EPBC-2000 USER Manual

Intel Atom® x7211RE Processor Ultra-Slim
2.5" Pico-ITX Embedded Single Board Computer

Vecow

Record of Revision

Version	Date	Page	Description	Remark
1.00	2025/08/29	All	Official Release	

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Order Information

Model	Description
EPBC-2000	EPBC-2000 2.5" Pico-ITX Single Board Computer, onboard Intel Atom® x7000 Processor (Amston Lake), 1 DDR5 SO-DIMM, 2 2.5GigE LAN, 2 USB3.2, 1 HDMI 2.0, 1 SIM, 2 COM RS-232/422/485, 12V DC-in

Order Accessories

Part Number	Description
75-VU3SSK0-010	EPBC-2000 SBC Heat Sink
61-13Q1009-0DA	COM Port Cable
61-1470022-005	PBC-1000/2000 SATA Power Cable
61-13B0707-3BA	PBC-1000/2000 SATA data cable
61-193102U-156	USB 2.0 Cable
61-1300024-39A	Audio Cable

Table of Contents

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GENERAL INTRODUCTION

1.1 Overview

The EPBC-2000 is a compact, fanless 2.5" Pico-ITX embedded board designed for space-constrained edge computing applications. Powered by the Intel$^®$ Atom$^®$ x7211RE processor (Amston Lake), it delivers reliable computing performance with ultra-low power consumption (TDP up to 6W), making it ideal for intelligent control, energy management, M2M communication, in-vehicle systems, and factory automation.

The board features a rich set of I/O in its small 100mm x 72mm footprint, including 2 2.5G LAN, 2 USB ports, 2 COM ports, 1 HDMI 2.0 supporting 4K @60Hz resolution, and 1 SIM card socket for mobile connectivity such as 5G, 4G/LTE, WiFi, or GPRS. It supports up to 16GB DDR5-4800 SO-DIMM memory and provides flexible expansion through an M.2 Key B slot for additional storage or wireless modules.

Engineered for harsh industrial conditions, the EPBC-2000 supports a wide operating temperature range of -40°C to 70°C and 12V DC power input. With its fanless design, compact size, and industrial-grade reliability, the platform is well-suited for embedded AIoT systems deployed at the edge.

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 EPBC-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
I/O Interface	
Front I/O	• 2 RJ45 2.5G LAN • 2 USB 3.2 Gen 2 • 1 HDMI 2.0 • 1 SIM Card Socket • 1 Power button • 1 Reset button • 1 Power LED • 1 HDD LED • 2 M.2 LED
Internal I/O	• 1 DDR5 SO-DIMM Socket • 1 M.2 Key B Connector (2280/3042/3052, PCIex2/USB3/default USB2) • 1 M.2 Key E Connector (2230, PCIex1/USB2) • 1 SATA Data Connector • 1 SATA Power Connector • 1 DC-IN Connector • 2 COM Header (RS-232/422/485) • 1 10-pin USB 2.0 x2 Header • 1 10-pin GPIO header • 1 Audio Mic in and Line out Header • 1 power LED header • 1 storage LED header • 1 Reset Header • 1 Clear CMOS Header
Storage	
SATA	1 SATA III (6Gbps)
M.2	1 M.2 Key B (2280/3042/3052, PCIex2, share with expansion)

| Expansion	
M.2	• 1 M.2 Key B (2280/3042/3052, PCIex2/USB3/default USB2) • 1 M.2 Key E (2230, PCIex1/USB2)
Others	
Power Input	12V DC-in
Power Interface	2-pin Wire-to-Board Connector : V+, V-
Power	
Watchdog Timer	Reset: 1 to 255 sec./min. Per Step
Smart	Wake on LAN, PXE supported
Management	Monitoring temperature, voltages. Auto throttling control when CPU overheats
Mechanical	
Dimension (W x L)	100.0mm x 72.0mm (9.34" x 2.83")
Environment	
Operating Temperature	-40°C to 70°C (-40°F to 158°F) with air flow
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	5% to 95% Humidity, Non-condensing
Relative Humidity	95% at 70°C
EMC	CE, FCC, ICES

1.4 Mechanical Dimension

1.4.1 Dimensions of EPBC-2000

100.0(3.94)

72.0(2.83)

16.5(0.65)

9.4(0.37)
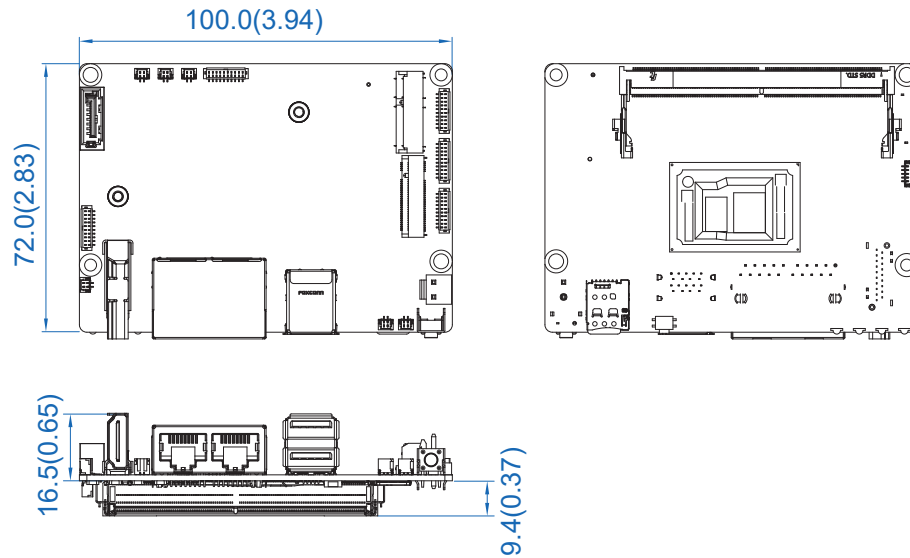
1.4.2 Dimensions of Heat Sink

100.0(3.94)

72.0(2.83)

27.5(1.03)

5.0(0.19)
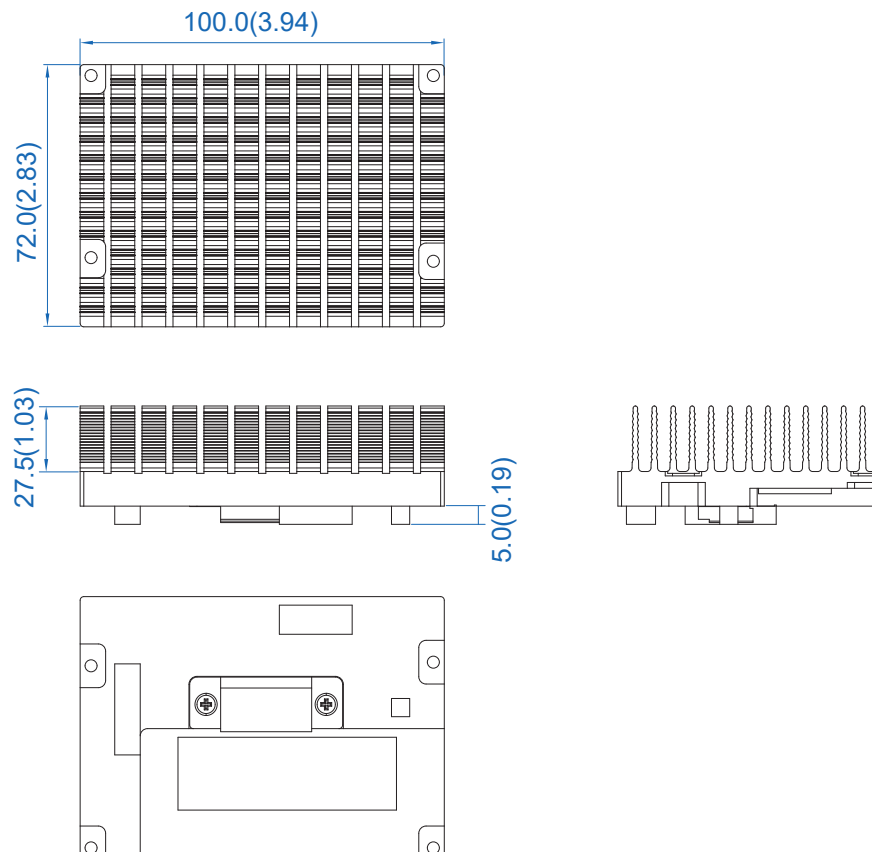
1.4.3 Dimensions of MB+Heat Sink

Unit : mm (inch)
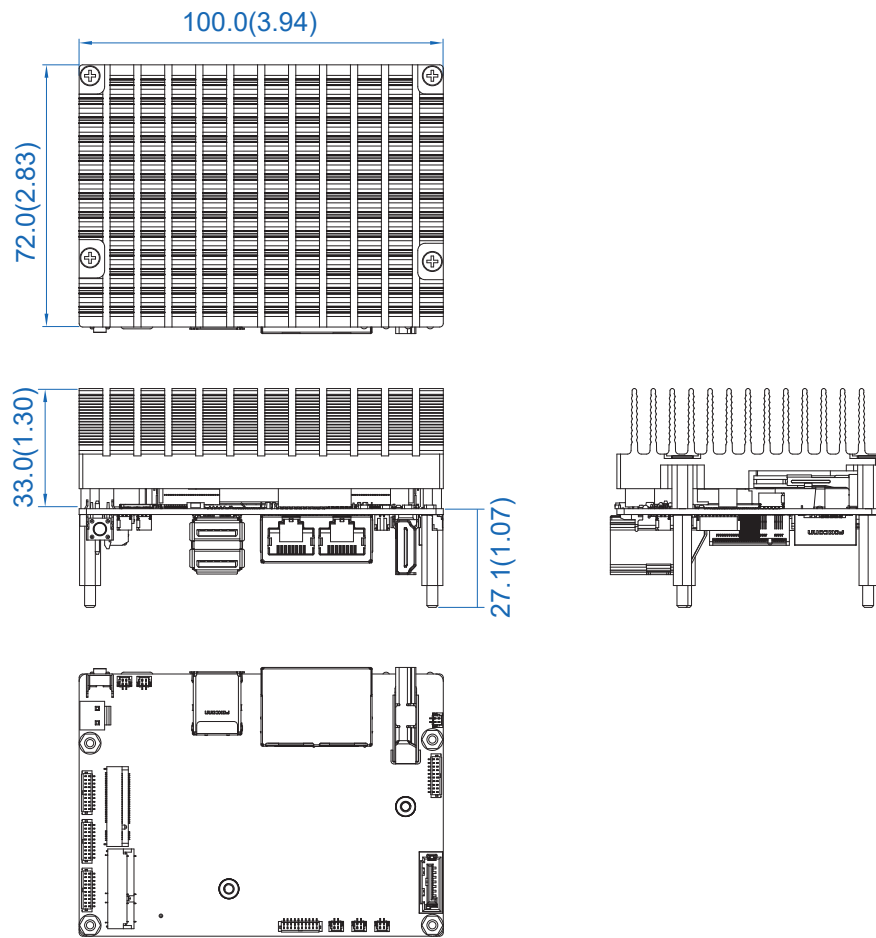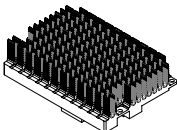
2

GETTING TO KNOW YOUR EPBC-2000

2.1 Packing List

Item	Description	Qty
1	EPBC-2000 Embedded System	1

Item	Description	Picture	Use for	P/N	Qty
1	Heat sink		EPBC-2000	75-VU3SSK0-010	1
2	Audio Cable		N/A	61-1300024-39A	1
3	SATA Power Cble		HDD	61-1470022-005	1
4	SATA Data Cable		HDD	61-13B0707-3BA	1
5	COM Cable		COM	61-13Q1009-0DA	2
6	USB Cable		USB	61-193102U-156	1

