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SECTION 1
INTRODUCTION

This section contains general information and detailed specifications of the   .Section 1 consist of the following sub-sections:

- General Descriptions
- System Specifications
- Dimensions
- I/O Outlets
- Packing List
- Model List

1.1 General Descriptions

The   is a rugged & Powerful GPU Computing fanless embedded system that features the 13th/12th generation Intel® Core™ i9/i7/i5/i3 & Celeron® with Intel® R680E chipset. It comes with an IP40-rated heavy-duty aluminum extrusion design, offers 9-36V DC power input with power protection, and supports -40°C to +65°C extended temperature range*, thus enabling reliable operation in harsh environments.

To minimize deployment time,   supports one flexible I/O window for customers to easily install additional I/O output. It also supports multiple I/O connections including 4 LAN ports (3*2.5G + 1*Gbe), 6 USB 3.2 ports, 4 COM ports, max up to 5 display (via MXM module), plus 2 SIM slots are provided for remarkable mobile availability. It is making perfectly suitable for Smart Manufacturing, Smart Surveillance, Machine Vision, Robotic Control, etc.

Features

- 13th/12th Gen Intel® Core™ i9/i7/i5/i3 and Celeron® processors with Intel® R680E chipset (Alder Lake S)

- Dual DDR5 SO-DIMM for up to 64GB of memory

- 4 LAN with optional PoE supported

- Dual 2.5" SATA HDD drive bays with RAID 0 & 1

- Supports MXM 3.1 Type A, up to 5 display outputs

- -40 °C to +65°C wide operating temperatures

- Wide range power input from 9 to 36 VDC

- Flexible I/O window supported via mPCIe modules

Reliable and Stable Design
The embedded system supports LGA1700 13th/12th gen Intel® Core™ i9/i7/i5/i3 and Celeron® 35 or 65 watt processors, along with high flexibility and multi-functional design that make it the best solution for AMR, Robotics, Embedded Controller, Machine Vision, OT Server applications.

Flexible Connectivity
The　　　　　comes with rich I/O interfaces including two RS-232/422/485 ports, two RS-232, six USB 3.2 ports, four GbE ports, two HDMI, one DisplayPort and flexible I/O window supported.

Embedded O.S. Supported
The　　　　　with 13th/12th generation platform supports Windows® 10/11, Windows® 10/11 IoT and Linux.

Various Storage Supported
In terms of storage, the　　　　　supports two 2.5" SATA storage drive bay, one mSATA and one NVMe devices.

1.2 System Specifications

1.2.1 CPU

● **CPU (13th gen, 35W/65W)**
  ■ Intel® Core™ i3-13100TE (35W)
  ■ Intel® Core™ i9-13900E (65W)

● **CPU (12th gen, 35W/65W)**
  ■ Intel® Core™ i5-12500E   (65W)
  ■ Intel® Core™ i5-12500TE (35W)
  ■ Intel® Core™ i9-12900E   (65W)
  ■ Intel® Core™ i3-12100TE (35W)

● **Chipset**
  ■ Intel® R680E

● **BIOS**
  ■ American Megatrends Inc. UEFI (Unified Extensible Firmware Interface) BIOS.

● **System Memory**
  ■ 2 x 262-pin DDR5-4800 SO-DIMM, up to 64GB

1.2.2 I/O System

● **Display**
  ■ 2 x HDMI 1.4b (Resolution: 4096x2160@30Hz)(1 x lockable)
  ■ 1 x DisplayPort++ 1.2a (Resolution: 4096x2160@60Hz)
  ■ 2 x DisplayPort 1.4a via optional MXM type A

● **Ethernet**
  ■ 3 x 2.5 GbE (Intel® i226-IT)
  ■ 1 x GbE LAN (Intel® i219-LM)

● **USB Ports**
  ■ 6 x USB 3.2 Gen 2x1 (10Gbps)

● **Serial Ports**
  ■ 2 x RS-232/422/485 with autoflow (COM1~COM2)
  ■ 2 x RS-232 (COM3~COM4)
  Baud rate support up to 115200

● **Audio**
  ■ 1 x Audio (MIC-in/Line-out)

● **Expansion Interface**
  ■ 1 x Full-size PCI Express Mini Card slot (USB 2.0+PCIe+SIM mSATA signal)
  ■ 1 x M.2 Key M 2280 socket (for storage)(PCIex4 signal)
  ■ 1 x M.2 Key E 2230 socket (for Wi-Fi 6E) (USB 2.0 signal)
  ■ 1 x M.2 Key B 3052 socket (for 5G) (PCIex1 +USB 3.0 signal)
  ■ 1 x Internal SIM slot for PCIe Mini Card slot
  ■ 1 x MXM3.1 type A connector

- **Storage**
  - 2 x 2.5" SATA HDD/SSD (up to 15 mm height; RAID 0,1 supported)
  - 1 x NVMe by M.2 Key M 2280
  - 1 x mSATA (enable in BIOS setting)

- **Flexible I/O Window**
  - Default : 2 x DB9 half cut bracket

- **Indicator**
  - 1 x Green LED for system power
  - 1 x Orange LED for HDD active
  - 4 x Programmable Green LED

- **Switch**
  - 1 x ATX PWR switch
  - 1 x Remote PWR switch
  - 1 x Reset switch

- **Antenna & SIM**
  - 5 x SMA type connector openings for antenna
  - 1 x front access SIM slot (for M.2 Key B)

- **TPM 2.0**
  - 1 x ST33HTPH2E32AHA6

1.2.3 System Specifications

- **System Block diagram**
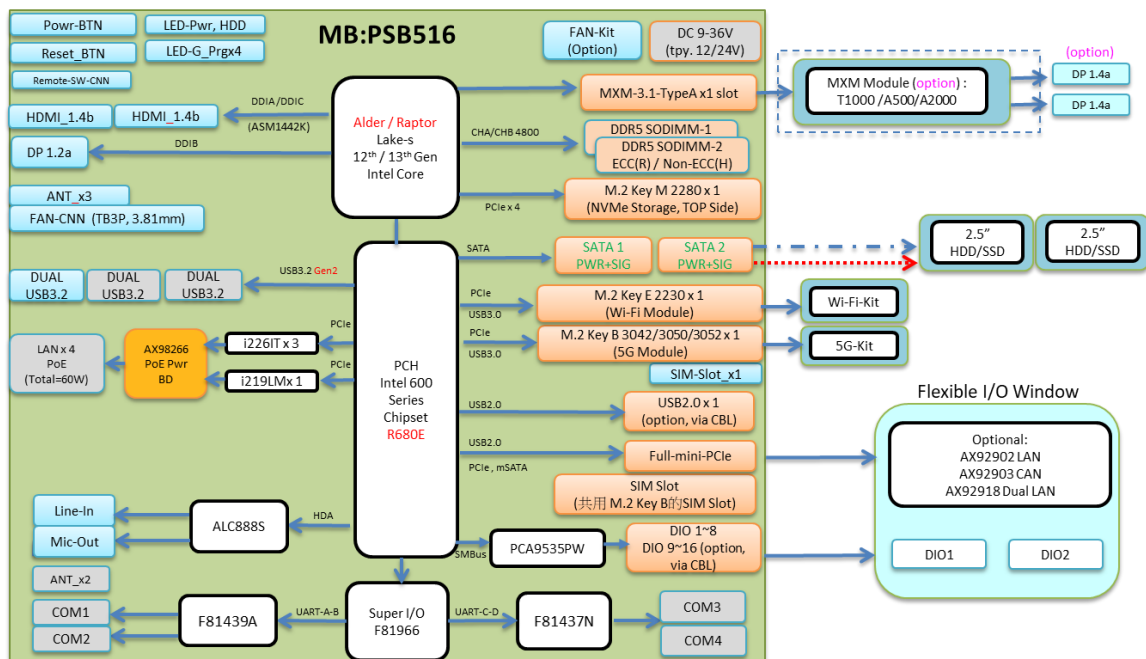
- **Watchdog Timer**
  - 1~255 seconds or minutes; up to 255 levels.

- **Power Supply**
  - 9-36V DC input with ignition

- **Operation Temperature**
  - **Without MXM module (for CPU 35W/65W)**
    - ➢ -40°C to +65°C (-40°F to +140°F) (with W.T. DRAM & SSD)

  - **With MXM module (only for CPU 35W) :**
    - ➢ For W.T MXM T1000 & A500
    - ➢ -40°C to +50°C (-40°F to +122°F) (with W.T. DRAM & SSD)

  - **With MXM module (only for CPU 35W) :**
    - ➢ For W.T MXM A2000 and must with optional FAN kit
    - ➢ -40°C to +50°C (-40°F to +122°F) (with W.T. DRAM & SSD

- **Storage Temperature**
  - -40℃ ~+80℃ (-40 ⁰F ~ 176⁰F)

- **Humidity**
  - 10% ~ 95% (non-condensation)

- **Shock**
  - IEC 60068-2-27 (w/SSD: 50G@wall mount, half sine,11 ms duration)

- **Vibration Endurance**
  - IEC 60068-2-64 (w/SSD: 3Grms STD, random, 5 - 500 Hz,1 hr/axis)

- **Weight**
  - 4.2 kg (9.25 lb) without package
  - 5 kg (11.02 lb) with package

- **Dimension**
  - 280 mm (11.02") (W) x 210 mm (8.26") (D) x 80.5 mm (3.16") (H)

1.2.4 Driver CD Contents

- **Ethernet**
- **Chipset**
- **Graphic**
- **Serial Port**
- **Intel® ME**
- **Intel Rapid Storage Technology**
- **Audio**
- **MXM Driver (optional)**

【**Note**】**:** *All specifications and images are subject to change without notice.*

1.3 Dimensions

The following diagrams show dimensions and outlines of the   .

1.3.1 System Dimensions
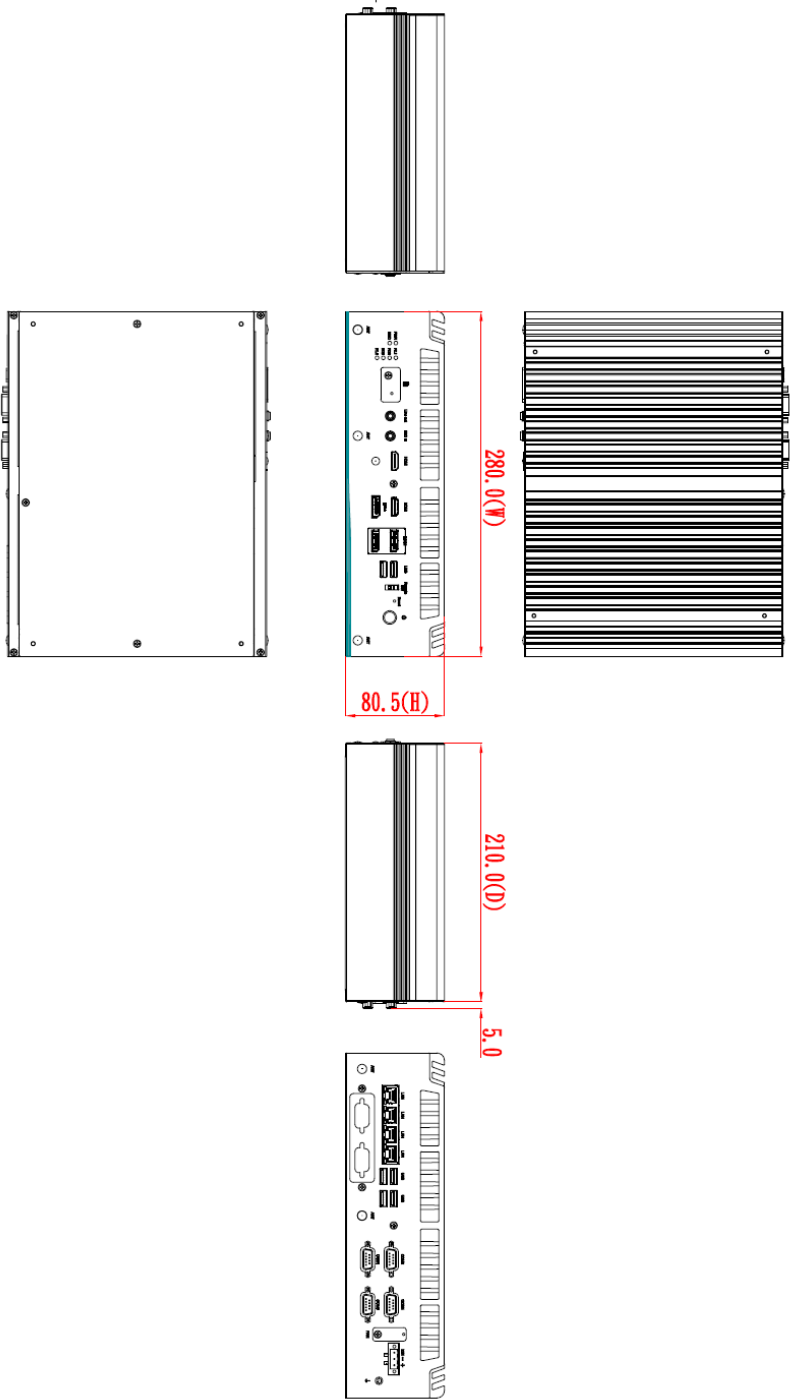
1.3.2 Wall-mount Bracket Dimensions

Users can get 6pcs truss head M3*6L screws for fixing the wall mount kit from the accessories box.

Note: When users install wall mount kit, please turn the LAN ports side outlet towards the floor.
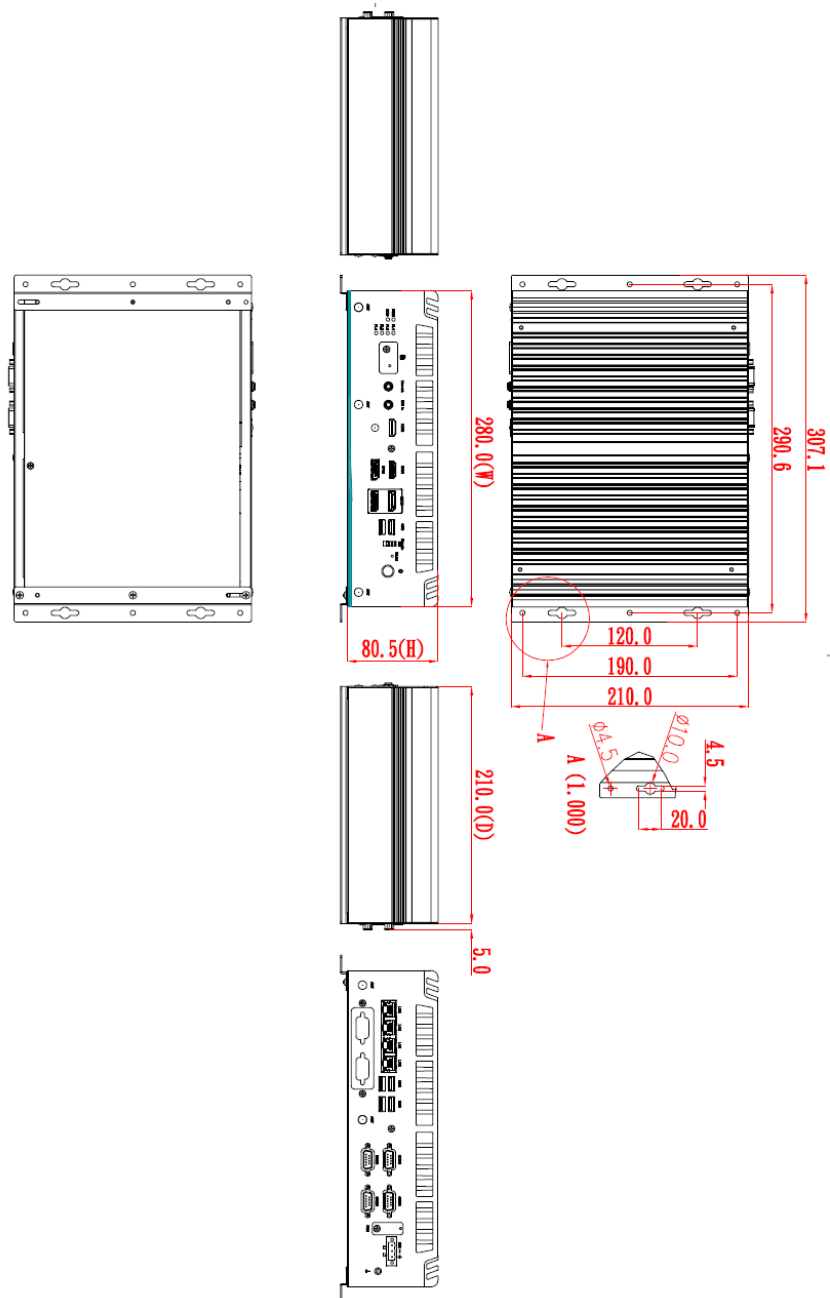
Wall-mount Bracket Assembly Drawing

Users can get 6pcs truss head M3*6L screws for fixing the wall mount kit from the accessories box.
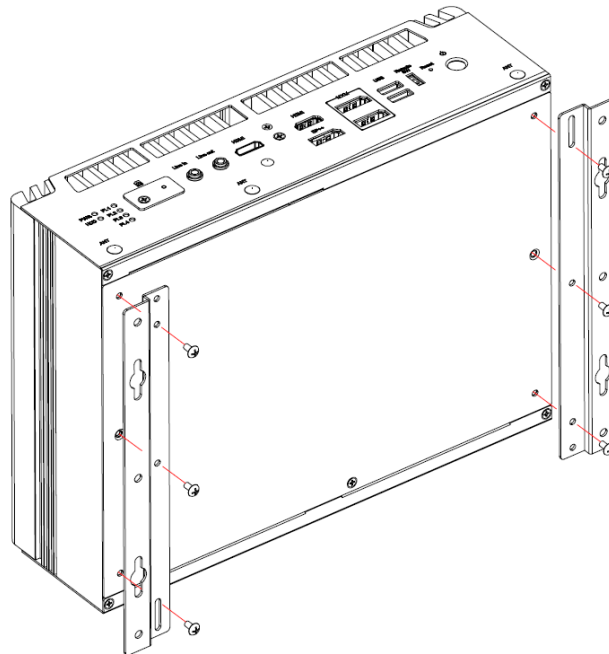
Note : If users install the screws in drywall, use the hollow wall anchors to ensure that unit does not pull away from the wall due to prolonged strain between the cable and power connector.
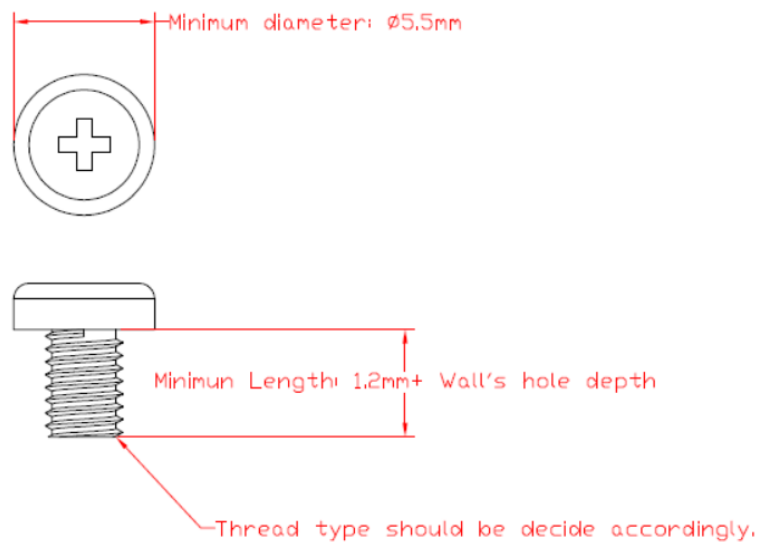
1.3.3 Din-Rail Bracket Dimensions

