MPT-1000R

Intel® Atom® x7-E3950 Processor Railway Computer System

User's Manual

Version 1.0

iBASE

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Trademarks

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Compliance

CE

This product has passed CE tests for environmental specifications and limits. This product is in accordance with the directives of the Union European (EU). If users modify and/or install other devices in this equipment, the CE conformity declaration may no longer apply.

FC

This product has been tested and found to comply with the limits for a Class A device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications.

WEEE

This product must not be disposed of as normal household waste, in accordance with the EU directive of for waste electrical and electronic equipment (WEEE - 2012/19/EU). Instead, it should be disposed of by returning it to a municipal recycling collection point. Check local regulations for disposal of electronic products.

Green IBASE

This product is compliant with the current RoHS restrictions and prohibits use of the following substances in concentrations exceeding 0.1% by weight (1000 ppm) except for cadmium, limited to 0.01% by weight (100 ppm).

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent chromium (Cr6+)
- Polybrominated biphenyls (PBB)
- Polybrominated diphenyl ether (PBDE)

Important Safety Information

Carefully read the precautions before using the device.

Environmental conditions:

- Slots and openings on the chassis are for ventilation. Make sure you leave plenty of space around the device for ventilation. Never allow objects of any kind to enter any openings in the system.
- Use this product in environments with ambient temperatures between -40˚C and 70˚C for SSD.
- Do not leave this device in an environment where the storage temperature may go below -40˚C or above 85˚C. This could damage the device. The device must be used in a controlled environment.

Care for your IBASE products:

- Before cleaning the device, turn it off and unplug all external power sources.
- Use neutral cleaning agents or diluted alcohol to clean the device with a cloth; then wipe it with a dry cloth.
- Vacuum the dust with a computer vacuum cleaner to prevent the air vent or slots from being clogged.

WARNING

Attention during use:

- Do not use this product near water.
- Do not spill water or any other liquids on your device.
- Do not place heavy objects on the top of the device.
- Operate the device from the type of power source indicated on the marking label.
- Do not allow anything to rest on the power cord.
- If an extension cord is used, make sure that the total ampere rating of the product plugged into the extension cord does not exceed the extension cord ampere rating.

Avoid Disassembly

Do not disassemble, repair or make any modification to the device. Doing so could generate hazards and cause damage to the device, even bodily injury or property damage, and will void any warranty.

CAUTION

Danger of explosion if internal lithium-ion battery is replaced by an incorrect type. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Warranty Policy

- **IBASE standard products:**

  24-month (2-year) warranty from the date of shipment. If the date of shipment cannot be ascertained, the product serial numbers can be used to determine the approximate shipping date.

- **3rd-party parts:**

  12-month (1-year) warranty from delivery for the 3rd-party parts that are not manufactured by IBASE, such as CPU, memory, HDD, power adapter, panel and touchscreen.

* PRODUCTS, HOWEVER, THAT FAILS DUE TO MISUSE, ACCIDENT, IMPROPER INSTALLATION OR UNAUTHORIZED REPAIR SHALL BE TREATED AS OUT OF WARRANTY AND CUSTOMERS SHALL BE BILLED FOR REPAIR AND SHIPPING CHARGES.

Technical Support & Services

1. Visit the IBASE website at www.ibase.com.tw to find the latest information about the product.
2. If you need any further assistance from your distributor or sales representative, prepare the following information of your product and elaborate upon the problem.
   - Product model name
   - Product serial number
   - Detailed description of the problem
   - The error messages in text or in screenshots if there is any
   - The arrangement of the peripherals
   - Software in use (such as OS and application software, including the version numbers)
3. If repair service is required, you can download the RMA form at http://www.ibase.com.tw/english/Supports/RMAService/. Fill out the form and contact your distributor or sales representative.

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Chapter 1
General Information

The information provided in this chapter includes:

- Features
- Packing List
- Specifications
- Product View
- Dimensions

1.1 Introduction

The MPT-1000R Intelligent Traffic Image Computer was developed for rolling stock applications, with features that meet IIOV, Intelligent Internet of Vehicle and harsh outdoor environment requirements. The shock-resistant system is powered by an Intel® Atom® x7 processor, operating in extended temperatures between -40°C and 70°C and with 9V-32VDC power input. It has robust M12 waterproof connectors and waterproof antenna connectors that ensure fault-free data transmission in rail vehicle monitoring & railway track side control box applications. Featuring a unique one-click recovery of peripheral expansion card as well as automatic voltage protection, MPT-1000R is certified with EN50155:2017 and EN45545-2 fire test standards. Designed for ease of use and maintenance, the innovative system overcomes space constraints and high installation costs, supporting an all-in-one cable-free setup with high-speed connectors that handle power and interface requirements without a glitch.

***** The MPT-1000R pictures above are for reference only.

1.2 Features

- EN50155 certified
- Fanless and ruggedized design
- Robust M12 connection for dual GbE, USB
- Onboard isolated CANbus
- SIM socket supports Dual WWAN
- Add on card slots reset function
- Quick accessible RTC battery

1.3 Packing List

Your product package should include the items* listed below.