2.2 Main Board Expansion Connectors

2.2.1 PBC-2000 Main Board Top Side View
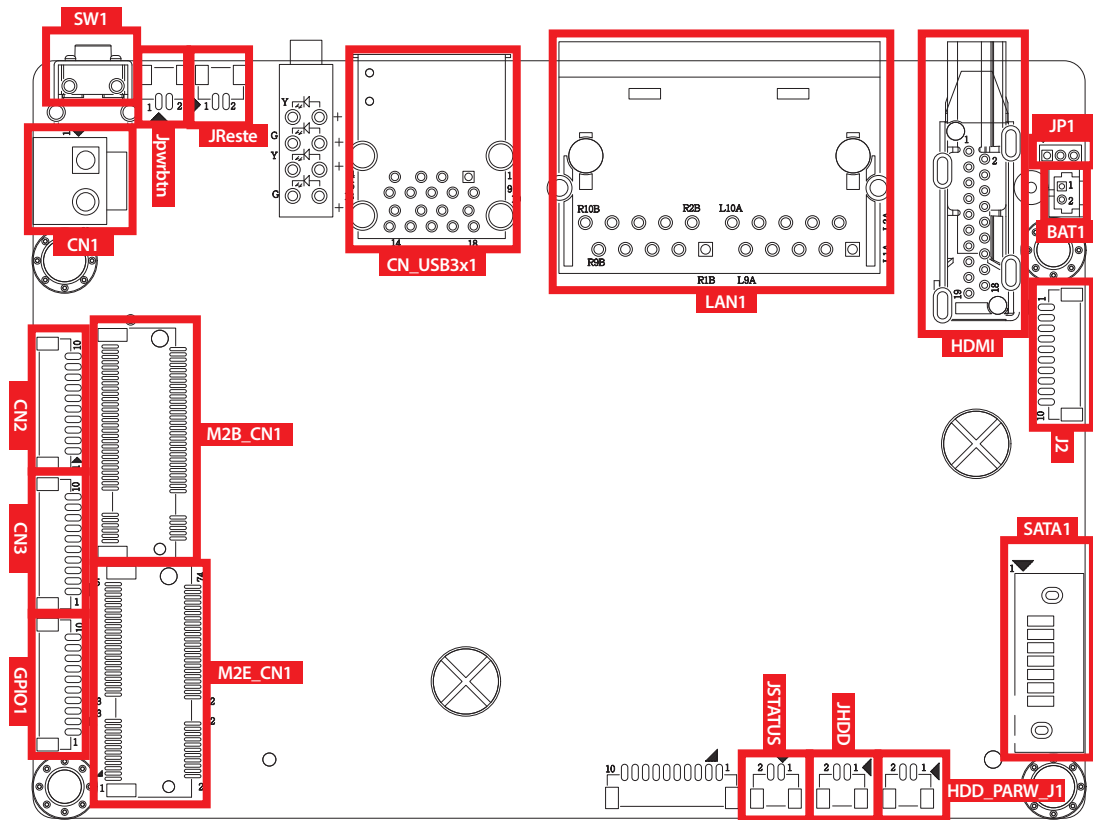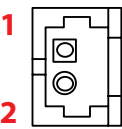
2.2.2 PBC-2000 Main Board Bot Side View
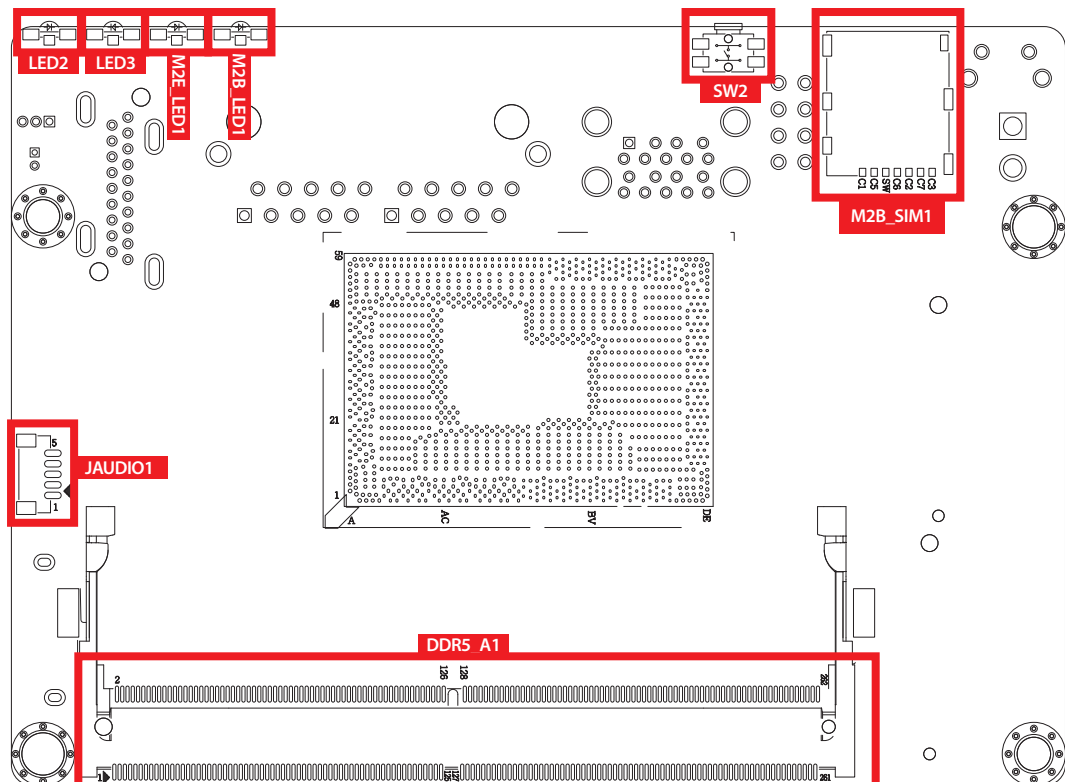
2.2.3 BAT2 : Battery

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.
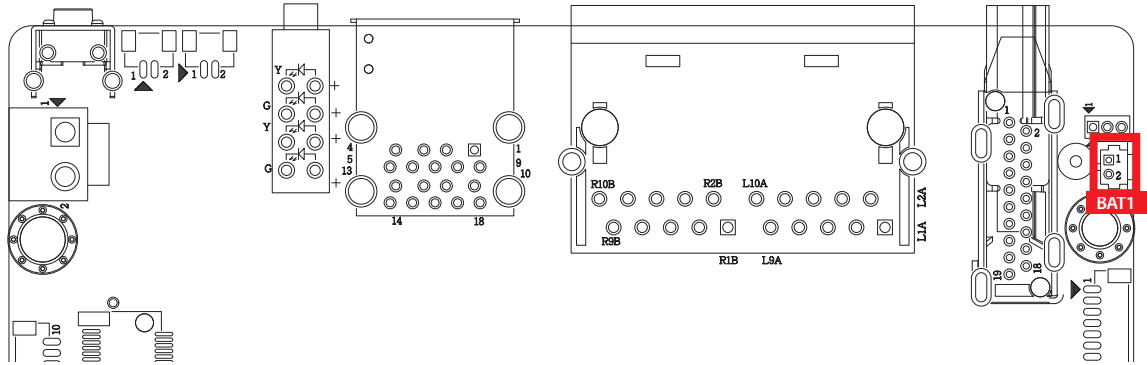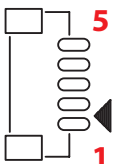
Pin No.	Function
1	+3V_BAT
2	GND

2.2.4 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 :
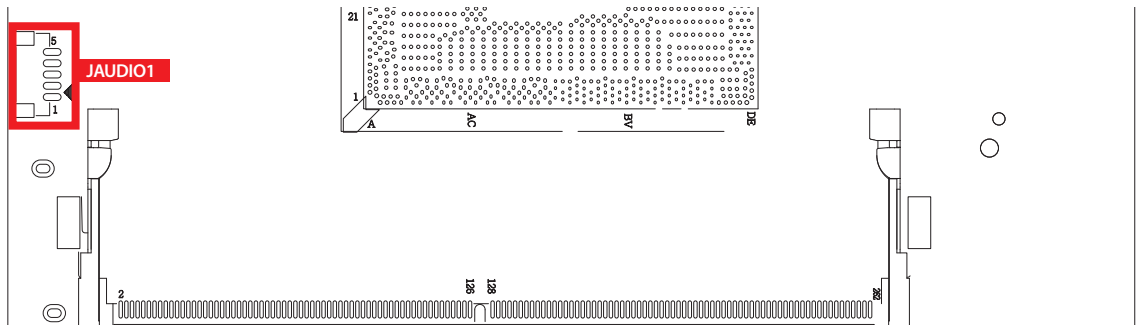
Pin No.	Function	Pin No.	Function
1	LINEO-L	2	LINEO-R
3	GND	4	MICI-L
5	MICI-R		

2.2.5 DIMM1 : DDR5 Slot
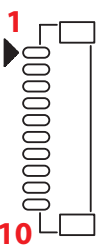
There is a DDR5 channel onboard, support DDR5 4800, max 16GB
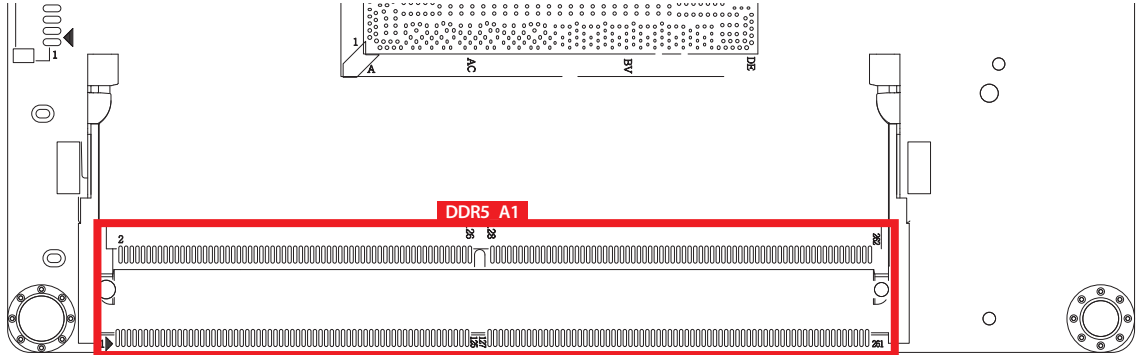
2.2.6 J2: Internal USB 2.0 Connector

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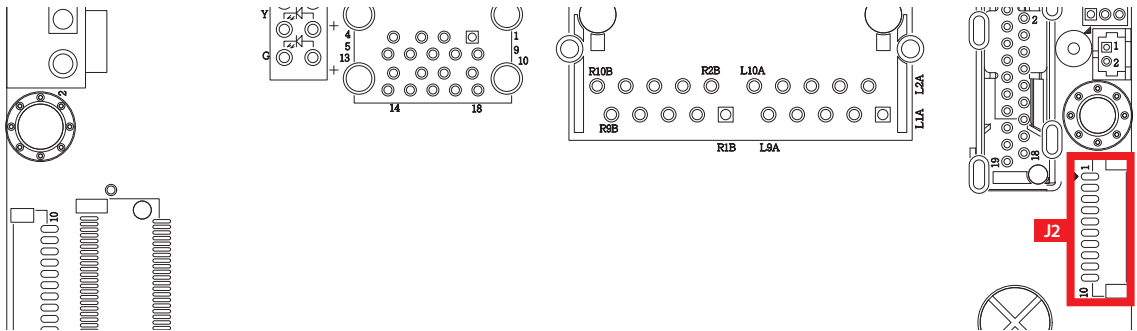
Pin No.	Definition	Pin No.	Definition
1	USB_VCC	2	USB_VCC
3	USB_VCC	4	USB_D_6N
5	USB_D_6P	6	USB_D_4N
7	USB_D_4P	8	GND
9	GND	10	GND

2.2.7 M2E_CN1 : M.2 key E Slot for USB 2.0, PCIe Gen3x1 support
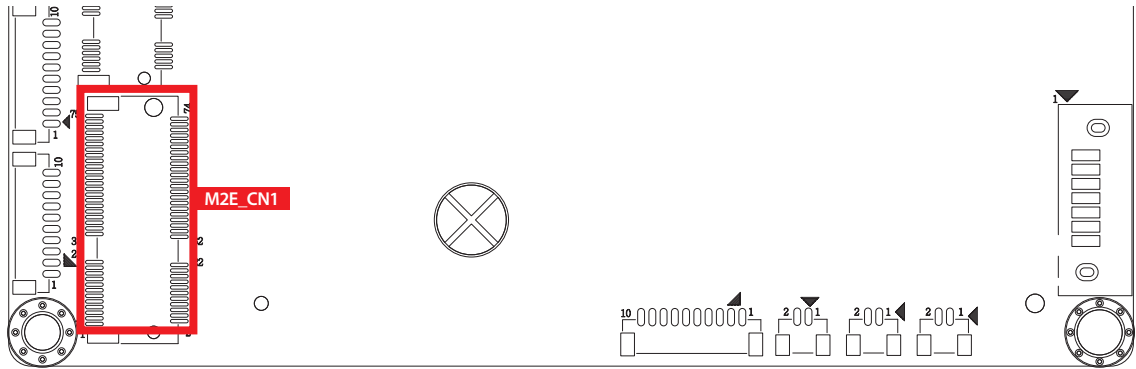
M.2 key E connector is suitable for applications that use wireless connectivity including Wi-Fi, Bluetooth, NFC of GNSS. Module card types include 2230. The pin assignments of M2E_CN1 are listed in the following table :

