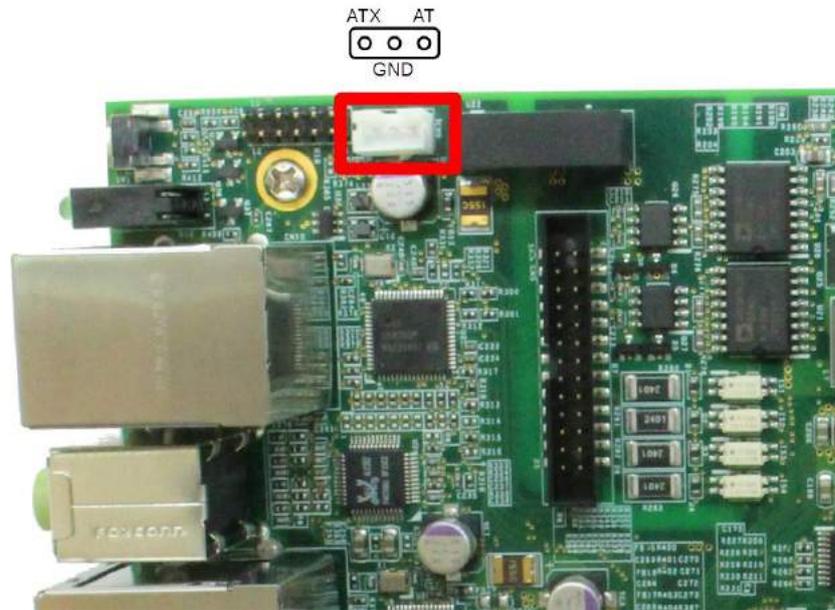


Figure 19: Remote on/off control connector

The remote on/off control function allows users to turn on or turn off the system remotely by connecting an external switch. The function is provided via a 3-pin, 2.0mm pitch wafer connector. Both AT-mode and ATX-mode on/off control are supported. For detail information of using remote on/off control function, please refer to section “Power on Using an External Latched Switch” and “Power on Using an External Non-latched Switch”.

### 3.3 Expansion Slot

The maximal supported card size is 205mm x 105mm. The following figure shows the definition of the card size. And this size applies to both PCI and PCIe cards.

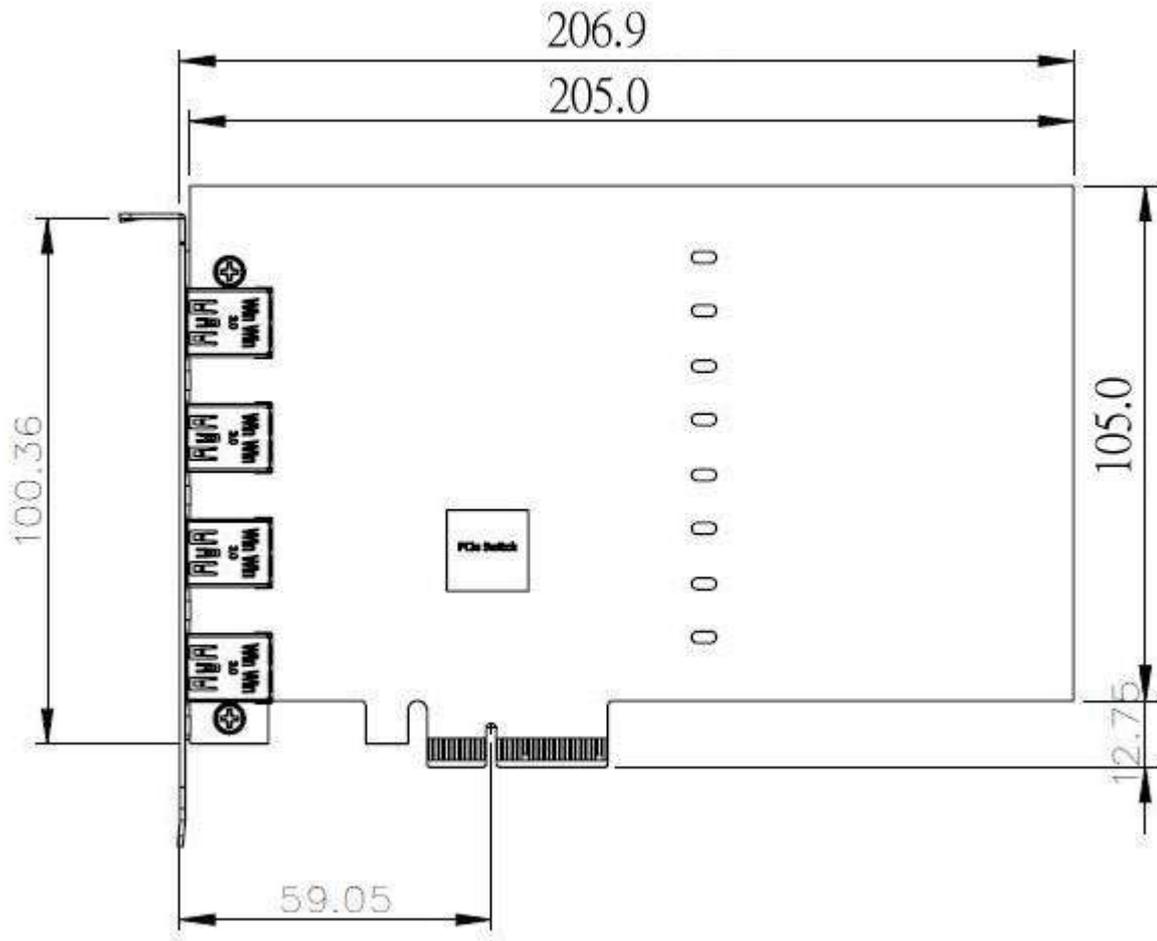


Figure 20: Maximum PCB size of add-on card supported by Nuvo-2400

### 3.3.1 PCI slot

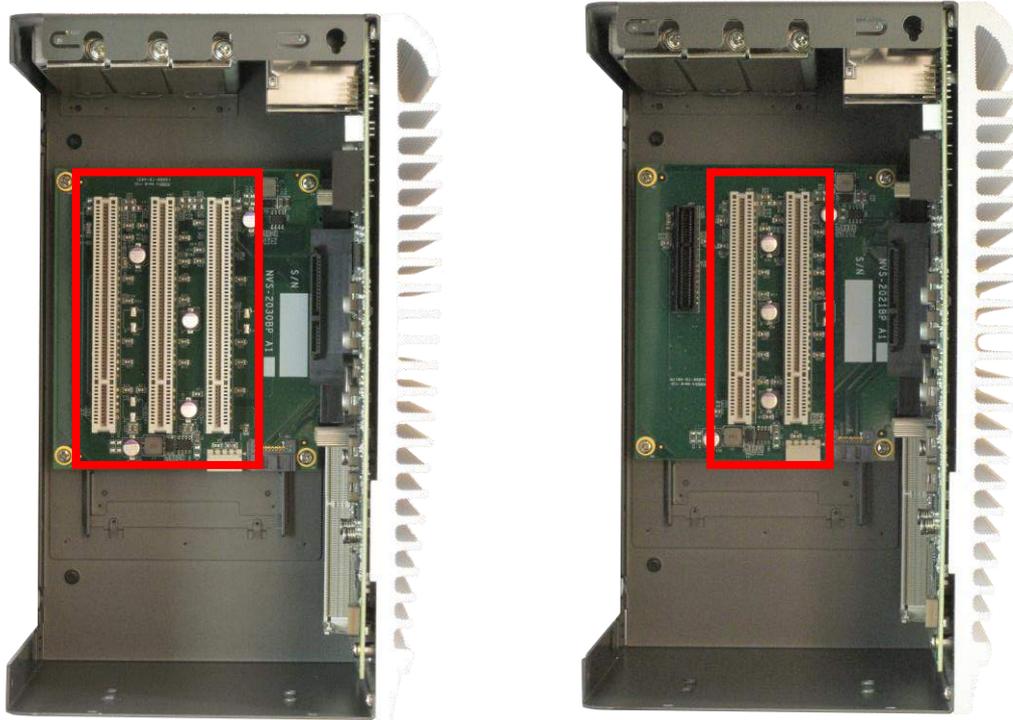


Figure 21: PCI Slots of Nuvo-2430(left) and Nuvo-2421(right)

PCI slots are located on the backplane of Nuvo-2400 Series. Nuvo-2430 provides three PCI slots and Nuvo-2421 provides two PCI slots. These PCI slots support 5V PCI bus. For information of installing PCI cards, please refer to the section “[Install an Add-on Card](#)”.

#### Note

*Due to the fanless feature, the total power consumption of installed PCI and PCIe cards should be confined to 12W to limit the heat generated by add-on cards and maintain the system stability. For applications need add-on cards which consume more than 12W, the fan option is suggested to maintain a reasonable temperature inside the chassis. Please contact Neosys Technology for the fan option.*

*The operating temperature of the whole system when cards installed is affected by the power consumption and operating temperature of add-on cards. Please consult your add-on card dealer or Neosys Technology for further information.*

### 3.3.2 PCI Express x4 slot

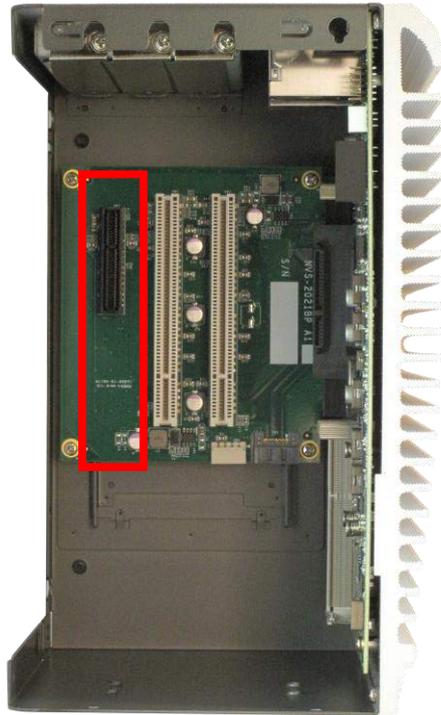


Figure 22: PCIe Slots of Nuvo-2421

Nuvo-2421 provides one x4 PCI Express slot. This PCI Express slot utilizes x1 PCIe link and delivers 4 Gbit/s bandwidth. For information of installing PCIe cards, please refer to the section “*Install an Add-on Card*” for detail.

