PBC-2000 USER Manual

Ultra-Slim Fanless Embedded System
with Intel Atom® x7211RE Processor

Vecow

1.2.0 Edition 20251212

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1.00	2025/08/28	All	Official Release	
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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 it is not installed and used in accordance with the instruction manual, it 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 products 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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Order Information

Model	2.5 GigE LAN	USB 3.2	HDMI 2.0	SIM	COM
PBC-2000	2	2	1	1	2

Order Accessories

Part Number	Description
DDR5 16G	Certified DDR5 16GB 4800MHz RAM
DDR5 8G	Certified DDR5 8GB 4800MHz RAM
PWA-60W-12V	60W, 12V, 90V AC to 264V AC Power Adapter with 2-pin Terminal Block
DIN Rail	DIN-RAIL Kit
M.2 Storage Module	M.2 Key B Storage Module
5G Module	5G Module with Antenna
4G Module	4G/GPS Module with Antenna
WiFi & Bluetooth	WiFi & Bluetooth Module with Antenna

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1

GENERAL INTRODUCTION

1.1 Overview

The PBC-2000 is an ultra-compact, fanless embedded system built for mission-critical edge computing. Powered by the Intel® Atom® x7211RE processor (Amston Lake), it delivers enhanced computing performance, improved GPU capability, and low power consumption, making it well-suited for industrial AIoT applications such as intelligent control, energy management, M2M communication, in-vehicle infotainment, and factory automation.

Featuring up to 1.49× faster CPU performance and 5× GPU improvement over previous-generation platforms, the system supports up to 16GB DDR5-4800 ECC memory and offers flexible storage expansion through M.2 and SATA III interfaces. It includes 2 2.5G LAN, USB 3.2 Gen 2, COM ports, and 1x HDMI 2.0 interface supporting 4K@60Hz display output for high-resolution visualization.

Designed for harsh industrial environments, the PBC-2000 supports wide operating temperatures from -40°C to 70°C, and offers 12V DC power input. The fanless, lightweight mechanical design enables easy installation via DIN rail or wall mount, making it ideal for space-constrained deployments.

1.2 Features

- Dual-Core Intel Atom® x7211RE Processor delivers notable improvements in CPU and GPU performance
- Small form factor, ultra-compact design
- Fanless, -40°C to 70°C Operating Temperature
- 2 2.5 GigE LAN, 2 USB 3.2, 2 COM, M.2 Key B, M.2 Key E
- HDMI 2.0 support up to 4K @60Hz resolution
- SIM Socket for 5G/4G/WiFi/LTE/GPRS/UMTS
- Support OpenVINO based AI accelerator and advanced Edge AI applications

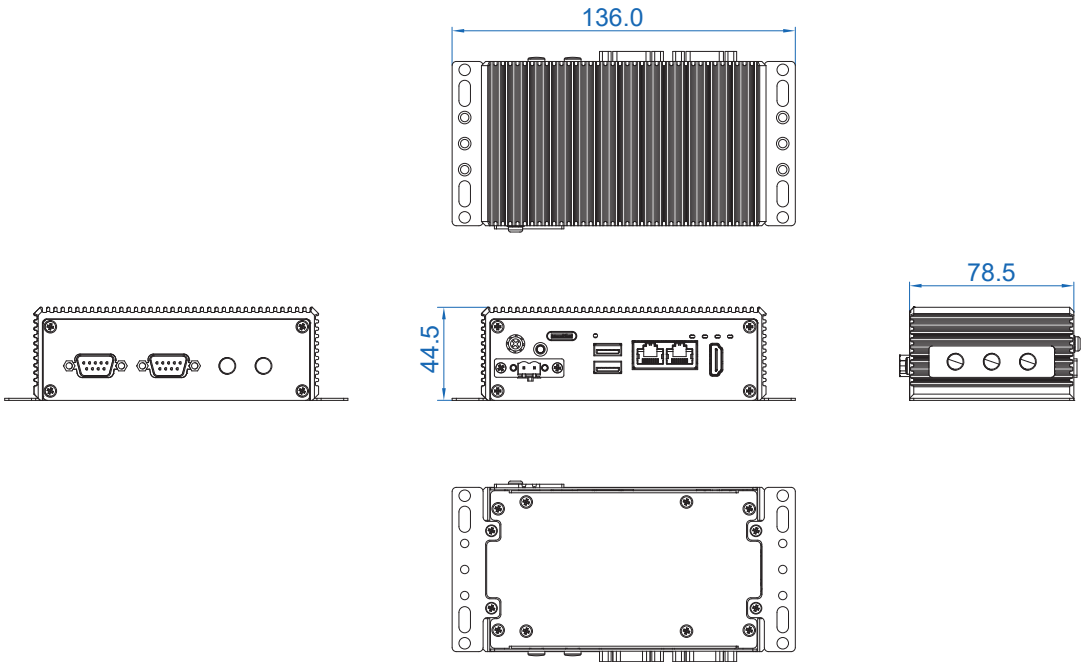
1.3 Product Specification of PBC-2000

System	
Processor	Intel® Atom® x7211RE
BIOS	AMI
SIO	IT8659E
Memory	1 DDR5 4800MHz SO-DIMM, up to 16GB, In-band ECC
OS	Windows 11, Windows 10, Linux
Graphics	
Processor	Intel® UHD Graphics
Interface	1 HDMI 2.0: Up to 4096 x 2160 @60Hz
Ethernet	
LAN 1	Realtek® RTL8125BI-CG 2.5G LAN
LAN 2	Realtek® RTL8125BI-CG 2.5G LAN
Audio	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
I/O Interface	
Serial	2 COM RS-232/422/485
USB	2 USB 3.2 Gen 2
LED	Power, HDD, M.2
SIM	1 External SIM Card Socket for 5G/4G/LTE/GPRS/UMTS wireless network
Storage	
SATA	1 SATA III (6Gbps)
M.2	1 M.2 Key B (2280/3042/3052, PCIex2, share with expansion)
Expansion	
M2	• 1 M.2 Key B Socket (2280/3042/3052, PCIex2/USB3/default USB2) • 1 M.2 Key E Socket (2230, PCIex1/USB2)
Power	
Power Input	12V DC-in
Power Interface	2-pin Terminal Block : V+, V-

Mechanical	
Dimension	136.0mm x 44.5mm x 78.5mm (5.35" x 1.75" x 3.09")
Weight	0.6kg (1.3lbs)
Mounting	• Wallmount by mounting bracket • DIN Rail mount (Optional)
Environment	
Operating Temper-ature	-40°C to 70°C (-40°F to 158°F) with air flow
Storage Tempera-ture	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% Humidity, Non-condensing
Relative Humidity	95% at 70°C
Shock	• IEC 60068-2-27 • SSD : 50G @wallmount, Half-sine, 11ms
Vibration	• IEC 60068-2-64 • SSD : 5Grms, 5Hz to 500Hz, 3 Axis
EMC	CE, FCC, EN50155, EN50121-3-2

1.4 Mechanical Dimension

Unit : mm (inch)

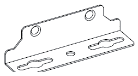


2

GETTING TO KNOW YOUR PBC-2000

2.1 Packing List

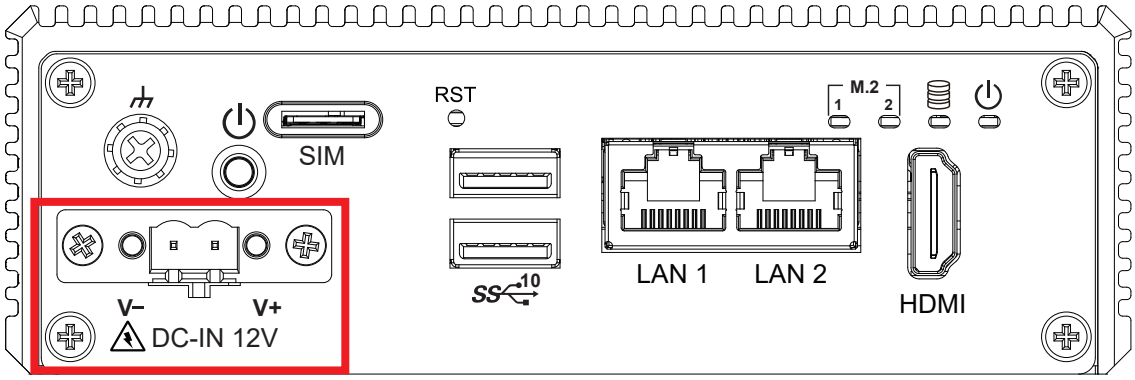
Item	Description	Qty
1	PBC-2000 Embedded System	1

Item	Description	Picture	Use for	P/N	Qty
1	PHILLPIS M3*4L		M.2	53-2426204-80B	3
2	M3x4L		Wall mount Bracket/HDD	53-M006350-010	8
3	Screw_M2.5_P Head L=3.0 mm_Ni		M.2 Key E	53-M035310-000	1
4	Terminal block 2-pin (5.0mm)		DC-IN	51-2411R02-S1C	1
5	Wall Mount		Mount	62-01P0727-B00	2
6	M.2 Bracket		M.2	62-03P0997-30A	1
7	SATA Power Cable		HDD	61-1470022-005	1
8	SATA Data Cable		HDD	61-13B0707-3BA	1
9	Foot Pad		Foot Pad	53-2700001-60D	5
10	Copper pillars_#4-40x4.8		COM Cable	53-M005081-014	4

2.2 Front Panel I/O & Functions

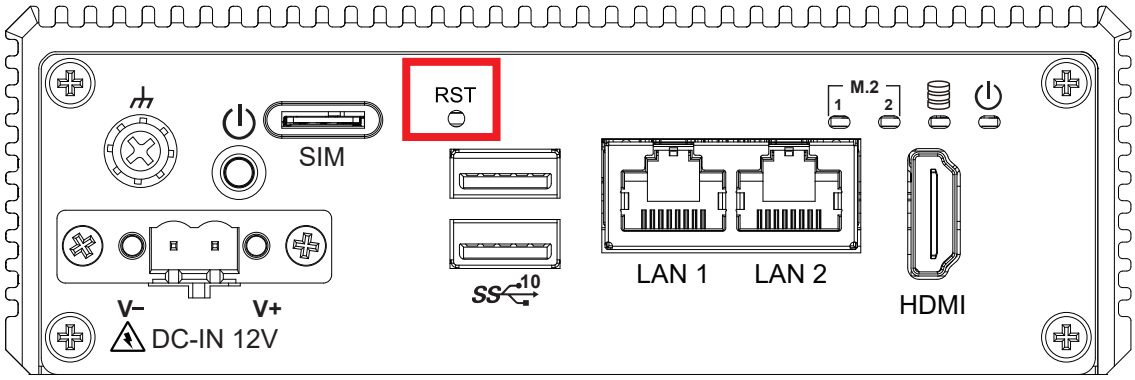
In Vecow's PBC-2000 series family, all I/O connectors are located on the front panel. Most of the general connections to the computer device, such as DC power input, SIM slot, Display port, USB3.2 and LAN Jack are placed on the front panel.

2.2.1 Power Terminal Block



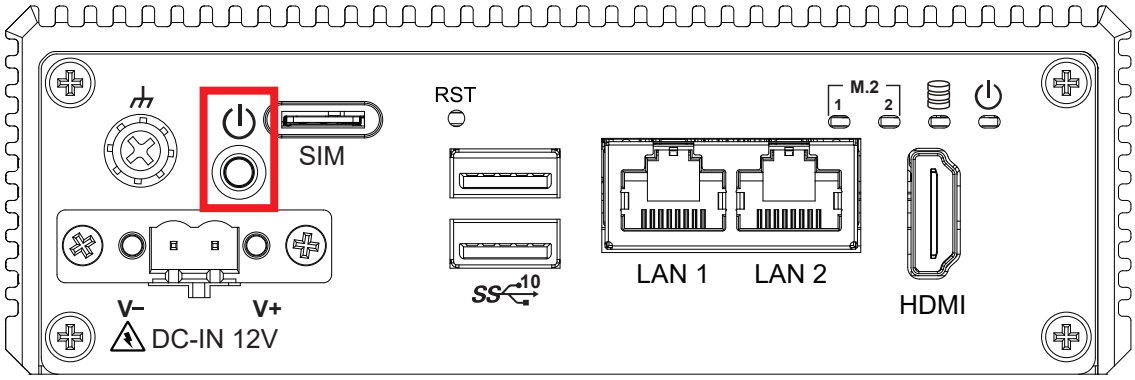
This system supports 12V only DC power input by terminal block in the rear side

2.2.2 Reset Tact Switch



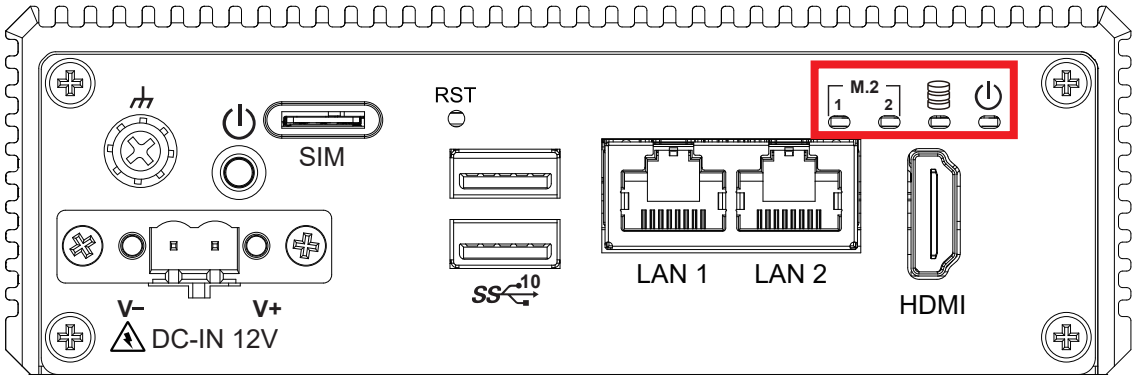
It is a hardware reset switch. Use this switch to reset the system without power off the system. Press the Reset Switch for a few seconds, and then reset will be enabled.

2.2.3 Power Button



The power button is a non-latched switch. To power on EPBC-2000, press the power button.To power off PBC-2000, you can either command shutdown by OS operation or simply press the power button. If system error appears, press and hold the power button for four seconds to shut down the machine directly.Please do note that a four-second interval between each two power-on/power-off operation is necessary in normal working status. (For example, once turning off the system, you have to wait for four seconds to initiate another power-on operation)

2.2.4 HDD,PWR,WWAN,WLAN LED Indicator



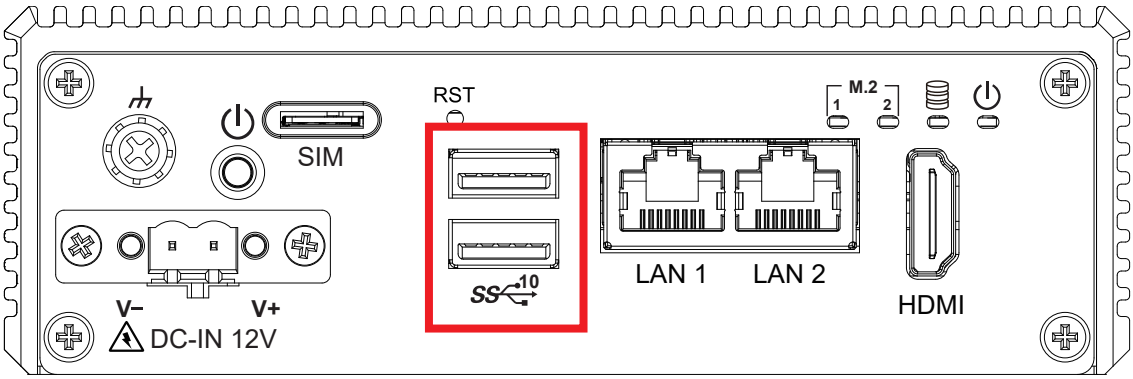
- **Green-M.2 _LED1 :**
  If the LED is solid green, it indicates that the device on M2 key-E Socket is working.

- **Green-M.2_LED2 :**
  If the LED is solid green, it indicates that the device on M2 key-B Socket is working.

- **Orange-HDD LED :**
  A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.

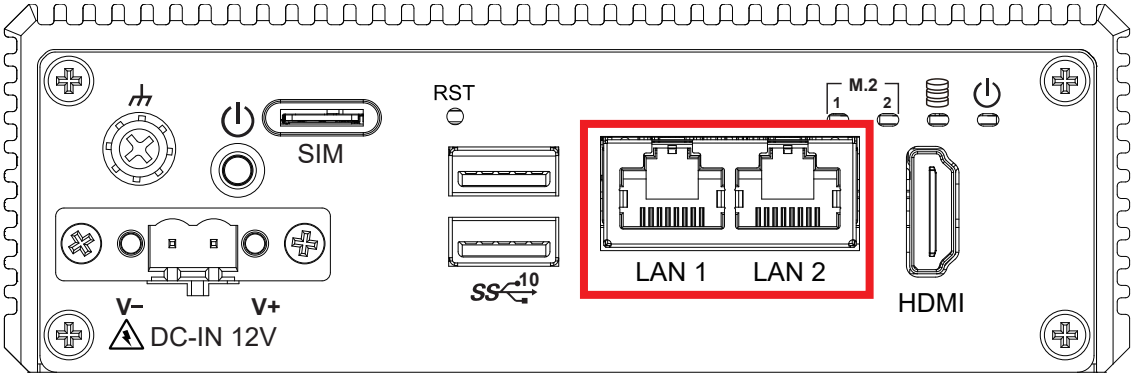
- **Green-Power LED :**
  If the LED is solid green, it indicates that the system is powered on

2.2.5 USB 3.2 Gen2



There are 2 USB 3.2 Gen2 connections available supporting up to 10GB per second data rate in the front side of PBC-2000. It is also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

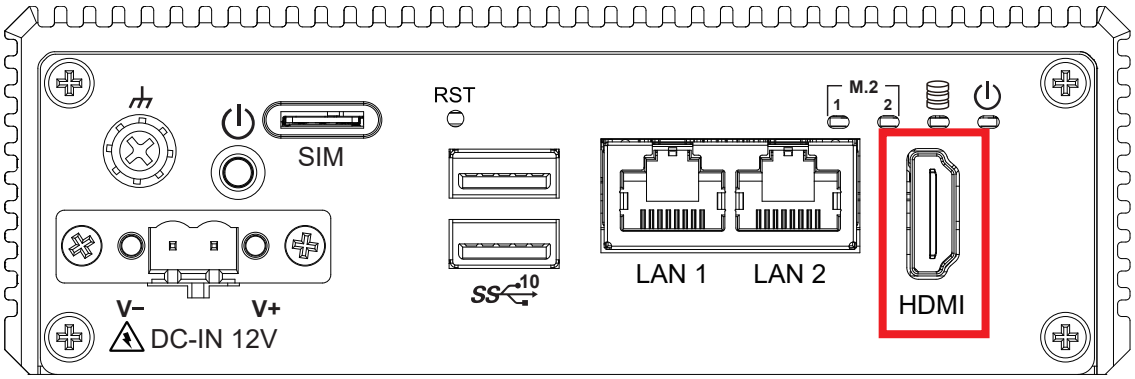
2.2.6 10/100/1000/2500 Mbps Ethernet Port