Item	Q'ty	IBASE Part Number
MPT-1000R	1	- -
Mounting bracket	2	- -
Terminal Block	1	C1216ECH311003100P
Screw, B71-BN, M3*L5mm	4	H0230561B710BN000P
Cover for audio (black)	2	A028AUDIOMB2K0000P
Flat head screw, A2-N, M2*L4	4	H02203511122000N0P
Screw, B21, Nickel, I head, M3*3.8	1	H0230321112200000P

* Optional items include WiFi antennas, 4G antenna, hole plugs for antenna

1.4 Specifications

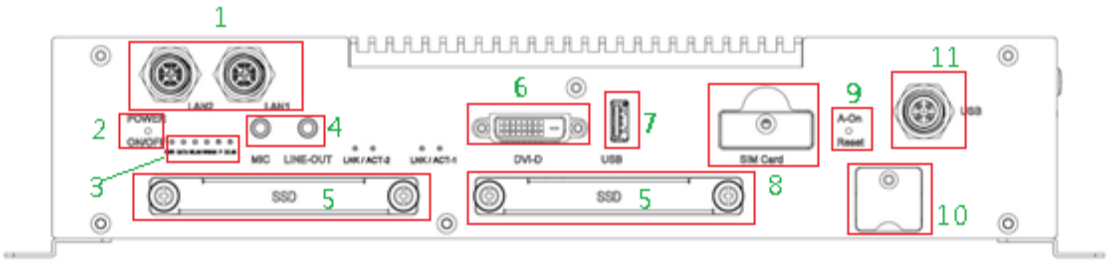
System	MPT-1000R
Motherboard	MBT-1001R
CPU	Intel® Atom® x7-E3950 Processor)
System Speed	1.6GHz , up to 2.0GHz
Memory	1x DDR3L SO-DIMM socket (horizontal type) w ECC support, default 4GB ECC
Graphics	Intel® HD graphics Gen. 7 with 4EU Supports DX 11, OGL 3.0, OCL 1.2, OGLES 2.0
Front Panel External I/O	1x Power Button 1x DVI-I 2x M12 X-code GbE LAN, Isolated 1x USB 1.1 type-A, Isolated 1x M12 A-code USB 2.0 Isolated 2x Audio jack for Line-in/out 5x LED indications, one is programmable 1x SIM card slot for dual micro SIM card 2x SSD drive slots 1x Reset button
Rear Panel External I/O	1x 10-pin terminal block connector 1x DSUB9 for RS232/485, isolated 1x DSUB9 for RS485, isolated 1x M12 8-pin A-code for 2 master CANbus, isolated 2x USB 2.0 type-A, isolated 1x M12 4-pin A-code for power input 1x blade fuse
Storage	2x 2.5” device bay for SSD/HDD 1x mSATA via miniPCIe slot (shared with one 2.5” device)

Expansion Slot	1x miniPCIe full/half-size, supports mSATA 1x miniPCIe full/half-size, supports second SIM card shared with M.2 slot 1x M.2 B-key 30x42 with USB 2.0 and USB 3.0 signal only, supports 2x SIM cards
Power Supply	DC 9~32V(±10%) / 1.5KV galvanic isolation protection
Operating Temperature	-40°C ~70°C, with SSD, not included add-on cards
Storage Temperature	-40°C ~ 85°C (-40°F~185°F)
Relative Humidity	10 ~ 95% @ 45°C, (non-condensing)
Vibration	Function: 1m/S2, 5Hz~150Hz (EN 61373) Lifetime: 7.9m/S2, 5Hz~150Hz (EN 61373)
Shock	50 m/S2, 30 msec (EN61373)
Certification	EN50155: 2017 CE (EN62368/ EN55032/ EN55025)/ FCC Class A EN45545-2

All specifications are subject to change without prior notice.

1.5 Product View

Front View



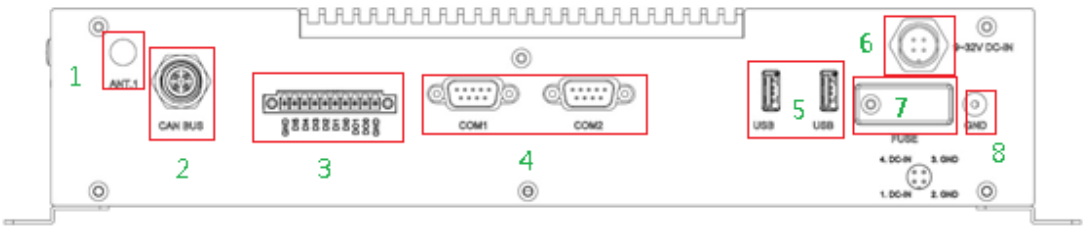
The items are listed from left to right, from top to bottom.

No.	Name	No.	Name
1	2x M12 X-code GbE, Isolated	7	USB 1.1 type –A, Isolated
2	Power Button	8	SIM Card Slot for Dual Micro SIM Cards
3	LEDs for PWR, SATA, WLAN, WWAN, Programable, and DC-status.	9	A-On Reset Button
4	Audio Jacks for Mic/Line Out	10	Cover for USB socket
5	2x Slots for SSD Trays	11	M12 A-code USB 2.0, Isolated (Not support mouse&K/B)
6	DVI Connector		

Remark:

1. *The programable LED can be set by customized program, please contact IBASE technical support to get the SDK software.*
2. *If you would like to enable A-on (expansion cards, ex: miniPCIe/M.2 module) reset button function, please contact IBASE technical support to get the SDK software.*