#### **Note**

*Due to the fanless feature, the total power consumption of installed PCI and PCIe cards should be confined to 12W to limit the heat generated by add-on cards and maintain the system stability. For applications need add-on cards which consume more than 12W, the fan option is suggested to maintain a reasonable temperature inside the chassis. Please contact Neosys Technology for the fan option.*

*The operating temperature of the whole system when cards installed is affected by the power consumption and operating temperature of add-on cards. Please consult your add-on card dealer or Neosys Technology for further information.*

# 3.4 Mechanical Dimension

## Front View



Figure 23: Front view of Nuvo-2400

## Side View (Right)

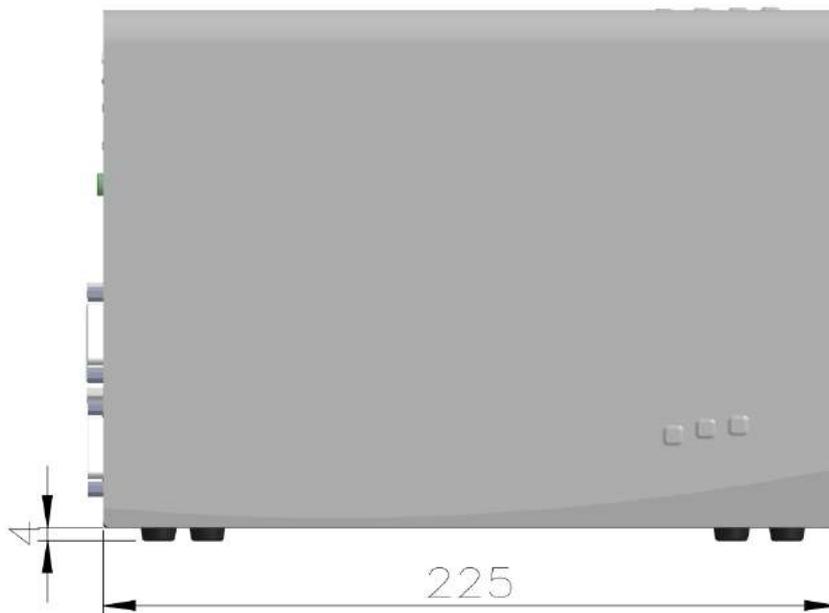


Figure 24: Side view (right) of Nuvo-2400

**Bottom View**

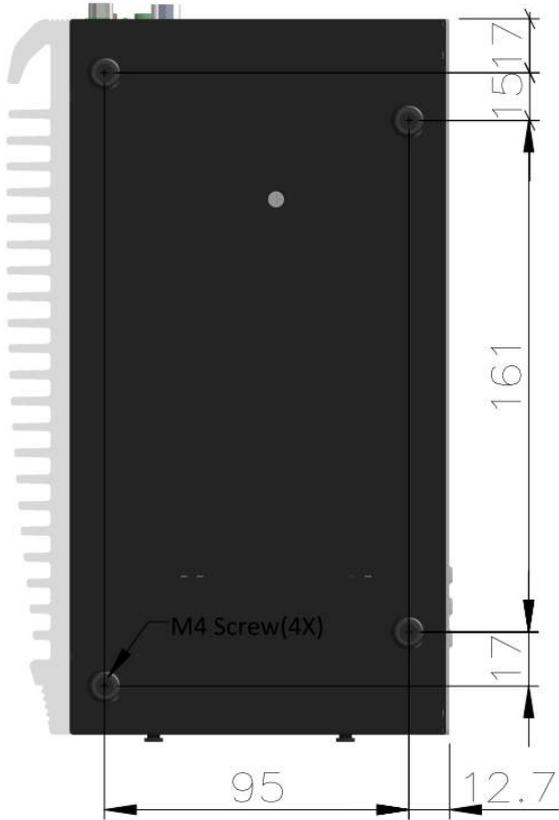


Figure 25: Bottom view of Nuvo-2400

**Back View**

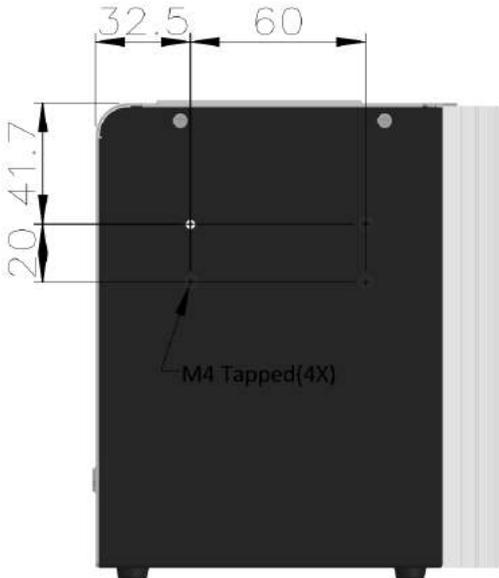


Figure 26: Back view of Nuvo-2400

# Chapter 4 Getting Started

In this chapter, we'll illustrate how to disassemble your Nuvo-2400 Series and install peripheral devices. Please note that the procedures might be varied for different models. Please follow the correct procedures to prevent any damage on your Nuvo-2400 Series"

## 4.1 Remove the Side Cover

Nuvo-2400 Series has a side cover. After removing the cover, you can see the internal I/O of Nuvo-2400. Please follow the instructions to remove the side cover.

1. Loose the 2 cover screws on the back side of the chassis



Figure 27: Cover screws

2. Place the chassis on a flat surface. Push the side cover towards the front panel first and then upwards as shown in the following figure. And you can remove the cover.

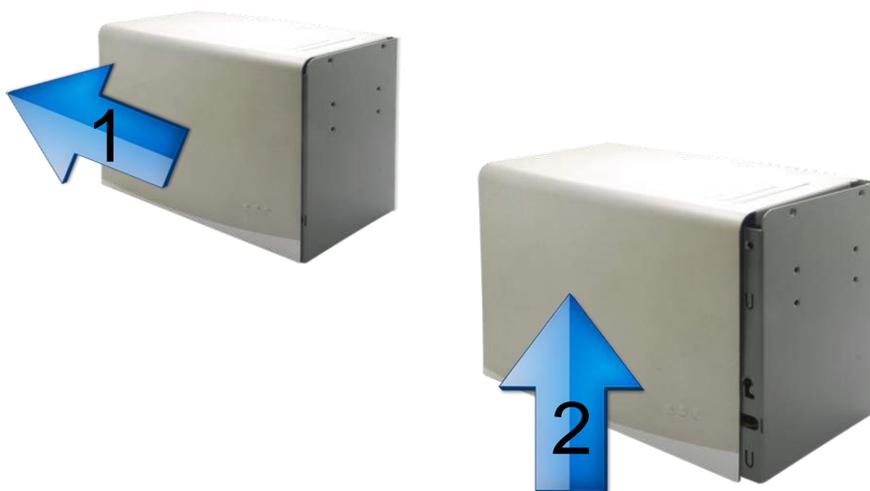


Figure 28: Two-step unlock of the side cover

## 4.2 Install an Add-on Card

Nuvo-2400 provides PCI and PCIe slots on its backplane. To install PCI/PCIe add-on cards, please follow the steps listed below.

1. Refer to the section "Remove the Side Cover" to remove the side cover.
2. Install your add-on card into the PCI/PCIe slot. Make sure the "golden finger" connector is firmly contacted with PCI/PCIe connector and the faceplate of the add-on card is well inserted to the groove underneath.

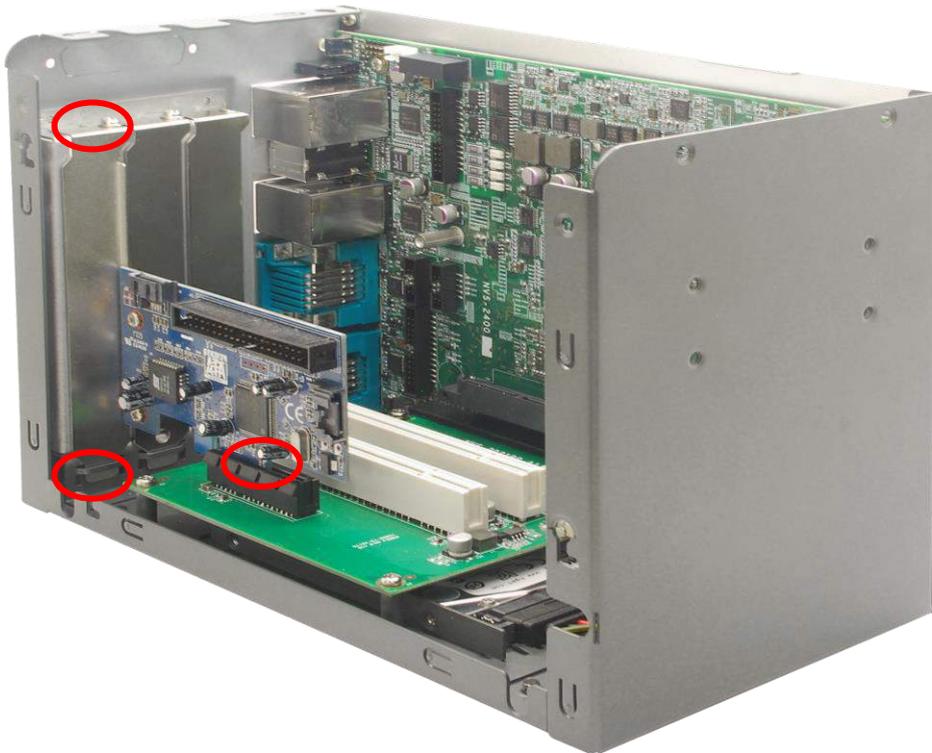


Figure 29: 3-point fixation of a PCI/PCIe card

3. Get the M3 PW-head screw from the accessory box. And use it to fix your PCI/PCIe add-on card.

## 4.3 Install an DDR3L SO-DIMM Module

Nuvo-2400 Series provides one 204-pin, SODIMM socket for installing 1.35V DDR3L memory module. You can install/replace the memory modules according to the following the steps.

**NOTE** *Installing incorrect memory module might damage the system or result in system failure. Please make sure you're installing a 1.35V DDR3L SODIMM module.*

1. Refer to the section "[Remove the Side Cover](#)" to remove the side cover. Find the memory module socket as shown in [Figure 15](#)
2. Tile the memory module and insert it to the socket. As it's firmly contacted with socket connectors, press it down till the clamps of the socket snap into the latching position of the memory module.

