EXBC-2000 USER Manual

Intel® Core™ U-series Processor (Whiskey Lake) 5.25" Single Board Computer, 4 GigE LAN with 2 PoE+, 4 USB, 4 COM, 16 GPIO, 1 Mini PCIe, 4 M.2

Vecow

1.4.0 Edition 20230612

Record of Revision

Version	Date	Page	Description	Remark
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1.10	2021/03/11	3, 20	Update	
1.20	2022/07/04	82-84	Update	
1.30	2023/06/06	19, 26, 30, 62, 72	Update	
1.40	2023/06/12	62	Update	

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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 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 comply 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

Part Number	Description
EXBC-2000-8665U	EXBC-2000, onboard Intel® Core™ i7-8665UE, 4 GigE LAN with 2 PoE+, 4 USB 3.1, 4 COM, 16 GPIO, 4 M.2, 1 Mini PCIe
EXBC-2000-8145U	EXBC-2000, onboard Intel® Core™ i3-8145UE, 4 GigE LAN with 2 PoE+, 4 USB 3.1, 4 COM, 16 GPIO, 4 M.2, 1 Mini PCIe

Optional Accessories

Part Number	Description
DDR4 32G	Certified DDR4 32GB 2666MHz RAM
DDR4 16G	Certified DDR4 16GB 2666/2400/2133 MHz RAM
DDR4 8G	Certified DDR4 8GB 2666/2400/2133 MHz RAM
DDR4 4G	Certified DDR4 4GB 2666/2400/2133 MHz RAM
H_Sink	Heat Sink for EXBC-2000 Series
M.2 Storage Module	M.2 Key M/Key B PCIe Storage Module
5G Module	5G Module with Antenna
4G Module	Mini PCIe 4G/GPS Module with Antenna
WiFi & Bluetooth Module	WiFi & Bluetooth Module with Antenna

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GENERAL INT RODUCTION

1.1 Overview

Vecow EXBC-2000 Series is powered by 8th Gen Intel® Core™ U-series processor with support for wide range temperature from -40°C to 85°C and wide range 9V to 50V power input. With outstanding performance, leading power protection, and industrial-grade reliability, Vecow EXBC-2000 Series is ideal for Digital Signage, Gaming, Intelligent Transport System (ITS), Intelligent Vending, or any AIoT/Industry 4.0 applications.

EXBC-2000 Series is a 5.25" single board computer and supports memory up to DDR4 2400MHz and has multiple DisplayPort and LVDS display interfaces up to 4K resolution. EXBC-2000 Series integrates 4 USB, 4 GigE LAN with 2 IEEE 802.3at PoE+, 2 SIM sockets, 4 COM RS-232/422/485, and 16 GPIO. To fulfill a variety of different applications requirements, EXBC-2000 Series supports an array of M.2 configuration options such as Key B/Key M/Key E, and Mini PCIe for expansions, delivering faster throughput and simplified installation.

Powered by 8th Gen Intel® Core™ U-series processor (Whiskey Lake), Vecow EXBC-2000 Series provides outstanding performance, rugged reliability, compact extensions and is a smart solution for Digital Signage, Gaming, Intelligent Transport System (ITS), Intelligent Vending, or any AIoT/Industry 4.0 applications.

1.2 Features

- 8th Generation Intel® Core™ U-series processor (Whiskey Lake) supports up to 40% greater productivity than former generation solution
- Fanless & cableless design supports -40°C to 85°C operation
- 2 DDR4 2400MHz memory, up to 64GB
- Multiple DisplayPort and LVDS support triple independent display, up to 4K resolution
- 4-port USB 3.1 support up to 10Gbps data transfer
- 4 Independent GigE LAN with 2 IEEE 802.3at PoE+
- SIM Socket for 5G/WiFi/4G/3G/LTE/GPRS/UMTS
- 4 COM RS-232/422/485, 16 GPIO
- Expansion : M.2 Key B, M.2 Key M, M.2 Key E and Mini PCIe
- 9V to 50V DC wide range Power Input
- Ignition Power Control, TPM 2.0

1.3 Product Specification

System	
Processor	Quad Core Intel® Core™ i7-8665UE/i3-8145UE Processor (Whiskey Lake)
Chipset	Intel® SoC (Cannon Lake)
BIOS	AMI
SIO	IT8786E
Memory	2 DDR4 2400MHz SO-DIMM, up to 64 GB
Graphics	
Graphics Processor	Intel® UHD Graphics 620
Interface	2 DisplayPort : Up to 4096 x 2304 @60Hz
Ethernet	
LAN 1	GigE LAN by Intel® Ethernet Controller I350
LAN 2	GigE LAN by Intel® Ethernet Controller I350
PoE	
LAN 3	GigE IEEE 802.3at (25.5W/48V) PoE+ by Intel® I350 with Power On/Off Control
LAN 4	GigE IEEE 802.3at (25.5W/48V) PoE+ by Intel® I350 with Power On/Off Control
Audio	
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio
Audio Interface	1 Mic-in, 1 Line-out
Storage	
M.2	• 1 M.2 Key M Socket (PCIe x4/SATA) • 1 M.2 Key B Socket (PCIe x2/SATA)
I/O Interface	
Serial	4 COM RS-232/422/485 (ESD 8kV)
USB	4 USB 3.1 (External)
GPIO	16 GPIO
LED	HDD, PoE
SIM Card	2 Internal SIM Card Socket
Expansion	
M.2	• 1 M.2 Key E Socket (PCIe x1) • 1 M.2 Key B Socket (PCIe x2/USB 3.1)
Mini PCIe	1 Mini PCIe for PCIe/USB/SIM Card

Power	
Power Input	9V to 50V DC-in
Power Interface	Mini DIN
Ignition Control	16 Mode
Remote Switch	3-pin Terminal Block : On, Off, IGN
Others	
TPM	Optional Infineon SLB9665 supports TPM 2.0, LPC Interface
Watchdog Timer	Reset : 1 to 255 sec./min. per step
Smart Management	Wake on LAN, PXE supported
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.
Software Support	
Microsoft	Windows 10
Linux	Fedora 19, Ubuntu 10.04 LTS, or Linux Kernel 3.0 above
Mechanical	
Dimension (W x L x H)	203.0mm x 146.0mm (7.99" x 5.75")
Weight	275 g (0.61 lb)
Mounting	Wallmount by mounting bracket
Environment	
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% Humidity, non-condensing
Relative Humidity	95% at 85°C
EMC	CE, FCC

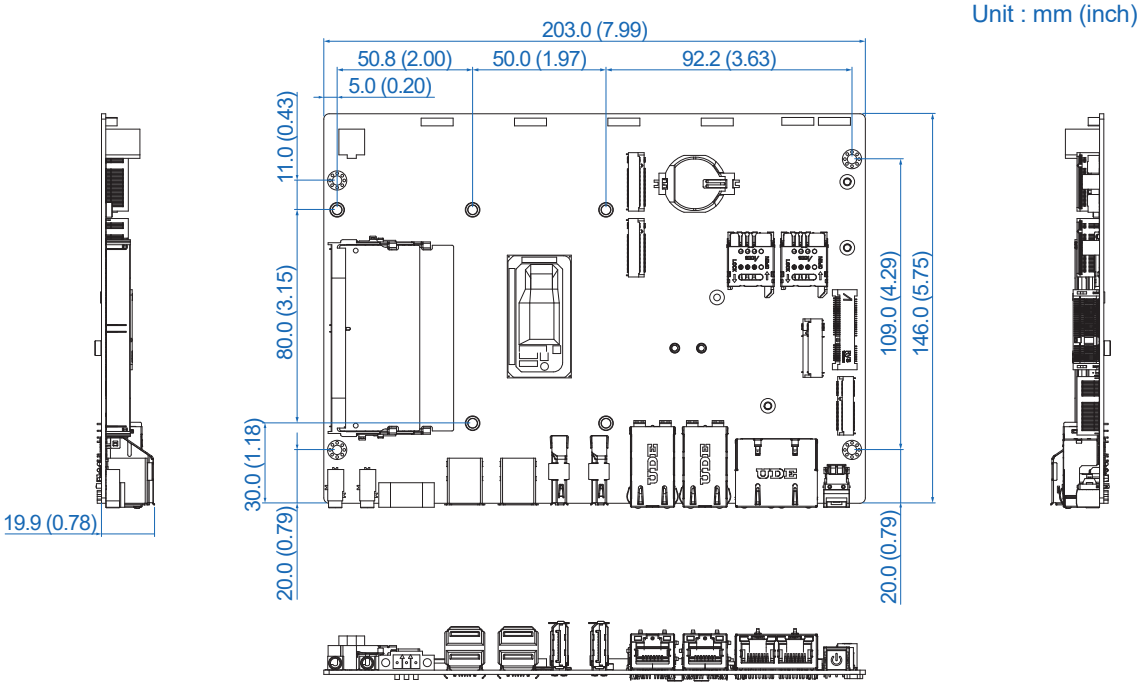
1.4 Supported CPU List

Processor No.	Cores	TDP	Cache	Max. Frequency	ECC Memory
Intel® Core™ i7-8665UE	4	15W	8M	Up to 4.4GHz	N
Intel® Core™ i3-8145UE	2	15W	4M	Up to 3.9GHz	N

1.5 Mechanical Dimension

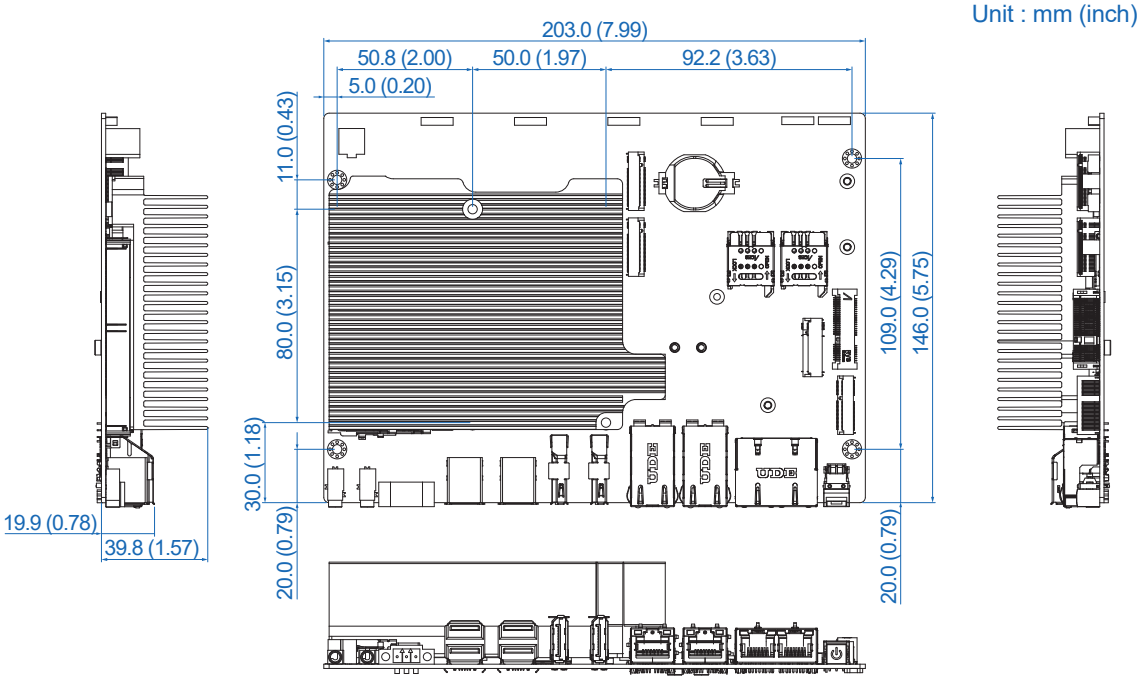
1.5.1 Dimension of EXBC-2000

Unit : mm (inch)



1.5.2 Dimension of EXBC-2000 with Sink

Unit : mm (inch)



2

GETTING TO KNOW YOUR EXBC-2000

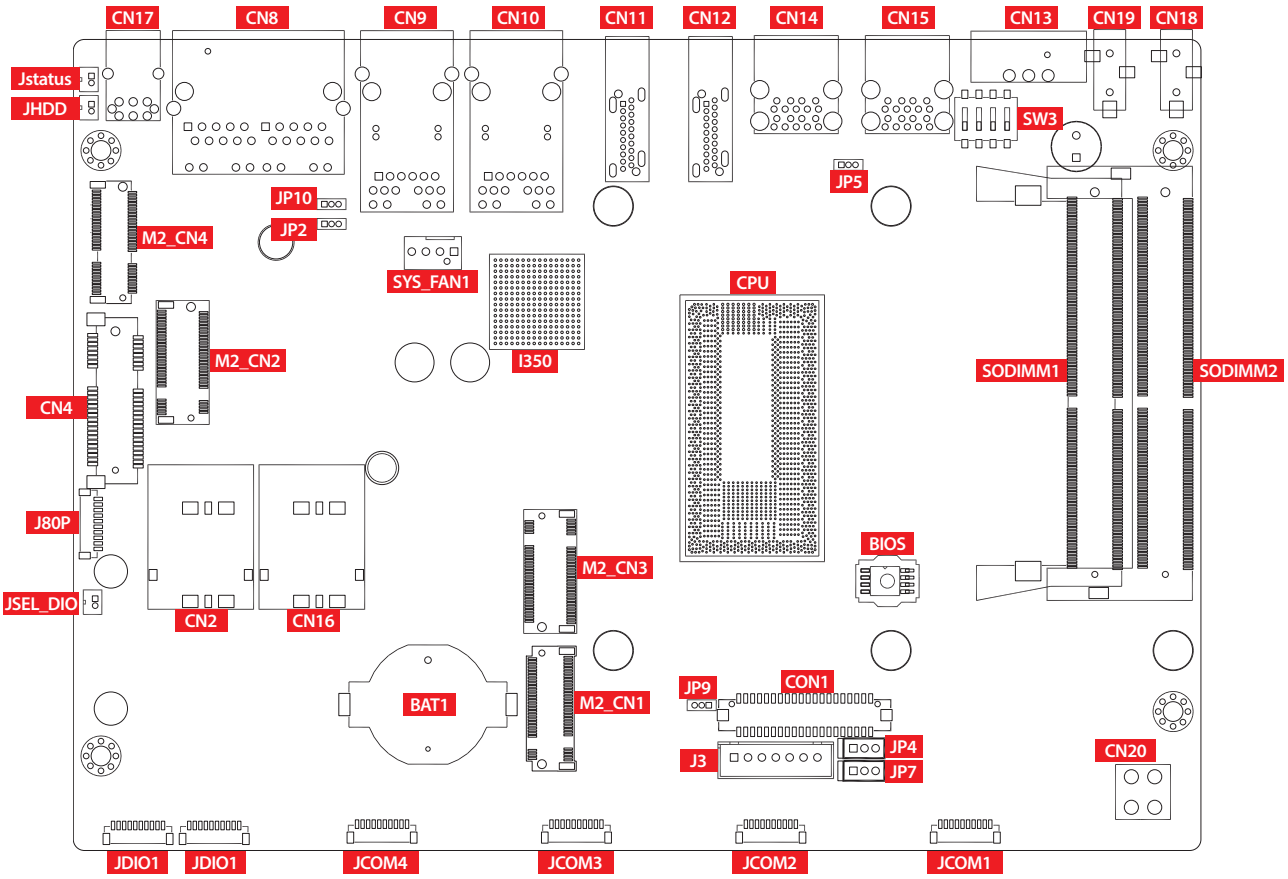
2.1 Packing List

Item	Description	Qty
1	EXBC-2000 5.25 Embedded Single Board Computer	1
2	EXBC-2000 series accessory box, which contains	

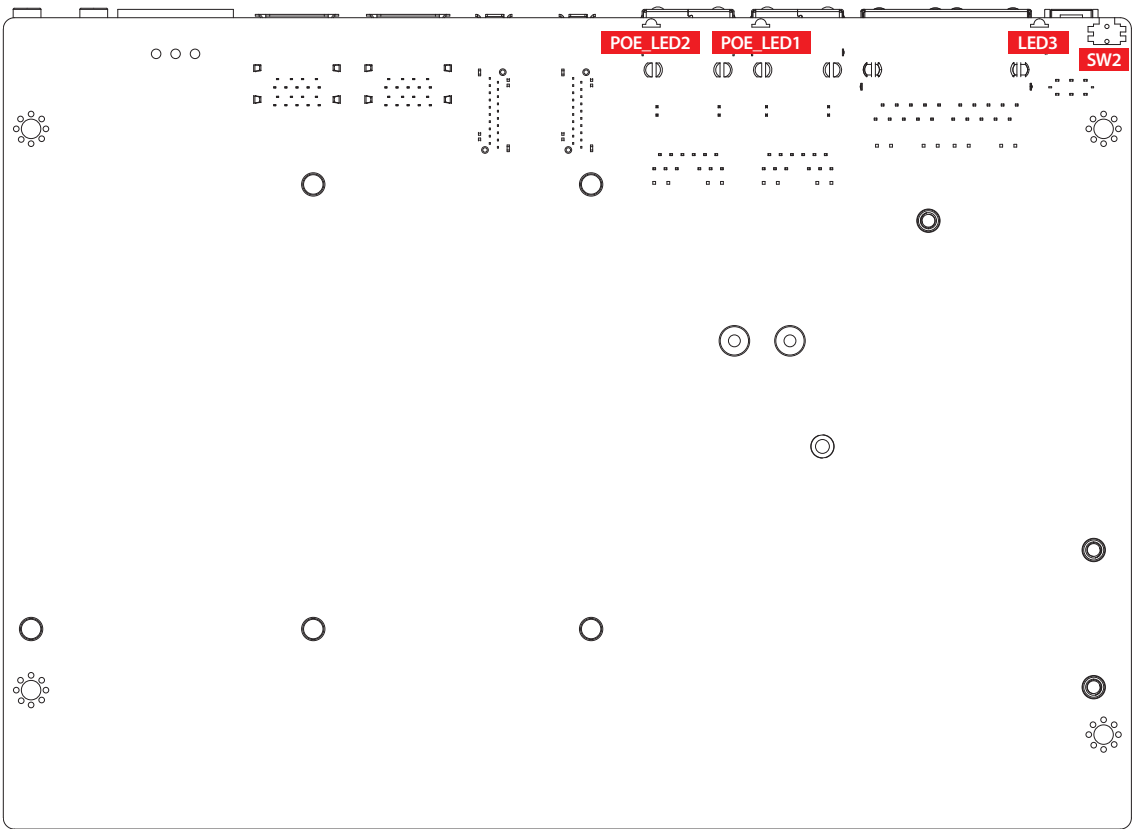
Item	Description	Outlook	Usage	P/N	Qty
3	PHILLPIS M2.5x6L, Ni		Mini PCIe slot	53-2426906-30B	1
4	PHILLPIS M3x6L, Ni+Ny		M.2 and Sink	53-2426206-80B	6
5	Terminal block 3-pin (3.5mm)		Switch	51-2211R03-S1A	1
6	M2x2L Ni		M.2 Key B 3042/3052	53-M004600-000	1
7	COM Cable		COM	61-13Q1009-0DA	2
8	#4-40x7 (5mm)		Lock for COM	53-I000172-001	4

2.2 Main Board Expansion Connectors

2.2.1 Top Side View

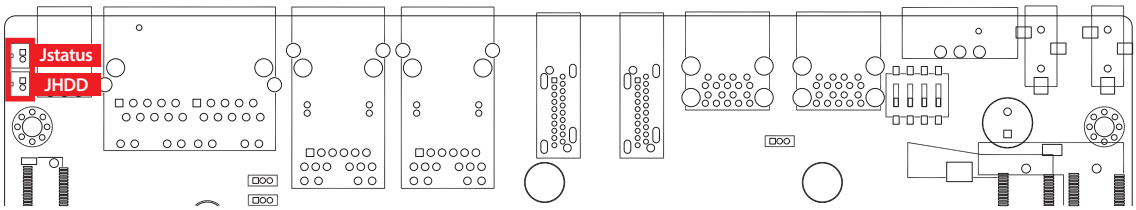


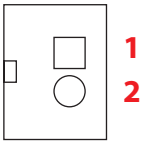
2.2.2 Bottom Side View



2.2.3 JSTATUS, JHDD : Miscellaneous Pin Header

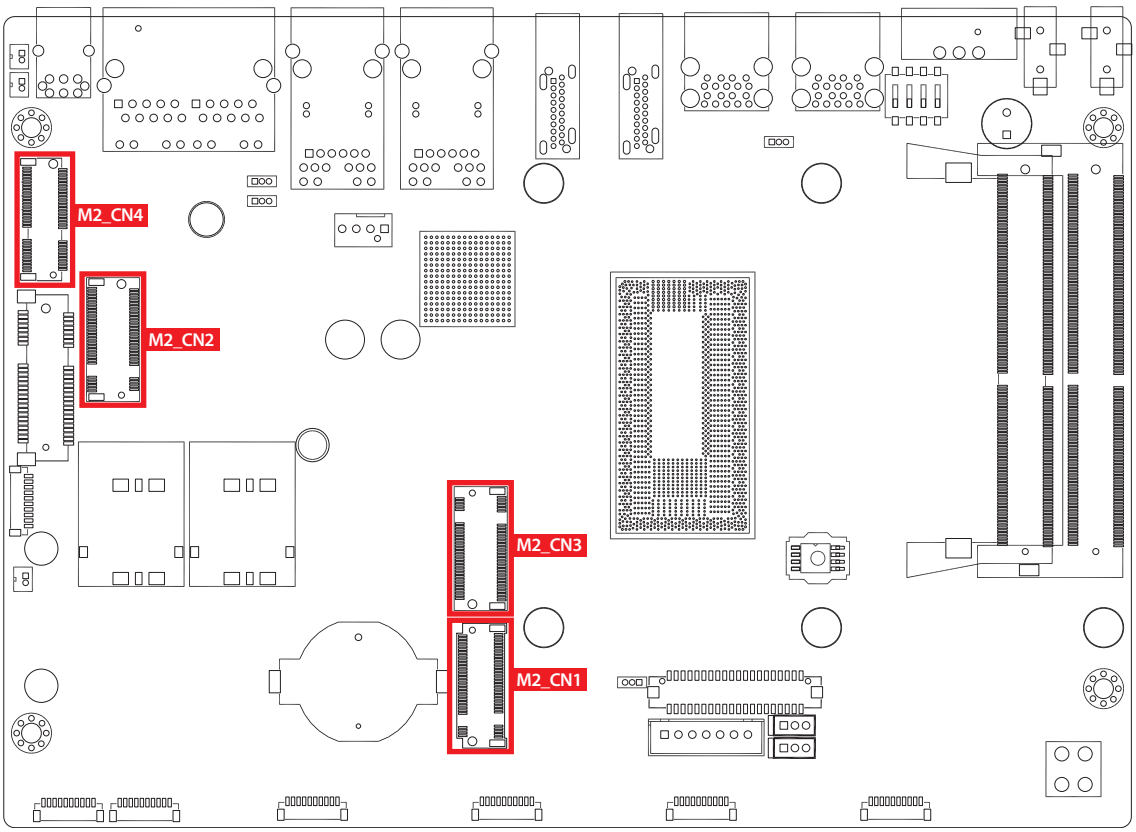
These pin headers can be used as a backup for the following functions : hard drive LED indicator, power LED indicator, which already can be accessed by front panel and top panel. The pinouts of Miscellaneous port are listed in following table :





Group	Pin No.	Description
JSTATUS	1	PWR_LED_N
	2	PWR_LED_P
JHDD	1	HDD_LED_N
	2	HDD_LED_P

2.2.4 M2_CN1, M2_CN2, M2_CN3, M2_CN4 : M.2 slot



2.2.4.1 M2_CN1 : M.2 KEY M (Dimension : 2280)

Pin No.	Signal Name	Pin No.	Signal Name
75	Ground		
73	Ground	74	3.3V
71	Ground	72	3.3V
69	PEDET	70	3.3V
67	Ground	68	NC
Mechanical Key			
57	Ground	58	NC
55	REFCLKp	56	NC
53	REFCLKn	54	PEWAKE#
51	Ground	52	CLKREQ#
49	PETp0/SATA_A+	50	PERST#
47	PETn0/SATA_A-	48	NC
45	Ground	46	NC
43	PERp0/SATA_B-	44	NC
41	PERn0/SATA_B+	42	NC
39	Ground	40	NC
37	PETp1	38	DEVSLP
35	PETn1	36	NC
33	Ground	34	NC
31	PERp1	32	NC
29	PERn1	30	NC
27	Ground	28	NC
25	PETp2	26	NC
23	PETn2	24	NC
21	Ground	22	NC
19	PERp2	20	NC
17	PERn2	18	3.3V
15	Ground	16	3.3V
13	PETp3	14	3.3V
11	PETn3	12	3.3V
9	Ground	10	LED1#
7	PERp3	8	NC
5	PERn3	6	NC
3	Ground	4	3.3V
1	Ground	2	3.3V

2.2.4.2 M2_CN2 : M.2 KEY B (Dimension : 3042, 3052) for 4G/5G module

Pin No.	Signal Name	Pin No.	Signal Name
		80	Ground
75	NC		
73	Ground	74	3.3V
71	Ground	72	3.3V
69	CONFIG_1	70	3.3V
67	NC	68	NC
65	NC	66	SIM DETECT
63	NC	64	NC
61	NC	62	NC
59	NC	60	NC
57	Ground	58	NC
55	REFCLKp	56	NC
53	REFCLKn	54	PEWAKE#
51	Ground	52	CLKREQ#
49	PETp0	50	PERST#
47	PETn0	48	NC
45	Ground	46	NC
43	PERp0	44	NC
41	PERn0	42	NC
39	Ground	40	NC
37	PETp1/USB3.1-TX+	38	DEVSLP
35	PETn1/USB3.1-TX-	36	UIM-PWR
33	Ground	34	UIM-DATA
31	PERp1/USB3.1-RX+	32	UIM-CLK
29	PERn1/USB3.1-RX-	30	UIM-RESET
27	Ground	28	NC
25	NC	26	NC
23	NC	24	NC
21	NC	22	NC
		20	NC
Mechanical Key			
11	Ground		
9	USB-	10	LED_1#
7	USB+	8	W_DISABLE1
5	Ground	6	FULL_CARD_PWR_OFF/ON
3	Ground	4	3.3V
1	NC	2	3.3V

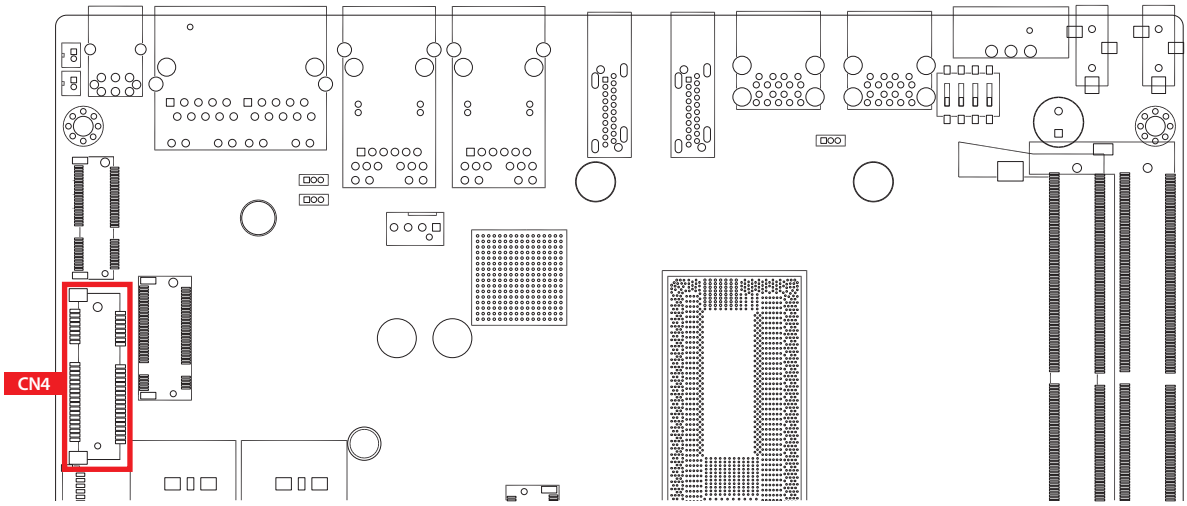
2.2.4.3 M2_CN3 : M.2 KEY B (Dimension : 2280)

Pin No.	Signal Name	Pin No.	Signal Name
		80	Ground
75	NC		
73	Ground	74	3.3V
71	Ground	72	3.3V
69	CONFIG_1	70	3.3V
67	NC	68	NC
65	NC	66	SIM DETECT
63	NC	64	NC
61	NC	62	NC
59	NC	60	NC
57	Ground	58	NC
55	REFCLKp	56	NC
53	REFCLKn	54	PEWAKE#
51	Ground	52	CLKREQ#
49	PETn0/SATA-A+	50	PERST#
47	PETn0/SATA-A-	48	NC
45	Ground	46	NC
43	PERn0/SATA-B-	44	NC
41	PERn0/SATA-B+	42	NC
39	Ground	40	NC
37	NC	38	DEVSLP
35	NC	36	UIM-PWR
33	Ground	34	UIM-DATA
31	NC	32	UIM-CLK
29	NC	30	UIM-RESET
27	Ground	28	NC
25	NC	26	NC
23	NC	24	NC
21	NC	22	NC
		20	NC
Mechanical Key			
11	Ground		
9	USB-	10	LED_1#
7	USB+	8	W_DISABLE1
5	Ground	6	FULL_CARD_PWR_OFF/ON
3	Ground	4	3.3V
1	NC	2	3.3V

