USER'S MANUAL

BCO-1000-ADLN

Basic Fanless Embedded Computer

Table of Contents

Prefaces 04

Revision 04

Disclaimer 04

Copyright Notice 04

Trademarks Acknowledgment 04

Environmental Protection Announcement 04

Safety Precautions 05

Technical Support and Assistance 06

Conventions Used in this Manual 06

Package Contents 07

Ordering Information 07

Optional Accessory 07

Chapter 1 Product Introductions 08

1.1 Overview 09

Key Feature 09

1.2 Hardware Specification 10

1.3 System I/O 12

1.4 Mechanical Dimension 14

Chapter 2 Mechanical Specifications 15

2.1 Switch and connector Locations 16

2.1.1 Top View 16

2.1.2 Rear I/O Panel 17

2.1.3 2.5 GbE RJ-45 LAN Jack 18

2.1.4 Board Dimension 19

2.2 Component Contents 20

Chapter 3 System Setup 36

3.1 Set torque force to 3.5 kgf-cm to screw or unscrew system parts 37

3.2 Before installing the system, separate the top and the bottom Covers 37

3.3 Install RAM 40

3.4 Install M.2 41
3.5 Install 2.5-inch hard drive 43
3.6 Installing wall mount kit 46
3.7 Installing DIN rail holder 48

Chapter 4 BIOS Setup 49

4.1 BIOS Setup 50
4.2 The Menu Bar 52
4.2.1 Menu 53
4.2.2 Advanced 54
4.3 Boot 61
4.4 Security 62
4.5 Chipset 72
4.6 Power 73
4.7 Save & Exit 74

Appendix GPIO WDT BKL SMBusAccess Programming 75

GeneralPurposedIO–GPIO/DIO 77
WatchdogTimer–WDT 78
LVDS BacklightControl –BKL 80
SMBusAccess 81

Prefaces

Revision

Revision	Description	Date
1.0	Manual Released	2024/04/18
2.0	1x DDR5 4800 MT/s SO-DIMM. Max. 16GB	2026/02/13

Disclaimer

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Environmental Protection Announcement

Do not dispose this electronic device into the trash while discarding. Please recycle to minimize pollution and ensure environment protection.

Safety Precautions

Before installing and using the equipment, please read the following precautions:

- Put this equipment on a reliable surface during installation. Dropping it or letting it fall could cause damage.
- The power outlet shall be installed near the equipment and shall be easily accessible.
- Turn off the system power and disconnect the power cord from its source before making any installation. Be sure both the system and the external devices are turned OFF. Sudden surge
- of power could ruin sensitive components. Make sure the equipment is properly grounded.
- When the power is connected, never open the equipment. The equipment should be opened only by qualified service personnel.
- Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
- Disconnect this equipment from the power before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
- Avoid the dusty, humidity and temperature extremes.
- Do not place heavy objects on the equipment.
- If the equipment is not used for long time, disconnect it from the power to avoid being damaged by transient over-voltage.
- The storage temperature shall be above -30°C and below 85°C.
- The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.
- If one of the following situation arises, get the equipment checked be service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated into the equipment.
    - The equipment has been exposed to moisture.
    - The equipment does not work well or it cannot work according the user's manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.

Technical Support and Assistance

1. Visit the Premio Inc website at www.premioinc.com where you can find the latest information about the product.
2. Contact your distributor, our technical support team or sales representative for technical support if you need additional assistance. Please have following information ready before you call:
   - Model name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Conventions Used in this Manual

WARNING

This indication alerts operators to an operation that, if not strictly observed, may result in severe injury.

CAUTION

This indication alerts operators to an operation that, if not strictly observed, may result in safety hazards to personnel or damage to equipment.

NOTE

This indication provides additional information to complete a task easily.

Package Contents

Before installation, please ensure all the items listed in the following table are included in the package.

Item	Description	Q'ty
1	**BCO-1000-ADLN** Fanless Mini Computer	1
2	Wall Mount Kit	1
3	Adapter 60W 12V 5A (selected models only)	1

Available Models

Model No.	Product Description
BCO-1000-ADLN-N97-2L	Fanless Mini Computer With 12th Gen Intel® IoTG N97 Processor, 1x DP, 1x HDMI, 2x COM, 2x LAN, 1x 2.5" Drive Bay
BCO-1000-ADLN97-2L-P	Fanless Mini Computer With 12th Gen Intel® IoTG N97 Processor, 1x DP, 1x HDMI, 2x COM, 2x LAN, 1x 2.5" Drive Bay, w/ Power Adapter

Optional Accessories

Model No.	Product Description
1-E09A06008	Adapter AC/DC 12V 5A 60W with 3pin Terminal Block Plug 5.0mm Pitch
1-TPCD00005	Power Cord, 3-pin US Type, 180cm
1-TPCD00002	Power Cord, European Type, 180cm
1-TPCD00001	Power Cord, 3-pin UK Type, 180cm
3-DINR-0004	Din Rail-2 Mounting Kit

Chapter 1

Product Introductions

1.1 Overview

Premio Basic Fanless Embedded Systems are designed for entry-level applications and basic needs. The BCO series can oversee connected devices and manage the collection, storage, and transmission of sensor data, and is capable of distilling unexplored value in data. It is not only robust and can withstand dust, shock, and vibration, but also can suitable for industrial automation, industrial control, kiosk & retail, and digital signage (without high demand in graphics).

Model No.	Rear Panel	Front Panel
BCO-1000-ADLN		

Key Features

- Support 12th Gen Intel® IoTG Alder Lake-N Processor N97, QC, 12W
- 1x DDR5 4800 MT/s SO-DIMM. Max. 16GB
- Dual Independent Display by 1x Display Port, 1x HDMI
- 2x Intel® I225-V 2.5GbE LAN
- 1x 2.5" Drive Bay
- 1x M.2 (B Key, (2242/ 2280/ 3042) (Default: 128GB M.2 SSD)
- 2x COM, 2x USB 3.2 Gen2, 2x USB 3.2 Gen1, 2x USB 2.0
- 9 to 36VDC Wide Range Power Input Supporting AT/ATX Mode
- Wide Operating Temperature 0°C to 50°C (12W CPU)
- TPM 2.0 Supported
- CE, FCC Class A

1.2 Hardware Specification

System

Processor
Support 12th Gen Intel® IoTG Alder Lake-N Processor N97, QC, 12W

System Chipset	SoC integrated
LAN Chipset	2x Intel® I225-V 2.5GbE LAN
Audio Codec	Realtek ALC897
System Memory	1x DDR5 4800 MT/s SO-DIMM. Max. 16GB
Graphics	Intel® UHD Graphics
BIOS	AMI UEFI BIOS
Watchdog	Software Programmable Supports 1~255 sec. System Reset
TPM	TPM 2.0

I/O

Audio	Line-in/Line-out/Mic-in
COM	2x DB9 COM1: RS232/422/485 COM2: RS232
DIO	1x 8 GPIO
LAN	2x RJ45 (2.5GbE)
USB	2x USB 3.2 Gen2 2x USB 3.2 Gen1 2x USB 2.0 Type-A
Others	2x Antenna Holes 1x Power button 1x HD LED 1x Power LED

Storage

M.2	1x M.2 B Key slot (2242/2280/3042) • Supports PCIe x1 signal • Supports B+M Key SSD • Default: 128GB
SATA	1 x 2.5" Drive Bay (7mm or 9mm)

Expansion

M.2	1x M.2 E Key (2230, PCIe x1 & USB 2.0, support Wi-Fi & BT)

Display

DisplayPort	1x DisplayPort 1.4a Max Resolution 4096 x 2304 @60Hz
HDMI	1x HDMI 1.4b Max Resolution 3840 x 2160 @30Hz
Multiple Display	2x Independent Displays

Power

Power Adapter	AC/DC 24V/9.2A, 60W (Default)
Power Mode	AT, ATX (Default ATX)
Power Supply Voltage	9~36VDC
Power Connector	3-pin Terminal Block

Operating System

Windows	Windows 10/11
Linux	Linux kernel

Environment

Operating Temp.	0°C to 50°C (12W CPU) Tested according to: IEC60068-2-1:2007 (Cold test procedure) IEC60068-2-2:2007 (Dry heat test procedure) IEC60068-2-3:2007 (Damp heat, steady state, test procedure) IEC60068-2-14:2009 (Wide temperature range thermal shock)
Storage Temp.	-30°C to 85°C
Relative Humidity	10% to 95% (non-condensing)
Certification	EMC: • CE • FCC Class A (47 CFR part 15.109 and part 15.107) • ICES-003 • UKCA Green Product: • RoHS 3.0 (Directive 2015/863/EU) • REACH
Vibration	IEC60068-2-64:2008 With SSD: 5 Grms (5 - 500 Hz, 0.5 hr/axis) Designed to comply with MIL-STD-810H Method 514.8 Procedure I
Shock	IEC60068-2-27:2008 With SSD: 50G half-sin 11ms Designed to comply with MIL-STD-810H Method 516.8 Procedure I Package Drop Test: ISTA 2A

Physical

Construction	Extruded Aluminum with Heavy Duty Metal
Dimension	192(W) x 140(D) x 68(H) mm
Mounting	Wall Mounting DIN-Rail Mounting (Optional)

*All specifications and photos are subject to change without notice.

1.3 System I/O

BCO-1000-ADLN

Front Panel

USB 3.2 Gen 2 port (10 Gbps)
Used to connect USB 3.2 device

USB 3.2 Gen 1 port (5 Gbps)
Used to connect USB 3.2 device

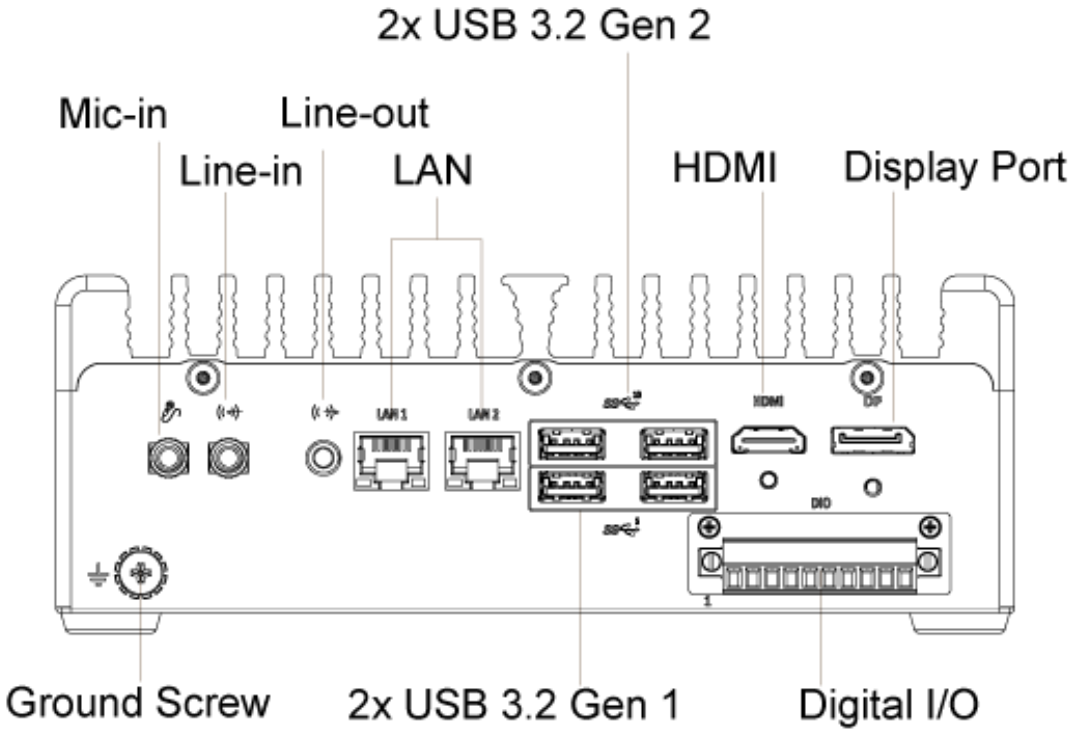
DisplayPort
Used to connect a DisplayPort monitor

HDMI port
Used to connect a HDMI monitor or connect optional split cable for dual display mode

Line-in / Line-out
Used to connect a speaker

Mic-in
Used to connect a microphone

Digital I/O
The Digital I/O terminal block supports 8 digital input and 8 digital output



Front Panel

BCO-1000-ADLN

Rear Panel

USB 2.0 port
Used to connect USB 2.0 device

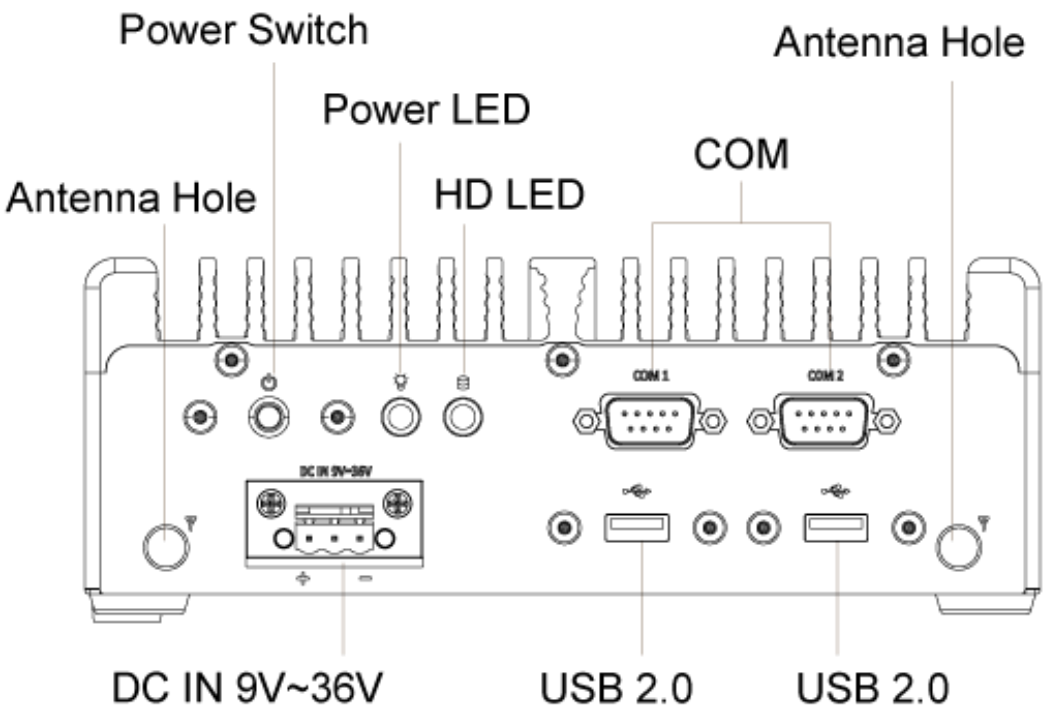
COM port
COM1 ~ COM2 support RS232/422/485 serial device