There are two 8-pin RJ-45 jacks supporting 10/100/1000/2500 Mbps Ethernet connections in the top side.Which is powered by Realtek RTL8119I Ethernet engine. When both of LANs work in normal status, iAMT function is enabled. Using suitable RJ-45 cable, you can connect the system to a computer, or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both of LANs support Wake on LAN and Pre-boot functions.The pin-outs of LAN 1 and LAN 2 are listed as follows :

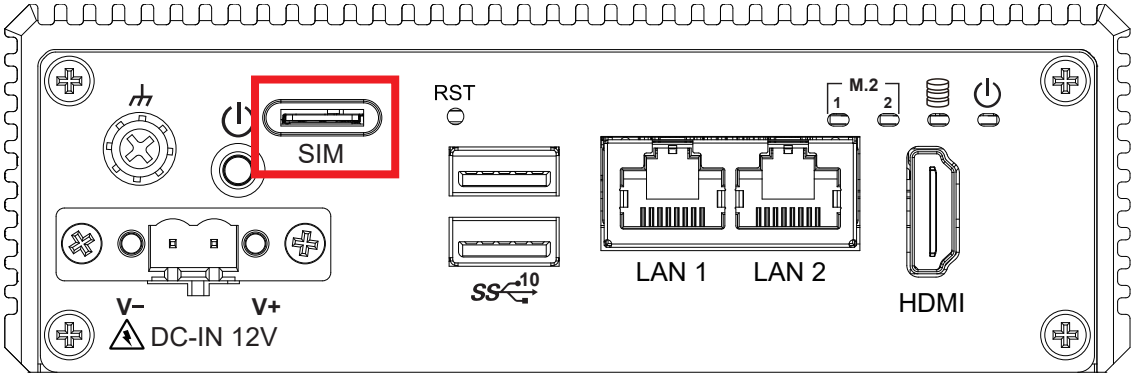
Pin No.	10/100 Mbps	1000/2500 Mbps
1	E_TX+	MDI0_P
2	E_TX-	MDI0_N
3	E_RX+	MDI1_P
4	--------	MDI1_N
5	--------	MDI2_P
6	E_RX-	MDI2_N
7	--------	MDI3_P
8	--------	MDI3_N

2.2.7 HDMI Port



Display Port connection supports up to 3840 x 2160 resolution at 60Hz

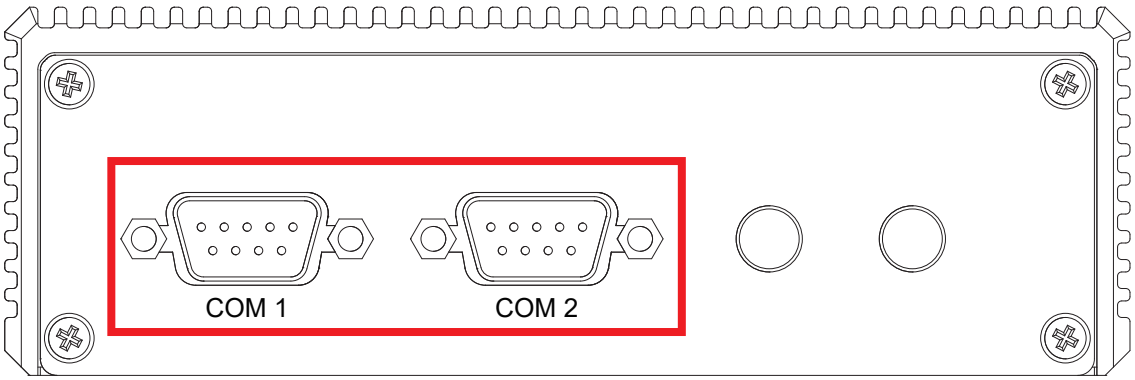
2.2.8 Nano SIM Card Socket for M.2 key B Slot



The Nano SIM card socket is support Push-Push type. Please make sure to unplug the system power before inserting the Nano SIM card.

2.3 Rear Panel I/O & Functions

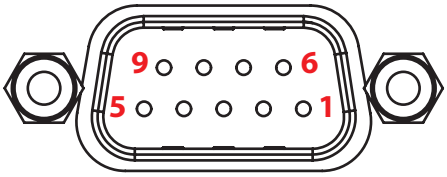
2.3.1 Serial Port COM



Serial port can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition is RS-232, but if you want to change to RS-422 or RS-485, you can find the settings in BIOS.

BIOS Setting	Function
COM1 COM2	RS-232
	RS-422 (5-wire)
	RS-485
	RS-485 w/z auto-flow control

The pin assignments are listed in the following table :

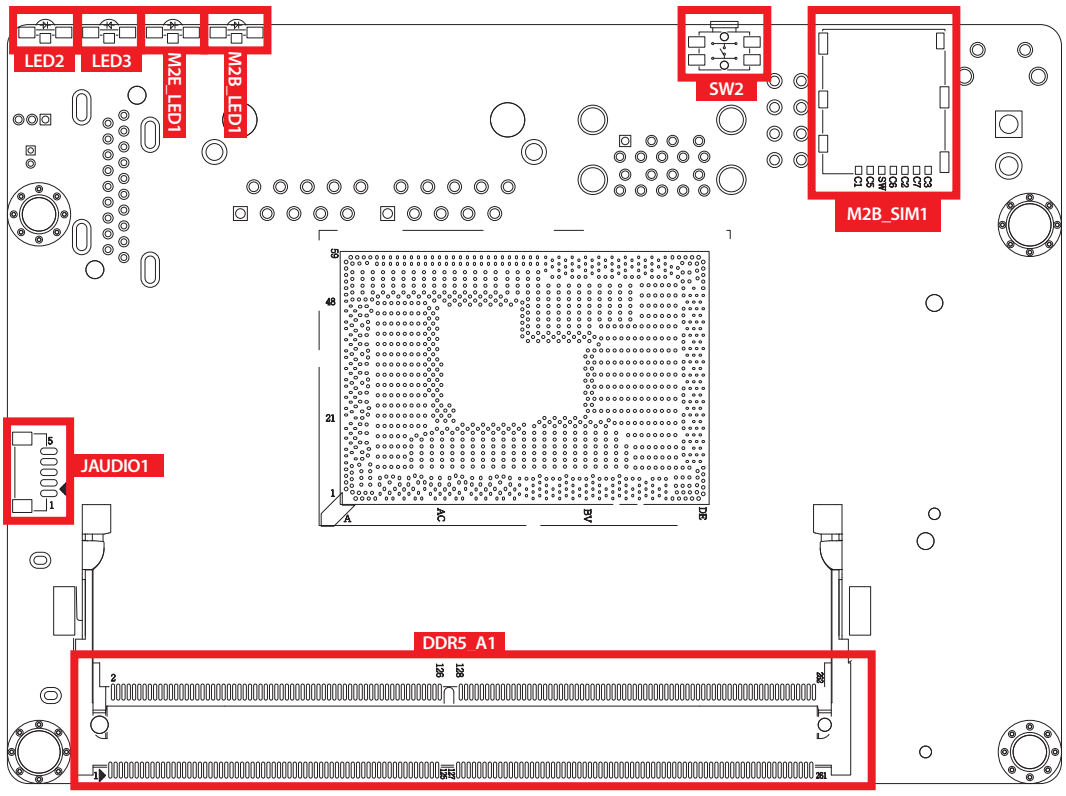


Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-485 (3-wire)
1 to 4	1	DCD	TXD-	DATA-
	2	RXD	TXD+	DATA+
	3	TXD	RXD+	----------
	4	DTR	RXD-	----------
	5	GND	GND	GND
	6	DSR	----------	----------
	7	RTS	----------	----------
	8	CTS	----------	----------
	9	RI	----------	----------

2.4 Main Board Expansion Connectors

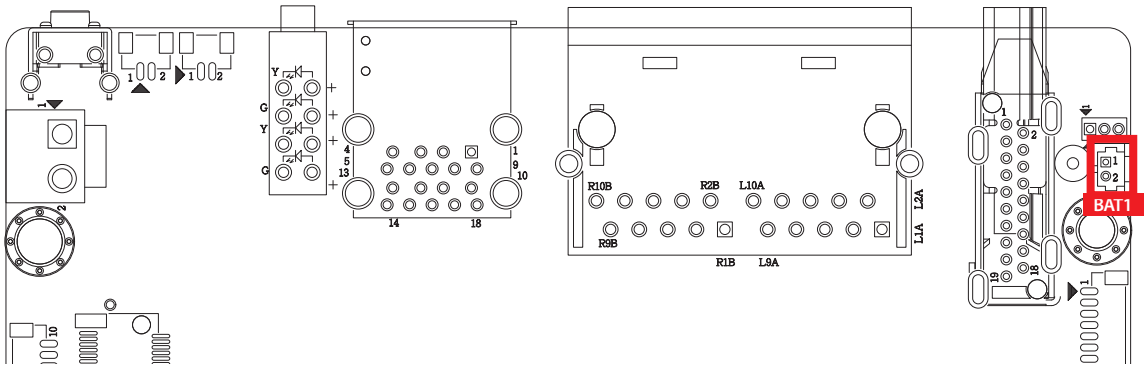
2.4.1 PBC-2000 Main Board Top Side View

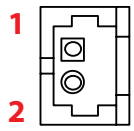
2.4.2 PBC-2000 Main Board Bot Side View



2.4.3 BAT2 : Battery

The EPBC-2000 real-time clock is powered by a lithium battery. It is equipped with Panasonic BR2032 190mAh lithium battery. It is recommended that you not replace the lithium battery on your own, but if the battery needs to be changed, please contact the Vecow RMA service team.

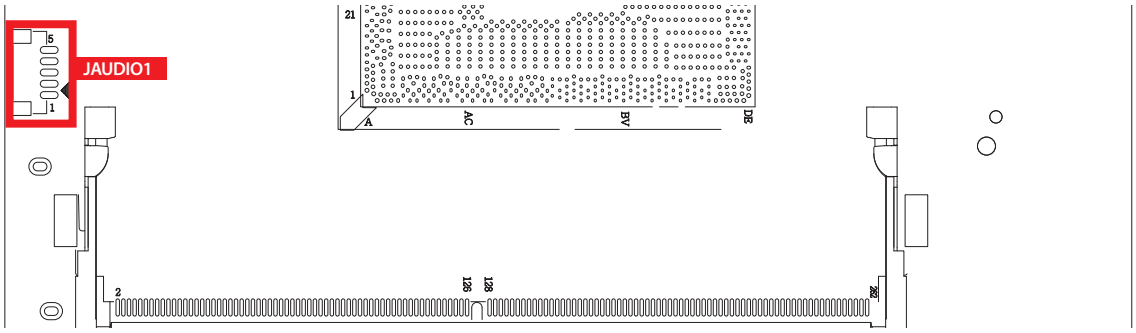


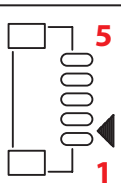


Pin No.	Function
1	+3V_BAT
2	GND

2.4.4 Jaudio: Mic-in / Line-out Audio Header

There is a audio line out connectors, line-out, in the bottom side of EPBC-2000. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel® High Definition Audio (Azalia) specifications. To utilize the audio function in Windows platform, you need to install corresponding drivers for both Alder Lake-N and Realtek ALC888SVD codec. Please refer to Chapter 4 for more details of driver installation. The pin assignments of JAudio1 and is listed in the following table :

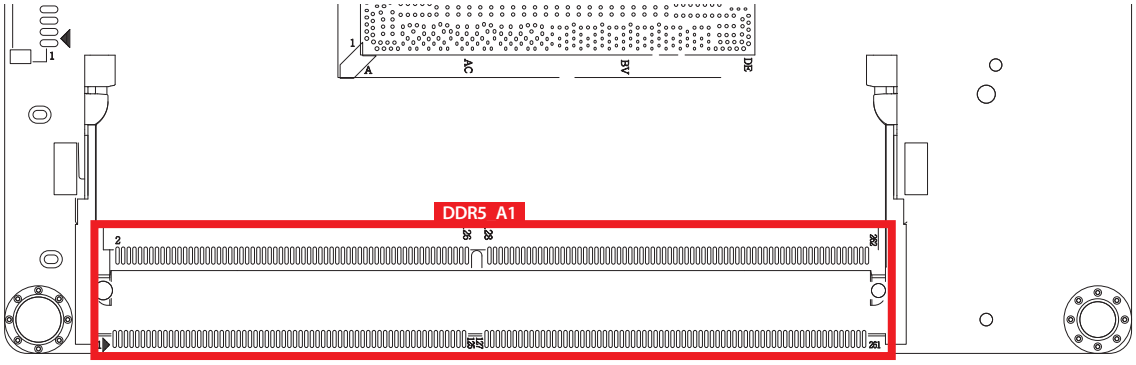




Pin No.	Function	Pin No.	Function
1	LINEO-L	2	LINEO-R
3	GND	4	MICI-L
5	MICI-R		

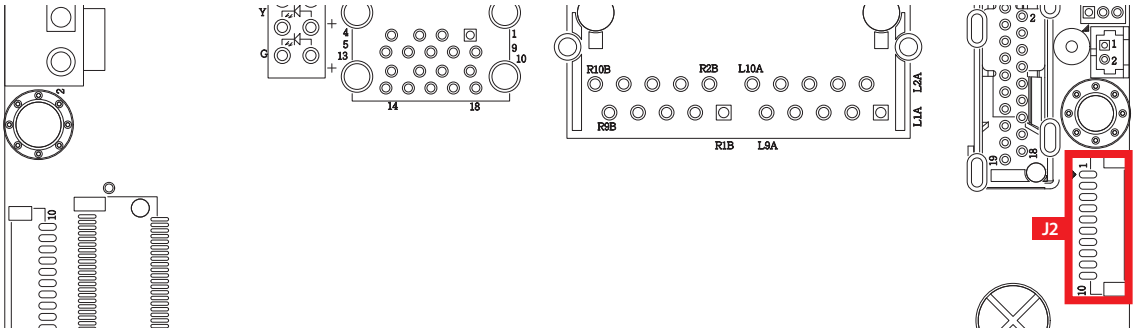
2.4.5 DIMM1 : DDR5 Slot

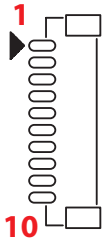
There is a DDR5 channel onboard, support DDR5 4800, max 16GB



2.4.6 J2: Internal USB 2.0 Connector

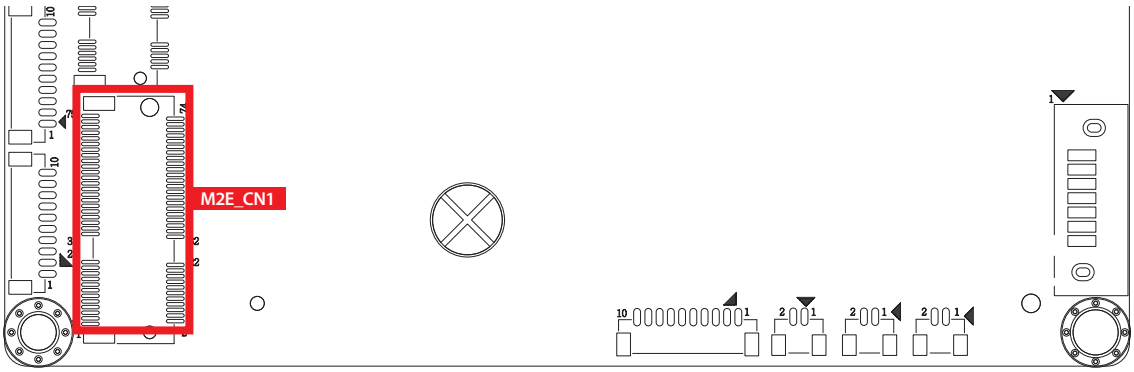
The EPBC-2000 series main board provides two expansion USB ports. The USB interface supports 480Mbps transfer rate which comply with high speed USB specification Rev. 2.0. The USB interface is accessed through one 10-pin JST 1.0mm connector. You will need an adapter cable if you use a standard USB connector. The adapter cable has a 10-pin connector on one end and a USB connector on the other. The pin assignments of JUSB1 and is listed in the following table :





Pin No.	Definition	Pin No.	Definition
1	USB_VCC	2	USB_VCC
3	USB_VCC	4	USB_D_6N
5	USB_D_6P	6	USB_D_4N
7	USB_D_4P	8	GND
9	GND	10	GND

2.4.7 M2E_CN1 : M.2 key E Slot for USB 2.0, PCIe Gen3x1 support

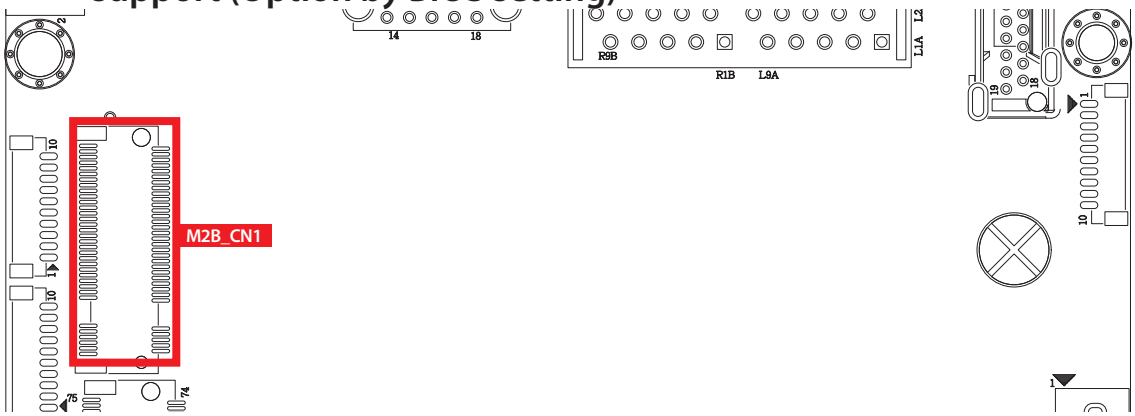


M.2 key E connector is suitable for applications that use wireless connectivity including Wi-Fi, Bluetooth, NFC of GNSS. Module card types include 2230. The pin assignments of M2E_CN1 are listed in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
74	3.3V	75	GND
72	3.3V	73	NC
70	NC	71	NC
68	NC	69	GND
66	NC	67	NC
64	NC	65	NC
62	ALERT# (O)(0/3.3V)	63	GND
60	12C_CLK (I)(0/3.3V)	61	NC
58	12C_DATA (I/O)(0/3.3V)	59	NC
56	NC	57	GND
54	NC	55	PEWAKE0# (I/O)(0/3.3V)
52	PERST0# (I)(0/3.3V)	53	CLKREQ0# (I/O)(0/3.3V)
50	NC	51	GND
48	NC	49	REFCLKn0
46	NC	47	REFCLKp0
44	NC	45	GND

42	NC	43	PERn0
40	NC	41	PERp0
38	NC	39	GND
36	NC	37	PETn0
34	NC	35	PETp0
32	NC	33	GND
	Module Key		Module Key
	Module Key		Module Key
	Module Key		Module Key
	Module Key		Module Key
22	NC	23	NC
20	NC	21	NC
18	NC	19	NC
16	LED2# (O)(od)	17	NC
14	NC	15	NC
12	NC	13	NC
10	NC	11	NC
8	NC	9	NC
6	LED1# (O)(od)	7	GND
4	3.3V	5	USB_D-
2	3.3V	3	USB_D+
		1	GND