2.2.4.4 M2_CN4 : M.2 KEY E (Dimension : 2230)

Pin No.	Signal Name	Pin No.	Signal Name
75	Ground		
73	NC	74	3.3V
71	NC	72	3.3V
69	Ground	70	PEWAKE1#
67	NC	68	NC
65	NC	66	NC
63	Ground	64	NC
61	NC	62	ALERT
59	NC	60	I2C_CLK
57	Ground	58	I2C_DATA
55	PEWAKE0#	56	NC
53	CLKREQ0#	54	NC
51	Ground	52	PERST0#
49	REFCLKn0	50	NC
47	REFCLKp0	48	NC
45	Ground	46	NC
43	PERn0	44	NC
41	PERp0	42	NC
39	Ground	40	NC
37	PETn0	38	DEVSLP
35	PETp0	36	NC
33	Ground	34	NC
		32	NC
Mechanical Key			
23	NC		
21	NC	22	NC
19	Ground	20	NC
17	NC	18	Ground
15	NC	16	NC
13	Ground	14	NC
11	NC	12	NC
9	NC	10	NC
7	Ground	8	NC
5	USB-	6	LED1#
3	USB+	4	3.3V
1	Ground	2	3.3V

2.2.5 CN4 : Mini PCIe

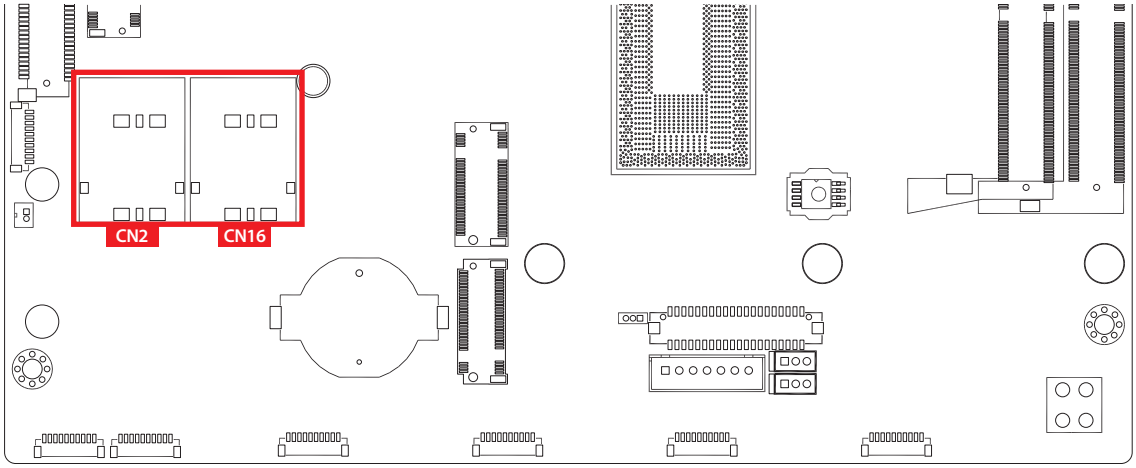


Standard full length mini PCIe slot

The pin assignments of CN4 are listed in the following table :

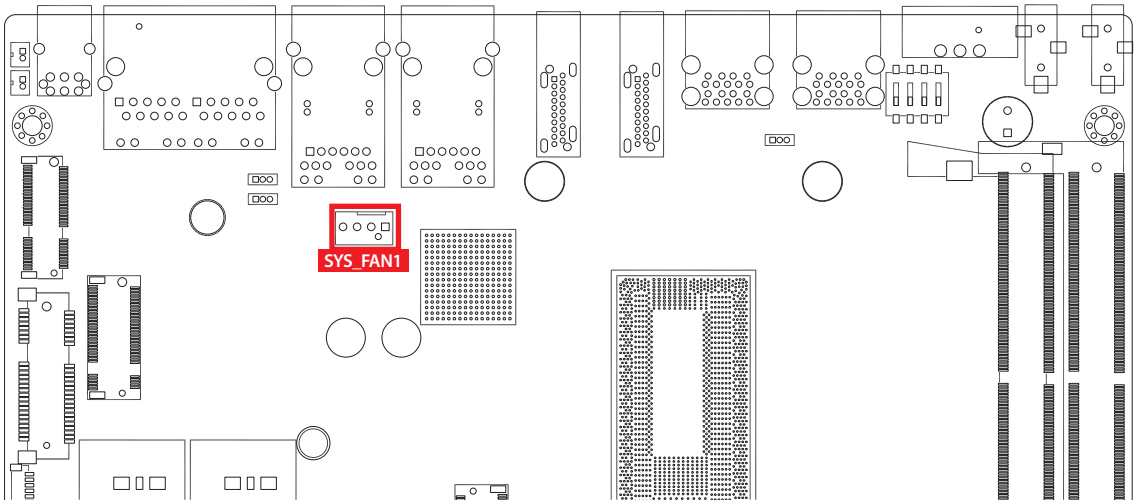
Pin No.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	SATA_PCIE_SEL	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND
Mechanical Key			
15	GND	16	Reserved
13	REFCLK+	14	Reserved
11	REFCLK-	12	Reserved
9	GND	10	Reserved
7	CLKREQ#	8	Reserved
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux

2.2.6 CN2, CN16 : SIM solt

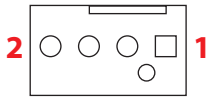


Location	SIM
CN4	CN2
M2_CN2	CN16

2.2.7 SYS_FAN1

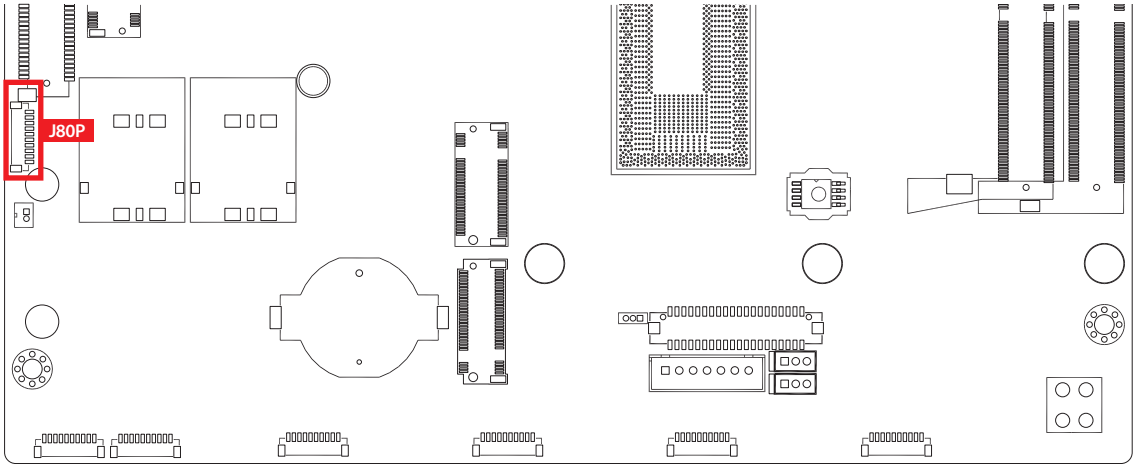


Fan power connector supports higher thermal requirements

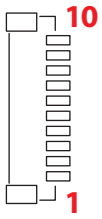


Pin No.	Definition	Pin No.	Definition
1	GND	3	Fan speed sensor
2	+12V (1.5A max)	4	Fan PWM

2.2.8 J80P : LPC Port 80 Header

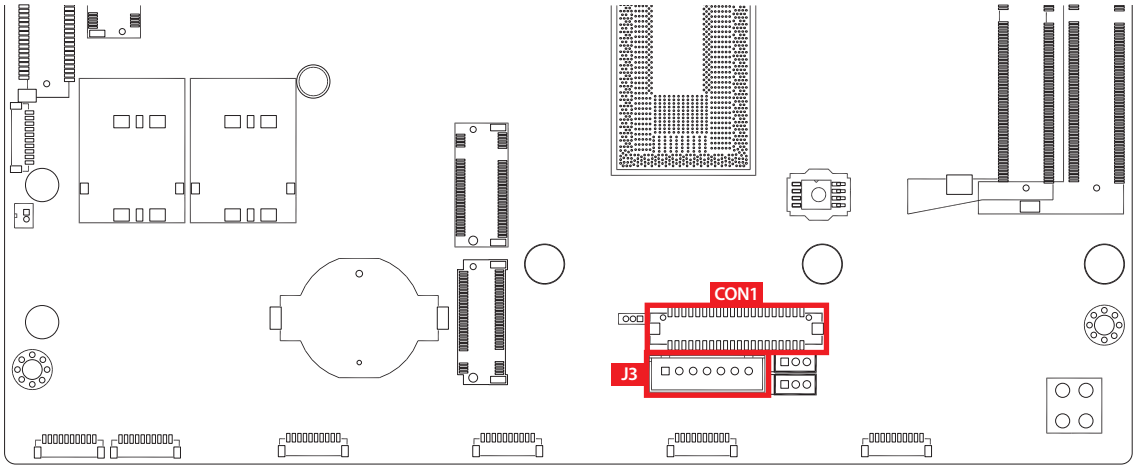


The system's provide a LPC Port 80 Header for Debug Card.



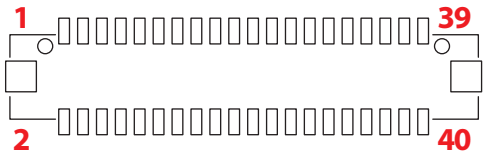
Pin No.	Function	Pin No.	Function
1	+3.3V	2	SERIRQ
3	LAD0	4	LAD1
5	LAD2	6	LAD3
7	LFRAME#	8	CLOCK
9	PLTRST	10	GND

2.2.9 CON1, J3 : LVDS



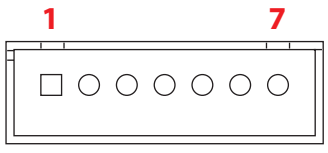
EXBC-2000 supports dual-channel 24-bit LVDS display and up to 4096 x 2304 pixels resolution.

The pin assignments of LVDS are listed in the following table :



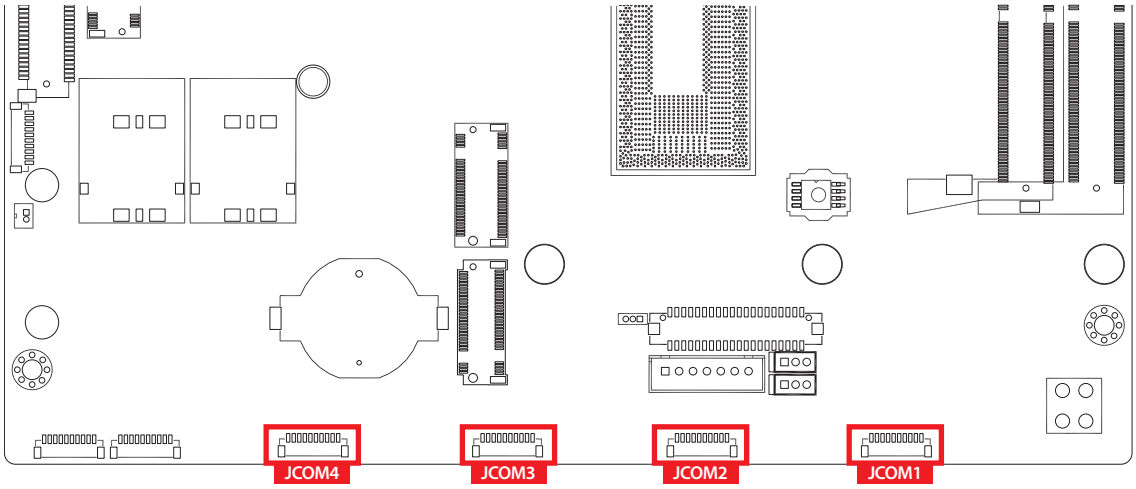
Pin No.	Function	Pin No.	Function
1	PANEL_VDD	21	GND
2	TXO0-	22	TXE0-
3	PANEL_VDD	23	GND
4	TXO0+	24	TXE0+
5	PANEL_VDD	25	GND
6	TXO1-	26	TXE1-
7	GND	27	GND
8	TXO1+	28	TXE1+
9	GND	29	GND
10	TXO2-	30	TXE2-
11	GND	31	GND
12	TXO2+	32	TXE2+
13	GND	33	GND
14	TXOC-	34	TXEC-
15	GND	35	GND
16	TXOC+	36	TXEC+
17	GND	37	GND
18	TXO3+-	38	TXE3-
19	GND	39	GND
20	TXO3+	40	TXE3+

The LCD inverter is connected to J3 via a JST 7-pin, 2.5mm connector providing +5V/+12V power to LCD display. The pin assignments are listed in the following table :

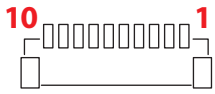


Pin No.	Definition	Pin No.	Definition
1	+5V	5	GND
2	+12V	6	GND
3	+12V	7	LBKLT_EN
4	LBKLT_CTL		

2.2.10 JCOM1, JCOM2, JCOM3, JCOM4 : Serial Port



Serial port 1 to 4 (JCOM 1 to 4) can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition of COM 1 to 4 is RS-232, if you want to change to RS-422 or RS-485, you can find the setting in BIOS.

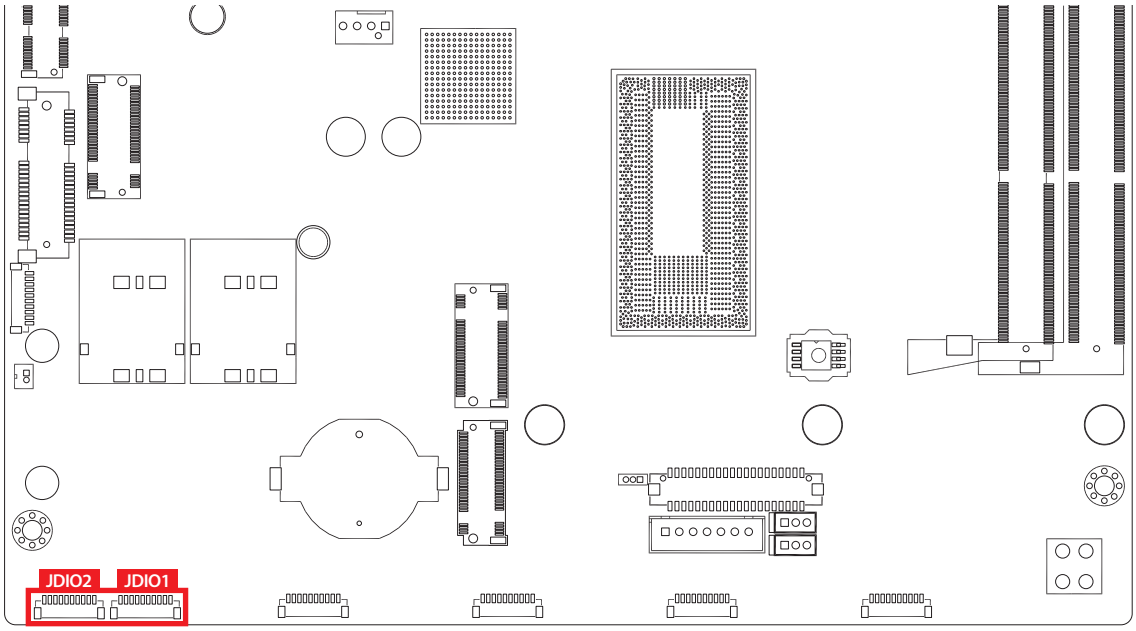


BIOS Setting	Function
JCOM1 JCOM2 JCOM3 JCOM4	RS-232
	RS-422 (5-wire)
	RS-422 (9-wire)
	RS-485
	RS-485 w/z auto-flow control

The pin assignments are listed in the following table :

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

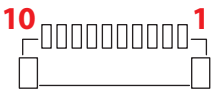
2.2.11 JDIO1, JDIO2 : GPIO from Super I/O



There is a 16-bit GPIO connector in the Top side. Each GPIO channel can be configuration GPI or GPO.

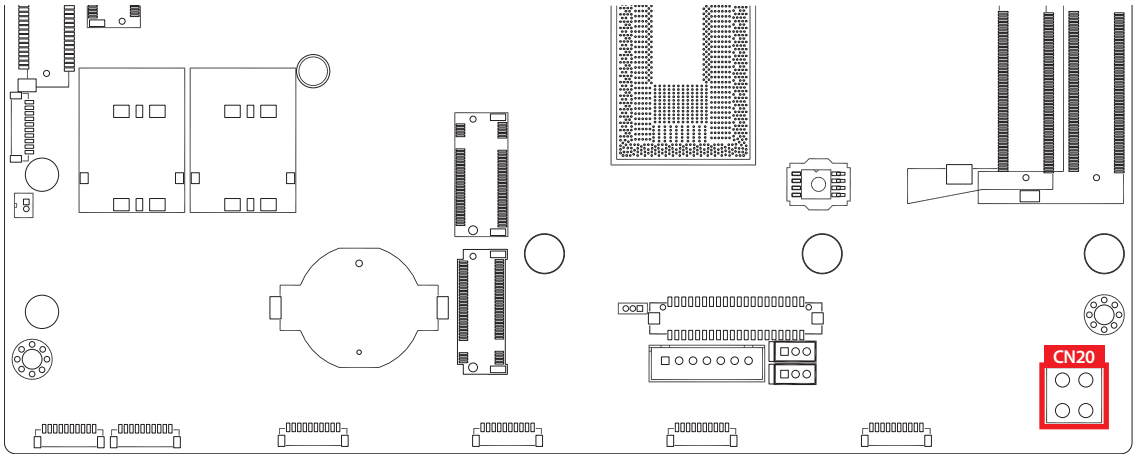
JSEL_DIO header is for SINK/SOURCE mode selection on ISO_DIO board (DMX-100-E)

JDIO1 and JDIO2 pins are defined in the following table :

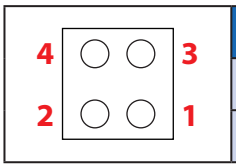


Pin No.	JDIO1 Definition	JDIO2 Definition
1	SIO_GPI80	SIO_GPO70
2	SIO_GPI81	SIO_GPO71
3	SIO_GPI82	SIO_GPO72
4	SIO_GPI83	SIO_GPO73
5	SIO_GPI84	SIO_GPO74
6	SIO_GPI85	SIO_GPO75
7	SIO_GPI86	SIO_GPO76
8	SIO_GPI87	SIO_GPO77
9	+3.3V	+3.3V
10	GND	GND

2.2.12 CN20 : DC Power input

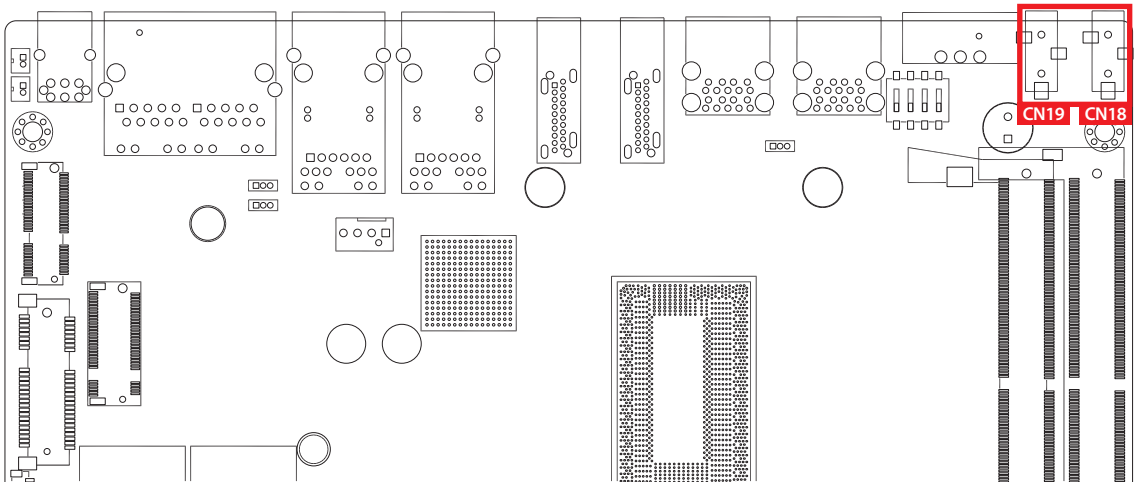


EXBC-2000 supports 9V to 50V DC power input by wire-to-board connector in the top side.



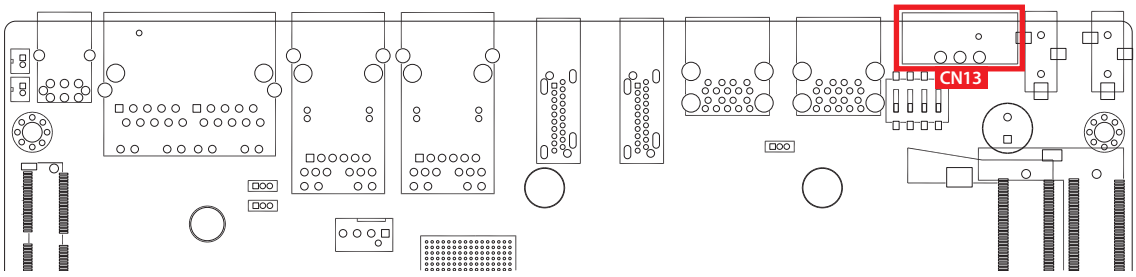
Pin No.	Definition	Pin No.	Definition
1	V-	2	V-
3	V+	4	V+

2.2.13 CN18, CN19 : Audio Connector

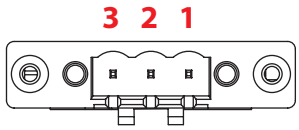


There are two audio connectors, mic-in and line-out, on the front side of EXBC-2000. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel® High Definition Audio (Azalia) specifications. To utilize the audio function on the Windows platform, you need to install corresponding drivers for Realtek ALC888S-VD codec.

2.2.14 CN13 : Remote Power On/Off Switch

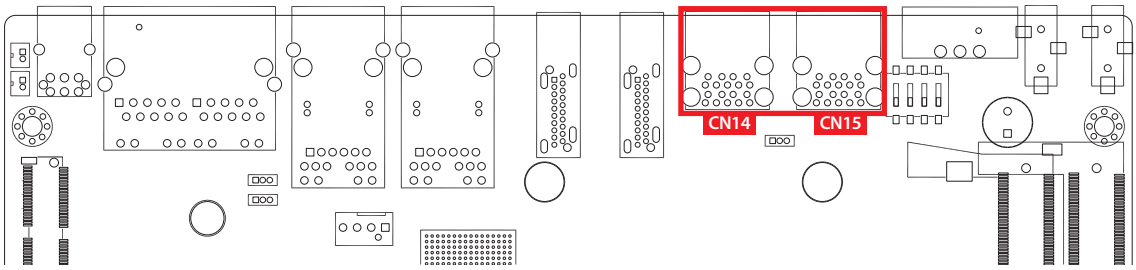


It is a 3-pin power-on/power-off switch through Phoenix Contact terminal block. You could turn on or off the system power by using this contact. This terminal block supports dual function on soft power-on/power-off (instant off or delay four seconds), and suspend mode.



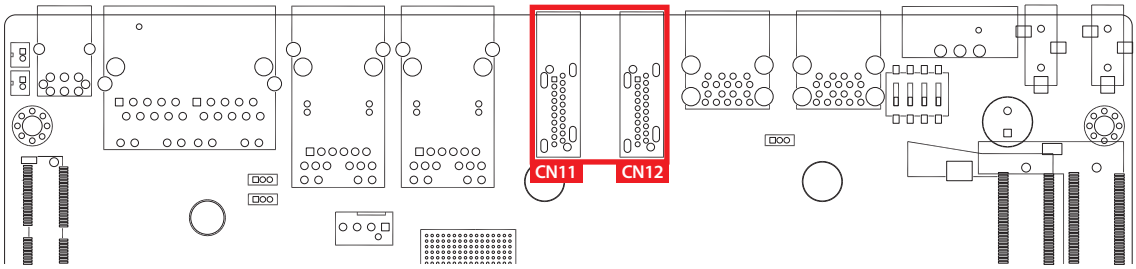
Pin No.	Definition
1	IGNITION
2	SW+
3	SW-

2.2.15 CN14, CN15 : USB 3.1



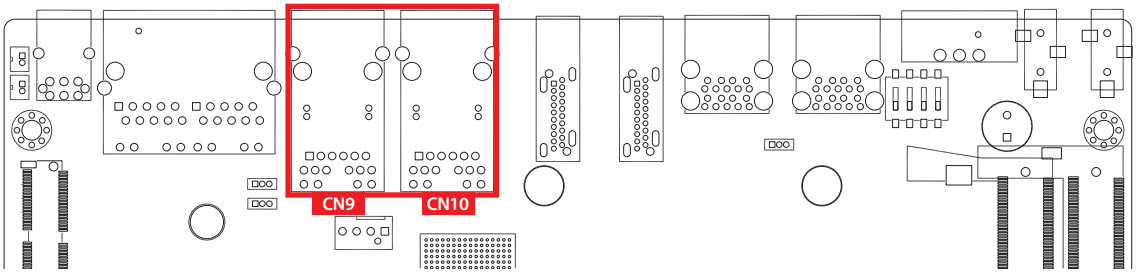
There are 4 USB 3.1 connections available supporting up to 10GB per second data rate in the front side of EXBC-2000. It also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

2.2.16 CN11, CN12 : Display Port



Onboard Display Port support auxiliary channel dual mode, connection supports up to 4096 x 2304 resolution at 60Hz.

2.2.17 CN9, CN10 : PoE Ports



There are 2 RJ45 connectors in the rear side of EXBC-2000. It supports IEEE 802.3at (PoE+) Power over Ethernet (PoE) connection delivering up to 37W/54V per port and 1000BASE-T gigabit data signals over standard Ethernet Cat 5/ Cat 6 cable. Each PoE connection is powered by Intel® I350 Gigabit Ethernet controller and independent PCI express interface to connect with multi-core processor for network and data transmit optimization. Only when PoE port starts to supply power to power devices, the dedicated LED will be lightened.

PS. Suggest to use PoE function when power input is over 12V.

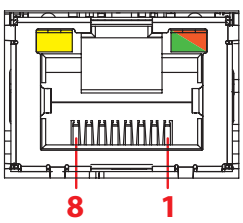
The pin-outs of LAN 3 and LAN 4 are listed as follows :

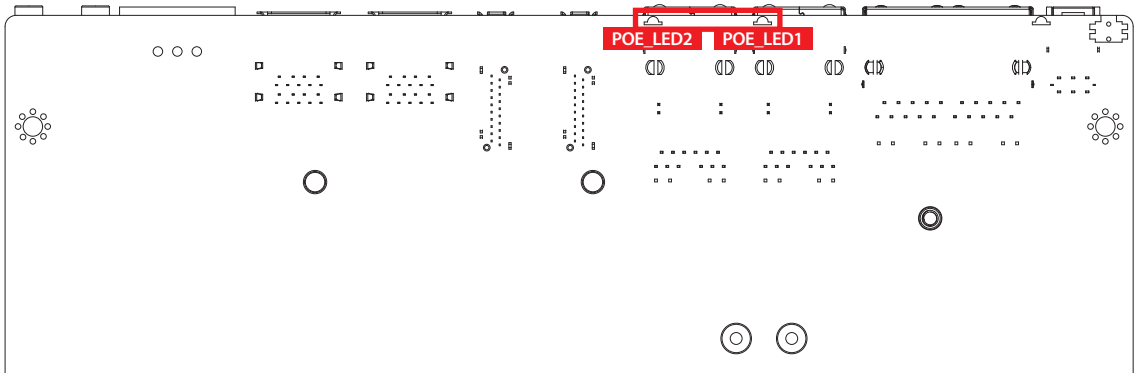
Pin No.	10/100 Mbps	1000Mbps	PoE
1	E_TX+	MDI0_P	PoE+
2	E_TX-	MDI0_N	PoE+
3	E_RX+	MDI1_P	PoE-
4	------	MDI2_P	------
5	------	MDI2_N	------
6	E_RX-	MDI1_N	PoE-
7	------	MDI3_P	------
8	------	MDI3_N	------

Each LAN port is supported by standard RJ-45 connector with LED indicators to present Active/Link/Speed status of the connection.

The LED indicator on the right bottom corner lightens in solid green when the cable is properly connected to a 100Mbps Ethernet network; The LED indicator on the right bottom corner lightens in solid orange when the cable is properly connected to a 1000Mbps Ethernet network; The left LED will keep twinkling/off when Ethernet data packets are being transmitted/received.

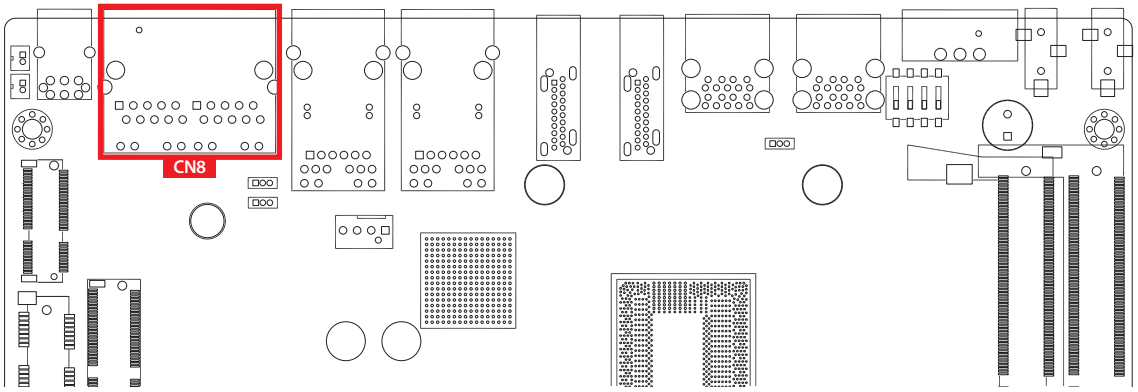
LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Right	Green/ Orange	Off	Solid Green	Solid Orange
Left	Yellow	Twinkling Yellow	Twinkling Yellow	Twinkling Yellow





PoE LED	LED Color	PoE Status
POE_LED1	Solid Green	PoE ON
POE_LED2	Solid Green	PoE ON

2.2.18 CN8 : 10/100/1000 Mbps Ethernet Port



There are two 8-pin RJ-45 jacks supporting 10/100/1000 Mbps Ethernet connections on the front side of EXBC-2000. LAN 1 and LAN 2 are powered by Intel® I350 Ethernet engine.