Users can get 6pcs truss head M3*6L screws for fixing the wall mount kit from the accessory box.
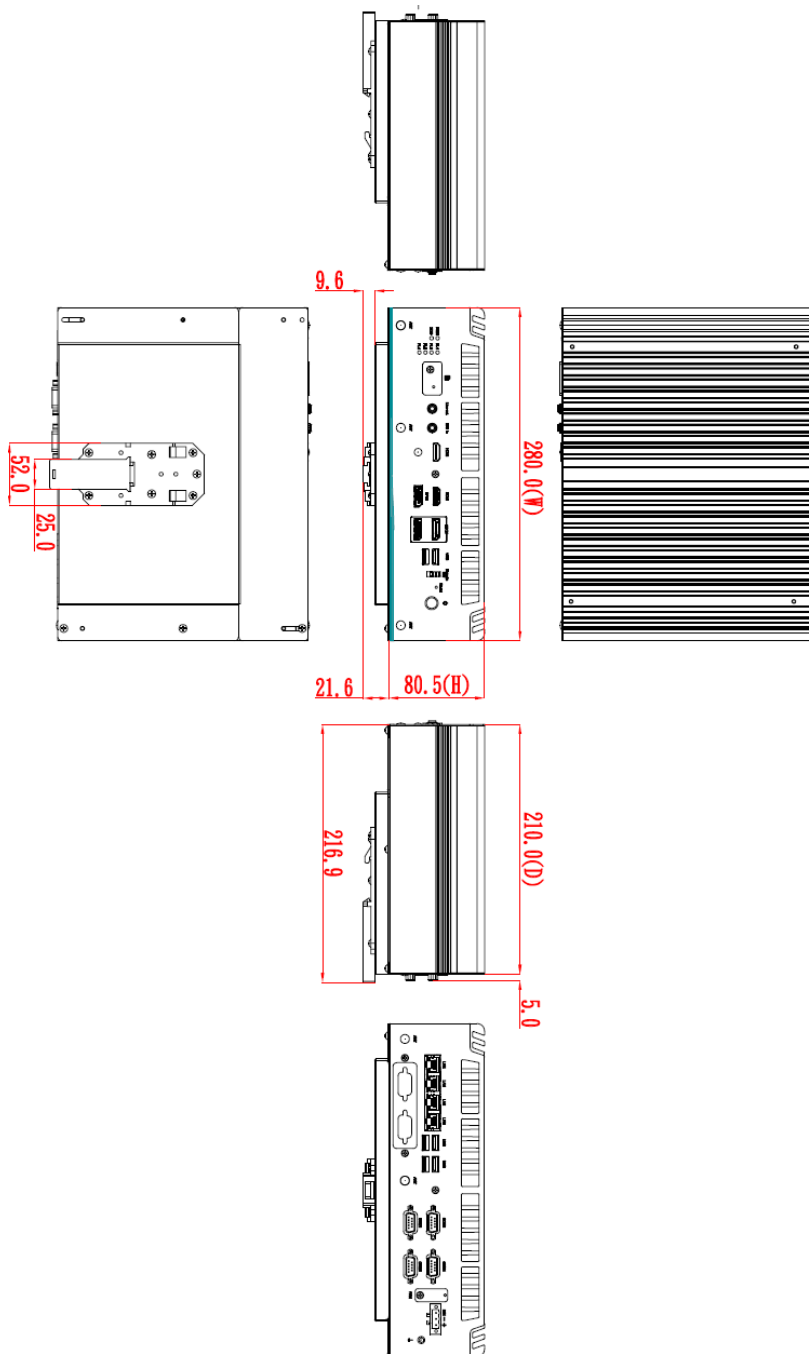
Din-Rail Bracket Assembly Drawing

Users can get 6pcs truss head M3*6L screws for fixing the wall mount kit from the accessory box.
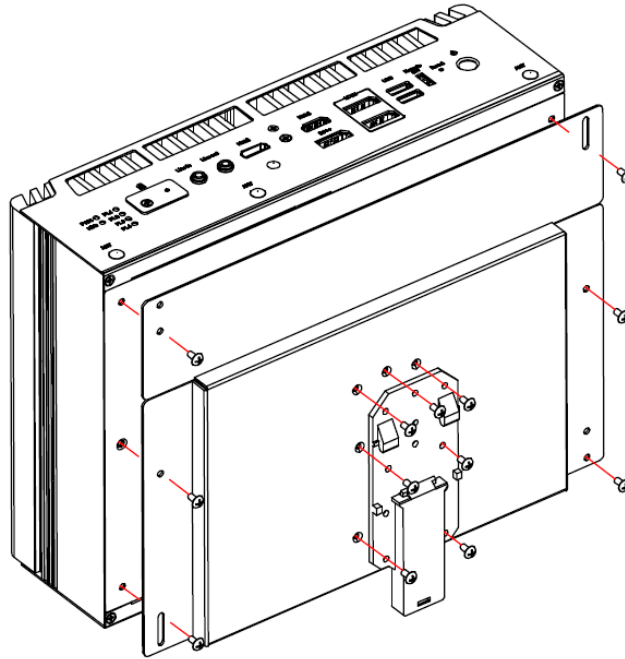
1.4 I/O Outlets

The following figures show I/O outlets on the   .

Front View
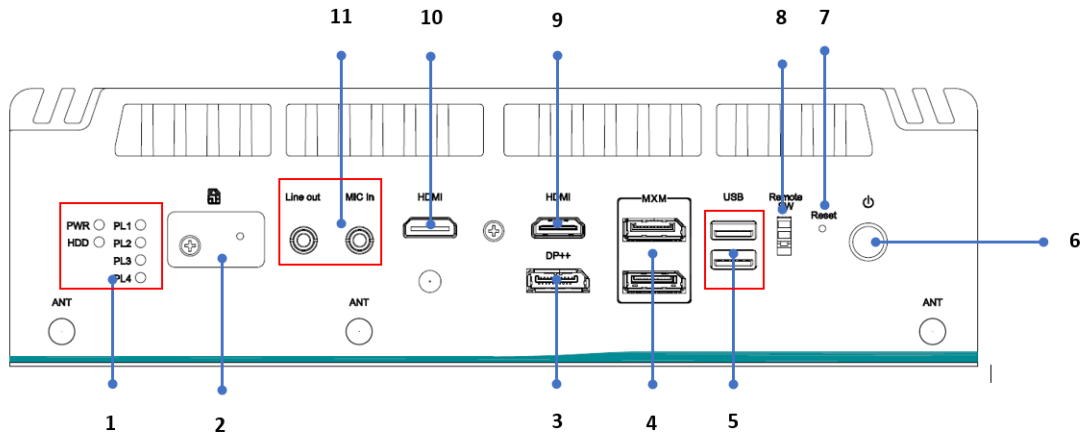
Rear View
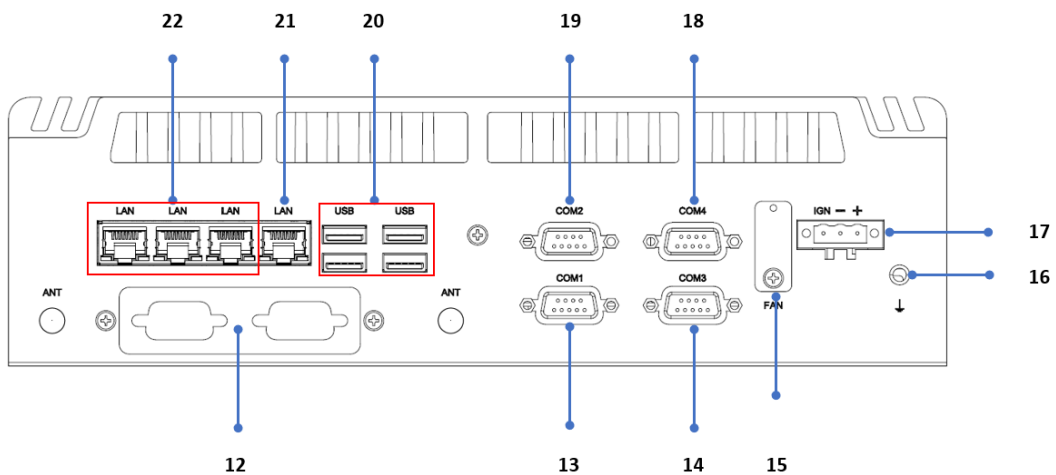
1	LEDs	11	Audio (Line in/Mic out)
2	1 x Front Access SIM slot	12	Flexible IO window
3	1 x DisplayPort++	13	RS232/422/485 (COM1)
4	Optional 2 x optional DP (via MXM module)	14	RS232(COM3)
5	2 x USB 3.2	15	Optional FAN kit connector
6	Power switch	16	Chassis Grounding screw
7	Reset switch	17	Phoenix type power input
8	Remote switch connector	18	RS232 (COM4)
9	1 x HDMI	19	RS232/422/485 (COM2)
10	1 x HDMI (lockable)	20	4 x USB 3.2
21	1 x LAN (i219-LM)	22	3 x LAN (i226-AT)

1.5 Packing List

The   comes with the following bundle package:

● **   System Unit x 1**

● **Thermal grease x 1**

● **3-pin terminal block connector x 1**

● **Remote power switch cable x 1**

● **Foot pad x 4**

● **HDD bracket x 2**

● **Screw pack x 1**

● **DRAM thermal pad x 2**

1.6 Model List

	Fanless embedded system with LGA1700 socket 13th/12th Gen Intel® Core™ i9/i7/i5/i3 or Celeron® processor, Intel® R680E, 2 HDMI, DisplayPort, 6 USB, 4 LAN, and 9 to 36 VDC

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SECTION 2
HARDWARE INSTALLATION

The _____ is convenient for various hardware configurations, such as CPU, DRAM, HDD (Hard Disk Drive), SSD (Solid State Drive), PCI Express Mini card modules and optional MXM graphic module. Section 2 contains guidelines for hardware installation.

2.1 Installation of CPU

Step 1 **Turn off the system and unplug the power cord.**
Step 2 **Loosen four screws of the top heatsink & two screws of the front/rear panel.**
Step 3 **Remove the top heatsink.**
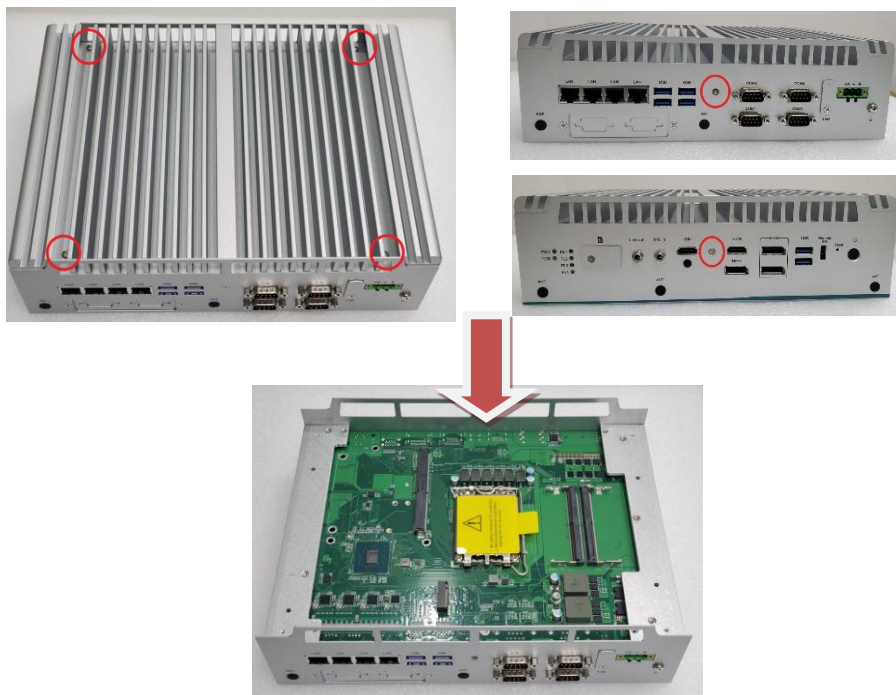
Step 4   Remove the warning label and disengage load lever.

● Disengage load lever by pushing its hook down and then pulling it slightly outward.

● Rotate load lever to open position at approximately 135°.

● Rotate load plate to open position at approximately 150°.

> **Note**
>
> ***Apply pressure to corner with right-hand thumb when opening or closing load lever - otherwise lever will bounce back (as a mouse trap) causing bent contacts.***

Step 5   CPU installation steps:

● Lift processor package from shipping media by grasping the substrate edges.

● Scan the processor package gold pads for any presence of foreign material.

● Locate connection 1 indicator on the processor which aligns with connection 1 indicator chamfer on the socket, and notice processor keying features that line up with posts along socket walls.

● Grasp the processor with thumb and index finger along the top and bottom edges.
The socket will have cutouts for your fingers to fit into.

● Carefully place the processor into the socket body vertically.
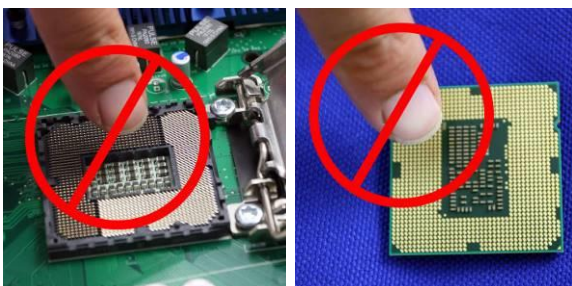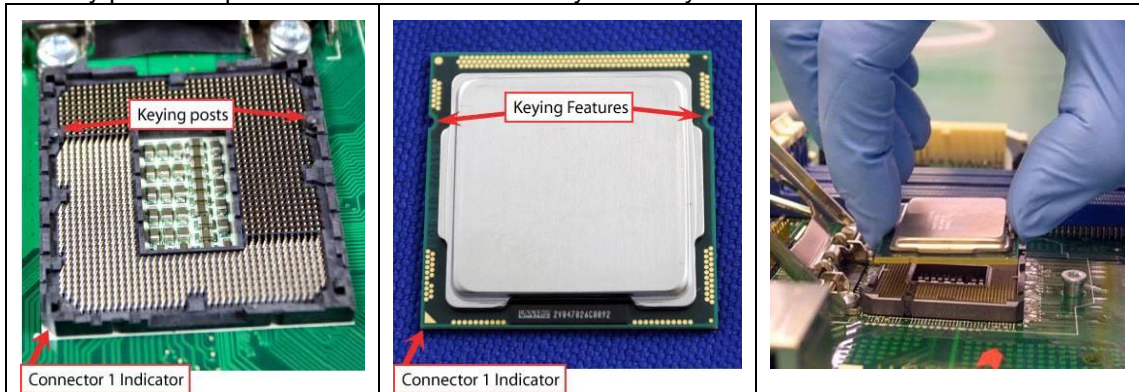
> **Caution**   ***Never touch fragile socket contacts to avoid damage and do not touch the processors sensitive contacts at any time during installation.***

Step 6 **Align pins of the CPU with pin holes of the socket. While installing the CPU, pay attention to the CPU's orientation by aligning the arrow mark on the CPU with the arrow key on the socket.**
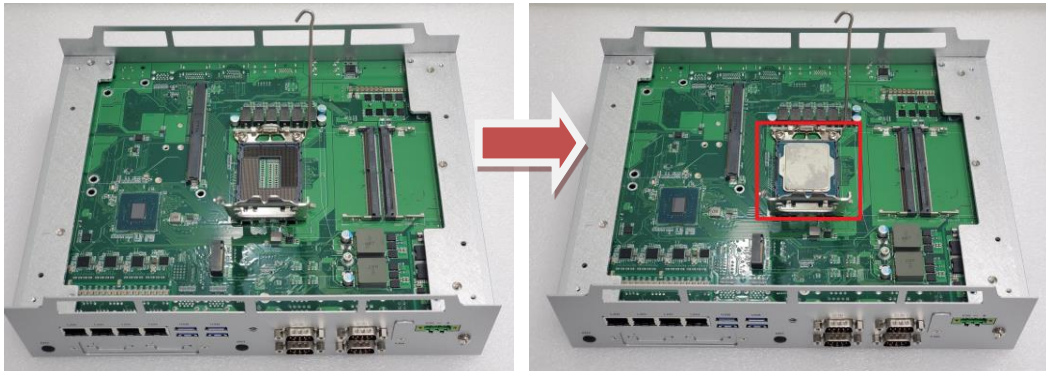
Step 7 **Put the top cover and fasten four screws of the top cover and two screws of the front/rear panel back onto the system.**

2.2 Installation of DRAM Module

Step 1 Turn off the system and unplug the power cord.

Step 2 Loosen four screws of the top heatsink & two screws of the front/rear panel.

Step 3 Remove the top heatsink and located the dual SO-DIMM socket.
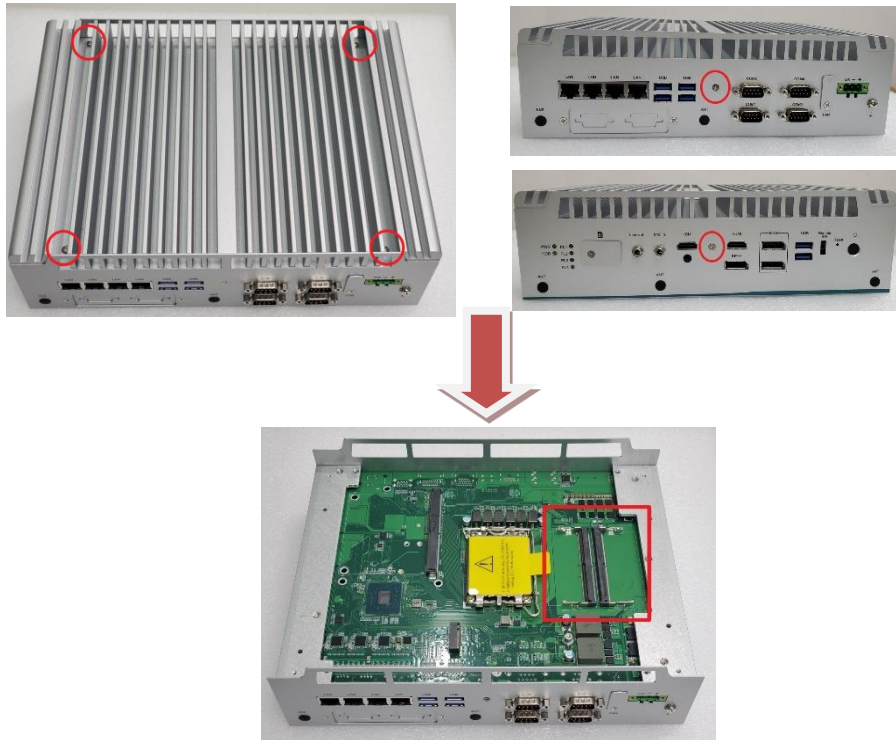
Step 4 Prepare thermal pad, the system will come with 2pcs thermal pad in accessory pack. The thermal pads will come with plastic liner on one side, so make sure it is removed before use. And then stick the thermal pad on the DRAM socket.
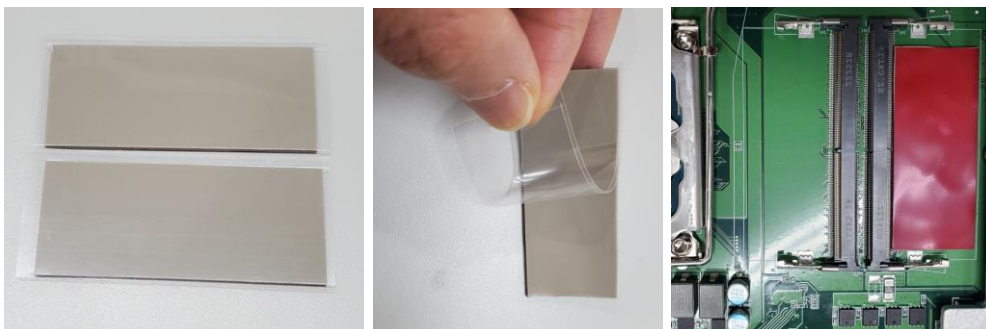
Step 5 Use a pair of tweezers to peel one side of protective film away from the remaining thermal pad and hold the edge of the DRAM and insert it into the DRAM notch at an angle of approximately 30 degrees, and then gently press it down until the latches are buckled.
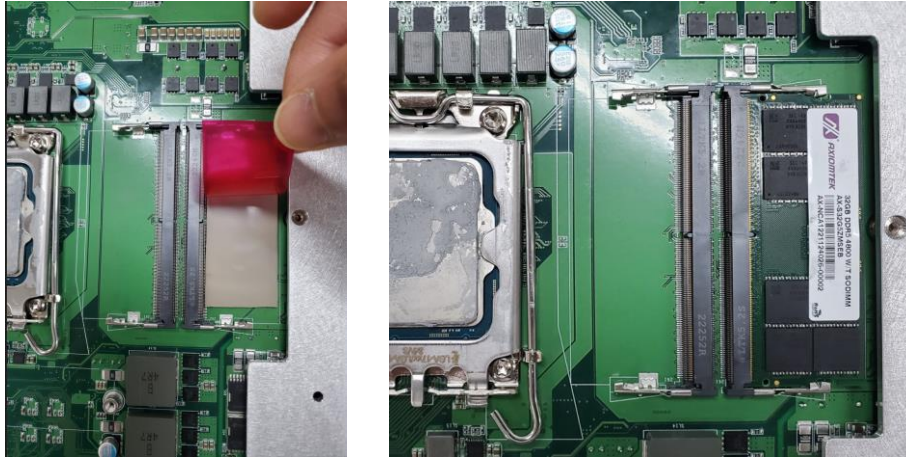
Step 6 Put the top cover and fasten four screws of the top cover and two screws of the front/rear panel back onto the system.