2.4.8 M2B_CN1 : M.2 key B Slot for PCIe Gen3x2 or USB3.2 Gen2 support (Option by BIOS setting)

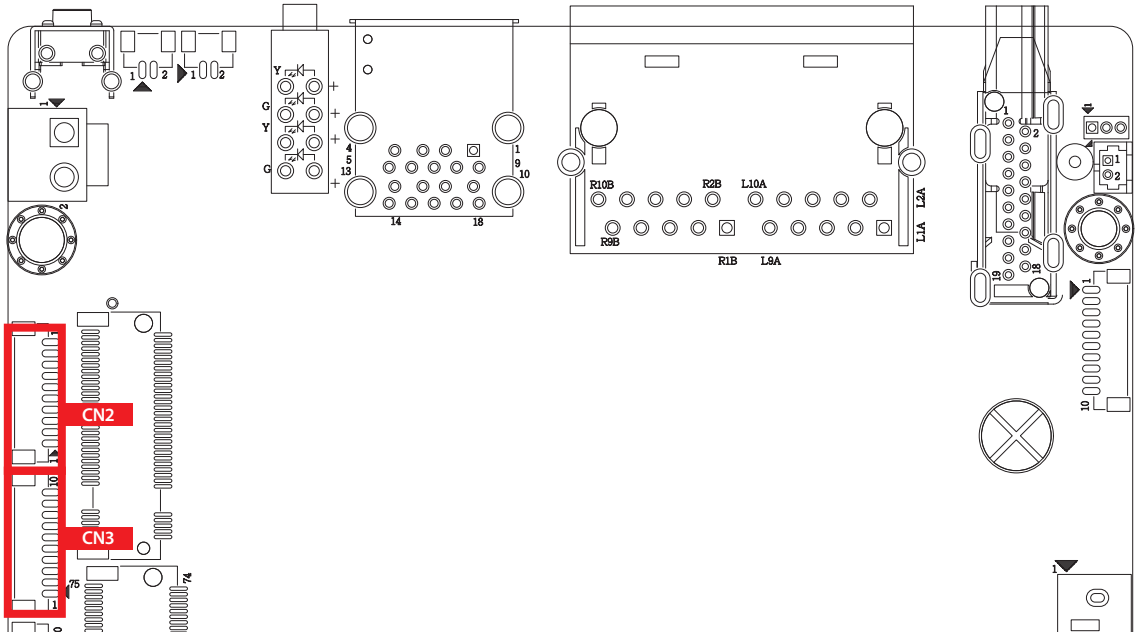


M.2 key B connector is suitable for applications that use wireless connectivity including LTE/5G module, and NVMe SSD (BW : PCIex2) or that types include 2280/3042/3052. The pin assignments of M2B_CN1 are listed in the following table :

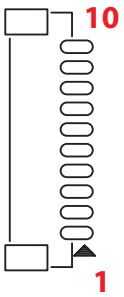
Pin No.	Signal Name	Pin No.	Signal Name
74	3.3V	75	NC
72	3.3V	73	GND
70	3.3V	71	GND
68	NC	69	CONFIG_1
66	SIM DETECT	67	NC
64	NC	65	NC
62	NC	63	NC
60	NC	61	NC
58	NC	59	NC
56	NC	57	GND
54	PEWAKE#	55	REFCLKp
52	CLKREQ#	53	REFCLKn
50	PERST#	51	GND
48	NC	49	PETp0/SATA-A+
46	NC	47	PETn0/SATA-A-
44	NC	45	GND

42	NC	43	PERp0/SATA-B-
40	NC	41	PERn0/SATA-B+
38	DEVSLP	39	GND
36	UIM-PWR	37	PETp1/USB3.1-TX+
34	UIM-DATA	35	PETp1/USB3.1-TX-
32	UIM-CLK	33	GND
30	UIM-RESET	31	PETp1/USB3.1-RX+
28	NC	29	PETp1/USB3.1-RX-
26	NC	27	GND
24	NC	25	NC
22	NC	23	NC
20	NC	21	NC
18	Module Key	19	Module Key
16	Module Key	17	Module Key
14	Module Key	15	Module Key
12	Module Key	13	Module Key
10	LED_1#	11	GND
8	W_DISABLE1	9	USB-
6	FULL_CARD_PWR_OFF/ON	7	USB+
4	3.3V	5	GND
2	3.3V	3	GND
		1	NC

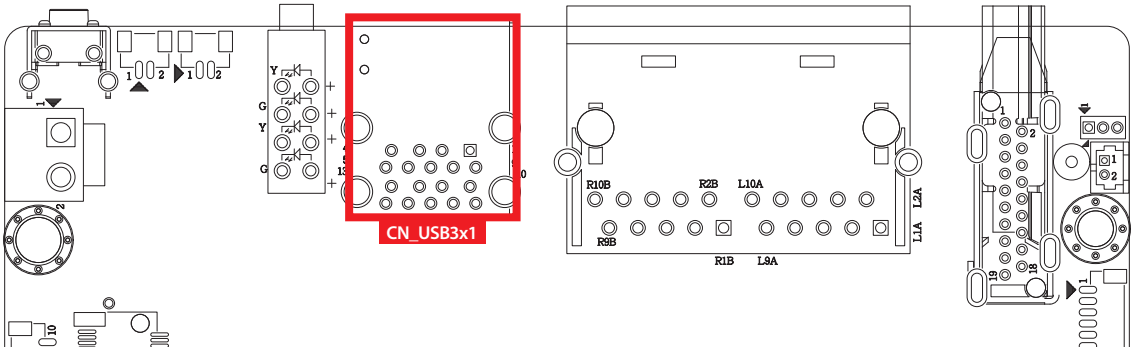
2.4.9 CN2.CN3 : Serial Port



CN2 and CN3 can be configured for RS-232, RS-422, or RS-485 with auto flow control communication, if you want to change to RS-422 or RS-485, you can find the setting in BIOS. The pin assignments are listed in the following table:

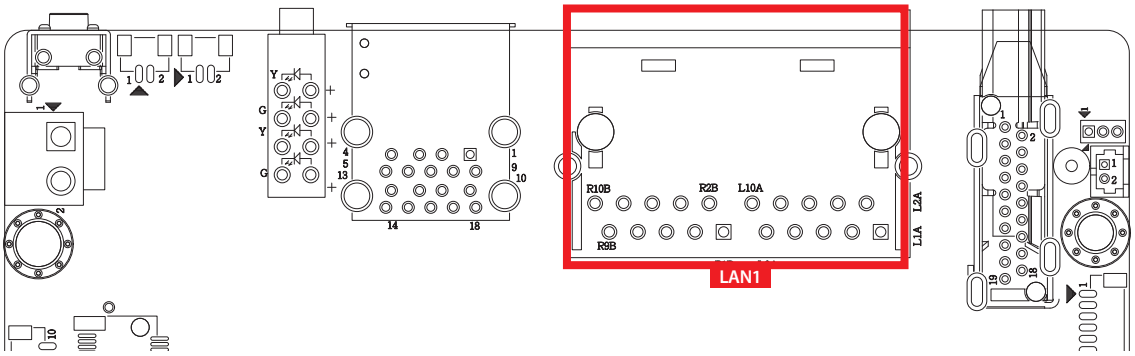
Serial Port	Pin Number	RS-232	RS-422 (5-wire)	RS-485 (3-wire)
	1	DCD	TXD-	DATA-
	2	RXD	TXD+	DATA+
	3	TXD	RXD+	--------
	4	DTR	RXD-	--------
	5	GND	GND	GND
	6	DSR	--------	--------
	7	RTS	--------	--------
	8	CTS	--------	--------
	9	RI	--------	--------

2.4.10 CN_USB3x1 : External USB 3.2 Gen2 Connector



There are 2 USB 3.2 Gen2 connections available supporting up to 10GB per second data rate in the top side of EPBC-2000 series. They are also compliant with the requirements of SuperSpeed (SS), high speed (HS), full speed (FS) and low speed (LS).

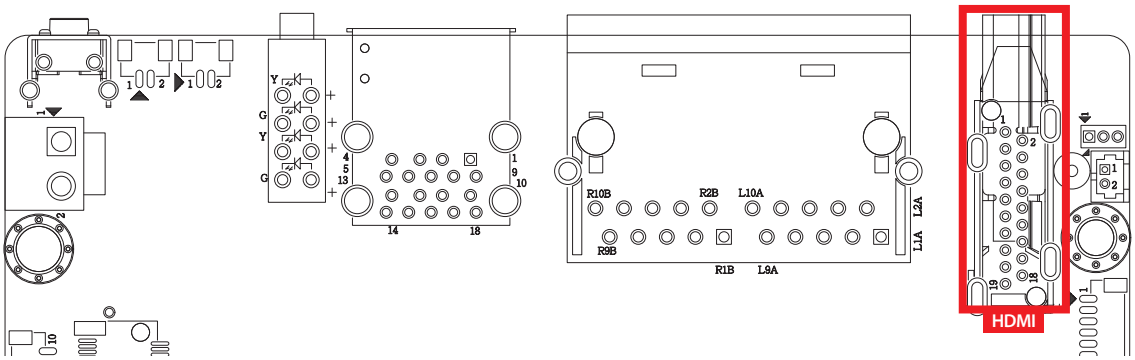
2.4.11 LAN1 : LAN Connector



There are two 8-pin RJ-45 jacks supporting 10/100/1000/2500 Mbps Ethernet connections in the top side.Which is powered by Realtek RTL8125BI Ethernet engine. When both of LANs work in normal status, iAMT function is enabled. Using suitable RJ-45 cable, you can connect the system to a computer, or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both of LANs support Wake on LAN and Pre-boot functions. The pin-outs of LAN 1 and LAN 2 are listed as follows :

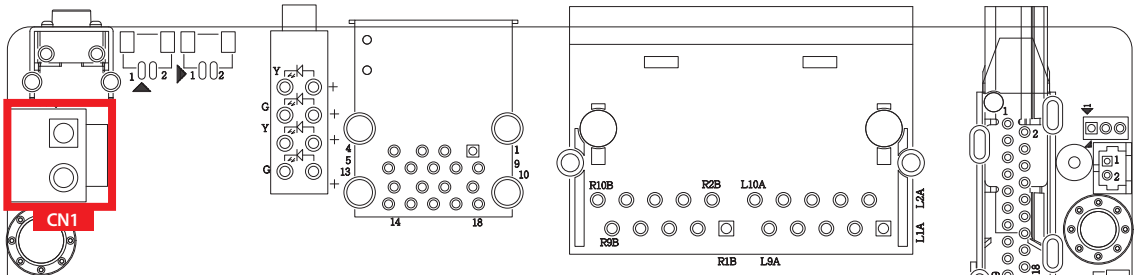
PinN umber	10/100 Mbps	1000/2500 Mbps
1	E_TX+	MDI0_P
2	E_TX-	MDI0_N
3	E_RX+	MDI1_P
4	--------	MDI1_N
5	--------	MDI2_P
6	E_RX-	MDI2_N
7	--------	MDI3_P
8	--------	MDI3_N

2.4.12 HDMI1

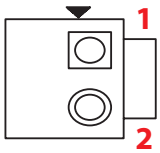


Onboard HDMI Port supports DDC channel mode. The connection supports up to 3840 x 2160 resolution at 60Hz

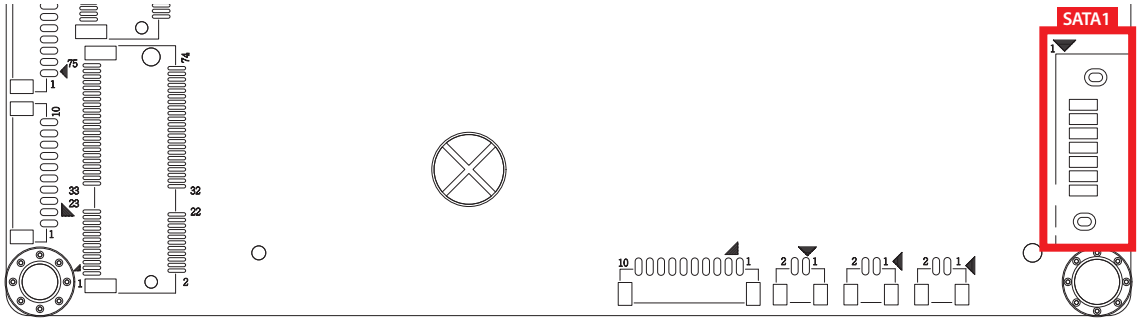
2.4.13 CN1 : DC Power input



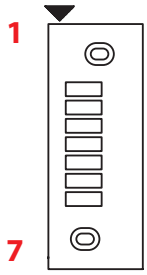
EPBC-2000 supports 12V DC power input by wire-to-board connector in the top side

	Pin No.	Definition	Pin No.	Definition
	1	V-	2	V+

2.4.14 SATA1 : SATA III Connector

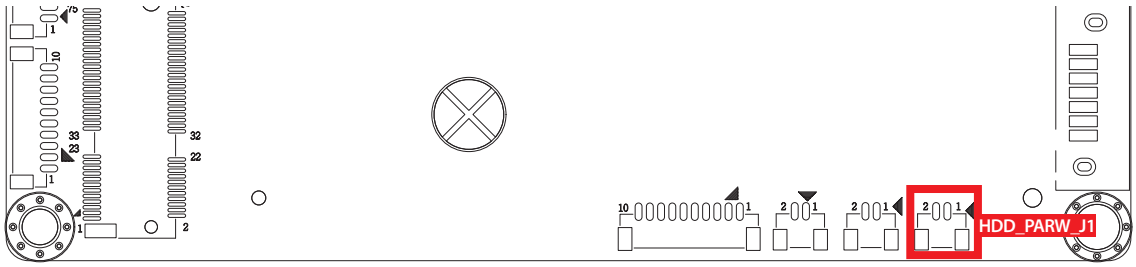


There is a high performance Serial ATA III (SATA III) on the EPBC-2000 series. They support higher storage capacity with less cabling effort and smaller required space. The pin assignments of SATA1 listed in the following table :

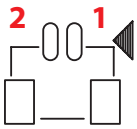


Pin No.	Definition	Pin No.	Definition
1	GND	2	TXP
3	TXN	4	GND
5	RXN	6	RXP
7	GND		

2.4.15 HDD_PWR_J1 : SATA Power Connector

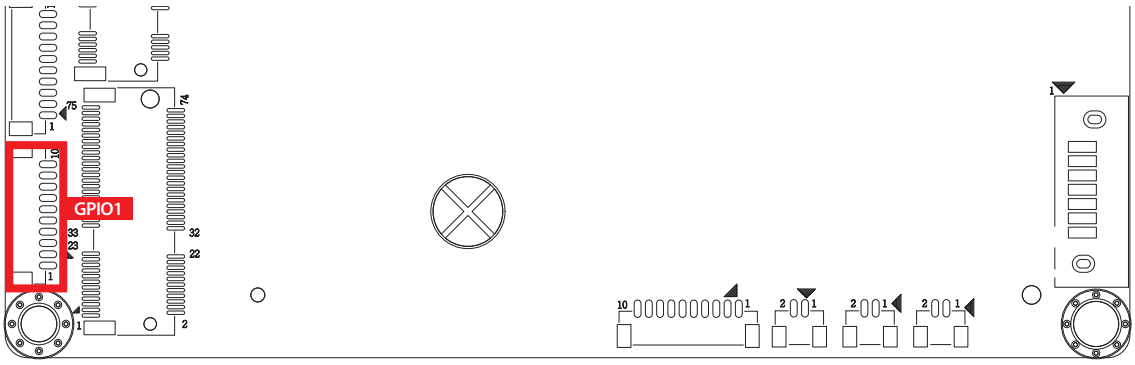


The EPBC-2000 series is also equipped with one SATA power connector. It supports 5V (Up to 1.2A) a to the SSD only. The pin assignments of HDD_PWR_J1 is listed in the following table



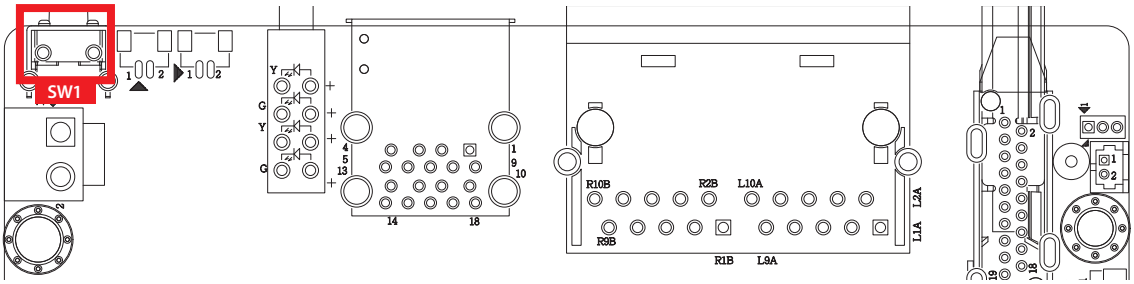
Pin No.	Definition	Pin No.	Definition
1	+5V	2	GND

2.4.16 GPIO1 : 8bit GPIO Header (only support 3.3V)



Pin No.	Definition
1	SIO_GPIO1
2	SIO_GPIO2
3	SIO_GPIO3
4	SIO_GPIO4
5	SIO_GPIO5
6	SIO_GPIO6
7	SIO_GPIO7
8	SIO_GPIO8
9	+3.3V
10	GND

2.4.17 SW1: Power Button

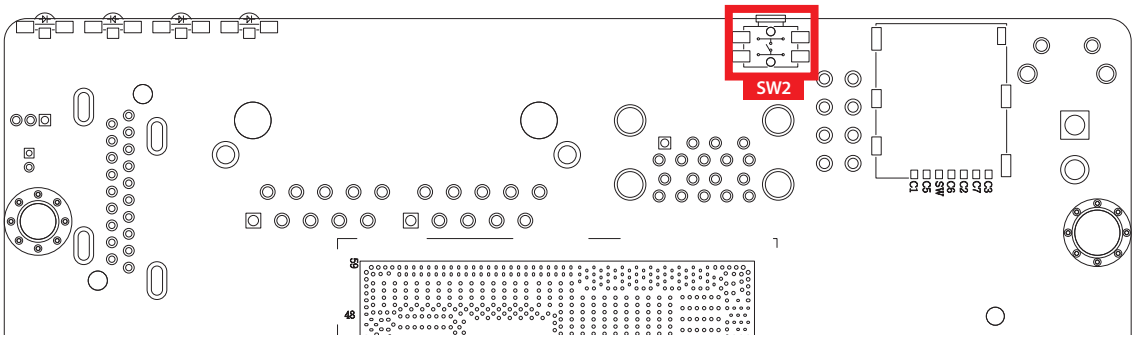


The power button is a non-latched switch. To power on EPBC-2000, press the power button.

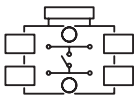
To power off EPBC-2000, you can either command shutdown by OS operation or simply press the power button. If system error appears, press and hold the power button for four seconds to shut down the machine directly.