- Intel® I350 Gigabit Ethernet Controller supports 1Gbps data ratet
- IEEE 802.3 Fast Ethernet over optical fiber standard compliant
- IEEE 1588 Precision Time Protocol (PTP)
- Up to 9.5KB Jumbo Frame
- Dual 100BASE-FX fiber ports
- Supports Wake-on-LAN (WoL) & PXE

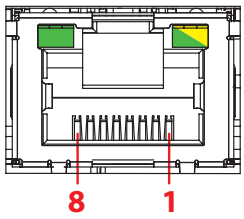
Using suitable RJ-45 cable, you can connect the EXBC-2000 system to a computer or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both LAN 1 and LAN 2 support "Wake" on LAN and preboot functions. The pinouts of LAN 1 and LAN 2 are listed in the following chart :

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

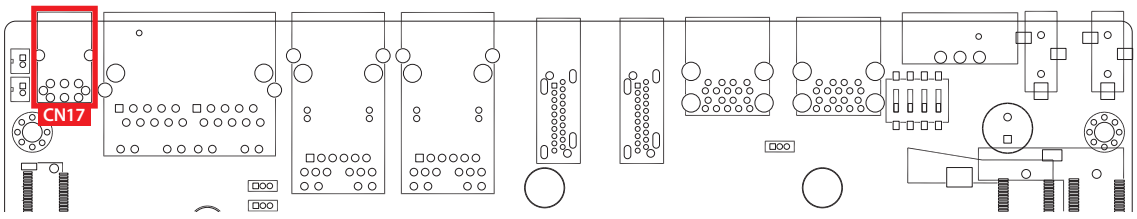
Each LAN port is supported by a standard RJ-45 connector with LED indicators to present active/link/speed statuses of the connection.

The LED indicator on the right bottom corner becomes solid green when the cable is properly connected to a 100Mbps Ethernet network; it becomes solid orange when the cable is properly connected to a 1000Mbps Ethernet network. The left LED will keep blinking off when Ethernet data packets are being transmitted or received.

LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Right	Green/ Yellow	Off	Solid Green	Solid Yellow
Left	Green	Blinking Green	Blinking Green	Blinking Green



2.2.19 CN17 : Power Button



The power button is a non-latched switch with dual color LED indication. It indicates power statuses : S0, S3 and S5. More details on the LED indications are listed in the following chart :

LED Color	Indication	System Status
Solid Blue	S0	System working
Solid Orange	S3, S5	Suspend to RAM, System off with standby power

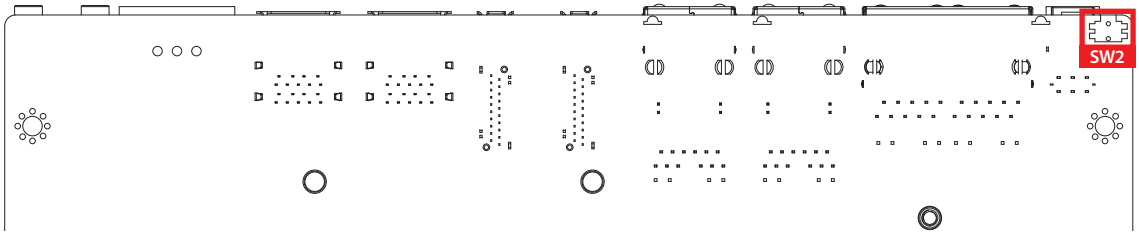
To power on EXBC-2000, press the power button which will light the blue LED.

To power off EXBC-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.

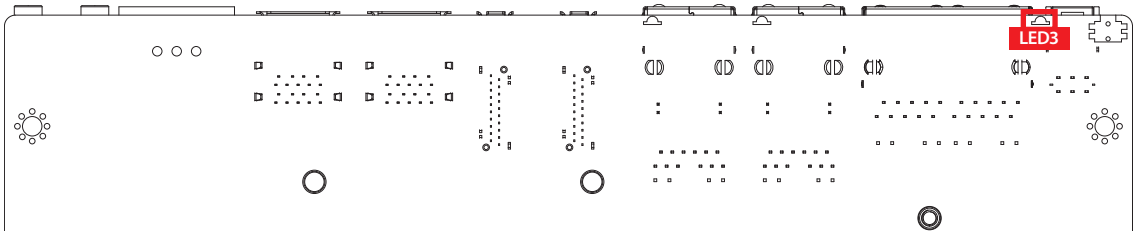
Please do note that a four-second interval between each two power-on/poweroff operation is necessary in normal working status. (For example, once turning off the system, you have to wait for four seconds to initiate another power-on operation).

2.2.20 SW2 : 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 the reset function will be enabled.

2.2.21 LED3 : HDD LED Indicator



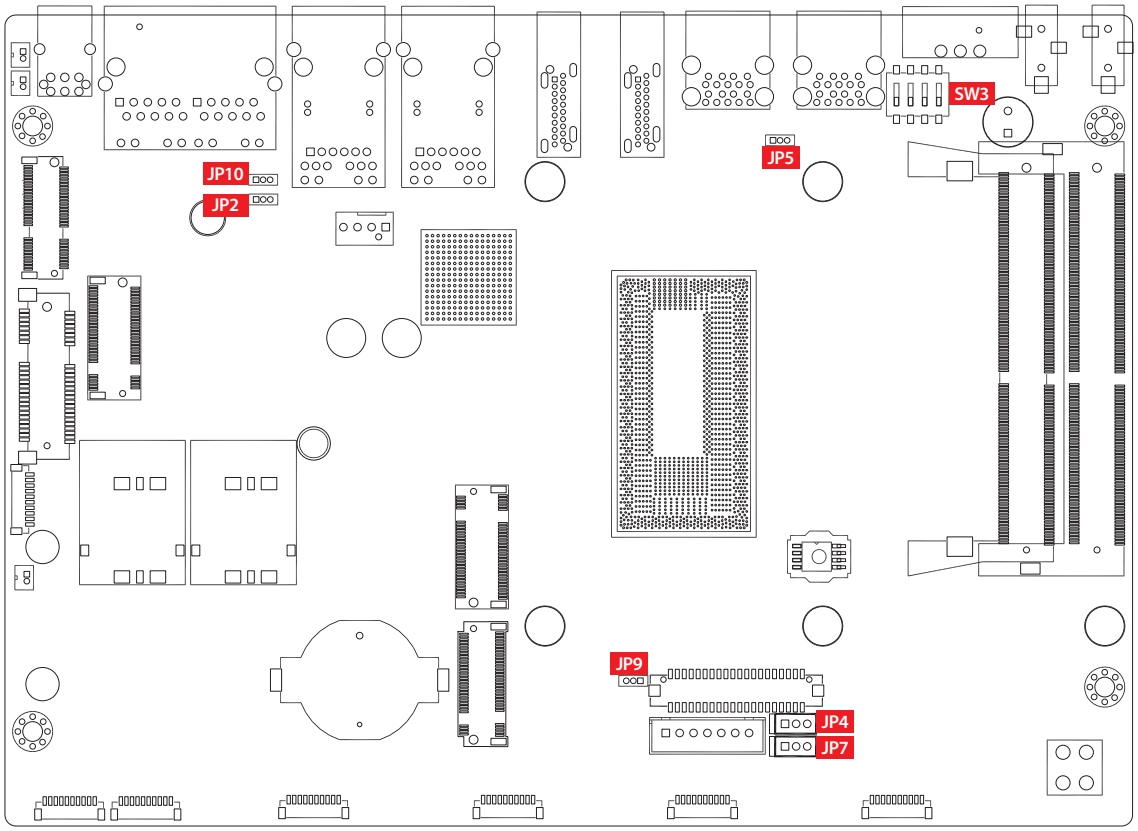
Yellow-HDD LED : A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.

LED Color	Indication	System Status
Yellow	HDD	• On/Off : Storage status, function or not. • Twinkling : Data transferring.

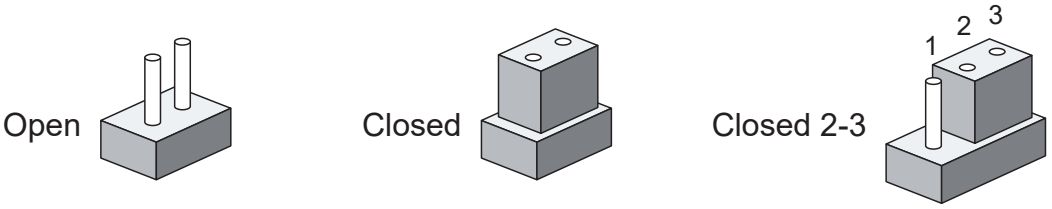
2.3 Main Jumper Settings

2.3.1 Front View of EXBC-2000 Main Board with Jumper Location

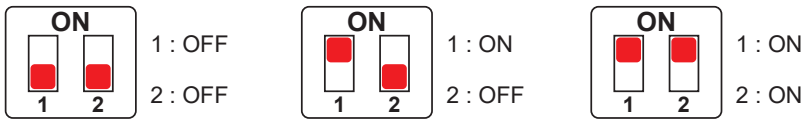
The figure below is the top view of the EXBC-2000 main board. It shows the location of the jumpers.



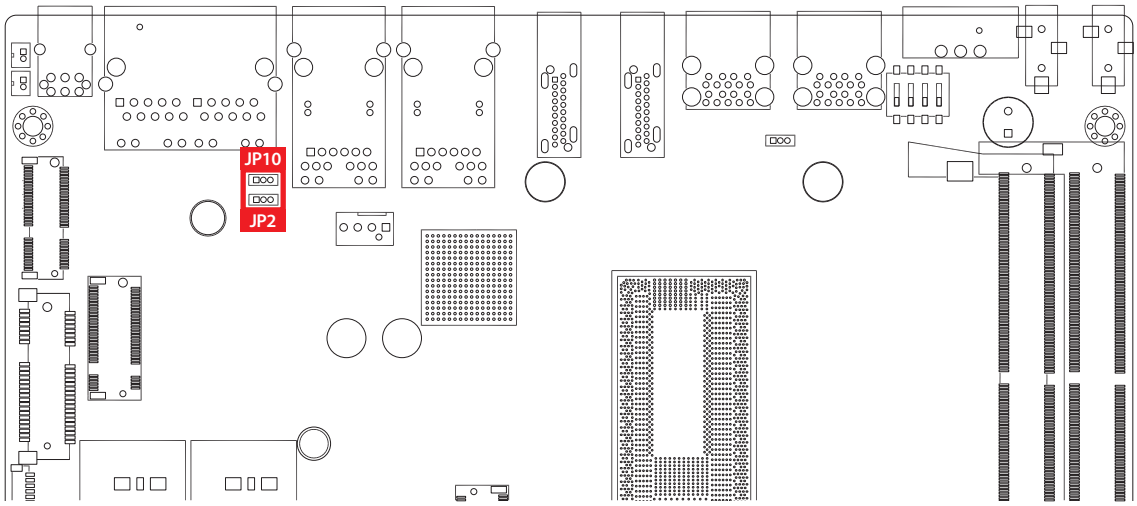
You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper, 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.



You may configure your card to match the needs of your application by DIP switch. As below show the DIP switch on and off.



2.3.2 JP2 : Clear CMOS, JP10 : Clear ME



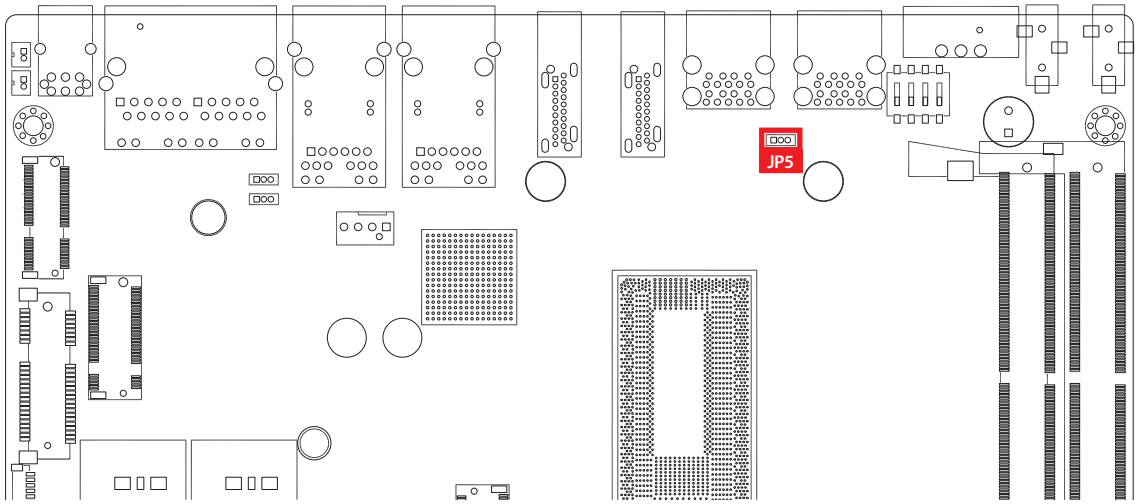
JP2

Pin No.	Definition
1-2	Normal
2-3	Clear CMOS

JP10

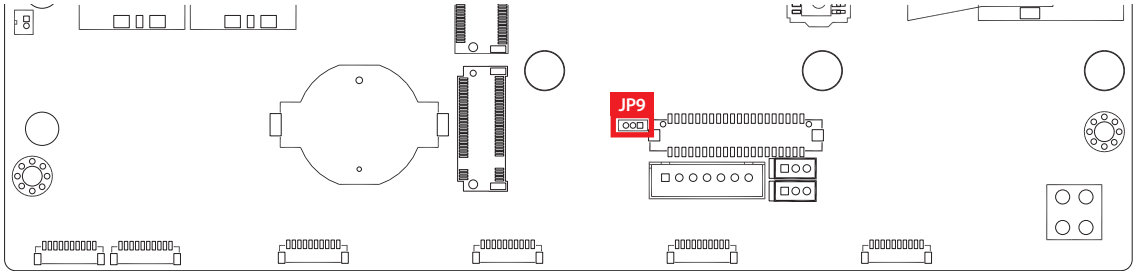
Pin No.	Definition
1-2	Normal
2-3	Clear ME

2.3.3 JP5 : Power Selection for EXT and INT USB 3.1 Gen2/USB 2.0 Ports



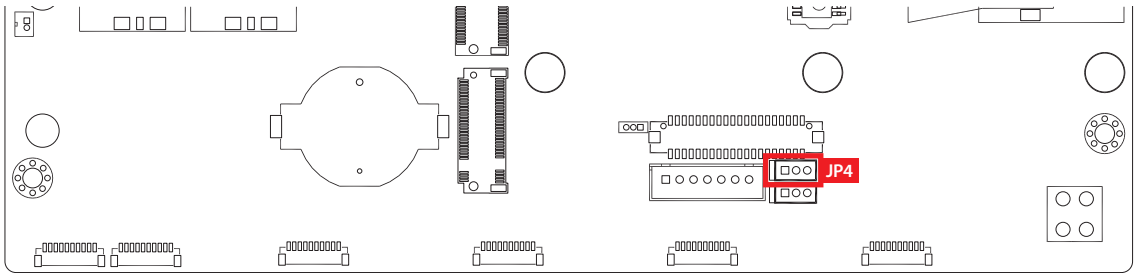
Pin No.	Power Source
1-2	+5V Standby Power
2-3	+5V System Power

2.3.4 JP9 : Backlight Control Level Selection



3 ○○□ 1	Pin No.	Power Source
	1-2	3.3V
	2-3	5V

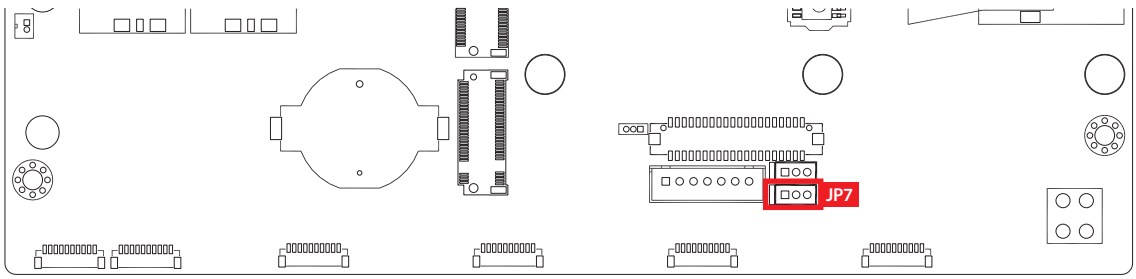
2.3.5 JP4 : Power Selection for LVDS Module



JP4 provides LVDS voltage selection function, Closing Pin 1 and Pin 2 is for 3.3V LVDS power input; closing Pin 2 and Pin 3 is for 5V LVDS power input.

1 □○○ 3	Pin No.	Power Source
	1-2	+3.3V (Default)
	2-3	+5V

2.3.6 JP7 : PoE Power ON Select



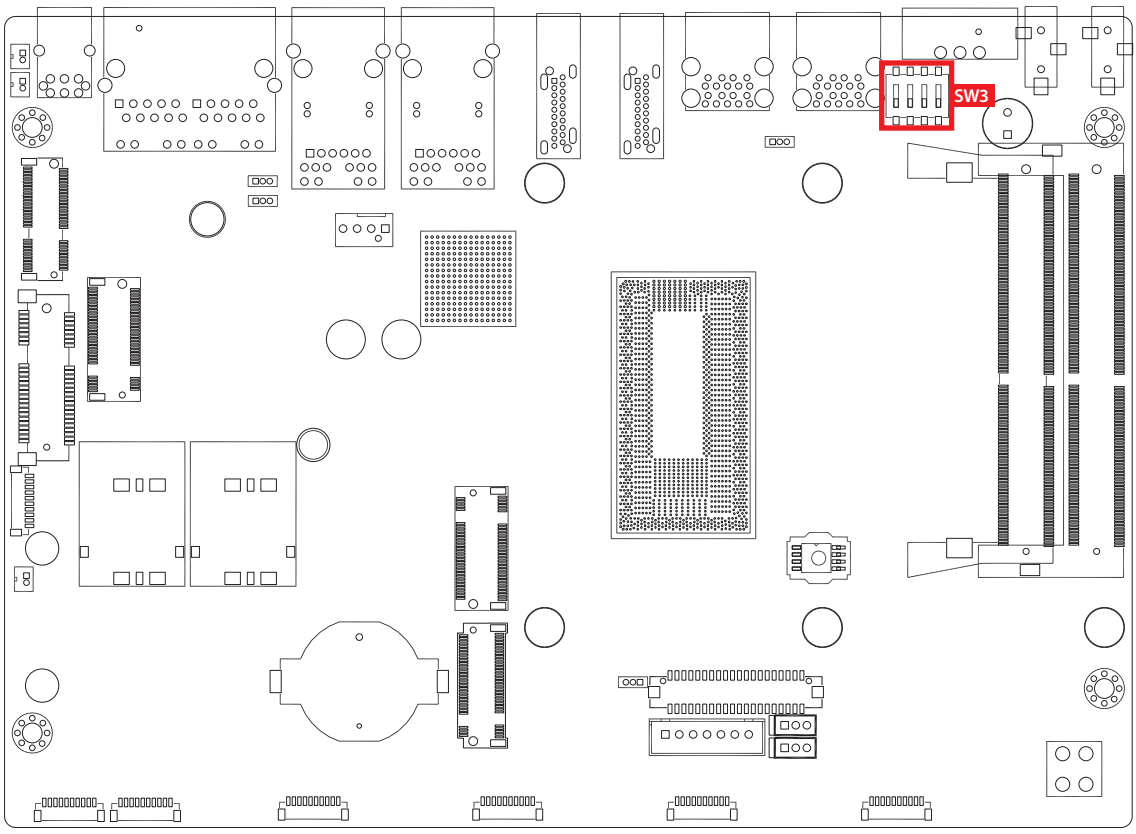
1 □○○ 3	Pin No.	Power Source
	1-2	PoE power on at standby power ready
	2-3	PoE power on after system power on (Default)

2.4 Ignition Control

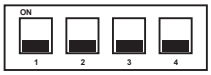
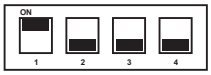
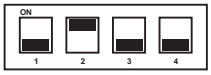
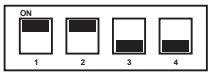
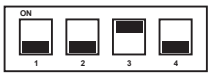
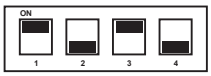
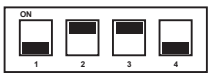
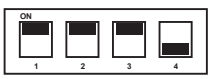
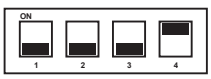
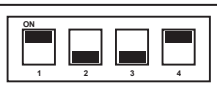
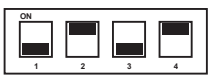
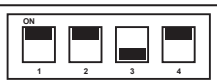
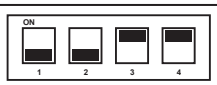
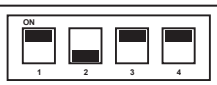
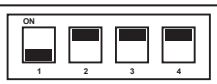
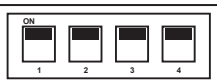
EXBC-2000 series provides ignition power control feature for in-vehicle applications. The built-in MCU monitors the ignition signal and turns on/off the system according to pre-defined on/off delay period.

2.4.1 Adjust Ignition Control Modes

EXBC-2000 series provides 16 modes of different power on/off delay periods adjustable via SW3 switch. The default rotary switch is set to 0 in ATX/AT power mode.



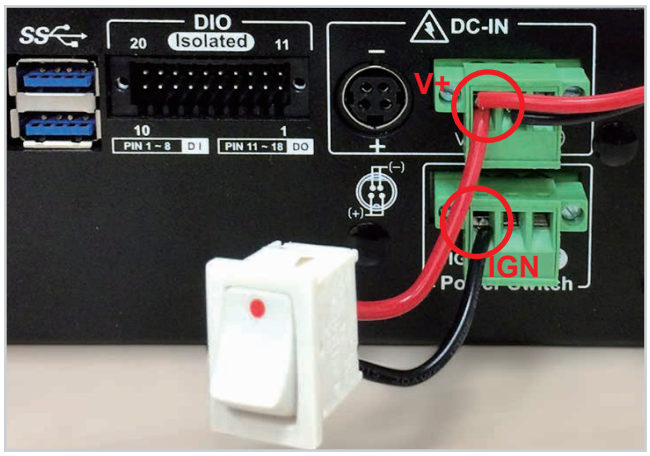
The modes are listed in below table :

DIP Switch Position	Power on delay	Power off delay	Switch Position
0	ATX/AT mode (Default)		
1	No delay	No delay	
2	No delay	5 seconds	
3	No delay	10 seconds	
4	No delay	20 seconds	
5	5 seconds	30 seconds	
6	5 seconds	60 seconds	
7	5 seconds	90 seconds	
8	5 seconds	30 minutes	
9	5 seconds	1 hour	
A	10 seconds	2 hours	
B	10 seconds	4 hours	
C	10 seconds	6 hours	
D	10 seconds	8 hours	
E	10 seconds	12 hours	
F	10 seconds	24 hours	

2.4.2 Ignition Control Wiring

To activate ignition control, you need to provide IGN signal via the 3-pin pluggable terminal block locates in the back panel. It is below the general wiring configuration.

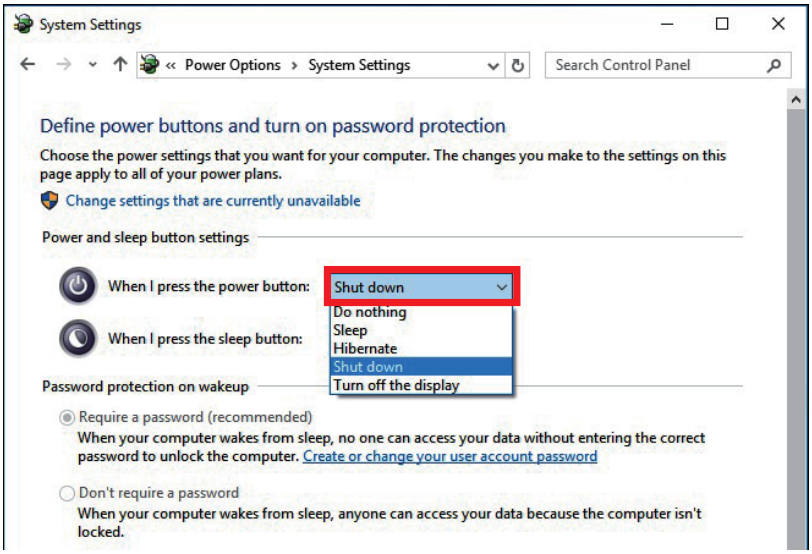
Pin No.	Definition
1	Ignition (IGN)
2	SW+
3	SW-



For testing purpose, you can refer to the picture blow to simulate ignition signal input controlled by a latching switch.

Note :

1. DC power source and IGN share the same ground.
2. EXBC-2000 supports 9V to 50V wide range DC power input in ATX/AT mode. In Ignition mode, the input voltage is fixed to 12V/24V for car battery scenario.
3. For proper ignition control, the power button setting should be "Power Down" mode.



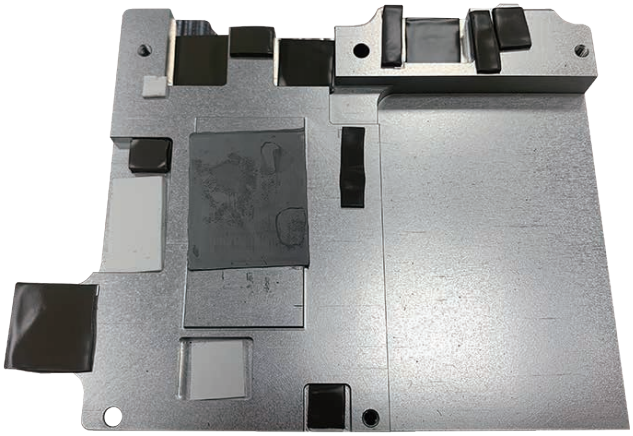
In Windows for example, you need to set "When I press the power button" to Shut down.

3

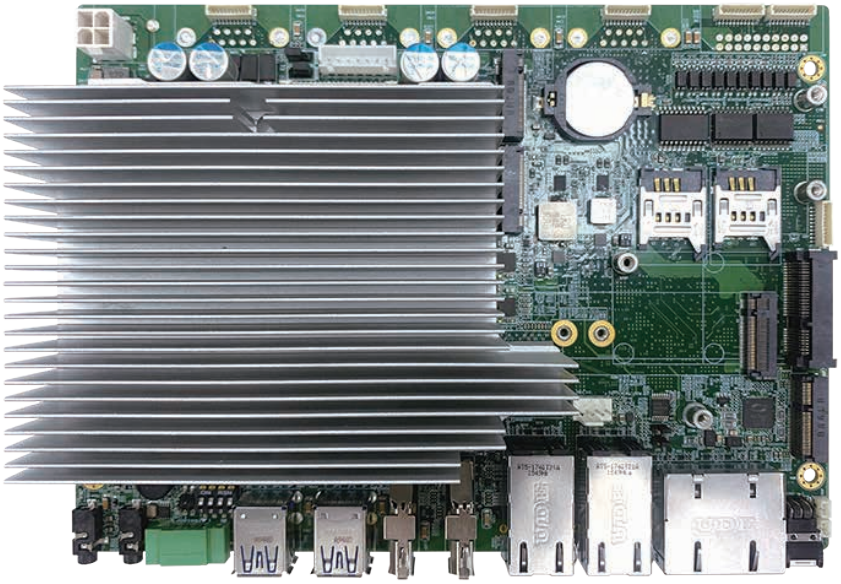
SYSTEM SETUP

3.1 Installing Heat Sink

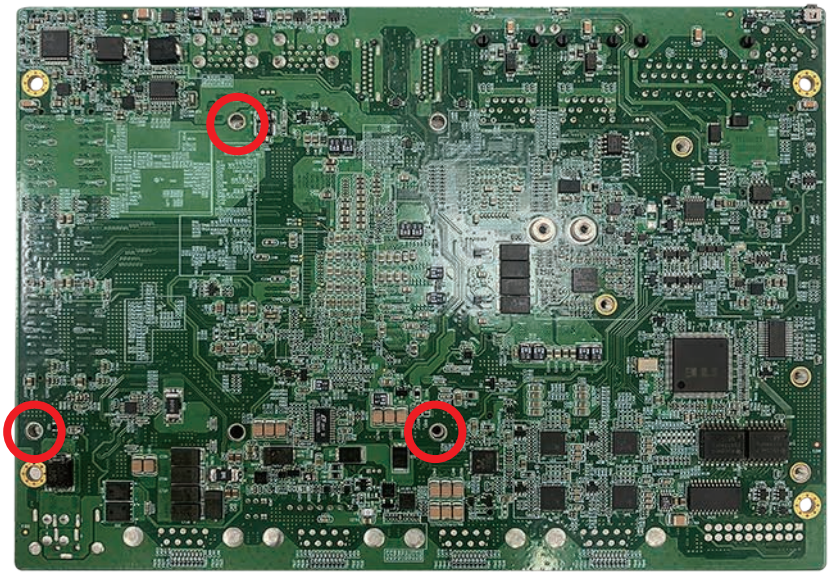
Step 1 Remove film on the thermal pad.