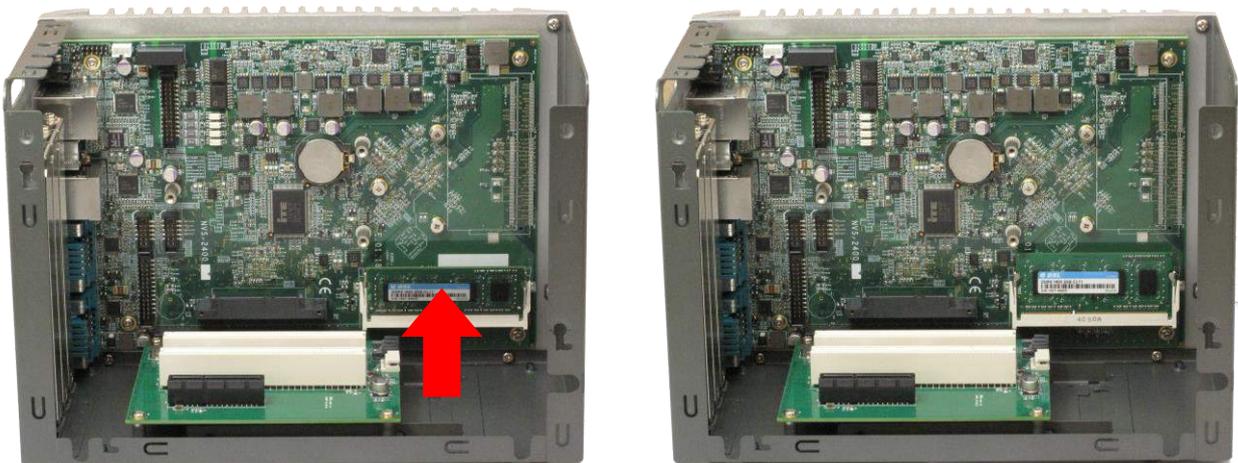


Figure 30: Install the memory module

## 4.4 Install an 2.5" HDD/SSD on SATA Connector #1

### Connector #1

1. Refer to the section "Remove the Side Cover" to remove the side cover.
2. Install your HDD into the HDD bracket, and fasten the HDD with four M3 flat-head screws. Note that the HDD must be placed in a right direction.



Figure 31: HDD bracket assembly of SATA connector #1

3. Slide the HDD bracket assembly into the SATA connector #1. Three holes of HDD bracket shall be aligned with three posts on the SBC.

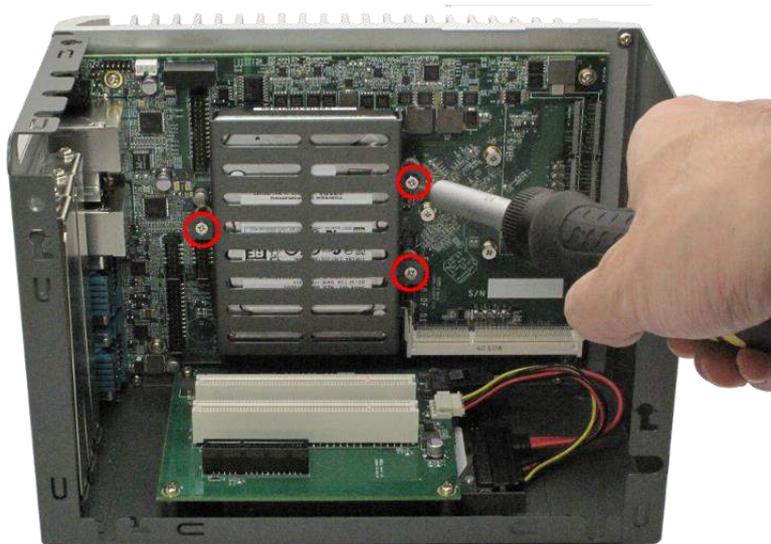


Figure 32: Installed HDD bracket assembly

4. Fasten the HDD bracket assembly with three M3, L16 P-head screws.

## 4.5 Install an 2.5" HDD/SSD on SATA Connector #2

The SATA connector #2 is located on the backplane via a 7-pin SATA connector plus a 4-pin power connector. HDD bracket for SATA connector #2 is part of the chassis and is on the bottom side. A dedicated cable is shipped with the product for connecting the 2.5" HDD. To install a HDD on SATA connector #2, please follow the steps listed below.

1. Get the SATA cable from the accessory box. And connect it to SATA connector #2 (7-pin SATA signals and 4-pin power) on the backplane. Note that the polarity of power connector must be connected correctly.

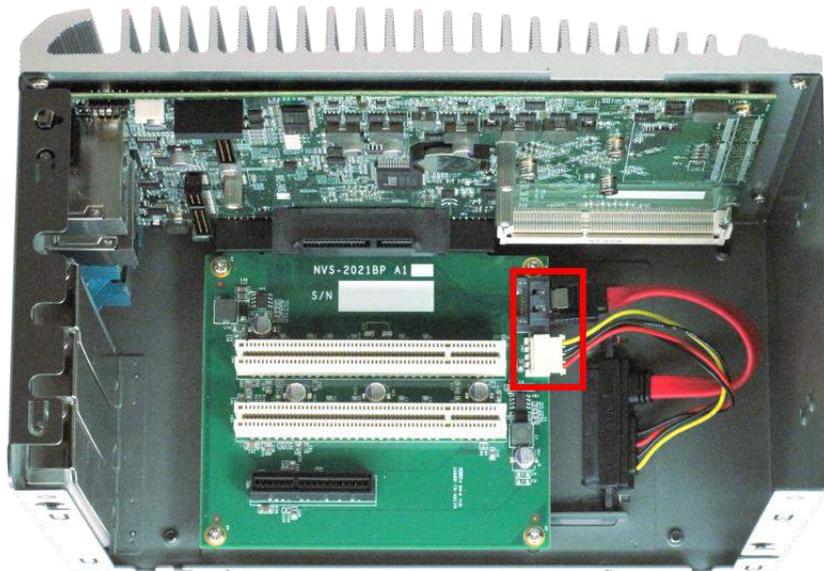


Figure 33: SATA cable connected to SATA connector #2

2. Put the chassis upside down. You can see the cover of HDD bracket exposed. Loose the screw to open and remove it.

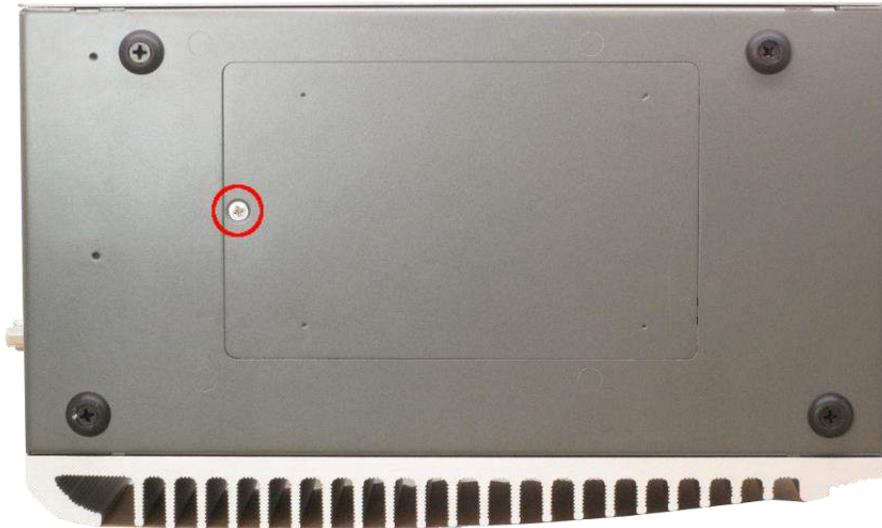


Figure 34: HDD bracket screw

3. Place your HDD into the HDD bracket and fix it with M3 flat-head screws in the accessory box. Note that the HDD must be placed in a right direction.



Figure 35: HDD bracket assembly of SATA connector #2

4. Connect the HDD bracket assembly to the 22-pin connector of the SATA cable.



Figure 36: HDD bracket assembly connected to SATA cable

5. Tilt the HDD bracket assembly and insert the wedge of HDD bracket to the bottom cover. Once it's firmly wedged, push it down and fix it using a M3 flat-head screw. Now you've done the installation of HDD for SATA connector #2.



Figure 37: Wedging the HDD bracket assembly

## 4.6 Mount your Nuvo-2400

Nuvo-2400 provides versatile ways of mounting. You can use wall-mounting brackets shipped with Nuvo-2400 to mount it on the wall. Neousys also offers optional DIN rail clip to mount Nuvo-2400 on a DIN rail. To mount your Nuvo-2400, please refer to the information listed below.

**NOTE** *For the best efficiency of heat dissipation, please ensure your system in a correct orientation, as shown in the following figure.*

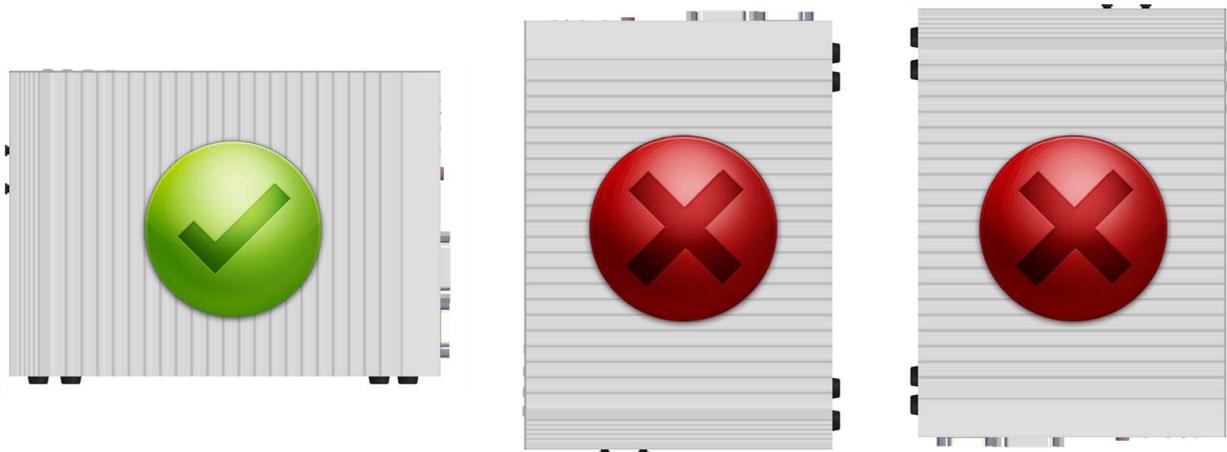


Figure 38: Correct Orientation of Mounting your System

## 4.6.1 Mount your Nuvo-2400 on the Wall

1. Get one wall-mounting bracket and four M4 screws from the accessory box. Fix the mounting bracket to the back side of Nuvo-2400 using M4 screws.