Rear View

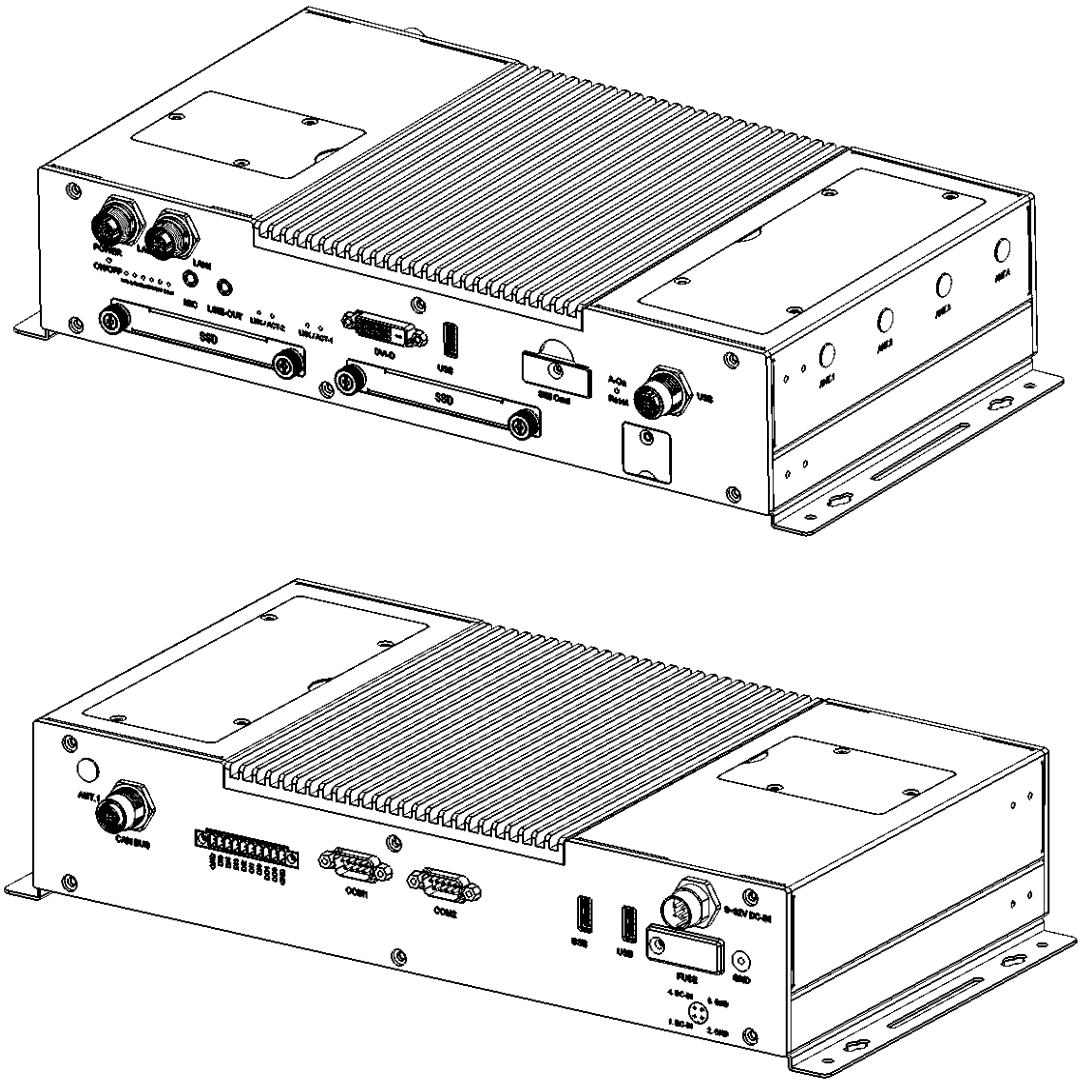


The items are listed from left to right, from top to bottom.

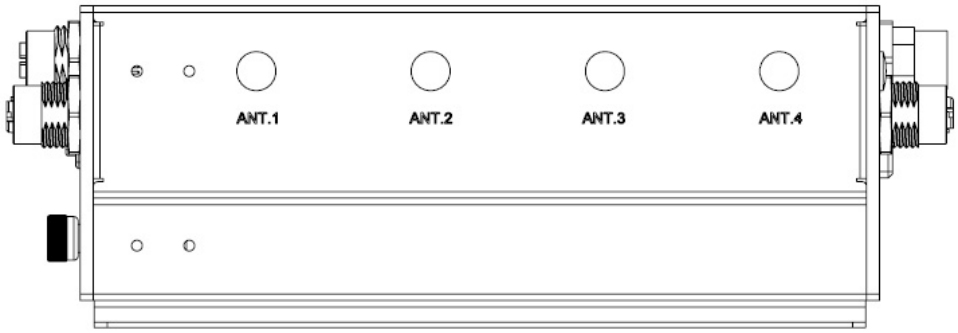
No.	Name	No.	Name
1	Antenna Hole	5	2x USB 2.0 type-A, Isolated Not support mouse&K/B
2	M12 8-pin A-code for 2 Master CANbus, isolated	6	M12 4-pin A-code for Power Input
3	10-pin Terminal Block - **2x insulated DO** ◆ Output type: Darlington transistor ◆ Sink current • 500 mA for one channel @ 100% duty ◆ Source current • 500 mA for one channel @100% duty cycle ◆ Supply voltage: 5-35 VDC ◆ Isolation voltage: 2500 VRMS **6x insulated DI** ◆ Maximum input range • 24 V, non-polarity ◆ Digital logic levels • 0-24 V, non-polarity ◆ Input high voltage: 5-24 V ◆ Input low voltage: 0-1.5 V ◆ Input resistance: 1.2 k @ 0.5 W Isolation voltage • 2500 VRMS	7	Blade Fuse
4	COM1:DSUB9 for RS232/485 COM2:DSUB9 for RS485 All isolated	8	Ground

Important: The MPT-1000R main power input range is DC9~32V. If your power source is out of range, the system will hold power and not boot up. You will see the red light blinking from the LED indication.