2.3 Installation of 2.5" SATA Device

Step 1 Turn off the system and unplug the power cord.

Step 2 Loosen three screws to remove bottom cover and locate two SSD/HDD within the red line as marked.
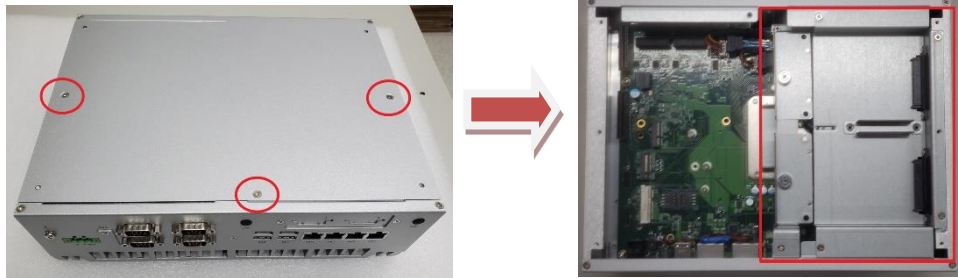
Step 3 Assembly each SSD/HDD with the HDD bracket with 2 screws.
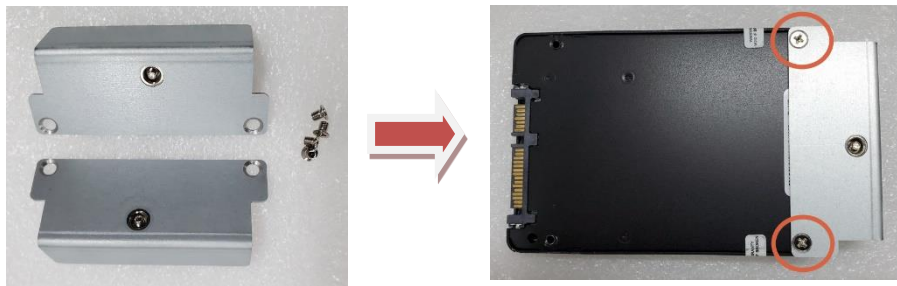
Step 4 Push the SATA drive tray to insert the connector firmly and fasten the screw to make sure the insertion is complete.
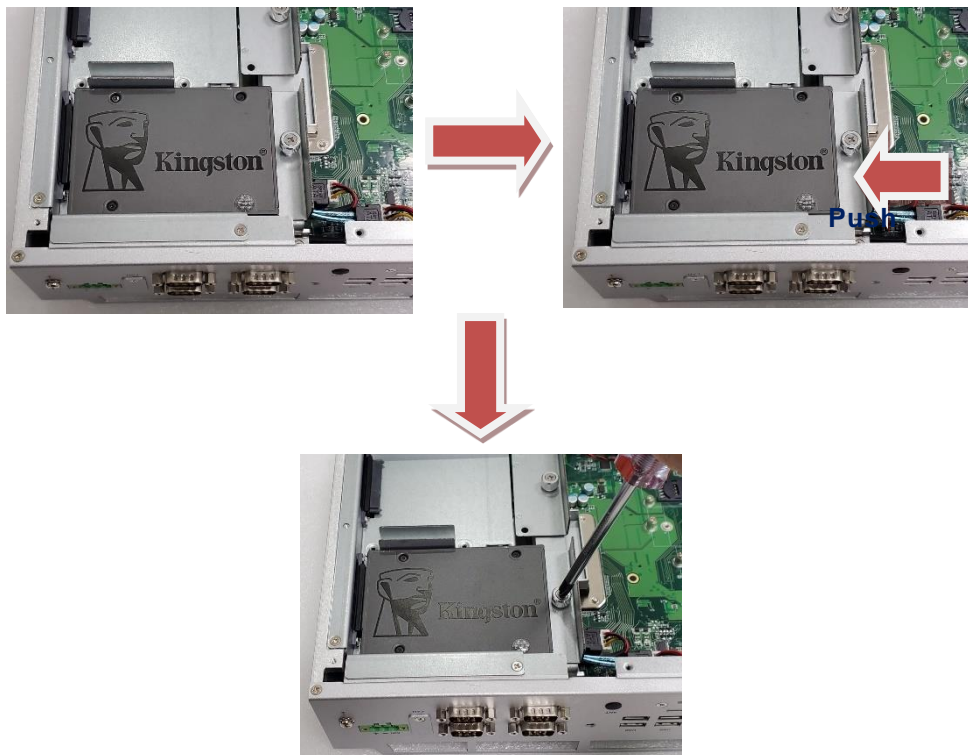
2.4 Installation of M.2 Key B Mini PCIe Module (CN20)

The _____ equipped with an M.2 Key B 3052 socket for users to install an 5G module.

Step 1 **Turn off the system and unplug the power cord.**
Step 2 **Loosen three screws to remove bottom cover and locate M.2 key B mini card slot within the red line as marked.**
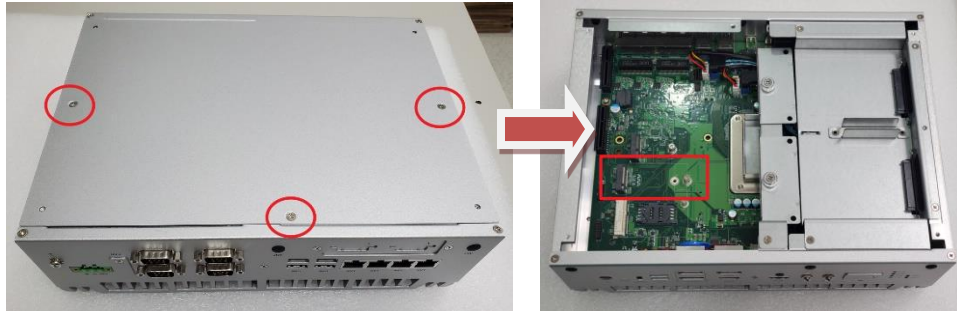
Step 3 **Insert 5G wireless module into the slot and tighten the card securely to the mainboard with M3x3 screw, and attach the IPEX-to-SMA cable to the 5G module.**
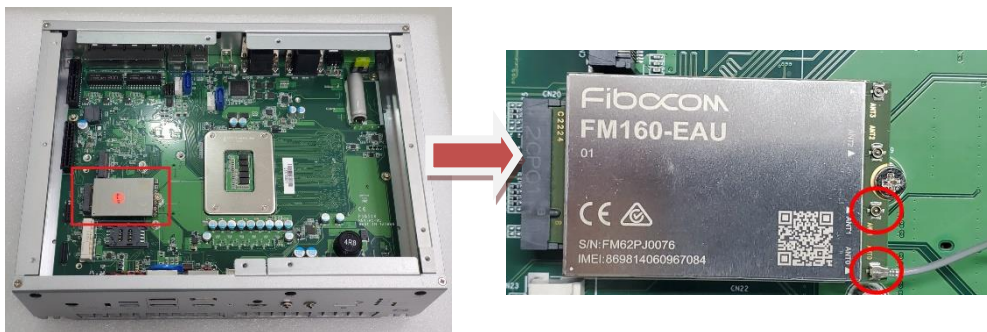
Step 4 **Remove the front panel-accessible SIM socket cover and insert the SIM card upside down to the SIM socket to support wireless communication.**
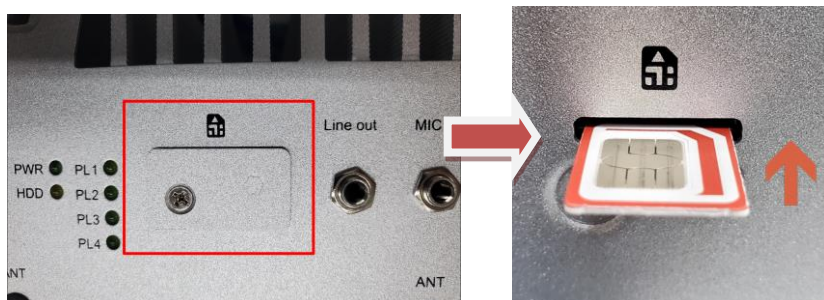
Step 5 **Remove the antenna cover from system, fix the SMA connector of the IPEX-to-SMA cable to one of the five antenna apertures on either front panel of back panel.**
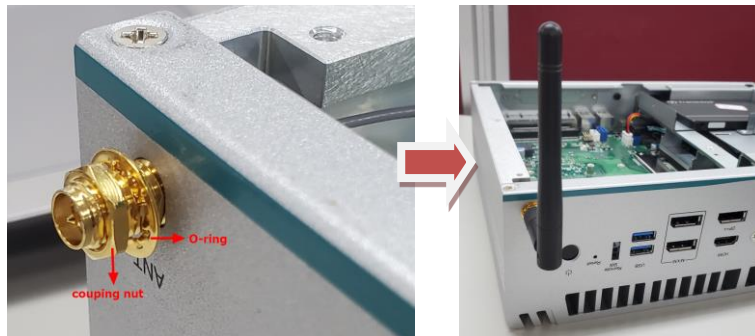
Step 6 **Put the bottom cover and fasten all screws back onto the system.**

Note: The thermal solution might be changed due to the different 5G module installed.

Note: There are five antenna holes on the system, please adjust the antenna placement accordingly

2.5 Installation of Mini PCIe Module (CN23)

provides one full-size mini-PCIe socket with SIM card support. Customers can use this socket for install wireless modules or flexible IO modules to expand functions

Install Mini PCIe Modules, please follow the instructions as blow:

- 1 x GbE Kit (RJ45*1)

- 1 x CAN Bus (DB9*1)

- 2 x RS-232 Kit (DB9*2, via flat cable)

- 2 x GbE Kit (RJ45*1)

Note: Please refence the data sheet for more mini card modules model.

Step 1   Prepare the optional mini PCIe module kit as below photo shows.
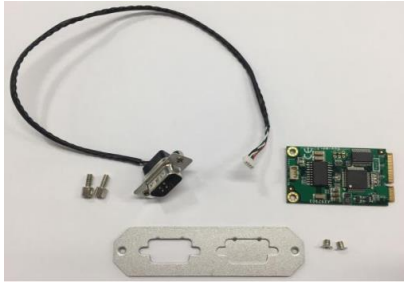
Step 2   Turn off the system and unplug the power cord.
Step 3   Loosen three screws to remove bottom cover and locate PCIe mini card slot within the red line as marked.
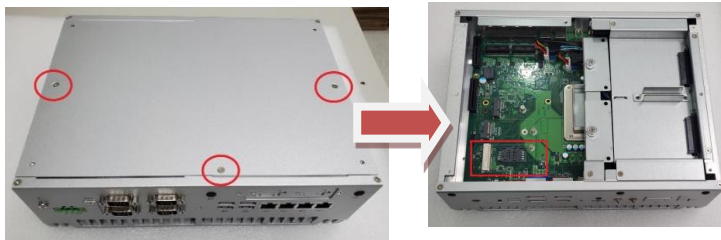
Step 4   Insert a mini PCIe module into the socket and tighten the card securely to the mainboard with one M3x2 screw.

Step 5 **Connect the cable to the module and assemble I/O connector to fix the I/O bracket then fasten dual screws of the Flexible I/O Window.**
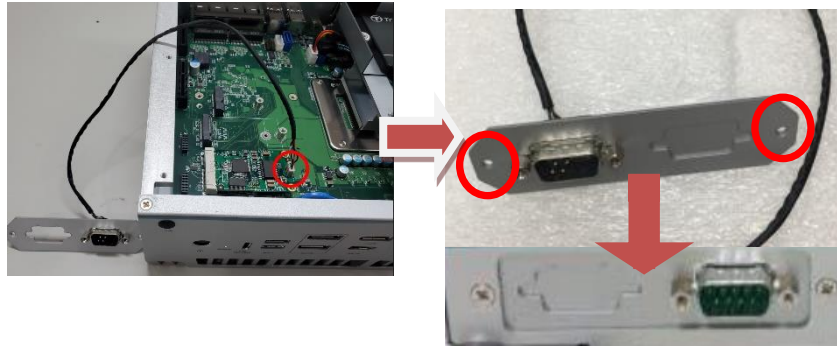
Step 6 **Put the bottom cover and fasten all screws back onto the system.**

Install LTE Mini PCIe Modules, please follow the instructions as blow:

Step 1 **Turn off the system and unplug the power cord.**
Step 2 **Loosen three screws to remove bottom cover and locate PCIe mini card slot within the red line as marked.**
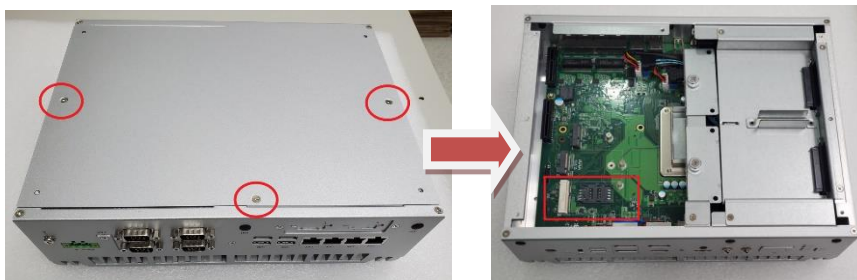
Step 3 **Insert the corresponding SIM card into SIM socket (CN22) before you install the mini-PCIe module.**

Slide and lift SIM card holder   Insert SIM card with pins facing up

Secure the SIM card by sliding the holder
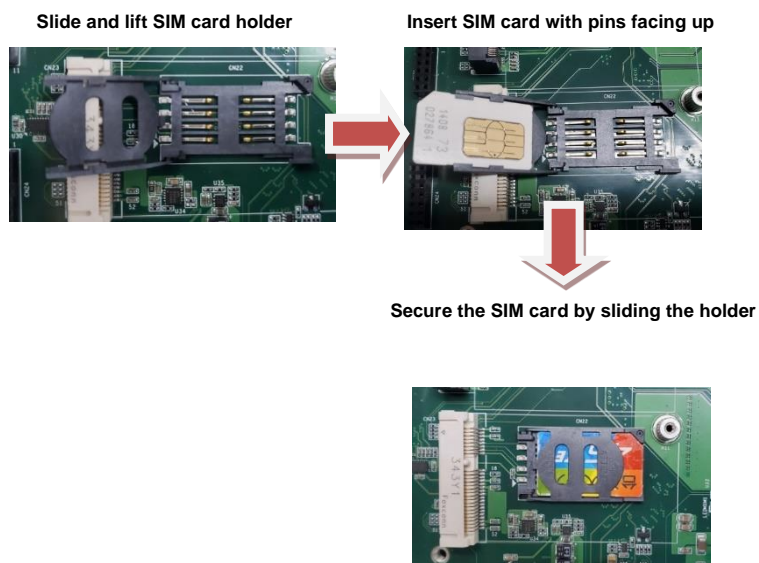
Step 4   Insert the LTE mPCIe module on a 45 degree angle into the mPCIe slot and secure the module with M3x2 screw.

Step 5   Remove the antenna cover from system, fix the SMA connector of the IPEX-to-SMA cable to one of the five antenna apertures on either front panel of back panel.
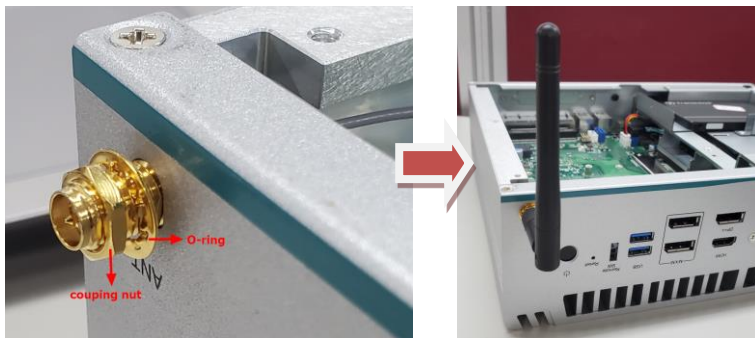
Note: Please use an extended bracket when using a half-size Mini card

Note: If users install Wi-Fi module, the installation procedure is the same as with LTE module, but there is no need to insert a sim card.

Note: There are five antenna holes in the system, please adjust the antenna placement according to the environment.

2.6 Installation of M.2 Key E Mini PCIe Module (CN19)

The _____ equipped with an M.2 Key E 2230 socket for users to install an Wi-Fi 6E wireless module.

Step 1 **Turn off the system and unplug the power cord.**
Step 2 **Loosen three screws to remove bottom cover and locate M.2 key E mini card slot within the red line as marked.**
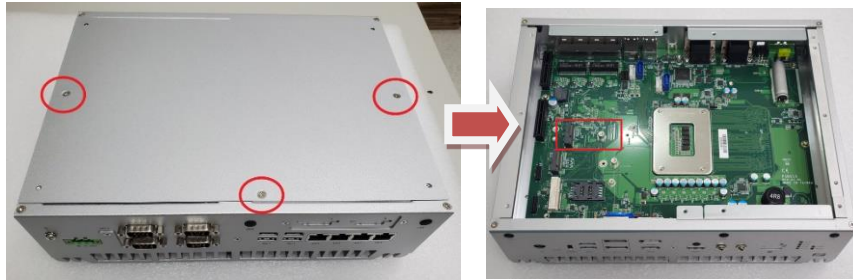
Step 3 **Insert Wi-Fi 6E wireless module into the slot and tighten the card securely to the mainboard with M3x3 screw.**
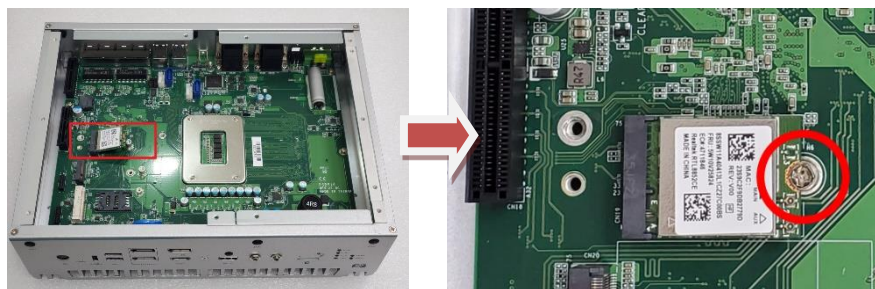
Step 4 **Attach the corresponding IPEX-to-SMA cable (2pcs) to the module as below red marked.**
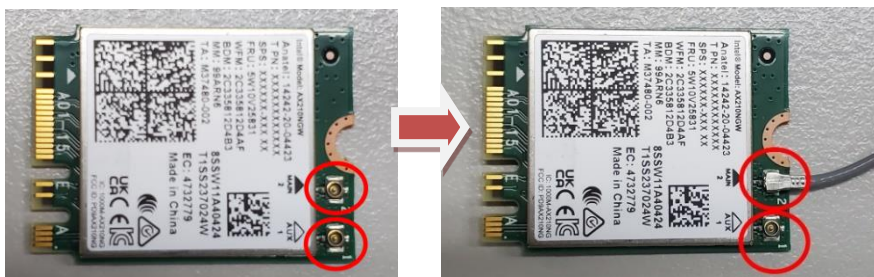
Step 5 **Remove the antenna cover from system, fix the SMA connector of the IPEX-to-SMA cable to one of the five antenna apertures on either front panel of back panel.**
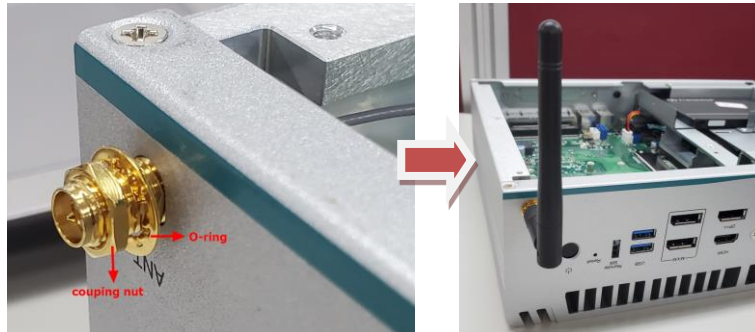
Step 6 **Put the bottom cover and fasten all screws back onto the system.**

Note: There are five antenna holes on the system, please adjust the antenna placement accordingly

2.7 Installation of Optional MXM Graphic Module (SCN4)

The _____ ,equipped with a MXM 3.1 type A slot for users to install a fan-less GPU module.