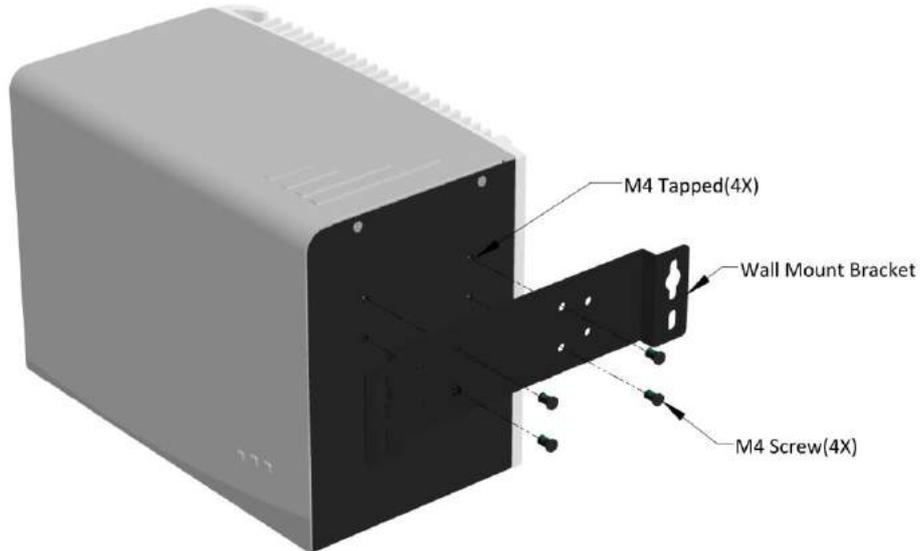


Figure 39: Assembling wall-mount bracket on the back side

2. Fix Nuvo-2400 on the wall via the screw holes of the mounting bracket. You can also take advantage of the keyhole-shaped holes of the mounting bracket to suspend Nuvo-2400 on the Wall.

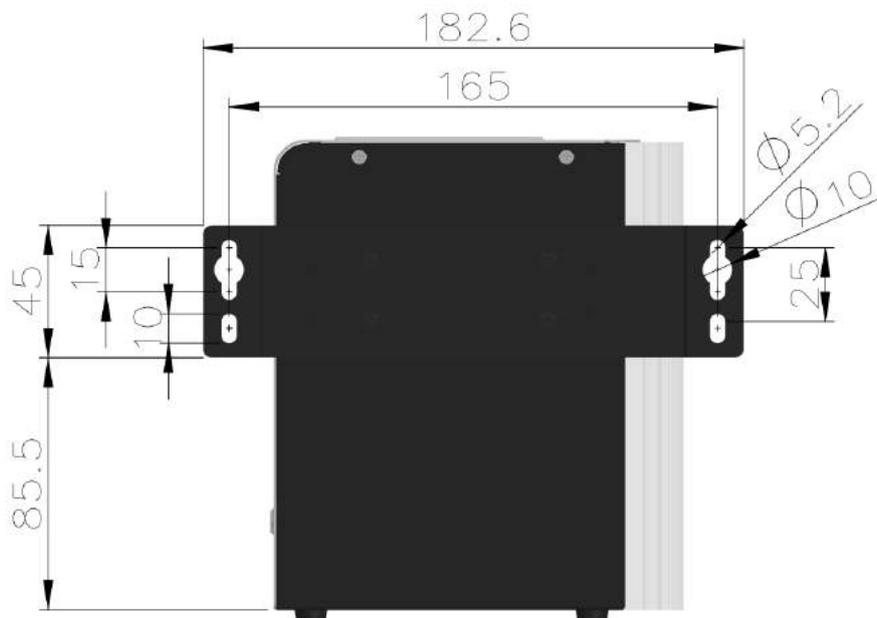


Figure 40: Dimension of screws holes for back side mounting

## 4.6.2 Mount your Nuvo-2400 on the DIN-Rail

Neosys also provides the option of the DIN-rail mounting clip. You should fix the clip to Nuvo-2400 using four M4 flat-head screws before mount it to a DIN rail. This option can be useful if you want to deploy Nuvo-2400 inside an equipment cabinet where DIN rail is available.

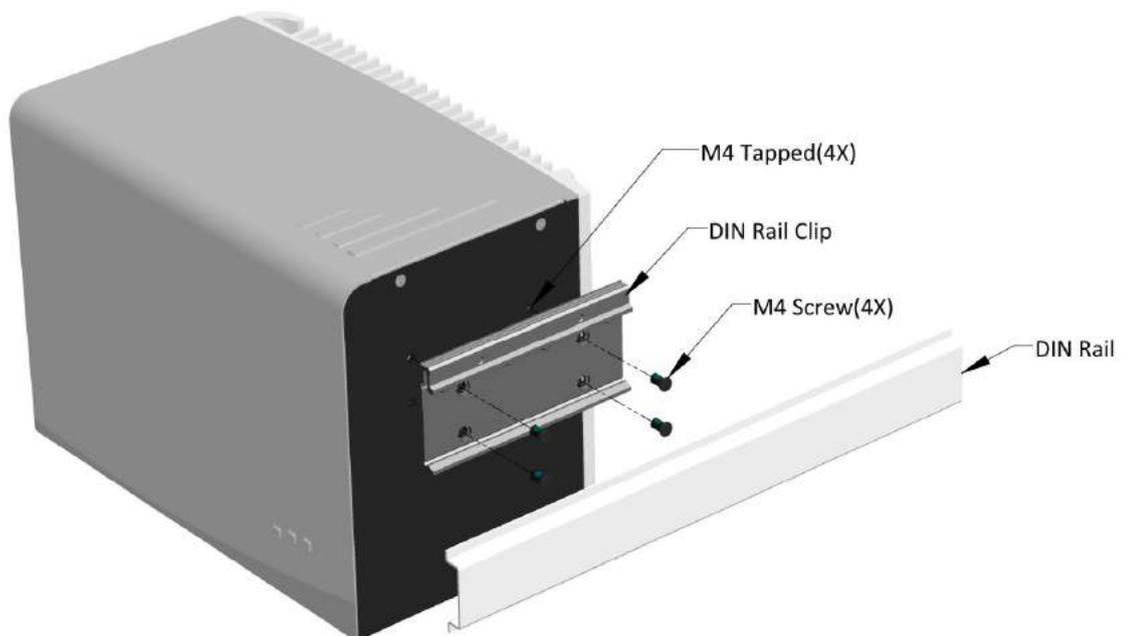


Figure 41: Assembling the DIN rail mounting clip

### 4.6.3 Mount your Nuvo-2400 on a Flat Surface

1. Get two wall-mounting brackets from the accessory box. Fix the mounting brackets to the bottom side of Nuvo-2400 using M4 screws which are originally used to lock the food pads.

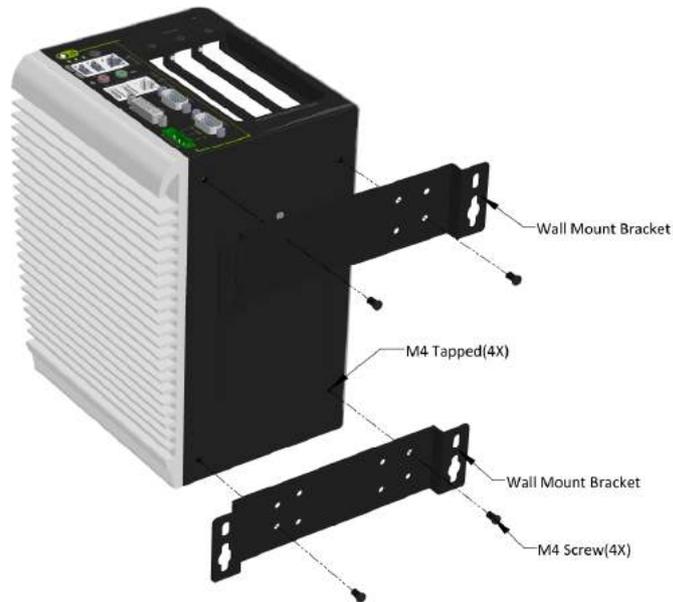


Figure 42: Assembling the mounting bracket on the bottom side

2. Fix Nuvo-2400 on a flat surface via the screw holes of two mounting brackets.

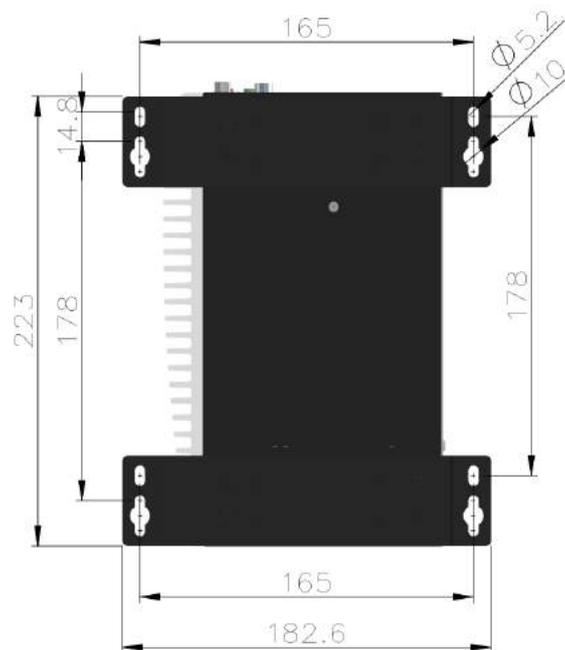


Figure 43: Dimension of screw holes for bottom side mounting

## 4.7 Connect DC Power to Nuvo-2400

Nuvo-2400 Series uses a 3-pin pluggable terminal block to accept from 8~25V DC power input. It provides the way for directly wiring the DC power. To connect DC power via the 3-pin pluggable terminal block, please follow the steps listed below.

1. Make sure the external DC power supply is power off or disconnected before you wire it to the pluggable terminal block.
2. Get the 3-pin pluggable terminal block from 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 pluggable terminal block. The polarities between DC power supply and terminal block must be positive (+) to positive (+) and negative (-) to negative (-).

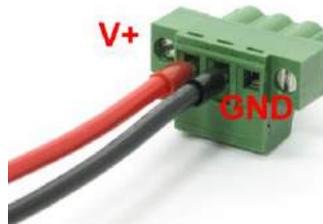


Figure 44: Wiring of DC Input Terminal Block

4. Push the terminal block to the DC input connector till it's firmly attached. Now you can supply the DC power and operate your system.