Antenna hole
Used to connect an antenna for optional Mini-PCIe WiFi module

DC IN
Used to plug a DC power input with terminal block

Power LED
Indicates the power status of the system

HDD LED
Indicates the status of the hard drive

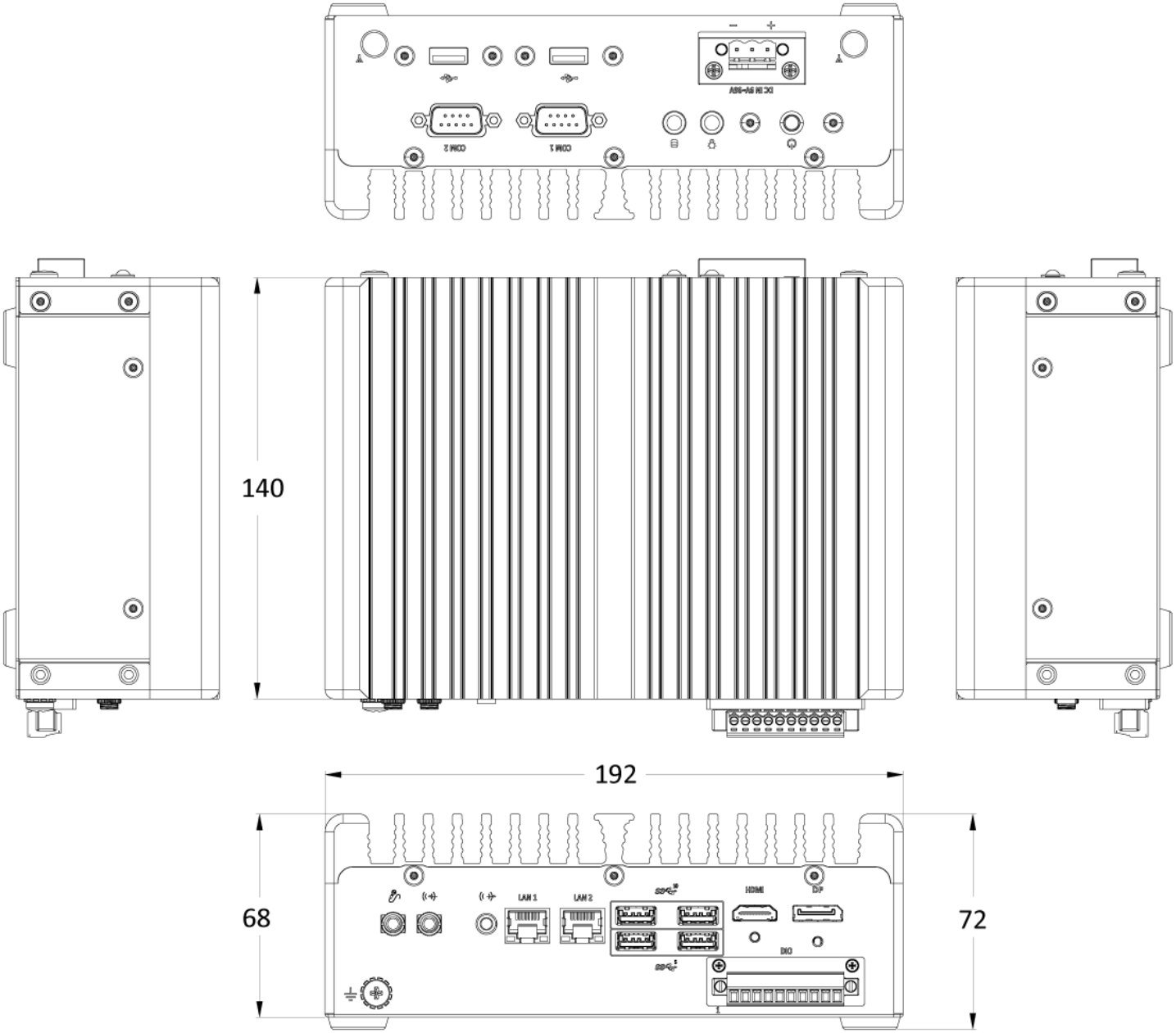


Rear Panel

1.4 Mechanical Dimensions

BCO-1000-ADLN

Unit: mm

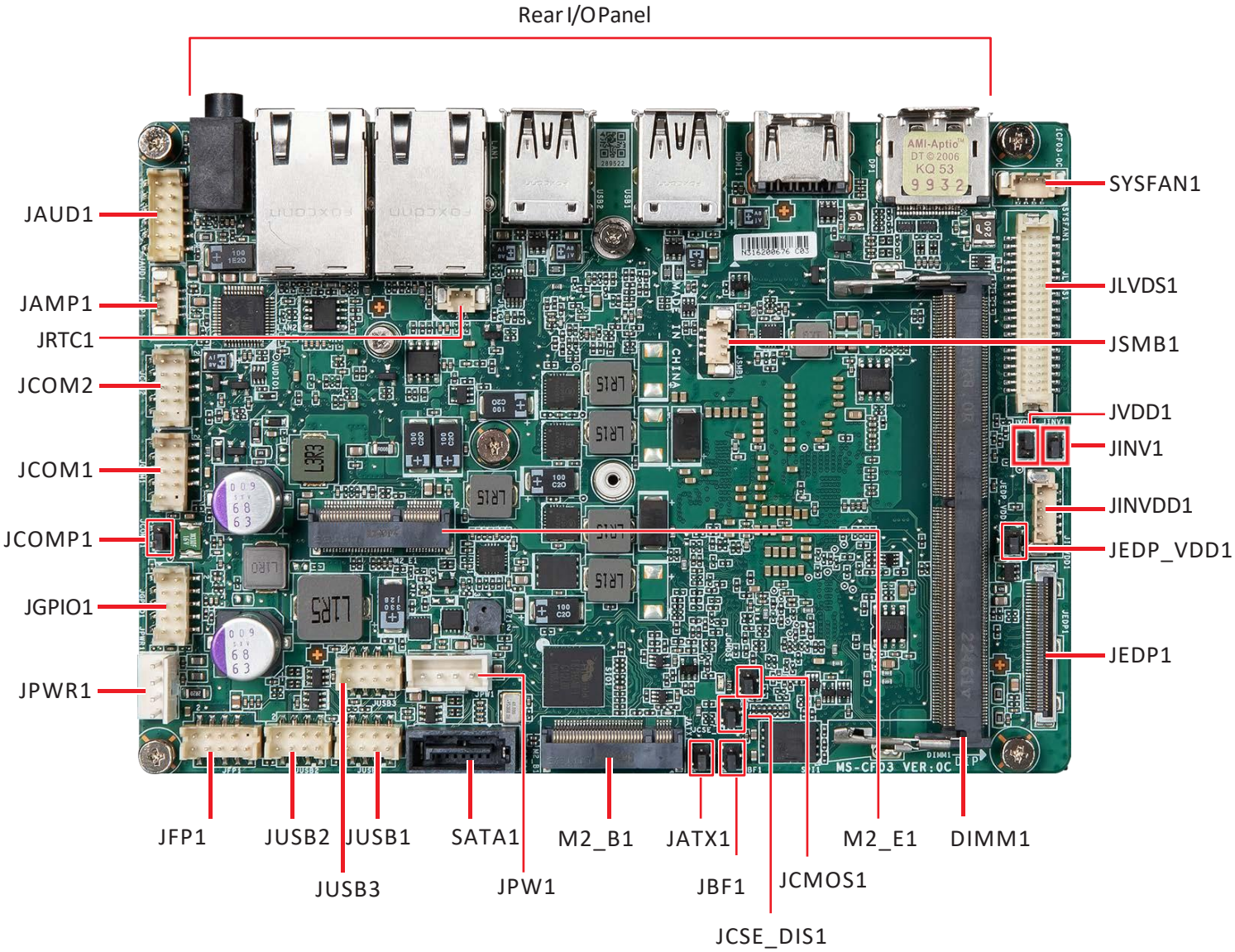


Chapter 2

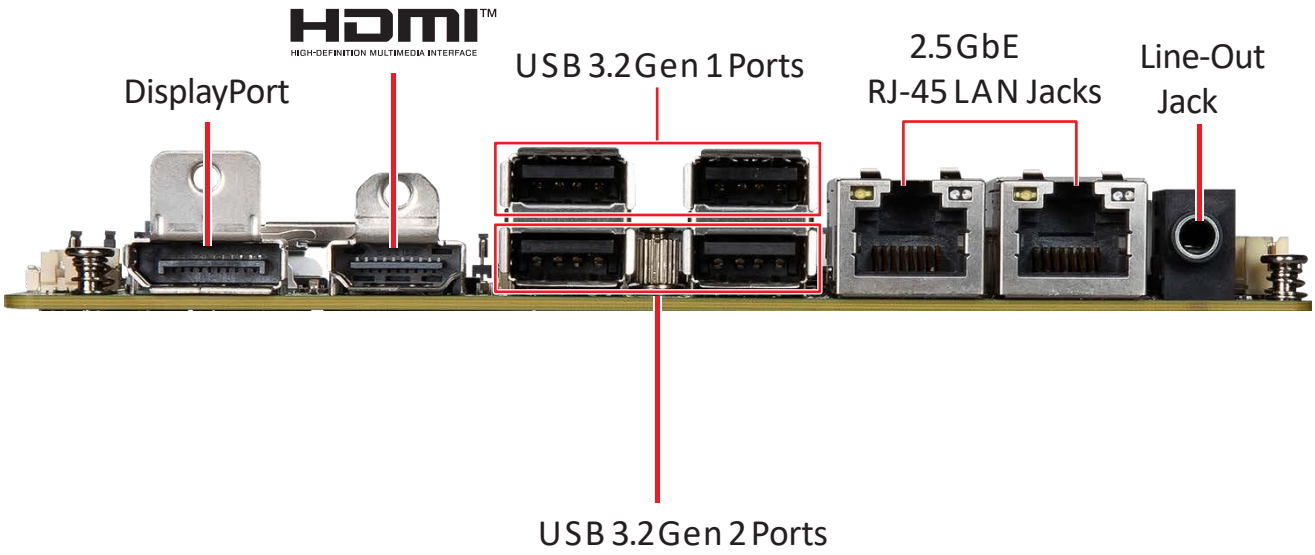
Mechanical Specifications

2.1 Switch and Connector Locations

2.1.1 TopView



2.1.2 Rear I/O Panel



DisplayPort

DisplayPort is a digital display interface standard. This connector is used to connect a monitor with DisplayPort inputs.

HDMI™ Connector

The High-Definition Multimedia Interface (HDMI™) is an all-digital audio/ video interface capable of transmitting uncompressed streams. HDMI™ supports all TV format, including standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.

USB 3.2 Gen 2 Port

USB 3.2 Gen 2, the **SuperSpeed USB 10Gbps**, delivers high-speed data transfer for various devices, such as storage devices, hard drives, video cameras, etc.

USB 3.2 Gen 1 Port

The USB (Universal Serial Bus) port is for attaching USB devices such as keyboards, mouse, or other USB-compatible devices. USB 3.2 Gen 1 supports data transfer rates up to **5 Gbps**.

2.1.3 2.5 GbE RJ-45 LAN Jack

2.5 GbE RJ-45 LAN Jack

The standard single RJ45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.

Link/ Activity LED	
Status	Description
Off	No link
Yellow	Linked
Blinking	Data activity

Speed LED	
Status	Description
Off	10/100Mbps
Green	1000Mbps
Orange	2.5Gbps

⚠Important

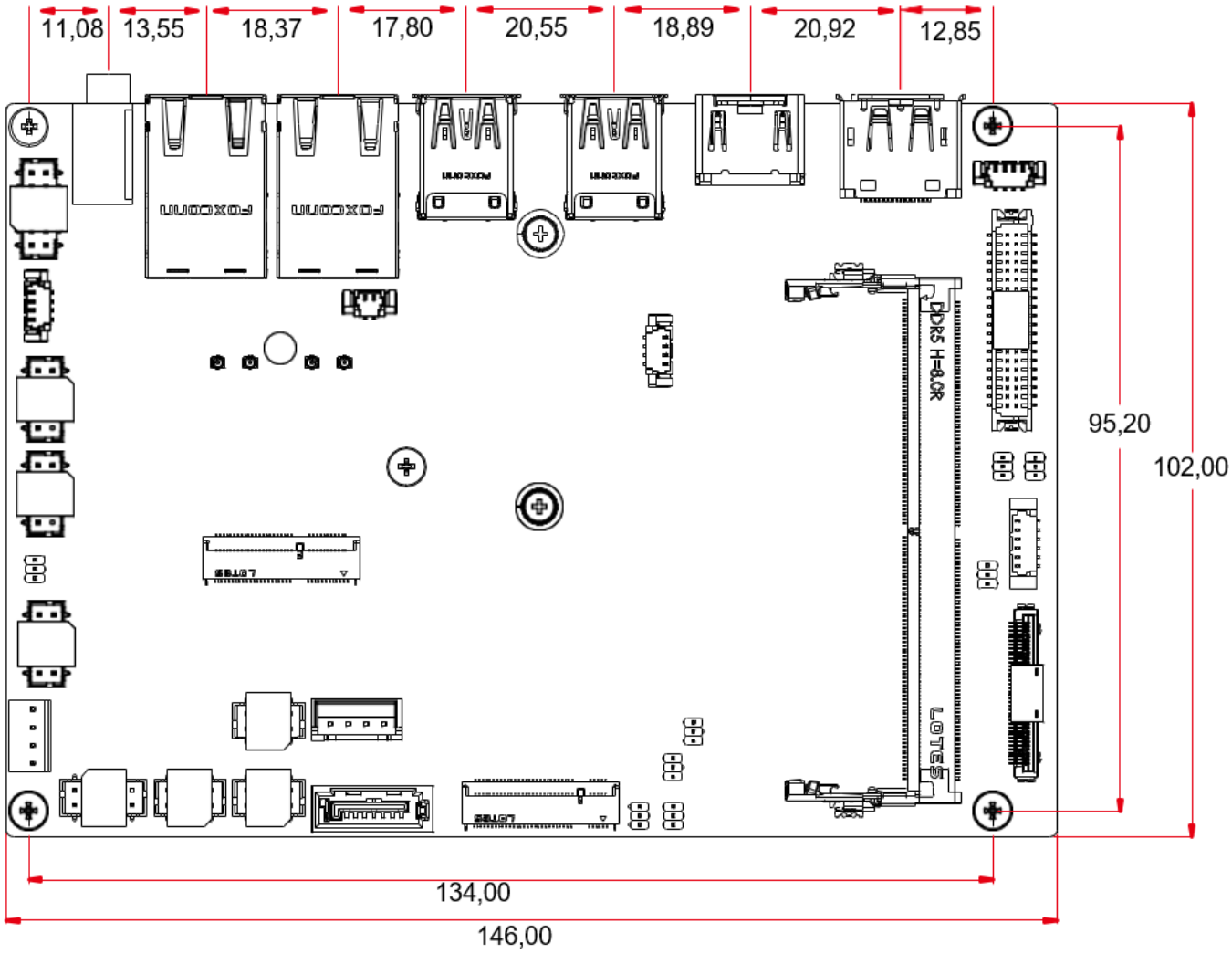
High-speed devices are recommended for USB 3.2 ports whereas low-speed devices, such as mouse or keyboard, are suggested to be plugged into the USB 2.0 ports.

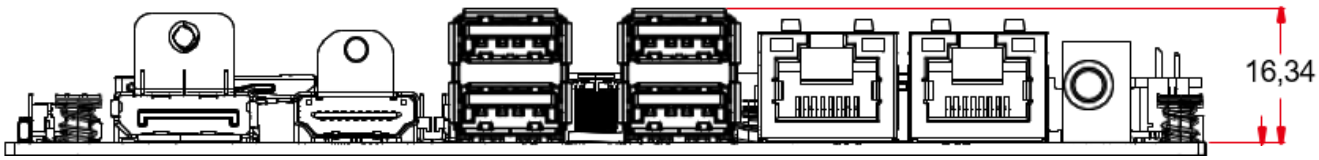
Line-Out Jack

This connector is provided for headphones or speakers.

2.1.4 Board Dimension

Unit: mm





2.2 Component Contents

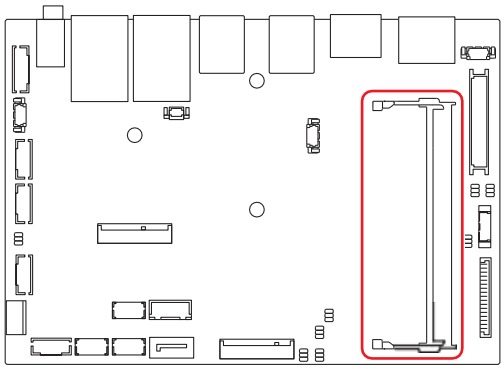
Component
Memory
DIMM1: DDR5 SO DIMM Slot
Storage
SATA1: SATA 3.06Gb/s Port
M2_B1: M.2 Slot (B Key, 2242, 3042, 2280)
Expansion Slots
M2_B1: M.2 Slot (B Key, 2242, 3042, 2280)
M2_E1: M.2 Slot (E Key, 2230)
Connectors
Power Connectors
JPWR1: 4-Pin DC-In Main Power Connector
JPW1: 4-Pin SATA Power Connector
Audio Connectors
JAUD1: Front Audio Header
JAMP1: Audio Amplifier Header
Graphics Connectors

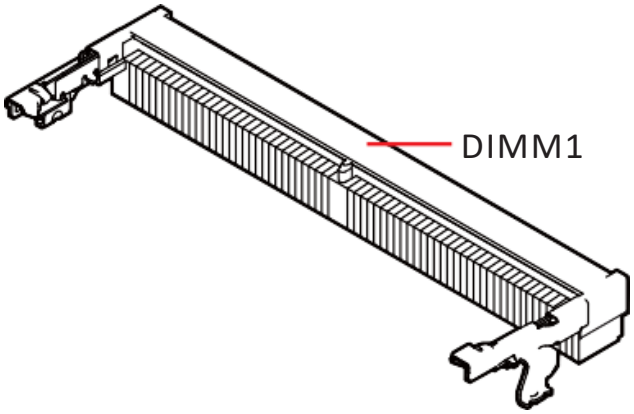
Component
JLVDS1: LVDS Wafer Connector
JINVDD1: LVDS Inverter Box Header
JEDP1: eDP Connector
Other Connectors
SYSFAN1: PWM System Fan Box Header
JFP1: Front Panel Connector
JCOM1, JCOM2: COM Port Box Headers
JGPIO1: GPIO (DIO) Box Header
JUSB1~3: USB 2.0 Box Headers
JSMB1: SMBus Box Header
JRTC1: CMOS Battery Header
Replacing CMOS battery
Jumpers

Memory

DIMM1 : DDR5 SO DIMM Slot

The SO-DIMM slots is intended for memory modules.





Installing DDR5 Memory

1. Locate the SO-DIMM slot. Align the notch on the DIMM with the key on the slot and insert the DIMM into the slot.
2. Push the DIMM gently downwards until the slot levers click and lock the DIMM in place.
3. To uninstall the DIMM, flip the slot levers outwards and the DIMM will be released instantly.

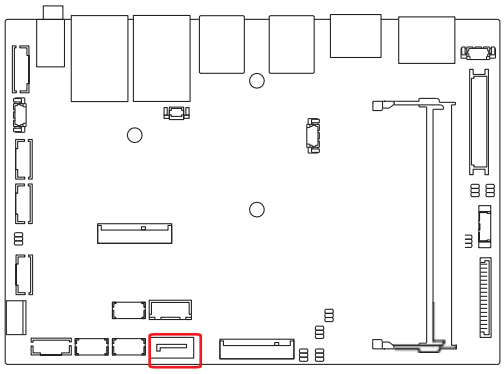
Important

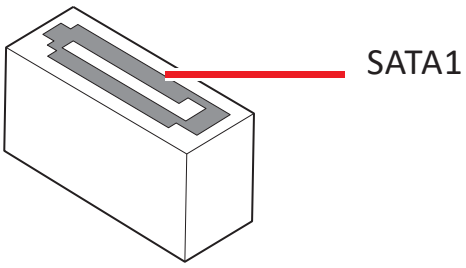
- You can barely see the golden finger if the DIMM is properly inserted in the DIMM slot.
- To ensure system stability for Dual channel mode, memory modules must be of the same type, number and density.

Storage

SATA1 : SATA 3.0 6Gb/s Port

This connector is SATA 6Gb/s interface port, it can connect to one SATA device.



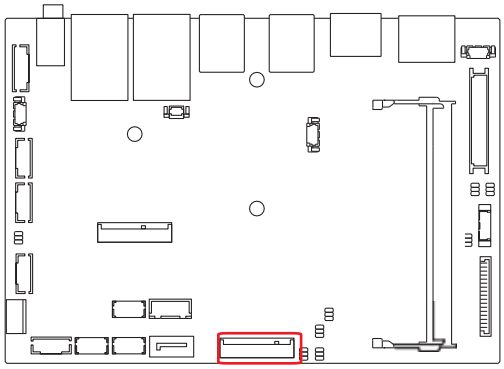


Important

- This SATA port supports hot plug.
- Please do not fold the SATA cable at a 90-degree angle. Data loss may result during transmission otherwise.
- SATA cables have identical plugs on either sides of the cable. However, it is recommended that the flat connector be connected to the motherboard for space saving purposes.

M2_B1 : M.2 Slot (B Key, 2242, 3042, 2280)

Please install the solid-state drive (SSD) into the M.2 slot as shown below.

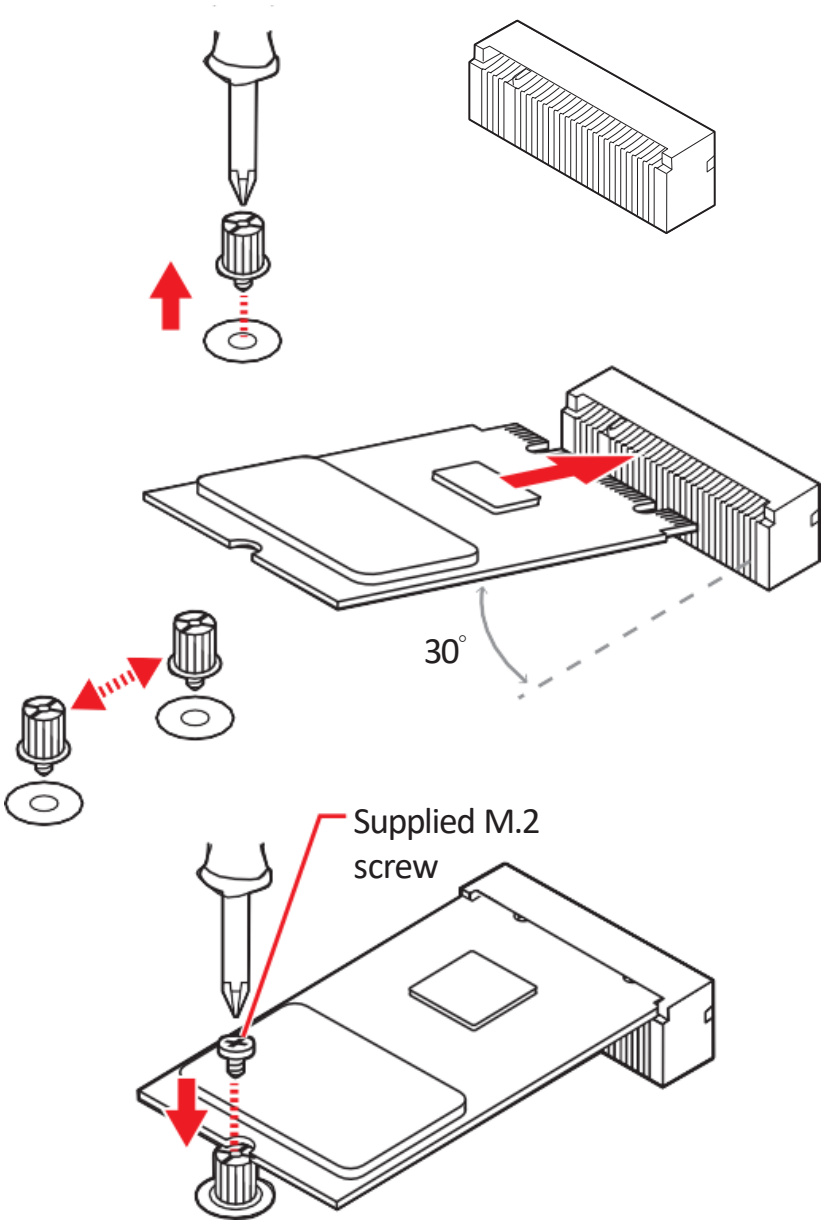


Feature

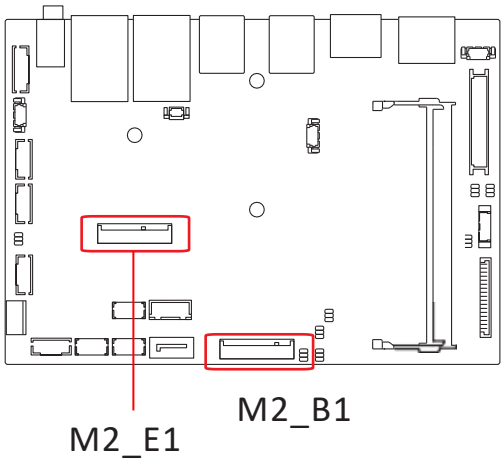
- Supports SATA 3.0 signal.
- Supports B+M Key SATA 3.0 SSD.