Step 1   Turn off the system and unplug the power cord.
Step 2   Loosen four screws of the top heatsink & two screws of the front/rear panel.
Step 3   Remove the top heatsink.
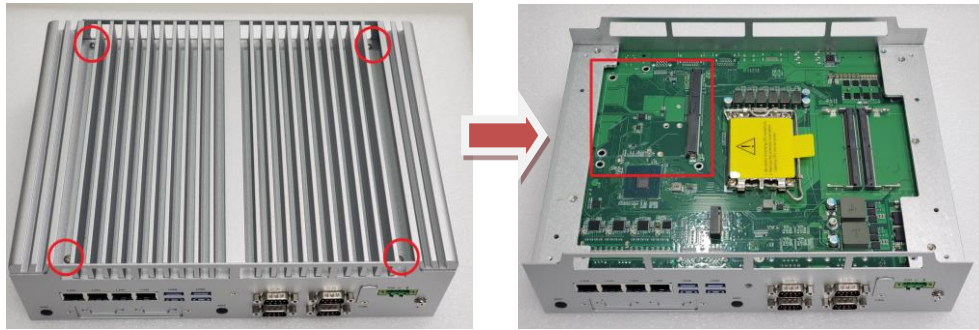
Step 4   Insert optional NVIDIA®/AMD® MXM module kit into the connector and fasten two screws.
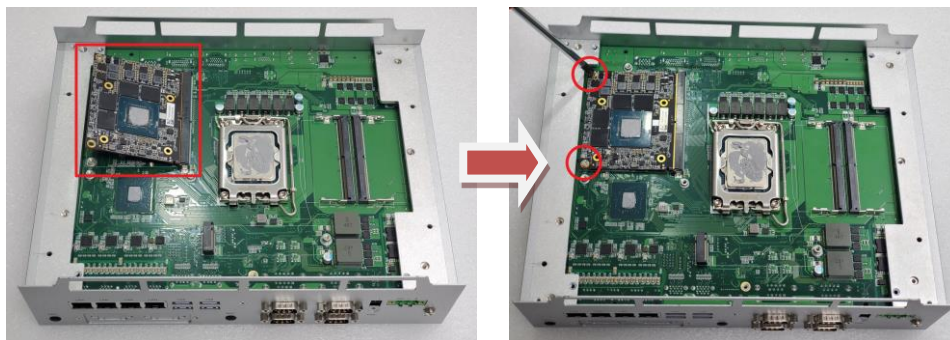
Step 5   Prepare the optional heat spreader (comes with MXM T1000 module kit) and put the grease as below red marked on the bottom side of the copper heat spreader.
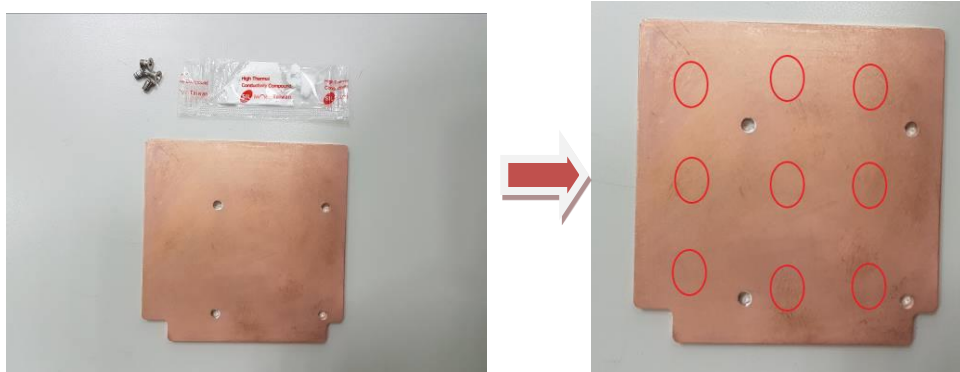
Step 6   Fasten the copper thermal pad onto the top heat sink, and please make sure that the notch as red marked is facing up.
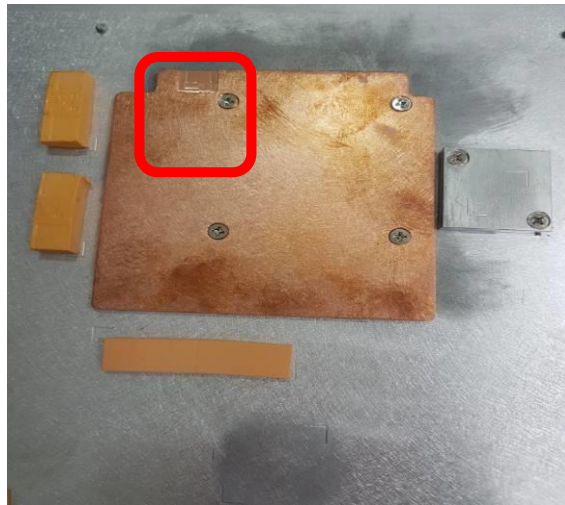
Step 7   Fasten the top cover back to complete the MXM module installation.

Note: The thermal solution might be changed due to the different MXM module installed, please find more information on product data sheet.

2.8 Installation of NVMe SSD Module (SCN1)

The _____ equipped with an M.2 Key M 2280 socket (PCIex4 signal) for users to install an NVMe SSD module. Please refer to the following instructions and illustrations for the installation of the NVMe SSD module.

Step 1   Turn off the system and unplug the power cord.
Step 2   Loosen four screws of the top heatsink & two screws of the front/rear panel.
Step 3   Remove the top heatsink.
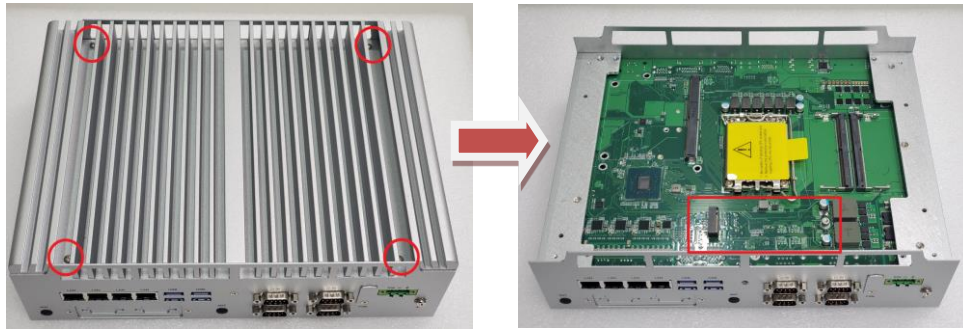
Step 4   Insert M.2 NVMe module into the slot and tighten the screw.
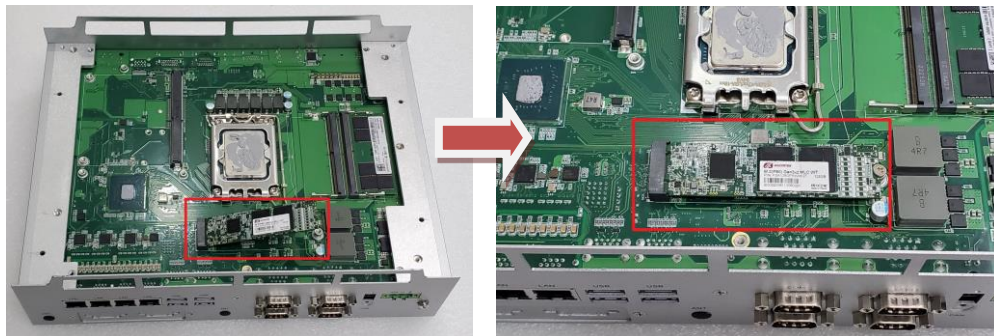
Step 5   Put the top cover and fasten all screws back onto the system.

2.9 Installation of External FAN kit (CN2)

The   supports optional FAN kit for MXM module if users need better operation temperature, please follow the following instruction to install the FAN kit.

The is designed with an optional external fan kit to enhance GPU computing performance and extend the operating temperature range. CN25 serves as the fan connector, making it easy and effortless for users to install and maintain the external fan kit

Step 1   Prepare the FAN kit module.

Step 2   Turn off the system and unplug the power cord.

Step 3   Assemble the fan kit bracket on both side of the system first and then secure four screws as red marked.
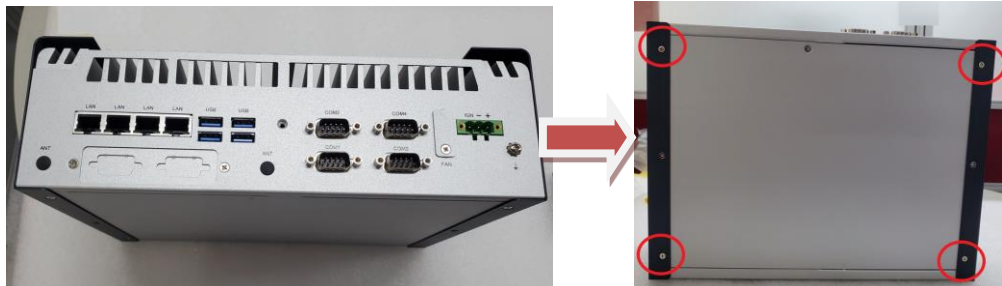
Step 4   Put the FAN kit top cover and fasten 4pcs screws.
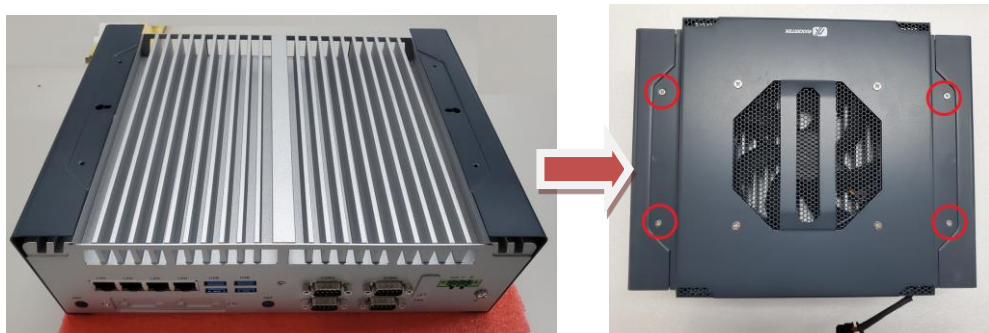
Step 5   remove the FAN connector cover.
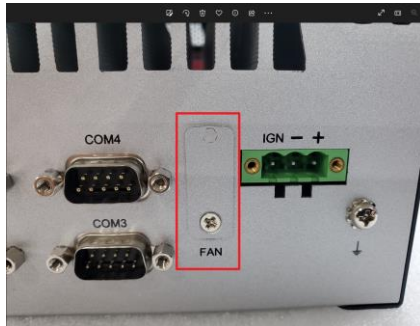
Step 6   Connector the fan cable to the fan connector of the system and put the cover back.
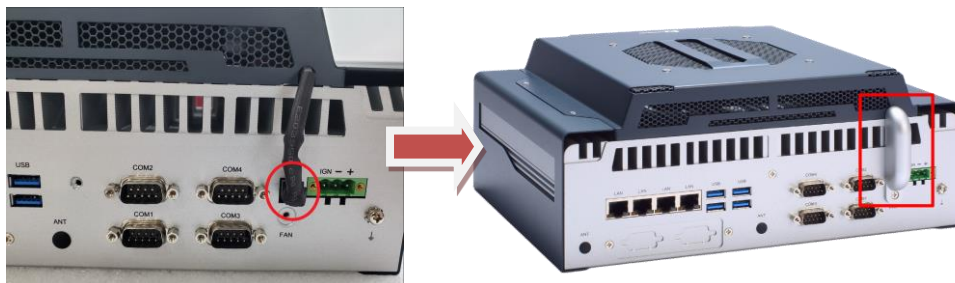
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SECTION 3
JUMPER & CONNECTOR SETTINGS

Proper jumper settings configure the   to meet various application needs. Hereby all jumpers settings along with their default settings are listed for devices onboard.

3.1 Locations of Jumpers & Connectors

PSB503 Top View
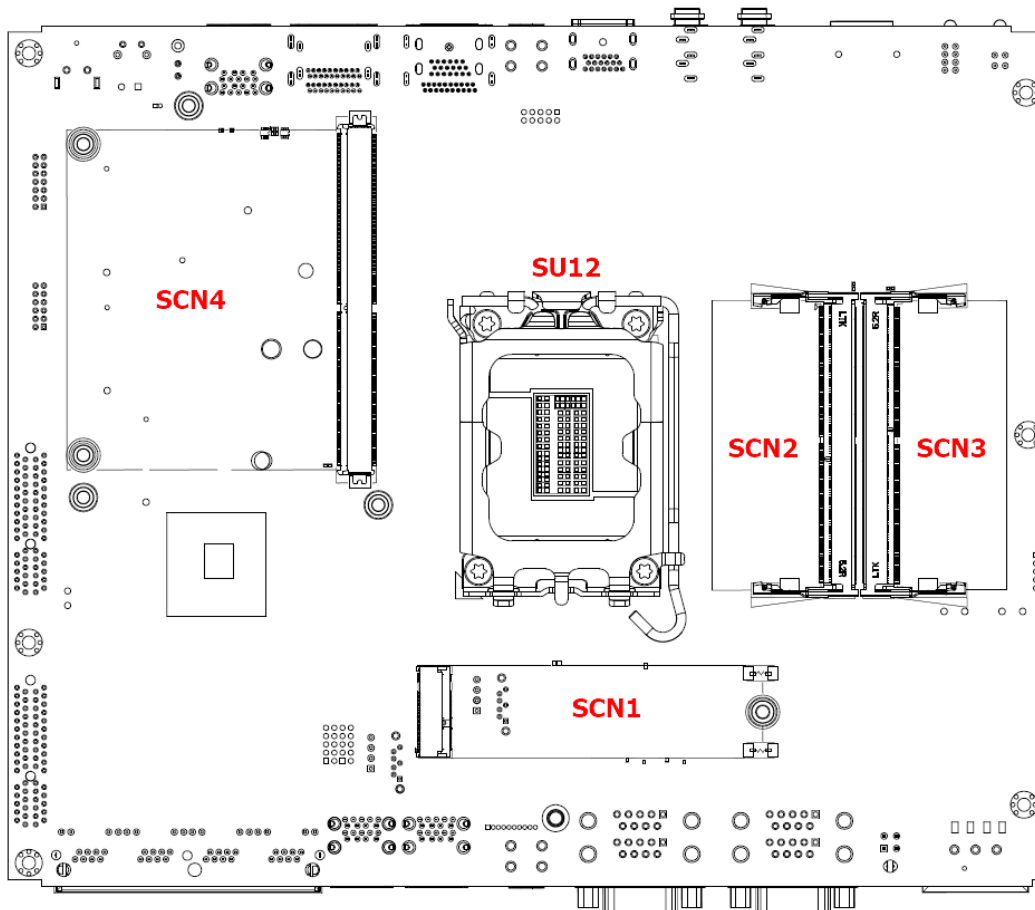
PSB503 Bottom View
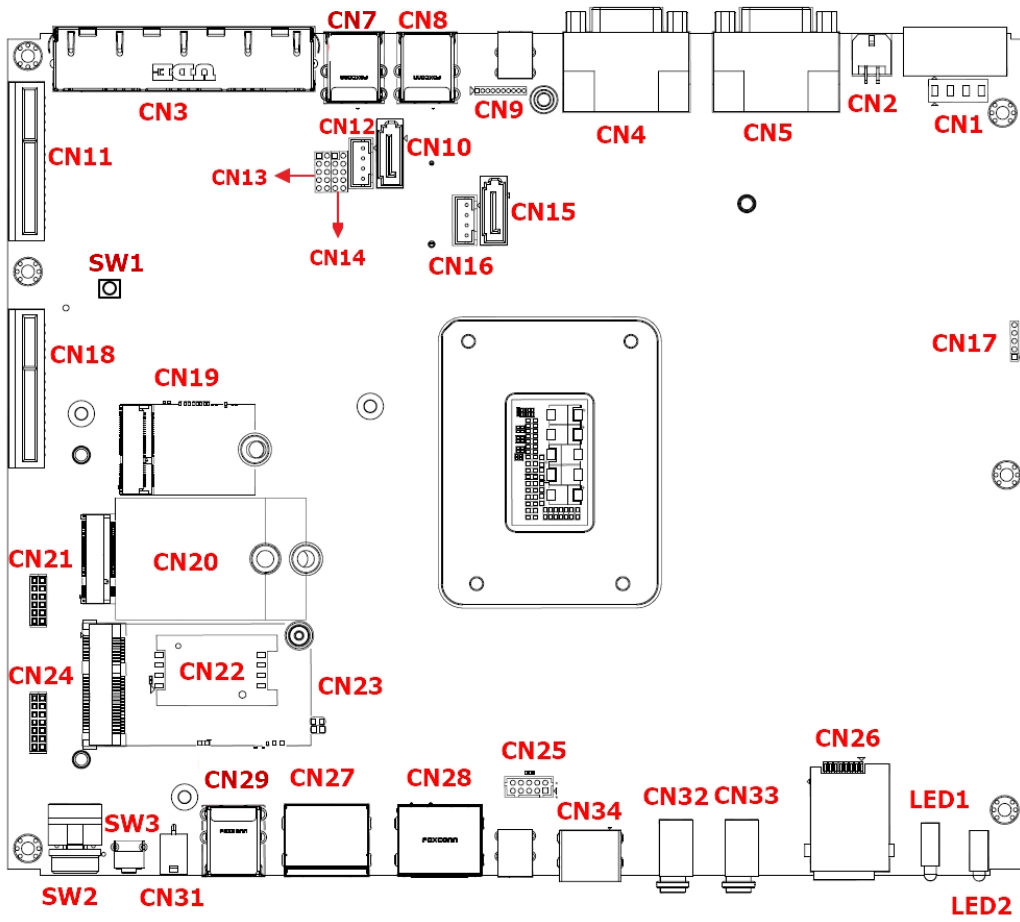
3.2 Summary of Jumper Settings

Proper jumper settings configure the   to meet various application purposes. A table
of all jumpers and their default settings is listed below.

【**Note**】**: How to setup Jumpers**

That a cap on a jumper is to "close" the jumper, whereas that offs a jumper is to "open" the
jumper.

[Open]   [Closed]   [Pin1-2 Closed]

3.2.1 Clear CMOS (SW1)

Use the switch SW1 to for clear CMOS.
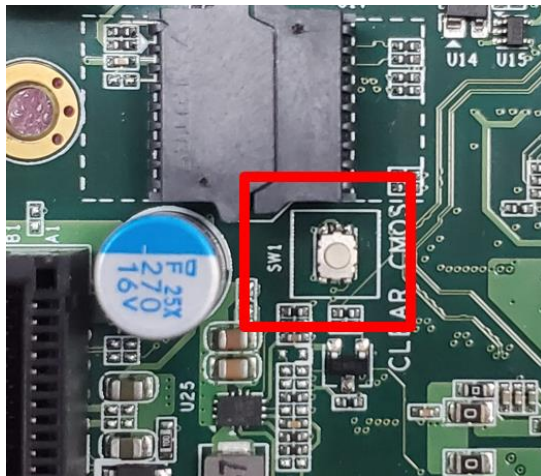
3.3 Connectors

Please refer to below connector table to get their pin assignments.

External Connectors	Sections
DC-in Phoenix Power Connector (CN1)	3.3.1
HDMI Connector (CN28, CN34)	3.3.2
DisplayPort Connector (CN28)	3.3.3
Serial Port Connector (CN4, CN5)	3.3.4
USB 3.2 Connector (CN29, CN8, CN7)	3.3.5
Ethernet Connector (LAN 1~ LAN 4)	3.3.6
ATX Power On/Off Button (SW2)	3.3.7
Reset Button (SW3)	3.3.8
Remote Power Switch Connector (CN31)	3.3.9
Optional FAN connector (CN2)	3.3.10
Internal Connectors	**Sections**
SATA Signal Connector (CN10, CN15)	3.3.11
SATA Power Connector (CN12, CN16)	3.3.12
SIM Slot (CN22, CN26)	3.3.13
Full-Size Express Mini Card slot (CN23)	3.3.14
M.2 Key B (CN20)	3.3.15
M.2 Key E (CN19)	3.3.16
M.2 Key M (SCN1)	3.3.17
Optional Audio (CN32, CN33)	3.3.18
Optional 8CH Digital IO (onboard) (CN13, CN14)	3.3.19

3.3.1   DC-in Phoenix Power Connector (CN1)

The system supports 9~48V Phoenix DC-in connector for system power input.