Figure 45: System with DC Input Terminal Block

## 4.8 Power on your Nuvo-2400

### 4.8.1 Power on Using the Power Button

This is the simplest way to turn on your system. The power button is a non-latched switch and behaves the ATX-mode on/off control. As DC power is connected, push the power button will turn on the system as well as the PWR LED indicator. Push the button when system is on will turn off the system. If your operating system supports ATX power mode (i.e. Microsoft Windows or Linux), push the power button causes a pre-defined system behavior, such as shutdown or hibernation.

### 4.8.2 Power on Using an External Latched Switch

When using the AT-mode on/off control, you need a latched switch. The external latched switch controls the feed-in of DC power. When the switch is closed, the DC power is break-off. When it's opened, the DC power is feed-in. To power on Nuvo-2400 using an external latched switch (AT-mode), please follow the steps listed below:

1. Configure the **[Power On after Power Failure]** BIOS option as **[ON]**. Please refer to section "[Power On after Power Failure Option](#)".
2. Prepare a latched switch with a 2-pin, 2.0mm pitch connector. Connect the latched switch to the AT pin and GND pin of the on-board wafer connector.

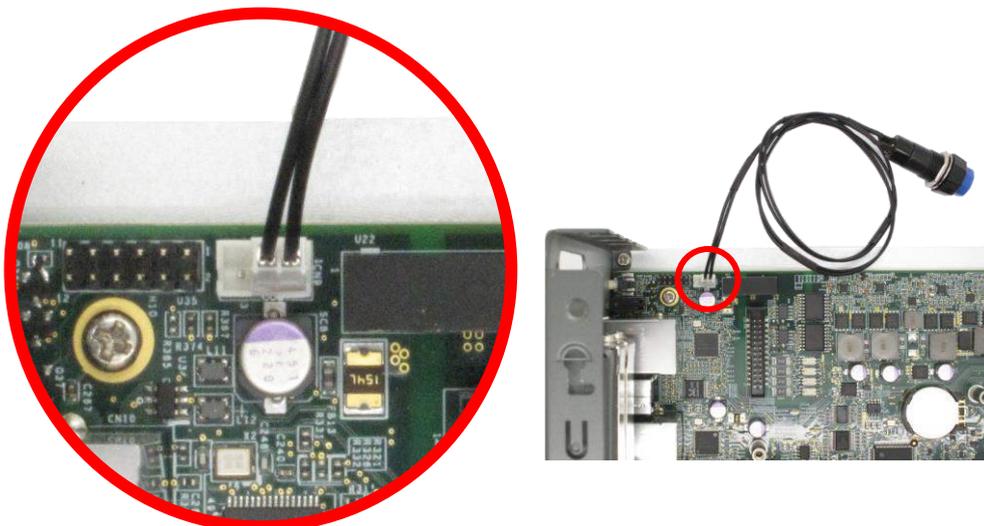


Figure 46: Connecting a latched switch to AT mode pin

3. When the latched switch is closed, the DC power is break off and system is turn off. When the latched switch is opened, the DC power is feed-in, and the system is turn on.

### 4.8.3 Power on Using an External Non-latched Switch

When using the ATX-mode on/off control, you need a non-latched switch. The external non-latched switch acts exactly the same as the power button on the front panel. To power on Nuvo-2400 using an external non-latched switch (ATX-mode), please follow the steps listed below:

1. Prepare a non-latched switch with a 2-pin, 2.0mm pitch connector. Connect the non-latched switch to the ATX pin and GND pin of the on-board wafer connector.

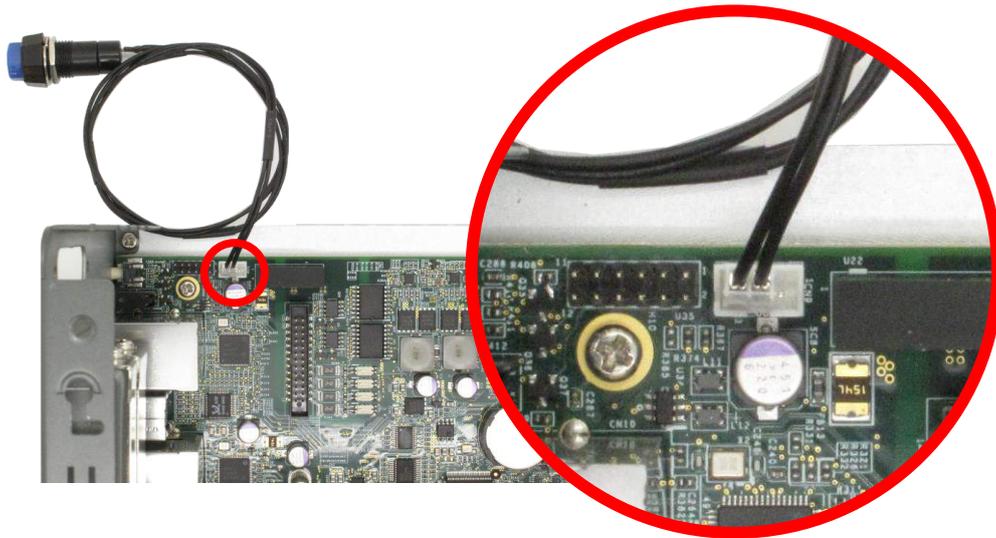


Figure 47: Connecting a latched switch to ATX mode pin

2. Push the non-latched switch and then system is on (the blue LED of power button on the front panel is on at the same time). Push the non-latched switch when system is on can turn off the system. If your operating system supports ATX power mode (i.e. Microsoft Windows or Linux), push the power button causes a pre-defined system behavior, such as shutdown or hibernation.

## 4.8.4 Power on Using Wake-on-LAN Function

Wake-on-LAN (WOL) is a mechanism to wake up a computer system from a S3 (standby), S4 (Hibernate) or S5 (system off with standby power) state via issuing Subnet Directed Broadcasts (SDB) or a magic packet. Nuvo-2400 Series implements the Wake-on-LAN function for its first GbE port. To enable WOL function and power on your system, please follow the steps listed below.

1. Configure the **[Wake on LAN]** BIOS option as **[Enabled]**. Please refer to section "Wake-on-LAN Option".
2. In Windows 7 system, identify the Local Area Connection of corresponding Intel® I210 Gigabit Controller and click the Configure button.

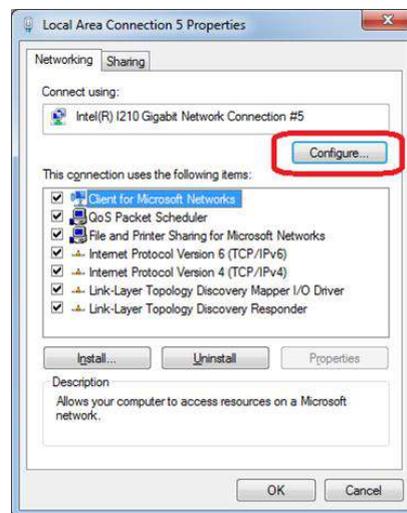


Figure 48: Configure Wake on LAN in Windows 7

3. Click the Power Management tag, and check the following two options respectively

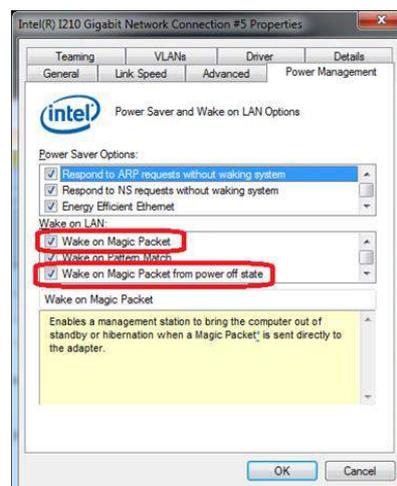


Figure 49: Enable Wake on Magic Packet in Configure Window

**Wake on Magic Packet**

Checking this option enables your system to wake up from S3 or S4 state upon receiving a magic packet.

**Wake on Magic Packet from power off state**

Checking this option enables your system to wake up from S5 (system off with standby power) state upon receiving a magic packet.

# Chapter 5 BIOS and Driver

## 5.1 BIOS Settings

**Nuvo-2400** is shipped with factory-default BIOS settings cautiously programmed for best 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.

To Enter BIOS setup:

When **Nuvo-2400** is booting up, press F2 to enter BIOS setup utility. Use following keys to edit or change BIOS options.

Table 14: Function Keys in BIOS

Keys	Function
F1	Help
↑↓←→	Select Item
F5/F6	Change Values
F9	Load Setup Defaults
Esc	Exit
Enter	Select -> SubMenu
F10	Save and Exit

## 5.1.1 COM1 & COM2 Operation Mode

COM1 and COM2 of **Nuvo-2400** support RS-232 (full-duplex), RS-422 (full-duplex) and RS-485 (half-duplex) mode. You can set the operating mode via BIOS settings. Another option in BIOS called **[Slew Rate]** defines how sharp the rising/falling edge is for the output signal of COM1 and COM2. For long-distance RS-422/485 transmission, you may set the **[Slew Rate]** option as **[High]** to improve signal quality. For RS-422/485 communication, the **[RS-422/485 Termination]** option determines whether to enable/disable internal termination of RS-422/485 transceiver according to your wiring configuration (e.g. with or without external termination).

To set COM1 and COM2 operating mode:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Go to **[Advanced]** / **[Peripheral Configuration]**
3. Set the **[Set COM1 as]** option to a proper mode for COM1 of your **Nuvo-2400**.