Please do note that a four-second interval between each two power-on/power-off operation is necessary in normal working status. (For example, once turning off the system, you have to wait for four seconds to initiate another power-on operation)

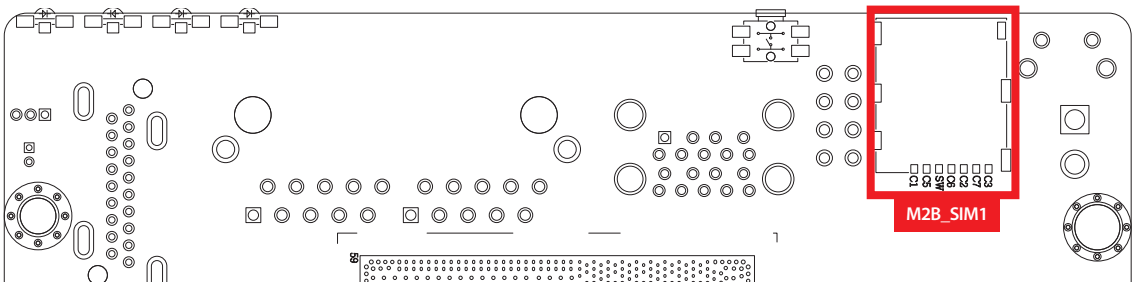
2.4.18 SW2 : RESET Button



Pin assignment as the following table :

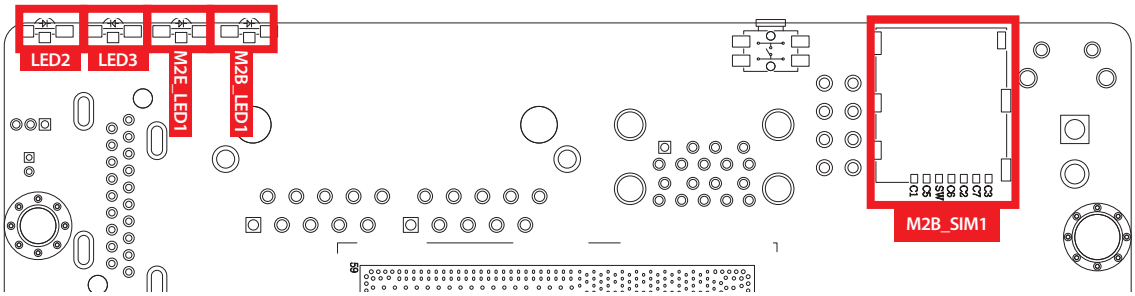
	Pin No.	Definition	Pin No.	Definition
	1	FP_RST_BTN_N	2	GND
	3	FP_RST_BTN_N	4	GND

2.4.19 M2B_SIM1 : Nano SIM Card Socket for M.2 key B Slot



The Nano SIM card socket is support Push-Push type. Please make sure to unplug the system power before inserting the Nano SIM card.

2.4.20 HDD,PWR,WWAN,WLAN LED Indicator



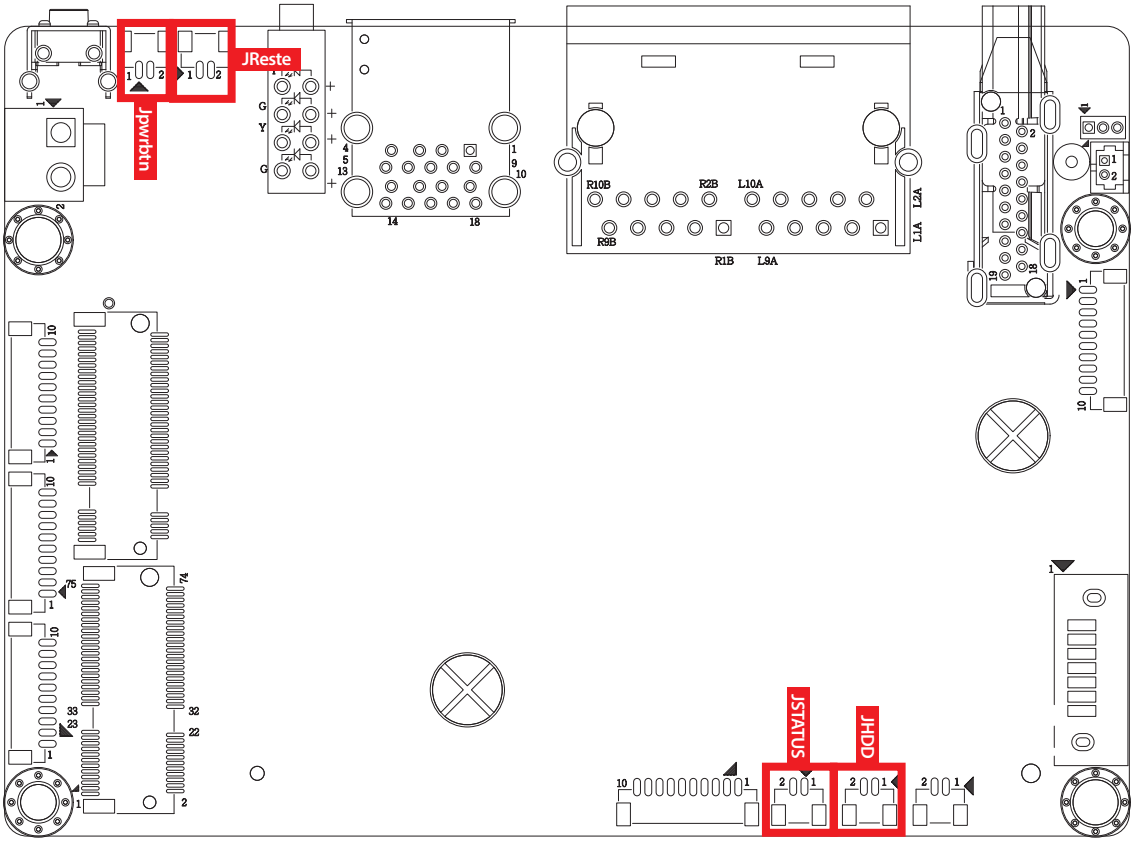
Orange-HDD LED3 :
A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.

Green-Power LED2 :
If the LED is solid green, it indicates that the system is powered on

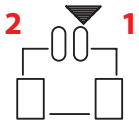
Green-WWAN M2B_LED1 :
If the LED is solid green, it indicates that the device on M2 key-B Socket is working.

Green-WLAN M2E_LED :
If the LED is solid green, it indicates that the device on M2 key-E Socket is working.

2.4.21 Jpwrbtn, JReset, JStatus, JHDD : 1.0mm 2p extend header



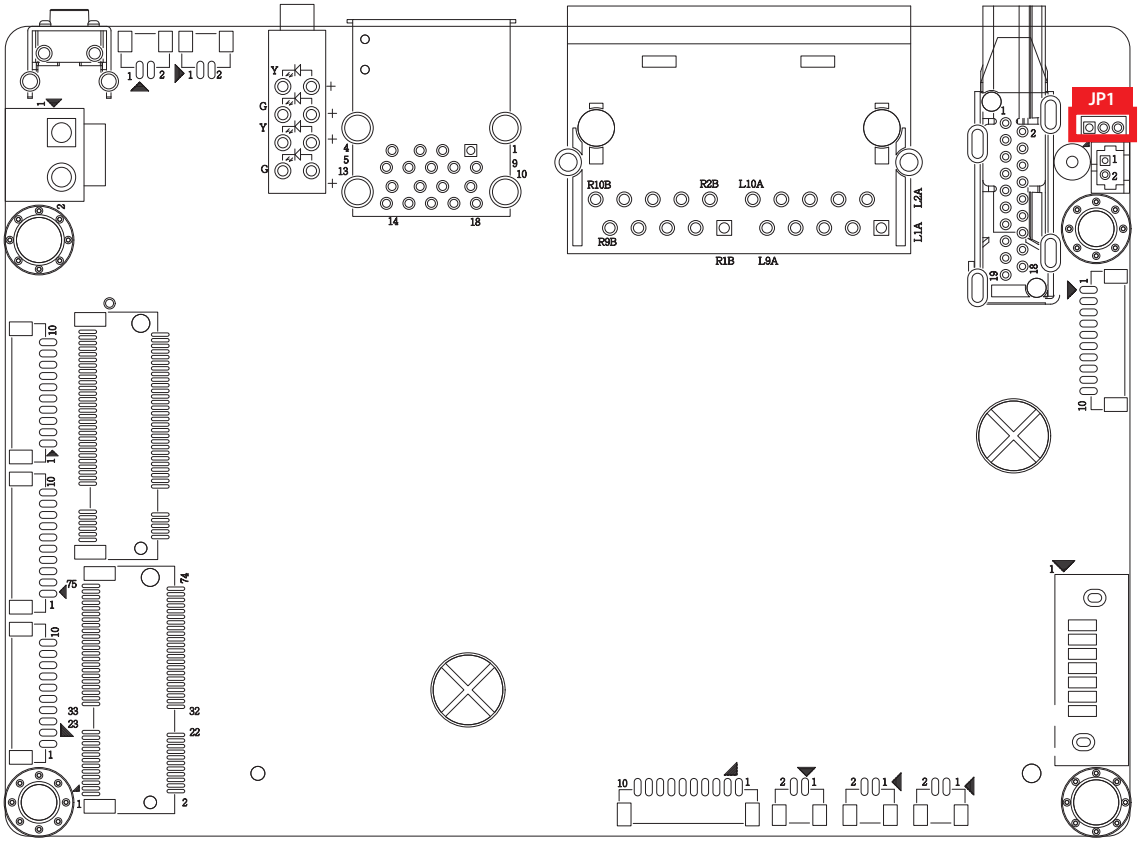
These pin header can be used as a backup for following functions, power button, reset button, power LED indicator and hard drive LED indicator, The pin assignments are listed in the following table :

Serial Port	Group	Pin No.	Definition
	JPWRBTN	1	FP_PWR_BTN_IN
		2	GND
	JRESET	1	FP_RST_BTN_IN
		2	GND
	JSTATUS	1	PWR_LED_P
		2	PWR_LED_N
	JHDD	1	HDD_LED_P
		2	HDD_LED_N

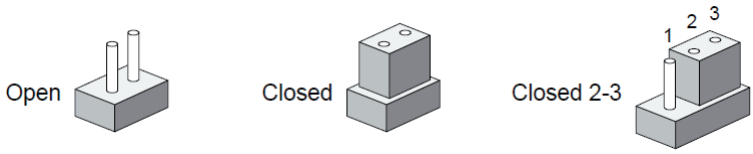
2.5 Main Board Jumper Settings

2.5.1 Top View of PBC-2000 Main Board With Jumper Location

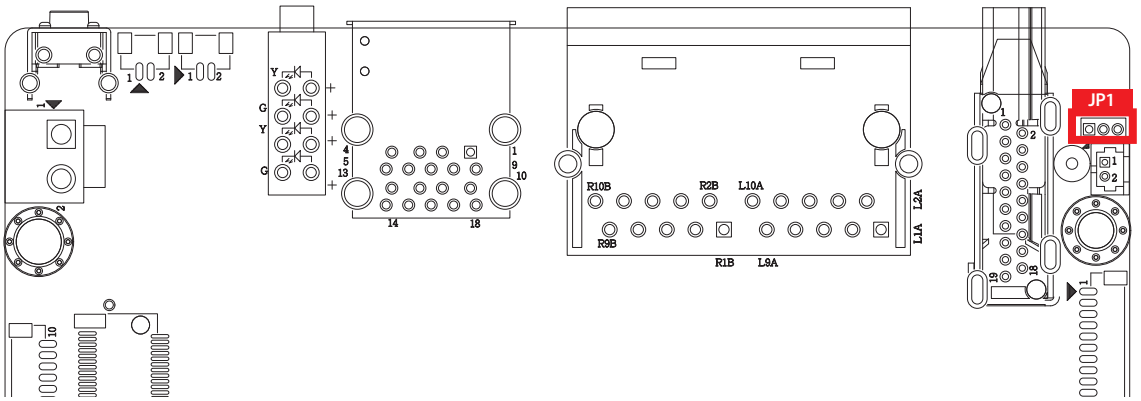
The figure below is the top view of the EPBC-2000 main board. It shows the location of the jumpers.



You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper, you connect the pins with the clip. To "open" a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case you would connect either pins 1 and 2, or 2 and 3.



2.5.2 JP1 : Clear CMOS



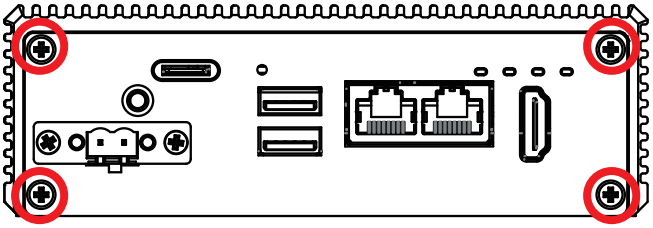
	Pin No.	Definition
1 3	1-2	Normal (default)
	2-3	Clear CMOS

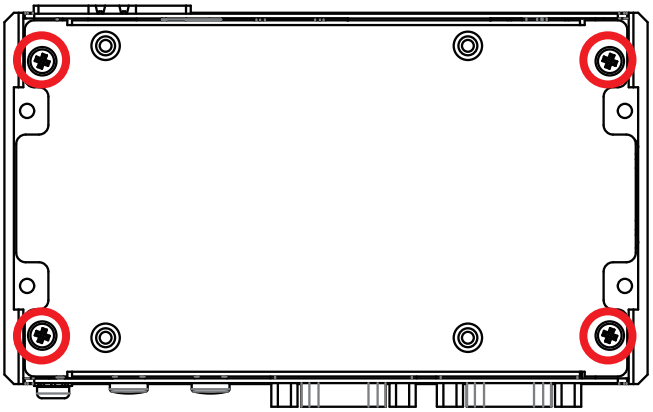
3

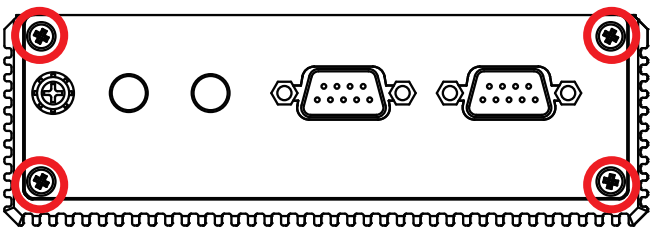
SYSTEM SETUP

3.1 How to Open Your PBC-2000

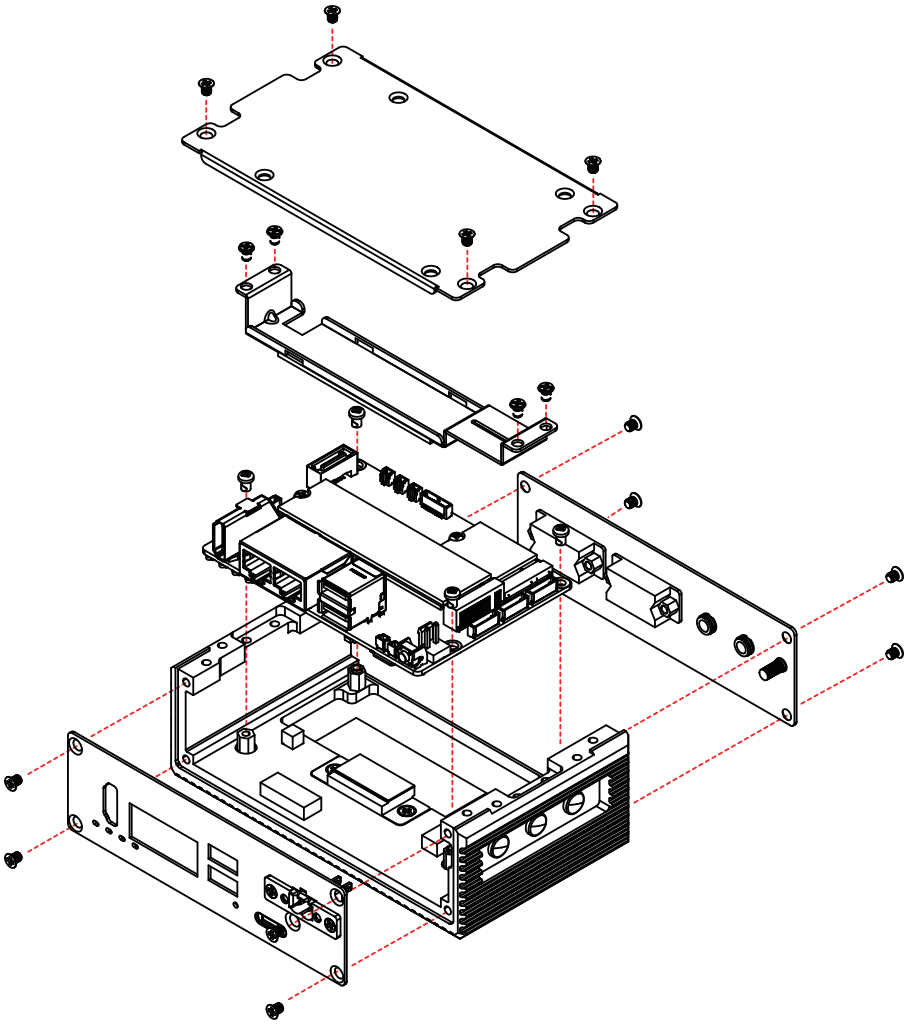
Step 1 Remove the screws securing the front panel, rear panel, and bottom cover.





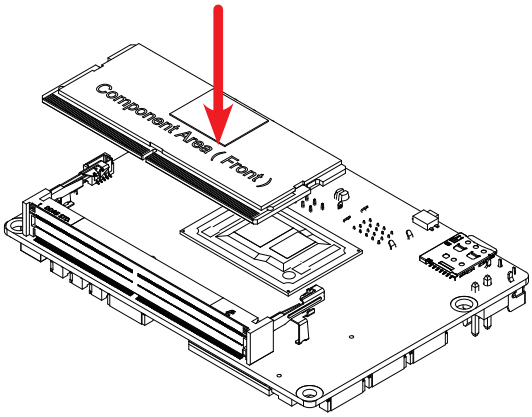


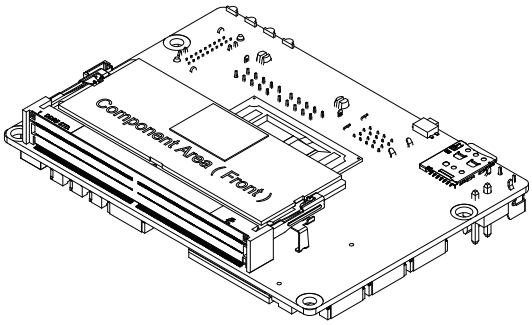
Step 2 The removal procedure of system components is illustrated in the diagram below.



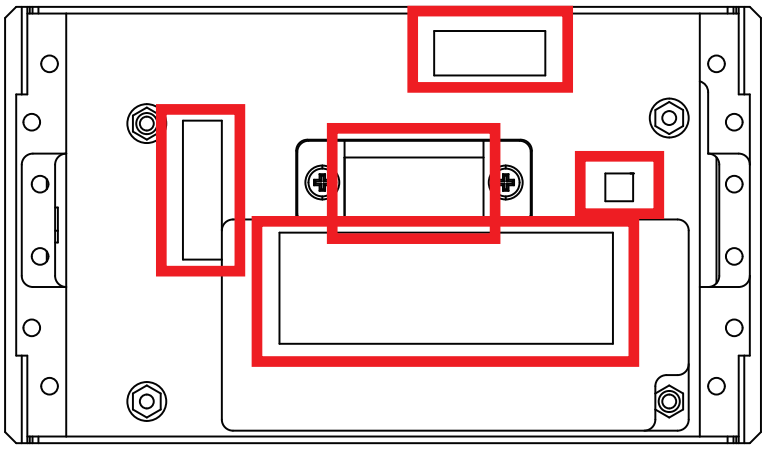
3.2 Installing DDR5 SO-DIMM Modules

Step 1 Install DDR5 SO-DIMM in Socket.