Pins	Signals
1	DC+
2	DC-
3	ACC
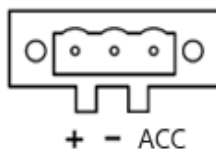
3.3.2   HDMI Connector (CN28, CN34)

The HDMI (High-Definition Multimedia Interface) is a compact digital interface which is capable of transmitting high-definition video and high-resolution audio over a single cable.

Pins	Signals	Pins	Signals
1	HDMI OUT_DATA2+	11	GND
2	GND	12	HDMI OUT Clock-
3	HDMI OUT_DATA2-	13	N.C.
4	HDMI OUT_DATA1+	14	N.C.
5	GND	15	HDMI OUT_SCL
6	HDMI OUT_DATA1-	16	HDMI OUT_SDA
7	HDMI OUT_DATA0+	17	GND
8	GND	18	+5V
9	HDMI OUT_DATA0-	19	HDMI_HTPLG
10	HDMI OUT Clock+		

HDMI1.4b
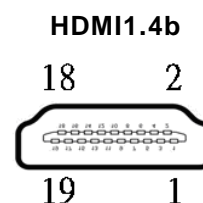
3.3.3 DisplayPort++ 1.2a Connector (CN28)

supports one DisplayPort outputs.

Pins	Signals	Pins	Signals
1	DPB_LANE0	11	GND
2	GND	12	DPB_LANE3#
3	DPB_LANE0#	13	Detect Pin
4	DPB_LANE1	14	GND
5	GND	15	DPB_AUX
6	DPB_LANE1#	16	GND
7	DPB_LANE2	17	DPB_AUX#
8	GND	18	DPB_HPDE
9	DPB_LANE2#	19	GND
10	DPB_LANE3	20	+3.3V
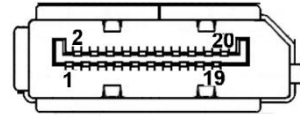
3.3.4 DisplayPort Connector (CN27)(optional, via MXM module)

support optional   two DisplayPort outputs via MXM module.

Pins	Signals	Pins	Signals
1	DPB_LANE0	11	GND
2	GND	12	DPB_LANE3#
3	DPB_LANE0#	13	Detect Pin
4	DPB_LANE1	14	GND
5	GND	15	DPB_AUX
6	DPB_LANE1#	16	GND
7	DPB_LANE2	17	DPB_AUX#
8	GND	18	DPB_HPDE
9	DPB_LANE2#	19	GND
10	DPB_LANE3	20	+3.3V
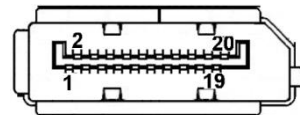
3.3.5 Serial Port Connector (CN4,CN5)

The system has two serial ports. COM1~COM2 are RS-232/422/485 ports. COM3~COM4 are RS-232 Please refer to Chapter 4 for the detail of BIOS setting.
Baud rate support up to 115200

Pins	RS-232	RS-422	RS-485
1	DCD, Data Carrier Detect	TX-	Data-
2	RXD, Receive Data	TX+	Data+
3	TXD, Transmit Data	RX+	No use
4	DTR, Data Terminal Ready	RX-	No use
5	GND, Ground	No use	No use
6	DSR, Data Set Ready	No use	No use
7	RTS, Request To Send	No use	No use
8	CTS, Clear To Send	No use	No use
9	RI, Ring Indicator	No use	No use
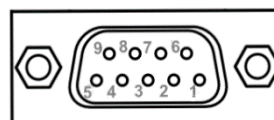
3.3.6 USB 3.2 Connector (CN29, CN8, CN7)

The system has six USB port, six port compliant with USB 3.2 gen2 (10GB/s), and ideally for installing USB peripherals such as scanner, camera, and USB devices, etc.

Pins	Signal USB Port 0	Pins	Signal USB Port 1
1	USB_VCC (+5V level standby power)	10	USB_VCC (+5V level standby power)
2	USB_Data-	11	USB_Data-
3	USB_Data+	12	USB_Data+
4	GND	13	GND
5	SSRX-	14	SSRX-
6	SSRX+	15	SSRX+
7	GND	16	GND
8	SSTX-	17	SSTX-
9	SSTX+	18	SSTX+
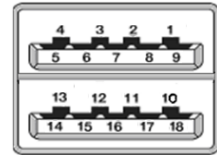
3.3.7 Ethernet Connector (LAN1~LAN4)

The board has four RJ-45 Gbe ports connectors, one LAN port is designed by Intel i219-LM and three LAN ports are Intel i226-IT.

Pins	LAN Signal	Pins	LAN Signal
L1	MDI0+	L5	MDI2+
L2	MDI0-	L6	MDI2-
L3	MDI1+	L7	MDI3+
L4	MDI1-	L8	MDI3-
A	Activity link LED(Yellow) OFF: No link Blinking: Link established; data activity detected		
B	Speed LED OFF: 10Mbps data rate Green: 100Mbps data rate Orange: 1GMbps data rate		
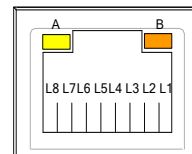
3.3.8   ATX Power On/Off (SW2)

The ATX power button is on the I/O side. It can allow users to control   power on/off.

Functions	Descriptions
On	Turn on/off system
Off	Keep system status

3.3.9   Reset Switch (SW3)

The Reset button can allow users to reset   system.

Functions	Descriptions
On	Reset system
Off	Keep system status

3.3.10 Remote Power Switch Connector (CN31)

One 2-pin connector output for remote power on/off switch.

Functions	Descriptions
Short(1-2)	Turn on/off system
Open	Keep system status
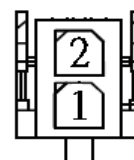
3.3.11 FAN Kit Connector (CN2)(optional)

One 4pin connector output for optional Fan.

Functions	Descriptions
1	FANIN_CPU
2	GND
3	+12V
4	FANOUT_CPU
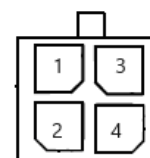
3.3.12 SATA Connector (CN10 & CN15)

These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for high-speed SATA interfaces. They are computer bus interfaces for connecting to devices such as hard disk drives. This board has two SATA 3.0 ports with 6Gb/s performance.

Pins	Signals
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND
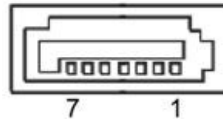
3.3.13 SATA Power Connector (CN12,CN16)

Based on CN12、CN16 to offer the SATA power for SATA 2.5" HDD/SSD.

Pins	Signals
1	+12V level
2	GND
3	GND
4	+5V level
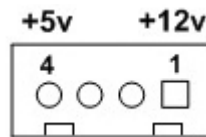
3.3.14 SIM Card Slots (CN22, CN26)

The _____ includes two SIM slots: CN22 on bottom side that support mini PCIe slot (for CN23), CN26 on top side of the system that support M.2 Key B (for CN20), It is mainly used in wireless network application on CN22 and CN26.

CN26

CN22

Pins	Signals
1	PWR
2	RST
3	CLK
4	NC
5	GND
6	VPP
7	I/O
8	NC
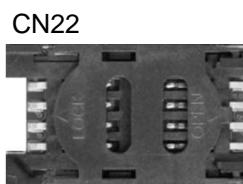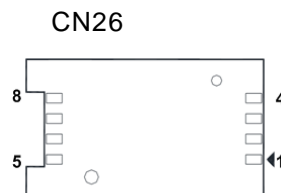
3.3.15 Full-Size PCI Express Mini Card Slot (CN23)

The _____ supports one full-size PCI-Express Mini Card slot.

CN23 is applying for PCI-Express or SATA (mSATA) via BIOS selection and USB signals; PCI-Express complies with PCI-Express Mini Card Spec. V1.2. Thus, users can install mSATA or WLAN/WWAN cards into this slot. Please refer to the SATA of BIOS setting to enable or disable mSATA supported.

Pins	Signals	Pins	Signals
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	No use
9	GND	10	No use
11	REFCLK-	12	No use
13	REFCLK+	14	No use
15	GND	16	No use
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	PE_RXN3/	24	+3.3VSB
25	PE_RXP3/	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PE_TXN3/	32	SMB_DATA
33	PE_TXP3/	34	GND
35	GND	36	USB_D8-
37	GND	38	USB_D8+
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB
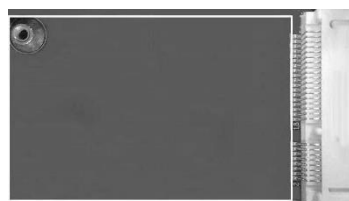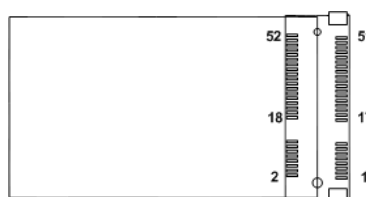
3.3.16 M.2 3052 Key B slot (CN20)

The M.2 3052 Key B for 5G Module.

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	NC	2	+3.3V	3	GND	4	+3.3V
5	GND	6	NC	7	USB_D+	8	NC
9	USB_D-	10	SATA_LED	11	GND	12	Key B
13	Key B	14	Key B	15	Key B	16	Key B
17	Key B	18	Key B	19	Key B	20	NC
21	NC	22	NC	23	NC	24	NC
25	NC	26	NC	27	GND	28	NC
29	USB3.1-Tx-	30	UIM-RESET	31	USB3.1-Tx+	32	UIM-CLK (O)
33	GND	34	UIM-DATA (I/O)	35	USB3.1-Rx-	36	UIM-PWR (O)
37	USB3.1-Rx+	38	NC	39	GND	40	NC
41	PERn0	42	NC	43	PERp0	44	NC
45	GND	46	NC	47	PETn0	48	NC
49	PETp0	50	PERST#	51	GND	52	CLKREQ#
53	REFCLKn	54	PEWAKE#	55	REFCLKp	56	NC
57	GND	58	NC	59	NC	60	NC
61	NC	62	NC	63	NC	64	NC
65	NC	66	NC	67	RESET# (I)(0/1.8V)	68	NC
69	NC	70	+3.3V	71	GND	72	+3.3V
73	GND	74	+3.3V	75	NC		
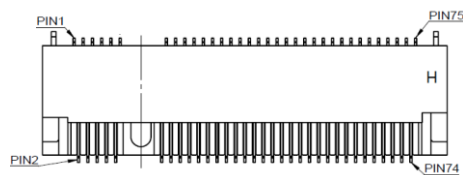
3.3.17 M.2 2230 Key E slot (CN19)

The system comes with one M.2 Key E socket (PCIe & USB2.0)

Pins	Signals	Pins	Signals
1	GND	2	+3.3V_SBY
3	USB_D+	4	+3.3V_SBY
5	USB_D-	6	NC
7	GND	8	M.2_BT_PCMCLK
9	CNVI_WGR_DATA1_D-	10	M.2_BT_PCMRST
11	CNVI_WGR_DATA1_D+	12	M.2_BT_PCMIN
13	GND	14	M.2_BT_PCMOUT
15	CNVI_WGR_DATA0_D-	16	NC
17	CNVI_WGR_DATA0_D+	18	GND
19	GND	20	UART_BT_WAKE-
21	CNVI_WGR_CLK_D-	22	CNVI_BRI_RSP
23	CNVI_WGR_CLK_D+	24	Key E
25	Key E	26	Key E
27	Key E	28	Key E
29	Key E	30	Key E
31	Key E	32	CNVI_RGI_DT
33	GND	34	CNVI_RGI_RSP
35	PCIE_TX_+	36	CNVI_BRI_DT
37	PCIE_TX_-	38	CL_RST
39	GND	40	CL_DATA
41	PCIE_RX_+	42	CL_CLK
43	PCIE_RX_-	44	CNVI_GNSS_PA_BLANKING
45	GND	46	CNVI_MFUART_TXD
47	CLK_PCIE_+	48	CNVI_MFUART_RXD
49	CLK_PCIE_-	50	SUSCLK (+3.3V Level)
51	GND	52	PERST# (+3.3V Level)
53	CLKREQ0#	54	BT_RF_KILL
55	PEWAKE0#	56	WIFI_RF_KILL
57	GND	58	NC
59	CNVI_WT_DATA1_D-	60	NC
61	CNVI_WT_DATA1_D+	62	NC
63	GND	64	GND
65	CNVI_WT_DATA0_D-	66	NC

67	CNVI_WT_DATA0_D+	68	NC
69	GND	70	NC
71	CNVI_WT_CLK_D-	72	+3.3V_SBY
73	CNVI_WT_CLK_D+	74	+3.3V_SBY
75	GND		
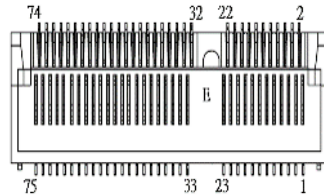
3.3.18 M.2 2230 Key M slot (SCN1)

The system comes with one M.2 Key E socket (PCIe & USB2.0)

3.3.19 HD Audio Digital Header (CN32, CN33)

This audio jack support for Audio Mic-In and Line-out.

Pin	Signal
1	Line Out
2	Microphone In
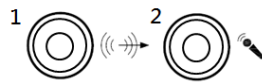
3.3.20 Digital I/O (CN13 and CN14) (optional)

The system is equipped with 16bit programmable Digital I/O, please refer to the following table to get default pin define. Default is 4in/4out.

The digital I/O can be configured to control cash drawers and sense warning signals from an Uninterrupted Power System (UPS) or perform store security control. You may use software programming to control these digital signals.

CN14

Pins	Signals	Pins	Signals
1	DIO1_IN	2	DIO8_OUT
3	DIO2_IN	4	DIO7_OUT
5	DIO3_IN	6	DIO6_OUT
7	DIO4_IN	8	DIO5_OUT
9	+5V	10	GND
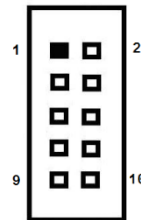
CN13

Pins	Signals	Pins	Signals
1	DIO9_IN	2	DIO16_OUT
3	DIO10_IN	4	DIO15_OUT
5	DIO11_IN	6	DIO14_OUT
7	DIO12_IN	8	DIO13_OUT
9	+5V	10	GND
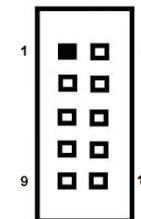
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SECTION 4
BIOS SETUP UTILITY

This section provides users with detailed descriptions in terms of how to set up basic system configurations through the BIOS setup utility.

4.1 Starting

To enter the setup screens, follow the steps below:

1.   Turn on the computer and press the <Del> key immediately.
2.   After press the <Del> key, the main BIOS setup menu displays. Users can access to other setup screens, such as the Advanced and Chipset menus, from the main BIOS setup menu.

It is strongly recommended that users should avoid changing the chipset's defaults. Both AMI and system manufacturer have carefully set up these defaults that provide the best performance and reliability.

4.2 Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.

【Note】: *Some of the navigation keys differ from one screen to another.*

Hot Keys	Descriptions
→← Left/Right	The Left and Right <Arrow> keys allow users to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow users to select a setup screen or sub-screen.
+− Plus/Minus	The Plus and Minus <Arrow> keys allow users to change the field value of a particular setup item.
Tab	The <Tab> key allows users to select setup fields.
F1	The <F1> key allows users to display the General Help screen.
F2	The <F2> key allows users to Load Previous Values.
F3	The <F3> key allows users to Load Optimized Defaults.
F4	The <F4> key allows users to save any changes they made and exit the Setup. Press the <F4> key to save any changes.
Esc	The <Esc> key allows users to discard any changes they made and exit the Setup. Press the <Esc> key to exit the setup without saving any changes.
Enter	The <Enter> key allows users to display or change the setup option listed for a particular setup item. The <Enter> key can also allow users to display the setup sub- screens.

4.3 Main Menu

The Main Menu screen is the first screen users see when entering the setup utility. Users can always return to the Main setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is also shown below.

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

 BIOS Information                                        Set the Date. Use Tab to
 Build Date and Time          09/06/2023 16:54:37        switch between Date elements.
 Project Version              PSB516 X009 CRB             Default Ranges:
                                                         Year: 1998-9999
 Firmware Information                                     Months: 1-12
 ME Firmware Version          16.1.27.2216                Days: Dependent on month
 ME Firmware Mode             Normal Mode                 Range of Years may vary.
 ME Firmware SKU              Corporate SKU

 Board Information
  Processor Name              AlderLake DT
             Type             12th Gen Intel(R)
                              Core(TM) i7-12700TE
             Stepping         C0                     ←→: Select Screen
                                                     ↑↓: Select Item
  PCH        Name             PCH-S                  Enter: Select
             SKU              R680E                  +/-: Change Opt.
             Stepping         B1                     F1: General Help
  Memory     Size             16384 MB               F2: Previous Values
             Frequency         4800 MHz              F3: Optimized Defaults
                                                     F4: Save & Exit
 System Date                  [Tue 10/10/2023]       ESC: Exit
 System Time                  [16:26:27]

 Access Level                 Administrator


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```

BIOS Information
Display the auto-detected BIOS information.

System Language
Choose the system default language.

System Date/Time
Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

Access Level
Display the access level of current user.

4.4 Advanced Menu

The Advanced menu also allows users to set configuration of the CPU and other system devices. Users can select any items in the left frame of the screen to go to sub menus:

- ► Smart Ignition Management
- ► ACPI Settings
- ► Trust Computing
- ► Storage Configuration
- ► NVMe Configuration
- ► AMT Configuration
- ► F81966 Super IO Configuration
- ► Hardware Monitor
- ► USB Configuration
- ► Device Configuration

For items marked with "►", please press <Enter> for more options.

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

    ▶ Smart Ignition Management              Setup or restore settings
    ▶ ACPI Settings                          - You may Save custom On/Off
    ▶ Trusted Computing                      settings or Restore factory
    ▶ Storage Configuration                  default settings
    ▶ NVMe Configuration
    ▶ AMT Configuration
    ▶ F81966 Super IO Configuration
    ▶ Hardware Monitor
    ▶ USB Configuration
    ▶ Device Configuration




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




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```

Smart Ignition Management

Press Enter to access the sub-menu. Calculated based on the 24-hour military-time clock.

```
                              Aptio Setup - AMI
    Advanced

Smart Ignition Management                              Enabled: System will turn on
Manufacturer                  Axiomtek                automatically by below
Model                         PSB516                  conditions
Firmware Version              V101                     - Manually disconnect and
                                                      reconnect system power
PSU State                     System On                - Power interruption: Resumed
Power Mode                    AT Mode                 power after power fail
Vin Voltage(V)                24.3                    Disabled: System will not turn
IGN Signal                    Off                     on automatically when power is
                                                      connected or power resumes
Shutdown Delay Timer (IGN Off)      00:00:02          from a power failure
Shutdown Delay Timer (Low Voltage)  00:03:00

Ignition Management           [Disabled]              →←: Select Screen
                                                      ↑↓: Select Item
Auto Power On                 [Enabled]               Enter: Select
                                                      +/-: Change Opt.
▶ Advance Setting                                     F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
▶ Save Settings                                       F4: Save & Exit
▶ Restore Factory Settings                            ESC: Exit



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```

BIOS menu item	Description
Ignition Management	Enabled
	Switch to ACC mode
	*Note: IGN signal will only be triggered when DCIN Terminal Block 4-Pin IGN relates to VCC.
	Disabled
	Switch to AT mode
	*Note: System will be reset after Ignition Management setting has been changed and saved.
Auto Power On	Enabled
	System will turn on automatically under following conditions:
	- Manually disconnects and reconnects system power
	- Power interruption: Resumes power after power failure
	Disabled

	System will not turn on automatically when power is connected or when power resumes from a power failure
Advance Setting	Set system on/off timing and voltage threshold levels
Save Settings	Save the current settings
Restore Factory Settings	Restores factory defaults to remove any incorrect or corrupt settings that might have prevented the system from properly powering on/off.

```
                          Aptio Setup - AMI
   Advanced

 ======= Voltage     =======                    The counter will be activated
 Activate Voltage Trigger(V)      9             once power source voltage is
 Low Voltage Trigger(V)           8             smaller than the value of [Low
                                                Voltage Trigger],then, system
 Shutdown Delay Timer (Low Voltage)             will be forced to turn off
 Minuium Timer              00:01:00            when time's up
 Maximum Timer              03:00:00
  Hour                      0
  Minute                    3
  Second                    0
 ======= IGN Function  =======
 IGN Trigger                [Disabled]


                                                ++: Select Screen
                                                ↑↓: Select Item
                                                Enter: Select
                                                +/-: Change Opt.
                                                F1: General Help
                                                F2: Previous Values
                                                F3: Optimized Defaults
                                                F4: Save & Exit
                                                ESC: Exit



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```

BIOS menu item	Description
Activate Voltage Trigger	The system only turns on when the voltage delivered by the power source is higher than the value you set here.
Low Voltage Trigger	The system will begin countdown stage once voltage drops below the value you set here. If the power source voltage does not come back above the value of [Activate Voltage Trigger] within the time you set for [Shutdown Delay Time (Low Voltage)], the system will shut down and remain off.
Shutdown Delay Timer (Low Voltage)	The counter will be activated once power source voltage drops below the value defined in [Low Voltage Trigger]. The system will be forced to turn off once timer completes countdown.
IGN Trigger	Enable [System Turn On Delay] and [Shutdown Delay] will be trigged by IGN. Disable IGN signal will not affect any power management.