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

2.2.8 M2B_CN1 : M.2 key B Slot for PCIe Gen3x2 or USB3.2 Gen2 support (Option by BIOS setting)
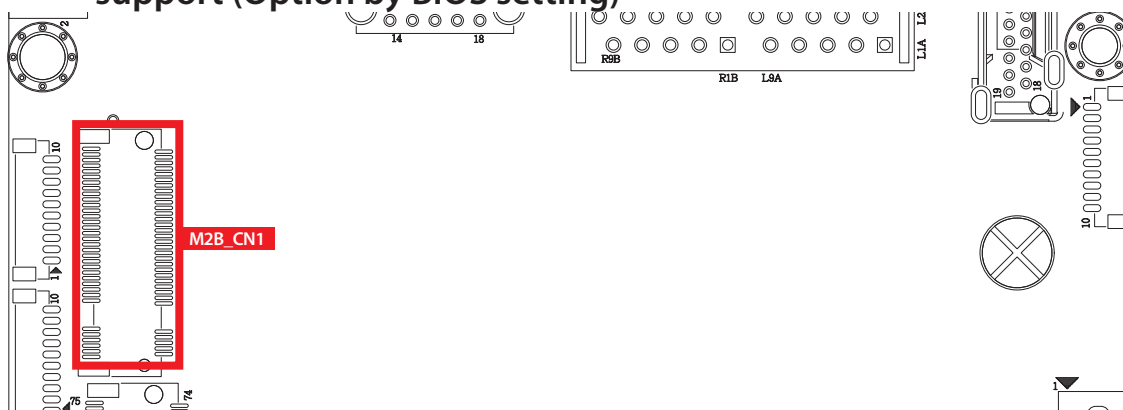
M.2 key B connector is suitable for applications that use wireless connectivity including LTE/5G module, and NVMe SSD (BW : PCIex2) or that types include 2280/3042/3052. The pin assignments of M2B_CN1 are listed in the following table :
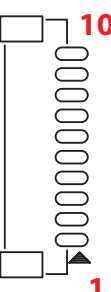
Pin No.	Signal Name	Pin No.	Signal Name
74	3.3V	75	NC
72	3.3V	73	GND
70	3.3V	71	GND
68	NC	69	CONFIG_1
66	SIM DETECT	67	NC
64	NC	65	NC
62	NC	63	NC
60	NC	61	NC
58	NC	59	NC
56	NC	57	GND
54	PEWAKE#	55	REFCLKp
52	CLKREQ#	53	REFCLKn
50	PERST#	51	GND
48	NC	49	PETp0/SATA-A+
46	NC	47	PETn0/SATA-A-
44	NC	45	GND

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

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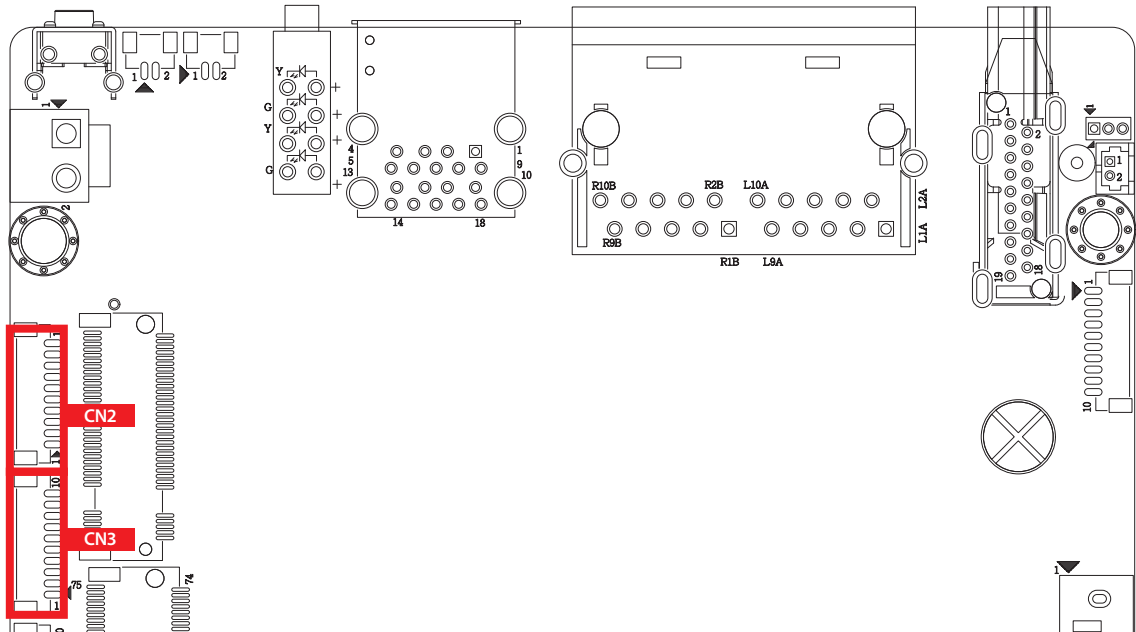
CN2 and CN3 can be configured for RS-232, RS-422, or RS-485 with auto flow control communication, if you want to change to RS-422 or RS-485, you can find the setting in BIOS. The pin assignments are listed in the following table:

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	--------	--------

2.2.10 CN_USB3x1 : External USB 3.2 Gen2 Connector
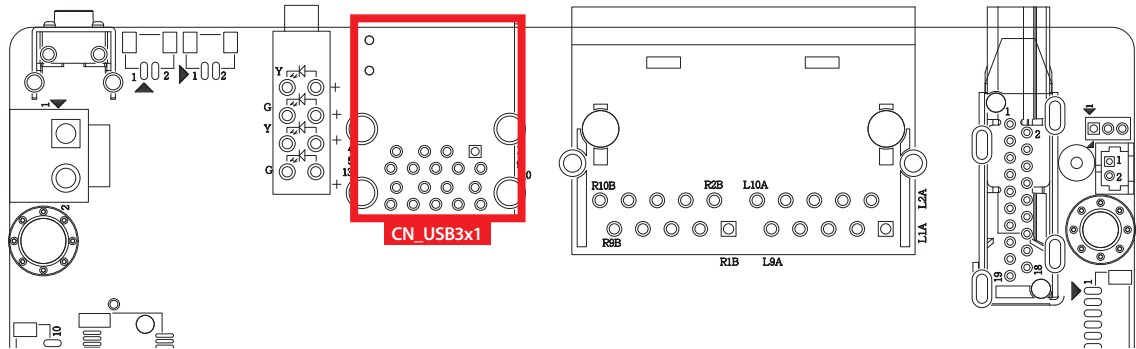
There are 2 USB 3.2 Gen2 connections available supporting up to 10GB per second data rate in the top side of EPBC-2000 series. They are also compliant with the requirements of SuperSpeed (SS), high speed (HS), full speed (FS) and low speed (LS).

2.2.11 LAN1 : LAN Connector
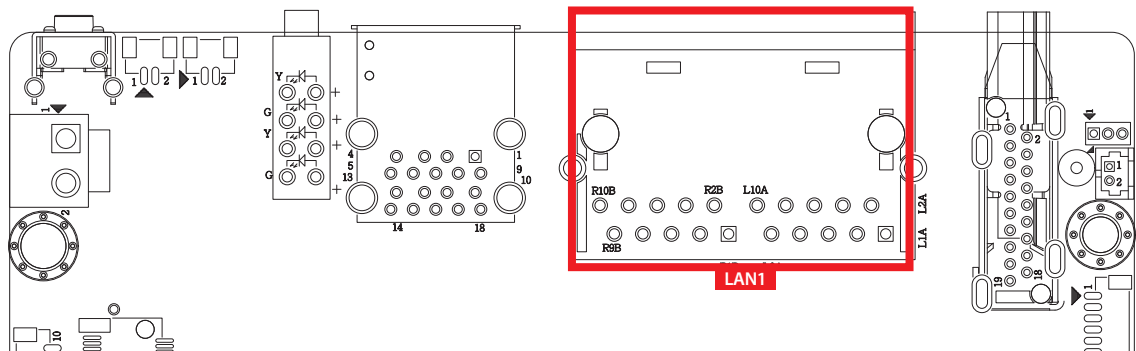
There are two 8-pin RJ-45 jacks supporting 10/100/1000/2500 Mbps Ethernet connections in the top side.Which is powered by Realtek RTL8125BI Ethernet engine. When both of LANs work in normal status, iAMT function is enabled. Using suitable RJ-45 cable, you can connect the system to a computer, or to any 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

2.2.12 HDMI1
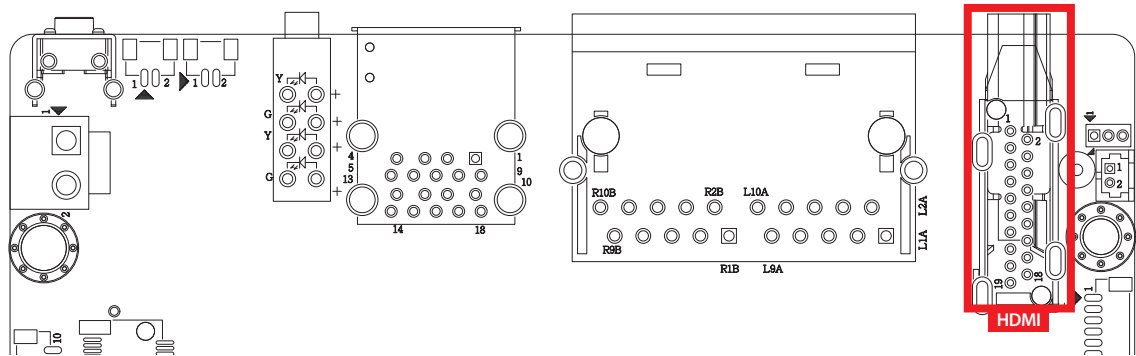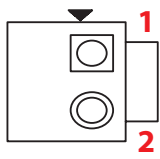
Onboard HDMI Port supports DDC channel mode. The connection supports up to 3840 x 2160 resolution at 60Hz

2.2.13 CN1 : DC Power input
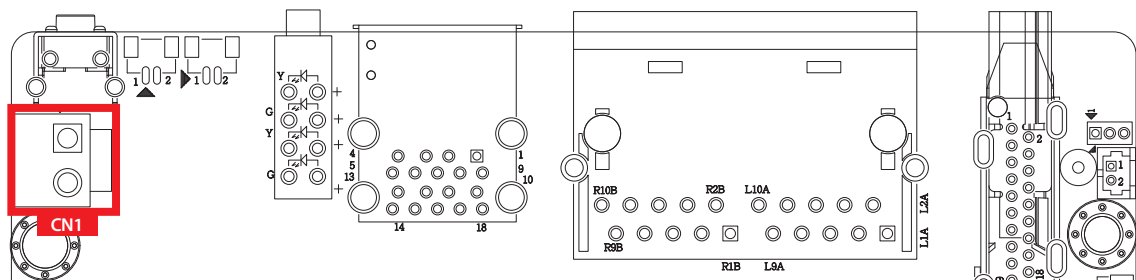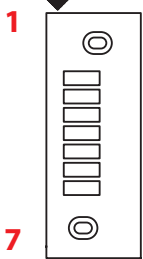
EPBC-2000 supports 12V DC power input by wire-to-board connector in the top side

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

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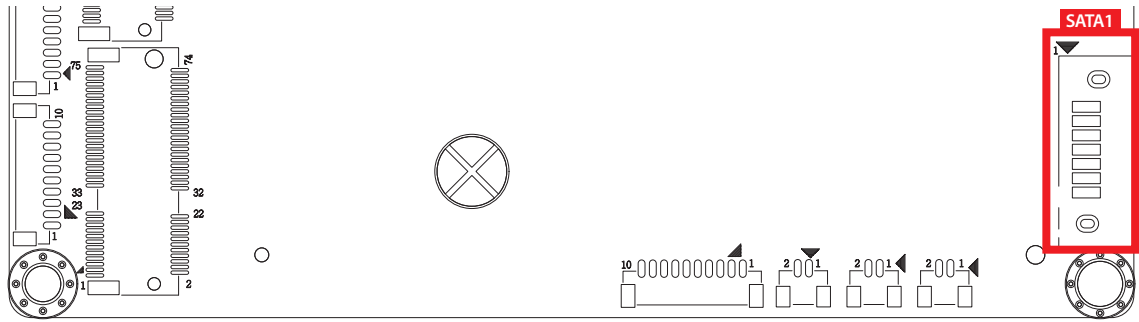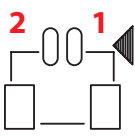
There is a high performance Serial ATA III (SATA III) on the EPBC-2000 series. They support higher storage capacity with less cabling effort and smaller required space. The pin assignments of SATA1 listed in the following table :