Installing M.2 SSD

1. Loosen the M.2 riser screw from the motherboard.
2. Set the M.2 riser screw at the appropriate location based on the length of your M.2 SSD.
3. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.
4. Secure the M.2 SSD in place with the supplied M.2 screw.



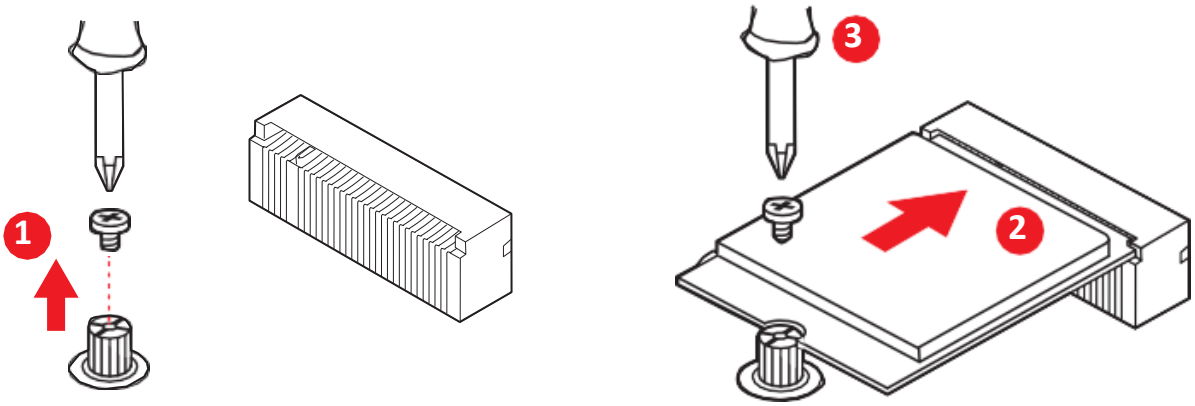
Expansion Slots



Expansion Slots

M2_B1: M.2 Slot (B Key, 2242, 3042, 2280)

Please install the module card into the M.2 slot as shown below.



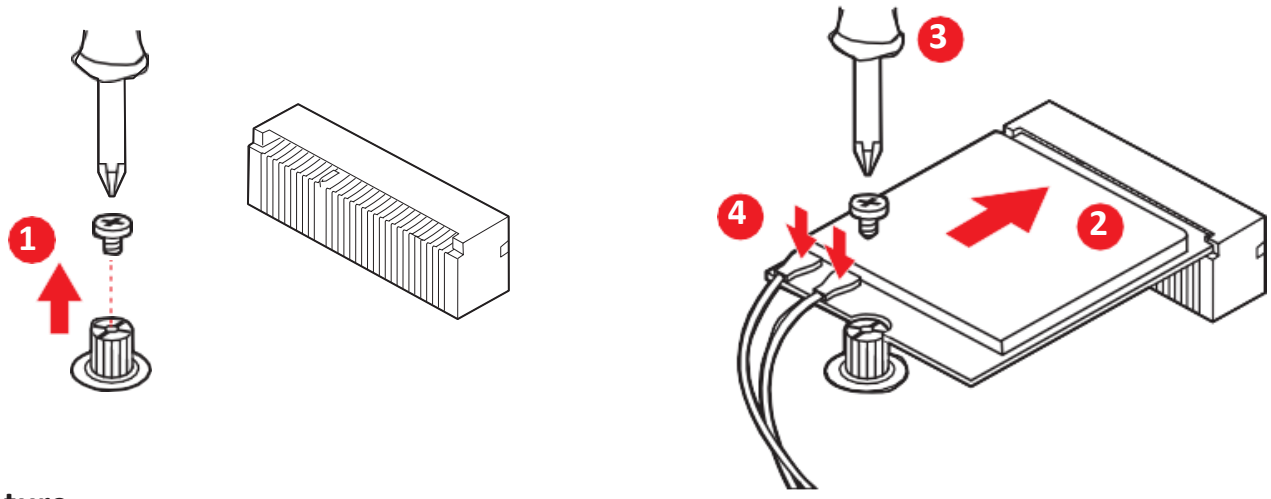
Feature

- Supports PCIe x1 signal.
- Supports B + M key PCIe x1 module.

M2_E1: M.2 Slot (E Key, 2230)

Please install the Wi-Fi/ Bluetooch card into the M.2 slot as shown below.

.



Feature

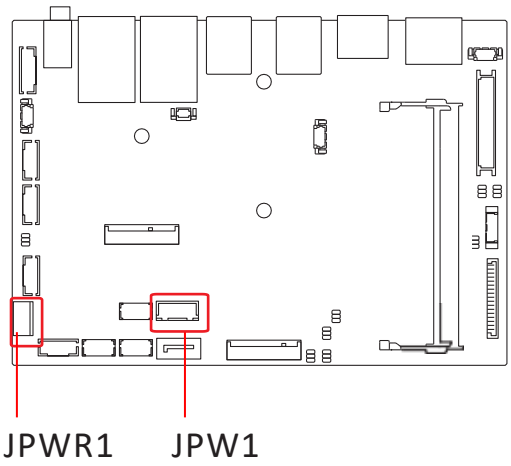
- Supports PCIe x1 & USB 2.0 signal.
- Supports Intel® Wi-Fi 6E AX210 + BT 5.2 wireless card.

⚠ Important

When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

Connectors

Power Connectors



JPWR1: 4-Pin DC-In Main Power Connector

This connector allows you to connect an power supply.

JPWR1 (1 – 4)	1	DC-IN	2	DC-IN
	3	GND	4	GND

JPW1: 4-Pin SATA Power Connector

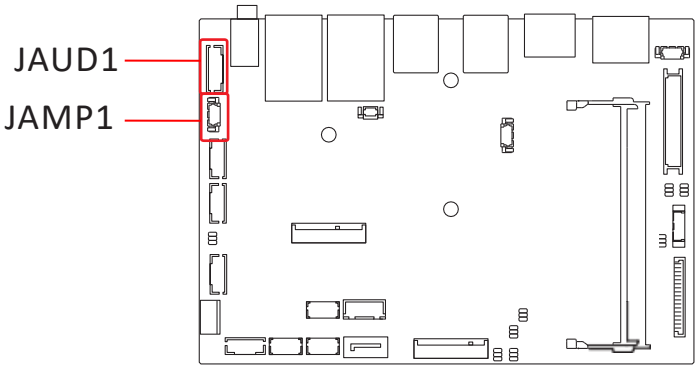
This connector is used to provide power to SATA devices.

JPW1 (1 – 4)	1	5V	2	GND
	3	GND	4	12V

Important

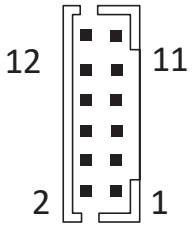
Make sure that all the power cables are securely connected to a proper power supply to ensure stable operation of the system.

Audio Connectors



JAUD1: Front Audio Header

This connector allows you to connect front panel audio.

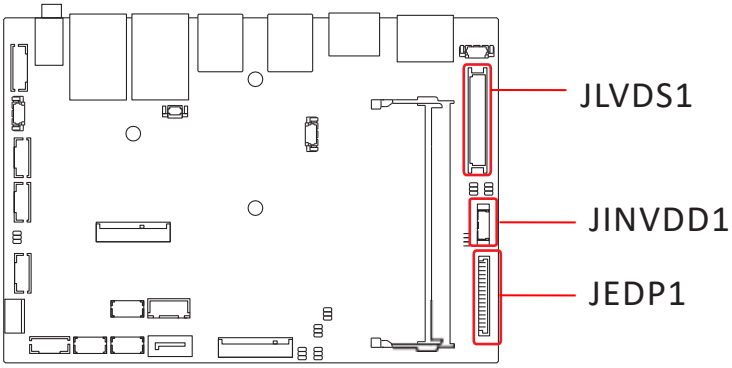
JAUD1 	1	LINE_IN_RA	2	MIC1_RA
	3	LINE_IN_LA	4	MIC1_LA
	5	LOUT_RA	6	MIC1_JD
	7	LOUT_LA	8	LINE_IN_JD
	9	FRONT_JD	10	GND
	11	GND	12	GND

JAMP1: Audio Amplifier Header

The connector is used to connect audio amplifiers to enhance audio performance..

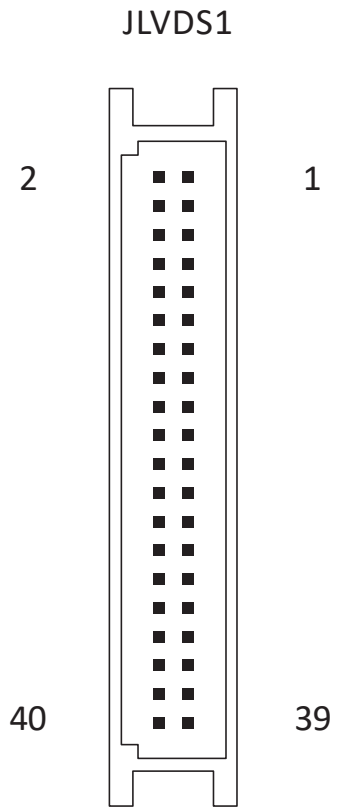
JAMP1	1	AMP_L-	2	AMP_L+
	3	AMP_R-	4	AMP_R+

Graphics Connectors



JLVDS1: LVDS Wafer Connector

This connector is designed for use with LVDS interface flat panels. When connecting your flat panel to this connector, be sure to check the panel datasheet to ensure that you set the LVDS power select jumper (JVDD1) to the appropriate power voltage.



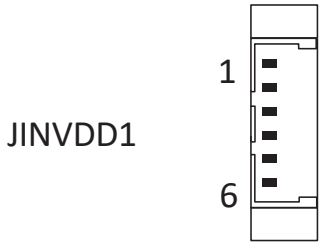
1	12V	2	12V
3	LCD_VDD	4	12V
5	LCD_VDD	6	LCD_VDD
7	DDC_CLK	8	DDC_DATA
9	L_BKLT_CTRL#	10	LCDEN
11	INV_ON	12	LVDS_DETECT#_C
13	LVDSA_DATA1	14	LVDSA_DATA0
15	LVDSA_DATA#1	16	LVDSA_DATA#0
17	GND	18	GND
19	LVDSA_DATA3	20	LVDSA_DATA2
21	LVDSA_DATA#3	22	LVDSA_DATA#2
23	GND	24	GND
25	LVDSB_DATA1	26	LVDSB_DATA0
27	LVDSB_DATA#1	28	LVDSB_DATA#0
29	GND	30	GND
31	LVDSB_DATA3	32	LVDSB_DATA2
33	LVDSB_DATA#3	34	LVDSB_DATA#2
35	GND	36	GND
37	LVDSB_CLK	38	LVDSA_CLK
39	LVDSB_CLK#	40	LVDSA_CLK#

Important

Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

JINVDD1: LVDS Inverter Box Header

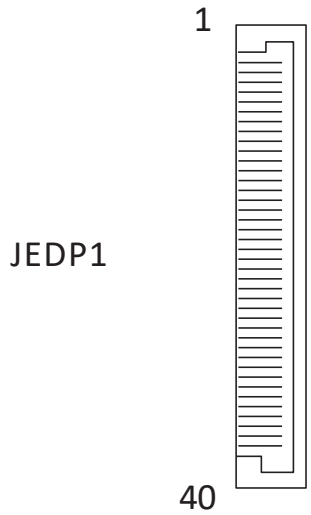
The connector is provided for LCD backlight options, be sure to check the panel datasheet to ensure that you set the LVDS Inverter Power Select Jumper (JINV1) to the appropriate power voltage (5V/12V).



1	5V/12V	2	5V/12V
3	BKLT_EN	4	BKLT_CTRL
5	GND	6	GND

JEDP1: eDP Connector

This connector is designed for use with eDP interface flat panels. When connecting your flat panel to this connector, be sure to check the panel datasheet to ensure that you set the eDP power select jumper (JEDP_VDD1) to the appropriate power voltage.

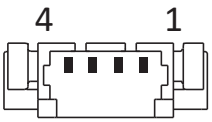


1	LCD_VDD1	2	LCD_VDD1
3	LCD_VDD1	4	LCD_VDD1
5	LCD_VDD1	6	VCC3
7	SMB_CLK	8	SMB_DATA
9	GND	10	HPD
11	N/C	12	N/C
13	GND	14	DPC_LINE3_DN
15	DPC_LINE3_DP	16	GND
17	DPC_LINE2_DN	18	DPC_LINE2_DP
19	GND	20	DPC_LINE1_DN
21	DPC_LINE1_DP	22	GND
23	DPC_LINE0_DN	24	DPC_LINE0_DP
25	GND	26	DSP_DDPC_AUXP
27	DSP_DDPC_AUXN	28	GND
29	VCC3	30	GND
31	+12V	32	GND
33	GND	34	VCC5
35	GND	36	BKLTCTL
37	BKLT_EN	38	+12V
39	VCC3	40	GND

Other Connectors

SYSFAN1: PWM System Fan Box Header

The fan power connector supports system cooling fans with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND.

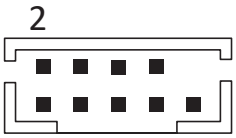
SYSFAN1 	1	GND	2	FAN POWER
	3	FAN SENSE	4	FAN_PWM

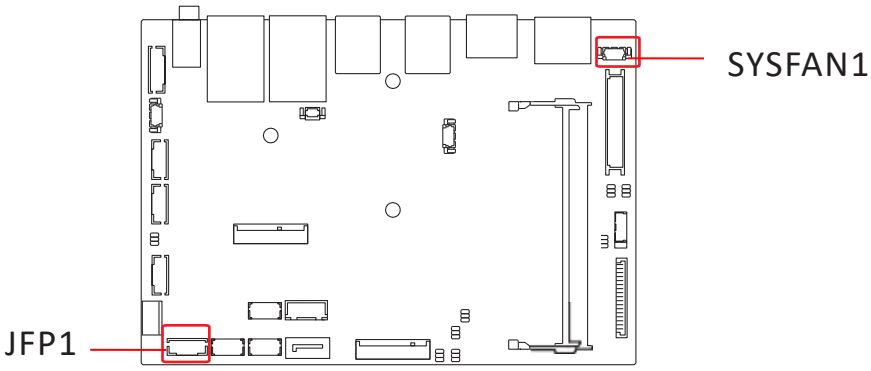
Important

Please refer to the recommended CPU fans at processor's official website or consult the vendors for proper CPU cooling fan.

JFP1: Front Panel Connector

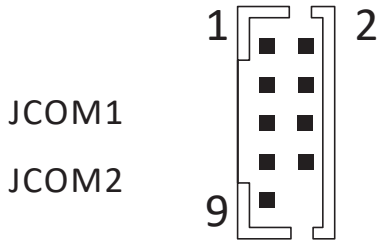
This front-panel connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.

JFP1 	1	HDD LED+	2	POWER LED
	3	HDD LED-	4	SUS LED
	5	GND	6	POWER SWITCH+
	7	RESET SWITCH+	8	POWER SWITCH-
	9	NC	10	No pin

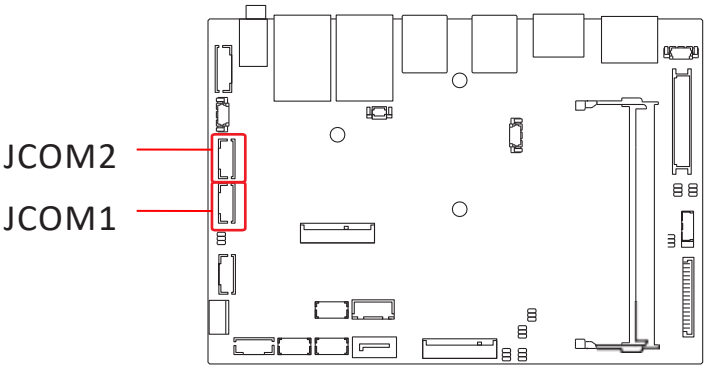


JCOM1, JCOM2: COM Port Box Headers

This connector is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. You can attach a serial device to it.



1	DCD#	2	SIN
3	SOUT	4	DTR
5	GND	6	DSR#
7	RTS	8	CTS#
9	VCC_COM (**JCOM1**) NC (**JCOM2**)	10	No pin



- **JCOM1**
  - Supports RS-232/422/485
  - With 0V/5V/12V
- **JCOM2**
  - Supports RS-232

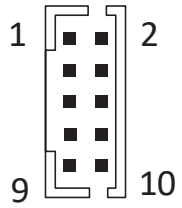
RS232		
PIN	**SIGNAL**	**DESCRIPTION**
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	VCC_COM/ NC	VCC_COM/ No Connection
10	No Pin	No Pin

RS422		
PIN	**SIGNAL**	**DESCRIPTION**
1	422 TXD-	Transmit Data, Negative
2	422 TXD+	Receive Data, Positive
3	422 RXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	NC	No Connection

RS485		
PIN	**SIGNAL**	**DESCRIPTION**
1	TXD-	Transmit Data, Negative
2	TXD+	Transmit Data, Positive
3	NC	No Connection
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	NC	No Connection

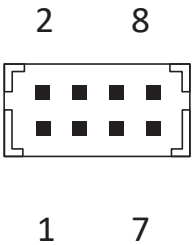
JGPIO1: GPIO (DIO) Box Header

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.

JGPIO1 	1	GND	2	VCC5
	3	GPO0	4	GPI0
	5	GPO1	6	GPI1
	7	GPO2	8	GPI2
	9	GPO3	10	GPI3

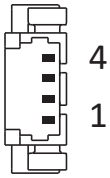
JUSB1~3: USB 2.0 Box Headers

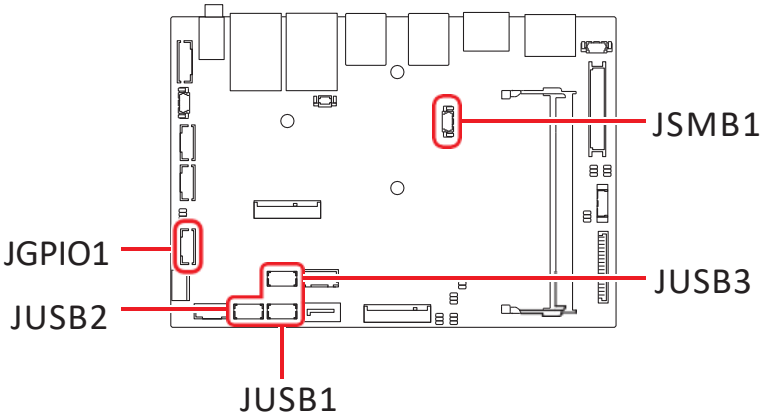
These connectors are ideal for connecting USB devices such as keyboard, mouse, or other USB-compatible devices.