ACPI Settings

Use this screen to select options for the ACPI configuration and change the value of the selected option. A description of the selected item appears on the right side of the screen.

```
                          Aptio Setup - AMI
      Advanced

   ACPI Settings                                          Select the highest ACPI sleep
                                                          state the system will enter
   ACPI Sleep State              [S3 (Suspend to RAM)]    when the SUSPEND button is
                                                          pressed.





                                                          ++: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit



                     Version 2.22.1287 Copyright (C) 2023 AMI
```
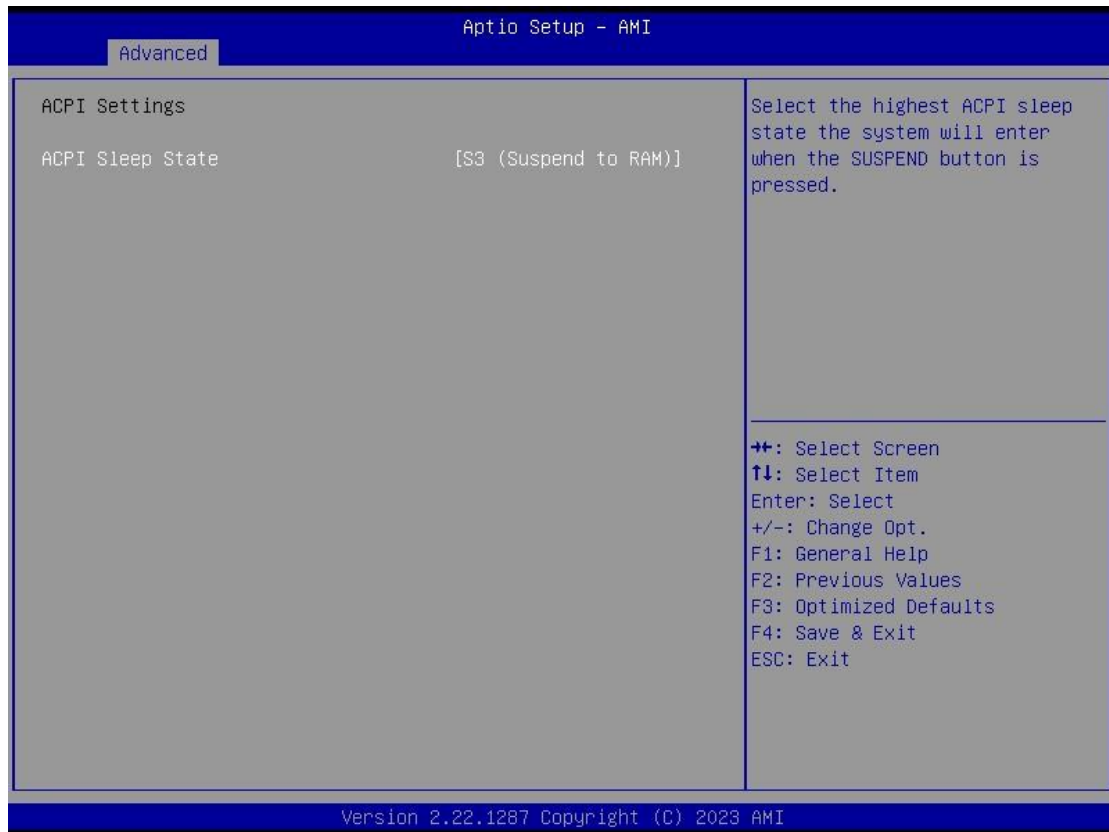
ACPI Sleep State

When the sleep button is pressed, the system will be in the ACPI sleep state.

The default is S3 (Suspend to RAM).

Trust Computing

If users install a security device, such as TPM, users will see the following information for the TPM device and status.

```
                            Aptio Setup - AMI
      Advanced

   TPM 2.0 Device Found                              Enables or Disables BIOS
   Firmware Version:           1.258                 support for security device.
   Vendor:                     STM                   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


                                                     ↔: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit



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```

Storage Configuration

This screen shows the CPU version and its detailed information.

```
                        Aptio Setup – AMI
  ┌──────────┐
  │ Advanced │
  └──────────┘

   Storage Configuration                    SATA Device Options Settings

 ▶ SATA Configuration




                                          ──────────────────────────────
                                          ↔: Select Screen
                                          ↑↓: Select Item
                                          Enter: Select
                                          +/-: Change Opt.
                                          F1: General Help
                                          F2: Previous Values
                                          F3: Optimized Defaults
                                          F4: Save & Exit
                                          ESC: Exit



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```

NVMe Configuration

This screen shows NVMe device information.

```
                              Aptio Setup - AMI
      Advanced

   NVMe Configuration

   No NVME Device Found


                                              ↔: Select Screen
                                              ↑↓: Select Item
                                              Enter: Select
                                              +/-: Change Opt.
                                              F1: General Help
                                              F2: Previous Values
                                              F3: Optimized Defaults
                                              F4: Save & Exit
                                              ESC: Exit



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```
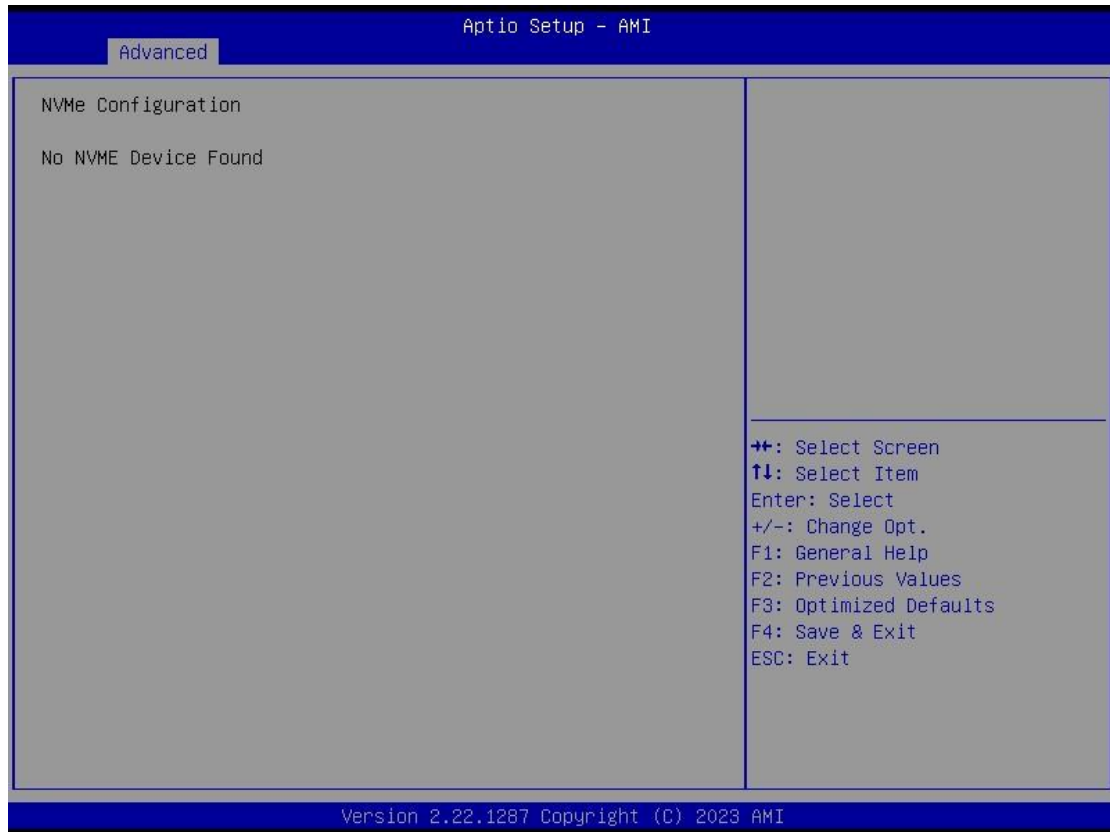
AMT Configurations

Users can use this screen to configure AMT parameters.

```
                              Aptio Setup - AMI
        Advanced

    F81966 Super IO Configuration                              Set Parameters of Serial Port
                                                               4 (COMD)
    Super IO Chip                        F81966
  ▶ Serial Port 1 Configuration
  ▶ Serial Port 2 Configuration
  ▶ Serial Port 3 Configuration
  ▶ Serial Port 4 Configuration


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



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```

Intel® AMT

Enable or disable Intel® Active Management Technology BIOS Extension.

The default is enabled.

F81966 Super IO Configurations

Use this screen to select options for the F81966 Super IO Configurations and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "►", please press <Enter> for more options

```
                          Aptio Setup - AMI
   Advanced

   F81966 Super IO Configuration                      Set Parameters of Serial Port
                                                       4 (COMD)
   Super IO Chip                    F81966
 ► Serial Port 1 Configuration
 ► Serial Port 2 Configuration
 ► Serial Port 3 Configuration
 ► Serial Port 4 Configuration


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



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```
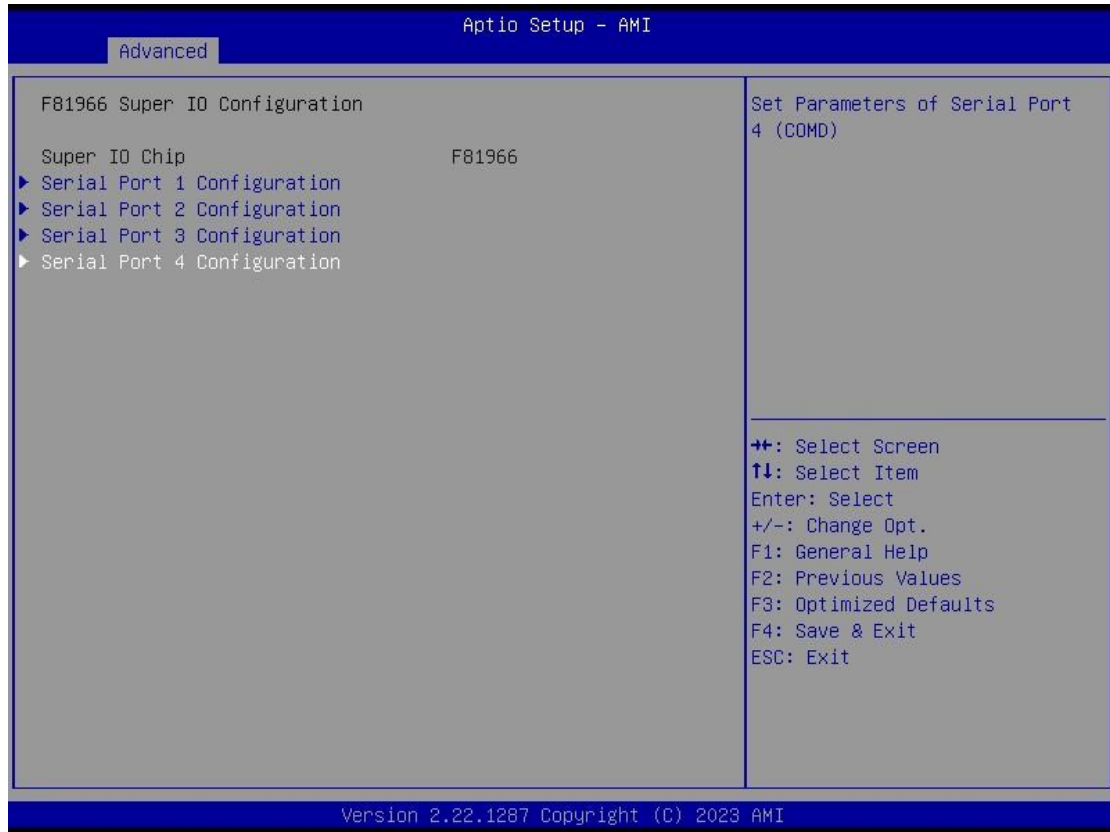
Serial Port 1~4 (COM1~4) Configurations

Use these items to set parameters related to serial ports COM1~2 (RS232/422/485)

Use these items to set parameters related to serial ports COM3~4 (RS232 only)

Serial Port 1

```
                                  Aptio Setup – AMI
  Main

   Serial Port 1 Configuration                              COM Port Type: RS232, RS422,
                                                            RS485
   Serial Port                          [Enabled]
   Device Settings                      IO=3F8h; IRQ=4;

   COM Port Type                        [RS232]


                          ┌─── COM Port Type ───┐
                          │ RS232               │
                          │ RS422               │
                          │ RS485               │
                          │                     │         →←: Select Screen
                          └─────────────────────┘         ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit



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```

Serial Port 2

```
                                  Aptio Setup – AMI
  Main

   Serial Port 2 Configuration                              COM Port Type: RS232, RS422,
                                                            RS485
   Serial Port                          [Enabled]
   Device Settings                      IO=2F8h; IRQ=3;

   COM Port Type                        [RS232]


                          ┌─── COM Port Type ───┐
                          │ RS232               │
                          │ RS422               │
                          │ RS485               │
                          │                     │         →←: Select Screen
                          └─────────────────────┘         ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit



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```

Serial Port 3

```
                              Aptio Setup - AMI
  Main

  Serial Port 3 Configuration                      Enable or Disable Serial Port
                                                    (COM)
  Serial Port                   [Enabled]
  Device Settings               IO=3E8h; IRQ=5;




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



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```

Serial Port 4

```
                              Aptio Setup - AMI
  Main

  Serial Port 4 Configuration                      Enable or Disable Serial Port
                                                    (COM)
  Serial Port                   [Enabled]
  Device Settings               IO=2E8h; IRQ=6;




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



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```

Hardware Monitor

This screen monitors hardware health status.

```
                          Aptio Setup - AMI
    Advanced

    Pc Health Status                                  Config Smart Fan setting

  ▶ Smart Fan Configuration
    CPU temperature                : +48 %
    System temperature             : +49 %
    SysFan Speed                   : N/A
    VCC_RTC                        : +3.024 V
    +5V                            : +5.129 V
    VSB3V                          : +3.344 V
    VSB5V                          : +5.136 V


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




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```

This screen displays the temperature of system and CPU as well as system voltages
(VCORE, +3V STBY, +5V STBY and +5V).

USB Configurations

This screen shows USB configuration.

```
                              Aptio Setup - AMI
   ┌─────────┐
   │ Advanced │
   └─────────┴──────────────────────────────────────────────────────────────

    USB Configuration

    USB Module Version             30

    USB Devices:
         1 Drive, 1 Keyboard, 1 Mouse


                                                    ──────────────────────

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




                     Version 2.22.1287 Copyright (C) 2023 AMI
```
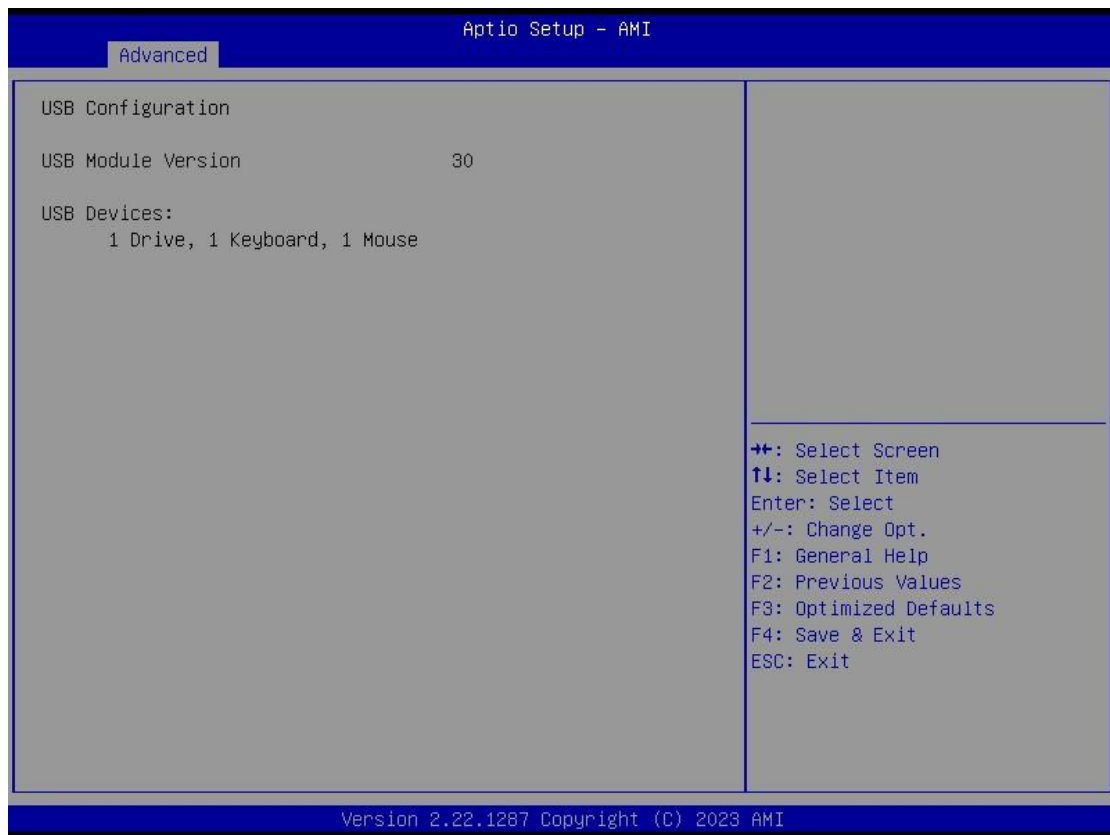
Device Configurations

Users can use this screen to configure Device configurations.

```
                              Aptio Setup - AMI
     Advanced

  ▶ Onboard Device Configuration                    Onboard Device Configuration
                                                    status




                                                    ┌─────────────────────────────
                                                    ↔: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



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```

```
                              Aptio Setup — AMI
  ┌──────────┐
  │ Advanced │
  └──────────┘
 ┌────────────────────────────────────────────┬──────────────────────────────┐
 │ ▶ Onboard DIO Configuration                │ Onboard DIO status           │
 │                                            │                              │
 │                                            │                              │
 │                                            │                              │
 │                                            │                              │
 │                                            │                              │
 │                                            │                              │
 │                                            │                              │
 │                                            ├──────────────────────────────┤
 │                                            │ ➡◀: Select Screen            │
 │                                            │ ↑↓: Select Item              │
 │                                            │ Enter: Select                │
 │                                            │ +/−: Change Opt.             │
 │                                            │ F1: General Help             │
 │                                            │ F2: Previous Values          │
 │                                            │ F3: Optimized Defaults       │
 │                                            │ F4: Save & Exit              │
 │                                            │ ESC: Exit                    │
 │                                            │                              │
 │                                            │                              │
 │                                            │                              │
 └────────────────────────────────────────────┴──────────────────────────────┘
                   Version 2.21.1278 Copyright (C) 2022 AMI
```

```
                              Aptio Setup - AMI
   ┌──────────────┐
   │   Advanced   │
   ┌──────────────────────────────────────────────────┬─────────────────────────┐
   │                                                   │ Enabled or Disabled DIO │
   │  Onboard DIO Configuration                        │ Modification            │
   │  DIO Modification              [Enabled]          │                         │
   │ ▶ Load Manufacture Default                        │                         │
   │ ▶ DIO port 1-8                                    │                         │
   │ ▶ DIO port 9-16                                   │                         │
   │                                                   │                         │
   │                                                   │                         │
   │                                                   │                         │
   │                                                   │                         │
   │                                                   │ ⇄: Select Screen        │
   │                                                   │ ↑↓: Select Item         │
   │                                                   │ Enter: Select           │
   │                                                   │ +/-: Change Opt.        │
   │                                                   │ F1: General Help        │
   │                                                   │ F2: Previous Values     │
   │                                                   │ F3: Optimized Defaults  │
   │                                                   │ F4: Save & Exit         │
   │                                                   │ ESC: Exit               │
   │                                                   │                         │
   └──────────────────────────────────────────────────┴─────────────────────────┘
                   Version 2.22.1287 Copyright (C) 2023 AMI
```

```
                          Aptio Setup - AMI
 Main

DIO status                                              Input/Output Setting
1.Input/Output Status        Out & Low
  Input/Output Setting       [Output]
  High/Low Setting           [Low]
2.Input/Output Status        Out & Low
  Input/Output Setting       [Output]
  High/Low Setting           [Low]
3.Input/Output Status        Out & Low
  Input/Output Setting       [Output]
  High/Low Setting           [Low]
4.Input/Output Status        Out & Low
  Input/Output Setting       [Output]
  High/Low Setting           [Low]
5.Input/Output Status         In & High       ++: Select Screen
  Input/Output Setting       [Input]          ↑↓: Select Item
6.Input/Output Status         In & High       Enter: Select
  Input/Output Setting       [Input]          +/-: Change Opt.
7.Input/Output Status         In & High       F1: General Help
  Input/Output Setting       [Input]          F2: Previous Values
8.Input/Output Status         In & High       F3: Optimized Defaults
  Input/Output Setting       [Input]          F4: Save & Exit
                                              ESC: Exit




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```

4.5 Chipset Menu

The Chipset menu allows users to change the advanced chipset settings. Users can select any of the items in the left frame of the screen to go to the sub menus:

► System Agent (SA) Configurations
► PCH-IO Configurations

For items marked with "►", please press <Enter> for more options.