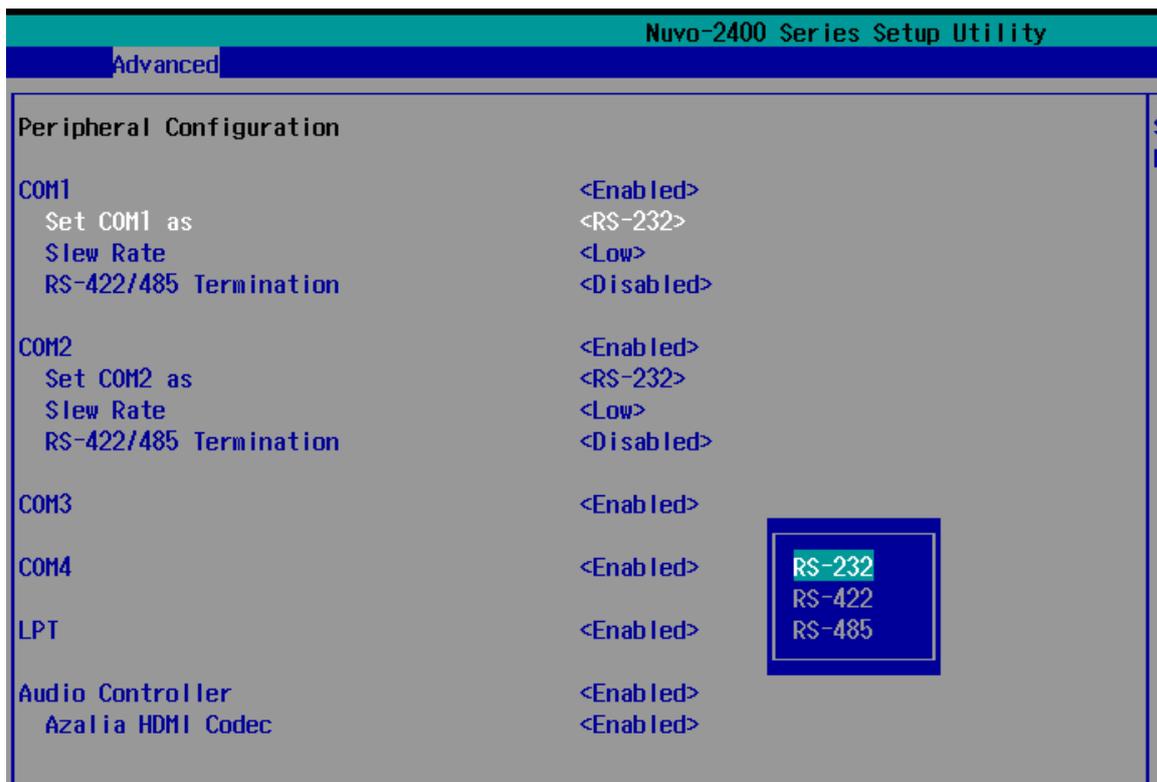


Figure 50: Setting Modes of COM Port in BIOS

## 5.1.2 Chipset SATA Mode

The SATA controller of **Nuvo-2400** supports two modes of operations, IDE and AHCI mode. IDE mode configures SATA controller to access SATA interface in legacy IDE mode and is compatible with most storage devices. AHCI mode, which exposes SATA's advanced capabilities such as hot swapping and native command queuing, can deliver better performance for disk read/write. As **Nuvo-2400** no longer supports Windows XP, we highly recommend you to set **[Chipset SATA Mode]** to **[AHCI]** for better system performance. To set **[Chipset SATA Mode]**:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Go to **[Advanced]** / **[SATA Configuration]**.
3. Set the **[Chipset SATA Mode]** option to a proper mode for your **Nuvo-2400**.

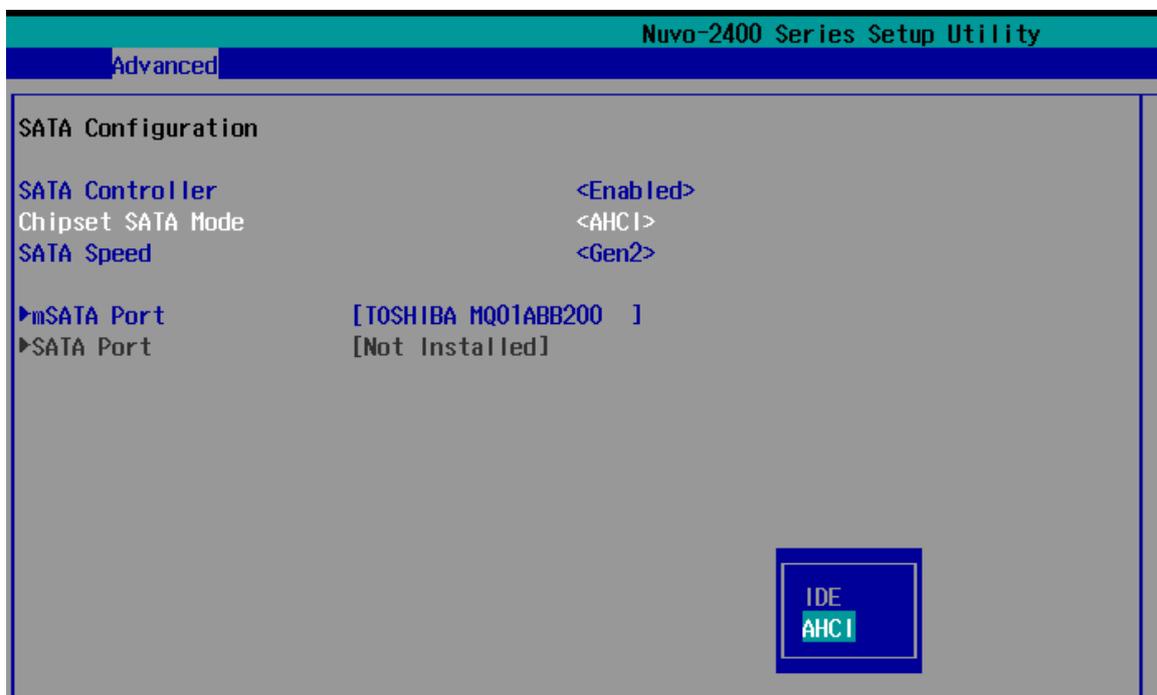


Figure 51: Setting Modes of SATA Mode in BIOS

### 5.1.3 C-States and Max C-States

C-States is a power-saving technique implemented in modern Intel processors. It shuts down the clock signals and power for idle logic units inside the CPU to save the energy consumed. The trade-off, however, is a longer latency for CPU to wake up and be 100% operational. Depending on your application, you can configure these options to have higher performance (disable “C-States”) or lower power-consumption (enable “C-States” and set “Max C-States” to C6/C7).

To set C-States and Enhanced C-States:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Go to **[Power] / [Advanced CPU Control]**.
3. Enable/disable the **[C-States]** option according to your application.
4. Configure the **[Max C-States]** option according to your application.

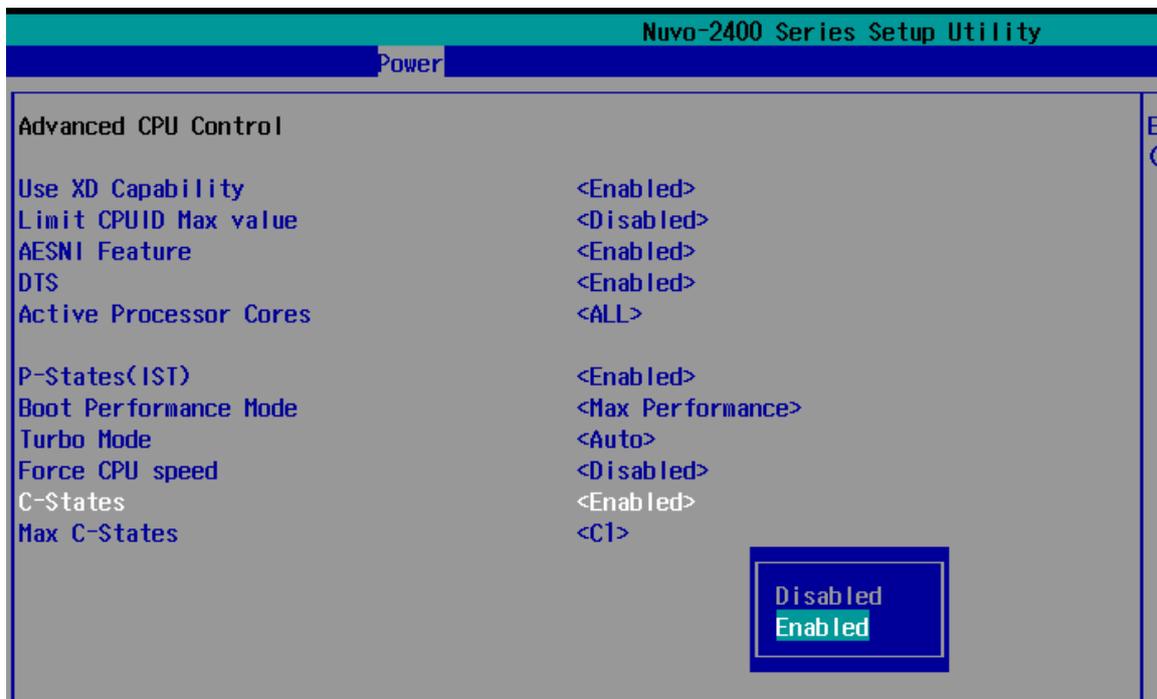


Figure 52: Configuring C-States in BIOS

## 5.1.4 Wake-on-LAN Option

Wake-on-LAN (WoL) is a mechanism which allows you to turn on your **Nuvo-2400** via Ethernet connection. To utilize Wake-on-LAN function, you have to enable this option first in BIOS settings. Please refer to the section "*Power on Using Wake-on-LAN Function*" for instructions of using WoL function.

To enable/disable Wake on LAN option:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Enable/disable the [**Wake on LAN**] option according to your application.



Figure 53: Enabling Wake on LAN in BIOS

## 5.1.5 Power On after Power Failure Option

This option defines the behavior of **Nuvo-2400** when DC power is supplied.

To set **[Power On after Power Failure]** option:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Go to **[Power]**.
3. Set the **[Power On after Power Failure]** option to a proper value for your **Nuvo-2400**.

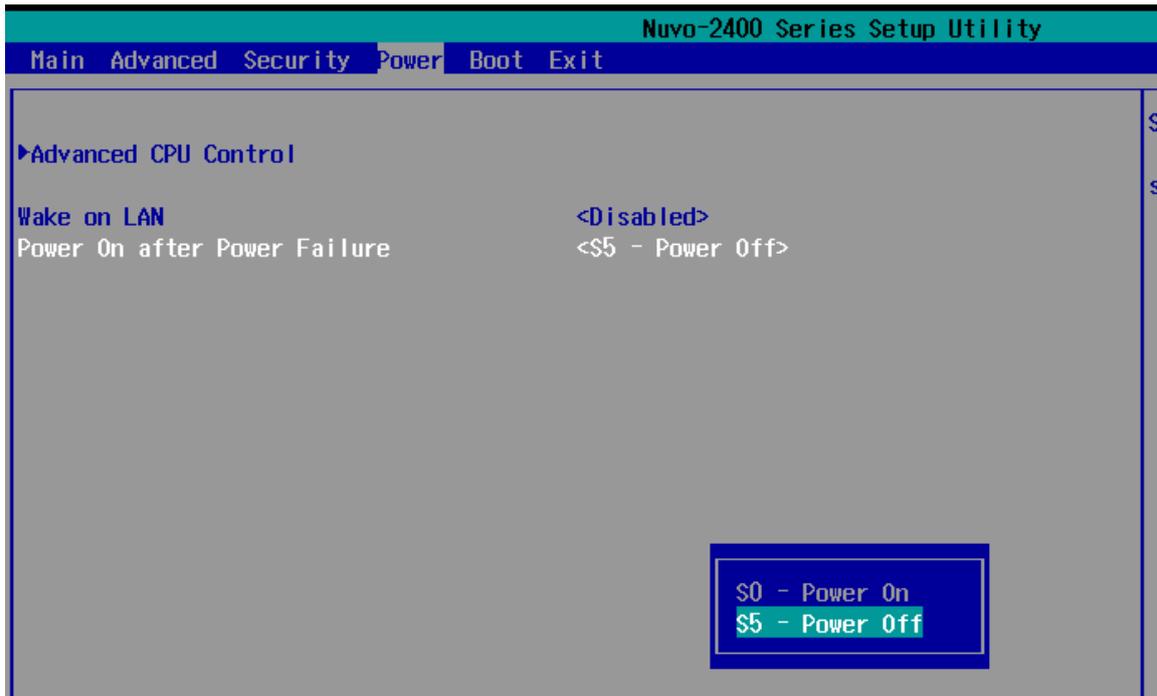


Figure 54: Configuring Power on after Power Failure in BIOS

The following table describes the options of this setting.