JUSB1 JUSB2 JUSB3 	1	5V	2	GND
	3	USB_0-	4	USB_1+
	5	USB_0+	6	USB_1-
	7	GND	8	5V

JSMB1: SMBus Box Header

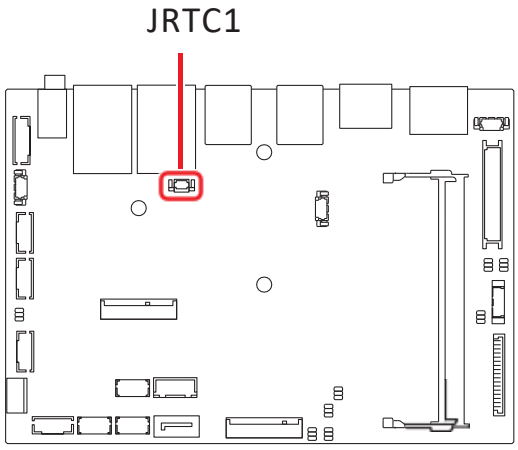
This connector, known as I2C, is for users to connect System Management Bus (SMBus) interface.

JSMB1 	1	5VSB	2	SMBCLK
	3	SMBDATA	4	GND



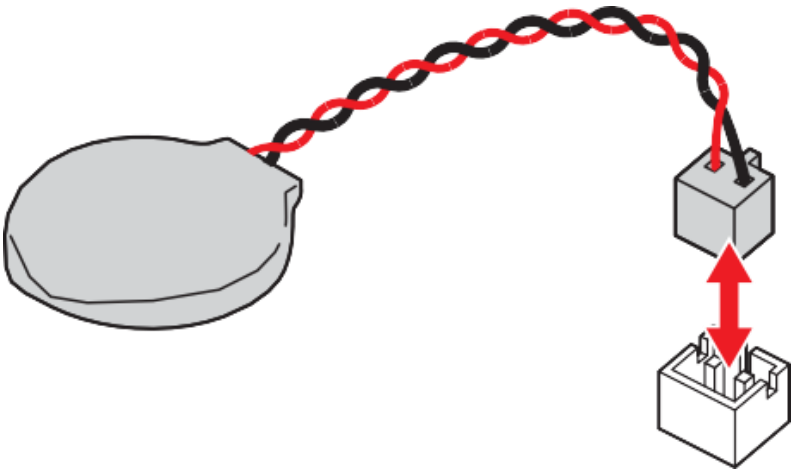
JRTC1: CMOS Battery Header

If the CMOS battery is out of charge, the time in the BIOS will be reset and the data of system configuration will be lost. In this case, you need to replace the CMOS battery.



Replacing CMOS battery

- Unplug the battery wire from the JRTC1 connector and remove the battery.
- Connect the new CR2032 battery with wire to the JRTC1 connector.



WARNING

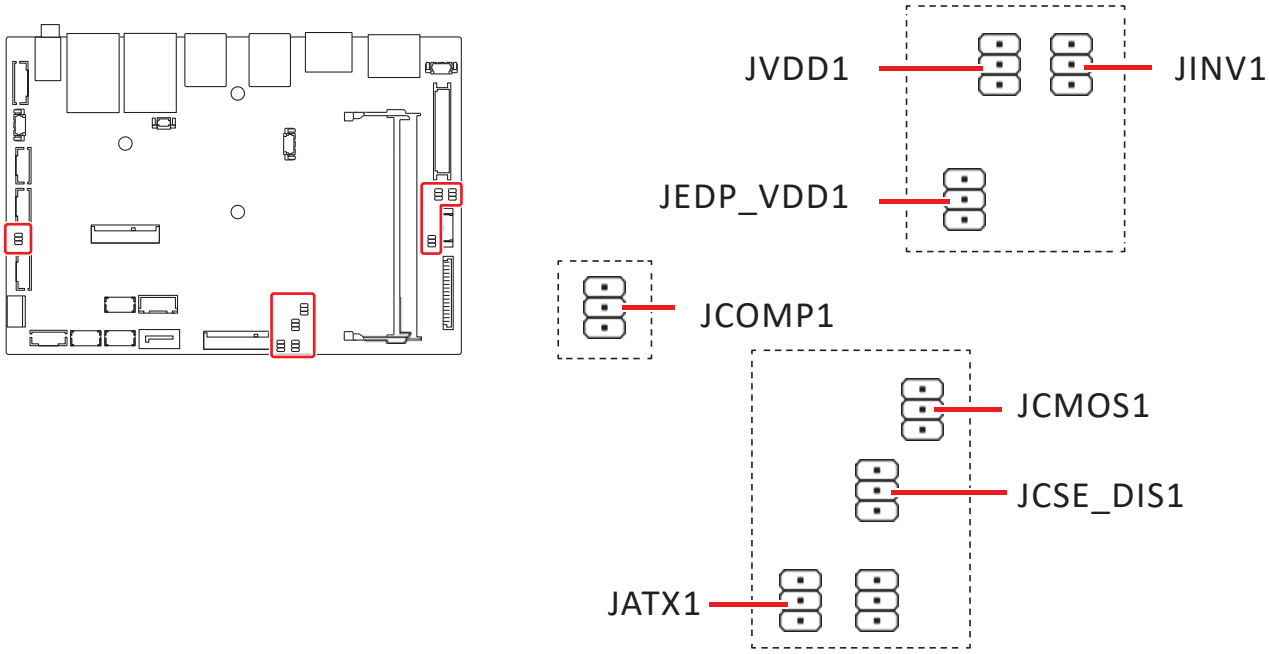
KEEP OUT OF REACH OF CHILDREN

- Swallowing can lead to chemical burns, perforation of soft tissue, can death.
- Severe burns can occur within 2 hours of ingestion.
- If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

Jumpers

Important

Avoid adjusting jumpers when the system is on; it will damage the motherboard.



Jumper Name	Default Setting	Description
JCOMP1	1	**COM Power Select Jumper** 1-2:5V Power (Default) 2-3:12V Power
JCMOS1	1	**Clear CMOS Jumper** 1-2: Normal (Default) 2-3:Clear CMOS
JCSE_DIS1	1	**CSE Jumper** 1-2: Normal (Default) 2-3:ME disable
JATX1	1	**AT/ ATX Mode Select Jumper** 1-2:ATX (Default) 2-3:AT
JVDD1	1	**LVDS Power Select Jumper** 1-2:3V (Default) 2-3:5V

Jumper Name	Default Setting	Description
JINV1	1	**LVDS Inverter Power Select Jumper** 1-2: 5V (Default) 2-3: 12V
JEDP_VDD1	1	**eDP Power Select Jumper** 1-2: 5V 2-3: 3V (Default)

Chapter 3

System Setup

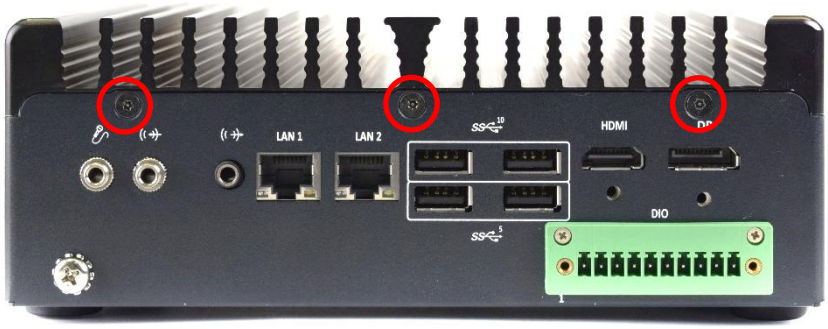
3.1 Set torque force to 3.5 kgf-cm to screw or unscrew system parts.

3.2 Before installing the system, separate the top and the bottom covers

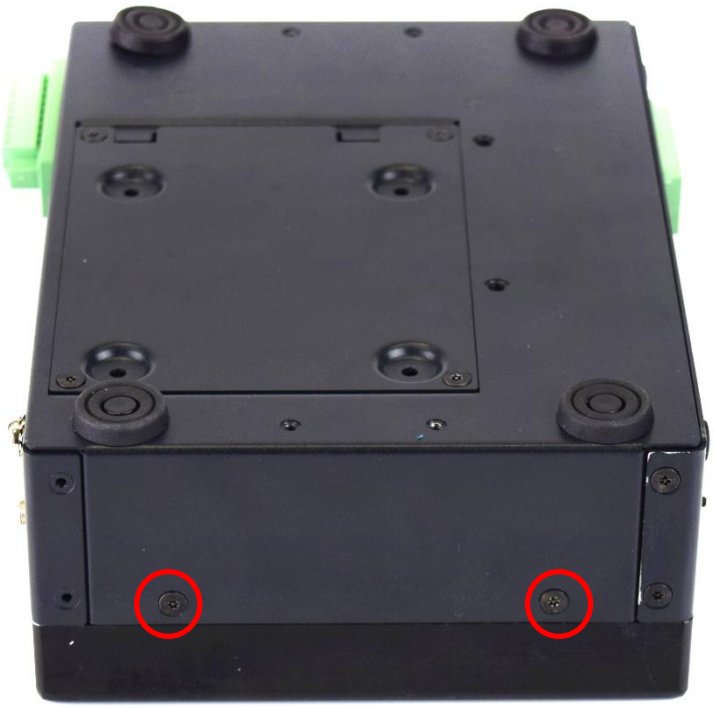
WARNING

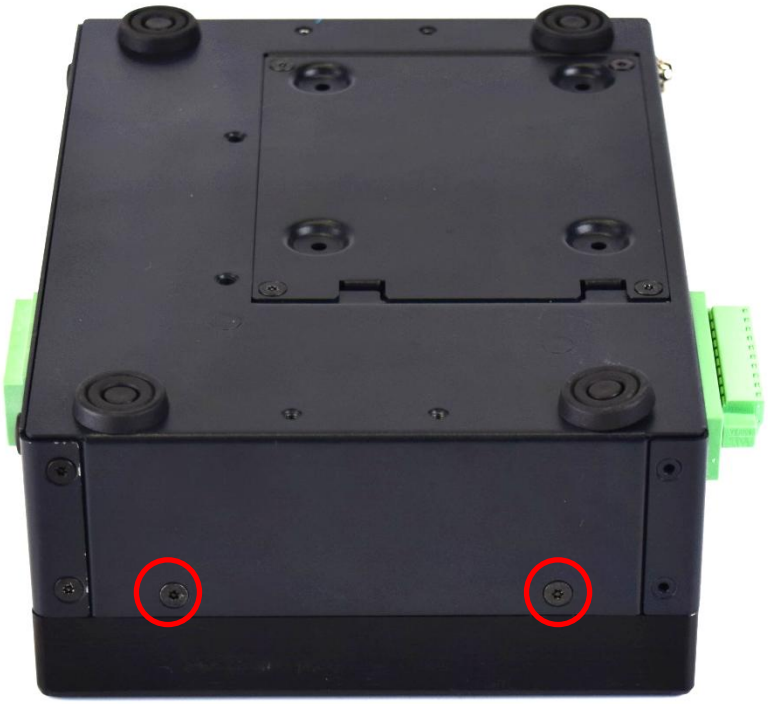
To ensure safety and prevent system damage, before disassembly, please switch off the system and disconnect the unit from its power source.

1. Remove the 3 screws on the front and rear side of the system as highlighted in the pictures below.

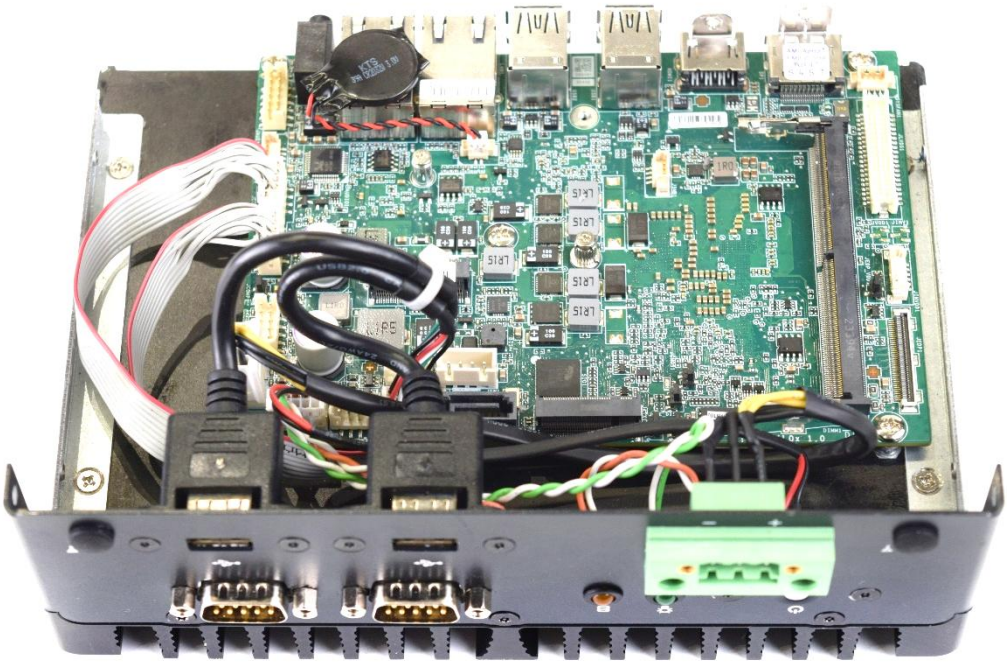


2. Remove the 2 screws on the left and right side of the system as highlighted in the pictures below



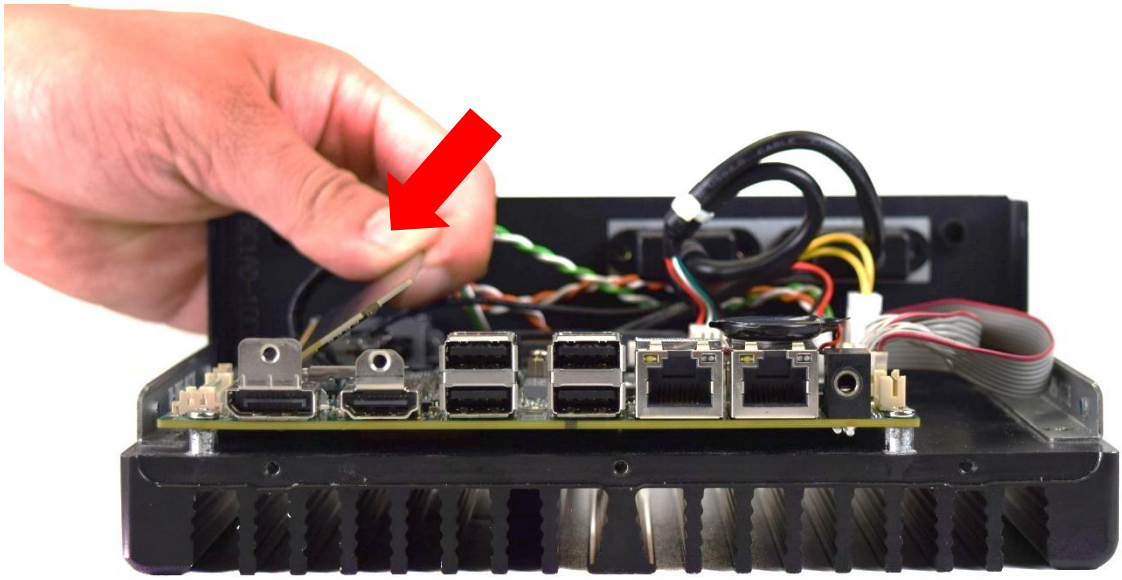


3. After opening the bottom cover, remove the top and bottom cable covers to facilitate the installation of hard drives and memory.