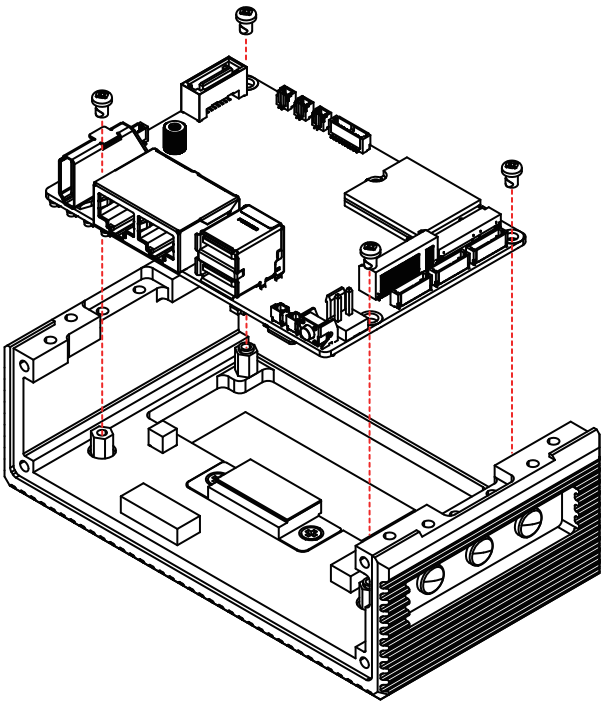




Step 2 Remove the release liner from the top cover.



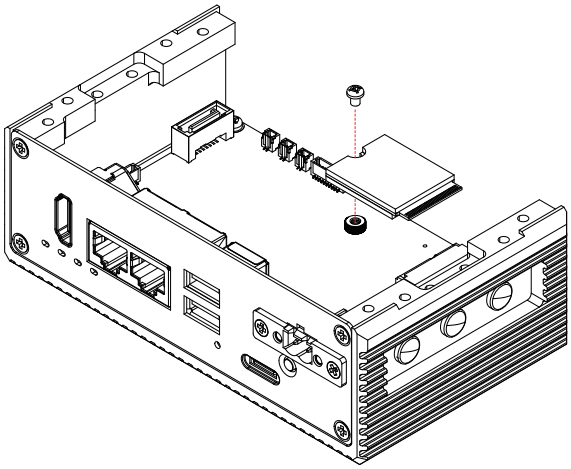
Step 3 Assemble the motherboard and top cover using M3x4L P head screws.



3.3 Installing M.2

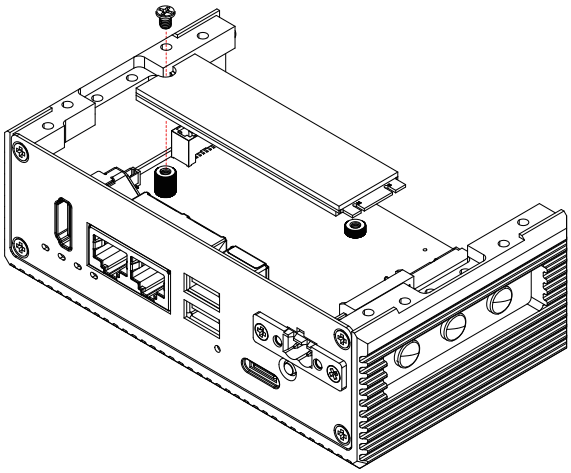
3.3.1 Key E 2230

Step 1 Install M.2 into the M.2 slot and fasten M2.5 (P Head) screw indicated.

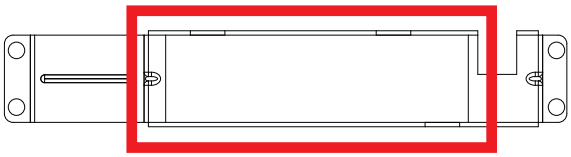


3.3.2 Key B 2280

Step 1 Install M.2 into the M.2 slot and fasten M3 (I Head) screw indicated.

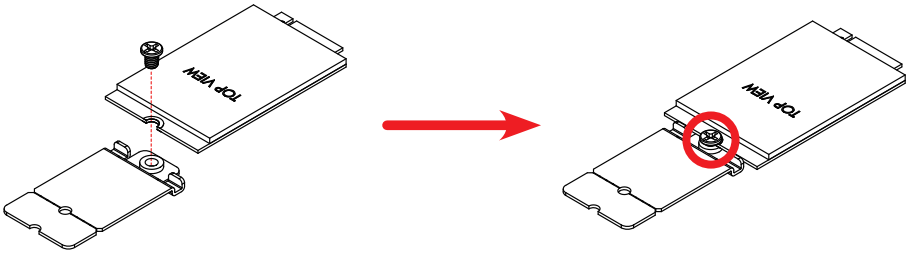


Step 2 Remove release liner.

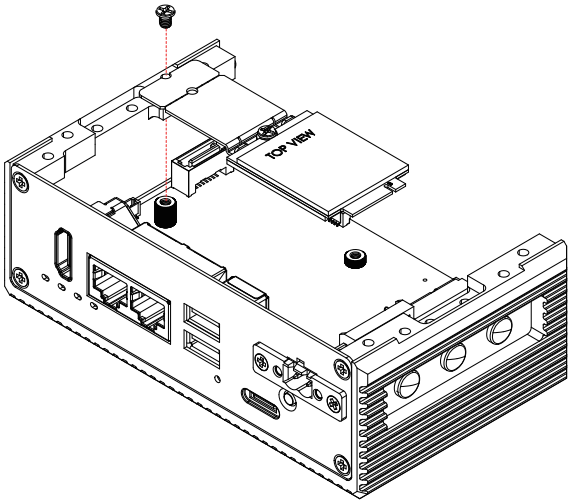


3.3.3 Key B 3042

Step 1 Install the M.2 module and M.2 bracket with I Head M3x4L screw to ensure proper fastening.

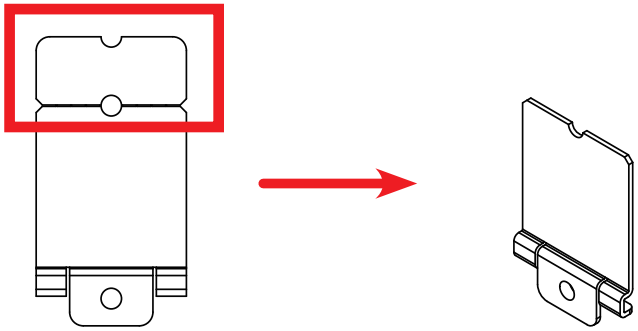


Step 2 Install M.2 into the M.2 slot and fasten M3 (I Head) screw indicated.

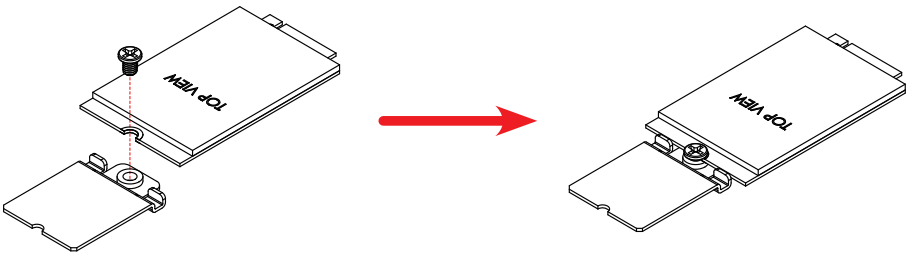


3.3.4 Key B 3052

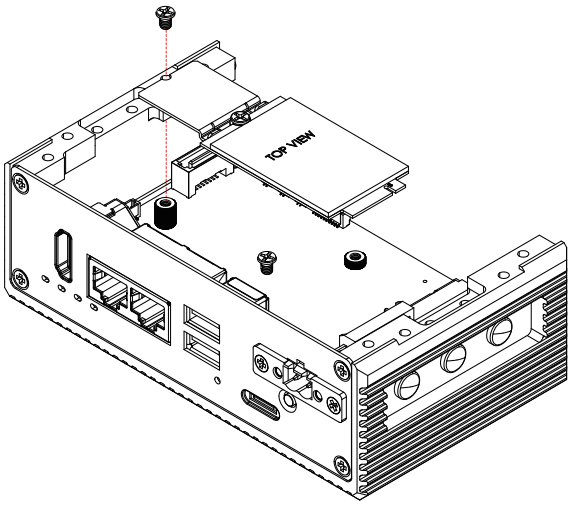
Step 1 Removal procedure of system components is illustrated in the diagram below.



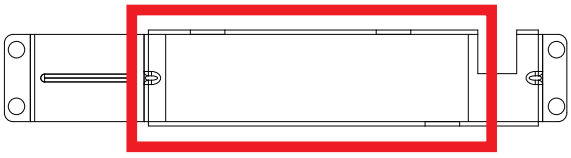
Step 2 Install the M.2 module and M.2 bracket with I Head M3x4L screw to ensure proper fastening.



Step 3 Install M.2 into the M.2 slot and fasten M3 (I Head) screw indicated.



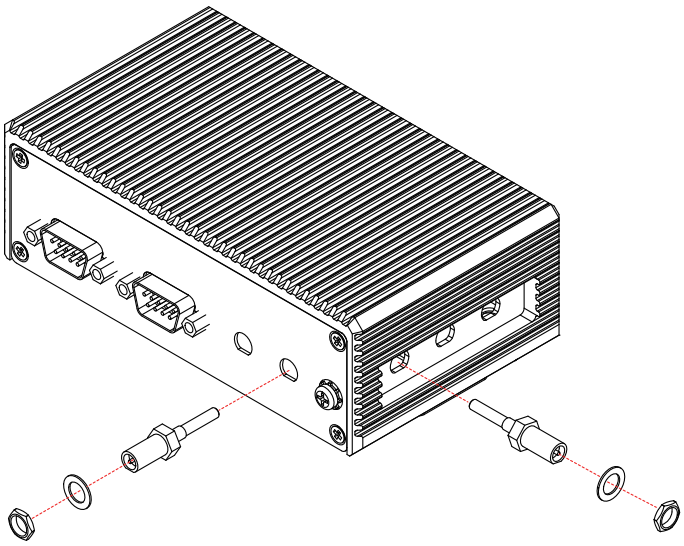
Step 4 Remove release liner.



3.4 Installing Antenna cable

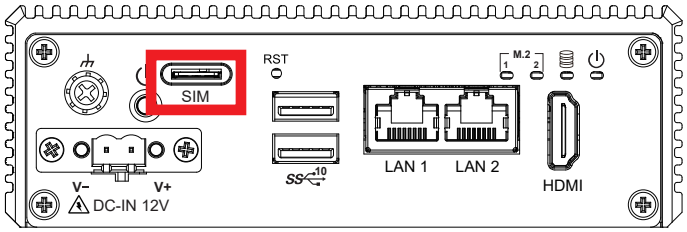
Step 1 Check antenna cable and washers.

Step 2 Install antenna cable and then fasten washer and nut.



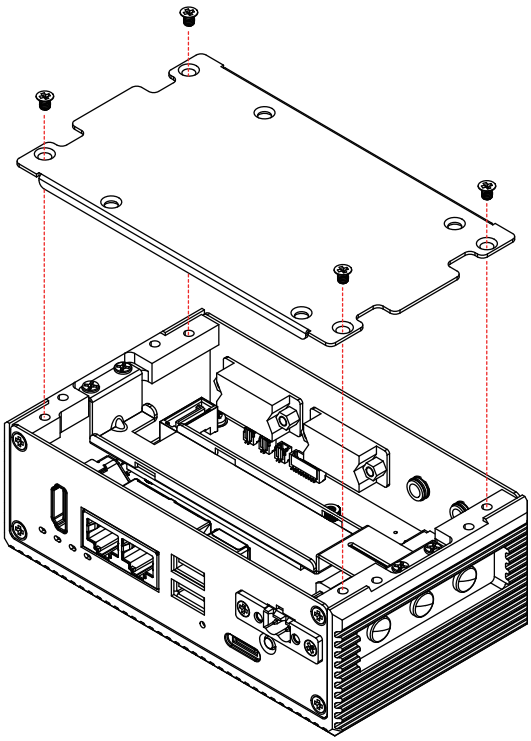
3.5 Installing SIM Card

Install SIM card into to the SIM card slot.

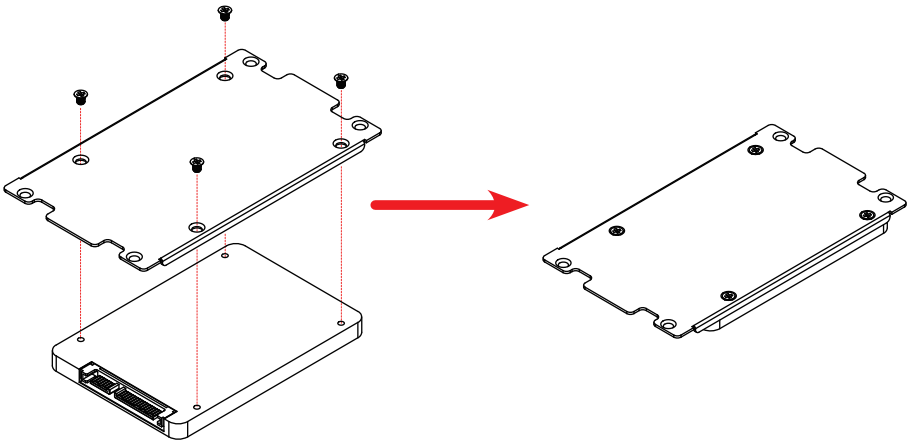


3.6 Installing SSD/HDD

Step 1 Remove the bottom cover.

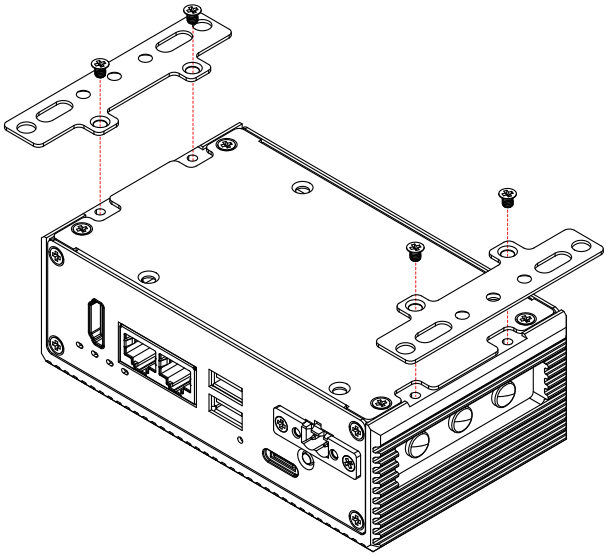


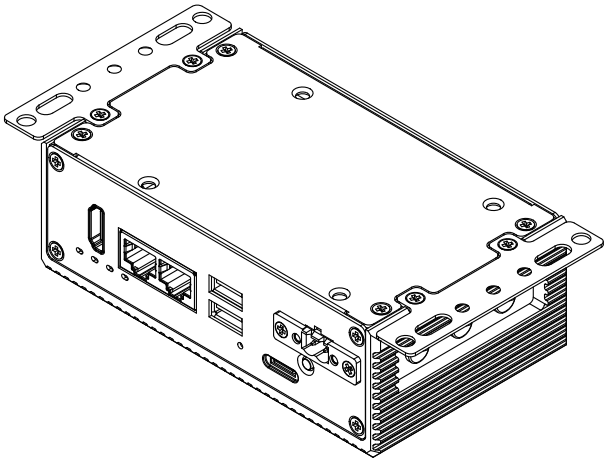
Step 2 Install four flat head M3x4L screws to lock bottom cover.



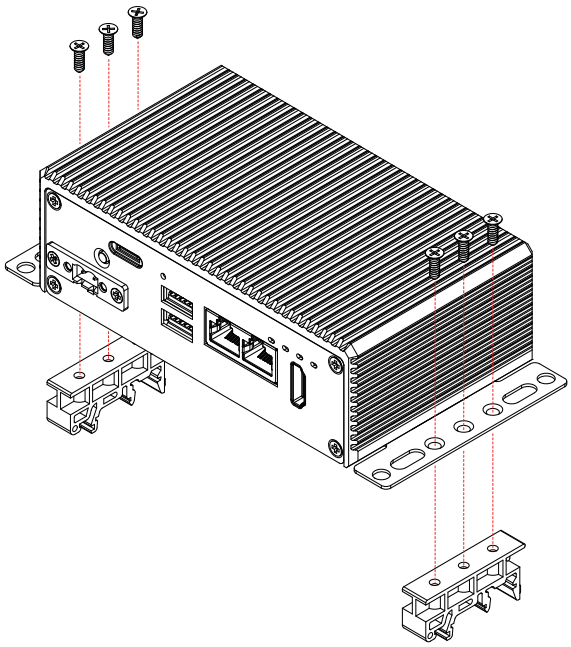
3.7 Mounting Your PBC-2000

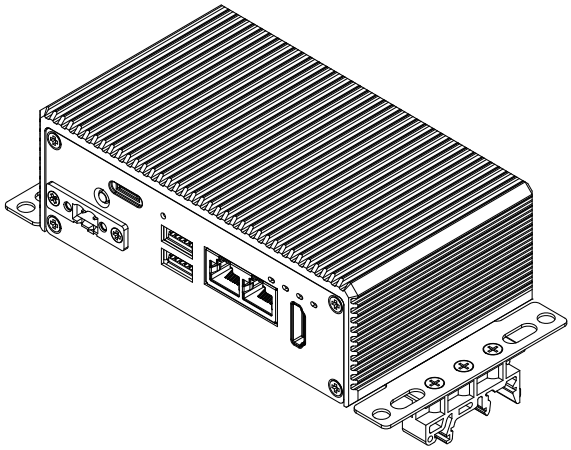
Step 1 Install four flat head M3x4L screws to lock wall mount bracket.





Step 2 Install six flat head M3x4L screws to lock DIN Rail Kit.