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

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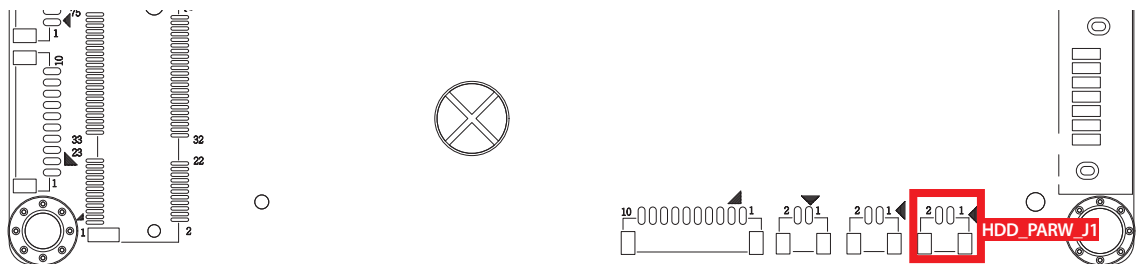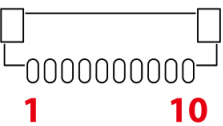
The EPBC-2000 series is also equipped with one SATA power connector. It supports 5V (Up to 1.2A) a to the SSD only. The pin assignments of HDD_PWR_J1 is listed in the following table

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

2.2.16 GPIO1 : 8bit GPIO Header (only support 3.3V)
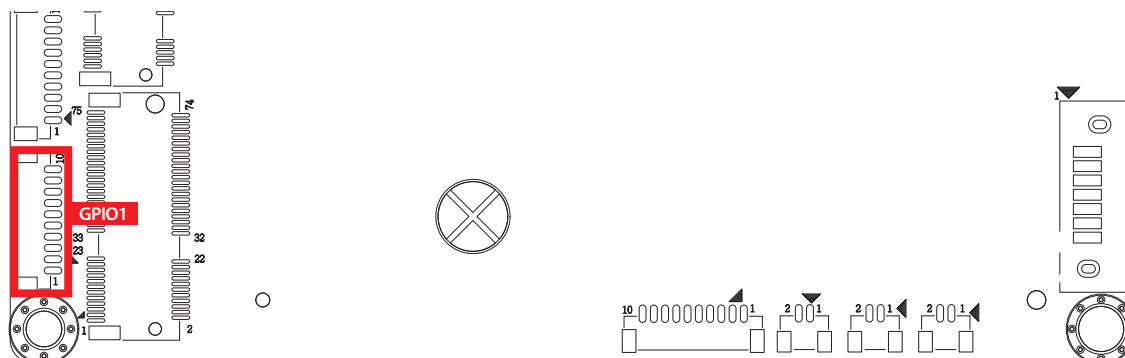
Pin No.	Definition
1	SIO_GPIO1
2	SIO_GPIO2
3	SIO_GPIO3
4	SIO_GPIO4
5	SIO_GPIO5
6	SIO_GPIO6
7	SIO_GPIO7
8	SIO_GPIO8
9	+3.3V
10	GND

2.2.17 SW1: Power Button
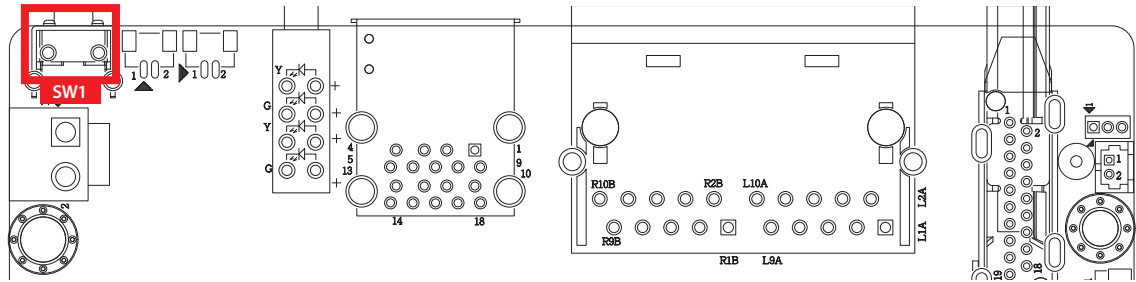
The power button is a non-latched switch. To power on EPBC-2000, press the power button.
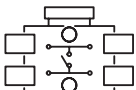
To power off EPBC-2000, you can either command shutdown by OS operation or simply press the power button. If system error appears, press and hold the power button for four seconds to shut down the machine directly.

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)

2.2.18 SW2 : RESET Button
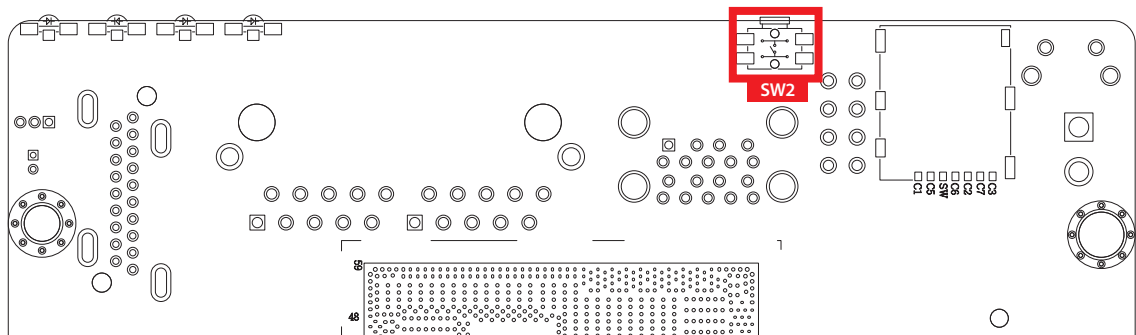
Pin assignment as the following table :

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

2.2.19 M2B_SIM1 : Nano SIM Card Socket for M.2 key B Slot
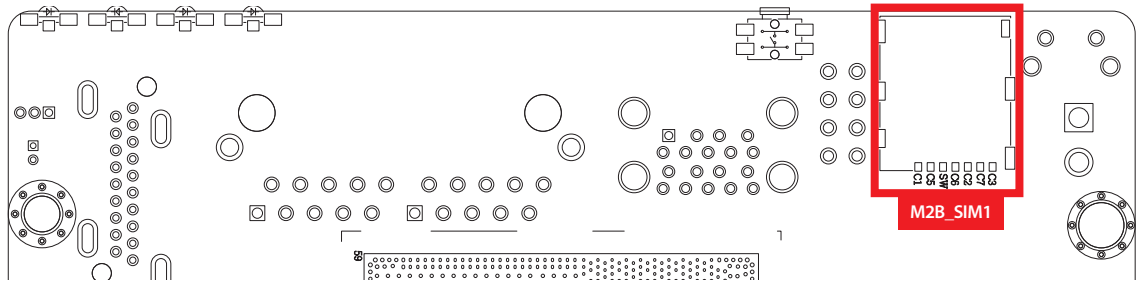
The Nano SIM card socket is support Push-Push type. Please make sure to unplug the system power before inserting the Nano SIM card.

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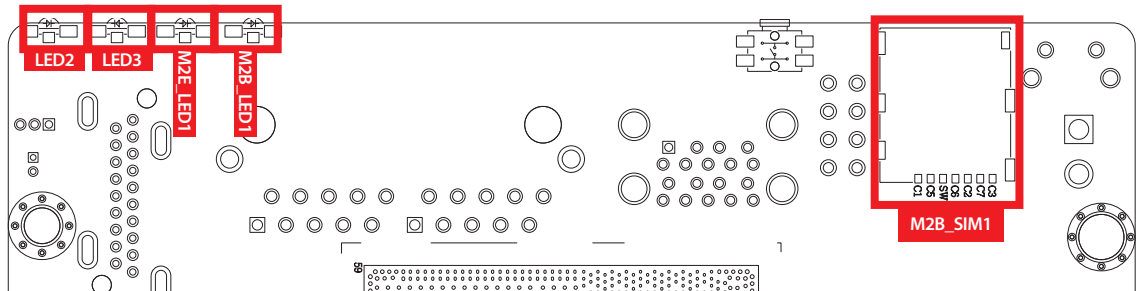
Orange-HDD LED3 :
A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.

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.

2.2.21 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

2.3 Main Board Jumper Settings

2.3.1 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.
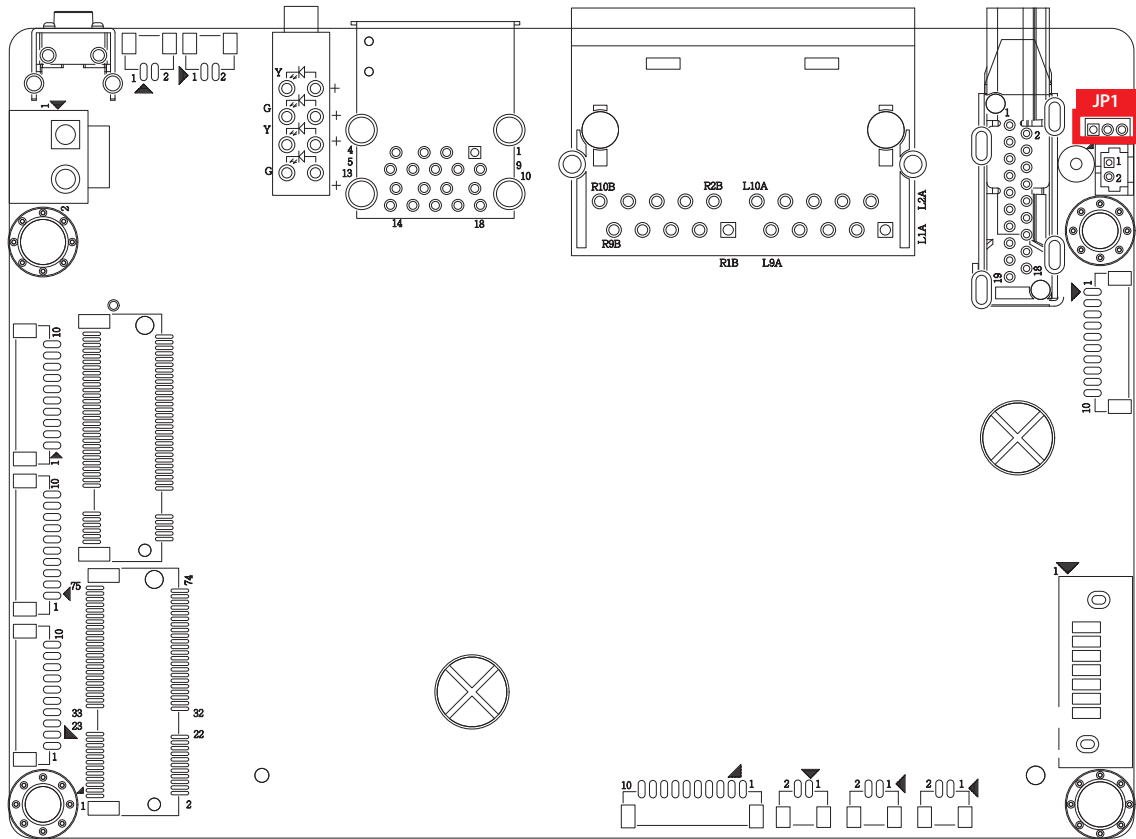
You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper, 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.
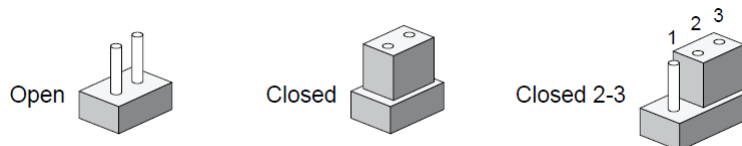
2.3.2 JP1 : Clear CMOS
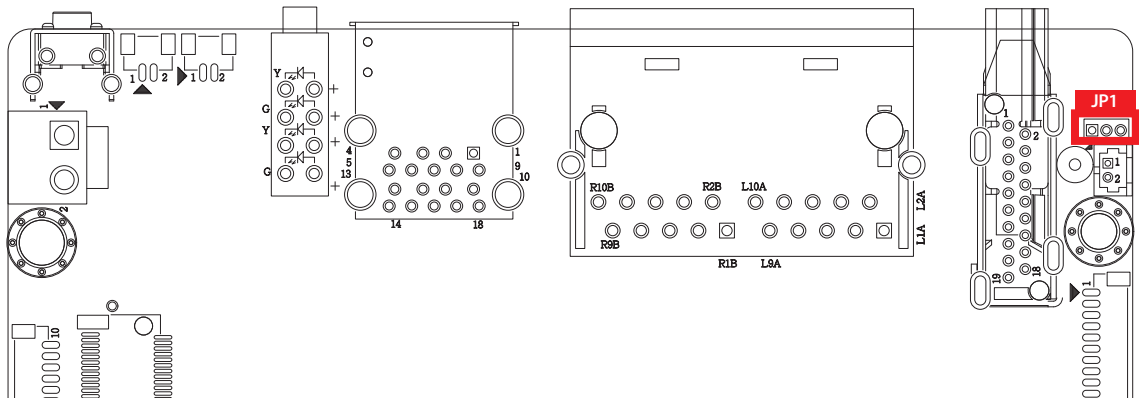
	Pin No.	Definition
1 ⊙⊙▢ **3**	1-2	Normal (default)
	2-3	Clear CMOS