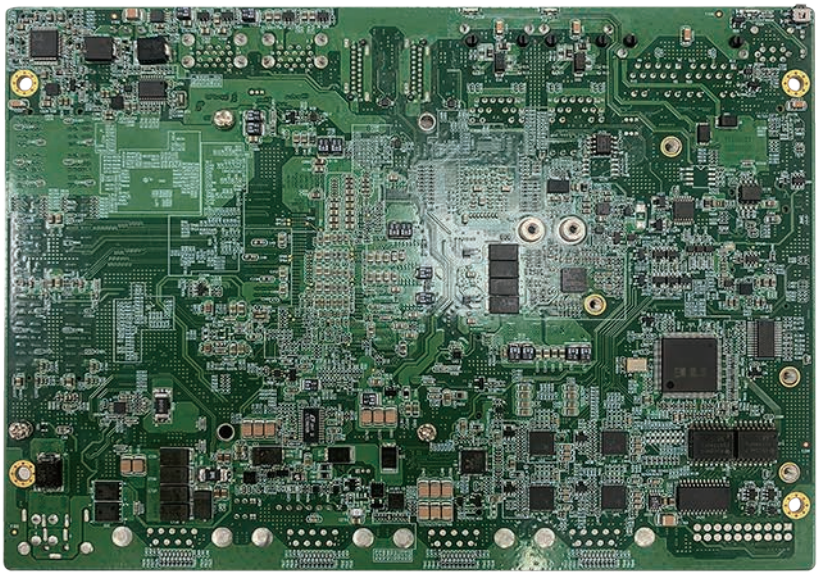
Step 2 Take heat sink on the mother board be care full.



Step 3 Turn over mother board. Fasten three M3x6L screws.

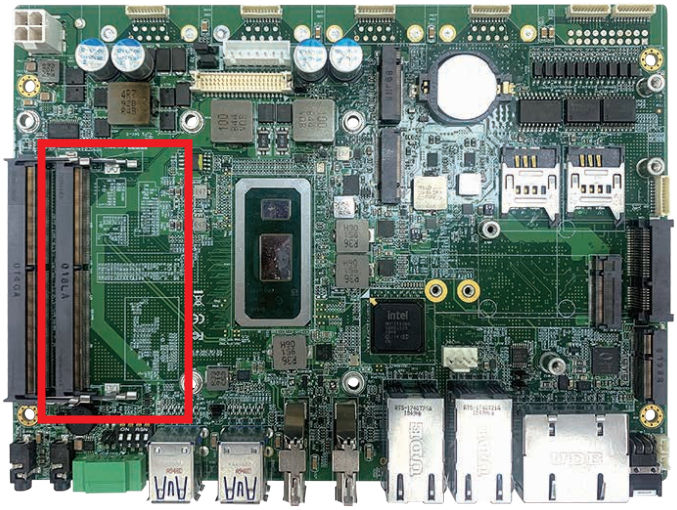


Step 4 Finish STEP 1~3.

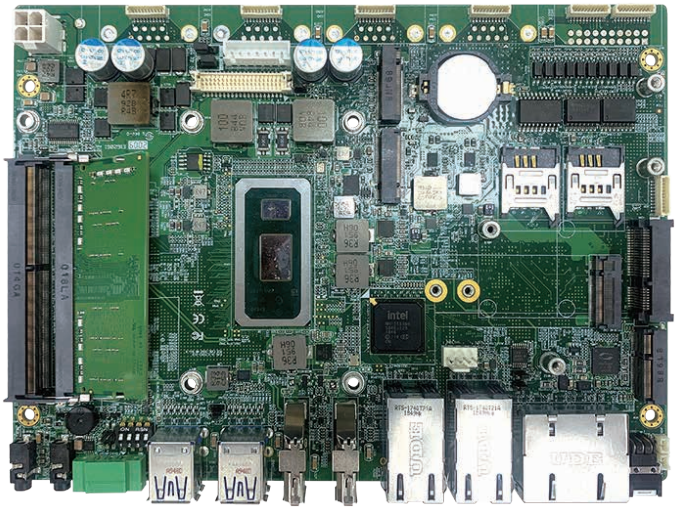


3.2 Installing DDR4 SO-DIMM Modules

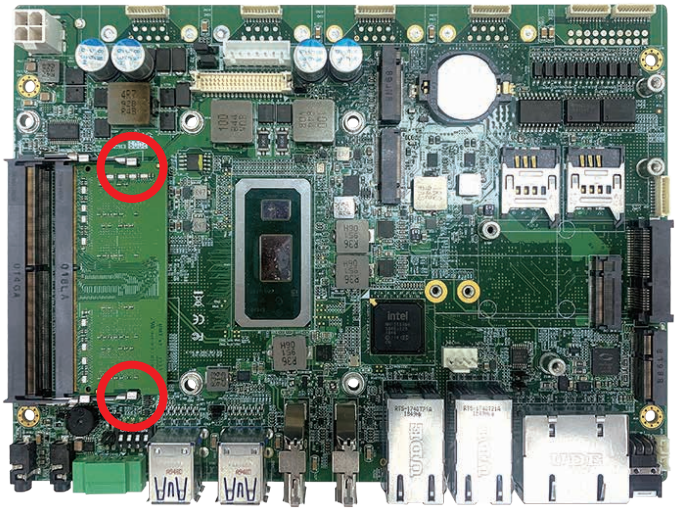
Step 1 DDR4 SO-DIMM slot.



Step 2 Install DDR4 RAM module into SO-DIMM slot.

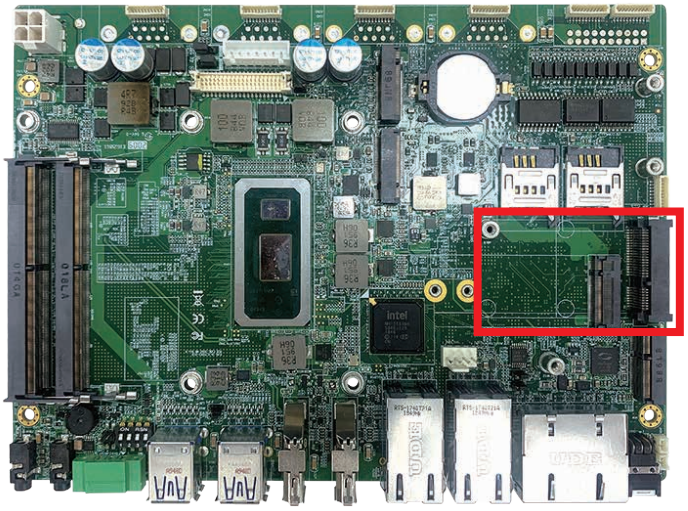


Step 3 Make sure the RAM module is locked by the memory slots.

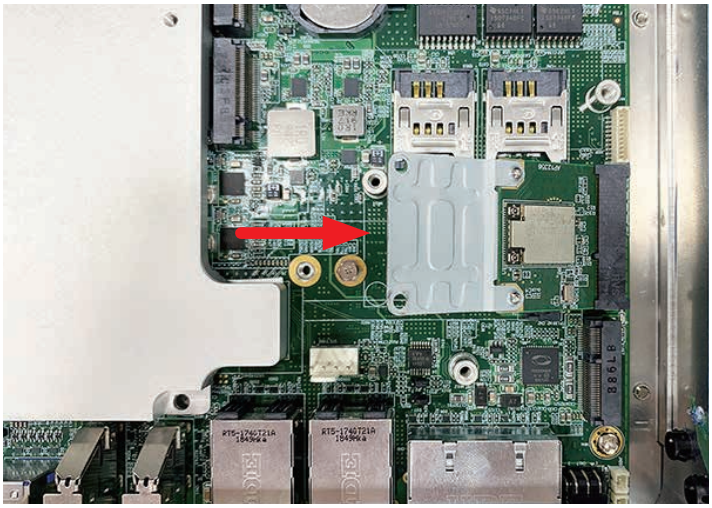


3.3 Installing Mini PCIe Card

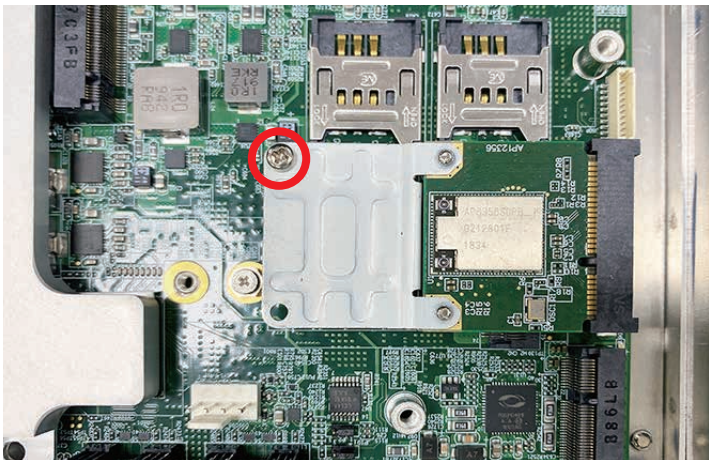
Step 1 Mini PCIe slot.



Step 2 Install Mini PCIe card into the Mini PCIe slot.



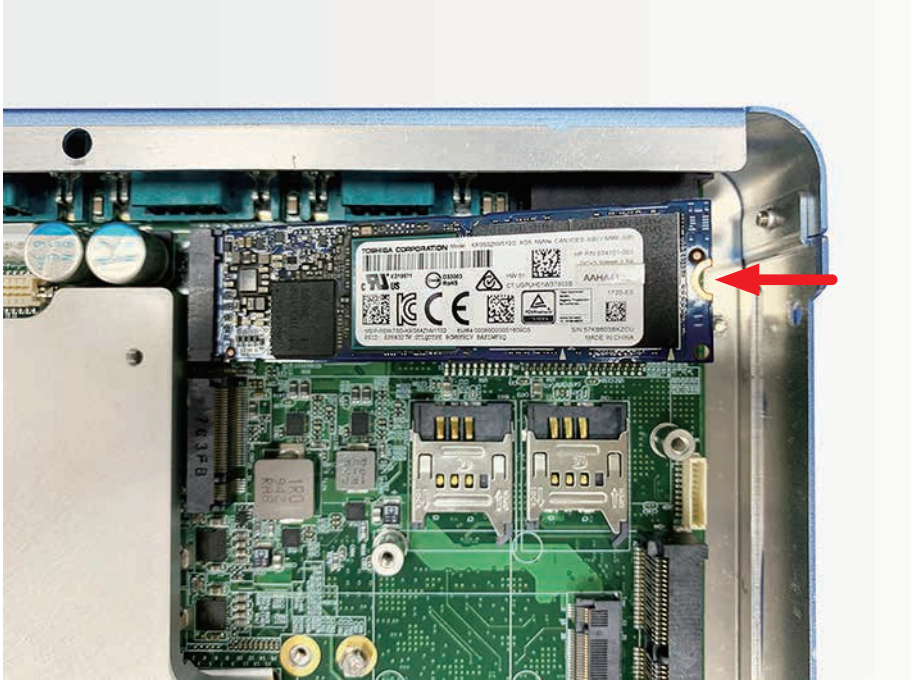
Step 3 Fasten one M2.5 screw.



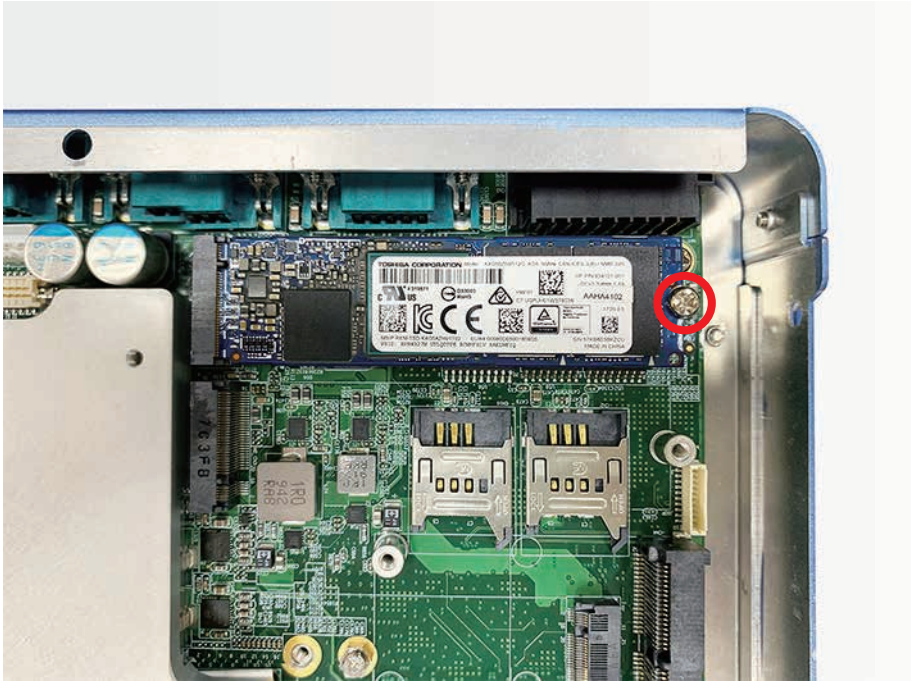
3.4 Installing M.2

3.4.1 Key E 2230, Key B 2280, Key M 2280

Step 1 Install M.2 card into the M.2 slot.

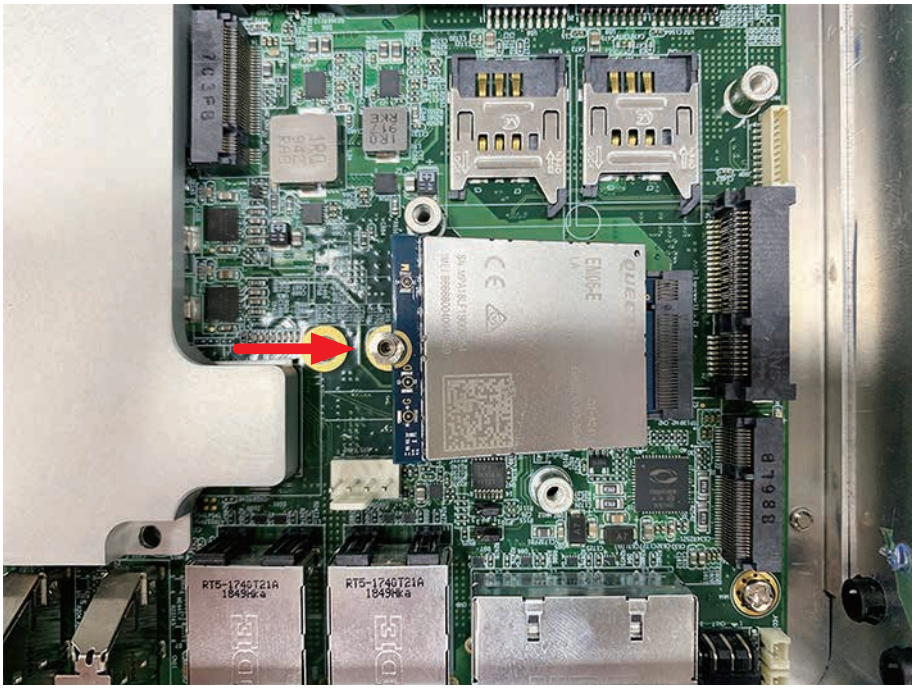


Step 2 Fasten one M3x6L screw.

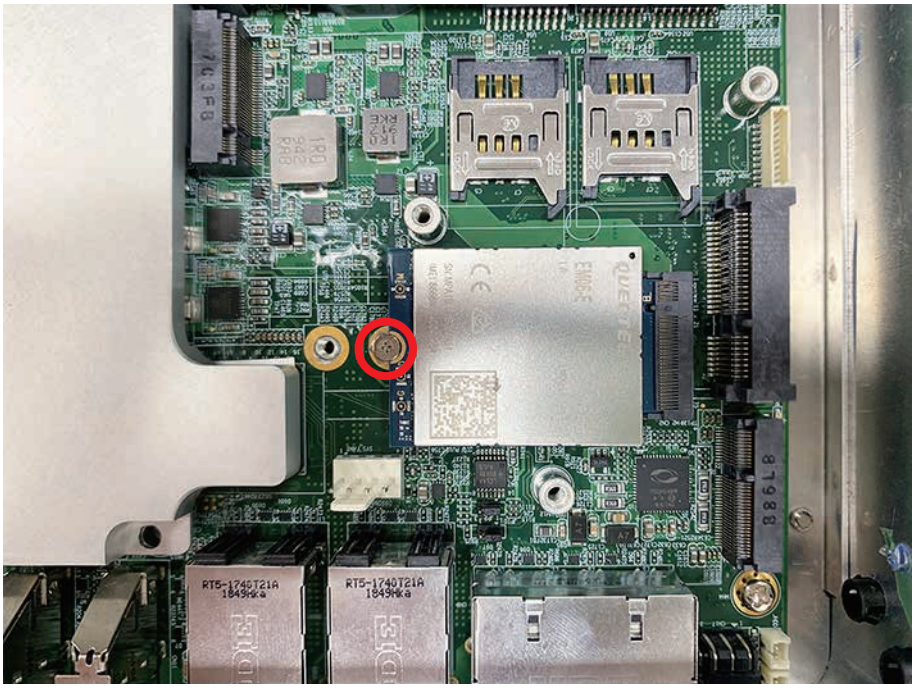


3.4.2 Key B 3042

Step 1 Install M.2 card into the M.2 slot.

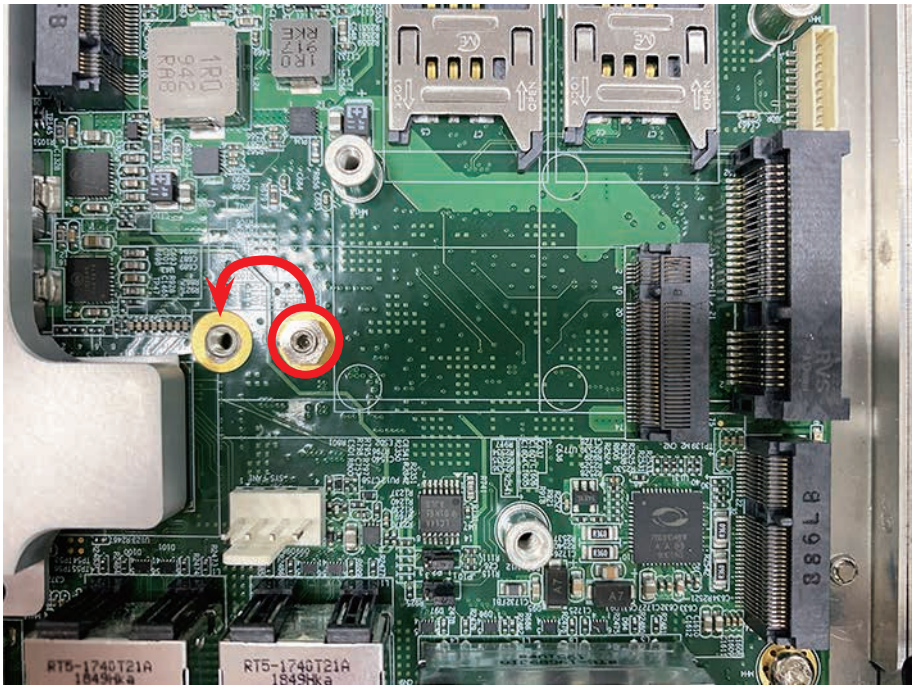


Step 2 Fasten one M2x2L screw.

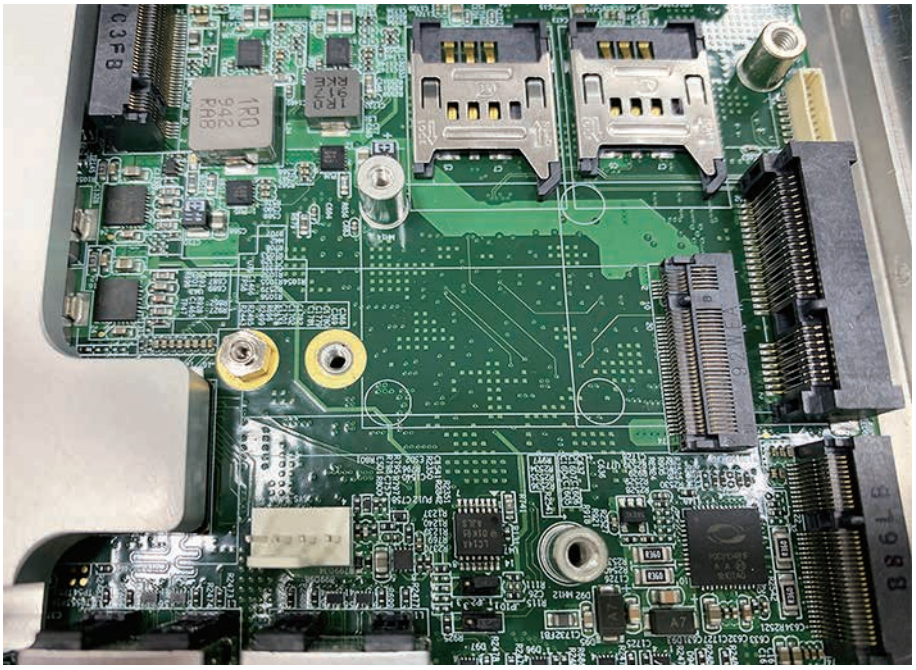


3.4.3 Key B 3052

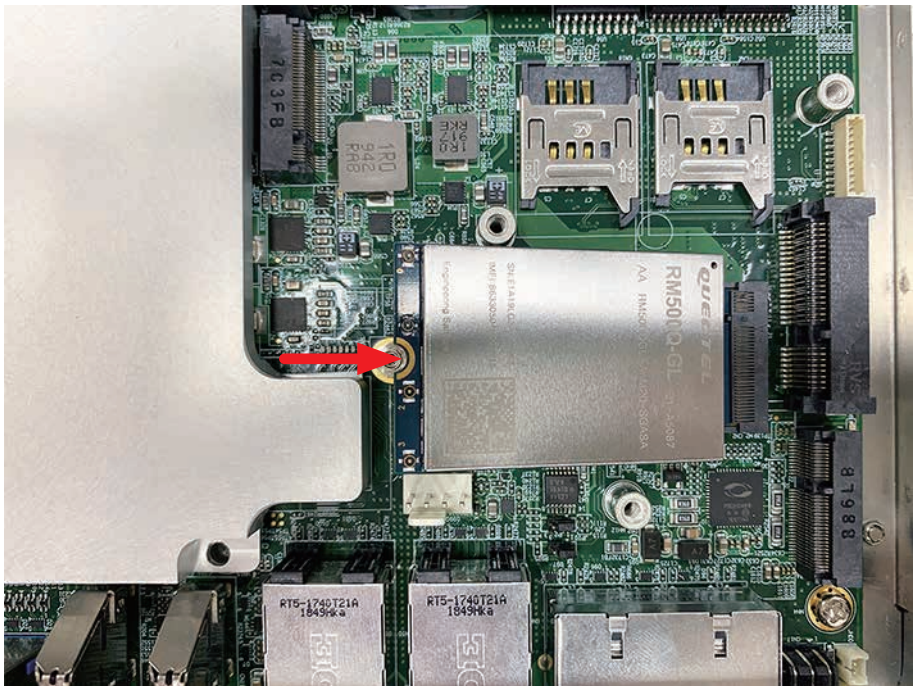
Step 1 Change the stud position.



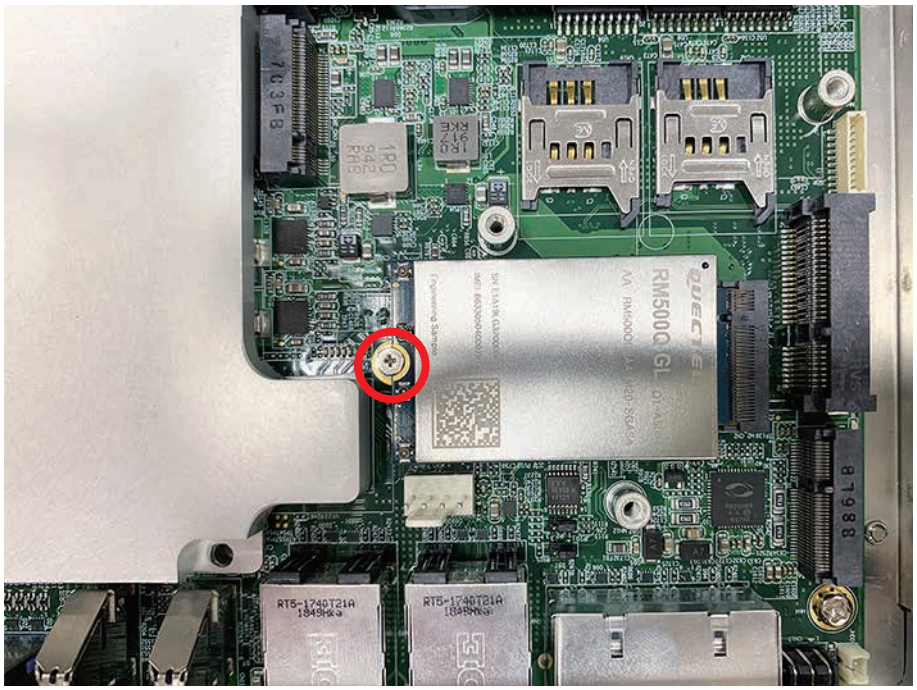
Step 2 Then, it is able to install M2 Key B 3052 module.



Step 3 Install M.2 card into the M.2 slot.

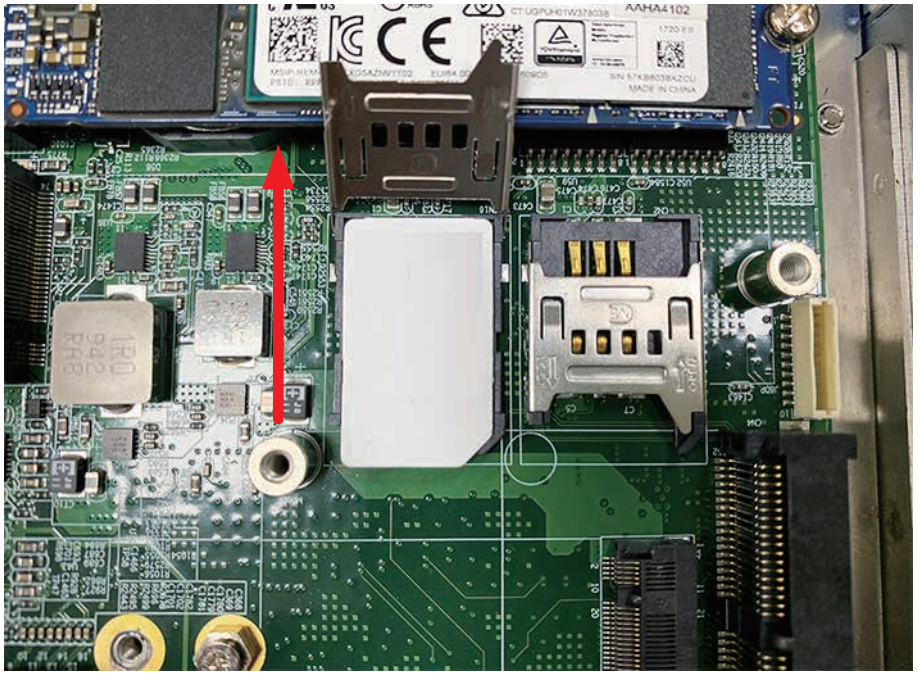


Step 4 Fasten one M2x2L screw.

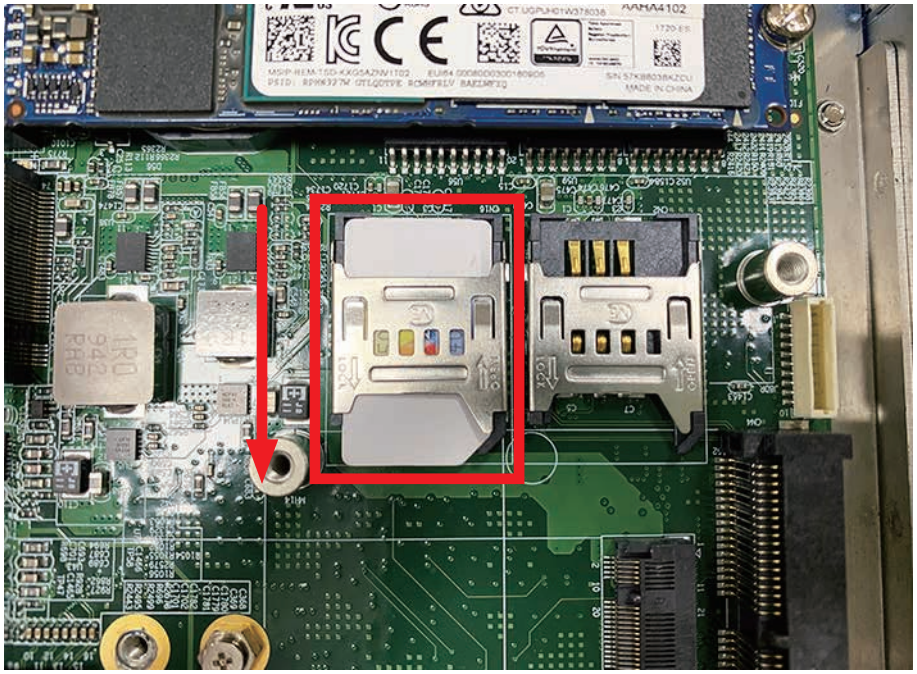


3.6 Installing SIM Card

Step 1 Push SIM card slot cover open and install SIM card.