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

 ▶ System Agent (SA) Configuration            System Agent (SA) Parameters
 ▶ PCH-IO Configuration






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



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```

System Agent (SA) Configurations

```
                              Aptio Setup - AMI
        ┌─────────┐
        │ Chipset │
        └─────────┘
 System Agent (SA) Configuration                    VT-d capability

 VT-d                             Supported

 VT-d                             [Enabled]
 Control Iommu Pre-boot Behavior  [Enable IOMMU during
                                  boot]
 Above 4GB MMIO BIOS assignment   [Enabled]

 ▶ Graphics Configuration

                                                    ➜←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



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```
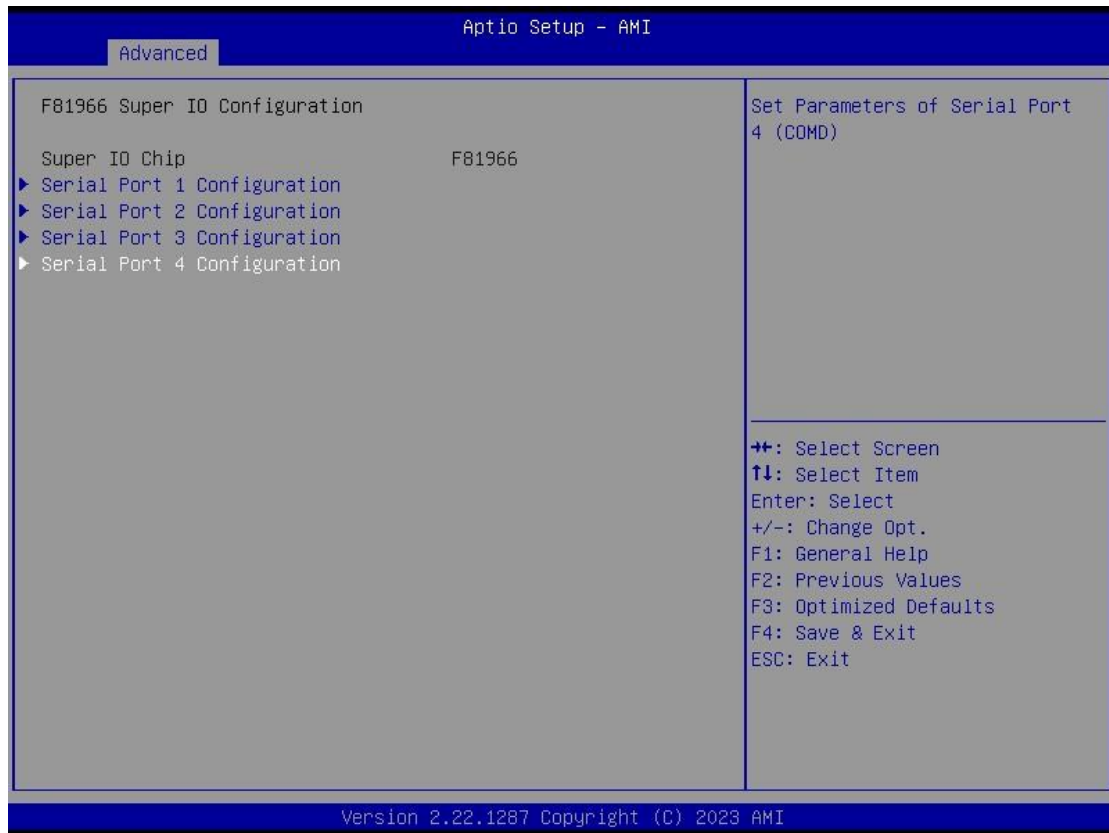
VT-d
VT-d capability.

Above 4GB MMIO BIOS assignment
Enable/Disable above 4GB Memory Mapped IO BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.

Graphics Configuration
Use this item to configure internal graphics controller.

Graphic Configurations

```
                              Aptio Setup - AMI
    ┌──────────┐
    │ Chipset  │
    └──────────┘

    Internal Graphics                [Auto]              Keep IGFX enabled based on the
                                                         setup options.




                        ┌─── Internal Graphics ───┐
                        │ Auto                     │
                        │ Disabled                 │
                        │ Enabled                  │
                        └──────────────────────────┘     →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit



                        Version 2.22.1287 Copyright (C) 2023 AMI
```
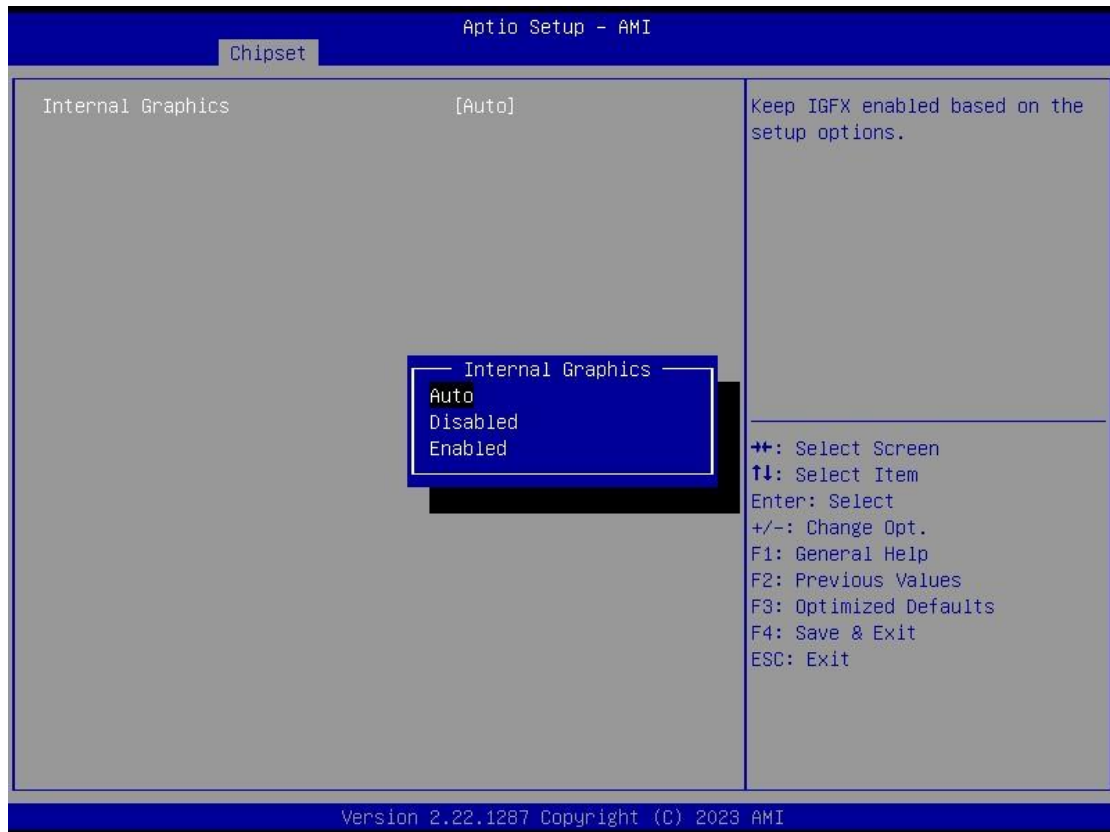
Internal Graphics
Keep IGFX enabled based on the setup options.

PCH-IO Configurations

This screen allows users to set PCH parameters.

```
                                Aptio Setup – AMI
         Chipset

    PCH-IO Configuration                                  Enable/Disable integrated LAN
                                                          to wake the system.
       Wake on LAN Enable             [Enabled]
    PCIE/SATA Switch                   [PCIE]








                                                         ⭾: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit




                         Version 2.22.1287 Copyright (C) 2023 AMI
```
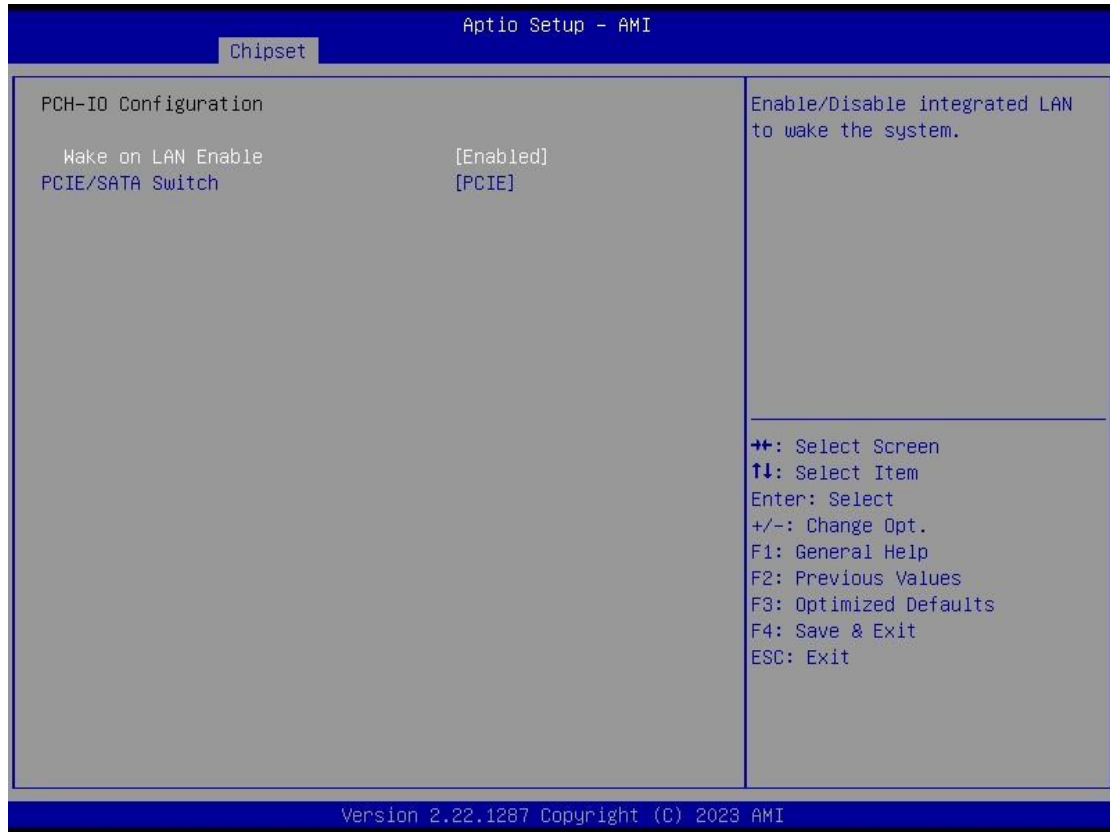
Wake on LAN Enable
Enable or disable integrated LAN to wake the system.

PCIE/SATA Switch
Enable or disable integrated LAN to wake the system.

Security Menu

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

   Password Description                           Set Administrator Password

   If ONLY the Administrator's password is set,
   then this only limits access to Setup and is
   only asked for when entering Setup.
   If ONLY the User's password is set, then this
   is a power on password and must be entered to
   boot or enter Setup. In Setup the User will
   have Administrator rights.
   The password length must be
   in the following range:
   Minimum length                  3
   Maximum length                  20                →←: Select Screen
                                                     ↑↓: Select Item
   Administrator Password                            Enter: Select
   User Password                                     +/-: Change Opt.
                                                     F1: General Help
 ▶ Secure Boot                                       F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit




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```

Administrator Password

This item indicates whether an administrator password has been set (installed or uninstalled).

User Password

This item indicates whether a user password has been set (installed or uninstalled).

```
                          Aptio Setup - AMI
                   Security

  System Mode                      Setup

  Secure Boot                      [Disabled]
                                   Not Active

  Secure Boot Mode                 [Custom]
▶ Restore Factory Keys
▶ Reset To Setup Mode

▶ Key Management

                                                  ↔: Select Screen
                                                  ↑↓: Select Item
                                                  Enter: Select
                                                  +/-: Change Opt.
                                                  F1: General Help
                                                  F2: Previous Values
                                                  F3: Optimized Defaults
                                                  F4: Save & Exit
                                                  ESC: Exit

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```

Secure Boot Mode

Use this item to set UEFI Secure Boot Mode to Standard mode or Custommode. This change is effective after save. After reset, this mode will return to Standardmode.

Restore Factory Keys

Use this item to force System to User Mode, to install factory default SecureBoot key databases.

Reset To Setup Mode

Select Yes and press <Enter> to restore the manufacturer default Secure Boot keys. This

will also reset the system to User mode. The options are Yes and No.

Key Management

Enables expert users to modify Secure boot policy variables without full authentication.

4.6 Boot Menu

The Boot menu allows users to change boot options of the system.

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

    Boot Configuration                                  Number of seconds to wait for
    Setup Prompt Timeout            1                   setup activation key.
    Bootup NumLock State            [On]                65535(0xFFFF) means indefinite
    Quiet Boot                      [Disabled]          waiting.
    Network Stack                   [Disabled]

    Boot Option Priorities
    Boot Option #1                  [UEFI:
                                    KingstonDataTraveler
                                    3.00000, Partition 1
                                    (KingstonDataTraveler
                                    3.00000)]

                                                        ++: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F3: Optimized Defaults
                                                        F4: Save & Exit
                                                        ESC: Exit



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```

Setup Prompt Timeout

Use this item to set up number of seconds to wait for setup activation key where 65535(0xFFFF) means indefinite waiting.

Bootup NumLock State

Use this item to select the power-on state for the keyboard NumLock.

Quiet Boot

Select to display either POST output messages or a splash screen during boot-up.

Boot Option Priorities

These are settings for boot priority. Specify the boot device priority sequence from the available devices.

4.7 Save & Exit Menu

The Save & Exit menu allows users to load system configurations with optimal or fail-safe default values.
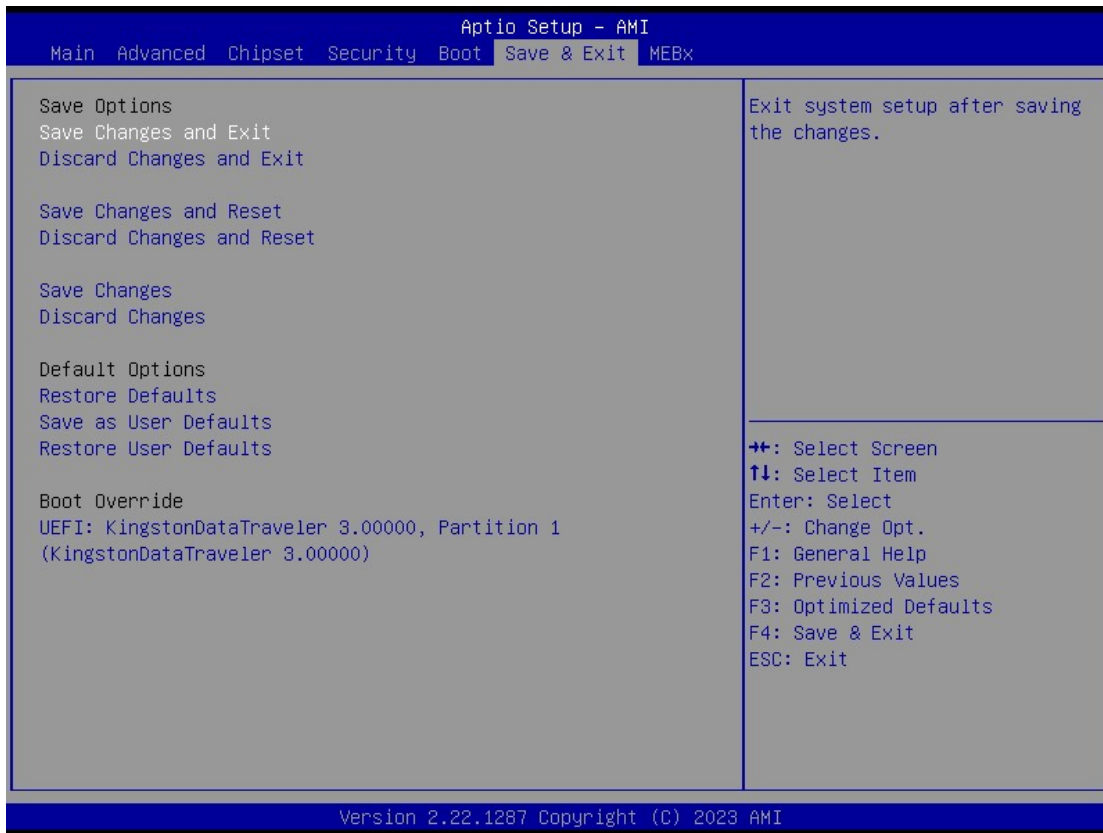
```
                          Aptio Setup - AMI
     Main  Advanced  Chipset  Security  Boot  Save & Exit  MEBx

  Save Options                               Exit system setup after saving
  Save Changes and Exit                      the changes.
  Discard Changes and Exit

  Save Changes and Reset
  Discard Changes and Reset

  Save Changes
  Discard Changes

  Default Options
  Restore Defaults
  Save as User Defaults
  Restore User Defaults                      →←: Select Screen
                                             ↑↓: Select Item
  Boot Override                              Enter: Select
  UEFI: KingstonDataTraveler 3.00000, Partition 1   +/-: Change Opt.
  (KingstonDataTraveler 3.00000)             F1: General Help
                                             F2: Previous Values
                                             F3: Optimized Defaults
                                             F4: Save & Exit
                                             ESC: Exit


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```

Save Changes and Exit

When users have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.

Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configurations and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.

Save Changes and Reset

Having completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configurations take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.

Discard Changes and Reset

Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

Save Changes

Having completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

Discard Changes

Select this option to quit Setup without making any permanent changes to the system configurations. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.

Restore Defaults

It automatically sets all Setup options to a complete set of default settings when users select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.

Save as User Defaults

Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.

Restore User Defaults

It automatically sets all Setup options to a complete set of User Defaults when users select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.

Boot Override

Select a drive to immediately boot that device regardless of the current boot order.

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APPENDIX A
WATCHDOG TIMER

A.1 About Watchdog Timer

Software stability is major issue in most application. Some embedded systems are not watched by human for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us solution.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

A.2 Sample Program

```
#include "stdafx.h"
#include <windows.h>
#include <stdio.h>
#include <tchar.h>
#include <stdlib.h>

#ifdef _DEBUG
#define new DEBUG_NEW
#endif

#pragma comment (lib, "User32.lib" )


#define  IDT_TIMER  WM_USER + 200
#define _CRT_SECURE_NO_WARNINGS 1
#define setbit(value,x) (value |=(1<<x))
#define clrbit(value,x) (value &=~(1<<x))

HINSTANCE hinstLibDLL = NULL;
```

```
LONG WDTDATA = 0;


typedef ULONG(*LPFNDLLGETIOSPACE)(ULONG);

LPFNDLLGETIOSPACE lpFnDll_Get_IO;

typedef void(*LPFNDLLSETIOSPACE)(ULONG, ULONG);

LPFNDLLSETIOSPACE lpFnDll_Set_IO;


int _tmain(int argc, _TCHAR* argv[])

{

int unit = 0;

int WDTtimer = 0;

if (hinstLibDLL == NULL)

{

hinstLibDLL = LoadLibrary(TEXT("diodll.dll"));

if (hinstLibDLL == NULL)

{

//MessageBox("Load diodll dll error", "", MB_OK);

}

}


if (hinstLibDLL)

{

lpFnDll_Get_IO  =  (LPFNDLLGETIOSPACE)GetProcAddress(GetModuleHandle("diodll.dll"),
"GetIoSpaceByte");

lpFnDll_Set_IO  =  (LPFNDLLSETIOSPACE)GetProcAddress(GetModuleHandle("diodll.dll"),
"SetIoSpaceByte");

}

printf("Input Watch Dog Timer type, 1:Second ; 2:Minute :");

scanf("%d",&unit);

printf("\nInput Timer to countdown:");

scanf("%d", &WDTtimer);

printf("Start to countdown...");


//==Enter MB Pnp Mode==

lpFnDll_Set_IO(0x2e, 0x87);

lpFnDll_Set_IO(0x2e, 0x87);

lpFnDll_Set_IO(0x2e, 0x07);

lpFnDll_Set_IO(0x2f, 0x07); //SET LDN 07
```

```
//set LDN07 FA 10 to 11
lpFnDll_Set_IO(0x2e, 0xFA);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 0);
lpFnDll_Set_IO(0x2f, WDTDATA);
if (unit == 1)
{
lpFnDll_Set_IO(0x2e, 0xF6);
lpFnDll_Set_IO(0x2f, WDTtimer);

//start watchdog counting
lpFnDll_Set_IO(0x2e, 0xF5);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 5);
lpFnDll_Set_IO(0x2f, WDTDATA);
}
else if (unit == 2)
{
//set  WDT Timer
lpFnDll_Set_IO(0x2e, 0xF6);
lpFnDll_Set_IO(0x2f, WDTtimer);
//set watchdog time unit to min
lpFnDll_Set_IO(0x2e, 0xF5);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 3);
lpFnDll_Set_IO(0x2f, WDTDATA);
//start watchdog counting
lpFnDll_Set_IO(0x2e, 0xF5);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 5);
lpFnDll_Set_IO(0x2f, WDTDATA);
}
system("pause");
return 0;
}
```

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APPENDIX B
CONFIGURING SATA FOR RAID

B.1 Configuring SATA Hard Drive(s) for RAID (Controller: Intel® R680E)

Before you begin the SATA configuration, please prepare:

● Two SATA hard drives (to ensure optimal performance, it is recommended that you use two hard drives with identical model and capacity). If you do not want to create RAID with the SATA controller, you may prepare only one hard drive.

Please follow up the steps below to configure SATA hard drive(s):

1. Install SATA hard drive(s) in your system.
2. Enter the BIOS Setup to configure SATA controller mode and boot sequence.
3. Configure RAID by the RAID BIOS.

1. Installing SATA hard drive(s) in your system.

Connect one end of the SATA signal cable to the rear of the SATA hard drive, and the other end to available SATA port(s) on the board. Then, connect the power connector of power supply to the hard drive.

2. Configuring SATA controller mode and boot sequence by the BIOS Setup.

You have to make sure whether the SATA controller is configured correctly by system BIOS Setup and set up BIOS boot sequence for the SATA hard drive(s).

2.1. Turn on your system, and then press the <Del> button to enter BIOS Setup during running POST (Power-On Self-Test). If you want to create RAID, just go to the Advanced Settings menu\VMD Configuration, enabled the "Enable VMD controller", save and exit the BIOS Setup.