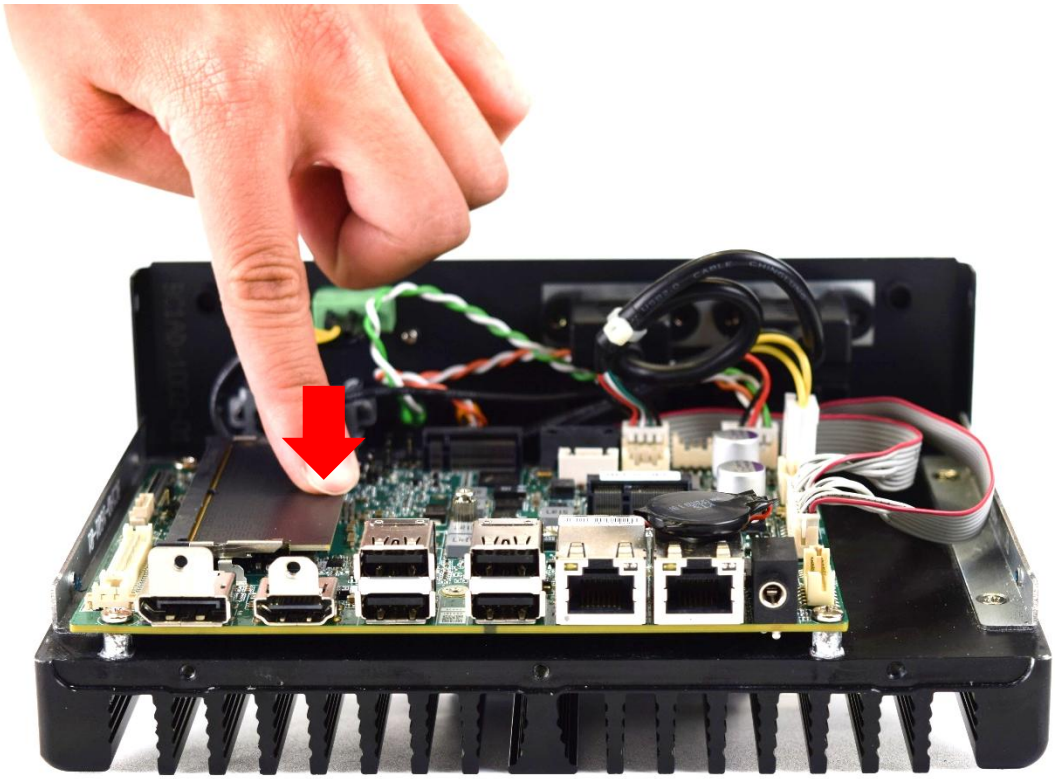


3.3 Install RAM

1. Insert at 45 degree angle

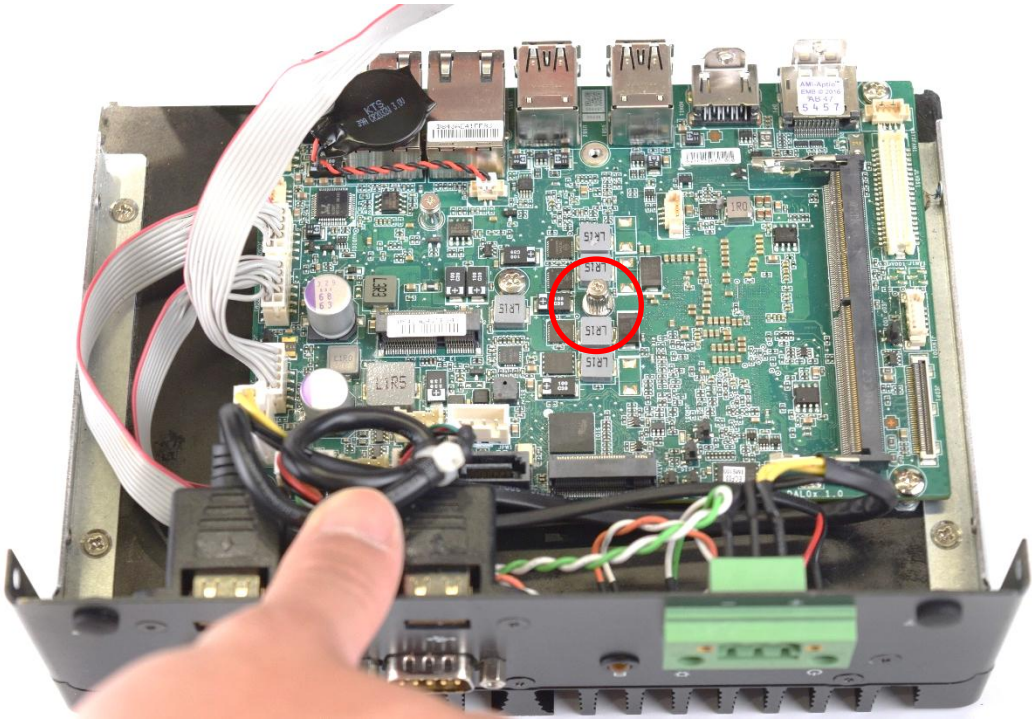


2. Press down lightly

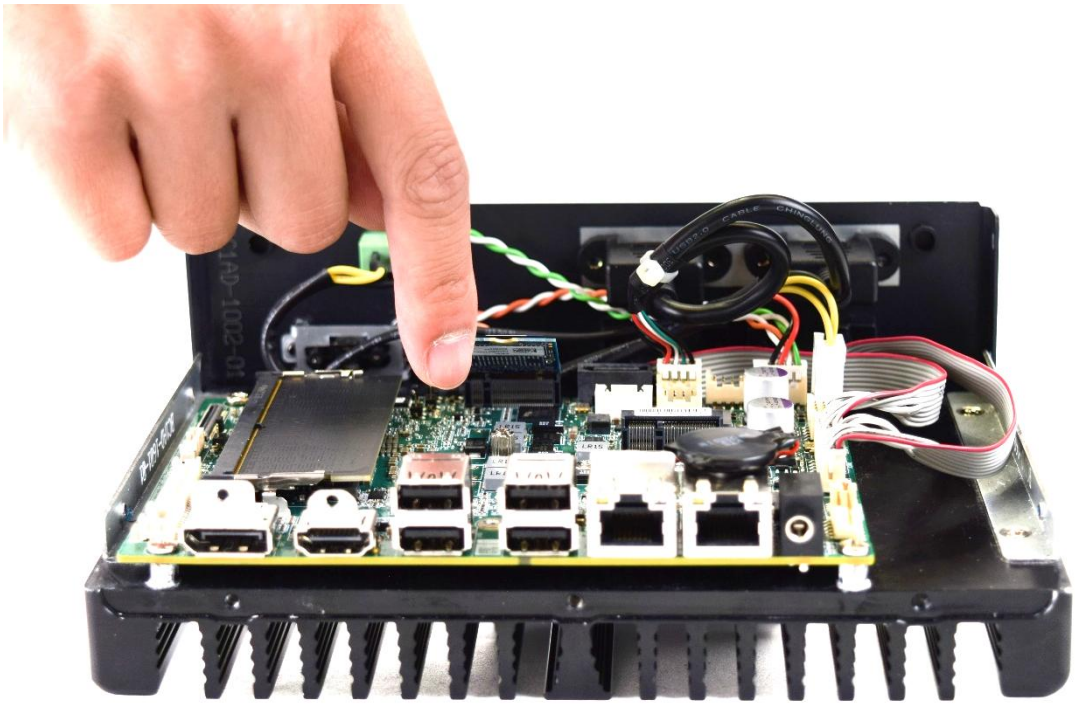


3.4 Install M.2

1. Loosen the screw



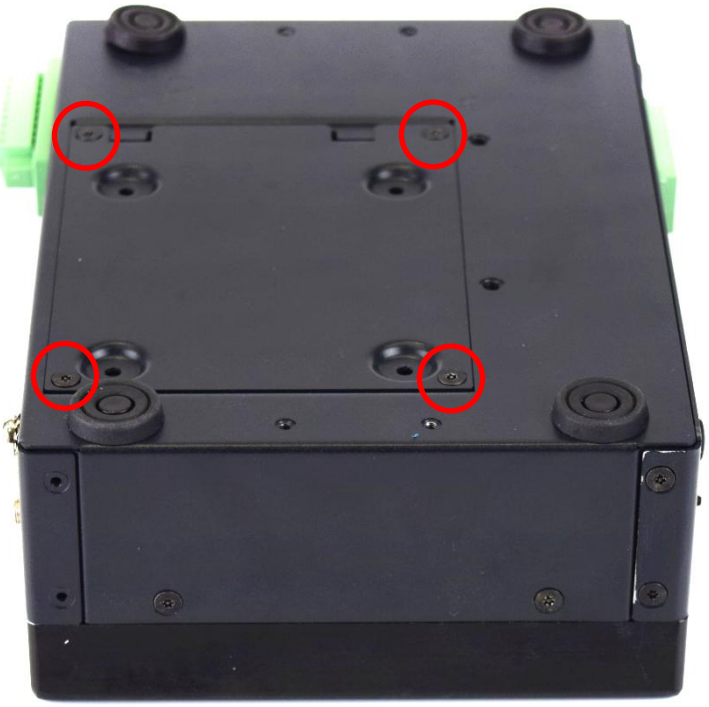
2. Insert M.2 at 45 degree angle



3. After pressing M.2, lock the screw

3.5 Install 2.5-inch hard drive

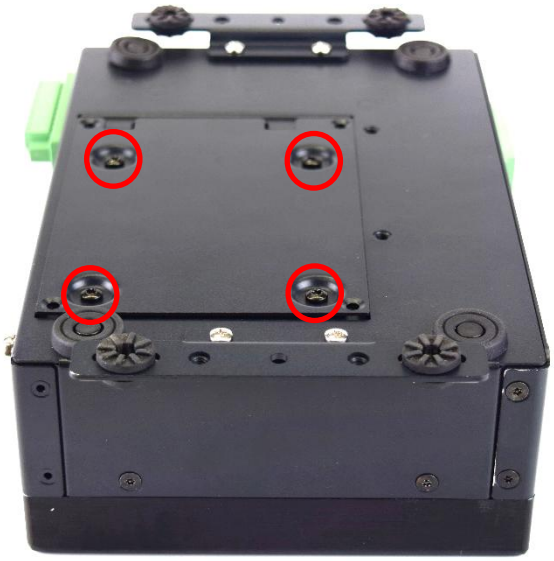
1. Remove the screws

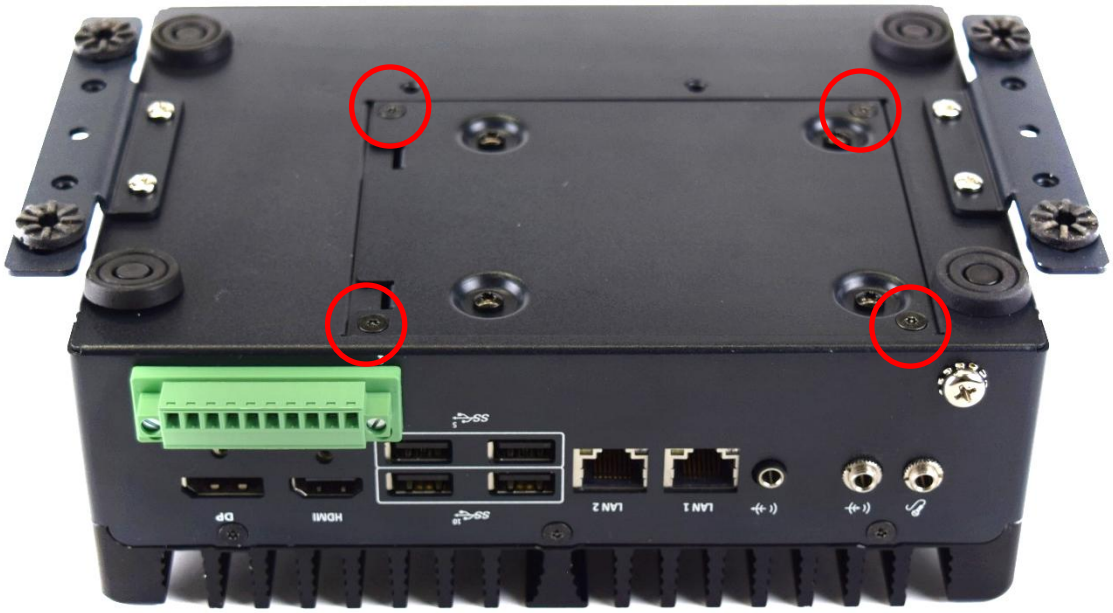


2. Open the lid

3. Install the 2.5-inch hard drive

4. Lock the screws

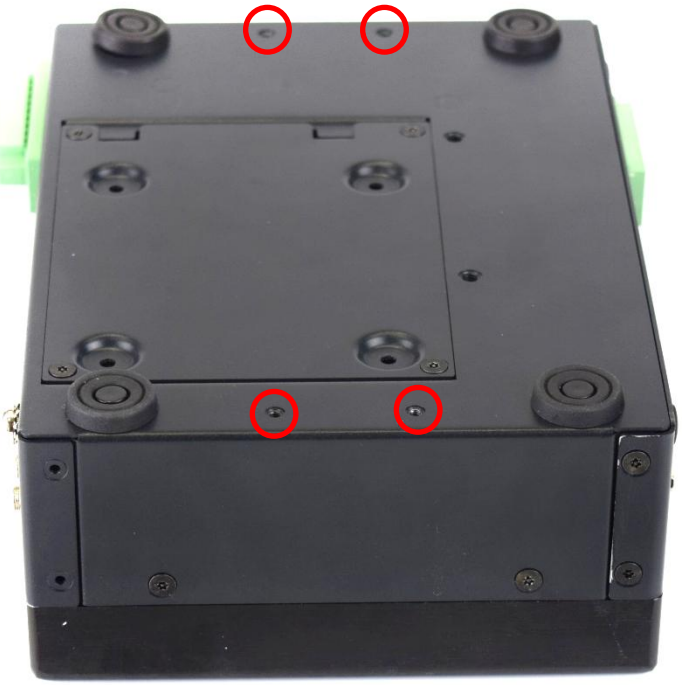




3.6 Installing wall mount kit

1. Wall mount kit is available for BCO-1000-ADLN included in the standard package.

2. Place the system upside down so you can see the bottom cover. The highlighted screw holes below will be used.

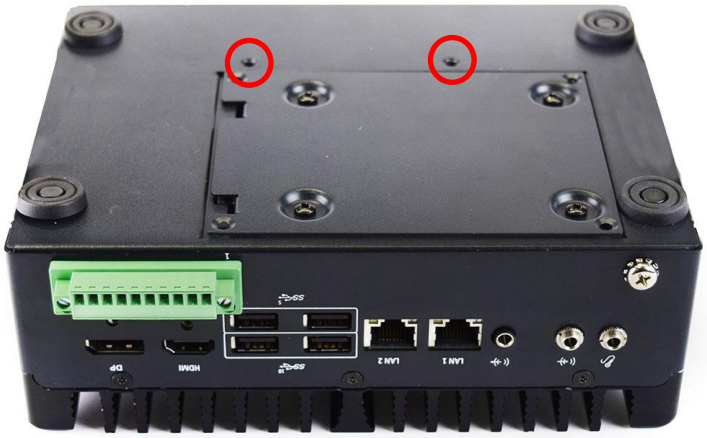


3. Lock the wall mount kit with eight screws (M3x5L, Nylok).

3.7 Installing DIN rail holder

1. Din rail holder is available for BCO-1000-ADLN series as optional accessories.

2. Place the system upside down so you can see the bottom cover. The highlighted screw holes below will be used.



3. Place the din rail holder on top of the bottom cover and lock it with two screws (M4x5L, Nylok).

Chapter 4

BIOS Setup

4.1 BIOS Setup

This chapter provides information on the BIOS Setup program and allows users to configure the system for optimal use.

Users may need to run the Setup program when:

- An error message appears on the screen at system startup and requests users to run SETUP.
- Users want to change the default settings for customized features.

Important

- Please note that BIOS update assumes technician-level experience.
- As the system BIOS is under continuous update for better system performance, the illustrations in this chapter should be held for reference only.

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <DEL> or <F2> key to enter Setup, **<F11>** key to Boot Menu, **<F12>** key to PXE Boot.

Press <DEL> or <F2> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it **OFF** and **On** or pressing the **RESET** button. You may also restart the system by simultaneously pressing **<Ctrl>, <Alt>, and <Delete>** keys.

Important

The items under each BIOS category described in this chapter are under continuous update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be held for reference only.

BIOS Introduction

Control Keys

? ?	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Value
Esc	Exit
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Reset*
F12	Screenshot capture
<K>	Scroll help area upwards
<M>	Scroll help area downwards

* When you press **<F10>**, a confirmation window appears and it provides the modification information. Select between **Yes** or **No** to confirm your choice.

Getting Help

Upon entering setup, you will see the Main Menu.

Main Menu

The main menu lists the setup functions you can make changes to. You can use the **arrow keys (↑↓)** to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

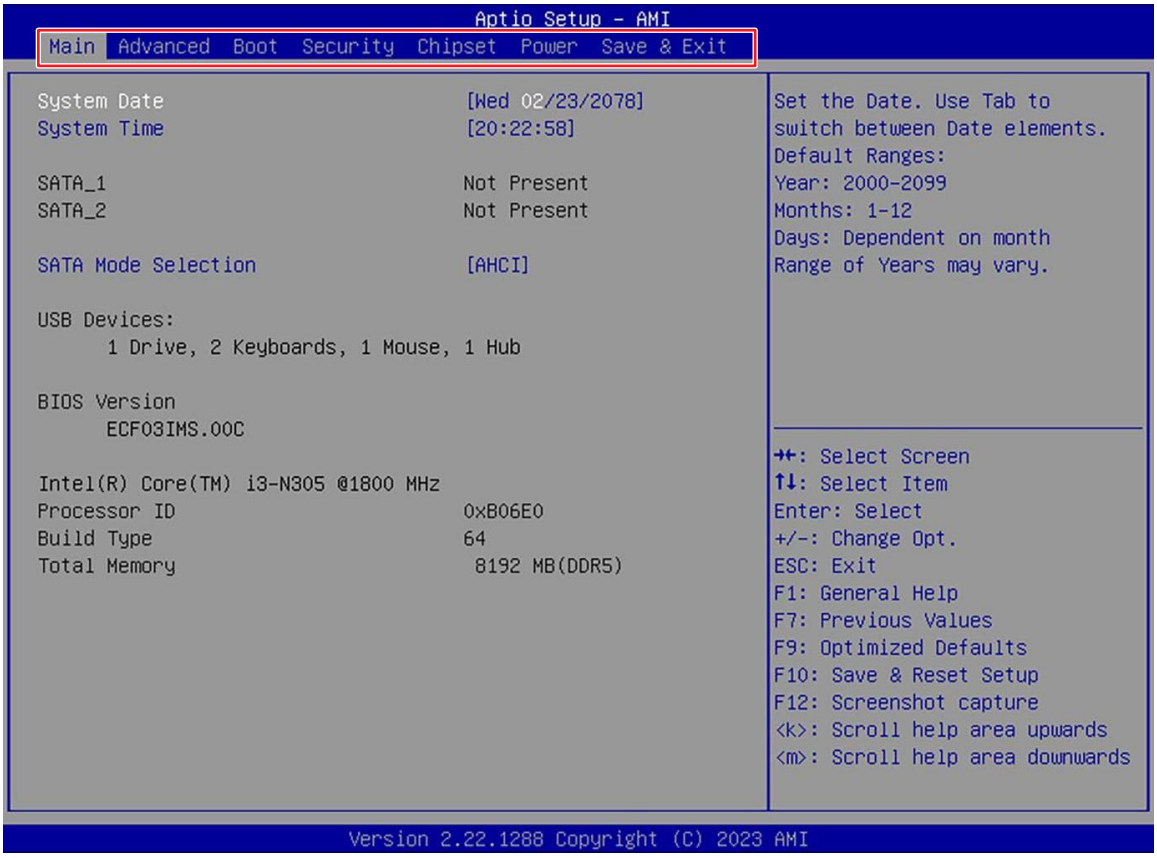
Sub-Menu

If you find a right pointer symbol appears to the left of certain fields that means a sub-menu can be launched from this field. A sub-menu contains additional options for a field parameter. You can use **arrow keys (↑↓)** to highlight the field and press **<Enter>** to call up the sub-menu. Then you can use the **control keys** to enter values and move from field to field within a sub-menu. If you want to return to the main menu, just press the **<Esc>.**

General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing **<F1>**. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press **<Esc>** to exit the Help screen.

4.2 The Menu Bar



▶ Main

Use this menu for basic system configurations, such as time, date, etc.

▶ Advanced

Use this menu to set up the items of special enhanced features.

▶ Boot

Use this menu to specify the priority of boot devices.

▶ Security

Use this menu to set supervisor and user passwords.

▶ Chipset

This menu controls the advanced features of the on-board chipsets.

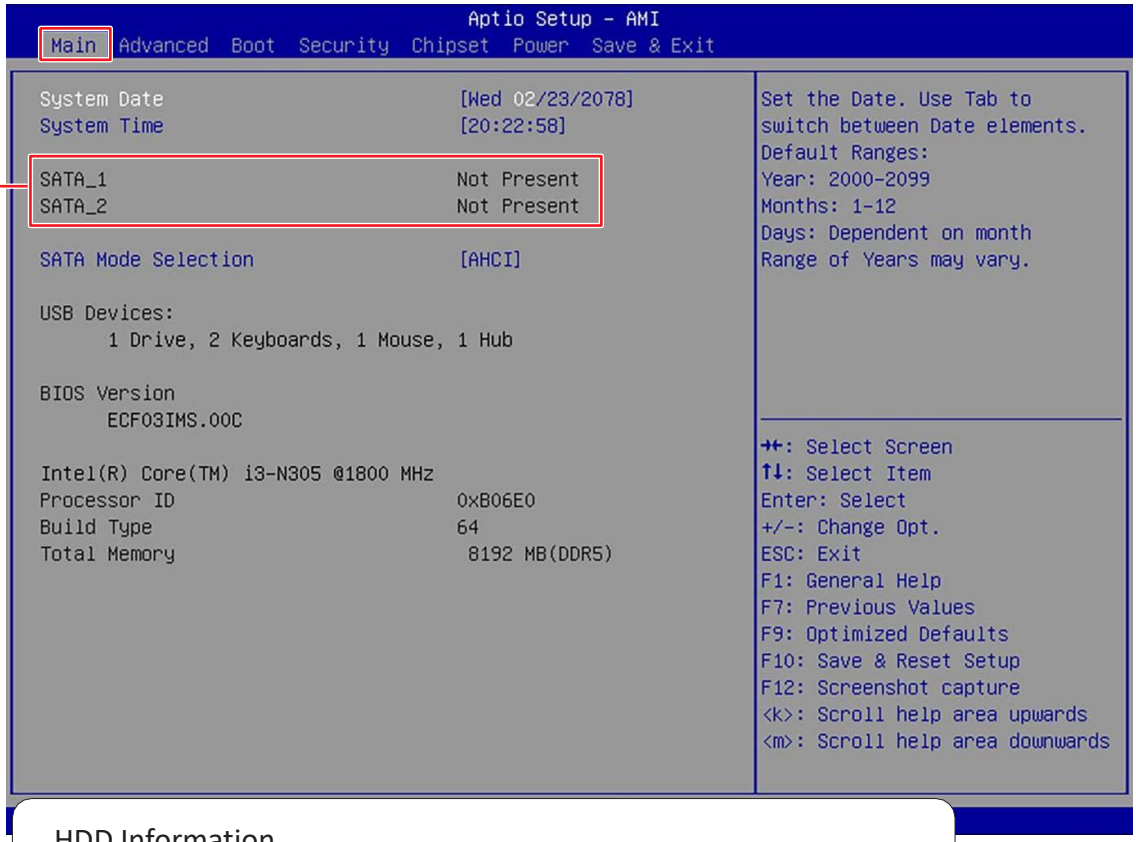
▶ Power

Use this menu to specify your settings for power management.