4

BIOS SETUP

4.1 BIOS Setup

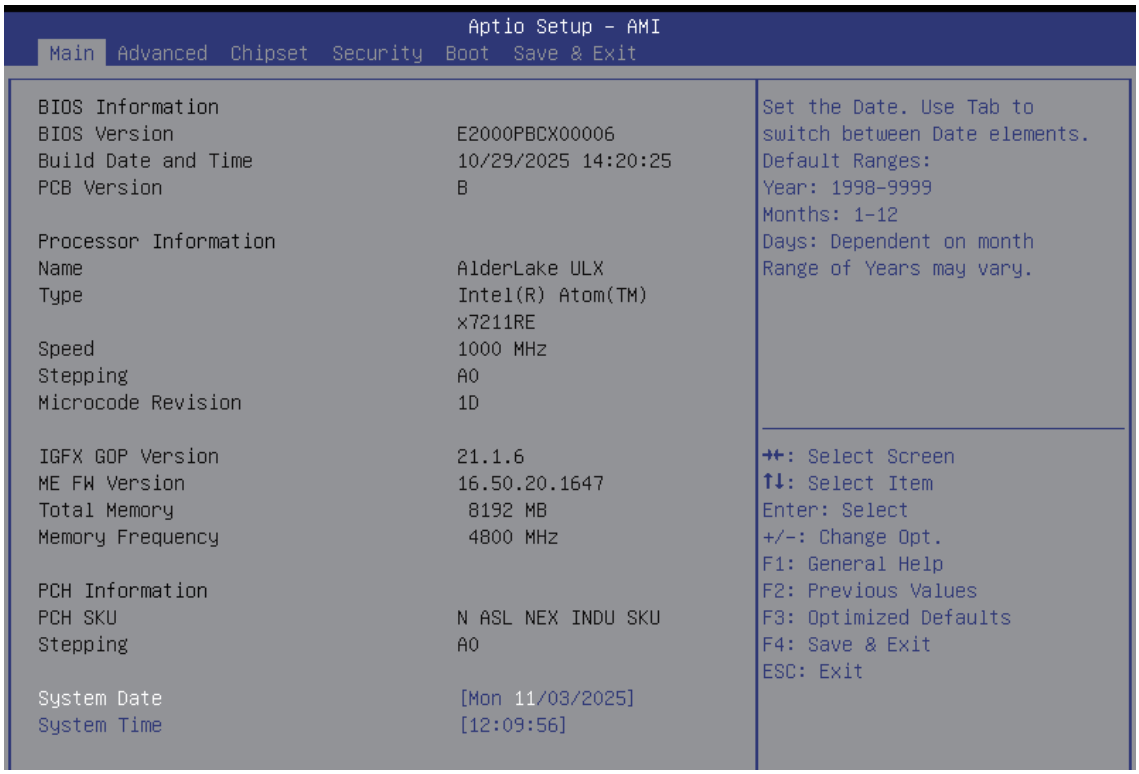


Figure 4-1 : Entering Setup Screen

BIOS provides an interface for users to check and change system configuration. The BIOS setup program is accessed by pressing the <Del> key when POST display output is shown.

4.2 Main Menu

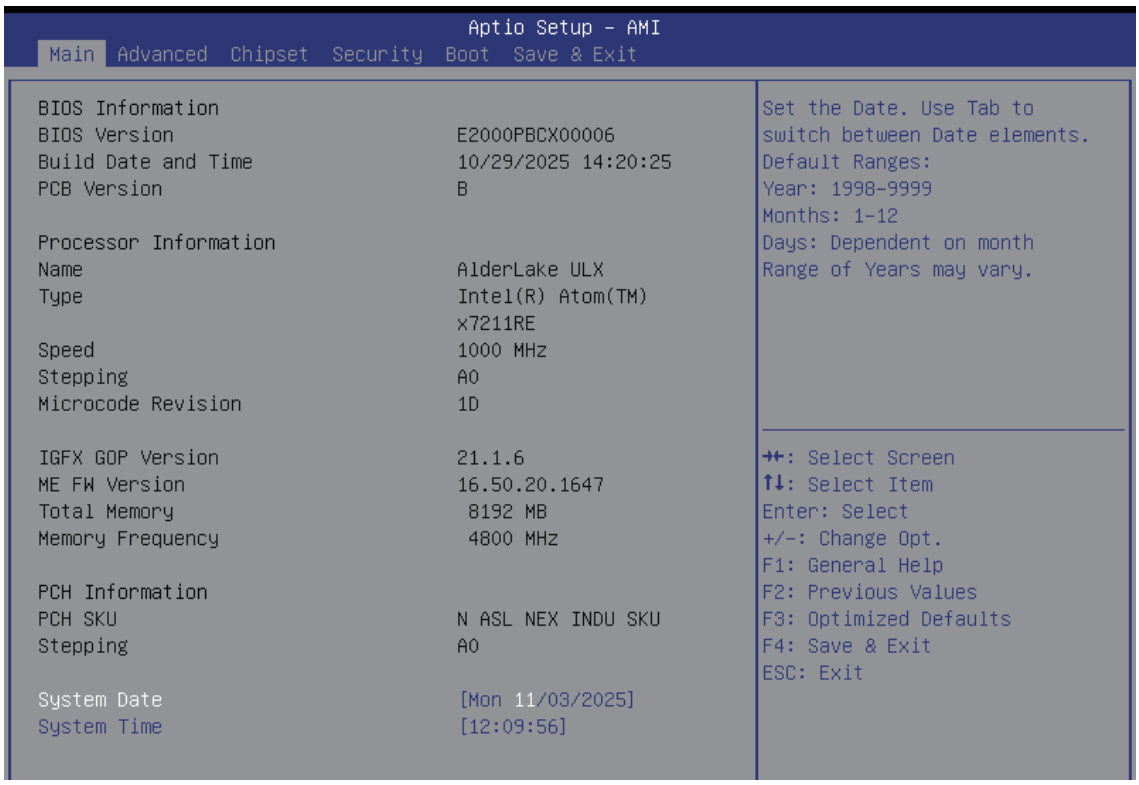


Figure 4-2 : Main Menu

The main menu displays BIOS version and system information. There are two options on the main menu, system date and system time.

System Date

Set the Date. Use <Tab> to switch between Date elements.
Default Ranges:
Year: 1998-9999
Months: 1-12
Days: Dependent on month
Range of Years may vary.

System Time

Set the Time. Use <Tab> to switch between Time elements.

4.3 Advanced Menu

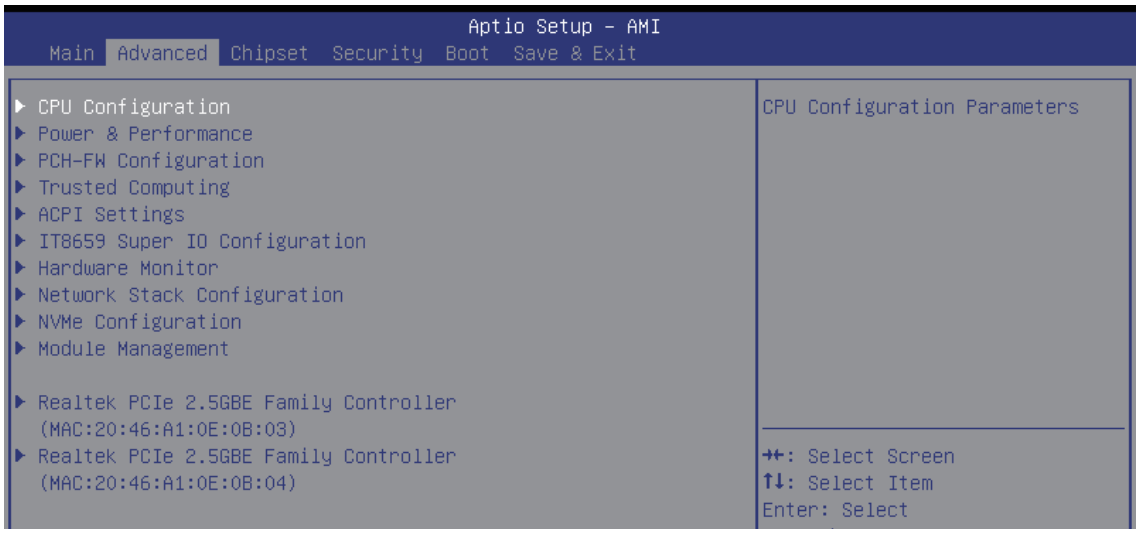


Figure 4-3 : Advanced menu

Select advanced tab to enter advanced BIOS setup options, such as CPU configuration, ACPI settings, and Super IO configuration.

4.3.1 CPU Configuration

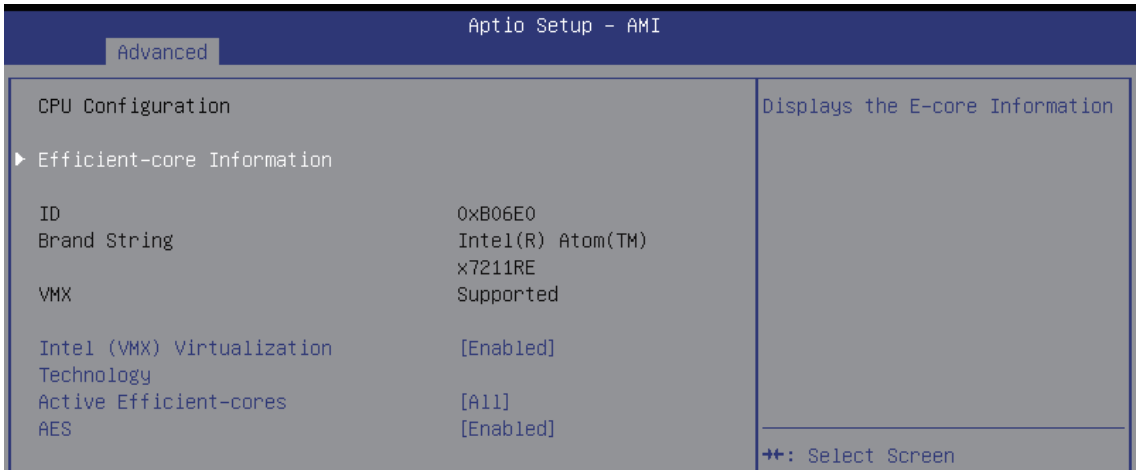


Figure 4-3-1 : CPU Configuration

Efficient-core Information

Displays the E-core Information.

Intel (VMX) Virtualization Technology

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Active Efficient-cores
Number of E-cores to enable in each processor package. Note: Number of Cores and E-cores are looked at together. When both are {0,0}, Pcode will enable all cores.

AES
Enable/Disable AES (Advanced Encryption Standard).

4.3.2 CPU - Power Management Control

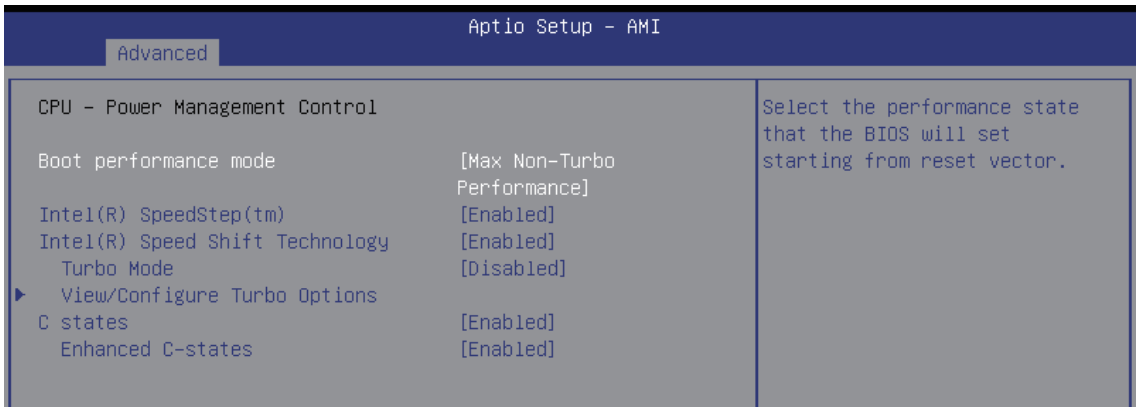


Figure 4-3-2 : CPU - Power Management Control

Boot performance mode
Select the performance state that the BIOS will set starting from reset vector.

Intel(R) SpeedStep(tm)
Allows more than two frequency ranges to be supported.

Intel(R) Speed Shift Technology
Enable/Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

Turbo Mode
Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.

View/Configure Turbo Options
View/Configure Turbo Options

C states
Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.

Enhanced C-states
Enable/Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.

4.3.3 PCH-FW Configuration

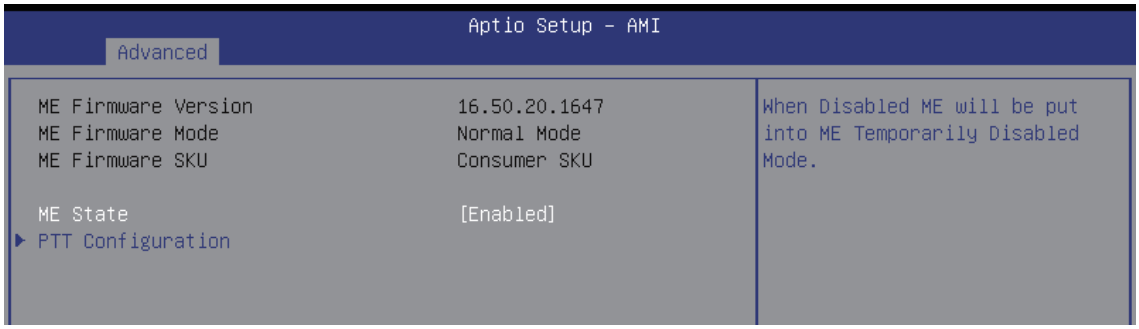


Figure 4-3-3-1 : PCH-FW Configuration

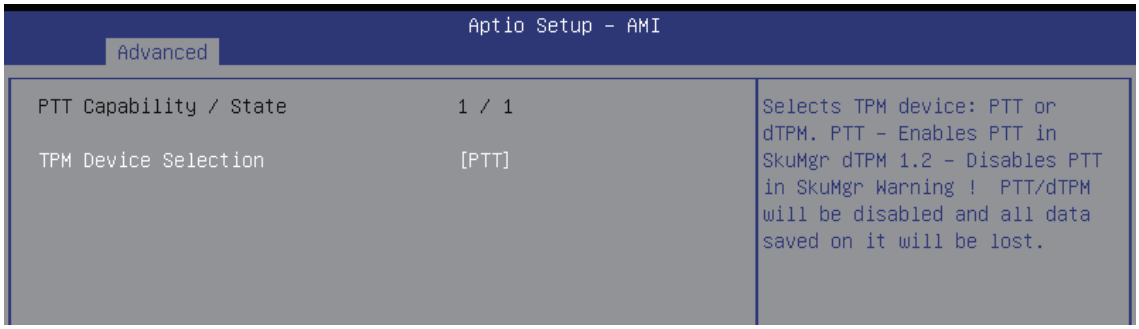


Figure 4-3-3-2 : PTT Configuration

ME State

When Disabled ME will be put into ME Temporarily Disabled Mode.

TPM Device Selection

Selects TPM device: PTT or discrete TPM.
PTT - Enables PTT in SkuMgr dTPM - Disables PTT in SkuMgr Warning! PTT/dTPM will be disabled and all data saved on it will be lost.

4.3.4 Trusted Computing

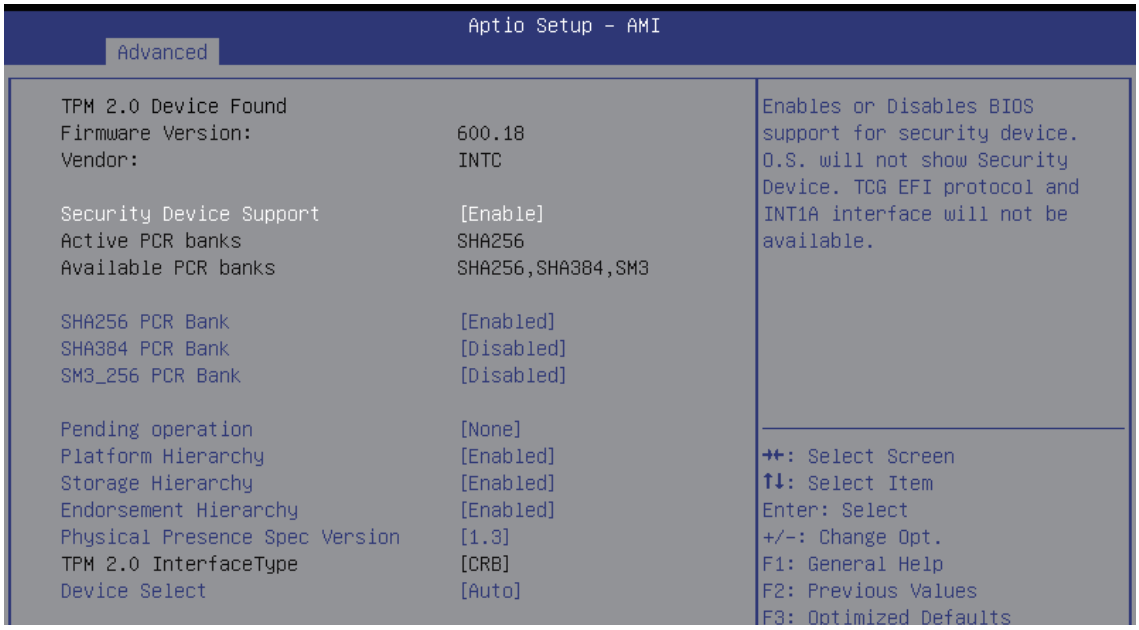


Figure 4-3-4 : Trusted Computing

Control the TPM device status and display related information if TPM chip is present.

4.3.5 ACPI Settings

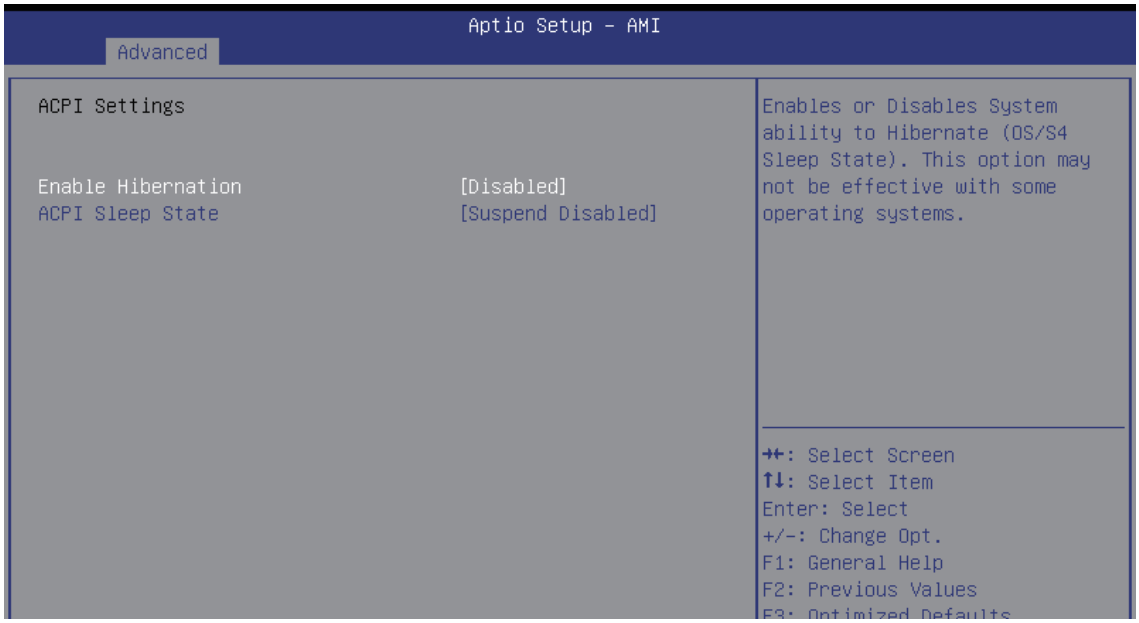


Figure 4-3-5 : ACPI Settings

Enable Hibernation

Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems.