Oblique View

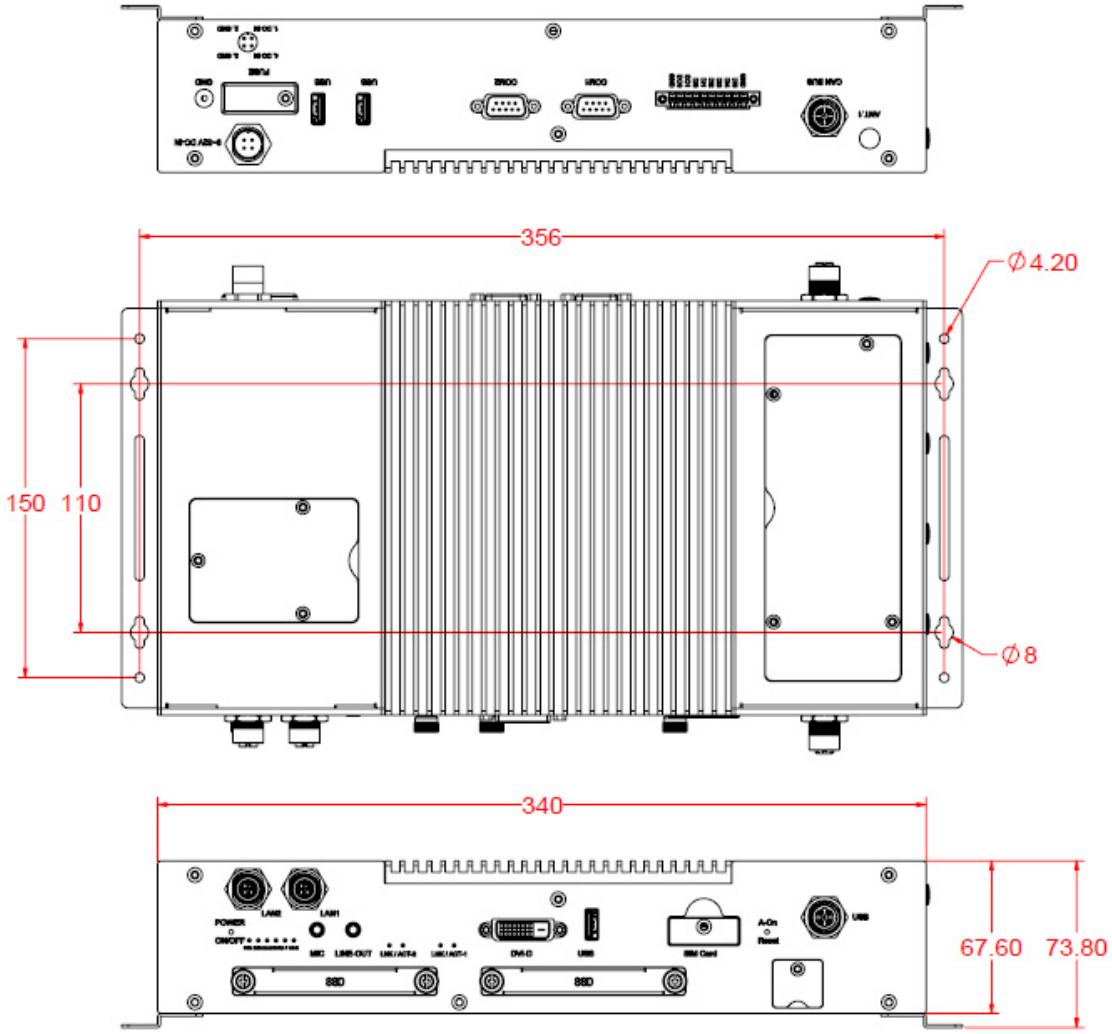


Side View



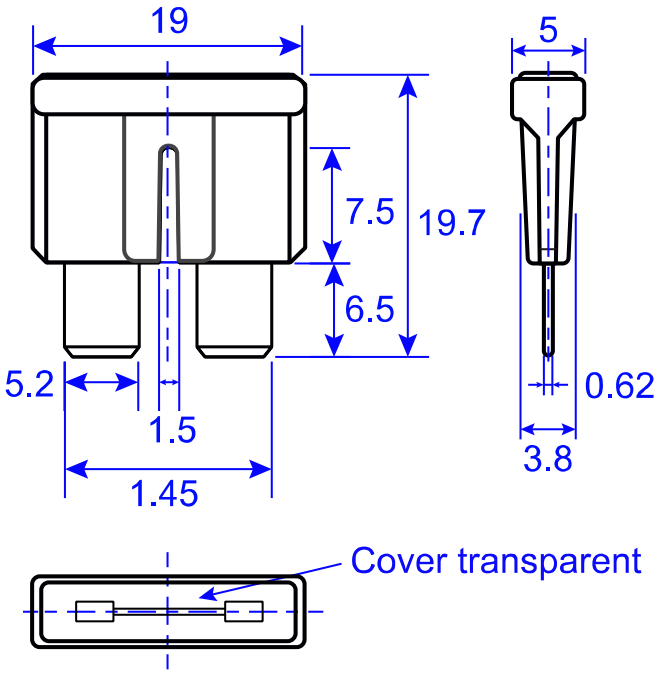
1.6 Dimensions

Unit: mm



Unit: mm

Fuse for MPT-1000R: Littlefuse® TAC ATO® Style Blade 15A, 58V DC



Chapter 2
Hardware Configuration

The information provided in this chapter includes:

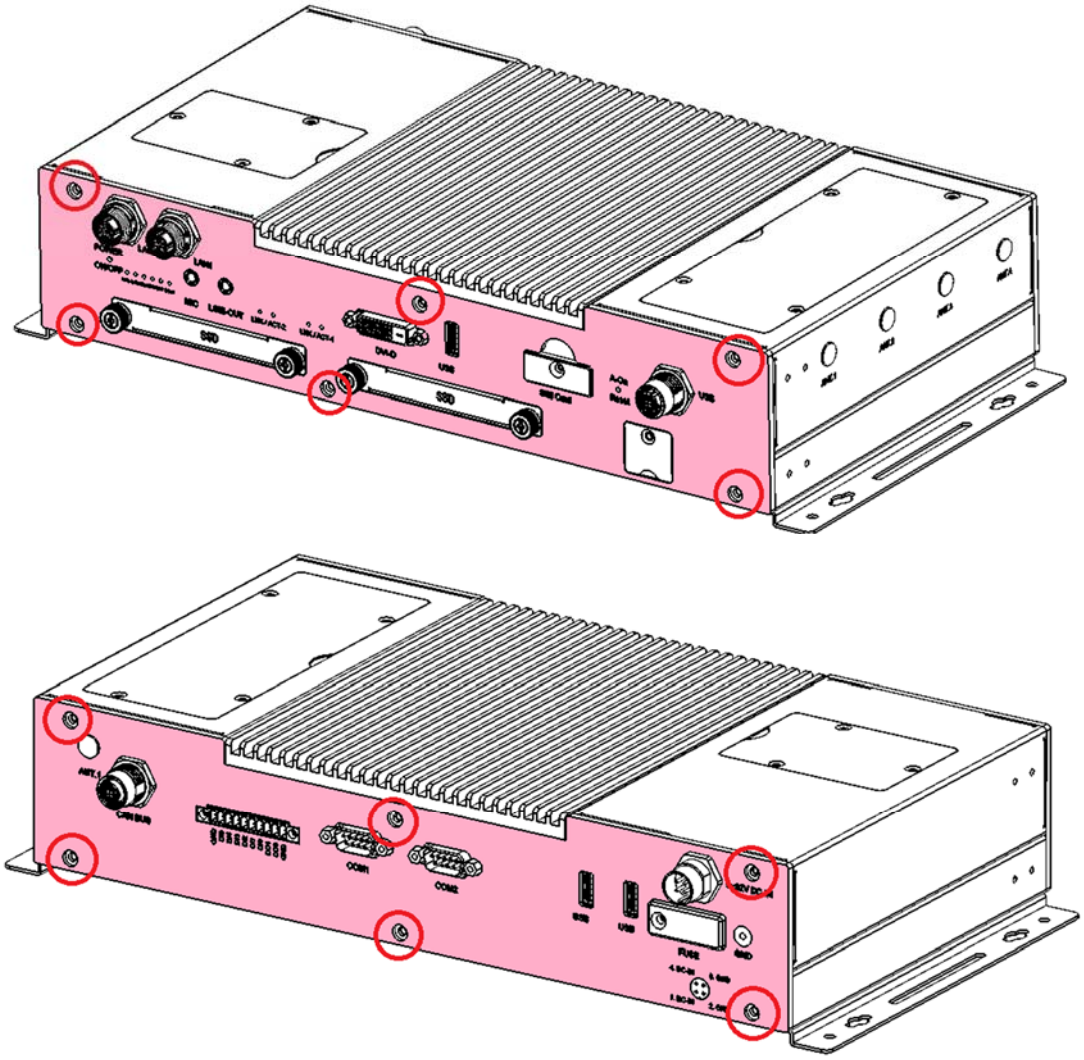
- Installations
- Information and locations of connectors

2.1 Installations

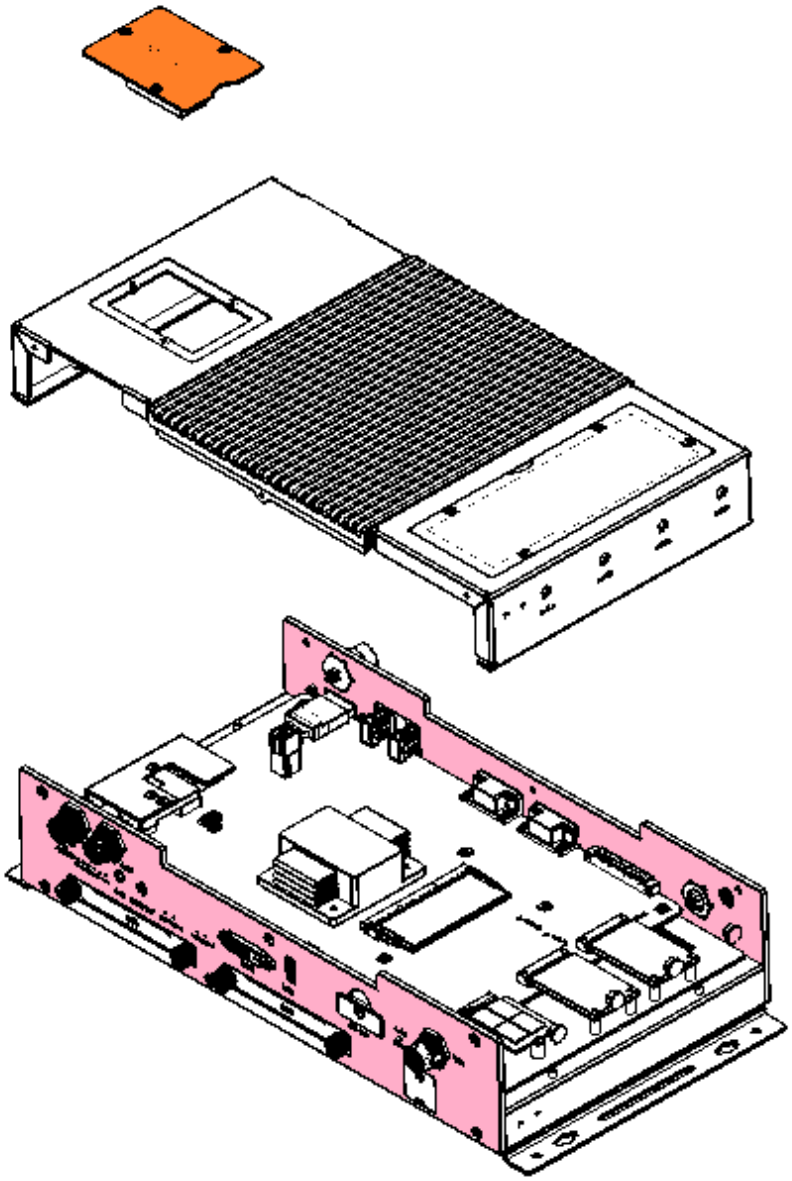
2.1.1 Memory Installation

Notice: iBASE does not suggest the end-user try to install/change the memory. It may cause unexpected problems. Please contact IBASE authorized partners and get the technical service from them.