```
                              Aptio Setup - AMI
        Advanced

    VMD Configuration                                    Enable/Disable to VMD
                                                         controller
    Enable VMD controller              [Enabled]

    Enable VMD Global Mapping          [Enabled]
    Map this Root Port under VMD       [Enabled]
    Root Port BDF details              SATA Controller

    RAID0                              [Enabled]
    RAID1                              [Enabled]
    RAID5                              [Enabled]
    RAID10                             [Enabled]
    Intel Rapid Recovery Technology    [Enabled]
    RRT volumes can span internal and  [Enabled]      →←: Select Screen
    eSATA drives                                      ↑↓: Select Item
    Intel(R) Optane(TM) Memory         [Enabled]      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit




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```

2.2. After restart, press <Del> button to enter BIOS Setup Menu. In Advanced Page, choose Intel(R) Rapid Storage Technology.

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

    ▶ ACPI Settings                                    System Super IO Chip
    ▶ Trusted Computing                                Parameters.
    ▶ Platform Misc Configuration
    ▶ CPU Configuration
    ▶ Storage Configuration
    ▶ NVMe Configuration
    ▶ AMT Configuration
    ▶ F81966 Super IO Configuration
    ▶ Hardware Monitor
    ▶ USB Configuration
    ▶ PCI Subsystem Settings
    ▶ CSM Configuration
    ▶ Intel(R) Rapid Storage Technology
    ▶ Intel(R) Ethernet Controller (3) I225-LM - 00:60:E0:6C:AE:A1   →←: Select Screen
    ▶ Intel(R) I211 Gigabit  Network Connection -     ↑↓: Select Item
      00:60:E0:6C:AE:A2                               Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit




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```
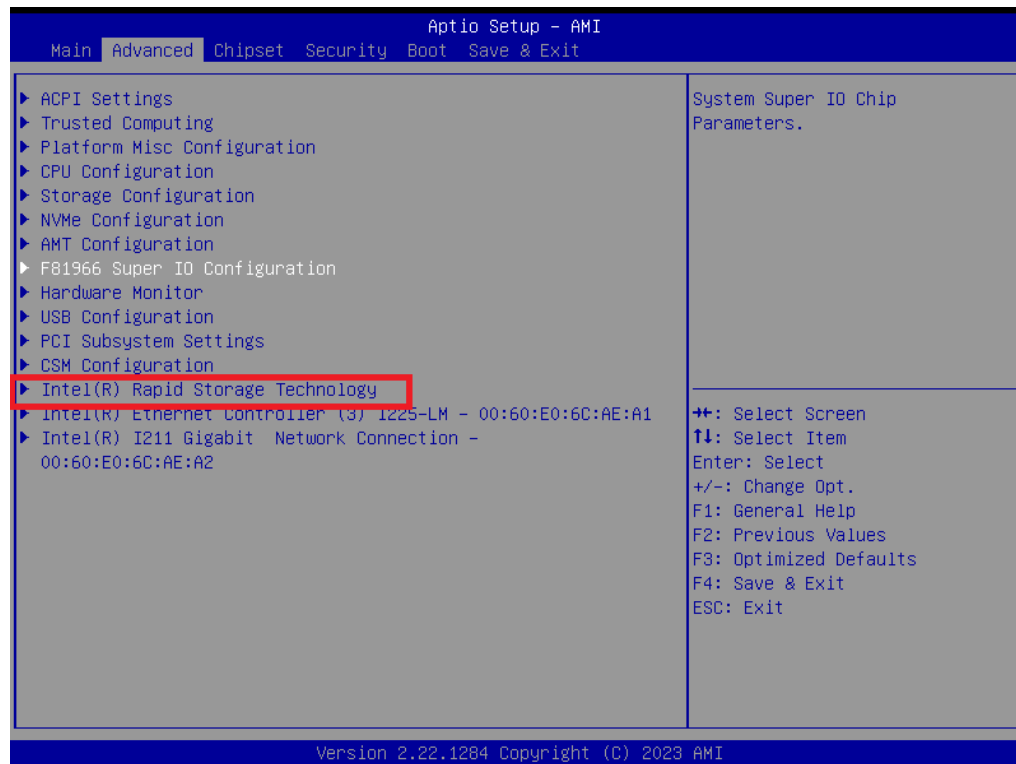
2.3. After restart, press <Del> button to enter BIOS Setup Menu. In Advanced Page, select Intel(R) Rapid Storage Technology.

```
                          Aptio Setup - AMI
        Advanced

   Intel(R) RST 19.0.0.5428 RST VMD Driver          This page allows you to create
 ▶ Create RAID Volume                                a RAID volume


   Non-RAID Physical Disks:
 ▶ SATA 0.0, 2.5" SATA SSD 3TE7 CA12202060270004, 55.8GB
 ▶ SATA 0.1, AXIOMTEK Corp.-FSA064GMW5T 0906AA0931116001,
   59.6GB

                                                   ↔: Select Screen
                                                   ↑↓: Select Item
                                                   Enter: Select
                                                   +/-: Change Opt.
                                                   F1: General Help
                                                   F2: Previous Values
                                                   F3: Optimized Defaults
                                                   F4: Save & Exit
                                                   ESC: Exit



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```
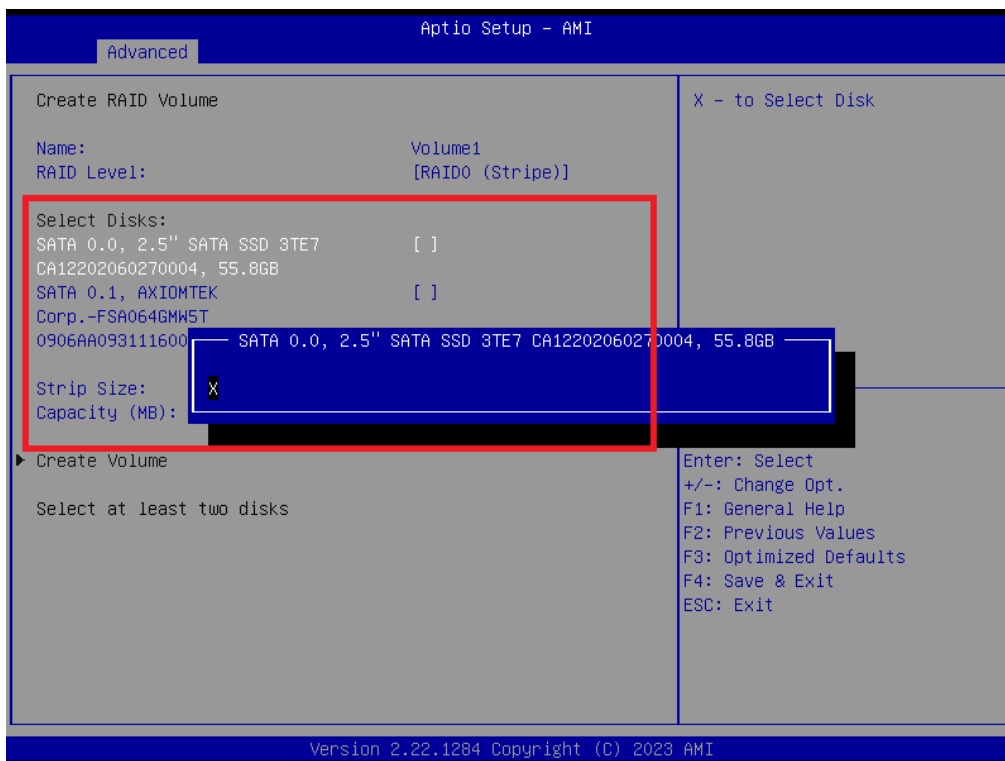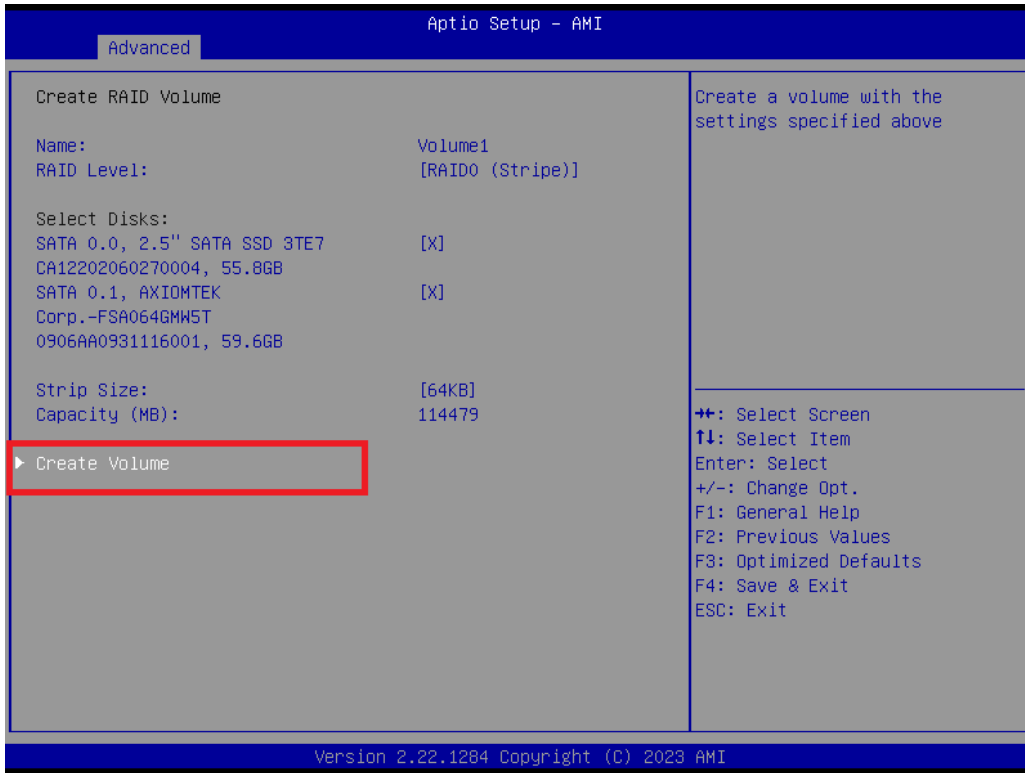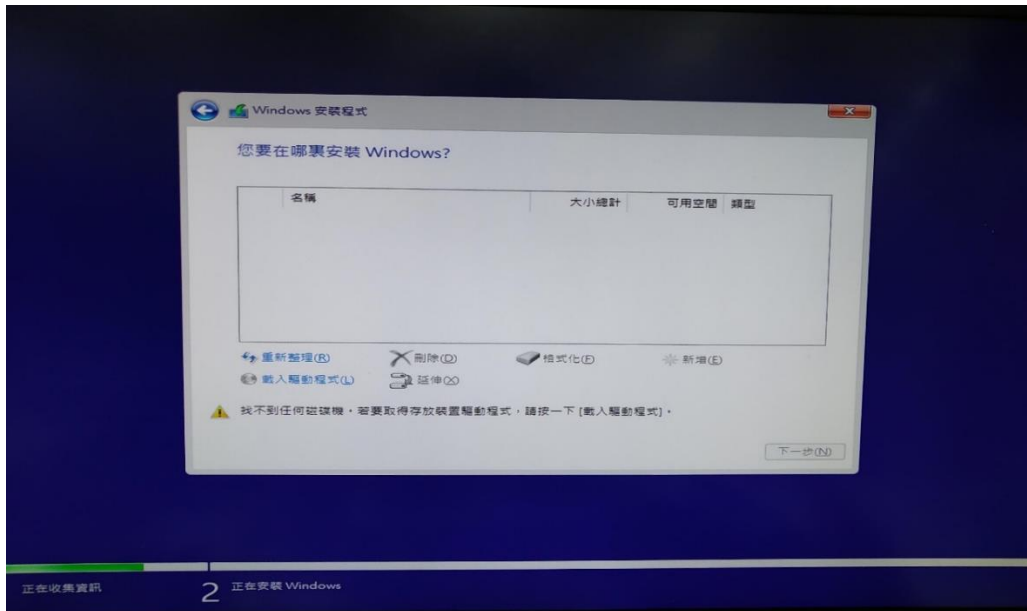
2.4. Select the storage that to be used to RAID function.

```
                          Aptio Setup - AMI
        Advanced

   Create RAID Volume                                X - to Select Disk

   Name:                          Volume1
   RAID Level:                    [RAID0 (Stripe)]

   Select Disks:
   SATA 0.0, 2.5" SATA SSD 3TE7        [ ]
   CA12202060270004, 55.8GB
   SATA 0.1, AXIOMTEK                  [ ]
   Corp.-FSA064GMW5T
   0906AA093111600 ┌── SATA 0.0, 2.5" SATA SSD 3TE7 CA122020602 0004, 55.8GB ──┐
                   │                                                           │
   Strip Size:     │  X                                                        │
   Capacity (MB):  └───────────────────────────────────────────────────────────┘

 ▶ Create Volume                                   Enter: Select
                                                   +/-: Change Opt.
   Select at least two disks                       F1: General Help
                                                   F2: Previous Values
                                                   F3: Optimized Defaults
                                                   F4: Save & Exit
                                                   ESC: Exit



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```
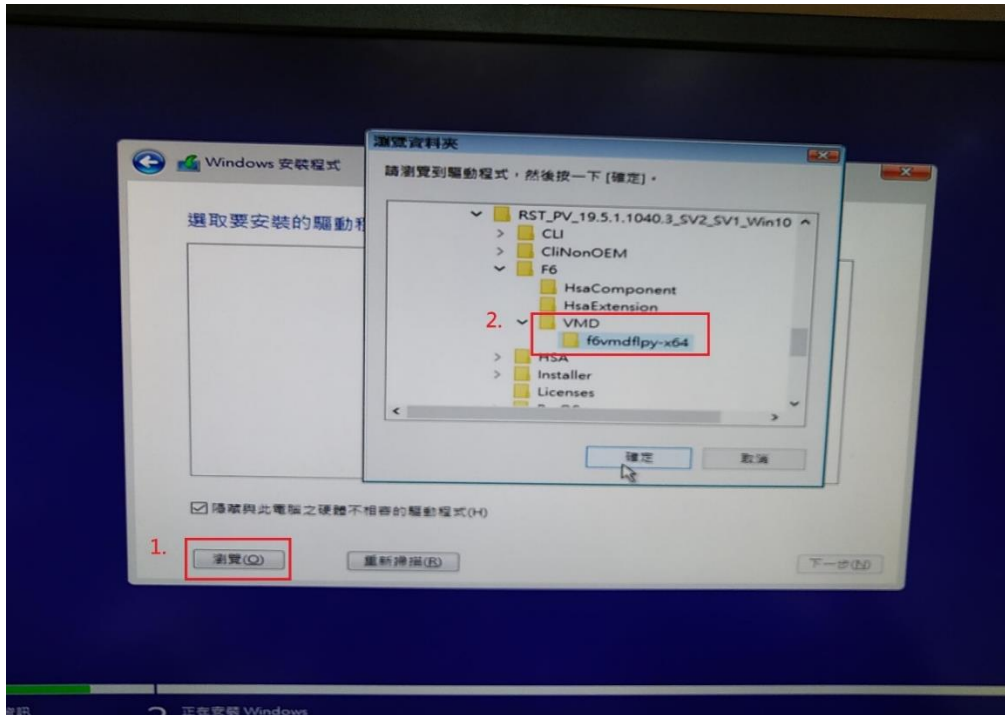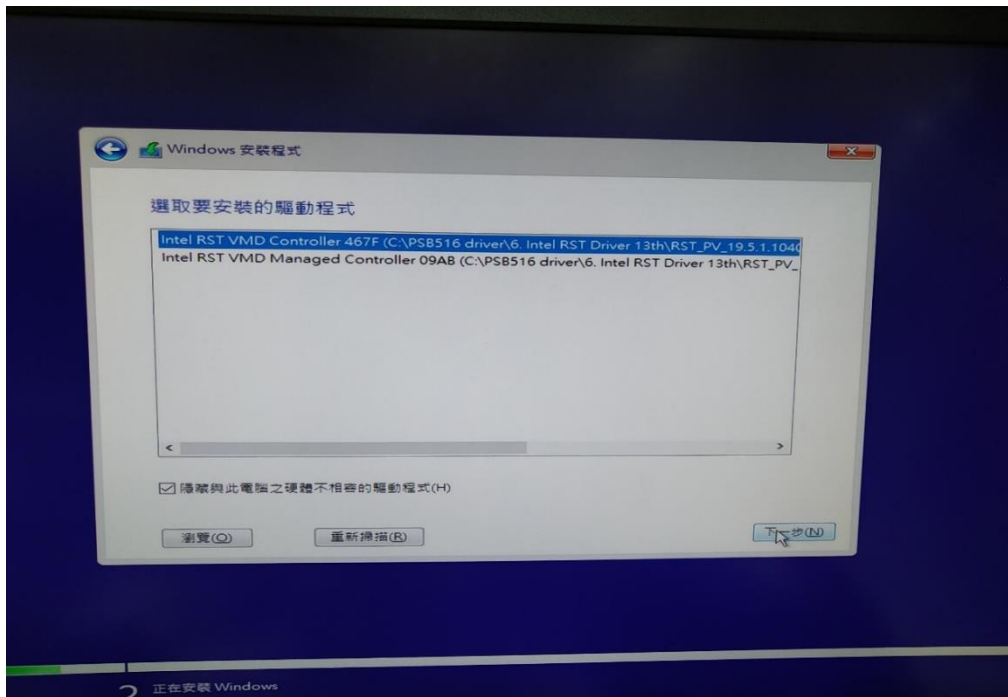
And press <Create volume>

2.6 Install OS. Click Load Driver.

2.7 Click Browse, Find the VMD File and choose "f6vmdflpy.x64".

2.8 Press NextStep.

2.9 The storage will be detected after the previous steps.