▶ Save & Exit

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes.

4.2.1 Menu



HDD Information

- RAID (VMD) Disabled: Display HDD information as plugging in status.
- RAID (VMD) Enabled: Display "Empty" only.
  *SATA_2 is for M.2 B key (SATA signal)

▶ System Date

This setting allows you to set the system date. Use <Tab> key to switch between date elements.

Format: <Day> <Month> <Date> <Year>.

▶ System Time

This setting allows you to set the system time. Use <Tab> key to switch between time elements.

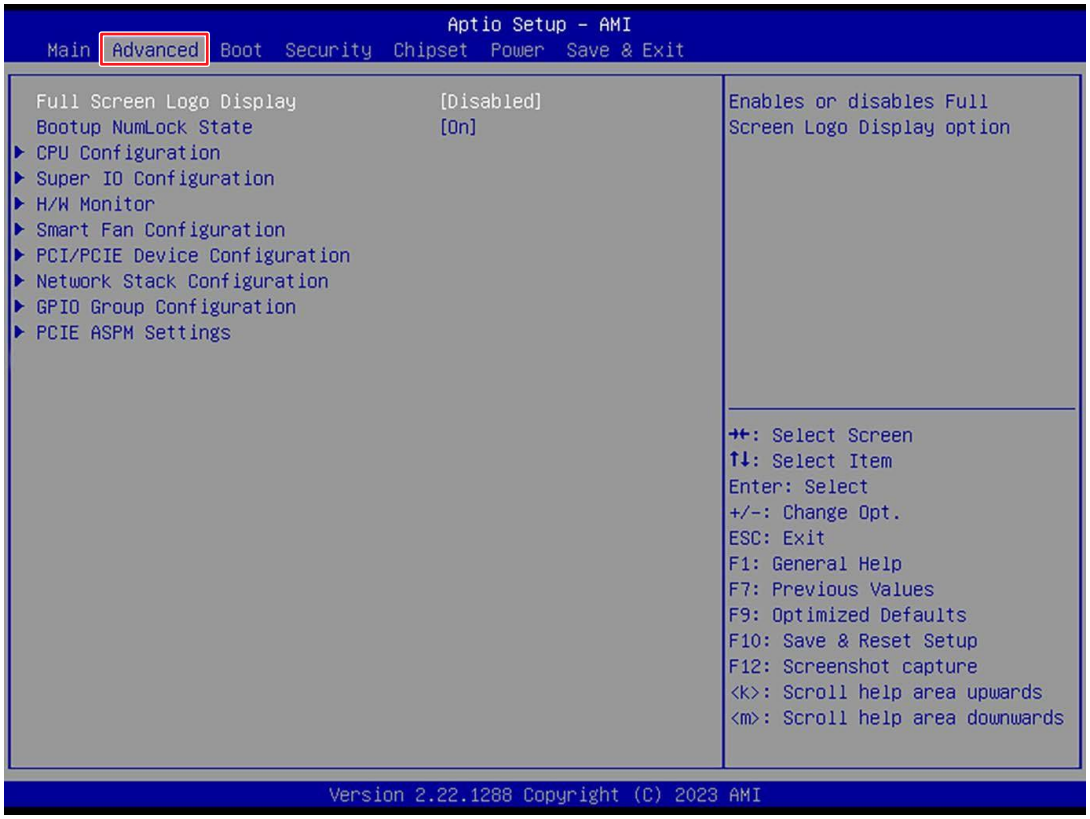
Format: <Hour> <Minute> <Second>.

▶ SATA Mode Selection

This setting specifies SATA controller mode.

[AHCI]	AHCI (Advanced Host Controller Interface), is a technical standard for an interface that allows the software to communicate with Serial ATA (SATA) devices. It offers advanced SATA features such as Native Command Queuing (NCQ) and hot-plugging.
[RAID]	RAID (Redundant Array of Independent Disks) is a virtual disk storage technology that combines multiple physical disks into one unit for data redundancy, performance improvement, or both.

4.2.2 Advanced



▶ Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

[Enabled]	BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.
[Disabled]	BIOS will display the normal POST messages, instead of the full- screen logo.

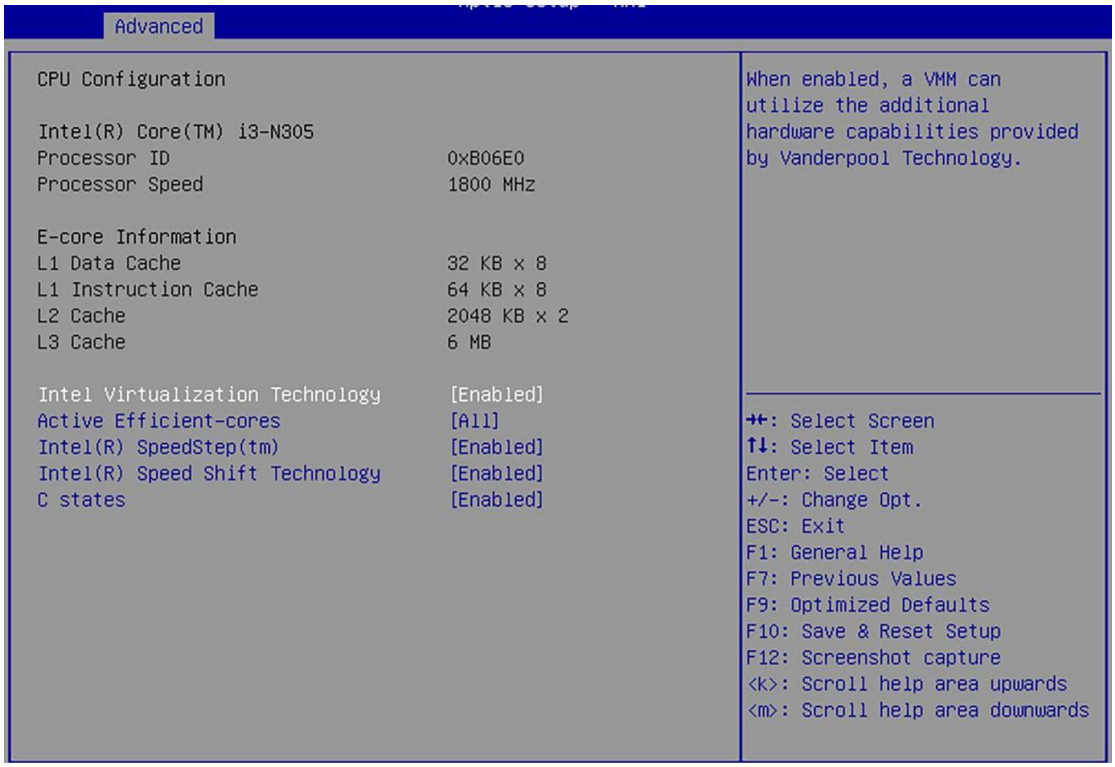
Please note that enabling this BIOS feature often adds 2-3 seconds to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended to disable this BIOS feature for faster boot-up.

Bootup NumLock State

This setting is to set the state of the Num Lock key on the keyboard when the system is powered on.

[On]	Turn on the Num Lock key when the system is powered on.
[Off]	Allow users to use the arrow keys on the numeric keypad.

CPU Configuration



▶ Intel Virtualization Technology

Enables or disables Intel Virtualization technology.

[Enabled]	Enables Intel Virtualization technology and allows a platform to run multiple operating systems in independent partitions. The system can function as multiple systems virtually.
[Disabled]	Disables this function.

▶ Active Efficient-cores

Select the number of active Efficient-cores (E-cores).

▶ Intel(R) SpeedStep(TM)

Enhanced Intel SpeedStep® Technology enables the OS to control and activate performance states (P-States) of the processor.

[Enabled]	When enabled, Intel SpeedStep® technology is activated. This technology allows the processor to manage its power consumption via performance state (P-State) transitions.
[Disabled]	Disables this function.

▶ Intel(R) Speed Shift Technology

Intel® Speed Shift Technology is an energy-efficient method that allows frequency control by hardware rather than the OS.

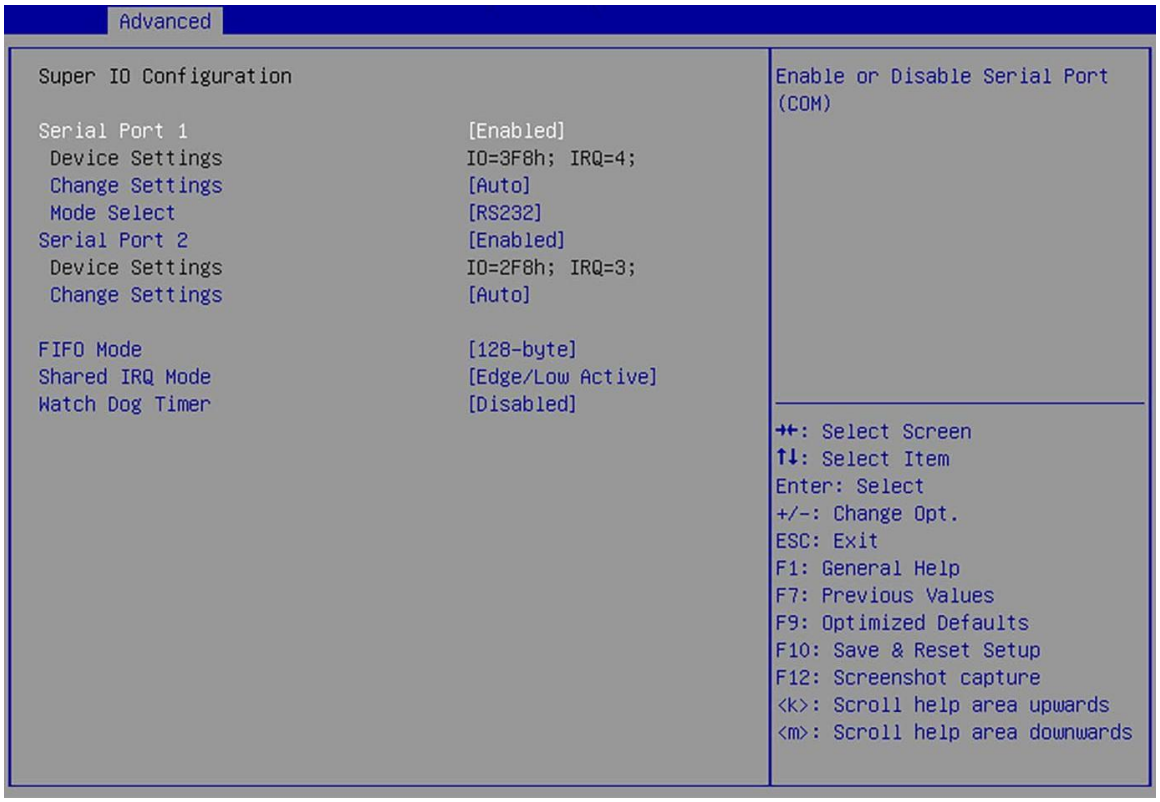
[Enabled]	When enabled, Intel® Speed Shift Technology is activated. The technology enables the management of processor power consumption via hardware performance state (P-State) transitions.
[Disabled]	Disable this function.

▶ C States

This setting controls the C-States (CPU Power states).

[Enabled]	Detects the idle state of system and reduce CPU power consumption accordingly.
[Disabled]	Disable this function.

Super IO Configuration



▶ Serial Port 1/ 2

This setting enables or disables the specified serial port.

» **Change Settings**

This setting is used to change the address & IRQ settings of the specified serial port.

» **Mode Select**

Select an operation mode for Serial Port 1/2.

▶ FIFO Mode

This setting controls the FIFO (First In First Out) data transfer mode.

▶ Shared IRQ Mode

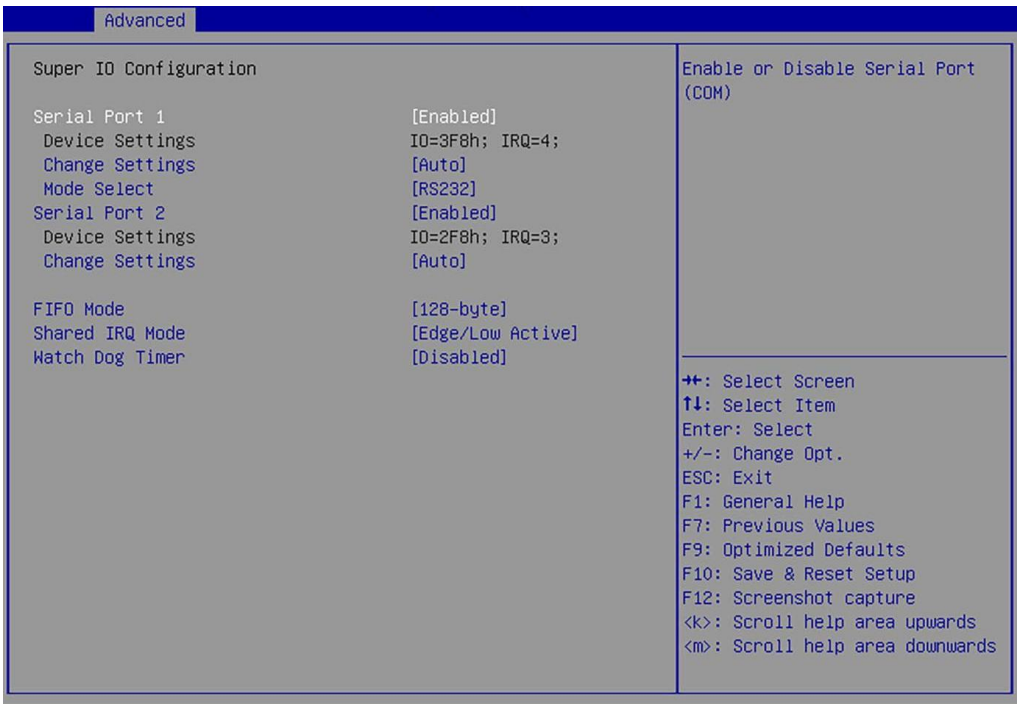
This setting provides the system with the ability to share interrupts among its serial ports.

▶ Watch Dog Timer

You can enable the system watchdog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watchdog polls it.

H/W Monitor (PC Health Status)

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.



▶ Thermal Shutdown

This setting determines the behavior of the system when the CPU temperature reaches a predefined threshold.

[Enabled]	Initiate an automatic shutdown of the system to protect from potential damage due to overheating.
[Disabled]	Disable this function.

▶ Smart Fan Configuration

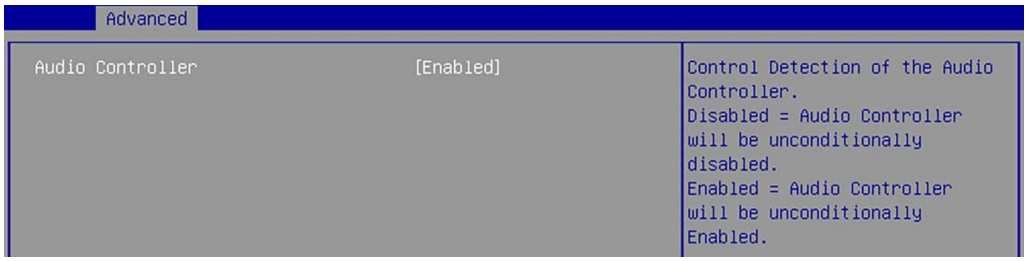
▶ SYSFAN

This setting enables or disables the Smart Fan function. Smart Fan is an excellent feature which will adjust the system fan speed automatically depending on the current system temperature, avoiding the overheating to damage your system. The following items will display when **SYSFAN** is enabled.

» **Min. Speed (%)**

The beginning speed of the System fan.

▶ PCI/PCIE Device Configuration

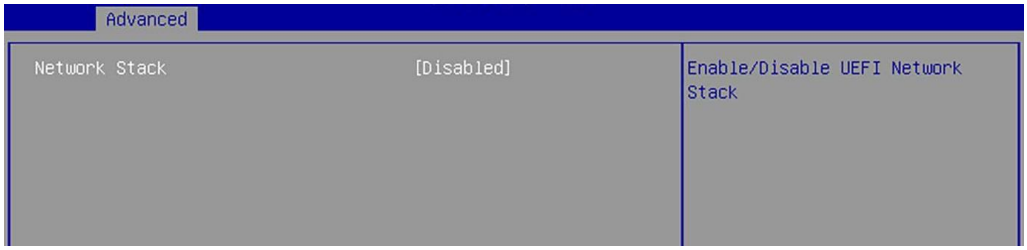


▶ Audio Controller

This setting enables or disables the detection of the onboard audio controller.

▶Network Stack Configuration

This menu provides Network Stack settings for users to enable network boot (PXE) from BIOS.



▶ Network Stack

This menu provides Network Stack settings for users to enable network boot (PXE) from BIOS. The following items will display when **Network Stak** is enabled.

» **IPV4 PXE Support**

Enables or disables IPv4 PXE boot support.

» **IPV4 HTTP Support**

Enables or disables Ipv4 HTTP Support.

» **IPV6 PXE Support**

Enables or disables Ipv6 PXE Support.

» **IPV6 HTTP Support**

Enables or disables Ipv6 HTTP Support.

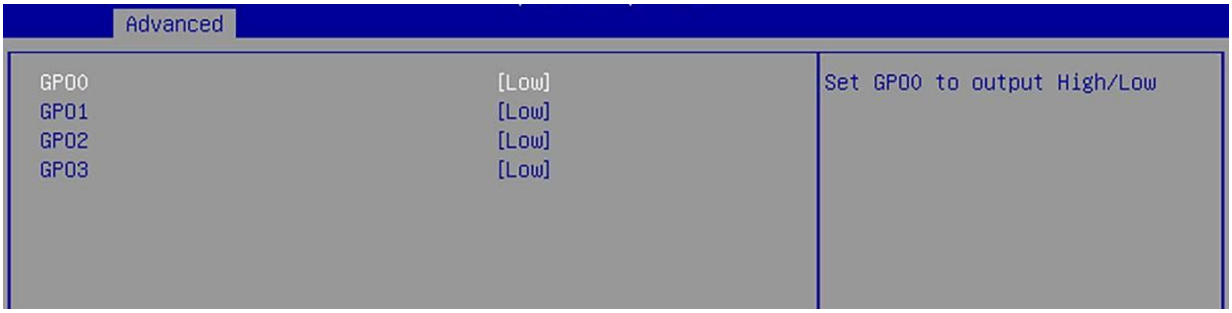
» **PXE boot wait time**

Use this option to specify the wait time to press the ESC key to abort the PXE boot. Press "+" or "-" on your keyboard to change the value. The default setting is 0.

» **Media detect count**

Use this option to specify the number of times media will be checked. Press "+" or "-" on your keyboard to change the value. The default setting is 1.