Table 15: Options of Power On after Power Failure

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.

## 5.1.6 Watchdog Timer for Booting

The BIOS of **Nuvo-2400** has a useful feature which allows users to use the watchdog timer to secure the booting process. You can specify the timeout value for watchdog timer. Once the watchdog timer expires, the BIOS issues a reset command to initiate another booting process. You can also set the behavior of how to stop the watchdog timer. There are two options in BIOS menu, **[Automatically after POST]** and **[Manually after Entering OS]**. When **[Automatically after POST]** is selected, the BIOS automatically stop the watchdog timer after POST (Power-On Self Test) OK. When **[Manually after Entering OS]** is selected, user applications have to stop the watchdog timer after OS is activated. 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 the chapter "*Using Watchdog Timer and DIO*".

To set the watchdog timer for boot in BIOS:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Go to **[Boot]** menu.
3. Disable or select timeout value for **[WDT for Booting]** option.
4. Once you give a timeout value, the **[WDT Stop Option]** option appears. You can select either **[Automatically after POST]** or **[Manually after Entering OS]**.

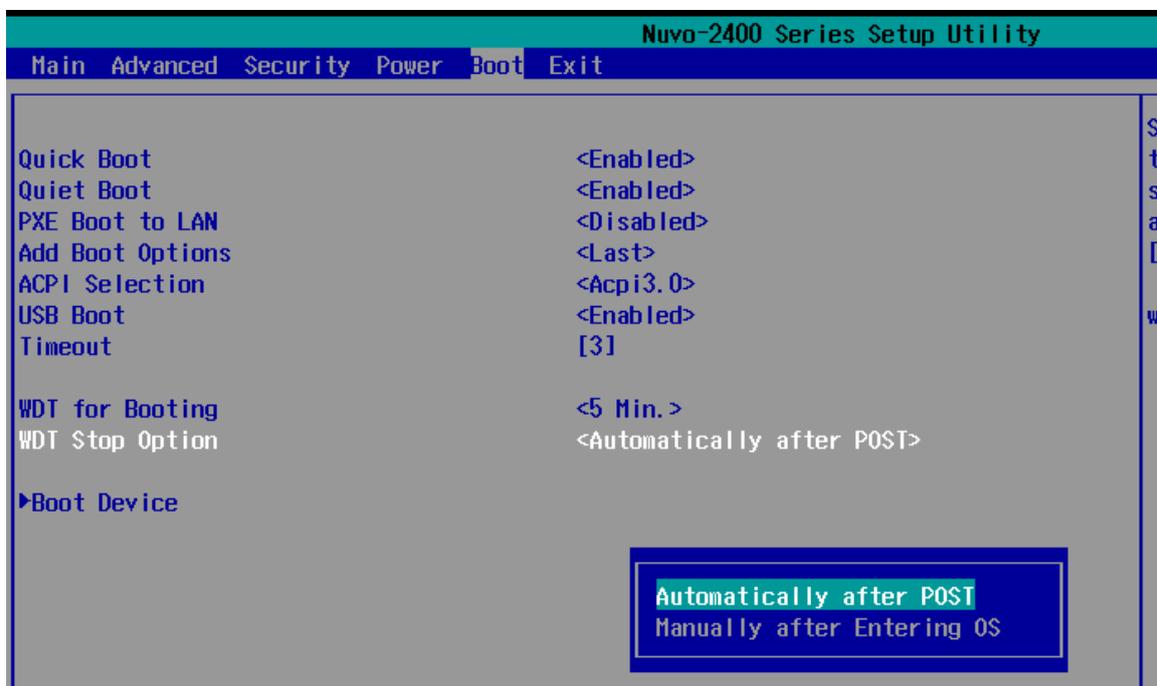


Figure 55: Configuring WDT in BIOS

## 5.1.7 Select a Boot Device

When you have multiple bootable devices, i.e. HDD, USB flash disk, USB DVD-drive, etc., connected to your **Nuvo-2400**, you may need to select one of them as the first boot device. There are two ways to select the device. You can either, press F12 when system boots up to go to Boot Manager and then select one of the devices, or select the boot device in BIOS settings.

To select a boot device in BIOS:

1. When **Nuvo-2400** boots up, press F2 to enter BIOS setup utility.
2. Go to **[Boot] / [Boot Device]**.
3. The **[Boot Menu]** option determines whether to list all bootable devices connected to your **Nuvo-2400** according to device or device type. The default order of boot device type is
  4. Hard Disk Drive
  5. USB
  6. CD/DVD-ROM Driver
  7. Floppy Drive
  8. Others

You can use F5/F6 or +/- to change the boot order of devices or device types.



Figure 56: Configuring order of booting devices in BIOS

## 5.2 Operating System Support

**Nuvo-2400** supports most operating system developed for Intel® x86 architecture. The following list contains the operating systems which have been tested in Neosys Technology Inc.

1. Microsoft Window 7 32-bit
2. Microsoft Window 7 64-bit
3. Microsoft Window 8/8.1 32-bit
4. Microsoft Window 8/8.1 64-bit
5. Ubuntu 14.04 or later version

**NOTE** *For Linux system, user may need to manually compile and install the driver for Intel I210 GbE controller if the driver is not embedded in kernel. You can visit Intel website for further information.*

Neosys will keep this list updated as we continuously test other operating systems with **Nuvo-2400**. Please contact us for the latest OS support list.

## 5.3 Driver Installation

Neosys Technology Inc. provides a very convenient utility in “Drivers & Utilities DVD” to allow the “One-Click” driver installation. This utility automatically detects your Windows operating system and installs all necessary drivers to your **Nuvo-2400** with just one mouse click.

### 5.3.1 Install All Drivers Using “One-Click” Driver

#### Installation

1. Insert the “Drivers & Utilities DVD” into a USB DVD-drive attached to your **Nuvo-2400**. A setup utility launches and the following dialog appears.



Figure 57: Neosys Driver & Utilities DVD

2. Click on the **[Automatic Driver Installation]**. The setup utility will automatically detect your Windows operating system and install all necessary drivers. According to different versions of Windows, the installation process takes about 6~8 minutes. Once driver installation is done, the setup utility reboots your Windows and your system works normally afterward.

## 5.3.2 Install Drivers Manually

You can also manually install each driver for **Nuvo-2400**. Please refer to the following information about installing drivers for different operating system.

### **Windows 7 32-bit**

The recommended driver installation sequence is

1. Chipset driver (x:\Driver\_Pool\Chipset\_Vlv\Win7\_8\_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver\_Pool\Graphics\_Vlv\_EMGD\Win7\_32\Setup.exe)
3. Audio driver (x:\Driver\_Pool\Audio\_ALC262\Win7\_8\_ALL\Setup.exe)
4. LAN driver  
(x:\Driver\_Pool\GbE\_I210\Win7\_8\_32\APPS\PROSETDX\Win32\DxSetup.exe)
5. USB 3.0 driver (x:\USB3\_Vlv\Win7\_ALL\Setup.exe)
6. Embedded I/O  
(x:\Driver\_Pool\IO\_Vlv\Win7\_32\Intel\_Processor\_Win7\_IO\_Drivers\_32Bit.msi)

### **Windows 7 64-bit**

The recommended driver installation sequence is

1. Chipset driver (x:\Driver\_Pool\Chipset\_Vlv\Win7\_8\_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver\_Pool\Graphics\_Vlv\_EMGD\Win7\_64\Setup.exe)
3. Audio driver (x:\Driver\_Pool\Audio\_ALC262\Win7\_8\_ALL\Setup.exe)
4. LAN driver  
(x:\Driver\_Pool\GbE\_I210\Win7\_8\_64\APPS\PROSETDX\Winx64\DxSetup.exe)
5. USB 3.0 driver (x:\Driver\_Pool\USB3\_Vlv\Win7\_ALL\Setup.exe)
6. Embedded I/O  
(x:\Driver\_Pool\IO\_Vlv\Win7\_64\Intel\_Processor\_Win7\_IO\_Drivers\_64Bit.msi)

### **Windows 8/8.1 32-bit**

The recommended driver installation sequence is

1. Chipset driver (x:\Driver\_Pool\Chipset\_Vlv\Win7\_8\_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver\_Pool\Graphics\_3rd\_i7\_Vlv\Win7\_8\_32\Setup.exe)
3. Audio driver (x:\Driver\_Pool\Audio\_ALC262\Win7\_8\_ALL\Setup.exe)
4. LAN driver  
(x:\Driver\_Pool\GbE\_I210\Win7\_8\_32\APPS\PROSETDX\Win32\DxSetup.exe)
5. TXE driver (x:\Driver\_Pool\TXE\_Vlv\Win8\_ALL\SetupTXE.exe)
6. Embedded IO (x:\Driver\_Pool\IO\_Vlv\Win8\_32\Setup.exe)

### **Windows 8/8.1 64-bit**

The recommended driver installation sequence is



1. Chipset driver (x:\Driver\_Pool\Chipset\_Vlv\Win7\_8\_ALL\SetupChipset.exe)
2. Graphics driver (x:\Driver\_Pool\Graphics\_3rd\_i7\_Vlv\Win7\_8\_64\Setup.exe)
3. Audio driver (x:\Driver\_Pool\Audio\_ALC262\Win7\_8\_ALL\Setup.exe)
4. LAN driver  
(x:\Driver\_Pool\GbE\_I210\Win7\_8\_64\APPS\PROSETDX\Winx64\DxSetup.exe)
5. TXE driver (x:\Driver\_Pool\TXE\_Vlv\Win8\_ALL\SetupTXE.exe)
6. Embedded IO (x:\Driver\_Pool\IO\_Vlv\Win8\_64\Setup.exe)



# Chapter 6 Using Watchdog Timer and DIO

## 6.1 Install WDT and DIO Library

The WDT\_DIO function library is delivered in the form of a setup package named **WDT\_DIO\_Setup.exe**. In prior to program WDT and DIO on **Nuvo-2400**, you should execute the setup program and install the WDT and DIO library. The following procedure shows steps to complete the installation of WDT and DIO Library.