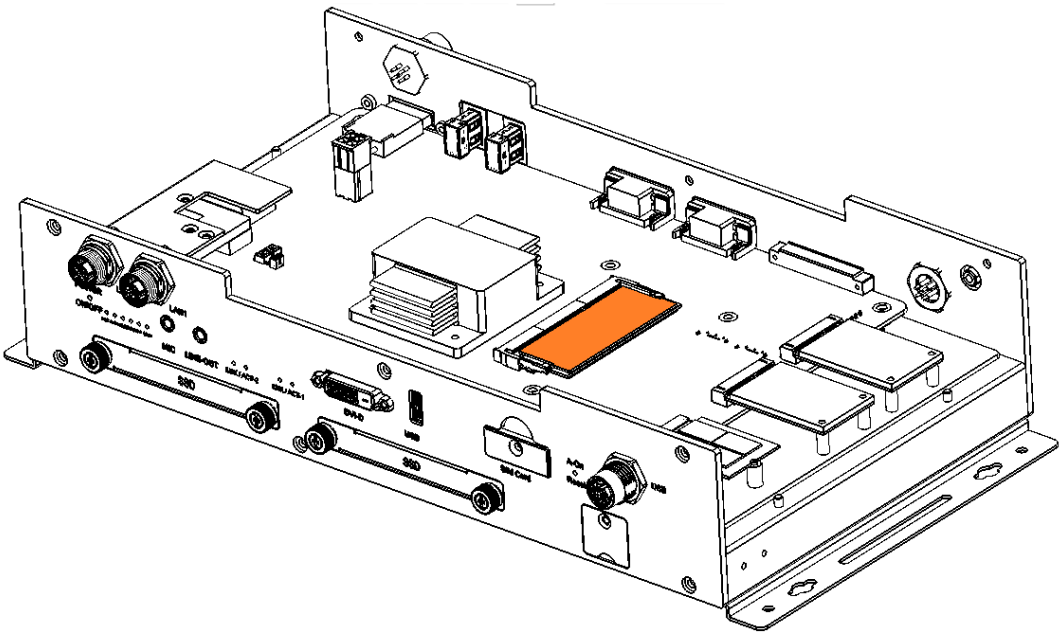
To access the memory slot on the motherboard, you have to first remove the top cover by removing the 12 screws as shown below.



1. When removing the top cover, you must first remove the battery module cover* as shown below.

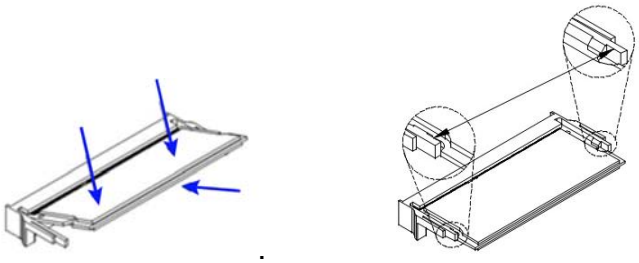


*When removing the battery module cover, you have to release the cable that is connected to the motherboard in order not to damage the cable or the motherboard.



3. Locate the memory slot and align the key of the memory module with that on the memory slot.
4. Insert the module slantwise and gently push the module straight down until the clips of the slot close to hold the module in place when the module touches the bottom of the slot.

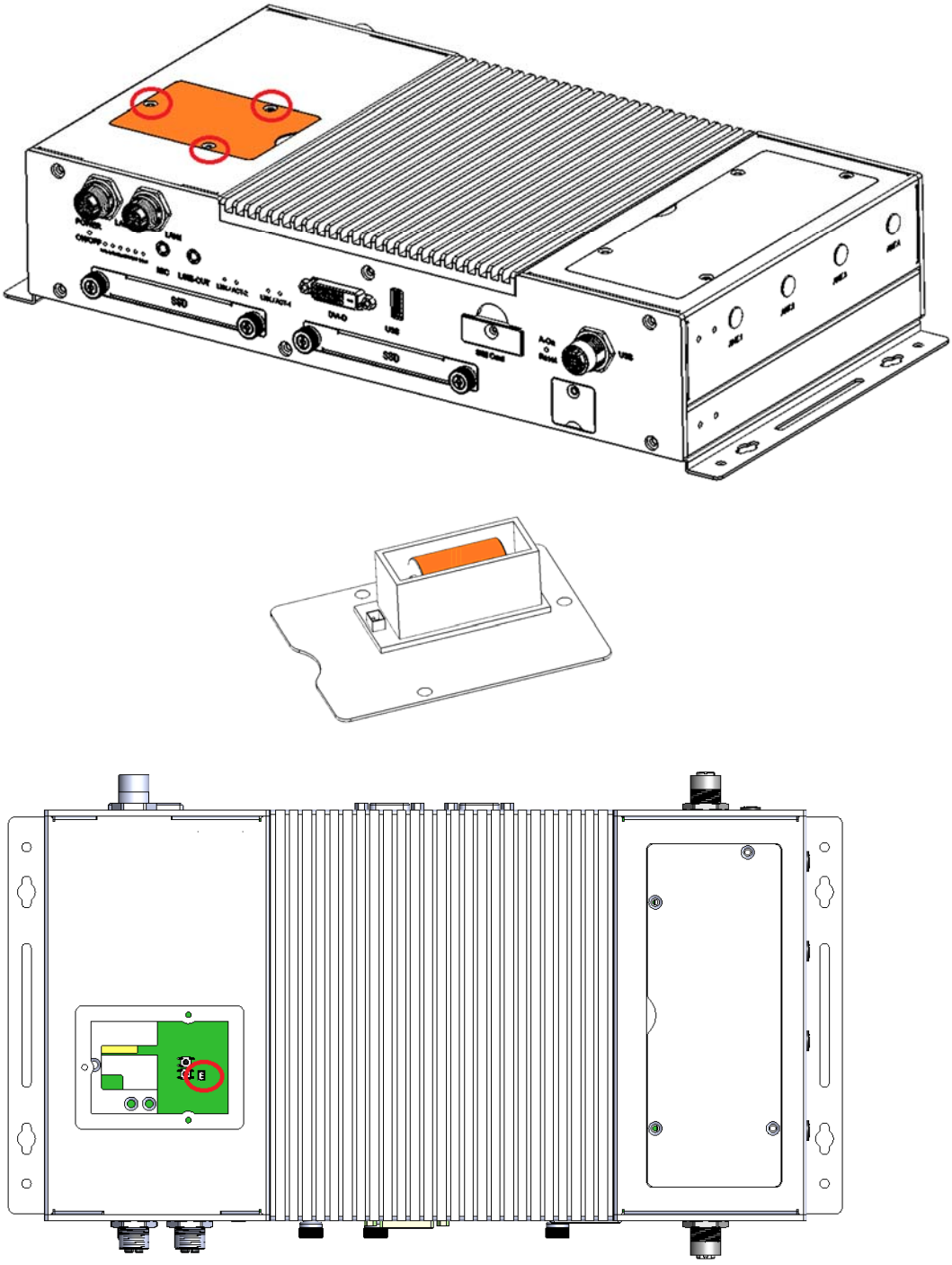
   To remove the module, press the clips outwards with both hands.