3

SYSTEM SETUP

3.1 Installing DDR5 SO-DIMM Modules

Step 1 Install DDR5 SO-DIMM in Socket.
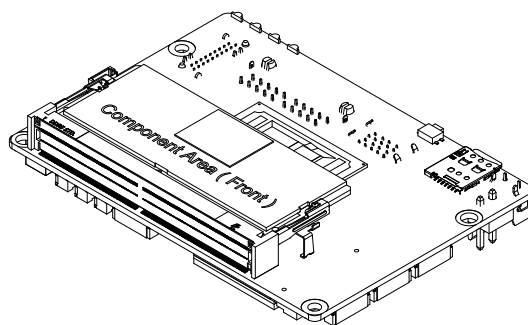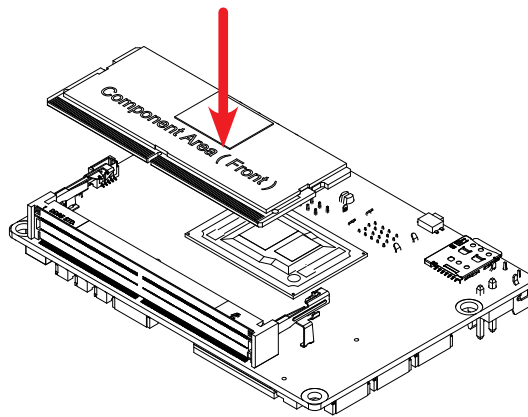
3.2 Installing M.2

3.2.1 Key E 2230

Step 1 Install M.2 into the M.2 slot and fasten M2.5 (P Head) screw indicated.
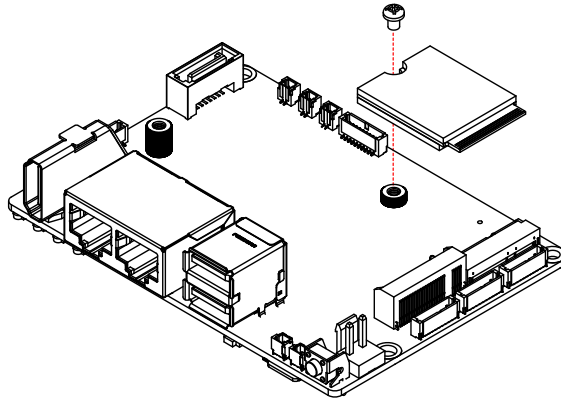
3.2.2 Key B 2280

Step 1 Install M.2 into the M.2 slot and fasten M3 (I Head) screw indicated.
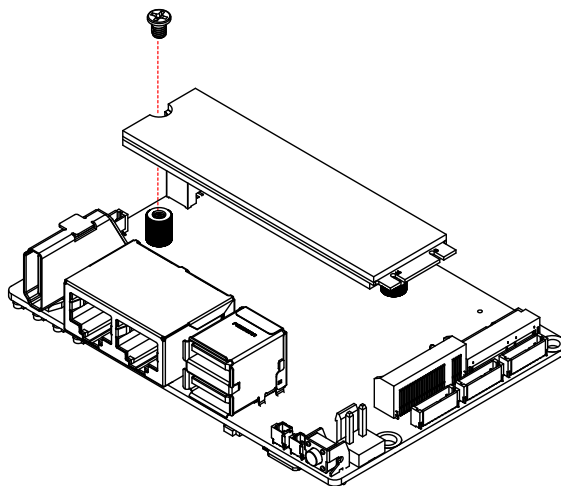
3.2.3 Key B 3042

Step 1 Install the M.2 module and M.2 bracket with I Head M3x4L screw to ensure proper fastening.
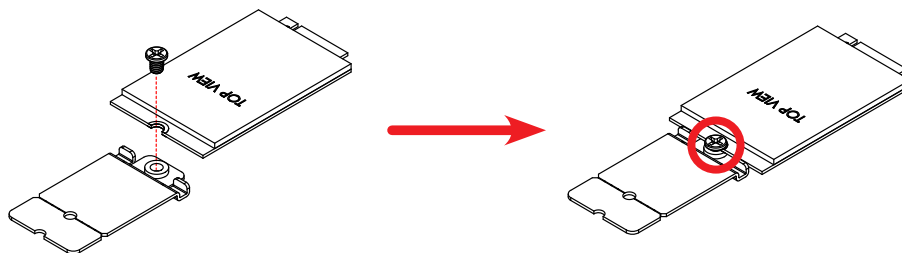
Step 2 Install M.2 into the M.2 slot and fasten M3 (I Head) screw indicated.
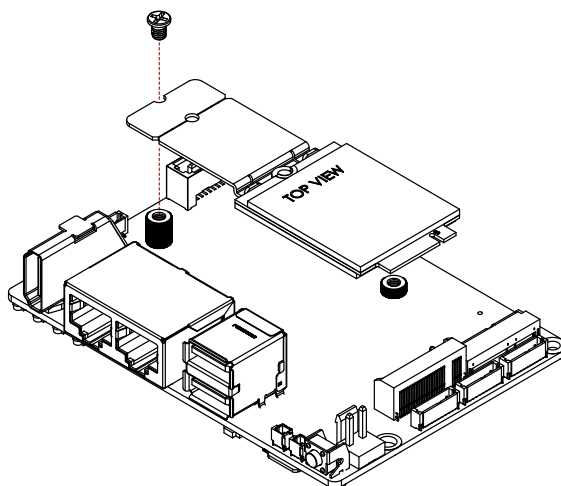
3.3.4 Key B 3052

Step 1 Removal procedure of system components is illustrated in the diagram below.
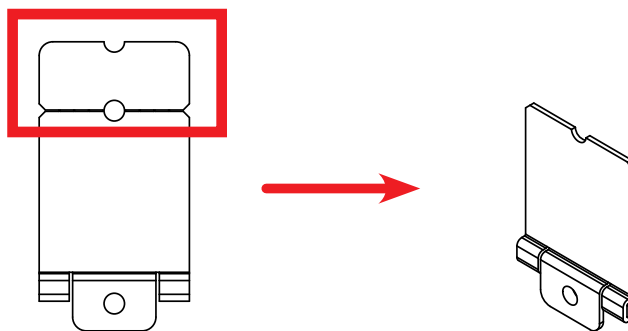
Step 2 Install the M.2 module and M.2 bracket with I Head M3x4L screw to ensure proper fastening.
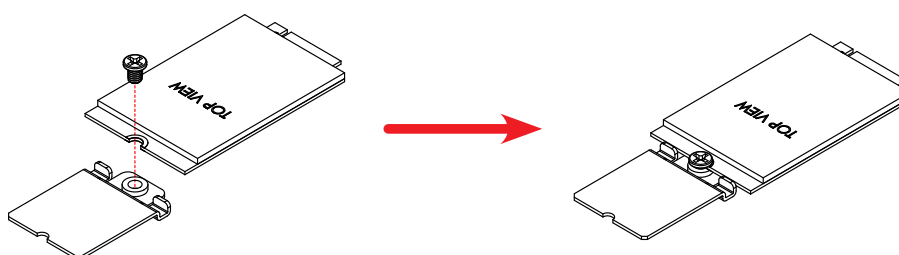
Step 3 Install M.2 into the M.2 slot and fasten M3 (I Head) screw indicated.
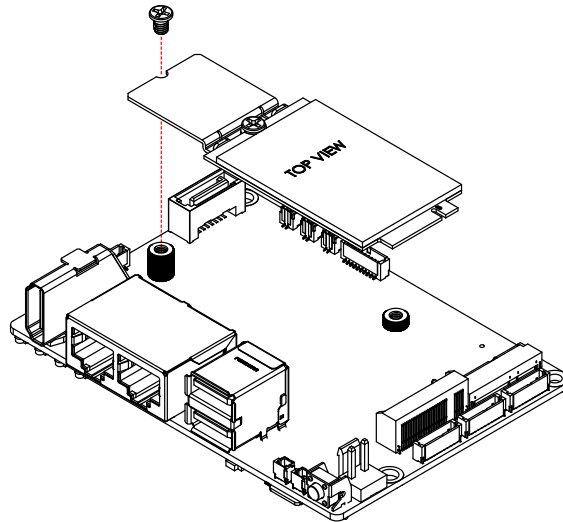
3.3 Installing SIM Card

Install SIM card into to the SIM card slot.
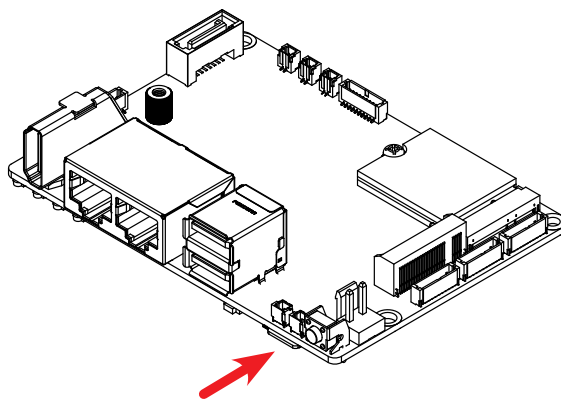
3.4 Installing Heatsink

Step 1 Remove the release liner from the Heatsink.
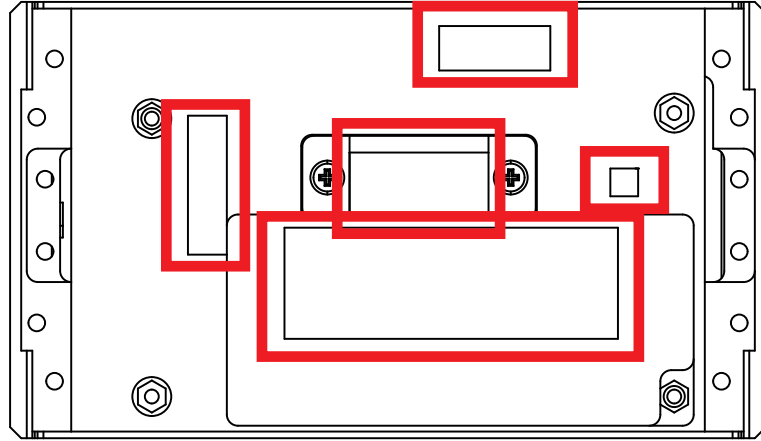
Step 2 Assemble the screws(I head M3x6L) standoffs(M3x12L), standoffs(M3x19.5L) and heatsink
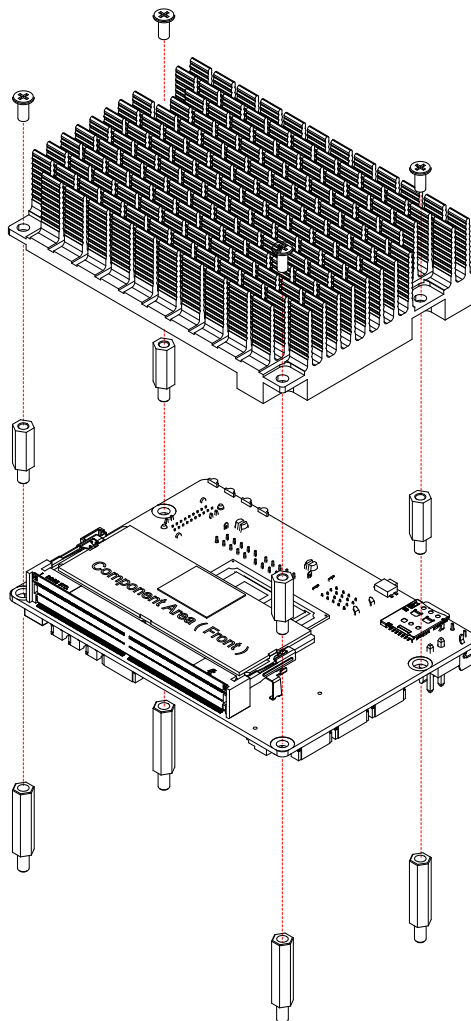
4