Step 2 Close the cover.



4

BIOS SETUP

4.1 BIOS Setting

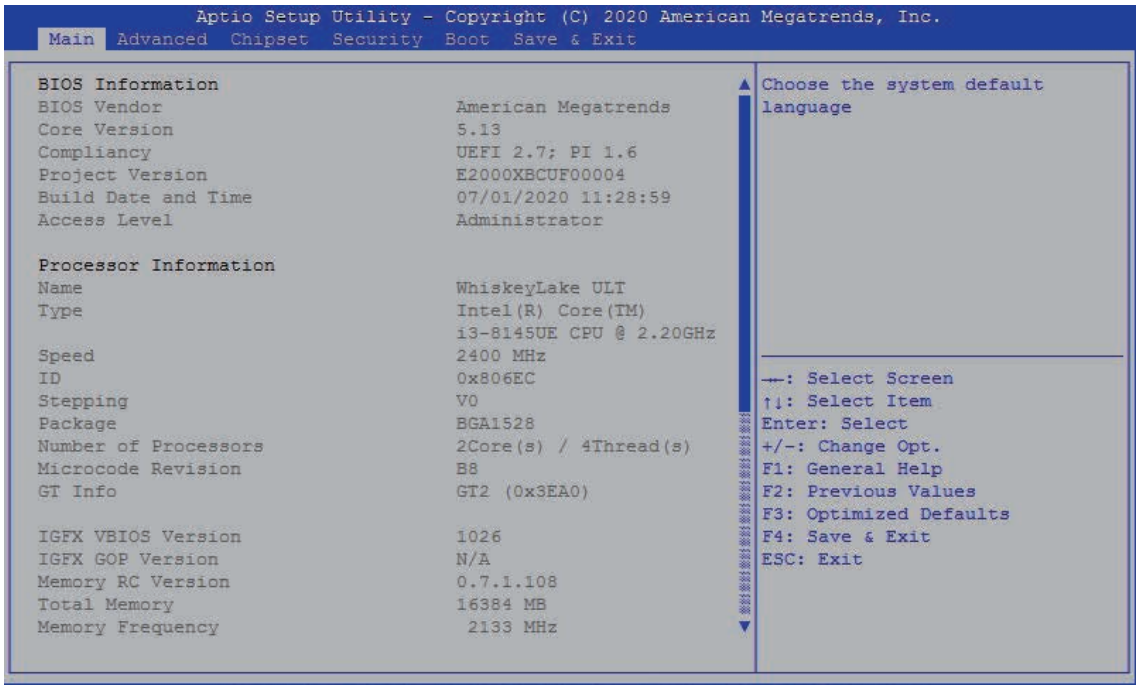


Figure 4-1 : Entering Setup Screen

BIOS provide an interface for user to check and change system configuration. The BIOS setup program is accessed by pressing the <Del> key when POST display output then main BIOS Setup menu screen is displayed.

4.2 Main Manu

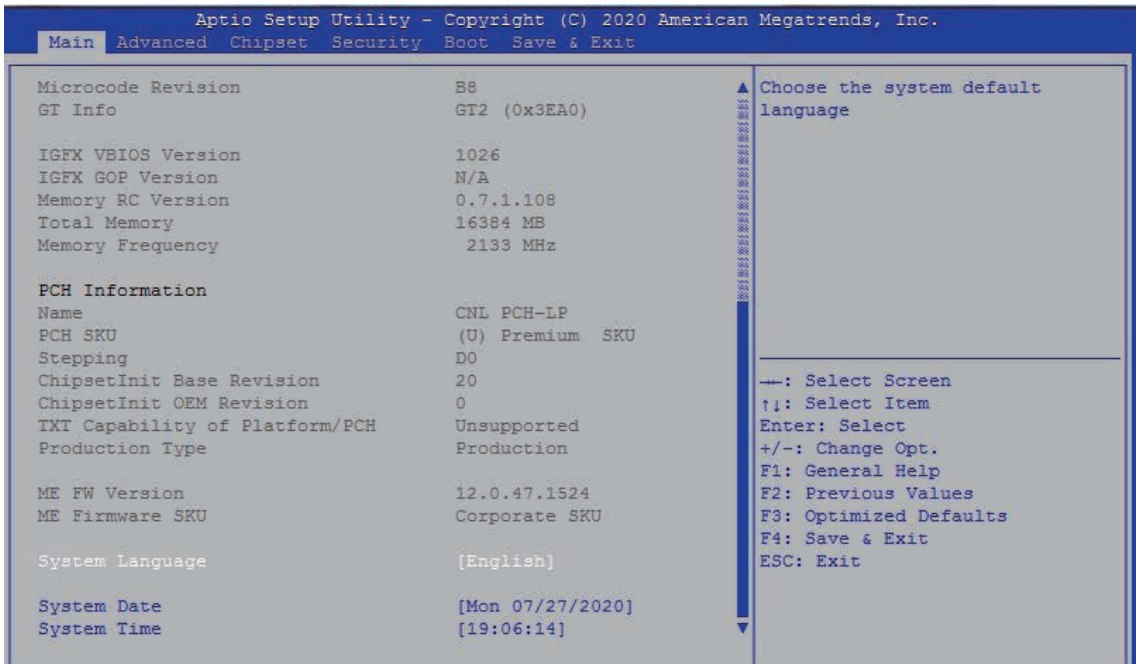


Figure 4-2 : BIOS Main Menu

The Main menu display BIOS version and system information.
There are two options on Main menu.

System Date

Set the Date. Use Tab to switch between Date elements.

System Time

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

4.3 Advanced Functions

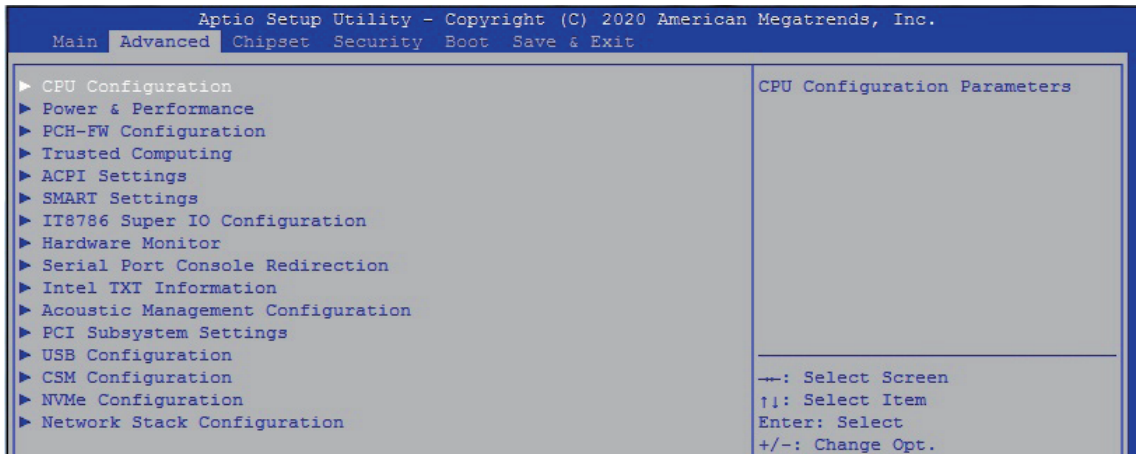


Figure 4-3 : BIOS Advanced Menu

Select Advanced tab to enter advanced BIOS Setup options such as CPU Configuration, SATA Configuration and USB Configuration.

4.3.1 CPU Configuration

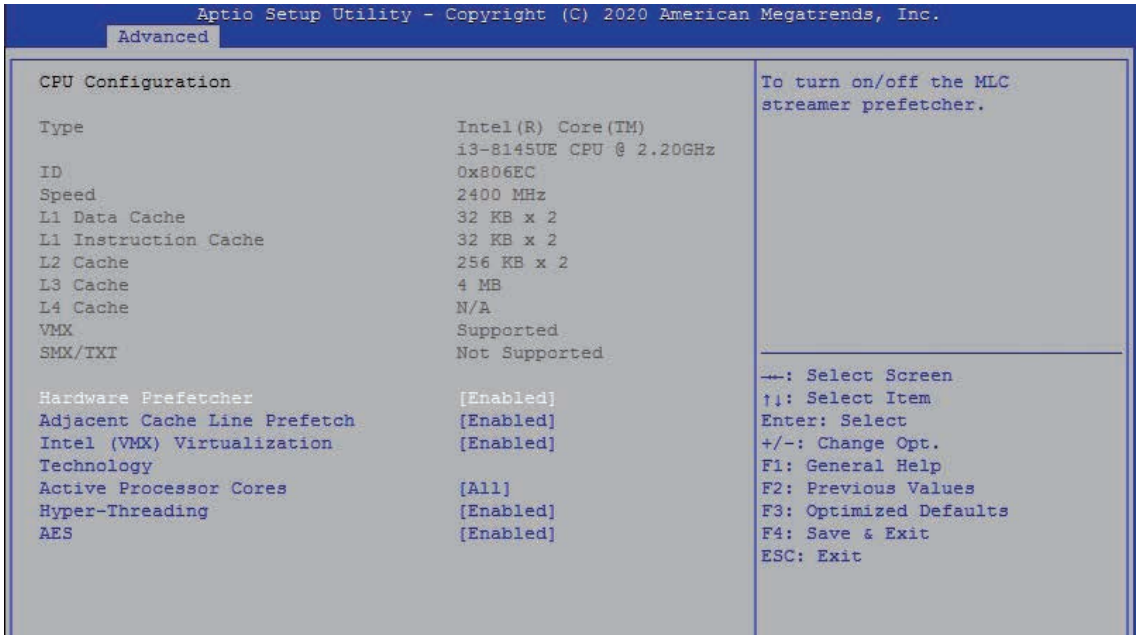


Figure 4-3-1 : CPU Configuration

Display CPU related information and features supported.

Hardware Prefetcher

To turn on/off the MLC streamer prefetcher.

Adjacent Cache Line Prefetch

To turn on/off prefetching of adjacent cache lines.

Intel (VMX) Virtualization Technology

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

Active Processor Cores

Number of cores to enable in each processor package.

Hyper-threading

Enabled or Disabled Hyper-Threading Technology.

AES

Enable/Disable AES (Advanced Encryption Standard).

4.3.2 Power & Performance

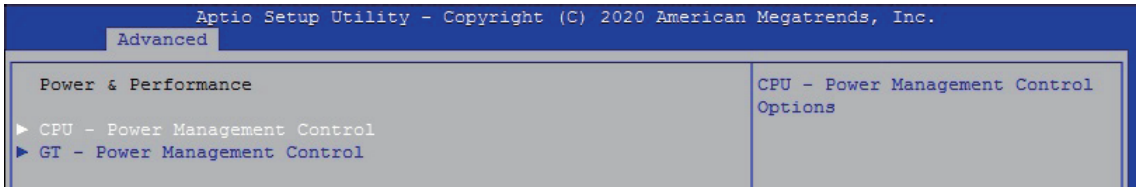


Figure 4-3-2 : Power & Performance

4.3.2.1 CPU-Power Management Control

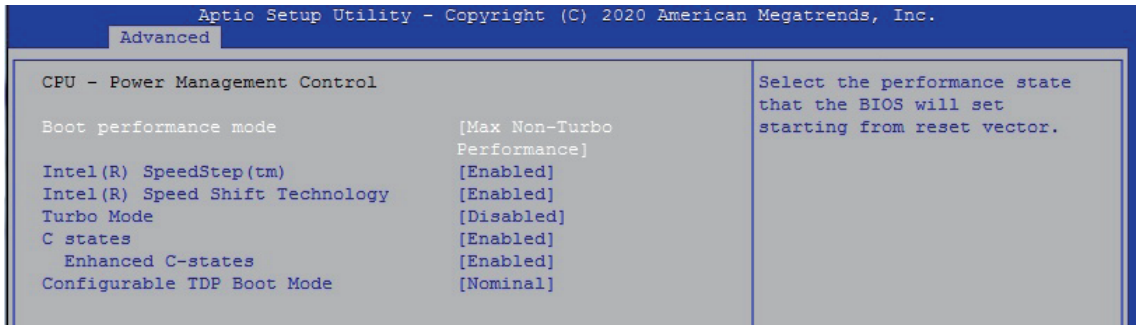


Figure 4-3-2-1 : CPU-Power Management Control

Boot performance mode

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

Intel(R) SpeedStep(tm)

Allow more than two frequency ranges to be supported.

Intel(R) Speed shift Technology

Enable/Disable Intel ® Speed shift Technology support. Enabling will expose the CPPCv2 interface to allow for hardware controlled P-states.

Turbo Mode

Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).

C states

Enable or disable CPU Power management. Allows CPU to go to C states when it's no 100% utilized.

Enhanced C-states

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

Configurable TDP Boot Mode

Configurable TDP Mode as Nominal/Up/Down/Deactivate TDP selection. Deactivate option will set MSR to Nominal and MMIO to Zero. Configurable TDP allows operation in situation where extra cooling is available or situations where a cooler and quieter mode of operation is desired.

4.3.2.2 GT-Power Management Control

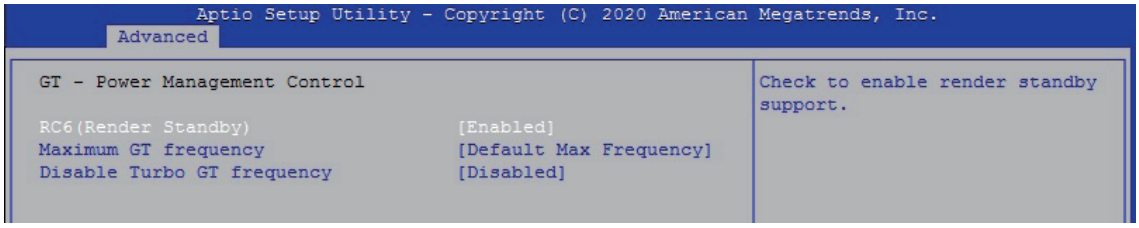


Figure 4-3-2-2 : GT-Power Management Control

RC6 (Render Standby)

Check to enable render standby support.

Maximum GT frequency

Maximum GT frequency limited by the user. Choose between 300MHz (RPN) and 1150 MHz (RP0). Value beyond the range will be clipped to min/max supported by SKU.

Disable Turbo GT frequency

Enabled : Disables Turbo GT frequency. Disabled : GT frequency is not limited.

4.3.3 PCH-FW Configuration

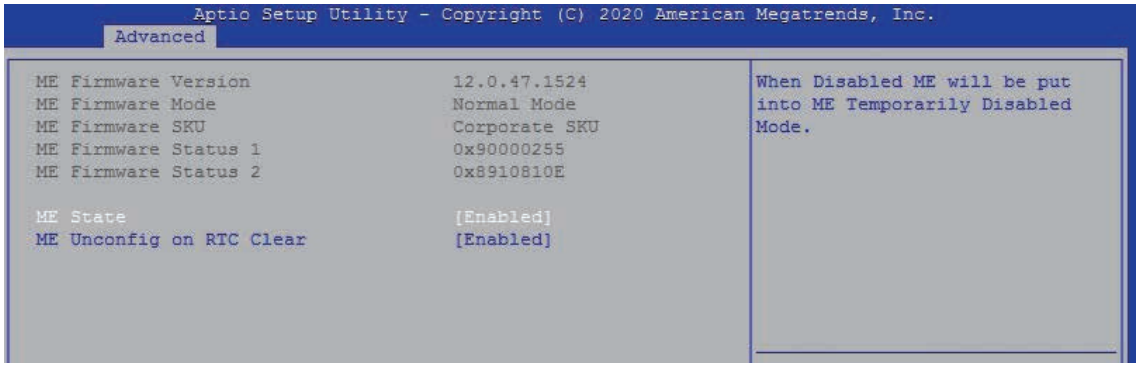


Figure 4-3-3 : PCH-FW Settings

ME State

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

ME Unconfig on RTC Clear

Disabling this option will cause ME not be unconfigured on RTC clear.

4.3.4 Trusted Computing

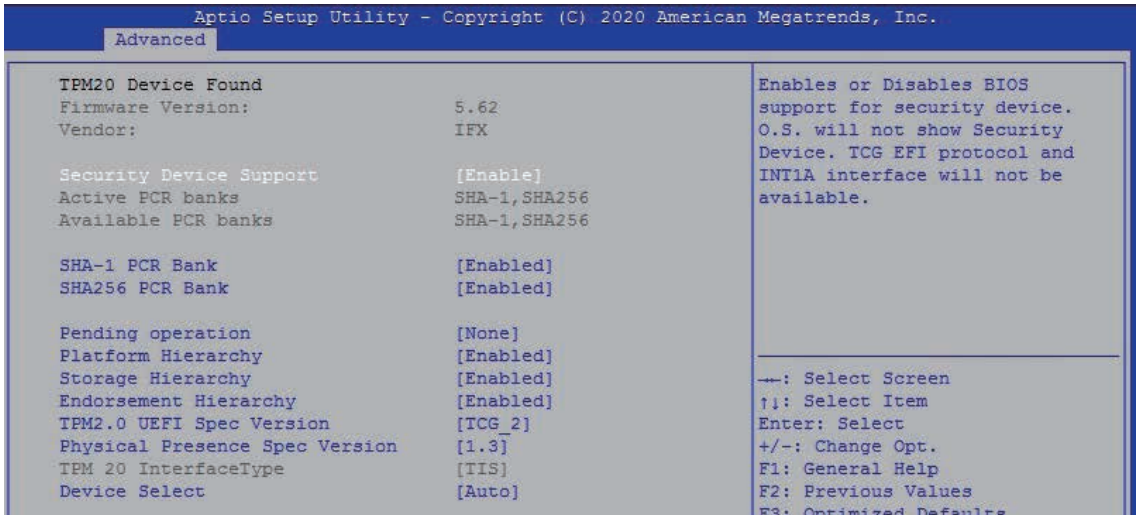


Figure 4-3-4 : Trusted Computing

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

4.3.5 ACPI Settings

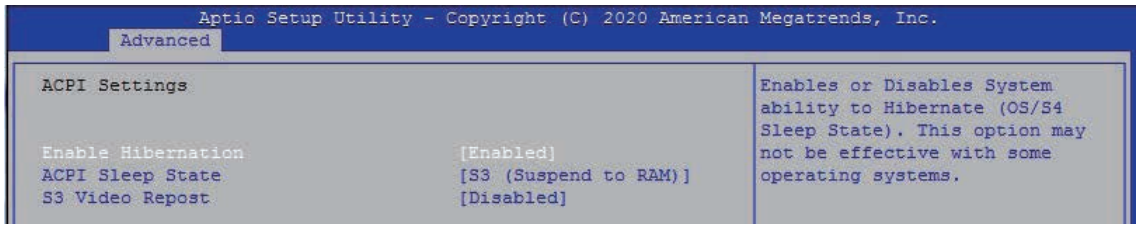


Figure 4-3-5 : ACPI Settings

Enable Hibernation

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

ACPI Sleep State

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

S3 Video Repost

Enable or Disable S3 Video Repost.

4.3.6 SMART Settings

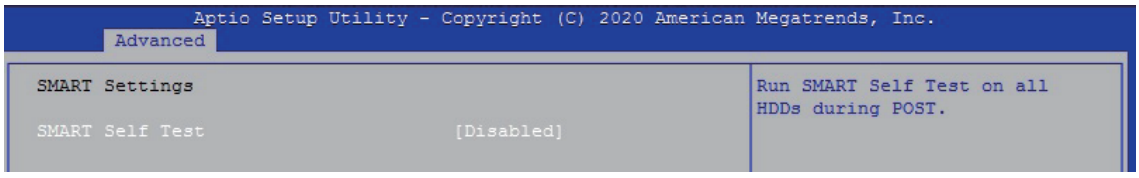


Figure 4-3-6 : SMART Settings

SMART Self Test

Run SMART Self-test on all HDDs during POST.

4.3.7 IT8786 Super IO Configuration

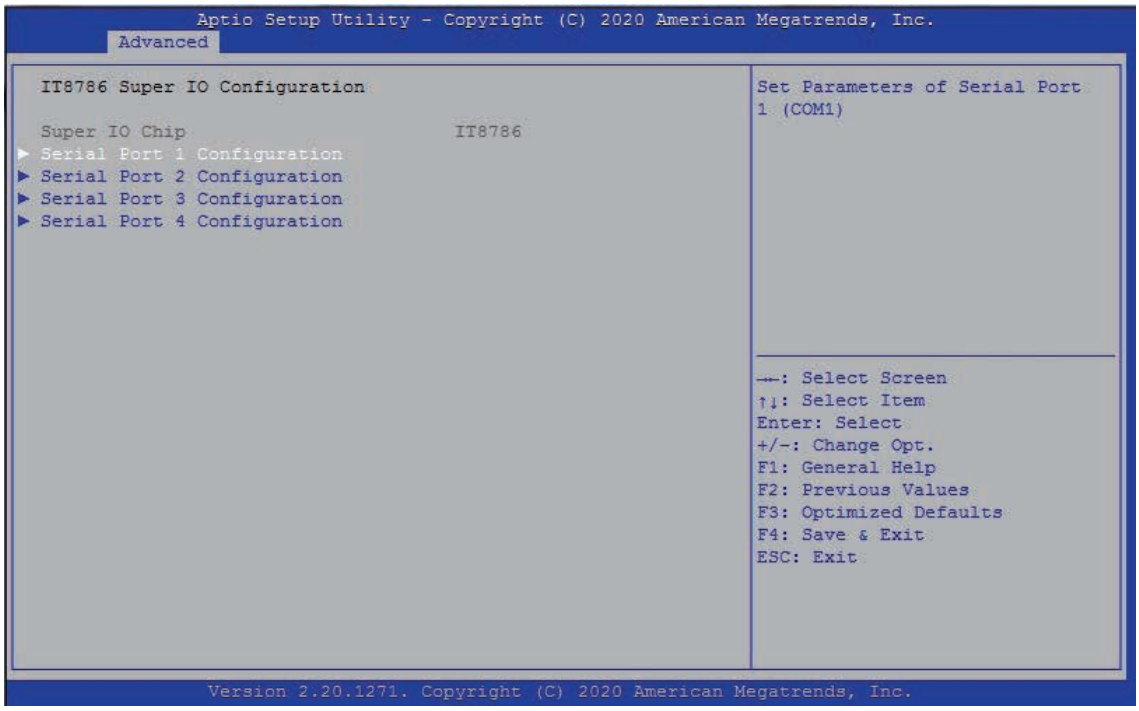


Figure 4-3-7 : Super IO Settings

Serial Port 1 Configuration

Set Parameters of Serial Port 1 (COM1).

Serial Port 2 Configuration

Set Parameters of Serial Port 2 (COM2).

Serial Port 3 Configuration

Set Parameters of Serial Port 3 (COM3).

Serial Port 4 Configuration

Set Parameters of Serial Port 4 (COM4).

4.3.8 Hardware Monitor

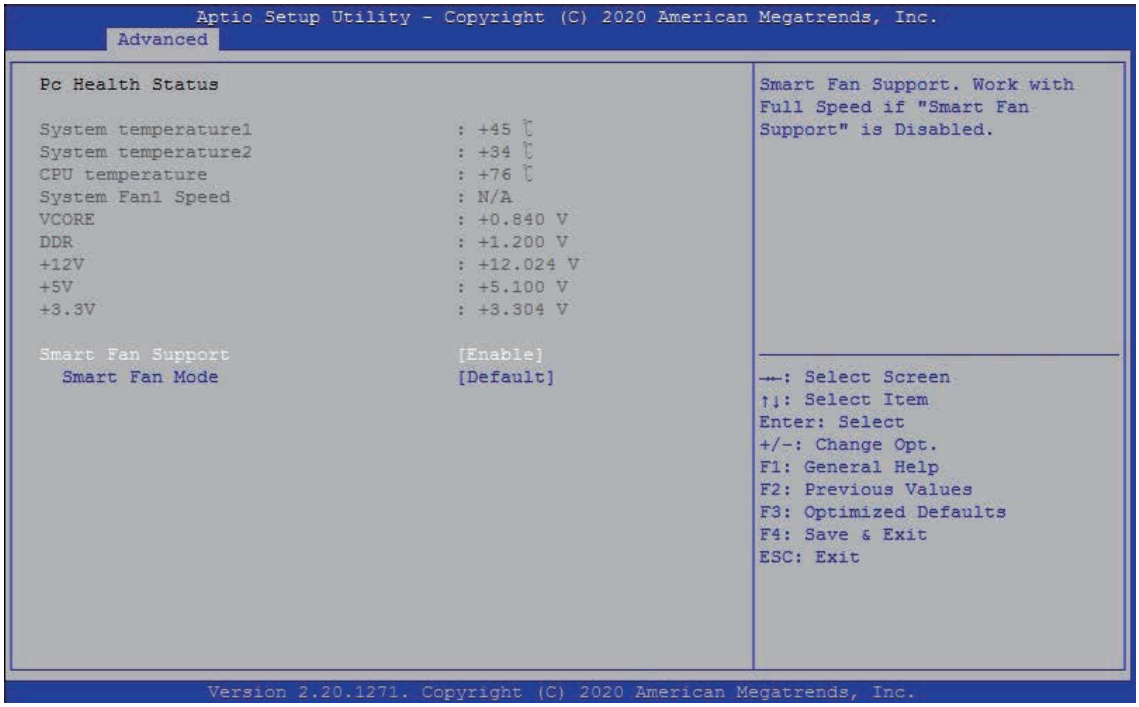


Figure 4-3-8 : Hardware Monitor Settings

The IT8786 SIO features an enhanced hardware monitor providing thermal, fan speed and system voltages status monitoring.

Smart Fan Support

Smart Fan Support. Work with full Speed if "Smart Fan Support" is Disabled.

Smart Fan Mode

Default : Using the default smart fan table.
User : Setting parameters by user.

Start Temperature

Temperature Limit value of Fan Start (Degree C).
(Range : 10-80)

PWM Start Value (%)

Default PWM Value of Fan.
(Range : 15%-100%)

Full Speed Temperature

Temperature Limit value of Fan Full Speed (Degree C).
(Range : 50-90)

4.3.9 Serial Port Console Redirection

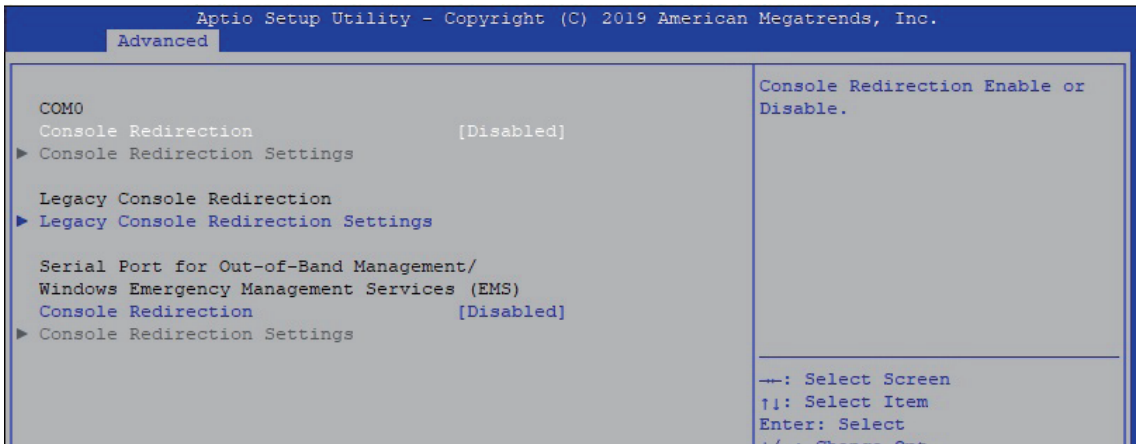


Figure 4-3-9 : Serial Port Console Redirection Settings

Console Redirection

Console Redirection Enable or Disable.

Console Redirection Settings

The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

Legacy Console Redirection Settings

Legacy Console Redirection Settings

Serial Port for Out-of-Band management/Windows Emergency Management Services (EMS)

Console Redirection Enable or Disable.

4.3.10 Intel TXT Information

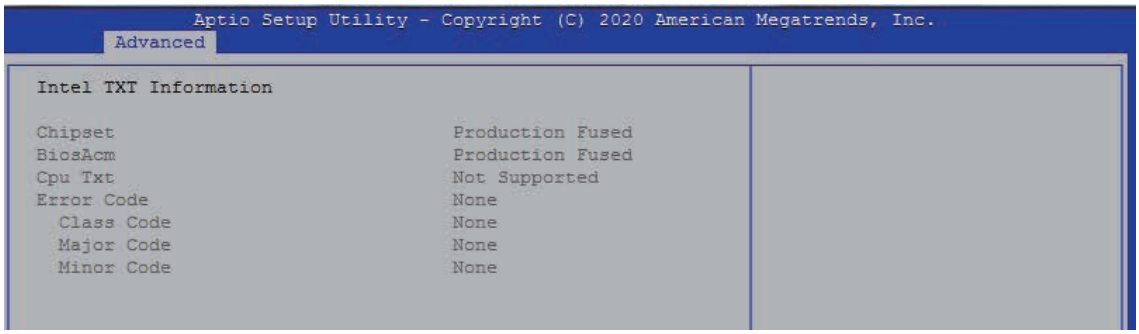


Figure 4-3-10 : Intel TXT Information

Display Intel TXT information.