After installation, fasten the 12 screws to secure the cover.

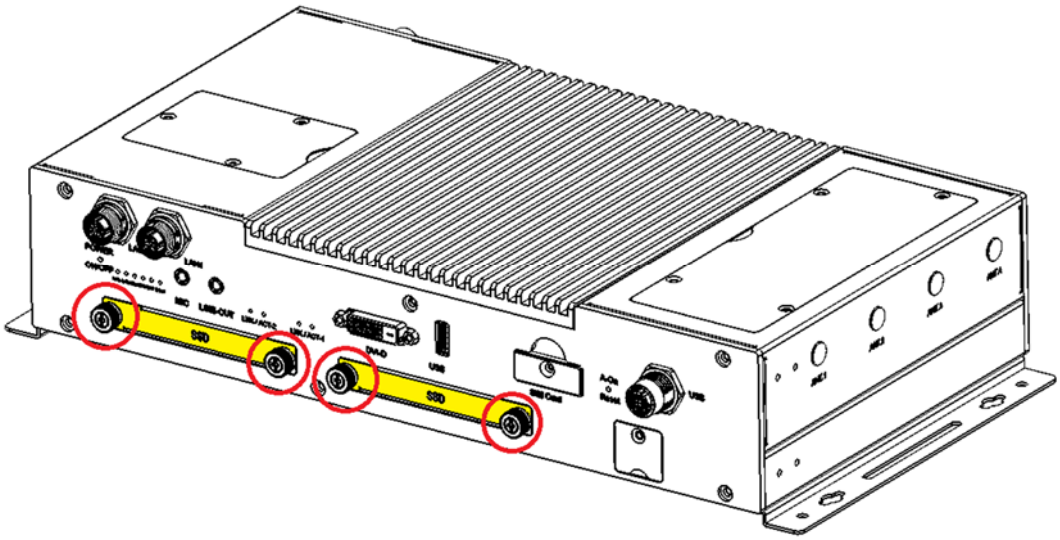
2.1.2 RTC Battery Installation

Remove the 3 screws of the cover shown below.
Turn the cover upside down to place the battery (ABP-MB70-BAT, part # ZM06ABPMB70B0A1100P). Pay attention to the polarity by following the + / - symbols in the battery compartment.



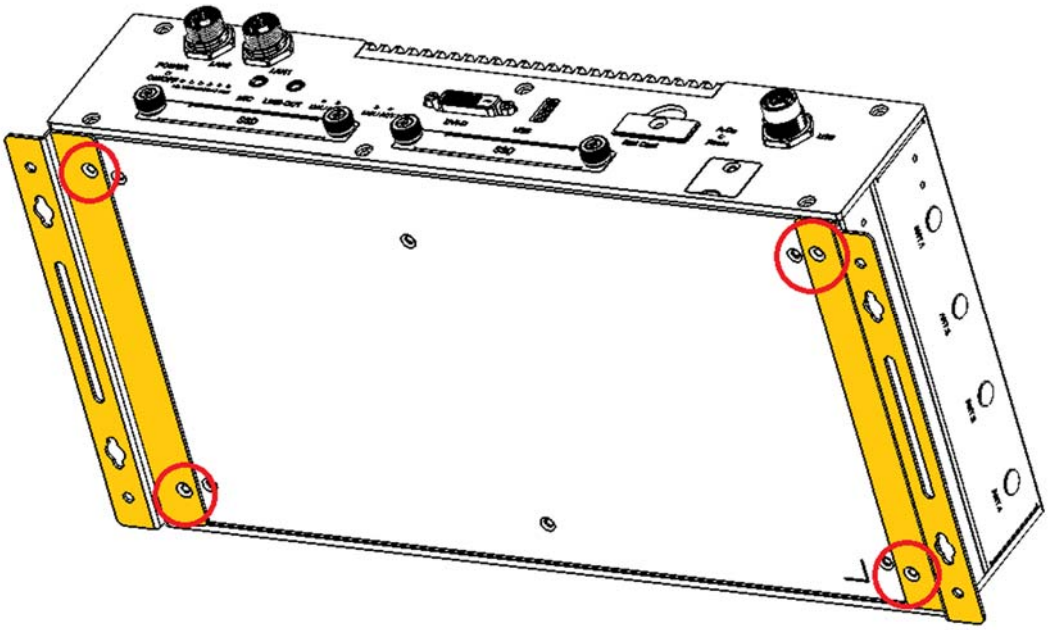
2.1.3 SSD Drive Installation

1. There are two SSD drive slots in the system. To remove the brackets, loosen the two screws on the bracket cover. After pulling the brackets out, use the four screws under the bracket to install/remove the SSD drive.



2.1.4 Wall Mount Brackets Installation

1. There are a total of four screws holding the two wall mount brackets underneath the system. Use them to install/remove the brackets as shown below.