ACPI Sleep State

Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

4.3.6 Super IO Configuration

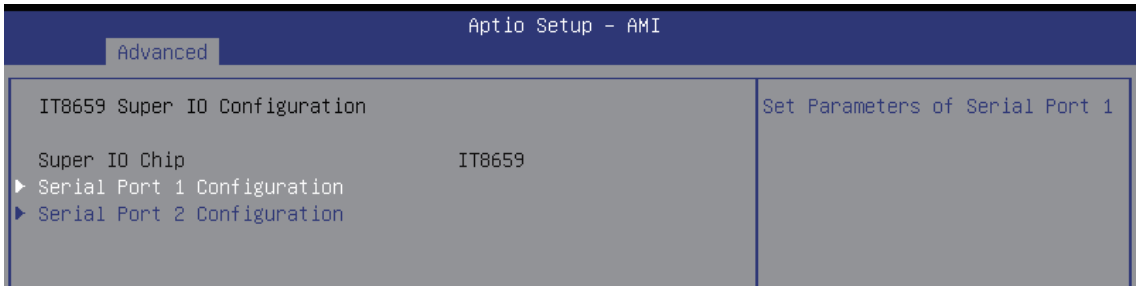


Figure 4-3-6-1 : Super IO Configuration

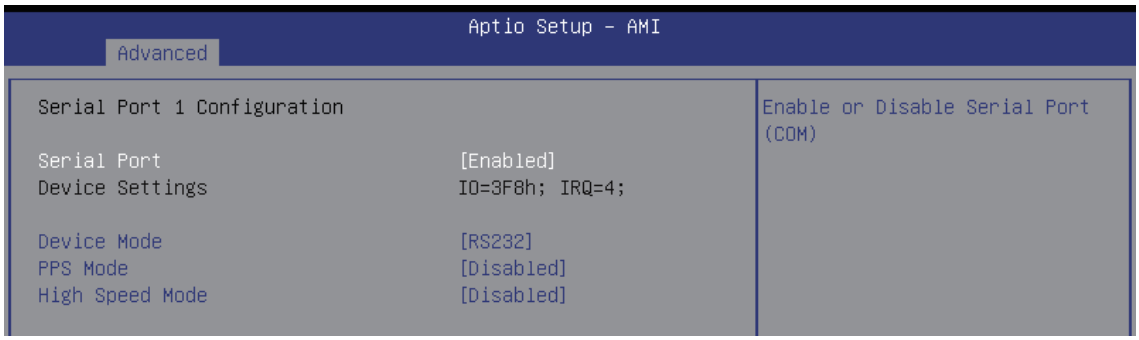


Figure 4-3-6-2 : Serial Port X Configuration

Serial Port X Configuration
Enable or Disable Serial Port (COM)

Device Mode
Select Device Mode.

PPS Mode
Enable or Disable PPS.

High Speed Mode (Port 1 only)
Enable or Disable Serial Port High Speed.

4.3.7 Hardware Monitor

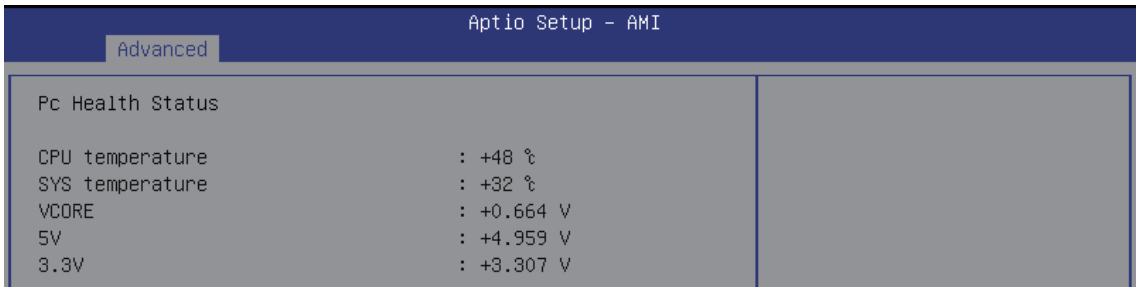


Figure 4-3-7 : Hardware Monitor

The IT8659 SIO features an enhanced hardware monitor providing thermal and system voltage status monitoring.

4.3.8 Network Stack Configuration

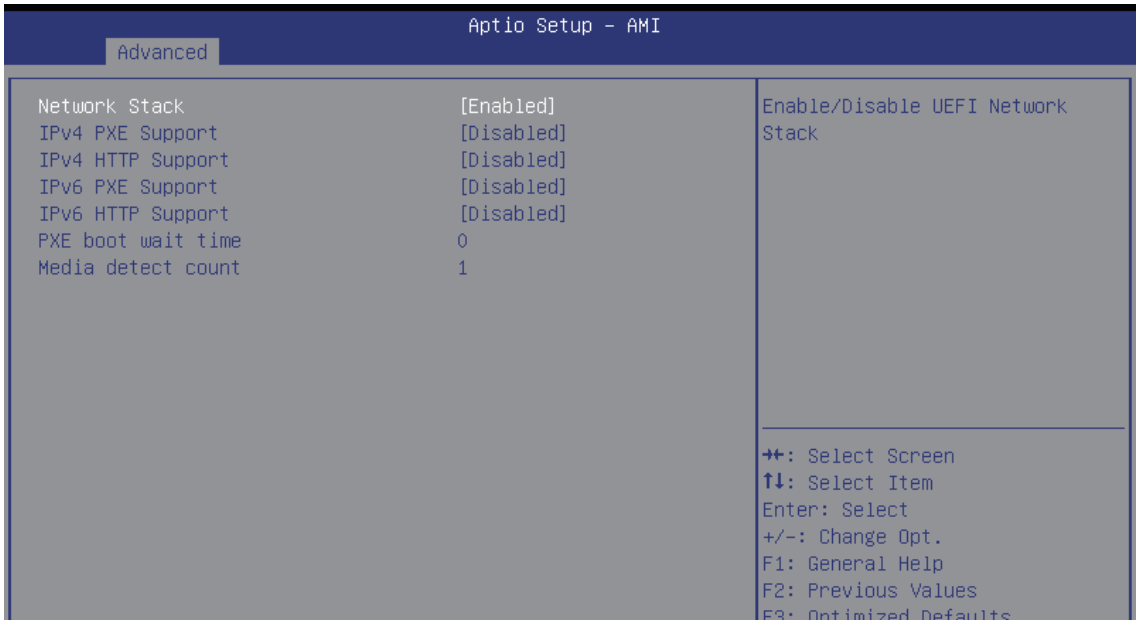


Figure 4-3-8 : Network Stack Configuration

Network Stack
Enable/Disable UEFI Network Stack.

IPv4 PXE Support
Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

IPv4 HTTP Support
Enable/Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.

IPv6 PXE Support
Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.

IPv6 HTTP Support
Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.

PXE boot wait time
Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

Media detect count
Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

4.3.9 NVMe Configuration

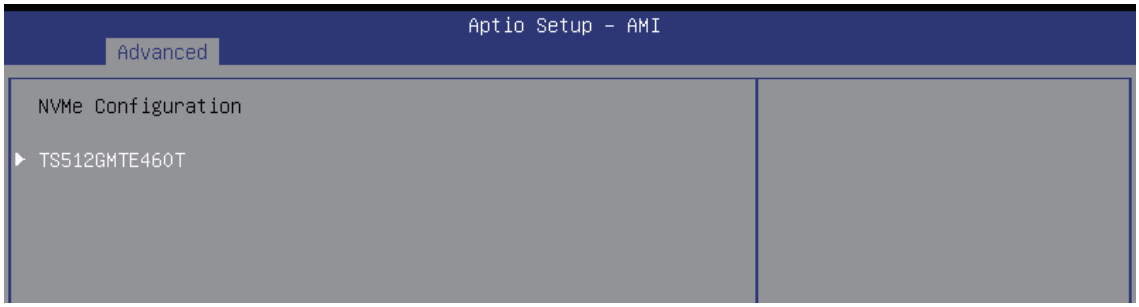


Figure 4-3-9 : NVMe Configuration

Display NVMe controller and Drive information.

4.3.10 Module Management

Figure 4-3-10 : Module Management

Specific device workaround

Workaround for specific device. (Boot delay / Warm reset / Cold reset)

Delay Time

Workaround Delay Time 0~255 (second).

4.4 Chipset Menu

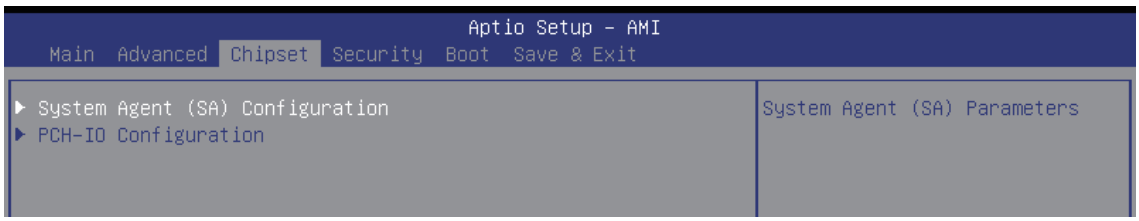


Figure 4-4 : Chipset Menu

Select Chipset tab to enter chipset BIOS setup options, such as System Agent (SA) Configuration, PCH-IO Configuration.

4.4.1 System Agent (SA) Configuration

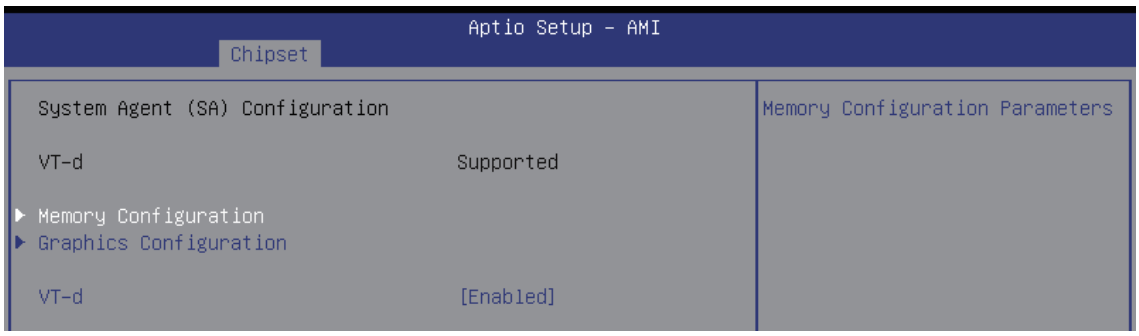


Figure 4-4-1 : System Agent (SA) Configuration

VT-d

VT-d capability.

4.4.2 Memory Configuration

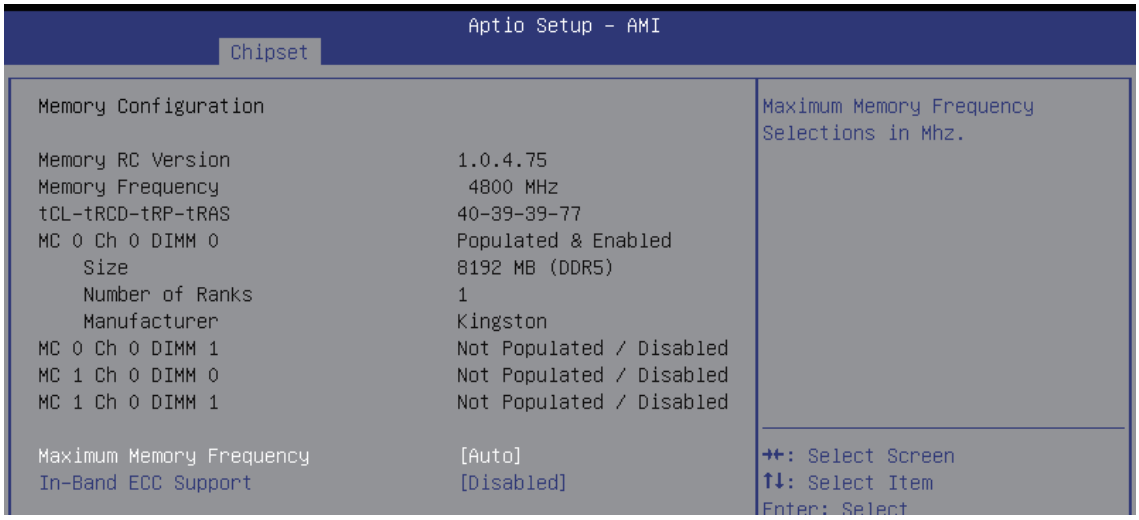


Figure 4-4-2 : Memory Configuration

Maximum Memory Frequency

Maximum Memory Frequency Selections in Mhz.

In-Band ECC Support

Enable/Disable In-Band ECC. Will be enabled if memory has symmetric configuration. (Supported only in Chrome systems.)

4.4.3 Graphics Configuration

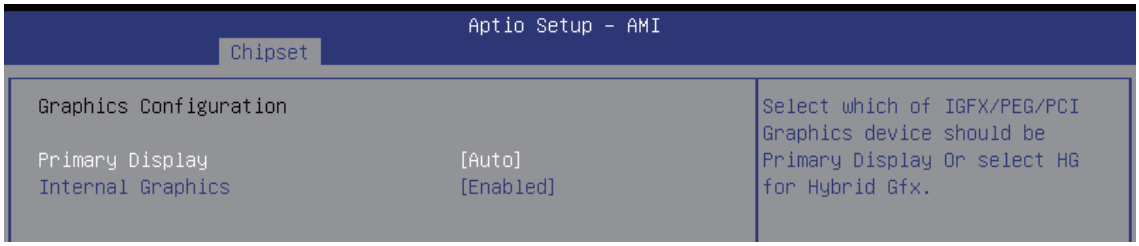


Figure 4-4-3 : Graphics Configuration

Primary Display

Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select HG for Hybrid Gfx.

Internal Graphics

Keep IGFX enabled based on the setup options.

4.4.4 PCH-IO Configuration

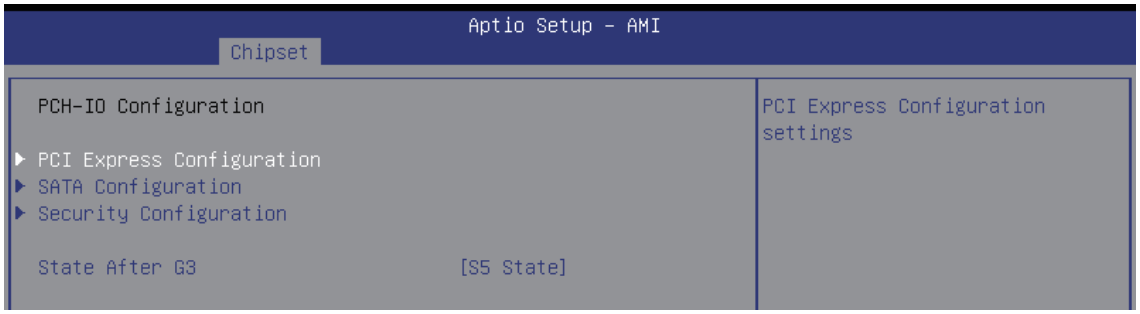


Figure 4-4-4 : PCH-IO Configuration

State After G3

Specify what state to go to when power is re-applied after a power failure (G3 state).
S0 State: Always turn-on the system when power source plugged-in.
S5 State: Always turn-off the system when power source plugged-in.

4.4.5 PCI Express Configuration

```
Aptio Setup - AMI
Chipset

PCI Express Configuration                          PCI Express Root Port Settings.

PCI Express Root Port 1          Lane configured as
                                 USB/SATA/UFS
PCI Express Root Port 2          Lane configured as
                                 USB/SATA/UFS
PCI Express Root Port 3          Lane configured as
                                 USB/SATA/UFS
PCI Express Root Port 4          Lane configured as
                                 USB/SATA/UFS
PCI Express Root Port 5          Not present in this SKU
PCI Express Root Port 6          Not present in this SKU
▶ PCI Express Root Port 7
PCI Express Root Port 8          Not present in this SKU    →←: Select Screen
▶ PCI Express Root Port 9                                   ↑↓: Select Item
▶ PCI Express Root Port 10                                  Enter: Select
PCI Express Root Port 11         Lane configured as         +/-: Change Opt.
                                 USB/SATA/UFS               F1: General Help
PCI Express Root Port 12         Lane configured as         F2: Previous Values
                                 USB/SATA/UFS               F3: Optimized Defaults
```

Figure 4-4-5-1 : PCI Express Configuration

```
Aptio Setup - AMI
Chipset

PCI Express Root Port 7          [Enabled]          Control the PCI Express Root
PCIe Speed                       [Auto]             Port.
```

Figure 4-4-5-2 : PCI Express Root Port X

PCI Express Root Port X

Control the PCI Express Root Port.

PCIe Speed

Configure PCIe Speed.

4.4.6 SATA Configuration

```
Aptio Setup - AMI
Chipset

SATA Configuration                                 Enable/Disable SATA Device.

SATA Controller(s)               [Enabled]

Serial ATA Port 0                Empty
Serial ATA Port 1                Empty
```

Figure 4-4-6 : SATA Configuration

SATA Controller(s)

Enable/Disable SATA Device.

4.5 Security Menu

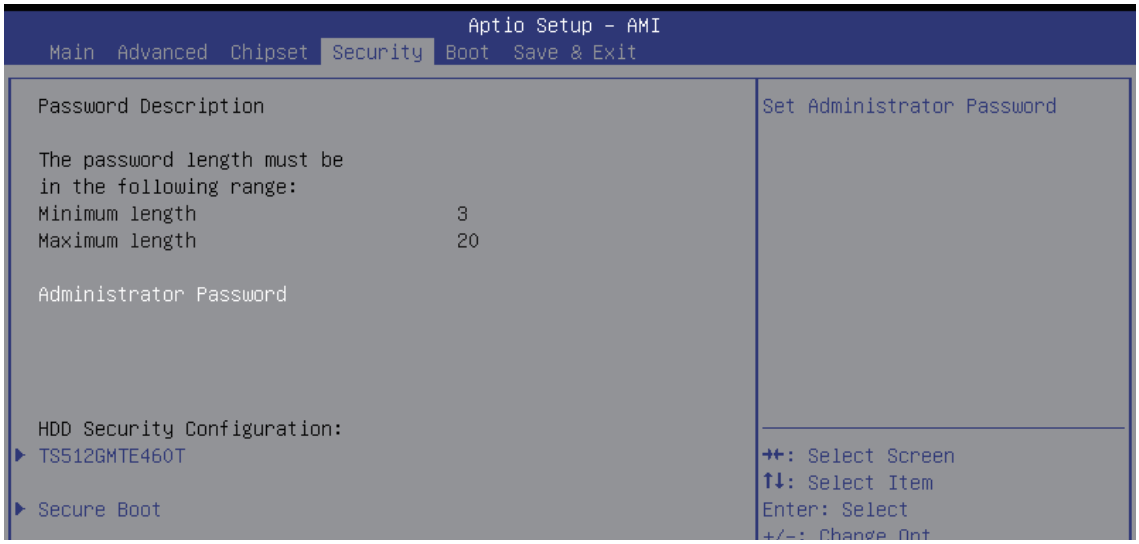


Figure 4-5 : Security Menu

Administrator Password

Set Administrator Password.