4.3.11 Acoustic Management Configuration

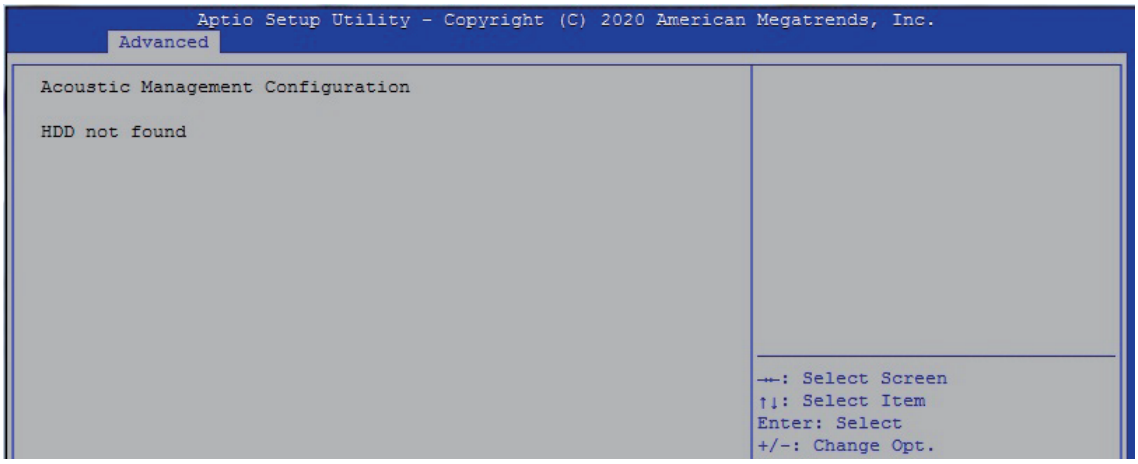


Figure 4-3-11 : Acoustic Management Settings

Acoustic Management Configuration

Option to Enable or Disable Automatic Acoustic Management.

4.3.12 PCI Subsystem Settings

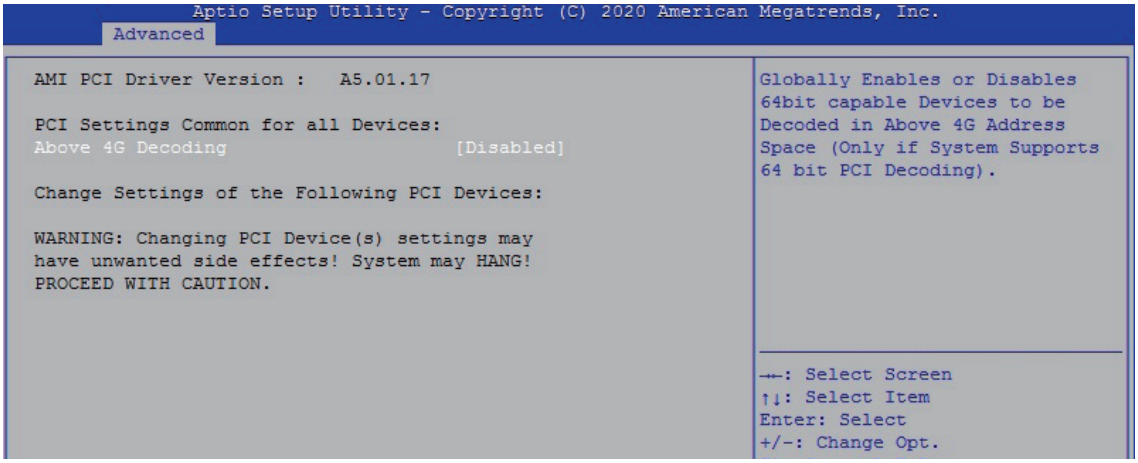


Figure 4-3-12 : PCI Subsystem Settings

Above 4G Decoding

Globally Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).

4.3.13 USB Configuration

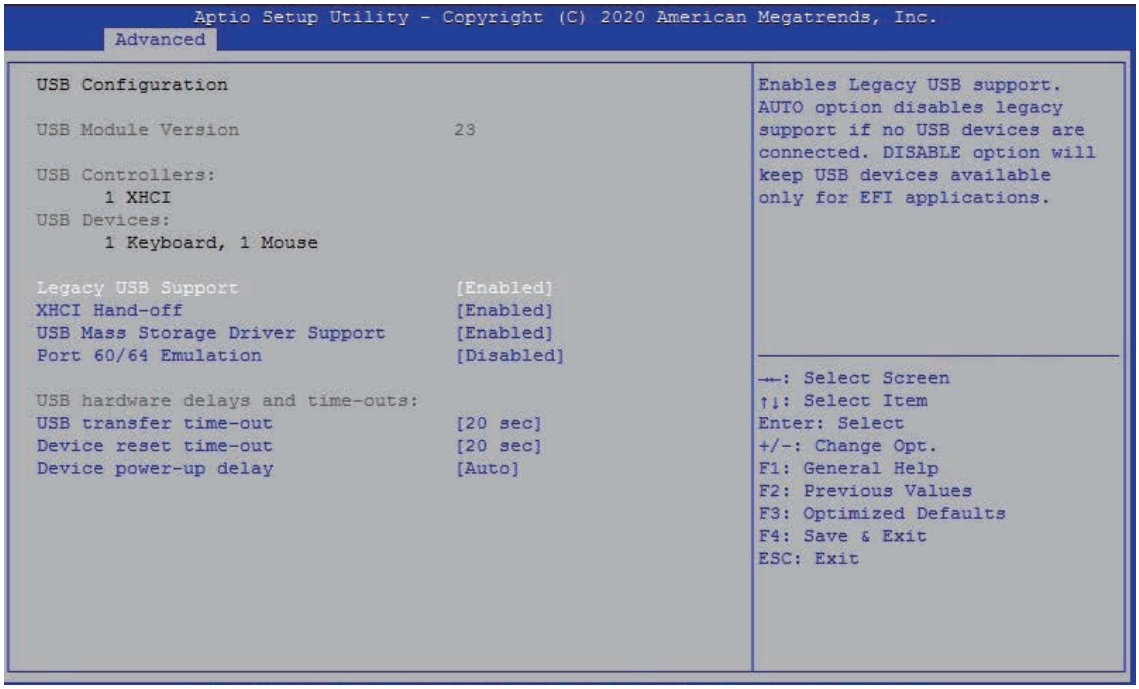


Figure 4-3-13 : USB Settings

Legacy USB Support

Enables Legacy USB support.
AUTO option disables legacy support if no USB devices are connected.
DISABLE option will keep USB devices available only for EFI applications.

XHCI Hand-off

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

USB Mass Storage Driver Support

Enable/Disable USB Mass Storage Driver Support.

Port 60/64 Emulation

Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OSes.

USB transfer time-out

The time-out value for Control, Bulk, and Interrupt transfers.

Device reset time-out

USB mass storage device Start Unit command time-out.

Device power-up delay

Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value : for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

4.3.14 CSM Configuration

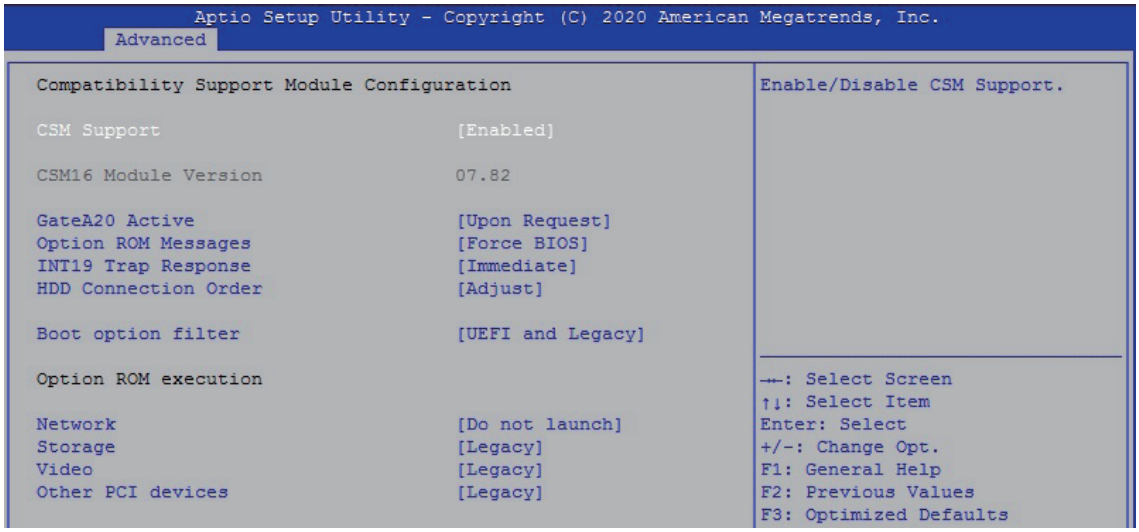


Figure 4-3-14 : CSM Settings

CSM Support

Enable/Disable CSM Support.

GateA20 Active

UPON REQUEST - GA20 can be disabled using BIOS services.
ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

Option ROM Messages

Set display mode for Option ROM.

INT19 Trap Response

BIOS reaction on INT19 trapping by Option ROM :
IMMEDIATE - execute the trap right away;
POSTPONED - execute the trap during legacy boot.

HDD Connection Order

Some OS require HDD handles to be adjusted, i.e. OS is installed on drive 80h.

Boot option filter

This option controls Legacy/UEFI ROMs priority.

Network

Controls the execution of UEFI and Legacy PXE OpROM.

Storage

Controls the execution of UEFI and Legacy Storage OpROM.

Video

Controls the execution of UEFI and Legacy Video OpROM.

Other PCI devices

Determines OpROM execution policy for devices other than Network, Storage, or Video.

4.3.15 NVMe Configuration

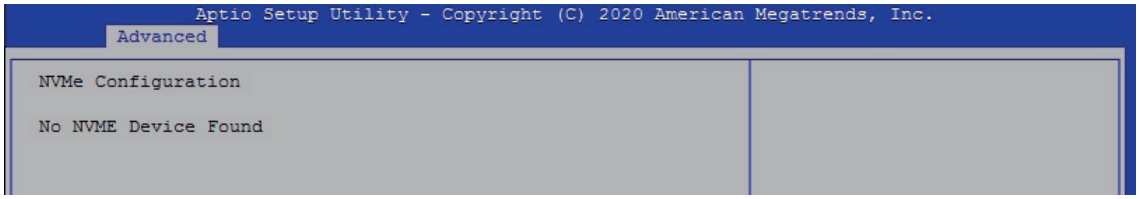


Figure 4-3-15 : NVMe Configuration

Display NVMe Controller and drive information.

4.3.16 Network Stack Configuration

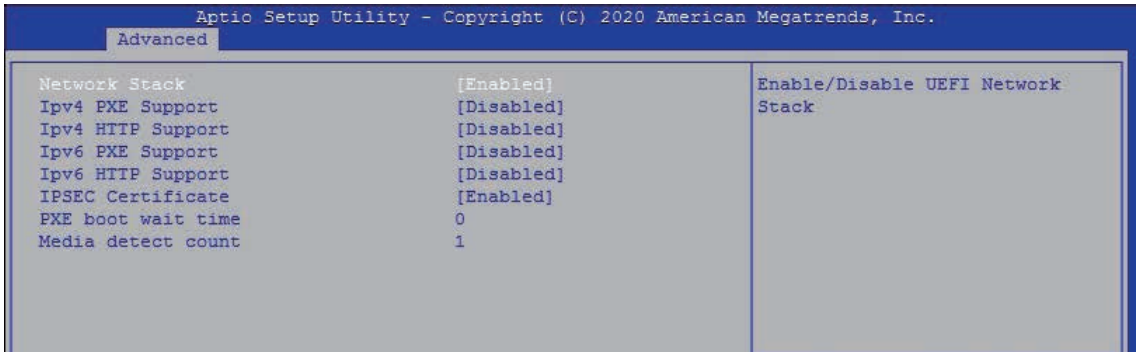


Figure 4-3-16 : Network Stack Settings

Network Stack

Enable/Disable UEFI Network Stack.

Ipv4 PXE Support

Enable/disable IPv4 PXE boot support.

Ipv4 HTTP Support

Enable/disable IPv4 HTTP boot support.

Ipv6 PXE Support

Enable/disable IPv6 PXE boot support.

Ipv6 HTTP Support

Enable/disable IPv6 HTTP boot support.

IPSEC Certificate

Support to Enable/disable IPSEC certificate for Ikev.

PXE boot wait time

Wait time to press ESC key to abort the PXE boot.

Media detect count

Number of times presence of media will be checked.

4.4 Chipset Functions

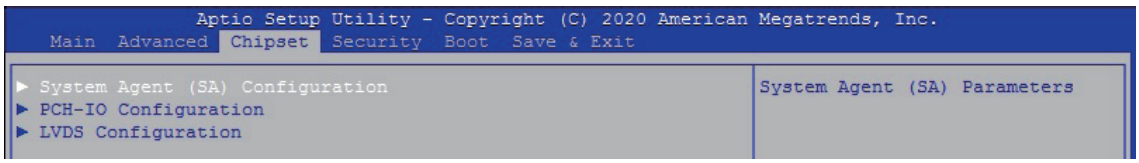


Figure 4-4 : BIOS Chipset Menu

System Agent (SA) Configuration
System Agent (SA) Parameters.

PCH-IO Configuration
PCH Parameters.

LVDS Configuration
LVDS Configuration.

4.4.1 System Agent (SA) Configuration

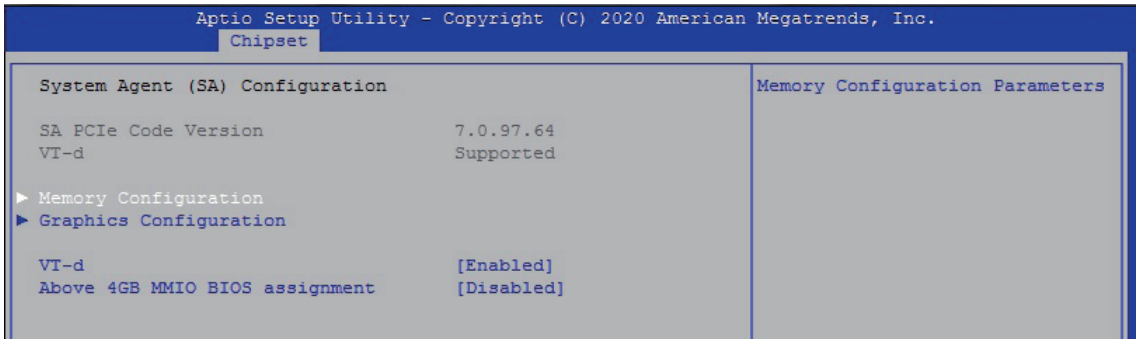


Figure 4-4-1 : System Agent Settings

VT-d
VT-d capability.

Above 4GB MMIO BIOS assignment
Enable/Disable above 4GB MemoryMappedIO BIOS assignment. This is disabled automatically when Aperture Size is set to 2048MB.

4.4.1.1 Memory Configuration

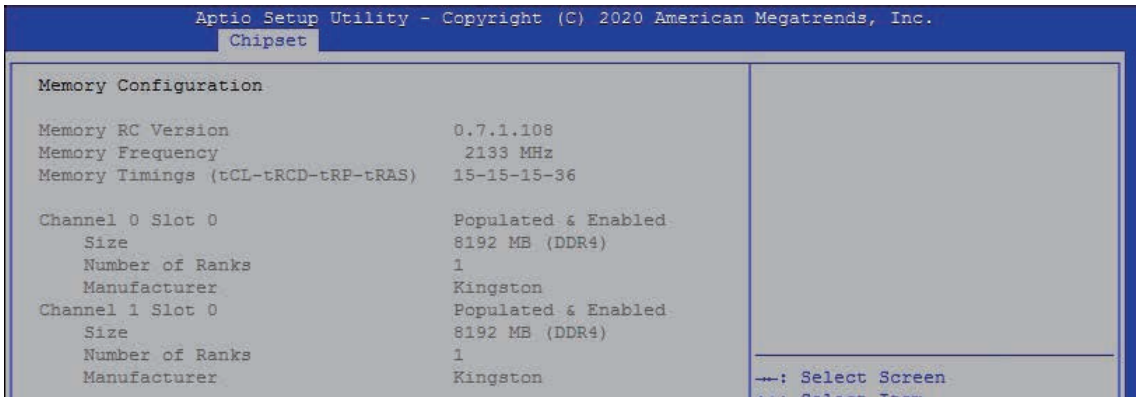


Figure 4-4-1-1 : Memory Information

Display memory information.

4.4.1.2 Graphics Configuration

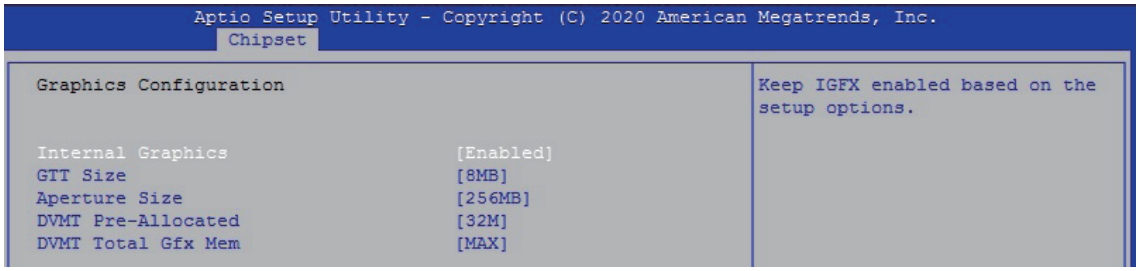


Figure 4-4-1-2 : Graphics Settings

Internal Graphics
Keep IGFX enabled based on the setup options.

GTT Size
Select the GTT size.

Aperture Size
Select the aperture size.
Note : Above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048MB aperture. To use this feature, please disable CSM support.

DVMT Pre-Allocated
Select DVMT 5.0 pre-allocated (fixed) graphics memory size used by the internal graphics device.

DVMT Total Gfx Mem
Select DVMT 5.0 total graphic memory size used by the internal graphics device.

4.4.2 PCH-IO Configuration

Figure 4-4-2 : PCH-IO Settings

PCH LAN Controller
Enable or disable onboard NIC.

Wake on LAN
Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.).

Serial IRQ Mode
Configure Serial IRQ Mode.

State After G3
Specify what state to go to when power is re-applied after a power failure (G3 state).

4.4.2.1 PCI Express Configuration of PCH-IO

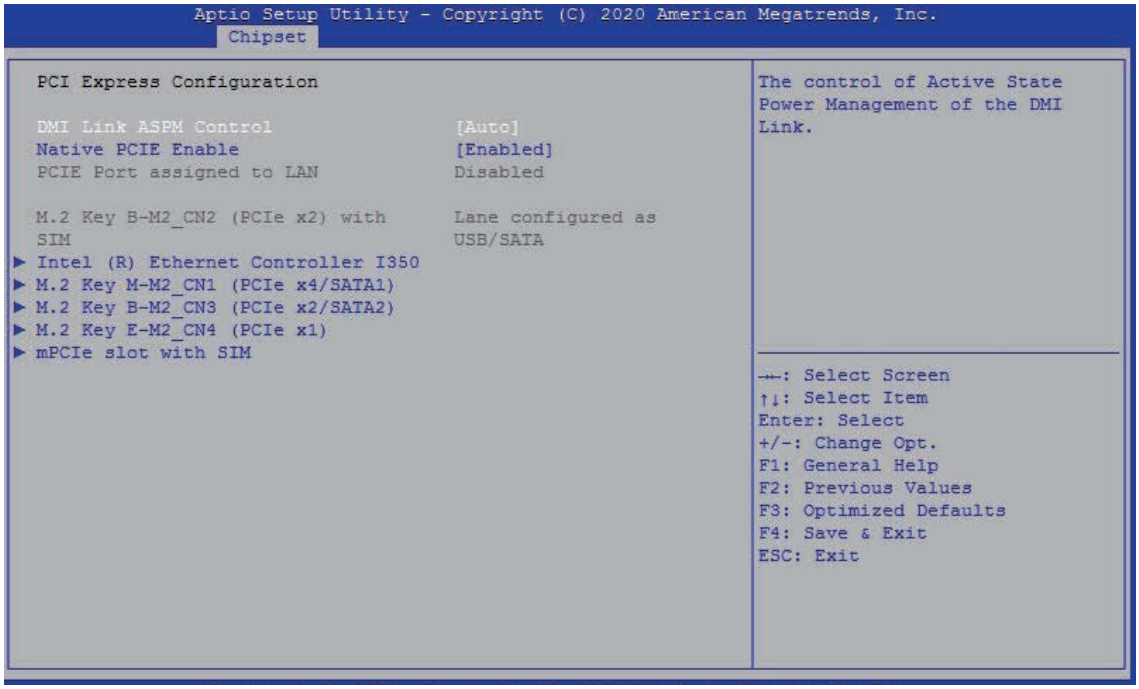


Figure 4-4-2-1 : PCI Express Configuration

DMI Link ASPM Control

The control of Active State Power Management of the DMI Link.

Native PCIE Enable

PCI Express Native Support Enable/Disable. This feature is available in vista and beyond Windows OS.

PCI Express device settings

BIOS options for PCI Express device setting.

4.4.2.2 SATA And RST Configuration

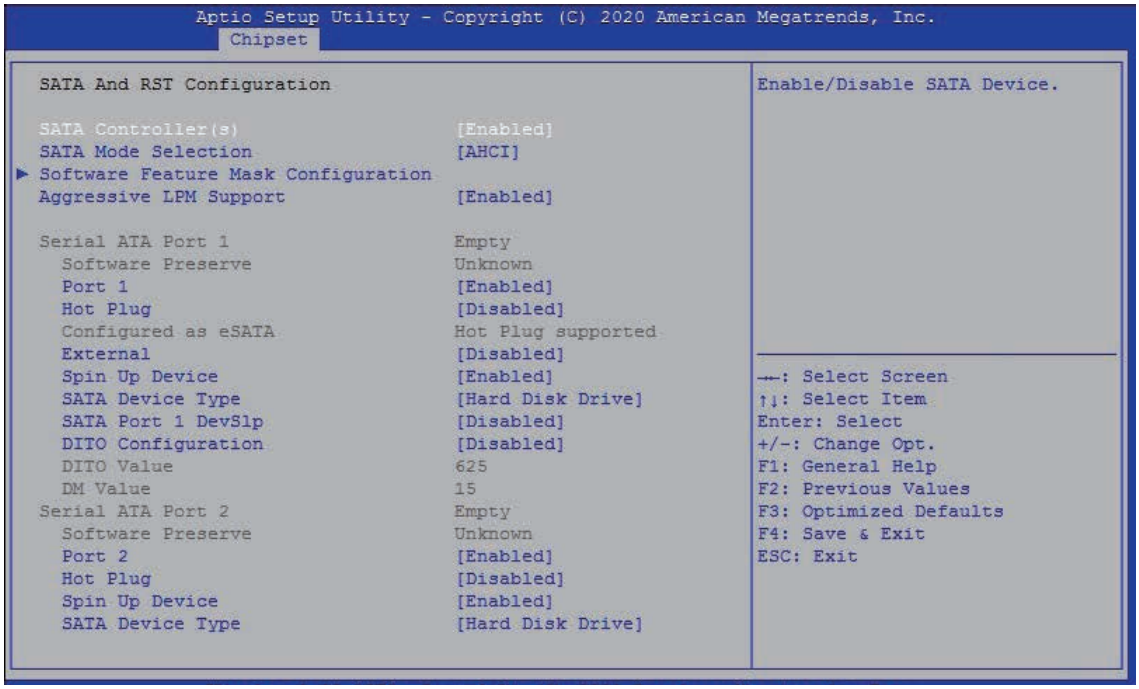


Figure 4-4-2-2 : SATA Devices Settings

SATA Controller(s)

Enable or disable SATA Device.

SATA Mode Selection

Determines how SATA controllers operate.

Software Feature Mask Configuration

RST Legacy OPROM/RST UEFI driver will refer to the SWFW configuration to enable/disable the storage features.

Aggressive LPM Support

Enable PCH to aggressively enter link power state.

Options for each SATA port.

Port n

Enable or disable SATA port.

Hot Plug

Designates this port as Hot Pluggable.

Spin Up Device

On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to the device.

SATA Device Type

Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

4.4.2.3 BIOS Security Configuration of PCH-IO

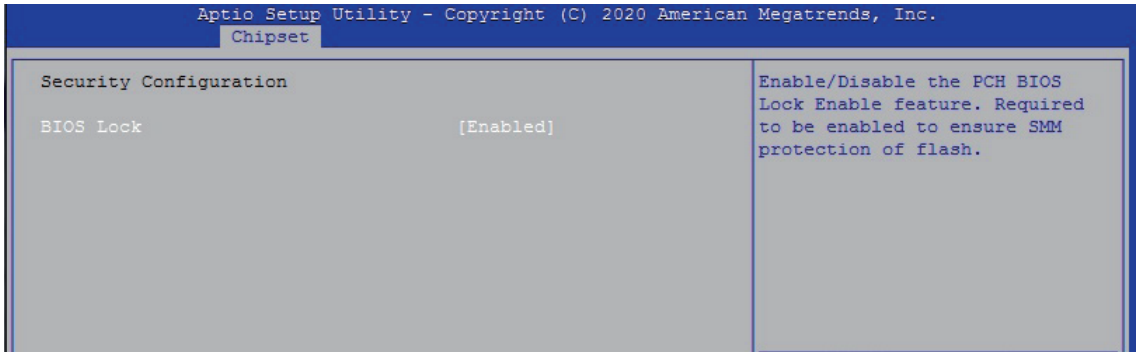


Figure 4-4-2-3 : BIOS Security Settings

BIOS Lock

Enable/Disable the PCH BIOS Lock Enable (BLE bit) feature.

4.4.3 LVDS Configuration

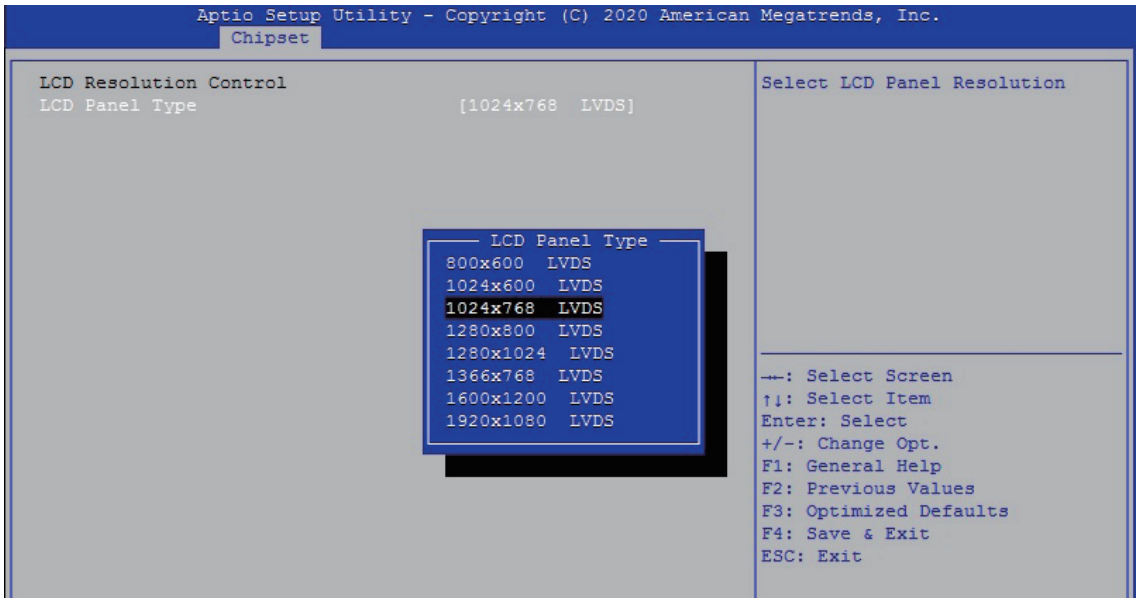


Figure 4-4-3 : LVDS Panel Settings

The LVDS Configuration option will be present if LVDS panel is connected on system.

LCD Panel Type

Select LCD Panel Resolution.

4.5 Security

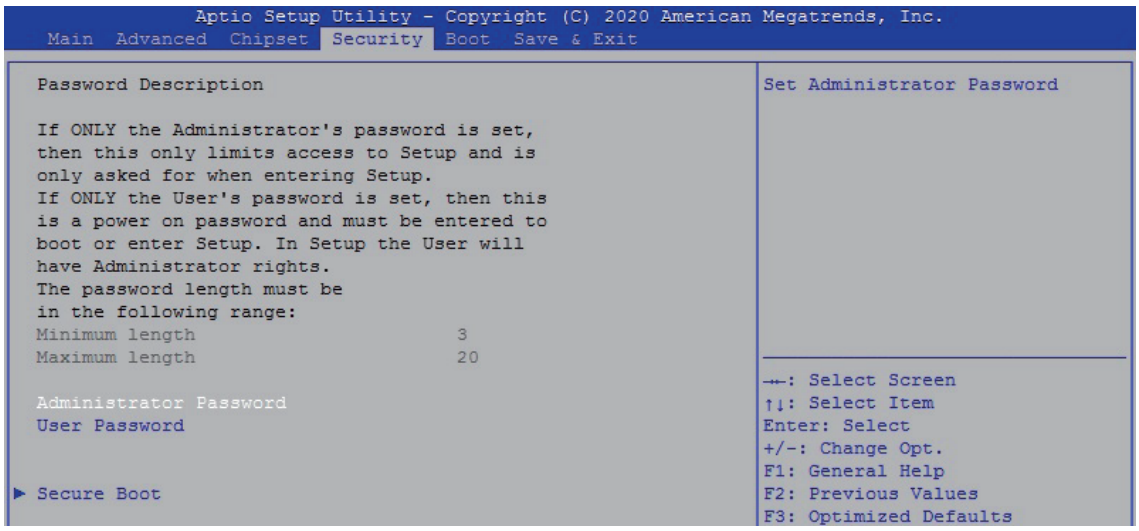


Figure 4-5 : BIOS Security Menu

Administrator Password

Set administrator password.