▶GPIO Group Configuration

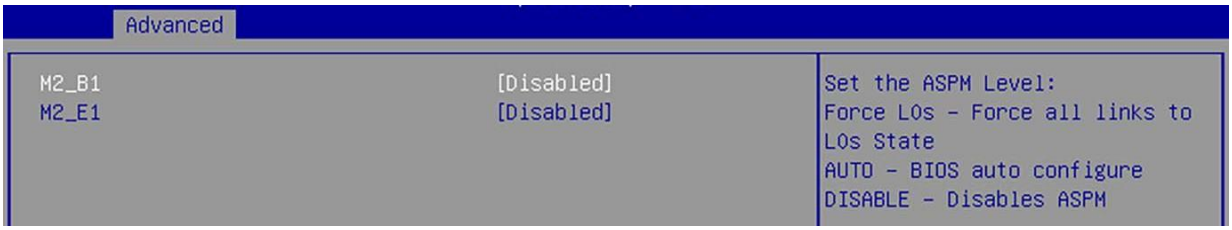


▶ GPO0 ~ GPO3

These settings control the operation mode of the specified GPIO.

▶ PCIE ASPM settings

This menu provide settings for PCIe ASPM (Active State Power Management) level for different installed devices.

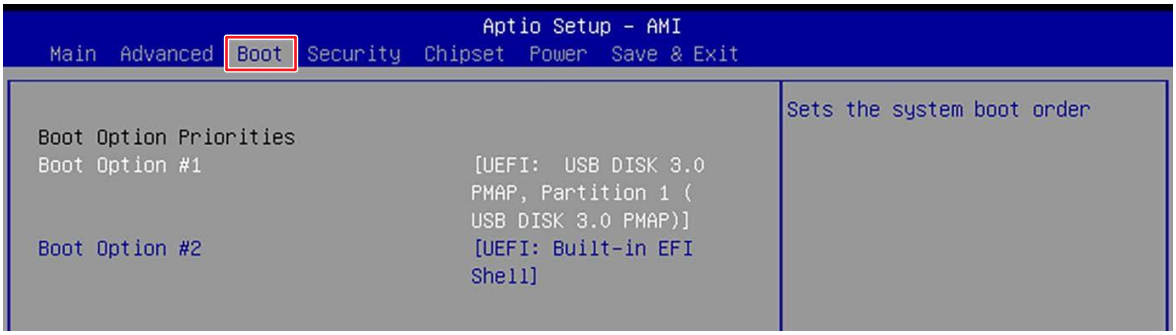


▶ M2_B1/ M2_E1

Sets PCI Express ASPM (Active State Power Management) state for power saving.

[L0s]	Initiate an automatic shutdown of the system to protect from potential damage due to overheating.
[L1]	Higher latency, lower power "standby" state **(optional)**.
[L0sL1]	Activate both L0s and L1 support.
[Disabled]	Disable this function.

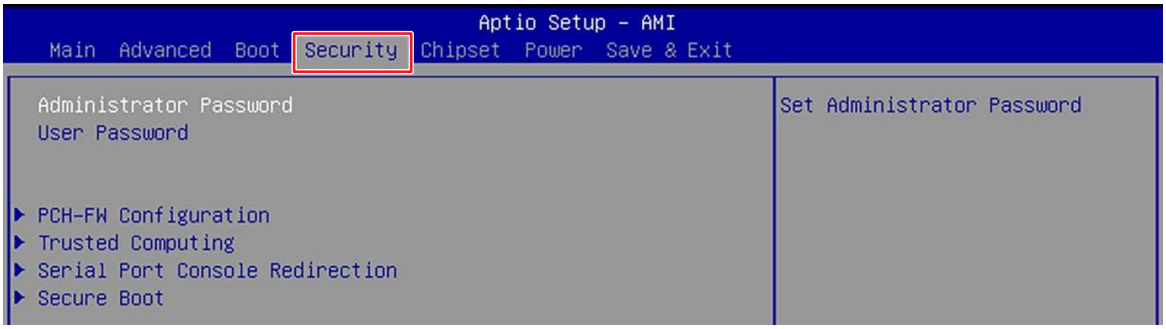
4.3 Boot



▶ Boot Option #1-2

This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

4.4 Security



▶ Administrator Password

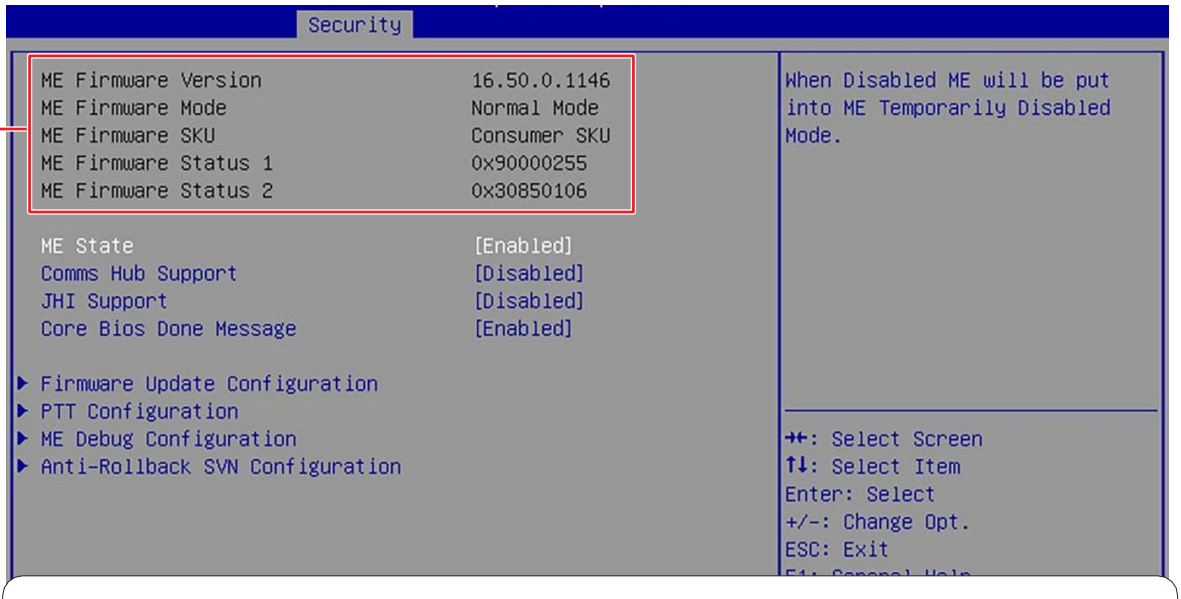
Administrator Password controls access to the BIOS Setup utility.

▶ User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

▶PCH-FW Configuration

This menu allows you to configure settings related to the PCH firmware.



Firmware Information

ME Firmware Version ME Firmware Mode ME Firmware SKU	System Integrity Value ME Firmware Status 1-2	These settings show the firmware information of the Intel ME (Management Engine).

▶ ME State

This menu controls the Intel® Management Engine State (ME state) parameters, which provides various management and security capabilities. The following items will display when **ME State** is enabled.

▶ Comms Hub Support

Enables or disables the communications hub support.

▶ JHI Support

Enables or disables JHI Support. JHI stands for Intel® Dynamic Application Loader Host Interface Service (Intel® DAL HIS) and is the engineering name for this feature. Enabling JHI Support in the BIOS settings allows the system to utilize this interface for communication between trusted applications and host- based applications.

▶ Core BIOS Done Message

Enables or disables Core BIOS Done Message sent to ME.

▶ Firmware Update Configuration

This menu will display when **ME State** is enabled.

» ME FW Image Re-Flash

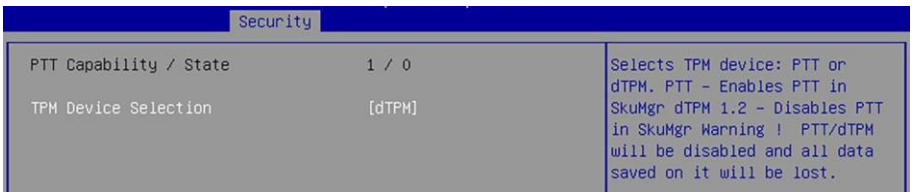
Enables or disables the ME Firmware Image Re-flashing.

» Local FW Update

Enables or disables the capability to perform a firmware update of the ME locally.

▶ PTT Configuration

Intel® Platform Trust Technology (PTT) is a platform functionality for credential storage and key management used by Microsoft Windows. This menu will display when **ME State** is enabled.



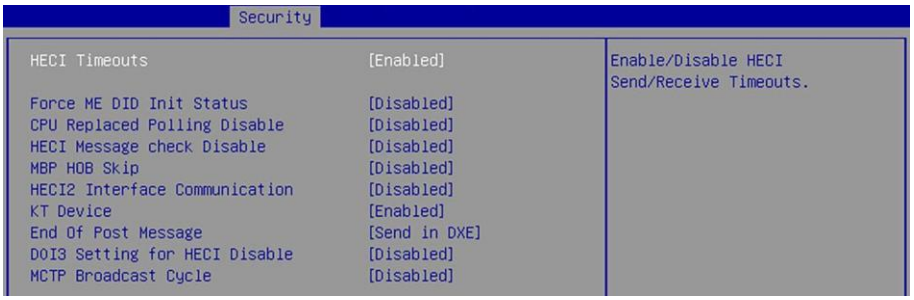
» TPM Device Selection

Select TPM (Trusted Platform Module) devices from PTT or dTPM (Discrete TPM).

[PTT]	Enables PTT in SkuMgr.
[dTPM]	Disables PTT in SkuMgr. **Warning! PTT/ dTPM will be disabled and all data saved on it will be lost.**

▶ ME Debug Configuration

This menu allows you to configure debug-related options for the Intel® Management Engine (ME). This menu will display when **ME State** is enabled.



» HECI Timeouts

This setting enables/ disables the HECI (Host Embedded Controller Interface) send/ receive timeouts.

» Force ME DID Init Status

Forces the ME Device ID (DID) initialization status value.

» **CPU Replaced Polling Disable**

Setting this option disables the CPU replacement polling loop.

» **HECI Message Check Disable**

This setting disables message check for BIOS boot path when sending messages.

» **MBP HOB Skip**

Setting this option will skip ME's Memory-Based Protection (MBP) HOB region.

» **HECI2 Interface Communication**

This setting Adds/ Removes HECI2 device from PCI space.

» **KT Device**

Enables or disables Key Transfer (KT) Device.

» **End of Post Message**

Enables or disables End of Post Message sent to ME.

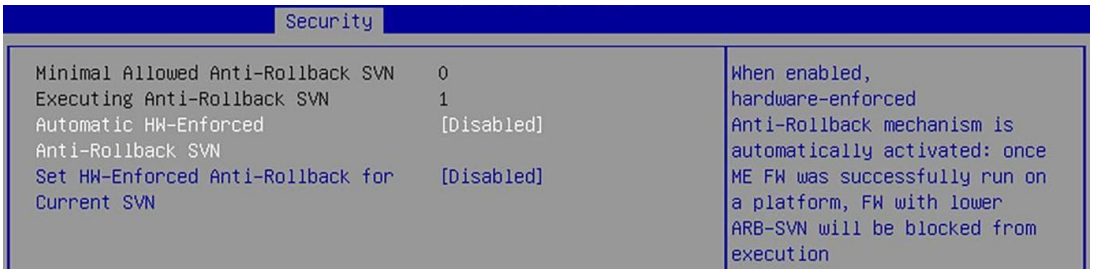
» **DOI3 Setting for HECI Disable**

Setting this option disables setting DOI3 bit for all HECI devices.

» **MCTP Broadcast Cycle**

Enables or disables Management Component Transport Protocol (MCTP) Broadcast Cycle.

▶ **Anti-Rollback SVN Configuration**



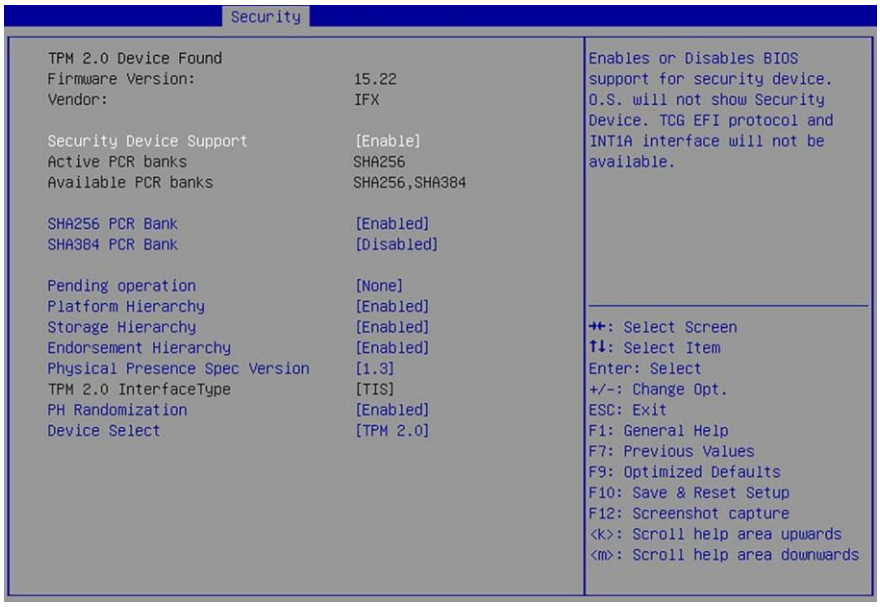
» **Automatic HW-Enforced Anti-Rollback SVN**

Setting this item enables will automatically activate the hardware-enforced anti-rollback protection based on the Secure Version Number (SVN). Once enabled, the hardware will enforce that only firmware updates with an SVN equal to or higher than the current SVN can be installed.

» **Set HW-Enforced Anti-Rollback for Current SVN**

Enable HW ERB mechanism for current ARB SVN value. FW with lower ARB-SVN will be blocked from execution. The value will be restored to disable after the command is sent. This item will display when **Automatic HW-Enforced Anti-Rollback SVN** is enabled.

▶ Trusted Computing



▶ Security Device Support

This item enables or disables BIOS support for security device. When set to [Disable], the OS will not show security device.

▶ SHA256/ SHA384 PCR Bank

These settings enables or disables the SHA256 PCR Bank and SHA384 PCR Bank.

▶ Pending Operation

When **Security Device Support** is set to [Enable], **Pending Operation** will appear. It is advised that users should routinely back up their TPM secured data.

[TPM Clear]	Clear all data secured by TPM.
[None]	Discard the selection.

▶ Platform Hierarchy, Storage Hierarchy, Endorsement Hierarchy

These settings enables or disables the Platform Hierarchy, Storage Hierarchy and Endorsement Hierarchy.

▶ Physical Presence Spec Version

This settings show the Physical Presence Spec Version.

▶ TPM 2.0 Interface Type

This setting shows the TPM 2.0 Interface Type.

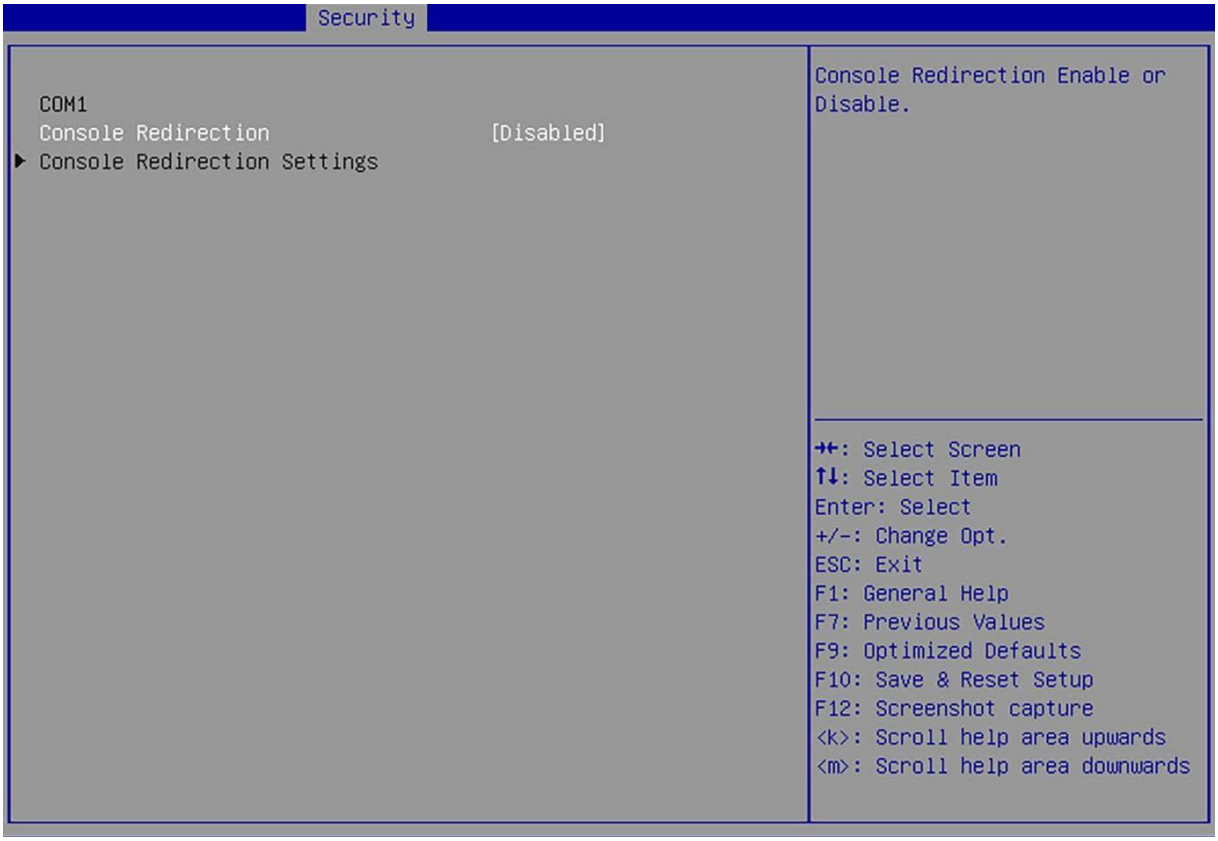
▶ PH Randomization

Enables or disables Platform Hierarchy (PH) Randomization.

▶ Device Select

Select your TPM device through this setting.

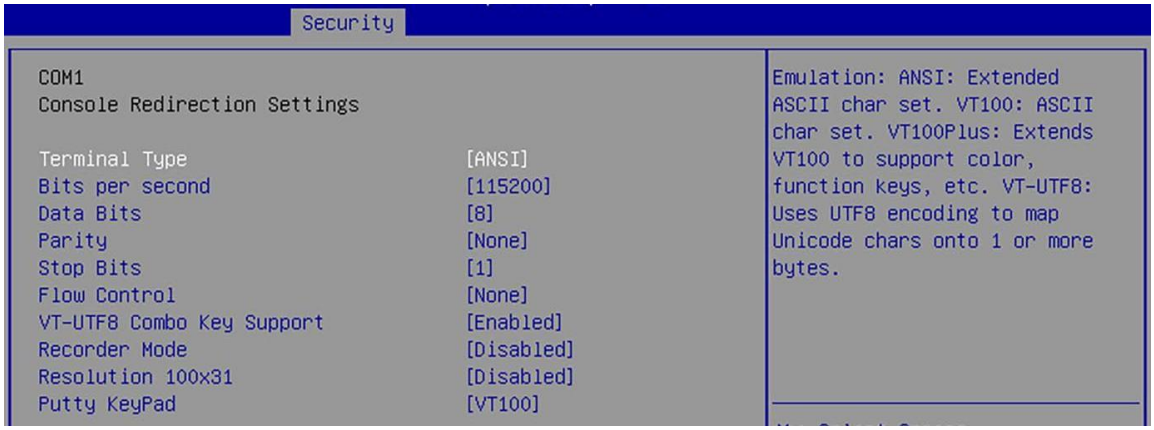
▶ Serial Port Console Redirection



▶ Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables or disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

▶ Console Redirection Settings (COM1)



» Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). You can select emulation for the terminal from this setting.