4.5.1 HDD Security Configuration

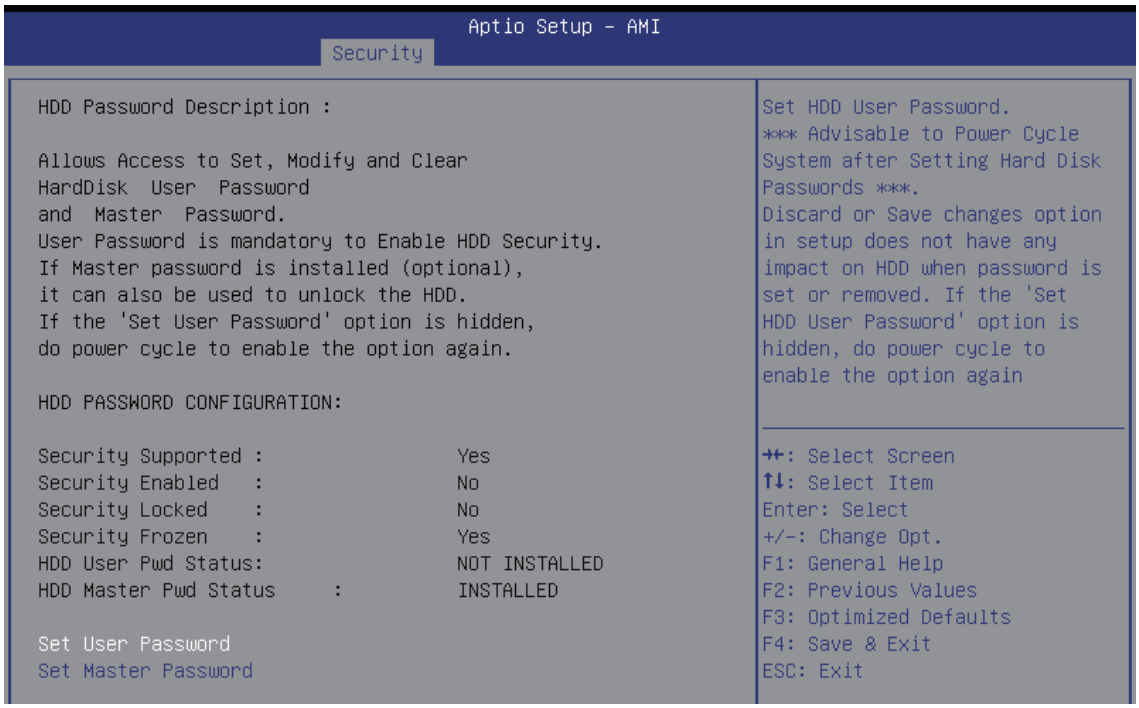


Figure 4-5-1 : HDD Security Configuration

Set User Password

Set HDD User Password.

*** Advisable to Power Cycle System after Setting Hard Disk Passwords ***.

Discard or Save changes option in setup does not have any impact on HDD when password is set or removed. If the 'Set HDD User Password' option is hidden, do power cycle to enable the option again.

Set Master Password

Set Master Password.

4.5.2 Secure Boot

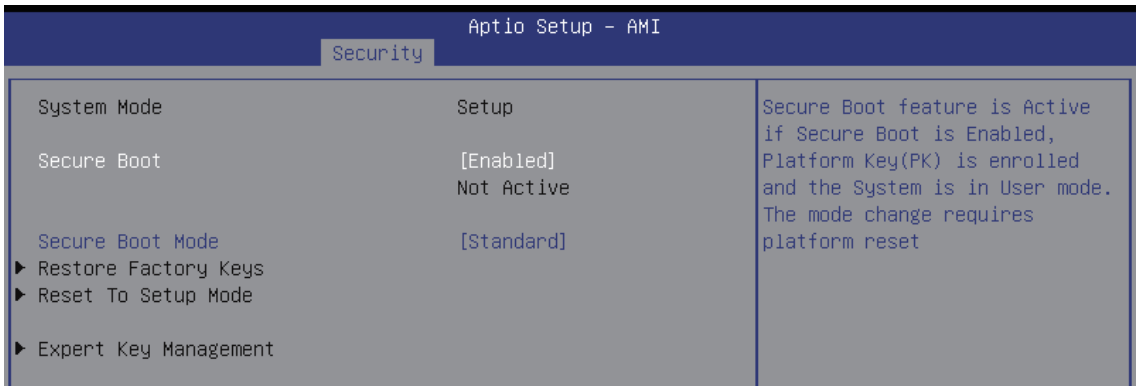


Figure 4-5-2 : Secure Boot

Secure Boot
Secure Boot feature is Active if Secure Boot is Enabled, Platform Key(PK) is enrolled and the System is in User mode. The mode change requires platform reset.

Secure Boot Mode
Secure Boot mode options: Standard or Custom.

In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication

Restore Factory Keys
Force System to User Mode. Install factory default Secure Boot key databases

Reset To Setup Mode
Delete all Secure Boot key databases from NVRAM

Expert Key Management
Enables expert users to modify Secure Boot Policy variables without variable authentication

4.6 Boot Menu

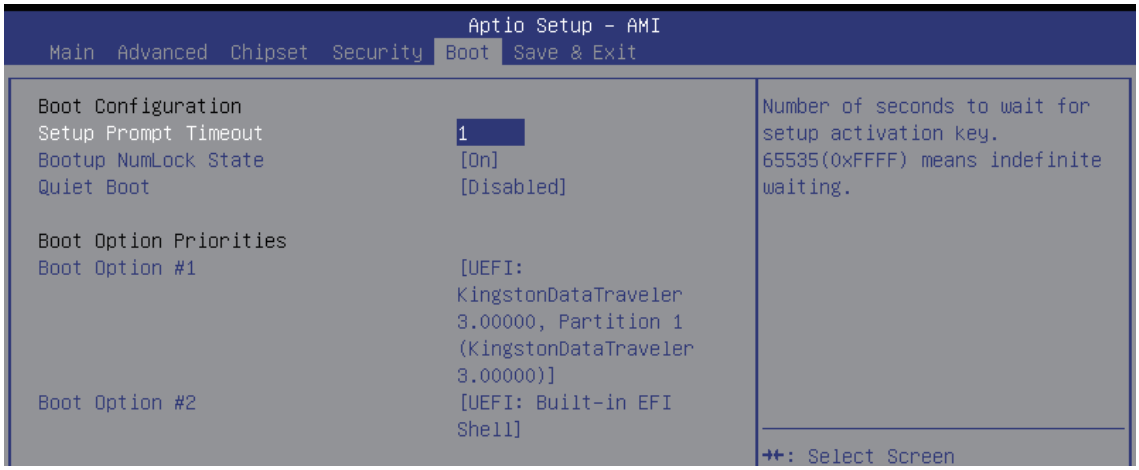


Figure 4-6 : Boot Menu

Setup Prompt Timeout

Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

Bootup NumLock State

Select the keyboard NumLock state.

Quiet Boot

Enables or disables Quiet Boot option.

Boot Option Priorities

Sets the system boot order.

4.7 Save & Exit

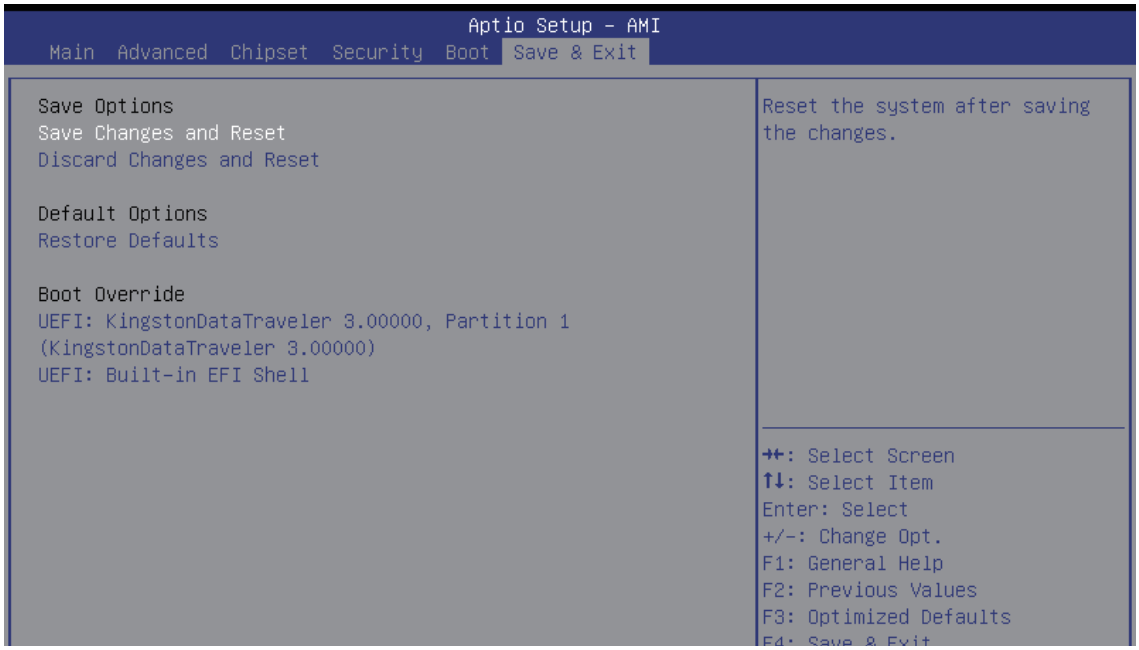


Figure 4-7 : Save & Exit

Save Changes and Reset

Reset the system after saving the changes.

Discard Changes and Reset

Reset system setup without saving any changes.

Restore Defaults

Restore/Load Default values for all the setup options.

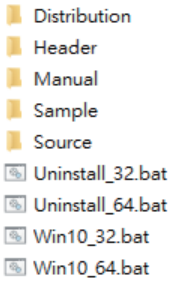
APPENDIX A : GPIO Guide

A.1 Function Description

The PBC-2000 offers a watchdog timer.

A.2 Software Package Contain

Distribution folders include x32 and x64 versions, use the batch file for driver installation.



There are included as fallowed:

Win10_32.bat, and Win10_64.bat:

Installation for driver, and

Uninstall_32.bat, and Uninstall_64.bat:

Uninstallation for driver

Run batch file as Administrator.

Make sure Windows version before installation.

Header folders include head file for software developer or System Integration.

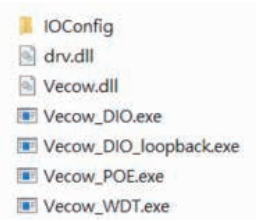
Manual folders include API description.

Sample folders include sample program, driver library, and API library for Windows/Linux

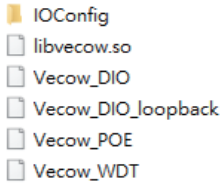
Source folders include sample program source code that compile on Visual Studio 2008/ ubuntu18.04.

A.3 Sample

Execute demo tool.



Windows



Linux

```
DIO sample version : v1.0.0609.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608
Config : IO port  I - Isolated DIO
         IO port II - Non-Isolated DIO(GPIO)

Choose IO : (1/2)
```

Vecow_DIO

```
DIO loopback sample version : v1.0.1509.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608
Config : IO port  I - Isolated DIO
         IO port II - Non-Isolated DIO(GPIO)

How many IO temp_port : (1/2)
```

Vecow_DIO_loopback

```
WDT sample version : v1.0.0509.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608
Config : IO port  I - Isolated DIO
         IO port II - Non-Isolated DIO(GPIO)

Set WDT timer seconds (1~3932100) :
```

Vecow_WDT

B

APPENDIX B : Software Functions

B.1 Driver API Guide

In Header folder, Vecow.h and VecowLinux.h contain usabled API for Windows/ Linux.

BOOL initial_SIO(BYTE Isolate_Type, BYTE DIO_NPN)

Initial machine for IO and watch dogtimer.

Isolate_Type: DIO type.

1: Isolated DIO; 0: Non-Isolated DIO(GPIO).

DIO_NPN: DI / DO type.

1: PNP (Source) mode for European rule; 0: NPN (Sink) mode for Japanese rule.

Return:

TRUE (1): Success.

FALSE (0): Fail (Driver not exists, or version is too old, or machine not match).

BOOL get_IO1_configuration
(BYTE *Iso, BYTE *DI_mode, BYTE *DO_mode, WORD *Mask)
BOOL get_IO2_configuration
(BYTE *Iso, BYTE *DI_mode, BYTE *DO_mode, WORD *Mask)

Get DIO configuration (by variable)

Isolate_Type: DIO type.

1: Isolated DIO; 0: Non-Isolated DIO(GPIO).

DI_mode ([7:0]): DI type, pin setting by hexadecimal bitmask only for Isolated DIO.

0xFF: PNP (Source) mode for European rule; 0: NPN (Sink) mode for Japanese rule.

DO_mode: DO type only for Isolated DIO.

1: PNP (Source) mode for European rule; 0: NPN (Sink) mode for Japanese rule.

Mask ([15:0]): In / Out, pin setting by hexadecimal bitmask only for Non-Isolated DIO(GPIO).

1: Output; 0: Input

Return :

TRUE (1): Success.

FALSE (0): Fail (Initial error, or call by pointer error, or hardware problem).

BBOOL set_IO1_configuration
(BYTE Iso, BYTE DI_mode, BYTE DO_mode, WORD Mask)
BOOL set_IO2_configuration
(BYTE Iso, BYTE DI_mode, BYTE DO_mode, WORD Mask)

Set DIO configuration.

Isolate_Type: DIO type.

1: Isolated DIO; 0: Non-Isolated DIO(GPIO).

DI_mode ([7:0]): DI type, pin setting by hexadecimal bitmask only for Isolated DIO.

0xFF: PNP (Source) mode for European rule; 0: NPN (Sink) mode for Japanese rule.

DO_mode: DO type only for Isolated DIO.

1: PNP (Source) mode for European rule; 0: NPN (Sink) mode for Japanese rule.

Mask ([15:0]): In / Out, pin setting by hexadecimal bitmask only for Non-Isolated DIO(GPIO).

1: Output; 0: Input

Return:

TRUE (1): Success.

FALSE (0): Fail (Initial error or hardware problem).

BOOL get_GPIO1(WORD *GPIO_data)

Get GPIO

GPIO_data ([15:0]): GPIO state, pin setting by hexadecimal bitmask.

1: High; 0: Low.

Return :

TRUE (1): Success.

FALSE (0): Fail (Initial error or hardware problem).

BOOL set_GPIO1(WORD GPIO_data)

Set GPIO

GPIO_data ([15:0]): GPIO state, pin setting by hexadecimal bitmask.

1: High; 0: Low

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error, or hardware problem)

BOOL get_WDT(DWORD *WDT)

Get watchdog timer setup

WDT: watchdog timer setup

Unit: second. (Range: 0 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error, or call by pointer error, or hardware problem)

BOOL Set_WDT(DWORD WDT)

Set watchdog timer setup

WDT: watchdog timer setup

Unit: second. (Range: 0 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error, or setup 0, or hardware problem)

BOOL Cancel_WDT()

Cancel watchdog timer

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error, or hardware problem)

BOOL config_COMPORT(BYTE *PORT_NUM)

Set COMPORT configuration.

A. PORT_NUM: Usable COMPORT number.
   Range: 1~2.

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error, or setup 0, or hardware problem)

BOOL set_COMPORT_mode(BYTE port, BYTE mode, BYTE term)

Set COMPORT mode.

B. port: which port set.
   Range: 1~2.

C. mode: Usable COMPORT number.
   0: RS232 mode; 1: RS422-5Wire mode.
   2: RS422-9Wire mode; 4: RS485 mode.
   4: Loopback mode.

D. term: Termination enable for RS422/RS485 mode.
   1: Enable; 0: Disable.

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error or hardware problem)

BOOL get_COMPORT_mode(BYTE port, BYTE *mode, BYTE term)

Get COMPORT mode.

E. port: which port get.
   Range: 1~2.

F. mode: Usable COMPORT number.
   0: RS232 mode; 1: RS422-5Wire mode.
   2: RS422-9Wire mode; 4: RS485 mode.
   4: Loopback mode.

G.term: Termination enable for RS422/RS485 mode.
   1: Enable; 0: Disable.

Return:

TRUE (1): Success;

FALSE (0): Fail (Initial error or hardware problem)

APPENDIX C : Power Consumption

Testing Board	EPBC-2000
RAM	16GB * 1
USB-1 : (USB 2.0)	USB Micsoft Wired Keyboard 600
USB-2 : (USB 2.0)	USB Mouse HP MOFYUO
SATA1 :	FORESEE S903S128G
Graphics Output :	HDMI
Power Plan :	Balance (Windows11 Power plan)
Power Source :	Chroma 62006P-100-25

C.1 Intel Atom® x7211RE Processor 6M Cache, up to 3.20 GHz

Power on and boot to Win 11 (64-bit)

CPU	Power Input	Standby Mode		Power on and boot to Win11 64bit			
				Sleep Mode		Idle Mode	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Intel Atom® x7211RE	12V	0.156A	01.87W	0.194A	02.33W	0.721A	08.65W

CPU	Power Input	Power on and boot to Win11 64bit			
		Run 100% CPU usage without 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Intel Atom® x7211RE	12V	1.109A	13.31W	1.140A	13.68W

C.2 Intel Atom® x7835RE Processor 6M Cache, up to 3.60 GHz

Power on and boot to Win 11 (64-bit)

CPU	Power Input	Standby Mode		Power on and boot to Win11 64bit			
				Sleep Mode		Idle Mode	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Intel Atom® x7835RE	12V	0.156A	01.87W	0.193A	02.32W	0.730A	08.76W

CPU	Power Input	Power on and boot to Win11 64bit			
		Run 100% CPU usage without 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Intel Atom® x7835RE	12V	1.803A	21.64W	1.826A	21.91W

D

APPENDIX D : Supported Memory & Storage List

D.1 Test Item

Testing Board	EPBC-2000
Memory Test	MemTest86 V11.4 Build 1000
BurnIn Test	BurnInTest Pro V10.2 (build 1011)

Channel	Memory Test	Sleep	Hibernate	Reboot	OS internal info
1 (DDR5_A1)	PASS	PASS	PASS	PASS	PASS

D.2 Supported Non-ECC Memory List

Brand	Info	Test Temp. (Celsius)
SAMSUNG 8GB DDR5-4800 SO-DIMM	M425R1GB4BB0-CQKOL	25ºC
Transcend 8GB DDR5-5600 SO-DIMM	TS1GSA64V6G	25ºC
SAMSUNG 16GB DDR5-5600 SO-DIMM	M425R2GA3PB0-CWMOD	25ºC

D.3 Supported ECC Memory List

Brand	Info	Test Temp. (Celsius)
innodisk 16GB DDR5-4800 SO-DIMM	M5D0-AGS2PCVP-H03	25ºC
Transcend 16GB DDR5-4800 SO-DIMM	TS2GSA72V8E	25ºC
innodisk 16GB DDR5-5600 SO-DIMM	M5D0-AGS2PCZQ-H03	25ºC
KINGSTON 16GB DDR5-5600 SO-DIMM	KSM56T46BS8KM-16HA	25ºC

D.4 Supported Storage List

Type	Vendor	Model	Capacity
M.2 SSD	Transcend	TS512GMTE460T	512GB
	innodisk	DEM28-C12DD1KCCQF-H03	512GB
SATA SSD	FORESEE	S903S128G	128GB
	Transcend	TS512GSSD460K	512GB
	innodisk	DES25-C12DK1KCCQL-H03	512GB

** If more help is needed, please contact Vecow Technical Support.**

For further support information, please visit www.vecow.com

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