BIOS SETUP

4.1 BIOS Setup

```
                          Aptio Setup - AMI
    Main  Advanced  Chipset  Security  Boot  Save & Exit

    BIOS Information                                        Set the Date. Use Tab to
    BIOS Version                E2000PBCX00005              switch between Date elements.
    Build Date and Time         07/07/2025 11:09:50         Default Ranges:
    PCB Version                 B                           Year: 1998-9999
                                                            Months: 1-12
    Processor Information                                   Days: Dependent on month
    Name                        AlderLake ULX               Range of Years may vary.
    Type                        Intel(R) Atom(TM)
                                x7211RE
    Speed                       1000 MHz
    Stepping                    A0
    Microcode Revision          1D

    IGFX GOP Version            21.1.6                      →←: Select Screen
    ME FW Version               16.50.20.1647              ↑↓: Select Item
    Total Memory                 8192 MB                    Enter: Select
    Memory Frequency             4800 MHz                   +/-: Change Opt.
                                                            F1: General Help
    PCH Information                                         F2: Previous Values
    PCH SKU                     N ASL NEX INDU SKU          F3: Optimized Defaults
    Stepping                    A0                          F4: Save & Exit
                                                            ESC: Exit
    System Date                 [Mon 07/21/2025]
    System Time                 [10:34:04]
```

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

```
                              Aptio Setup - AMI
   Main  Advanced  Chipset  Security  Boot  Save & Exit

   BIOS Information                                      Set the Date. Use Tab to
   BIOS Version                   E2000PBCX00005         switch between Date elements.
   Build Date and Time            07/07/2025 11:09:50    Default Ranges:
   PCB Version                    B                      Year: 1998-9999
                                                         Months: 1-12
   Processor Information                                 Days: Dependent on month
   Name                           AlderLake ULX          Range of Years may vary.
   Type                           Intel(R) Atom(TM)
                                  x7211RE
   Speed                          1000 MHz
   Stepping                       A0
   Microcode Revision             1D

   IGFX GOP Version               21.1.6                 ↔: Select Screen
   ME FW Version                  16.50.20.1647          ↑↓: Select Item
   Total Memory                    8192 MB               Enter: Select
   Memory Frequency                4800 MHz              +/-: Change Opt.
                                                         F1: General Help
   PCH Information                                       F2: Previous Values
   PCH SKU                        N ASL NEX INDU SKU     F3: Optimized Defaults
   Stepping                       A0                     F4: Save & Exit
                                                         ESC: Exit
   System Date                    [Mon 07/21/2025]
   System Time                    [10:34:04]
```

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
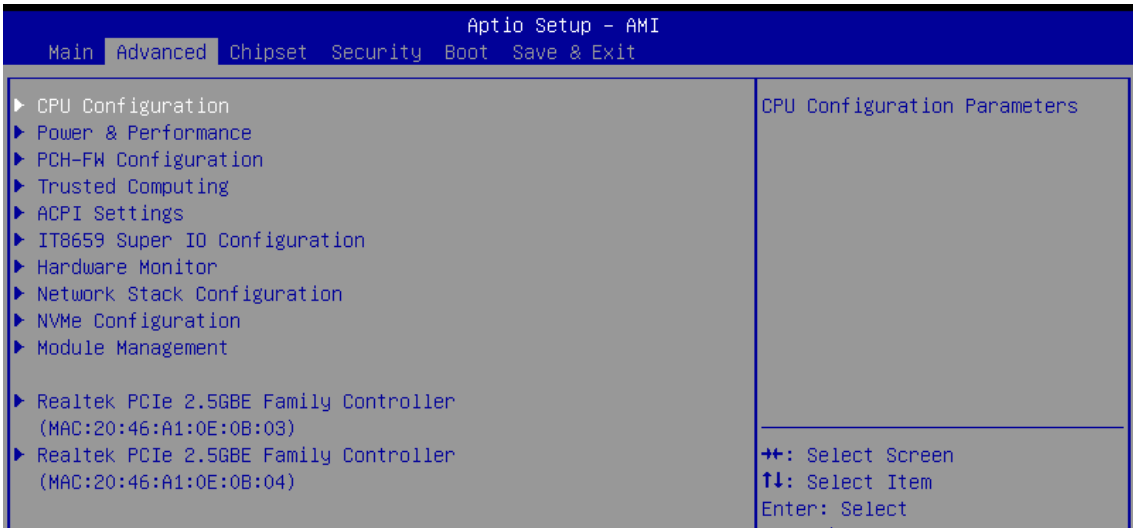
Figure 4-3 : Advanced menu

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

4.3.1 CPU Configuration
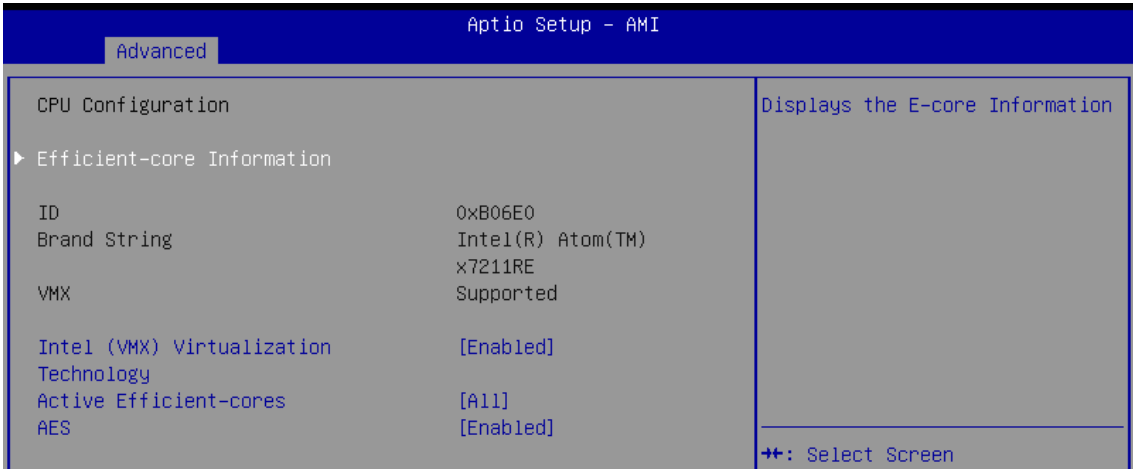
Figure 4-3-1 : CPU Configuration

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

```
                        Aptio Setup - AMI
      Advanced

  CPU - Power Management Control                      Select the performance state
                                                      that the BIOS will set
  Boot performance mode         [Max Non-Turbo        starting from reset vector.
                                 Performance]
  Intel(R) SpeedStep(tm)        [Enabled]
  Intel(R) Speed Shift Technology  [Enabled]
    Turbo Mode                  [Disabled]
  ▶ View/Configure Turbo Options
  C states                      [Enabled]
    Enhanced C-states           [Enabled]
```
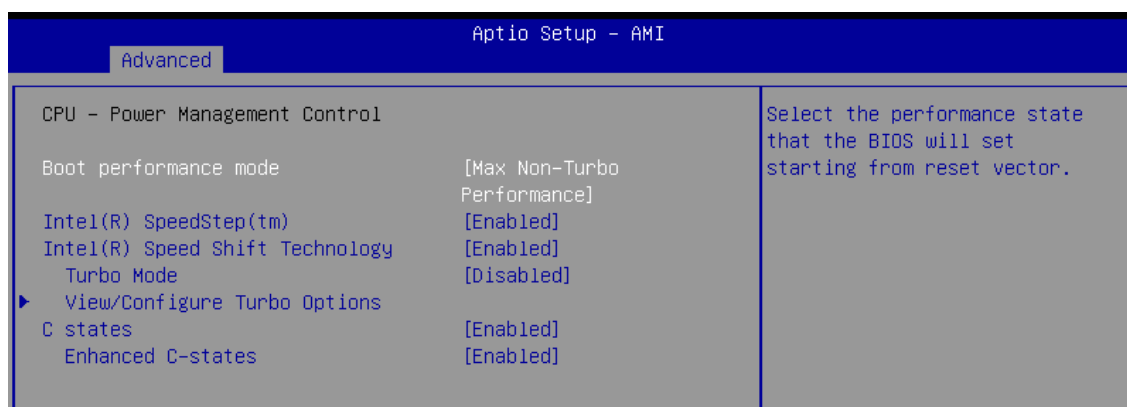
Figure 4-3-2 : CPU - Power Management Control

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

```
                              Aptio Setup - AMI
   Advanced

   TPM 2.0 Device Found                               Enables or Disables BIOS
   Firmware Version:             600.18               support for security device.
   Vendor:                       INTC                 O.S. will not show Security
                                                      Device. TCG EFI protocol and
   Security Device Support       [Enable]             INT1A interface will not be
   Active PCR banks              SHA256               available.
   Available PCR banks           SHA256,SHA384,SM3

   SHA256 PCR Bank               [Enabled]
   SHA384 PCR Bank               [Disabled]
   SM3_256 PCR Bank              [Disabled]

   Pending operation             [None]
   Platform Hierarchy            [Enabled]            ++: Select Screen
   Storage Hierarchy             [Enabled]            ↑↓: Select Item
   Endorsement Hierarchy         [Enabled]            Enter: Select
   Physical Presence Spec Version [1.3]               +/-: Change Opt.
   TPM 2.0 InterfaceType         [CRB]                F1: General Help
   Device Select                 [Auto]               F2: Previous Values
                                                      F3: Optimized Defaults
```

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

```
                              Aptio Setup - AMI
   Advanced

   ACPI Settings                                      Enables or Disables System
                                                      ability to Hibernate (OS/S4
                                                      Sleep State). This option may
   Enable Hibernation            [Enabled]            not be effective with some
   ACPI Sleep State              [S3 (Suspend to RAM)] operating systems.

                                                      ++: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
```
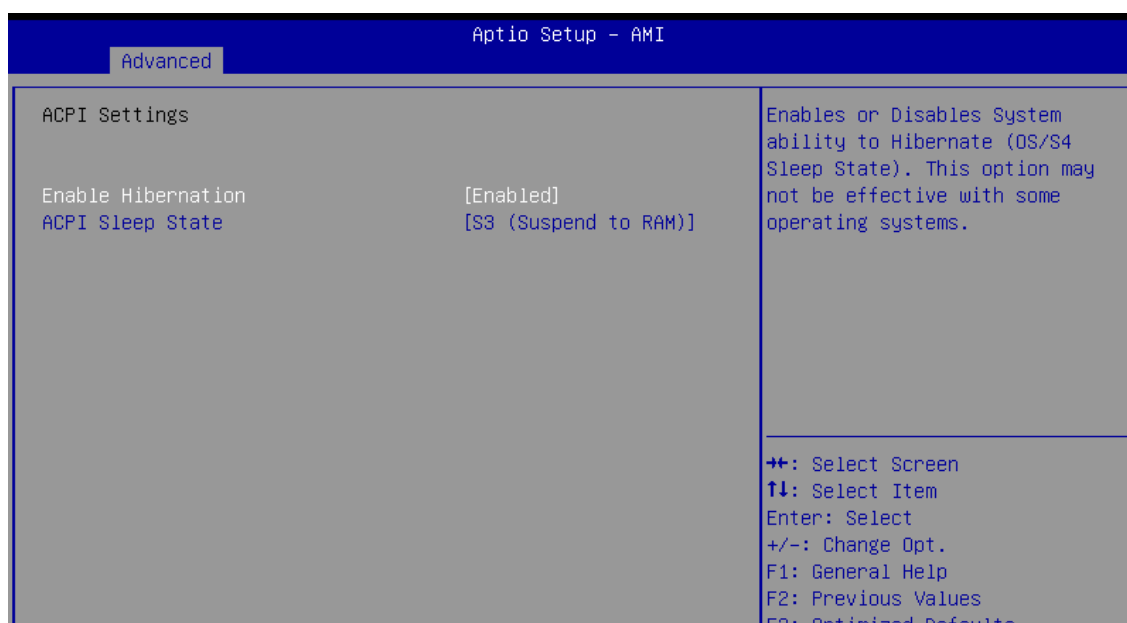
Figure 4-3-5 : ACPI Settings