User Password

Set user password.

Secure Boot

Secure Boot coonfiguration.

4.5.1 Security Boot

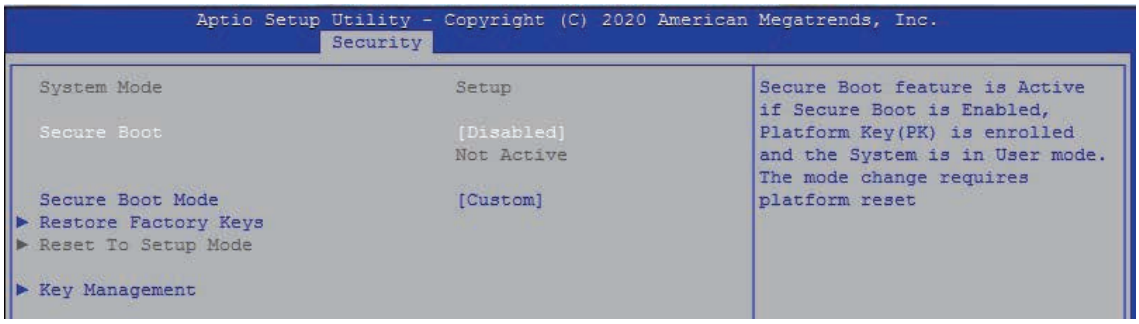


Figure 4-5-1 : Security Boot Settings

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.

Key Management

Enables expert users to modify Secure Boot Policy variables without full authentication.

4.6 Boot Functions

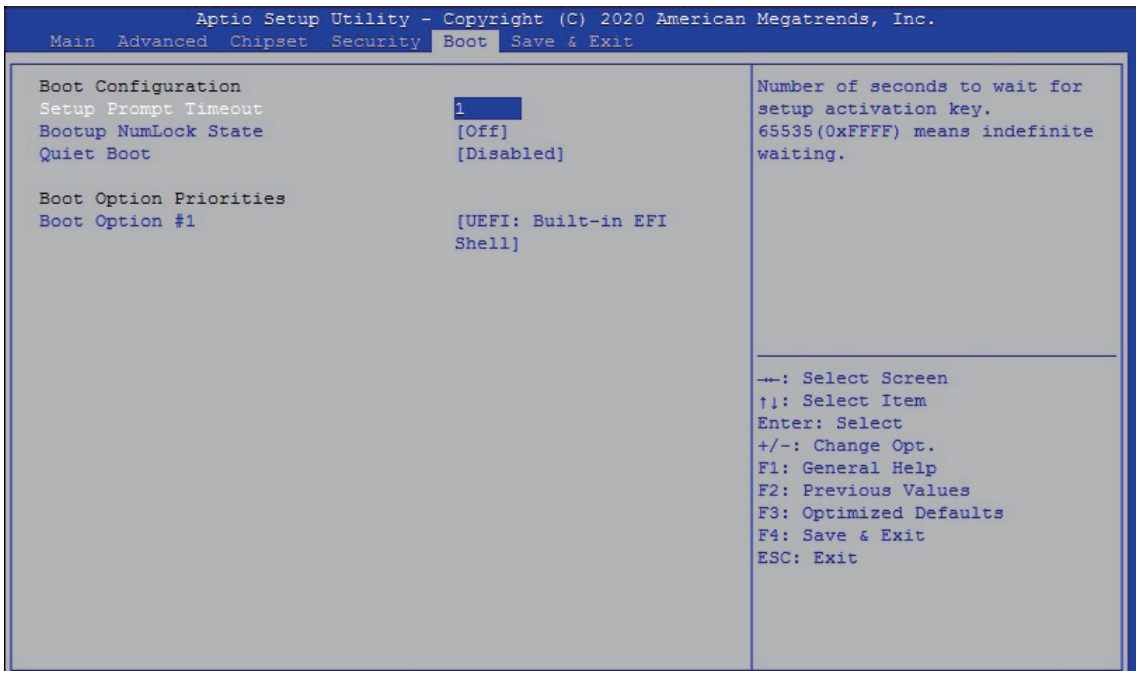


Figure 4-6 : BIOS Boot Menu

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 #x

Sets the system boot order.

Hard Drive BBS Priorities

Set the order of the legacy devices in this group.

4.7 Save & Exit

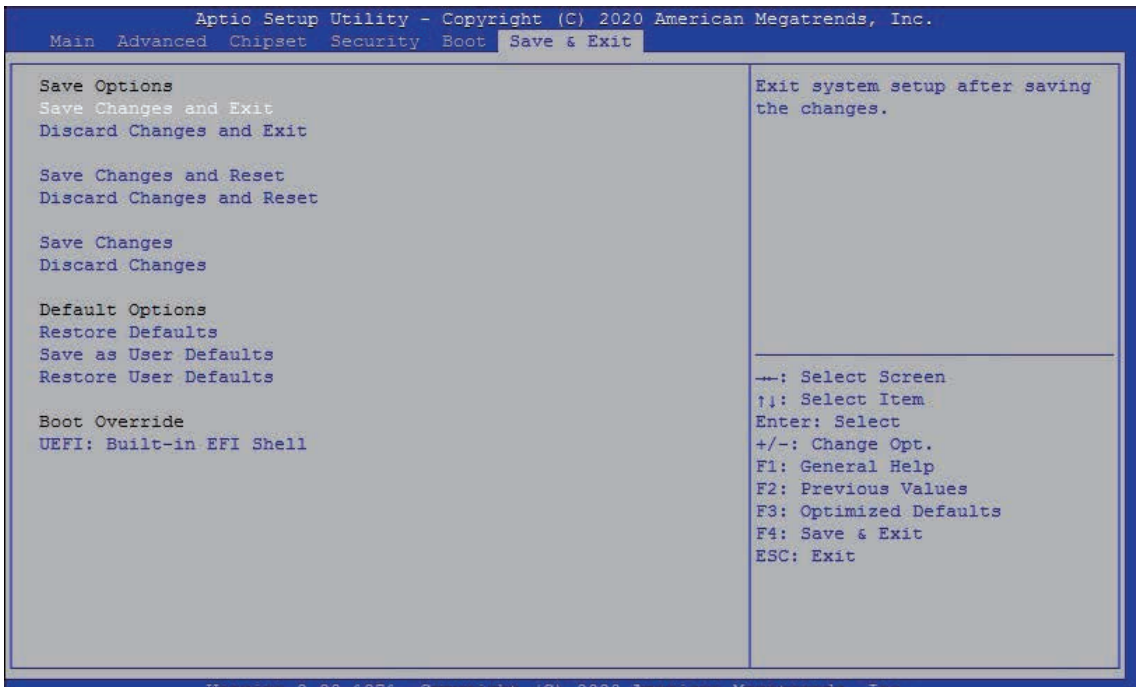


Figure 4-7 : BIOS Save and Exit Menu

Save Changes and Exit

Exit system setup after saving the changes.

Discard Changes and Exit

Exit system setup without saving any changes.

Save Changes and Reset

Reset the system after saving the changes.

Discard Changes and Reset

Reset system setup without saving any changes.

Save Changes

Save Changes done so far to any of the setup options.

Discard Changes

Discard Changes done so far to any of the setup options.

Default Options :

Restore Defaults

Restore/Load Default values for all the setup options.

Save as User Defaults

Save the changes done so far as User Defaults.

Restore User Defaults

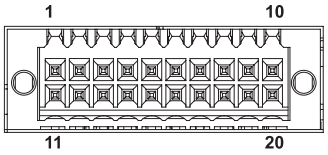
Restore the User Defaults to all the setup options.

APPENDIX A : GPIO Guide

A.1 Function Description

The EXBC-2000 offers a 16-bit GPIO 20-pin terminal block connector, a watchdog timer, and a 2-port PoE.

DIO definition is shown below :

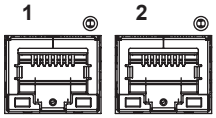


Pin No.	GPIO Definition	Pin No.	GPIO Definition
1	GPIO 0	11	GPIO 8
2	GPIO 1	12	GPIO 9
3	GPIO 2	13	GPIO 10
4	GPIO 3	14	GPIO 11
5	GPIO 4	15	GPIO 12
6	GPIO 5	16	GPIO 13
7	GPIO 6	17	GPIO 14
8	GPIO 7	18	GPIO 15
9	+VDI_COM1	19	GND_ISO_DIO1
10	GND_ISO_DIO1	20	+VDIO_EXT1

PoE definition is shown below :

Do NOT use these functions in below :

1. PE-2000 : DIO1 (ID = 0), POE
2. PE-3000 : POE (ID = 0)
3. UE-1000 : USB (ID = 0)



Pin No.	Definition
1	POE0
2	POE1

A.2 Software Package Contain

Distribution folder include x32 and x64 versions, use batch file for installation.

There are included as followed :

Win10_32.bat, and Win10_64.bat :

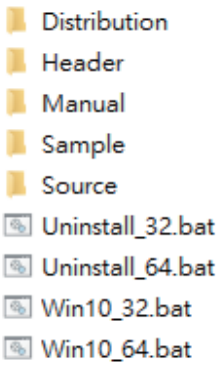
Installation for driver, and

Uninstall_32.bat, and Uninstall_64.bat :

Uninstallation for driver

Run batch file as Administrator.

Make sure Windows version before installation.



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

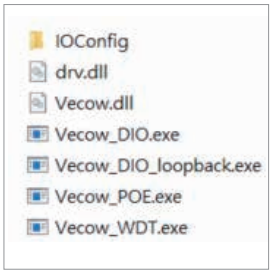
Manual folder include API description.

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

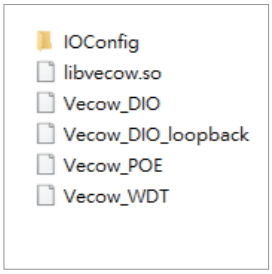
Source folder include sample program source code that compile on Visual Studio 2008/ubuntu16.04.

A.3 Sample

Execute demo tool.



Windows



Linux

Sample, as shown below :

```
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

```
POE sample version : v1.0.1609.0608
Load Vecow.dll at least v1.8.1409.0608
Vecow.dll Version : v1.8.1409.0608

Initial POE success!
Usable slave address ID : 0
Select slave address ID :
```

Vecow_POE

```
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)

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).

BOOL set_IO1_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.

Retur :

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 initial_POE(BYTE Scan, BYTE ID)

Initial POE.

Scan : POEID scan type

2 : Auto scan;

1 : Manual setup.

ID : POE ID by manual setting.

Range : 0~15.

Return :

TRUE (1) : Success.

FALSE (0) : Fail (Driver not exists, or version is too old, or out of range error).

BOOL get_POE_configuration(BYTE ID, BYTE *Auto, BYTE *Mask)

Get POE configuration (by variable).

ID : POE ID.

Range : 0~15.

Auto ([3:0]) : Auto mode, pin setting by hexadecimal bitmask.

1 : Auto;

0 : Manual.

Mask ([3:0]) : DC Enable/Disable, pin setting by hexadecimal bitmask.

1 : Enable;

0 : Disable.

Return :

TRUE (1) : Success.

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

BOOL set_POE_configuration(BYTE ID, BYTE Auto, BYTE Mask)

Set POE configuration (by variable).

ID : POE ID.

Range : 0~15.

Auto ([3:0]) : Auto mode, pin setting by hexadecimal bitmask.

1 : Auto;

0 : Manual.

Mask ([3:0]) : DC Enable/Disable, pin setting by hexadecimal bitmask.
1 : Enable;
0 : Disable.
Return :
TRUE (1) : Success.
FALSE (0) : Fail (Initial error, or out of range error, or hardware problem).

BOOL get_POE(BYTE ID, BYTE *POE)

Get POE state.
ID : POE ID.
Range : 0~15.
POE ([3:0]) : POE state, pin setting by hexadecimal bitmask.
1 : On;
0 : Off.
Return :
TRUE (1) : Success.
FALSE (0) : Fail (Initial error, or out of range error, or call by pointer error, or hardware problem).

BOOL set_POE(BYTE ID, BYTE POE)

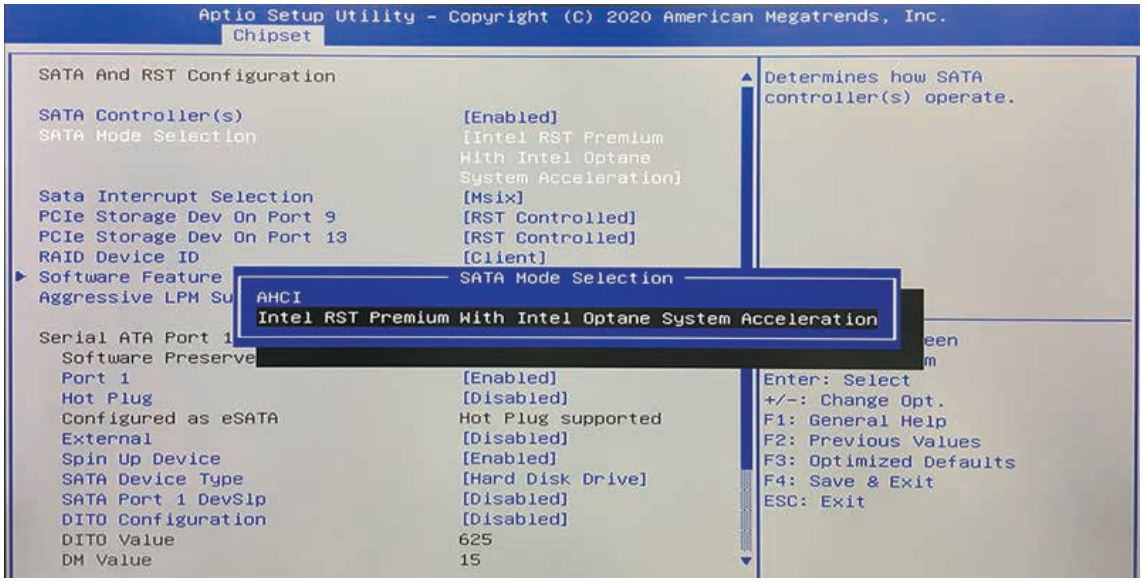
Set POE state.
A. ID : POE ID.
Range : 0~15.
B. POE ([3:0]) : POE state, pin setting by hexadecimal bitmask.
1 : On;
0 : Off.
Return :
TRUE (1) : Success.
FALSE (0) : Fail (Initial error, or out of range error, or hardware problem).

APPENDIX C : RAID Functions

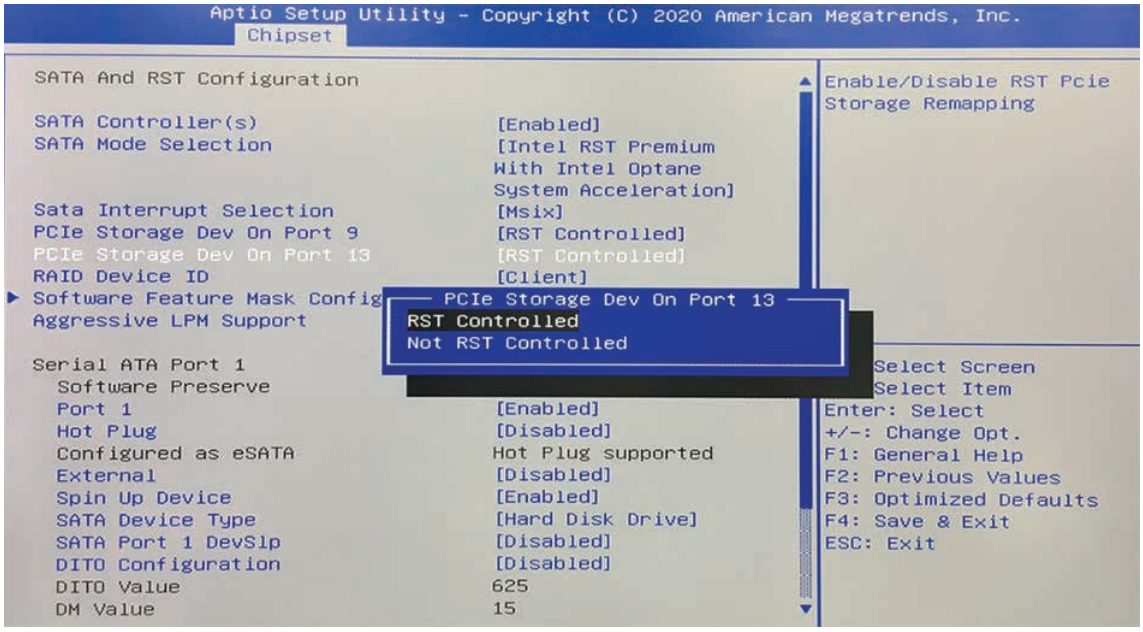
C.1.1 SATA Mode for RAID

Please select SATA Device to RAID mode on BIOS menu.

Advanced → SATA Configuration → SATA Mode Selection → Intel RST Premium

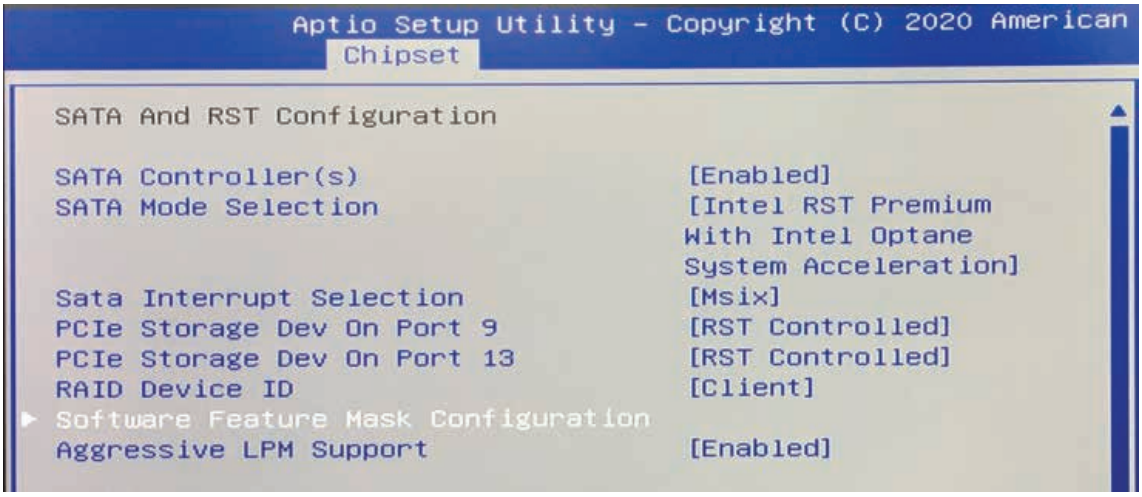


2. Both PCIe storage Dev on port 9 and port 13 needs to be selected as RST controlled.

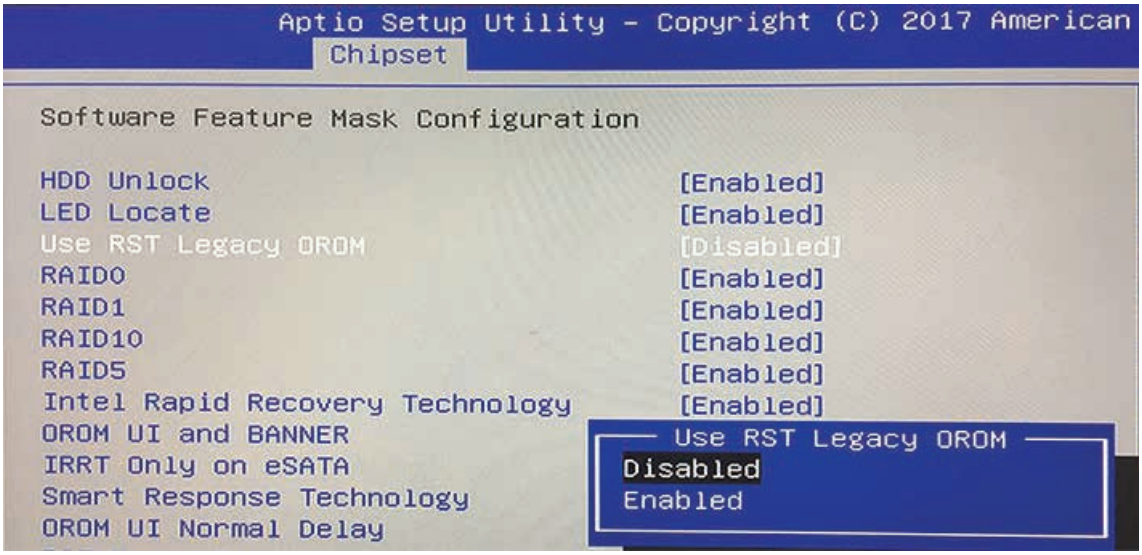


C.1.2 UEFI Mode for RAID

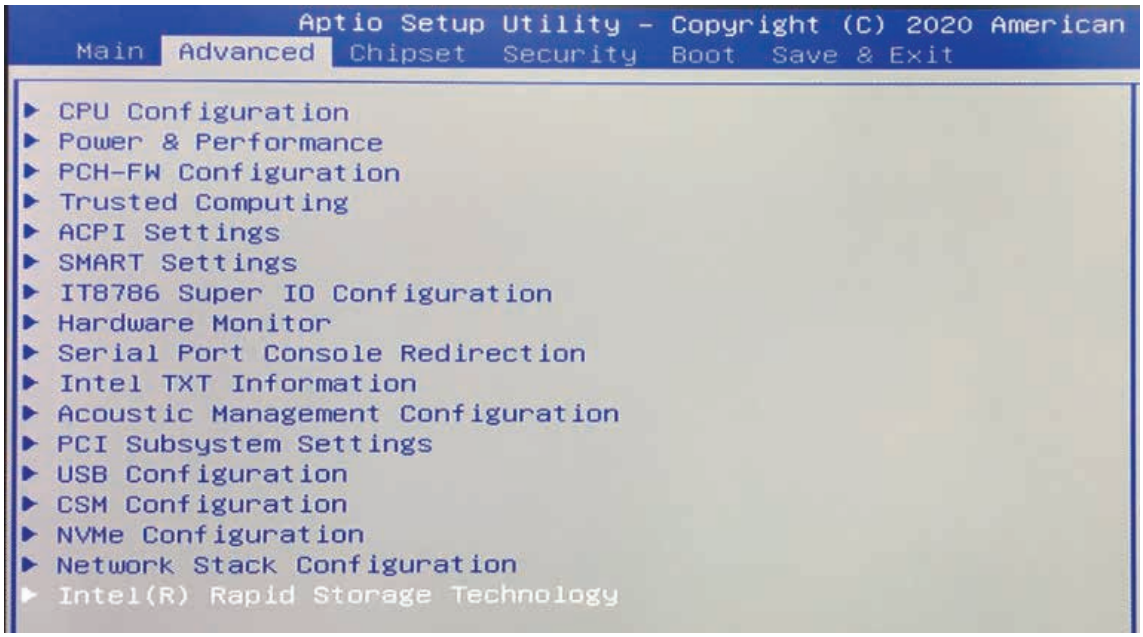
1. Please select Software Feature Mask Configuration on BIOS menu.



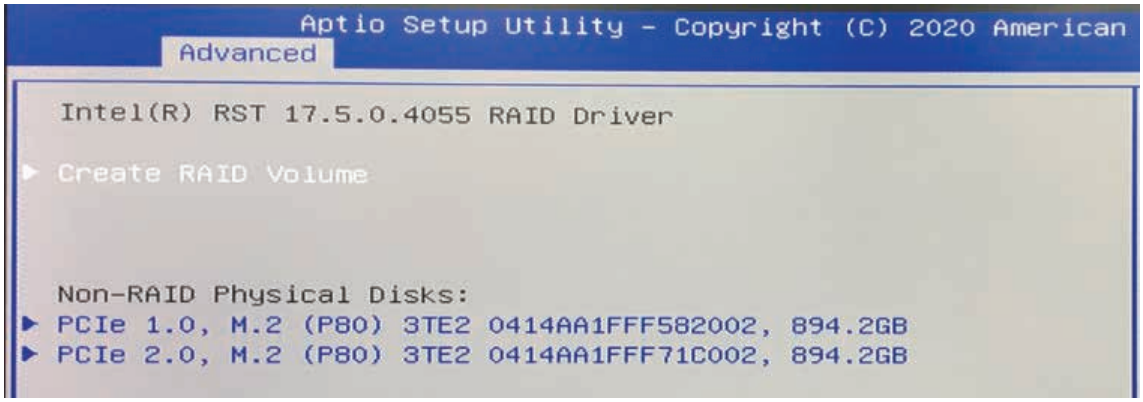
2. Use RST Legacy OROM → Disabled → Save Changes and Reset. When asked if you want to save changes, click "Yes".



3. Access BIOS menu again, select Intel(R) Rapid Storage Technology.



4. Select Create RAID Volume on BIOS menu.



5. Select disks to create RAID Volume then Save Changes and Reset to install OS with EFI mode.

C.2 OS Installation

EXBC-2000 is featured with two NVMe PCIe M.2 (2280) SSD storage.

We take two 1TB NVMe PCIe M.2 SSDs for Windows 10 OS installation as an example.

C.3 To Install All Device Drivers of the System

The instructions are as follows :

1. Install Chipset driver
2. Install Graphics driver
3. Install ME driver (if available)
4. Install Network driver
5. Install Audio driver
6. Install Intel® Rapid Storage Technology (Intel® RST) driver

C.4 To Install "Intel® Rapid Storage Technology (Intel® RST)" Software

You can get the latest information and the software directly from Intel website.

http://www.intel.com/p/en_US/support/highlights/chpsts/imsm

The RAID environment has been done if you completed the steps above.

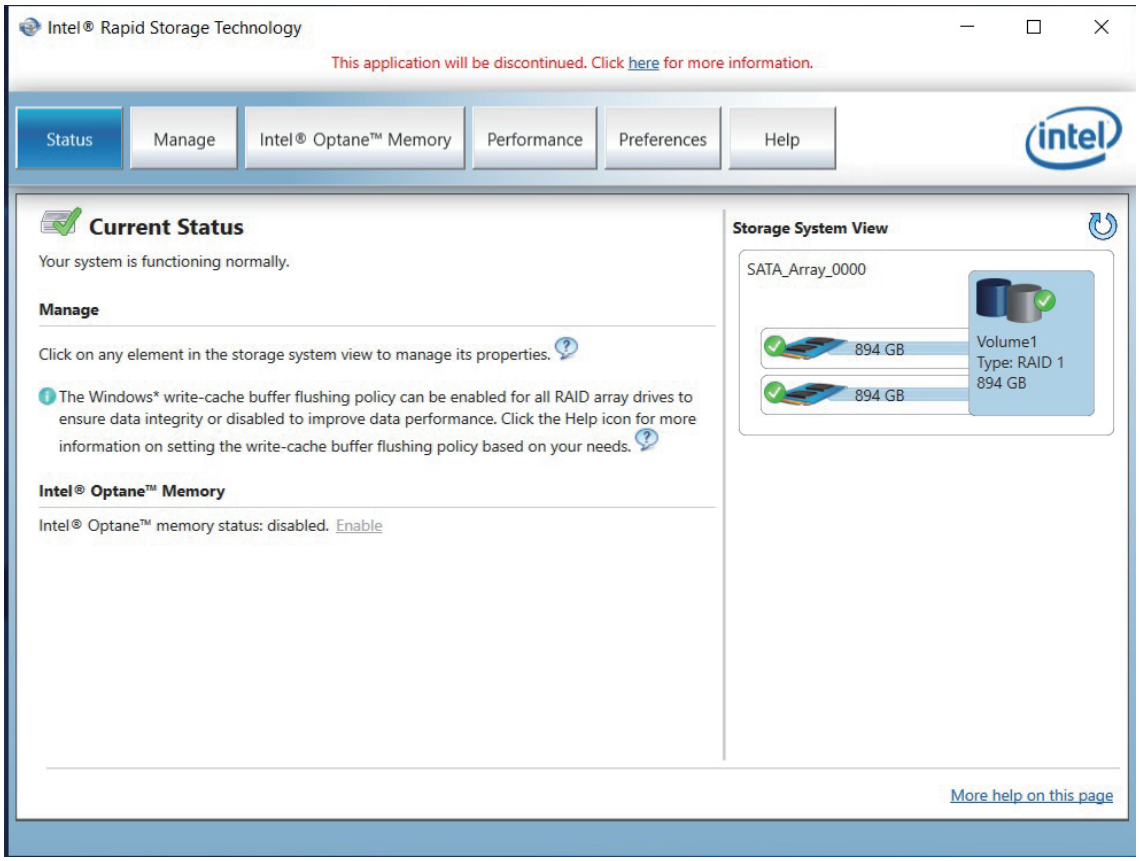
C.5 To Insert NVMe PCIe M.2 SSD for RAID 1

There are two M.2 SSD sockets on the system board. The computer support M.2 SSD cards.

Please note, you can use two M.2 SSD sockets for NVMe PCIe M.2 (2280) SSD.