[ANSI]	Extended ASCII character set.
[VT100]	ASCII character set.
[VT100Plus]	Extends VT100 to support color, function keys, etc.
[VT-UTF8]	Uses UTF8 encoding to map Unicode characters onto one or more bytes.

» Bits per second, Data Bits, Parity, Stop Bits

These setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

» Flow Control

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

» VT-UTF8 Combo Key Support

This setting enables or disables the VT-UTF8 combination key support for ANSI/ VT100 terminals.

» Recorder Mode, Resolution 100x31

These settings enables or disables the recorder mode and the resolution 100x31.

» Putty KeyPad

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

▶ Secure Boot

▶ Secure Boot

Secure Boot function can be enabled only when the **Platform Key (PK)** is enrolled and running accordingly.

▶ Secure Boot Mode

Selects the secure boot mode. This item appears when **Secure Boot** is enabled.

[Standard]	The system will automatically load the secure keys from BIOS.
[Custom]	Allows user to configure the secure boot settings and manually load the secure keys.

▶ Restore Factory Keys

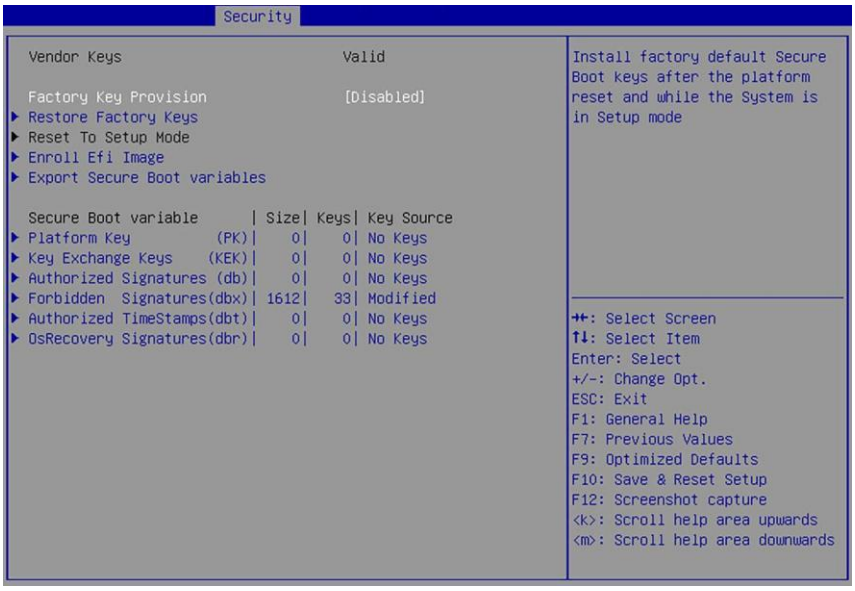
Allows you to restore all factory default keys. The settings will be applied after reboot or at the next reboot. This item appears when **"Secure Boot Mode"** sets to **[Custom]**.

▶ Reset to setup Mode

Allows you to delete all the Secure Boot keys (PK,KEK,db,dbt,dbx). The settings will be applied after reboot or at the next reboot. This item appears when "**Secure Boot Mode**" sets to **[Custom]**.

▶ Key Management

Press **Enter** key to enter the sub-menu. Manage the secure boot keys. This item appears when **"Secure Boot Mode"** sets to **[Custom]**.



» **Platform Key (PK):**

The Platform Key (PK) can protect the firmware from any un-authenticated changes. The system will verify the PK before your system enters the OS. Platform Key (PK) is used for updating KEK.

» **Set New Key**

Sets a new PK to your system.

» **Delete Key**

Deletes the PK from your system.

» **Key Exchange Keys (KEK):**

Key Exchange Key (KEK) is used for updating DB or DBX.

» **Set New Key**

Sets a new KEK to your system.

» **Append Key**

Loads an additional KEK from storage devices to your system.

» **Delete Key**

Deletes the KEK from your system.

» **Authorized Signatures (db) :**

Authorized Signatures (db) lists the signatures that can be loaded.

» **Set New Key**

Sets a new db to your system.

» **Append Key**

Loads an additional db from storage devices to your system.

» **Delete Key**

Deletes the db from your system.

» **Forbidden Signatures (dbx):**

Forbidden Signatures (dbx) lists the forbidden signatures that are not trusted and cannot be loaded.

» **Set New Key**

Sets a new dbx to your system.

» **Append Key**

Loads an additional dbx from storage devices to your system.

» **Delete Key**

Deletes the dbx from your system.

» **Authorized TimeStamps (dbt):**

Authorized TimeStamps (dbt) lists the authentication signatures with authorization time stamps.

» **Set New Key**

Sets a new DBT to your system.

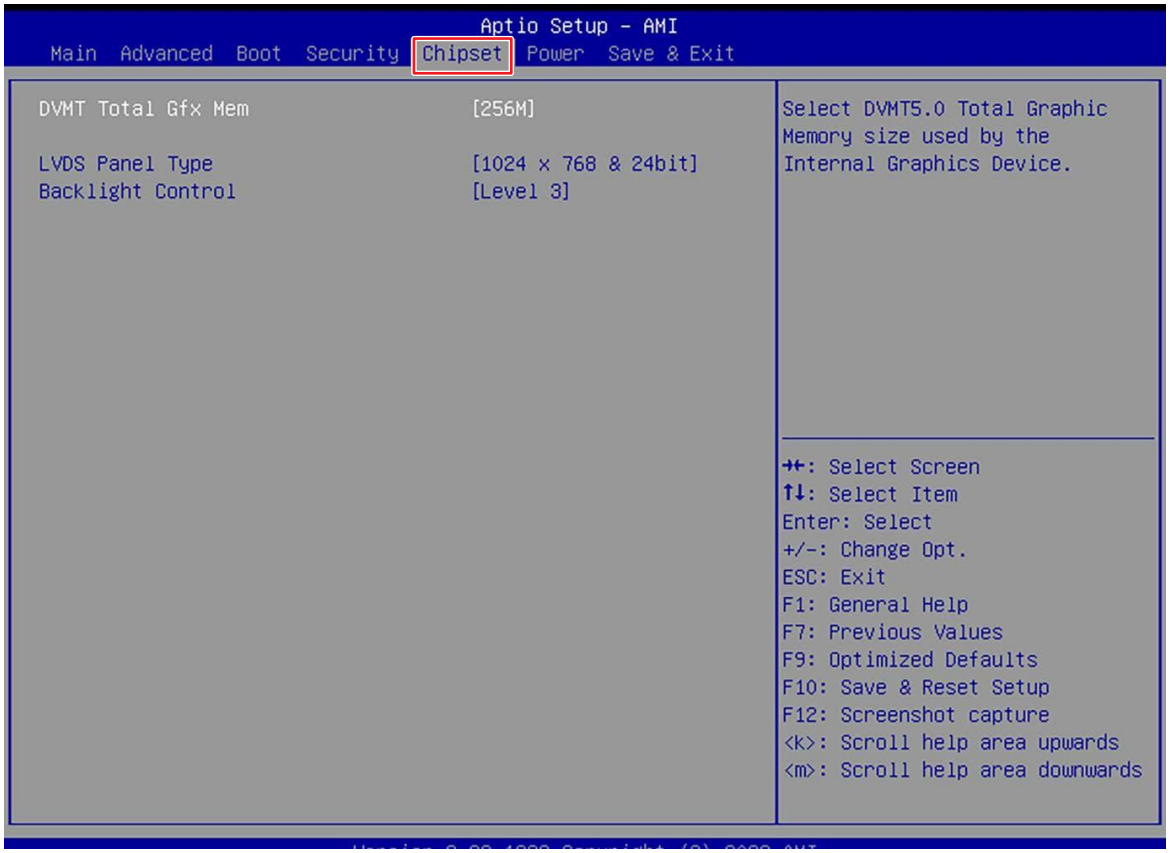
» **Append Key**

Loads an additional DBT from storage devices to your system.

» **OsRecovery Singnatures (dbr):**

Lists the available signatures for OS recovery.

4.5 Chipset



▶ DVMT Total Gfx Mem

This setting specifies the total graphics memory size for Dynamic Video Memory Technology (DVMT).

▶ LVDS Panel Type

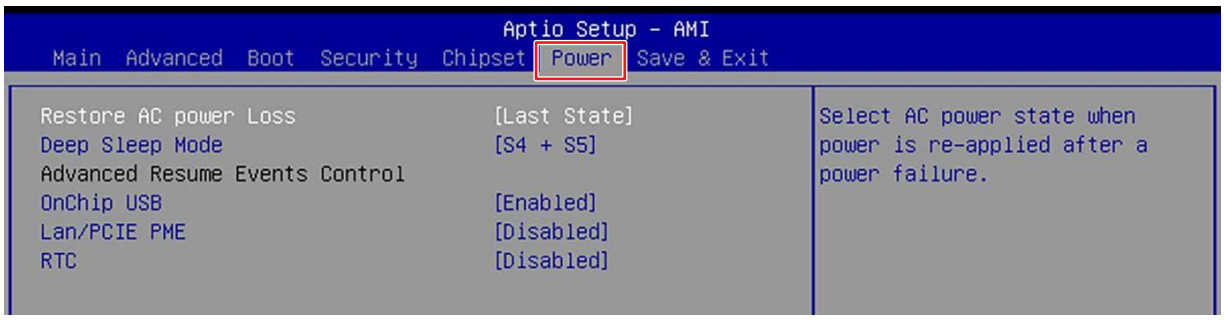
This setting specifies the LVDS Panel's resolution and distribution formats.

▶ Backlight Control

This setting controls the intensity of the LED's backlight output. When lighting conditions are brighter, set it high for a clearer image and low when it is darker.

LED's backlight output	
[Level 1]	20%
[Level 2]	40%
[Level 3]	60%
[Level 4]	80%
[Level 5]	100%

4.6 Power



▶ Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off]	Leaves the computer in the power off state. Leaves the
[Power On]	computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

▶ Deep Sleep Mode

The setting enables or disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can "wake" on input from the keyboard, clock, modem, LAN, or USB device.

▶ OnChip USB

The item allows the activity of the OnChip USB device to wake up the system from S4/S5 sleep state.

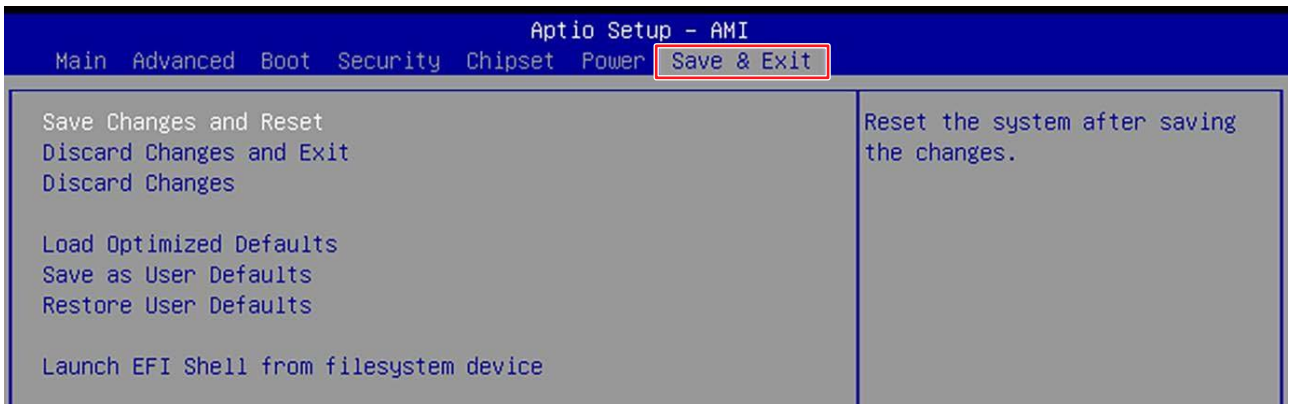
▶ LAN/ PCIE PME

Enables or disables the system to be awakened from the power saving modes when activity or input signal of Intel LAN device and onboard PCIE PME is detected.

▶ RTC

When [Enabled], your can set the date and time at which the RTC (real-time clock) alarm awakens the system from suspend mode.

4.7 Save & Exit



▶ Save Changes and Reset

Save changes to CMOS and reset the system.

▶ Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

▶ Discard Changes

Abandon all changes.

▶ Load Optimized Defaults

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

▶ Save as User Defaults

Save changes as the user's default profile.

▶ Restore User Defaults

Restore the user's default profile.

▶ Launch EFI Shell from filesystem device

This setting helps to launch the EFI Shell application from one of the available file system devices.

Appendix

GPIO WDT BKL SMBus Access Programming

GPIO WDT BKL SMBus Access Programming

This chapter provides GPIO (General Purpose Input/ Output), WDT (Watch Dog Timer), LVDS Backlight and SMBus Access programming guide.

Abstract

In this section, code examples based on C programming language provided for customer interest. **Inportb, Outportb, Inportl** and **Outportl** are basic functions used for access IO ports and defined as following.

Inportb: Read a single 8-bit I/O port. **Outportb:** Write a single byte to an 8-bit port. **Inportl:** Reads a single 32-bit I/O port.

Outportl: Write a single long to a 32-bit port.

1. General Purposed IO – GPIO/DIO

The GPIO port configuration addresses are listed in the following table:

Name	IO Port	IO address	Name	IO Port	IO address
N_GPI0	0xA10	Bit 0	**N_GPO0**	0xA10	Bit 4
N_GPI1	0xA10	Bit 1	**N_GPO1**	0xA10	Bit 5
N_GPI2	0xA10	Bit 2	**N_GPO2**	0xA10	Bit 6
N_GPI3	0xA10	Bit 3	**N_GPO3**	0xA10	Bit 7

1.1 Set output value of GPO

1. Read the value from GPO port.
2. Set the value of GPO address.
3. Write the value back to GPO port.

Example: Set **N_GPO0** output "high"

```
val = Inportb (0xA10);        // Read value from N_GPO0 port.
val = val | (1<<4);           // Set N_GPO0 address (bit 4) to 1 (output "high").
Outportb (0xA10, val);        // Write back to N_GPO0 port.
```

Example: Set **N_GPO1** output "low"

```
val = Inportb (0xA10);        // Read value from N_GPO1 port.
val = val & (~(1<<5));        // Set N_GPO1 address (bit 5) to 0 (output "low").
Outportb (0xA10, val);        // Write back to N_GPO1 port.
```

1.2 Read input value from GPI

1. Read the value from GPI port.
2. Get the value of GPI address.

Example: Get **N_GPI2** input value.

```
val = Inportb (0xA10);        // Read value from N_GPI2 port.
val = val & (1<<2);           // Read N_GPI2 address (bit 2).

if (val)printf ("Input of   N_GPI2   is High");  printf
else    ("Input of   N_GPI2   is Low");
```

2. Watchdog Timer – WDT

The base address (WDT_BASE) of WDT configuration registers is 0xA10.

2.1 Set WDT Time Unit

```
val = Inportb (WDT_BASE + 0x05);    // Read current WDT setting
val = val | 0x08;                   // minute mode. val = val & 0xF7 if second mode
Outportb (WDT_BASE + 0x05, val);    // Write back WDT setting
```

2.2 Set WDT Time

```
Outportb (WDT_BASE + 0x06, Time);   // Write WDT time, value 1 to 255.
```

2.3 Enable WDT

```
val = Inportb (WDT_BASE + 0x0A);    // Read current WDT_PME setting
val = val | 0x01;                   // Enable WDT OUT: WDOUT_EN (bit 0) set to 1.
Outportb (WDT_BASE + 0x0A, val);    // Write back WDT setting.
val = Inportb (WDT_BASE + 0x05);    // Read current WDT setting
val = val | 0x20;                   // Enable WDT by set WD_EN (bit 5) to 1.
Outportb (WDT_BASE + 0x05, val);    // Write back WDT setting.
```

2.4 Disable WDT

```
val = Inportb (WDT_BASE + 0x05);    // Read current WDT setting
val = val & 0xDF;                   // Disable WDT by set WD_EN (bit 5) to 0.
Outportb (WDT_BASE + 0x05, val);    // Write back WDT setting.
```

2.5 Check WDT Reset Flag

If the system has been reset by WDT function, this flag will set to 1.

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting.
val = val & 0x40;                       // Check WDTMOUT_STS (bit 6).

if (val)     printf ("timeout event occurred");
else  printf ("timeout event not occurred");
```

2.6 Clear WDT Reset Flag

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val | 0x40;                       // Set 1 to WDTMOUT_STS (bit 6);
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting
```

3. LVDS Backlight Control – BKL

The controller support **LVDS** backlight level control from 0(0%) to 255(100%), the default backlight level is 100%. It must be controlled by SMBus access. The details of SMBus access (SMBus_ReadByte, SMBus_WriteByte) are provided in this document.

3.1 Set the Level of LVDS Backlight

1. Write **0x0D** into address **0x00** on SMBus device **0x42**.
2. Write desired backlight level from 0(0%) to 255(100%) into address **0x35** on SMBus device **0x42**.

Example 3: Set **LVDS backlight level to** "100%"

SMBus_WriteByte (0x42, 0x00, 0x0D) SMBus_WriteByte (0x42, 0x35, 0xFF)

3.2 Read the Level of LVDS Backlight

4. Write **0x0D** into address **0x00** on SMBus device 0x42.
5. Read current backlight level from address **0x35** on SMBus device **0x42**.

Example 4: Get **LVDS backlight level** SMBus_WriteByte(0x42, 0x00, 0x0D); BKL_Value = SMBus_ReadByte(0x42, 0x35);

4. SMBus Access

The base address of SMBus must know before access. The relevant bus and device information are as following.

```
#define IO_SC                    0xCF8
#define IO_DA                    0xCFC
#define PCIBASEADDRESS           0x80000000
#define PCI_BUS_NUM              0
#define PCI_DEV_NUM              31
#define PCI_FUN_NUM              4
```

4.1 Get SMBus Base Address

```
int SMBUS_BASE;
int DATA_ADDR = PCIBASEADDRESS + (PCI_BUS_NUM<<16) +
                (PCI_DEV_NUM<<11) +  (PCI_FUN_NUM<<8);

Outportl (DATA_ADDR + 0x20, IO_SC);
SMBUS_BASE = Inportl (IO_DA) & 0xfffffff0;
```

4.2 SMBus_ReadByte (char DEVID, char offset)

Read the value of OFFSET from SMBus device DEVID.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS_BASE) + 0x04, DEVID + 1); //out Base + 04, (DEVID + 1)
Outportb (LOWORD (SMBUS_BASE) + 0x03, OFFSET);   //out Base + 03, OFFSET

Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);     //out Base + 02, 48H
mdelay (20);                                     //delay 20ms to let data ready
while ((Inportl (SMBUS_BASE) & 0x01) != 0);      //wait SMBus ready

SMB_DATA = Inportb (LOWORD (SMBUS_BASE) + 0x05); //input Base + 05
```

4.3 SMBus_WriteByte (char DEVID, char offset, char DATA)

Write DATA to OFFSET on SMBus device DEVID.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS_BASE) + 0x04, DEVID);    //out Base + 04, (DEVID)
Outportb (LOWORD (SMBUS_BASE) + 0x03, OFFSET);   //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS_BASE) + 0x05, DATA);     //out Base + 05, DATA
Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);     //out Base + 02, 48H
mdelay (20);                                     //wait 20ms
```

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