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

```
                          Aptio Setup - AMI
     Advanced

  IT8659 Super IO Configuration                    Set Parameters of Serial Port 1

  Super IO Chip                    IT8659
▶ Serial Port 1 Configuration
▶ Serial Port 2 Configuration
```
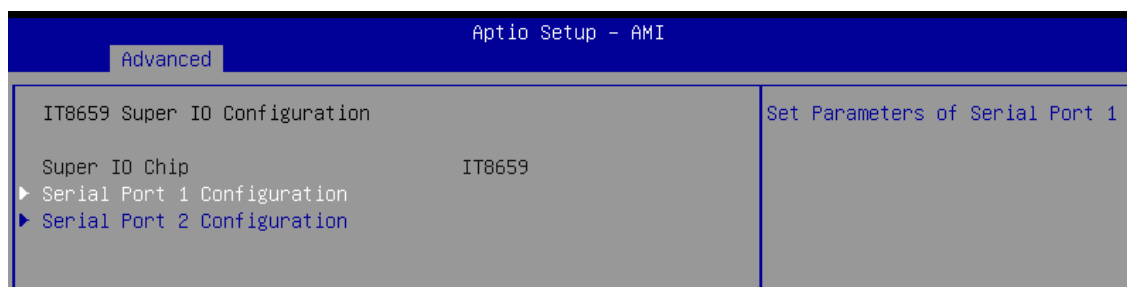
Figure 4-3-6-1 : Super IO Configuration

```
                          Aptio Setup - AMI
     Advanced

  Serial Port 1 Configuration                      Enable or Disable Serial Port
                                                   (COM)
  Serial Port                    [Enabled]
  Device Settings                IO=3F8h; IRQ=4;

  Device Mode                    [RS232]
  PPS Mode                       [Disabled]
  High Speed Mode                [Disabled]
```
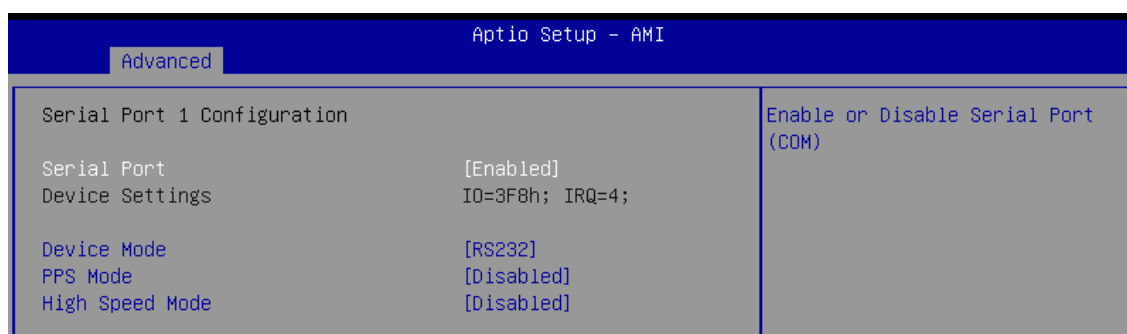
Figure 4-3-6-2 : Serial Port X Configuration

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

```
                          Aptio Setup - AMI
     Advanced

  Pc Health Status

  CPU temperature                : +48 ℃
  SYS temperature                : +32 ℃
  VCORE                          : +0.664 V
  5V                             : +4.959 V
  3.3V                           : +3.307 V
```
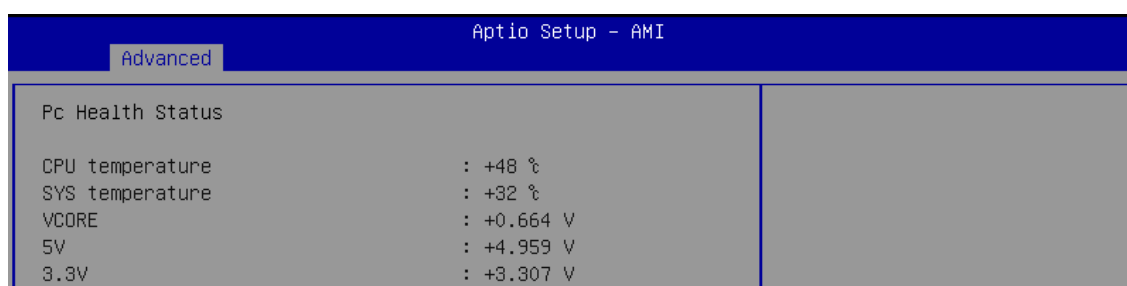
Figure 4-3-7 : Hardware Monitor

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

4.3.8 Network Stack Configuration

```
                          Aptio Setup - AMI
     Advanced

 Network Stack                   [Enabled]            Enable/Disable UEFI Network
 IPv4 PXE Support                [Disabled]           Stack
 IPv4 HTTP Support               [Disabled]
 IPv6 PXE Support                [Disabled]
 IPv6 HTTP Support               [Disabled]
 PXE boot wait time              0
 Media detect count              1




                                                      ++: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
```
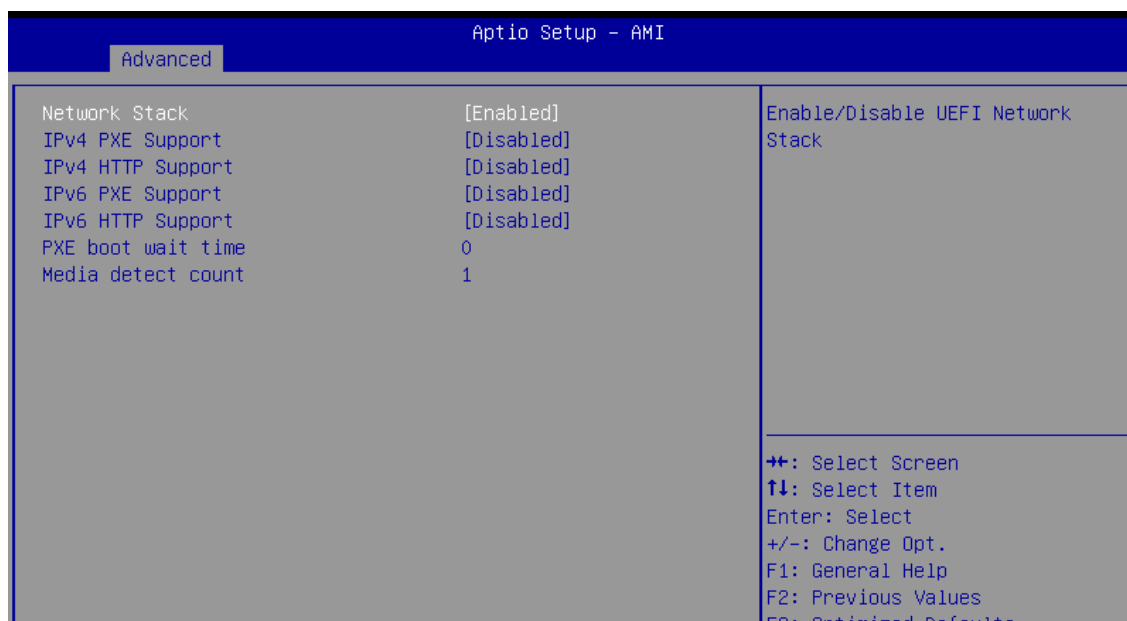
Figure 4-3-8 : Network Stack Configuration

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
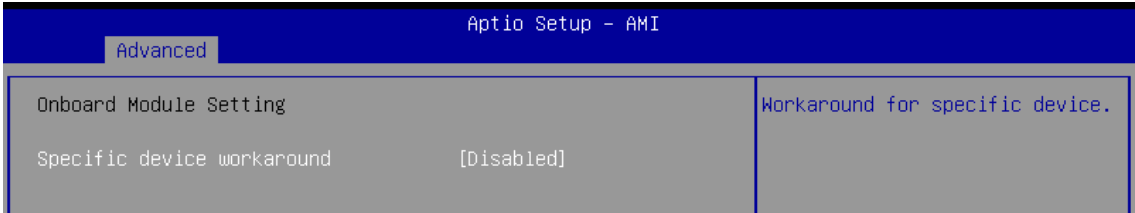
Figure 4-3-10 : Module Management

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
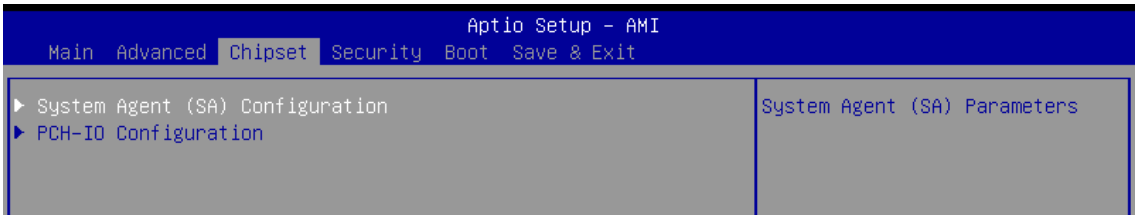
Figure 4-4 : Chipset Menu

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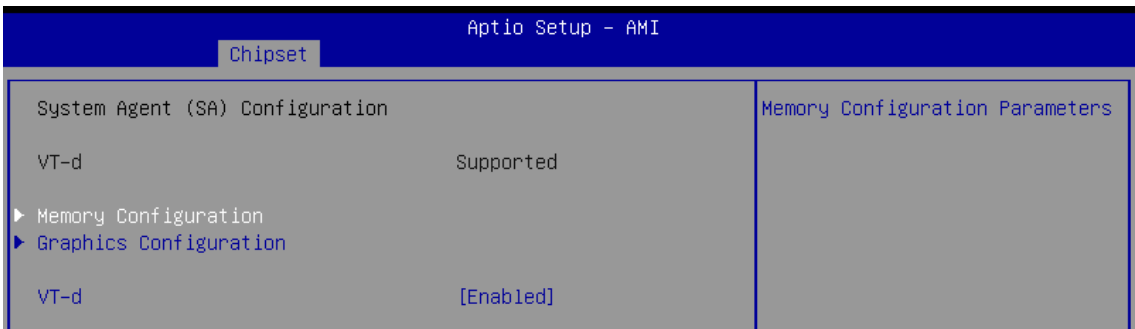
Figure 4-4-1 : System Agent (SA) Configuration

VT-d
VT-d capability.

4.4.2 Memory Configuration

```
                            Aptio Setup - AMI
            Chipset

   Memory Configuration                                Maximum Memory Frequency
                                                       Selections in Mhz.
   Memory RC Version              1.0.4.75
   Memory Frequency               4800 MHz
   tCL-tRCD-tRP-tRAS             40-39-39-77
   MC 0 Ch 0 DIMM 0              Populated & Enabled
       Size                     8192 MB (DDR5)
       Number of Ranks          1
       Manufacturer             Kingston
   MC 0 Ch 0 DIMM 1             Not Populated / Disabled
   MC 1 Ch 0 DIMM 0             Not Populated / Disabled
   MC 1 Ch 0 DIMM 1             Not Populated / Disabled

                                                       →←: Select Screen
   Maximum Memory Frequency      [Auto]                ↑↓: Select Item
   In-Band ECC Support           [Disabled]            Enter: Select
```

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

```
                            Aptio Setup - AMI
            Chipset

   Graphics Configuration                               Select which of IGFX/PEG/PCI
                                                        Graphics device should be
   Primary Display               [Auto]                 Primary Display Or select HG
   Internal Graphics             [Enabled]              for Hybrid Gfx.
```

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

```
                           Aptio Setup - AMI
            Chipset

    PCH-IO Configuration                              PCI Express Configuration
                                                      settings
  ▶ PCI Express Configuration
  ▶ SATA Configuration
  ▶ Security Configuration

    State After G3                    [S5 State]
```
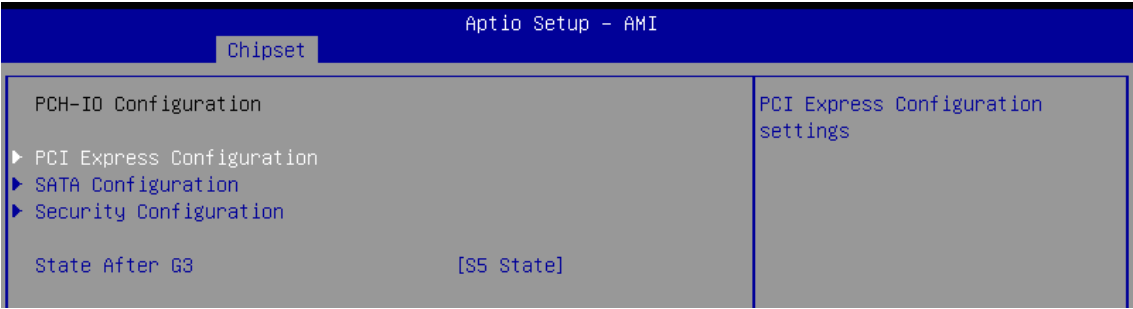
Figure 4-4-4 : PCH-IO Configuration

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

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

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

Figure 4-4-6 : SATA Configuration

SATA Controller(s)
Enable/Disable SATA Device.