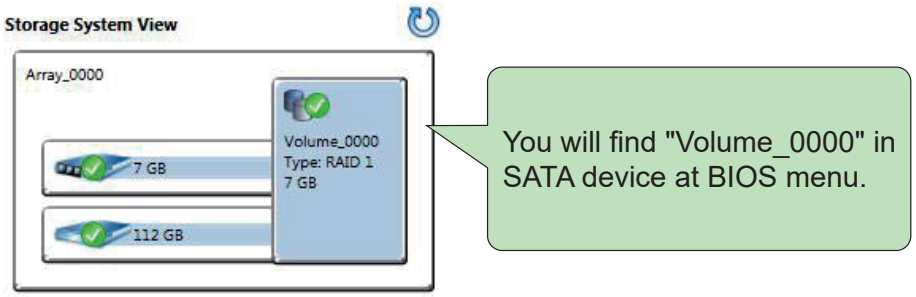
C.6 To Create RAID Volume on"Rapid Storage Technology" Software

EXBC-2000 is featured with two NVMe PCIe M.2 SSDs for RAID volume, so there are two options to choose on this page. Let's take RAID 1 as an example, select "RAID 1".



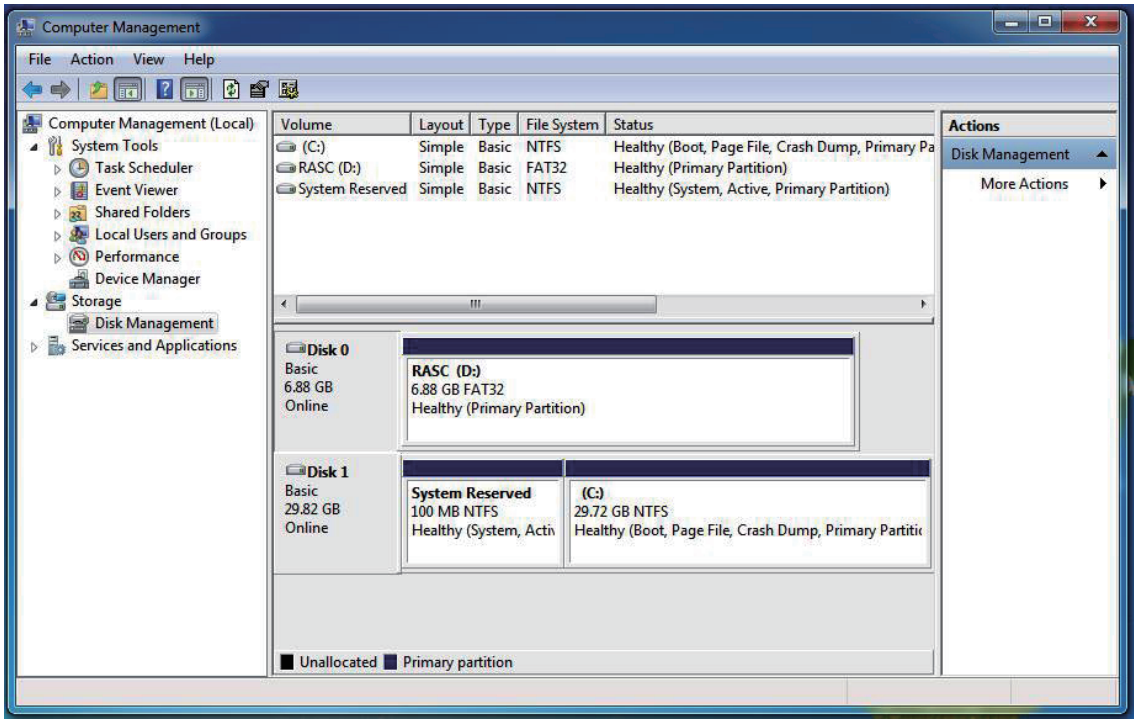
C.7 Disk Management : Partition the Disk

After RAID 1 volume is created, you can see the figure of M.2 storage device allocation.



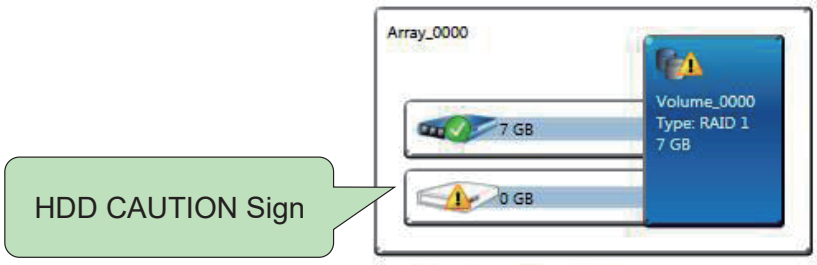
To start Disk Management tool and select "Initialize Disk".

Then add "Logical Device" for Windows access.

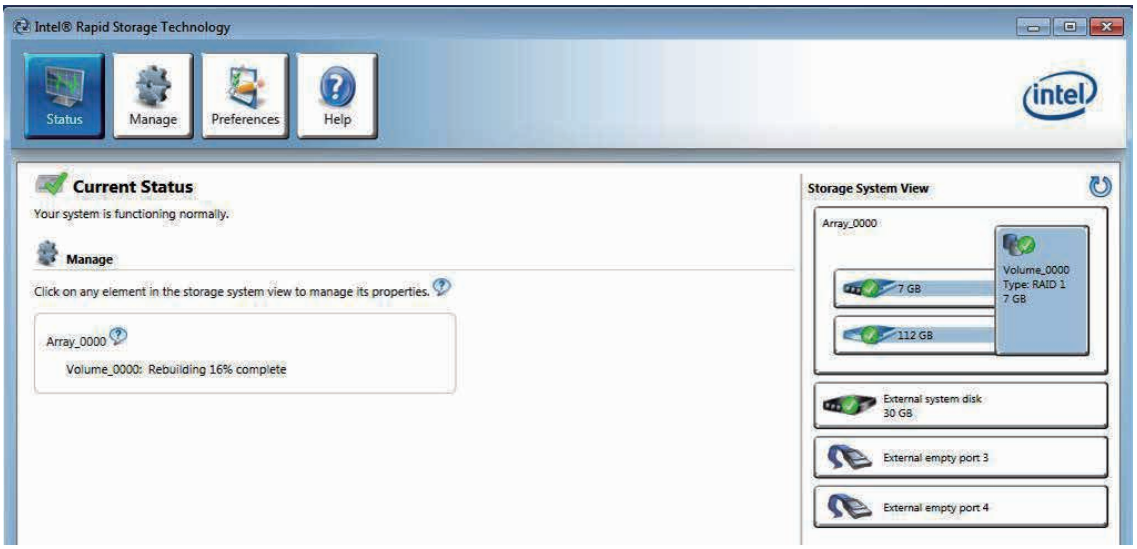


C.8 If One SATA HDD on RAID Volume is Out-of-use

After RAID 1 volume created, you can see the figure of SATA device allocation.



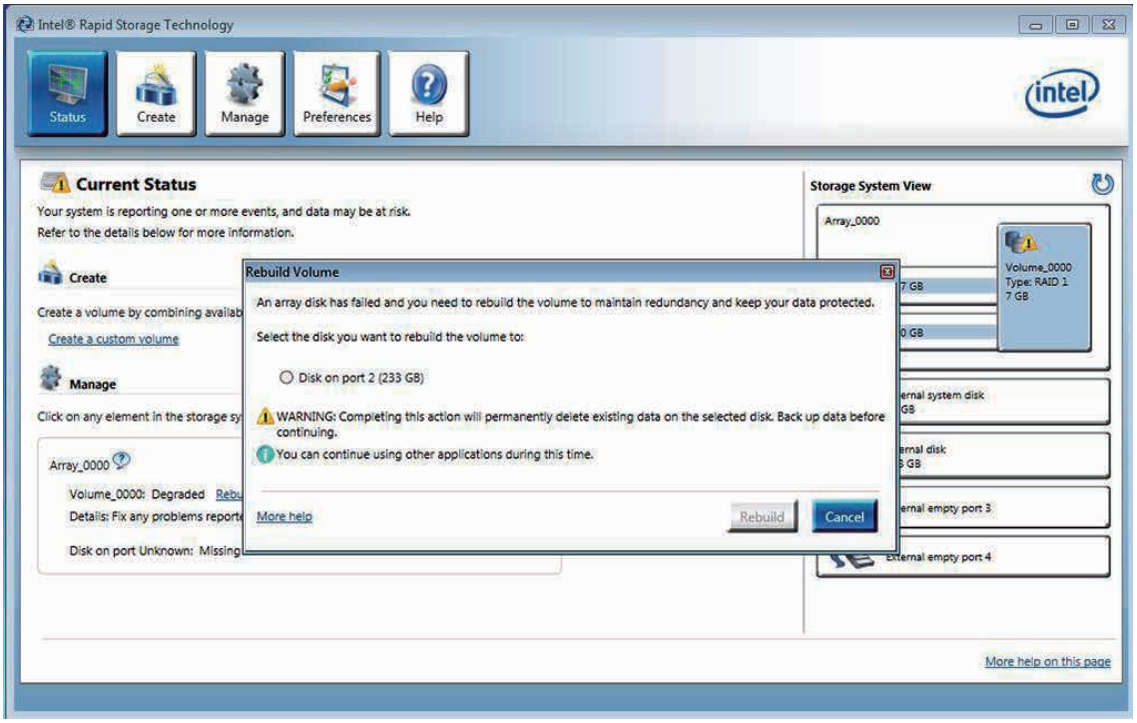
C.9 Recovery and Auto Re-build When Use the SAME RAID HDD



C.10 Recovery and Auto Re-build When Use DIFFERENT RAID HDD

There is a warning that will pop up to ask you if the disk is not a member of original RAID volume.

If you press "Rebuild", it will replace the broken SATA HDD to the last one SATA HDD of RAID volume.



D

APPENDIX D : Power Consumption

Testing Board	EXBC-2000
RAM	16GB * 2
USB-1 : (USB 3.0)	USB Flash Transecnd 3.0 8GB
USB-2 : (USB 3.0)	USB Flash Transecnd 3.0 8GB
USB-3 : (USB 2.0)	USB Micsoft Wired Keyboard 600
USB-4 : (USB 2.0)	USB Mouse HP G1K28AA
M.2 PCIe SSD	INNODISK M.2 (P80) 3TG3-P 2TB SSD
LAN 1 (i350)	1.0 Gbps
LAN 2 (i350)	1.0 Gbps
LAN 3 (i350)	1.0 Gbps
LAN 4 (i350)	1.0 Gbps
Graphics Output	DP
Power Plan	Balance (Windows10 Power plan)
Power Source	Chroma 62006P-100-25

D.1 Intel® Core i7-8665UE 1.70GHz (8M Cache, up to 4.40GHz)

CPU	Power Input	Standby Mode		Power on and boot to Win 10 (64-bit)			
				Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i7-8665UE	9V	0.322A	02.99W	0.406A	03.78W	1.289A	11.99W
	12V	0.253A	03.03W	0.318A	03.82W	0.996A	11.95W
	24V	0.156A	03.74W	0.188A	04.52W	0.494A	11.86W
	50V	0.108A	05.38W	0.124A	06.18W	0.264A	13.22W

CPU	Power Input	Power on and boot to Win10 (64-bit)			
		Run 100% CPU usage with 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Core™ i7-8665UE	9V	2.100A	19.53W	3.079A	28.63W
	12V	1.753A	21.03W	2.360A	28.32W
	24V	0.882A	21.17W	1.172A	28.13W
	50V	0.455A	22.74W	0.590A	29.50W

D.2 Intel® Core i3-8145UE 2.20GHz (4M Cache, up to 3.90GHz)

CPU	Power Input	Standby Mode		Power on and boot to Win 10 (64-bit)			
				Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i3-8145UE	9V	0.216A	02.01W	0.345A	03.21W	1.133A	10.53W
	12V	0.167A	02.00W	0.266A	03.19W	0.918A	11.01W
	24V	0.112A	02.69W	0.162A	03.88W	0.473A	11.36W
	50V	0.085A	04.23W	0.107A	05.36W	0.262A	13.08W

CPU	Power Input	Power on and boot to Win10 (64-bit)			
		Run 100% CPU usage with 2D		Run 100% CPU usage with 3D	
		Max Current	Max Consumption	Max Current	Max Consumption
Core™ i3-8145UE	9V	1.967A	18.29W	2.846A	26.47W
	12V	1.525A	18.30W	2.201A	26.41W
	24V	0.789A	18.95W	1.088A	26.12W
	50V	0.404A	20.19W	0.530A	26.49W

APPENDIX E : Supported List (Memory/M.2)

E.1 Test Item

Testing Board	EXBC-2000
Memory Test	MemTest86 V8.2
BurnIn Test	BurnInTest Pro V8.1 (build 1025)

Channel	Memory Test	Burn-in Test	Flash BIOS	Remove Battery	Sleep	Hibernate	Reset	CPU-Z
*2	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
*1 (DIMM 1)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
*1 (DIMM 2)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

E.2 Supported Non-ECC Memory List

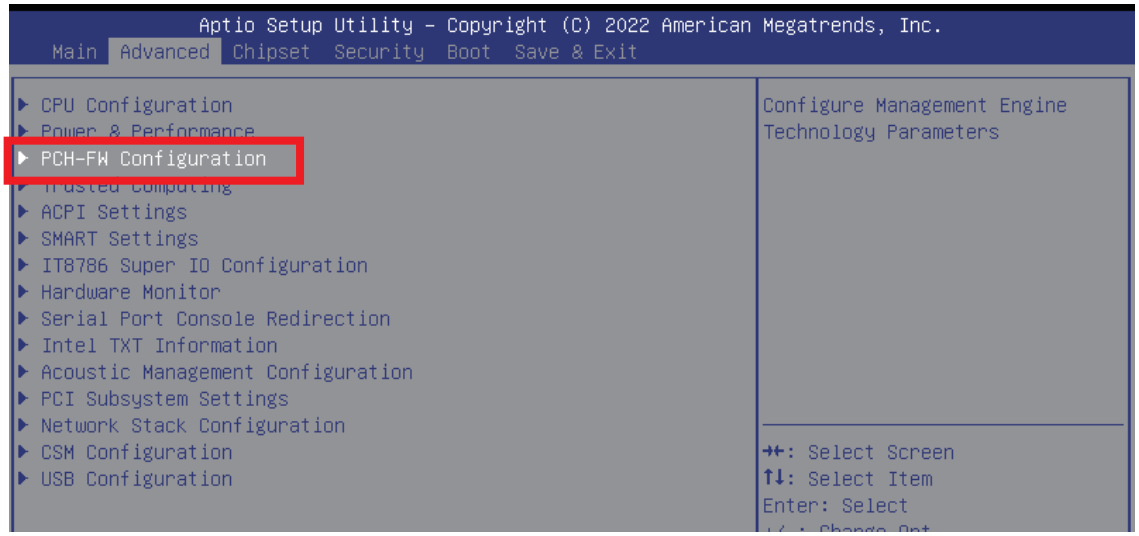
Brand	Info	Test Temp. (Celsius)
Innodisk 4GB DDR4-2400 WT SODIMM	M4S0-4GSSN5SJ-H03	25ºC
Innodisk 16GB DDR4-2400 ST SODIMM	M4S0-AGS1OCSJ-H03	25ºC
Kingston 4GB DDR4-2666 ST SODIMM	KVR26S19S6/4	25ºC
Kingston 8GB DDR4-2666 ST SODIMM	KVR26S19D8/8	25ºC
Kingston 16GB DDR4-2666 ST SODIMM	KVR26S19D8/16	25ºC
Vecow 8GB DDR4-2666 WT SODIMM	VMD4NIT-08G00A	25ºC
Vecow 16GB DDR4-2666 WT SODIMM	VMD4NIT-16G00A	25ºC
Vecow 4GB DDR4-3200 ST SODIMM	VMD4NCS-04G00C	25ºC
Vecow 8GB DDR4-3200 ST SODIMM	VMD4NCS-08G00C	25ºC
Vecow 16GB DDR4-3200 ST SODIMM	VMD4NCS-16G00C	25ºC
Vecow 4GB DDR4-3200 WT SODIMM	VMD4NIS-04G00C	25ºC
Vecow 8GB DDR4-3200 WT SODIMM	VMD4NIS-08G00C	25ºC
Vecow 16GB DDR4-3200 WT SODIMM	VMD4NIS-16G00C	25ºC

E.3 Supported Storage List

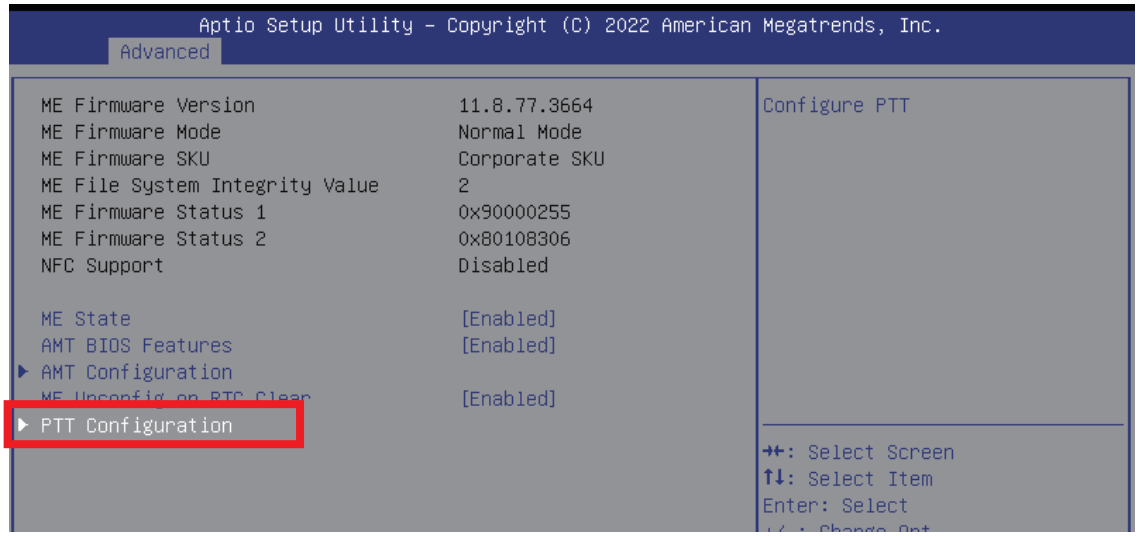
Type	Brand	Model	Capacity
M.2 SSD (SATA)	Kingston	SUV500M8	960GB
	Innodisk	3MG2-P	128GB
	Memxpro	PM31	256GB
M.2 SSD (PCIe)	Toshiba	KXG50ZNV512G	512GB
	Phison	ESMP256GTB3C2-E12	256GB
	Samsung	Samsung SSD 970 EVO Plus	250GB
	FORESEE	FSGMMC-256G	256GB
	Kingston	SA2000MB	500GB
	Intel	Intel® SSD 760p	128GB
	Memxpro	PT33	512GB
	Innodisk	3TG3-P ST	2TB
		3TE6 ST	1TB
	UDinfo	M2P-80DC ST	960GB

APPENDIX F : Install Win11 (BIOS TPM Setting)

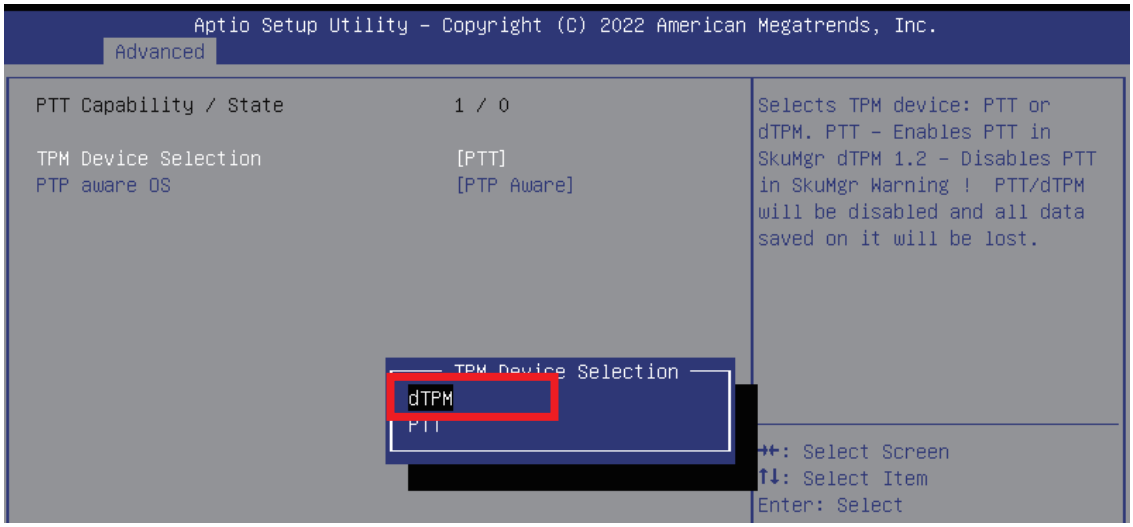
Step 1 Click on “Advanced”, then click on “PCH-FW Configuration”

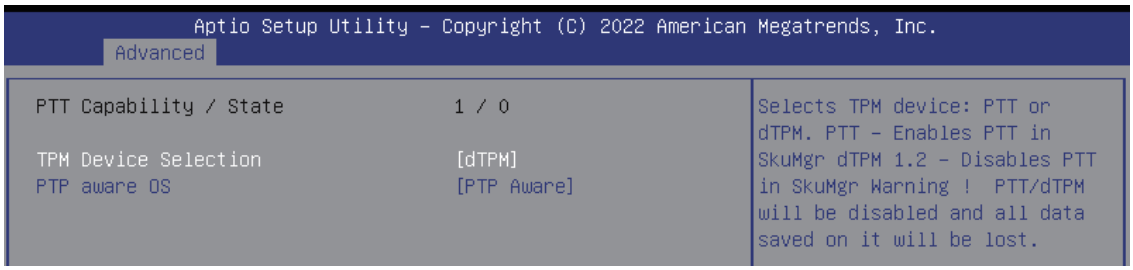


Step 2 Click on “PTT Configuration”

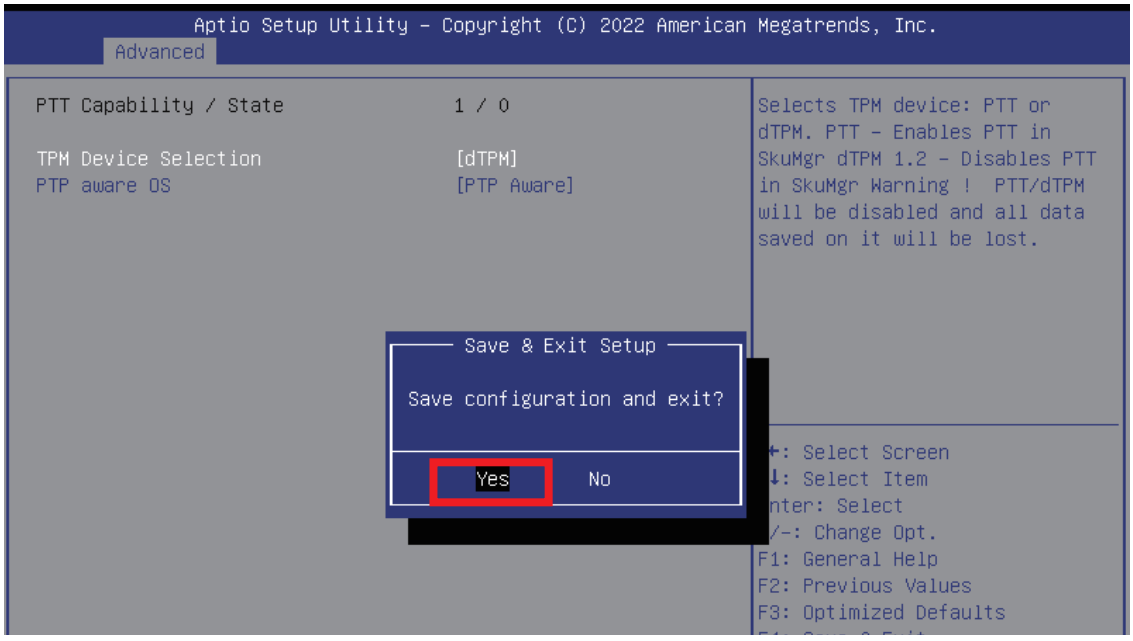


Step 3 Click on “dTPM” (TPM Device Selection)

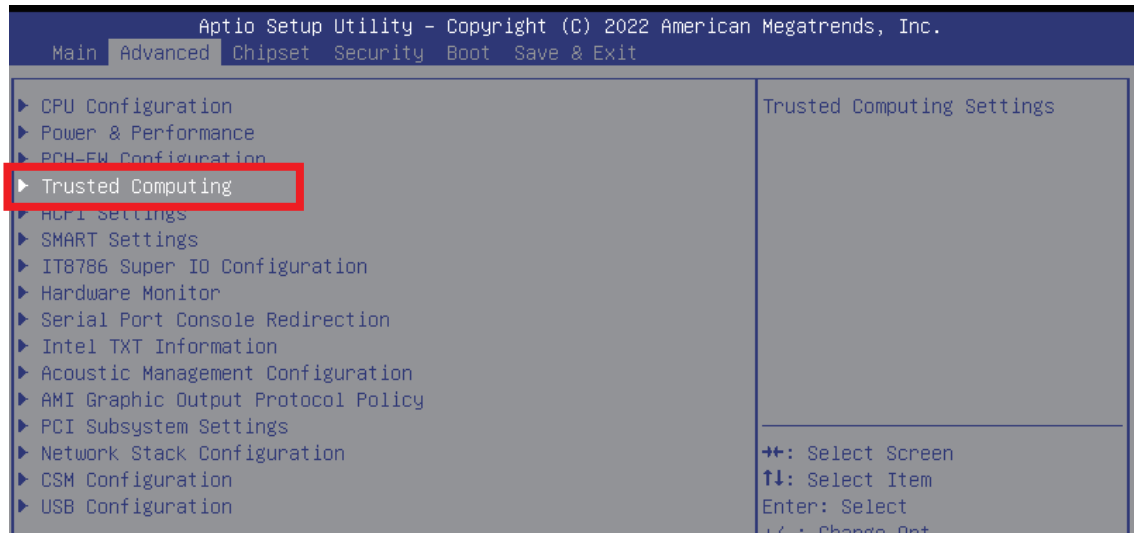




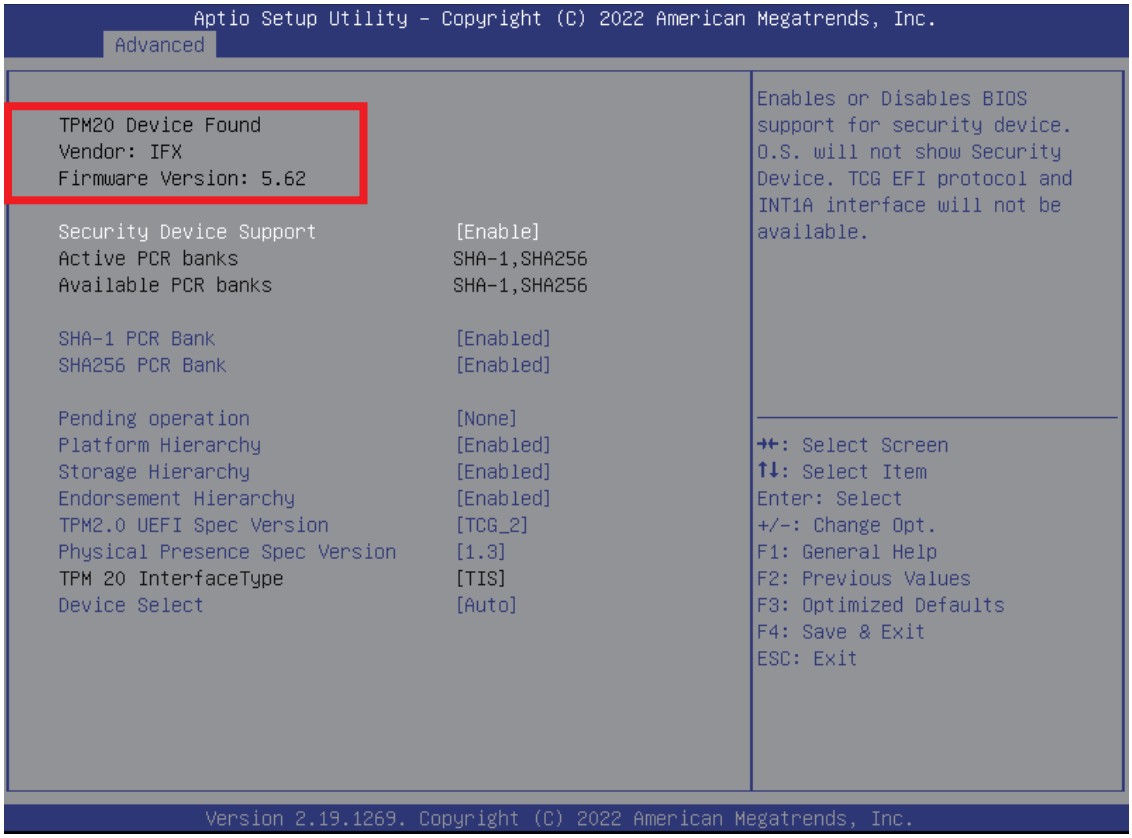
Step 4 Please save the BIOS settings by pressing F4. Please press Enter when the pop-up window which asks “Save configuration and exit?” appears. The computer will then restart.



Step 5 Click on “Trusted Computing”



Step 6 If the window shows “TPM2.0 Device Found Firmware Version:5.62”, then the setting is completed.



** If more help is needed, please contact Vecow technical support **

Vecow

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