1. Execute **WDT\_DIO\_Setup.exe**. The following dialog appears.

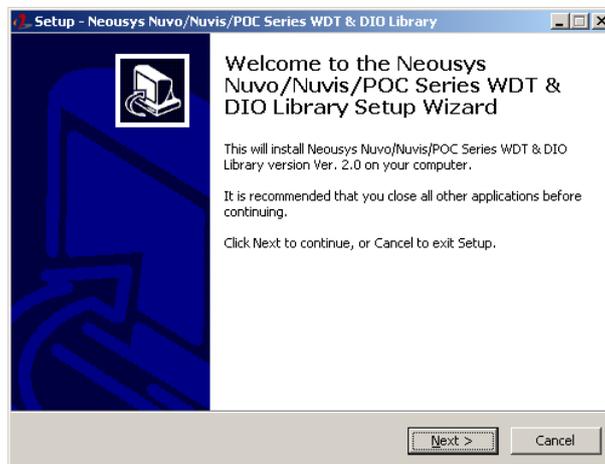


Figure 58: Welcome Window of WDT and DIO Library Install Program

2. Click “Next >” and specify the directory of installing related files. The default directory is C:\Neosys\WDT\_DIO.

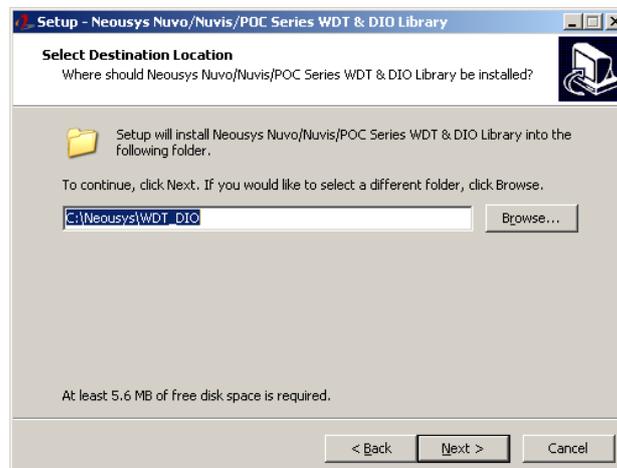


Figure 59: Set Installation Folder of WDT and DIO Library

3. Once the installation is finished, a dialog appears to prompt you to reboot the system.

The WDT & DIO library will take effect after system rebooting.

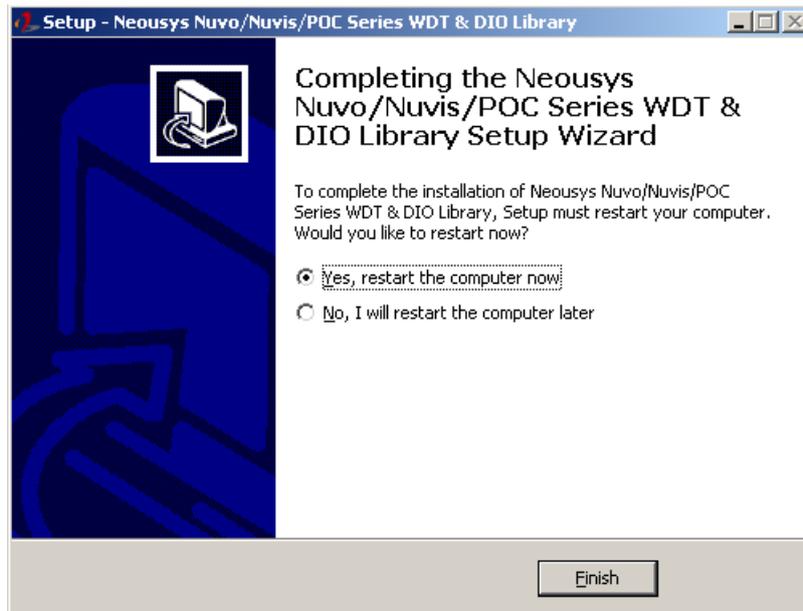


Figure 60: Complete WDT and DIO Library Installation

4. When you programming your WDT or DIO program, the related files are located in
- |                     |          |
|---------------------|----------|
| Header File:        | \Include |
| Library File:       | \Lib     |
| Function Reference: | \Manual  |
| Sample Code:        | \Sample\ |

## 6.2 Using WDT Function

### 6.2.1 WDT Function Reference

#### 6.2.1.1 InitWDT

##### Description

Initialize the WDT function. You should always invoke InitWDT() before set or start watchdog timer.

##### Parameter

None

##### Return Value

Returns TRUE if initialization successes, FALSE if initialization failed.

##### Usage

```
BOOL bRet = InitWDT()
```

## 6.2.1.2 SetWDT

### 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
```

### 6.2.1.3 StartWDT

#### Description

Start countdown of WDT. When WDT is started, the WDT LED indicator starts to blink in a frequency of 1Hz. If no ResetWDT() or StopWDT is invoked before WDT is counted to 0, the WDT expires and system resets.

#### Parameter

None

#### Return Value

If the timeout value is given in correct format, this function returns TRUE, otherwise FALSE.

#### Usage

```
BOOL bRet = StartWDT()
```

## 6.2.1.4 ResetWDT

### Description

Reset the timeout value to the value given by SetWDT(). If no ResetWDT() or StopWDT is invoked before WDT is counted to 0, the WDT expires and system resets.

### Parameter

None

### Return Value

Always returns TRUE;

### Usage

```
BOOL ret = ResetWDT()
```

## 6.2.1.5 StopWDT

### Description

Stop the countdown of WDT. When WDT is stopped, the WDT LED indicator stops blinking.

### Parameter

None

### Return Value

Always returns TRUE;

### Usage

```
BOOL ret = StopWDT()
```

## 6.3 Using DIO Function

### 6.3.1 Wiring for Isolated DIO

The digital input function of Nuvo series is implemented using a photo-coupler with an internally series-connected 1k $\Omega$  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.

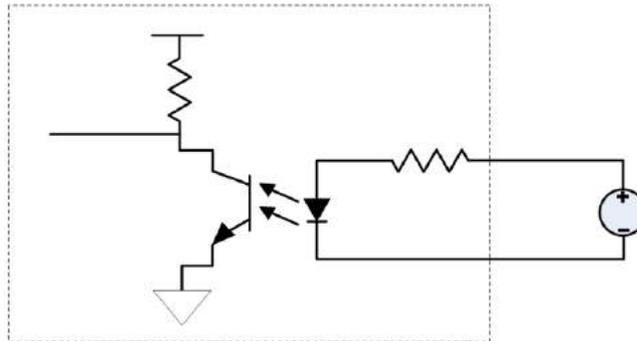


Figure 61: Wiring of isolated digital inputs

The digital output function of Nuvo series is implemented using Power MOSFET + Analog Device iCoupler<sup>®</sup> component. The DO channels are configured as NO (normally-open) configuration. When you turn on 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 Nuvo series supports sinking current connection. The following diagrams are the suggested wiring for DO:

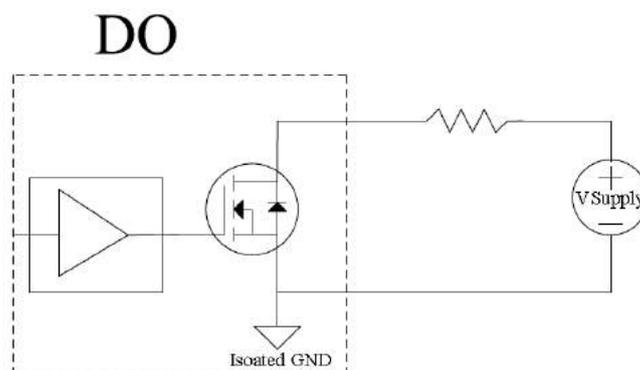


Figure 62: Wiring of isolated digital outputs

## 6.3.2 DIO Function Reference

### 6.3.2.1 InitDIO

#### Syntax

```
BOOL InitDIO(void);
```

#### Description

Initialize the DIO function. You should always invoke InitDIO() before write/read any DIO port/channel.

#### Parameter

None

#### Return Value

Returns TRUE if initialization successes, FALSE if initialization failed.

#### Usage

```
BOOL bRet = InitWDT();
```

## 6.3.2.2 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. Valid values are 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
```

### 6.3.2.3 DIReadPort

#### Syntax

```
WORD DIReadPort(void);
```

#### Description

Read the entire isolated digital input port (8 channels).

#### Parameter

None

#### Return Value

A WORD value indicates the status of DI port. Return value are 0~255.

#### Usage

```
WORD DIPortValue = DIReadPort ();
```

## 6.3.2.4 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. Valid value are 0~7.

*value*

BOOL value (TRUE or FALSE) specifies the status of DO channel.

### Return Value

None

### Usage

```
BYTE ch=3; //DI channel #3  
BOOL DOChValue=TRUE;
```

```
DOWriteLine(ch, DOChValue); //write DO channel #3 as TRUE
```

### 6.3.2.5 DOWritePort

#### Syntax

```
void DOWritePort(WORD value);
```

#### Description

Write the entire isolated digital output port (8 channels).

#### Parameter

*value*

WORD value specifies the status of the DO port. Valid values are 0~255.

#### Return Value

None

#### Usage

```
WORD DOPortValue=0xFF; //11111111b  
DOWritePort(DOPortValue); //write DO port as 11111111b
```

### 6.3.2.6 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. Valid values are 0~7.

*value*

BOOL value (TRUE or FALSE) specifies the status of DO channel.

#### Return Value

None

#### Usage

```
BYTE ch=3; //DI channel #3  
BOOL DOChValue=TRUE;
```

```
DOWriteLineChecked(ch, DOChValue); //write DO channel #3 as TRUE
```

## 6.3.2.7 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. Valid values are 0~255.

### Return Value

None

### Usage

```
WORD DOPortValue=0xFF; //11111111b  
DOWritePortChecked(DOPortValue); //write DO port as 11111111b
```