4.5 Security Menu


```
                         Aptio Setup - AMI
     Main  Advanced  Chipset  Security  Boot  Save & Exit

  Password Description                          Set Administrator Password

  The password length must be
  in the following range:
  Minimum length              3
  Maximum length              20

  Administrator Password



  HDD Security Configuration:
▶ TS512GMTE460T                                →←: Select Screen
                                               ↑↓: Select Item
▶ Secure Boot                                  Enter: Select
                                               +/-: Change Opt
```

Figure 4-5 : Security Menu

Administrator Password
Set Administrator Password.

4.5.1 HDD Security Configuration

```
                        Aptio Setup - AMI
              Security

HDD Password Description :                          Set HDD User Password.
                                                    *** Advisable to Power Cycle
Allows Access to Set, Modify and Clear              System after Setting Hard Disk
HardDisk  User  Password                            Passwords ***.
and  Master  Password.                              Discard or Save changes option
User Password is mandatory to Enable HDD Security.  in setup does not have any
If Master password is installed (optional),         impact on HDD when password is
it can also be used to unlock the HDD.              set or removed. If the 'Set
If the 'Set User Password' option is hidden,        HDD User Password' option is
do power cycle to enable the option again.          hidden, do power cycle to
                                                    enable the option again
HDD PASSWORD CONFIGURATION:

Security Supported :            Yes                 ++: Select Screen
Security Enabled   :            No                  ↑↓: Select Item
Security Locked    :            No                  Enter: Select
Security Frozen    :            Yes                 +/-: Change Opt.
HDD User Pwd Status:            NOT INSTALLED       F1: General Help
HDD Master Pwd Status  :        INSTALLED           F2: Previous Values
                                                    F3: Optimized Defaults
Set User Password                                   F4: Save & Exit
Set Master Password                                 ESC: Exit
```

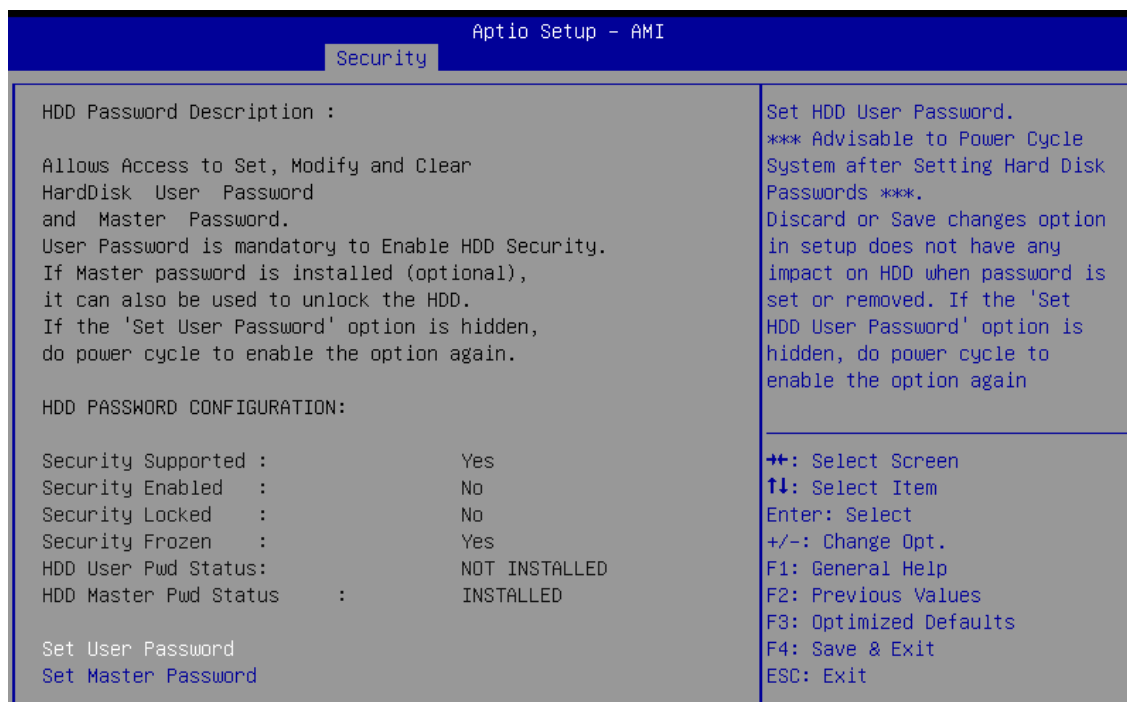Figure 4-5-1 : HDD Security Configuration

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

```
                            Aptio Setup – AMI
                    Security

  System Mode                    Setup                    Secure Boot feature is Active
                                                          if Secure Boot is Enabled,
  Secure Boot                    [Enabled]                Platform Key(PK) is enrolled
                                 Not Active               and the System is in User mode.
                                                          The mode change requires
  Secure Boot Mode               [Standard]               platform reset
▶ Restore Factory Keys
▶ Reset To Setup Mode

▶ Expert Key Management
```
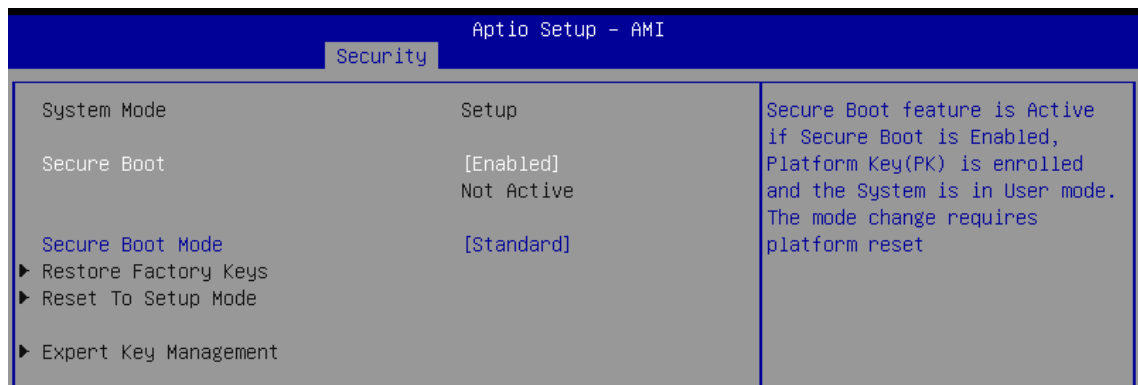
Figure 4-5-2 : Secure Boot

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

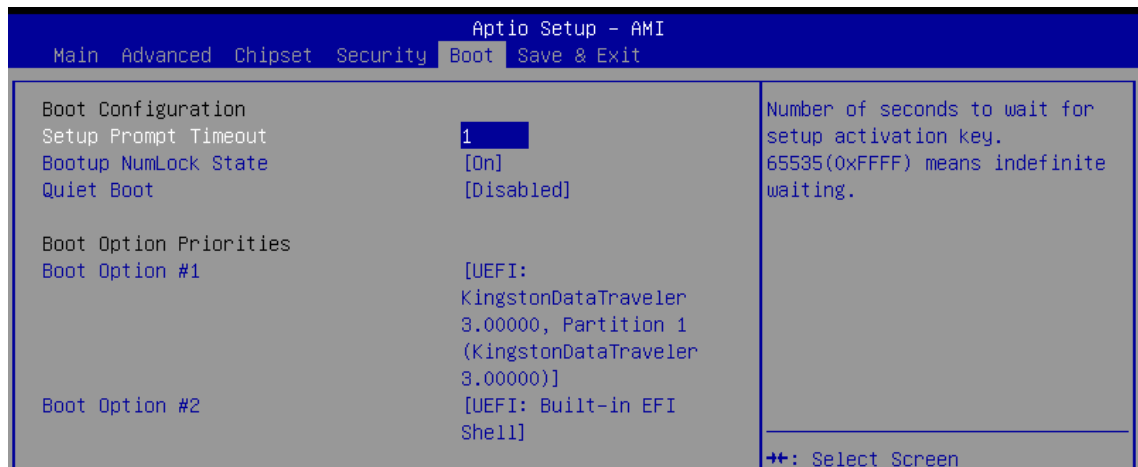## Setup Prompt Timeout
Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

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


```
                          Aptio Setup - AMI
    Main  Advanced  Chipset  Security  Boot  Save & Exit

    Save Options                                  Reset the system after saving
    Save Changes and Reset                        the changes.
    Discard Changes and Reset

    Default Options
    Restore Defaults

    Boot Override
    UEFI: KingstonDataTraveler 3.00000, Partition 1
    (KingstonDataTraveler 3.00000)
    UEFI: Built-in EFI Shell

                                                  →←: Select Screen
                                                  ↑↓: Select Item
                                                  Enter: Select
                                                  +/-: Change Opt.
                                                  F1: General Help
                                                  F2: Previous Values
                                                  F3: Optimized Defaults
                                                  F4: Save & Exit
```
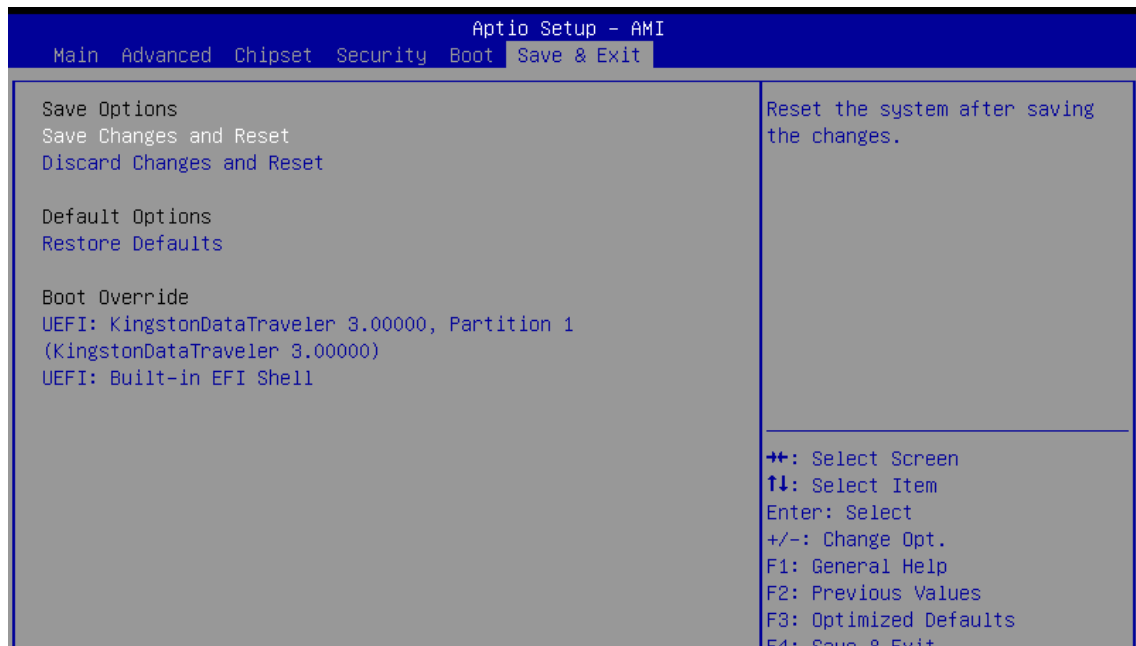
Figure 4-7 : Save & Exit

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.

A

APPENDIX A : GPIO Guide

A.1 Function Description

The EPBC-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)

C

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® x7211RE	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® x7211RE	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.**

Vecow

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