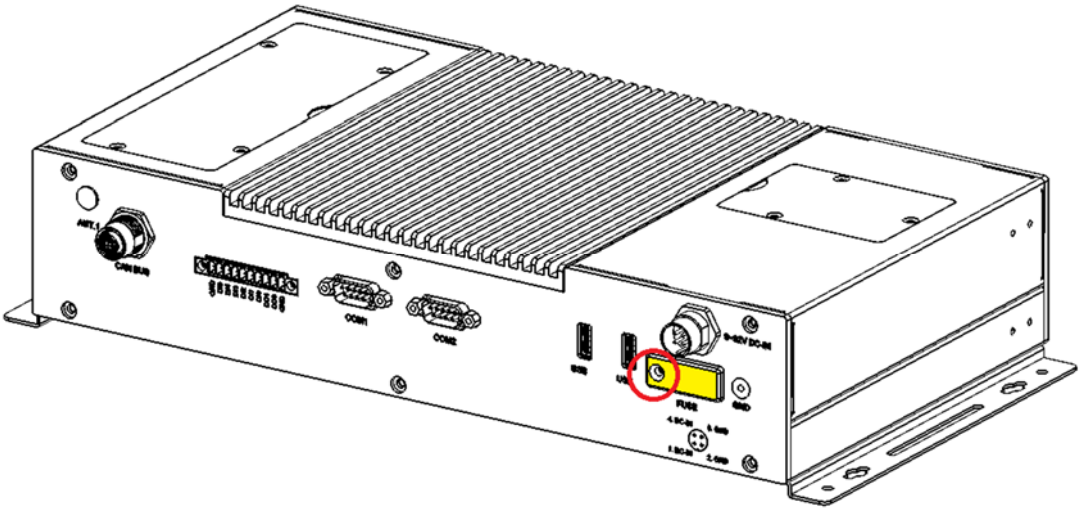


2.1.5 Fuse Installation

Notice: Please exclude all possibilities of issues before you need to change a new fuse. If you cannot clear the problem caused by the fuse broke, please contact IBASE technical support.

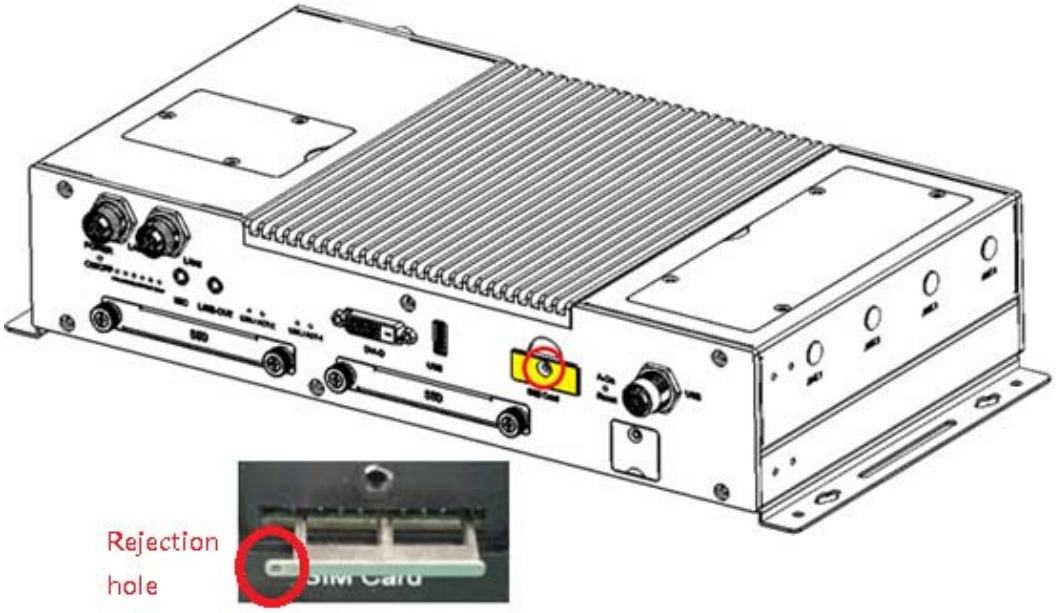
1. The fuse cover uses only one screw. Remove this screw to access the blade fuse*.

   * Littlefuse® TAC ATO® Style Blade 15A, 58V DC



2.1.6 SIM Card Installation

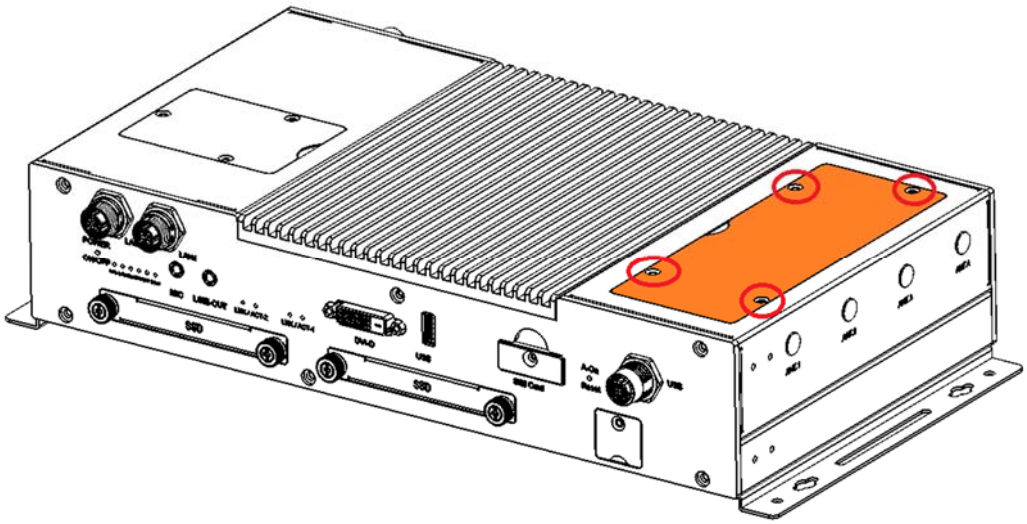
1. The SIM card cover uses one screw. Remove this screw to see the SIM card holder for two SIM cards. Poke the rejection hole of holder to release it.



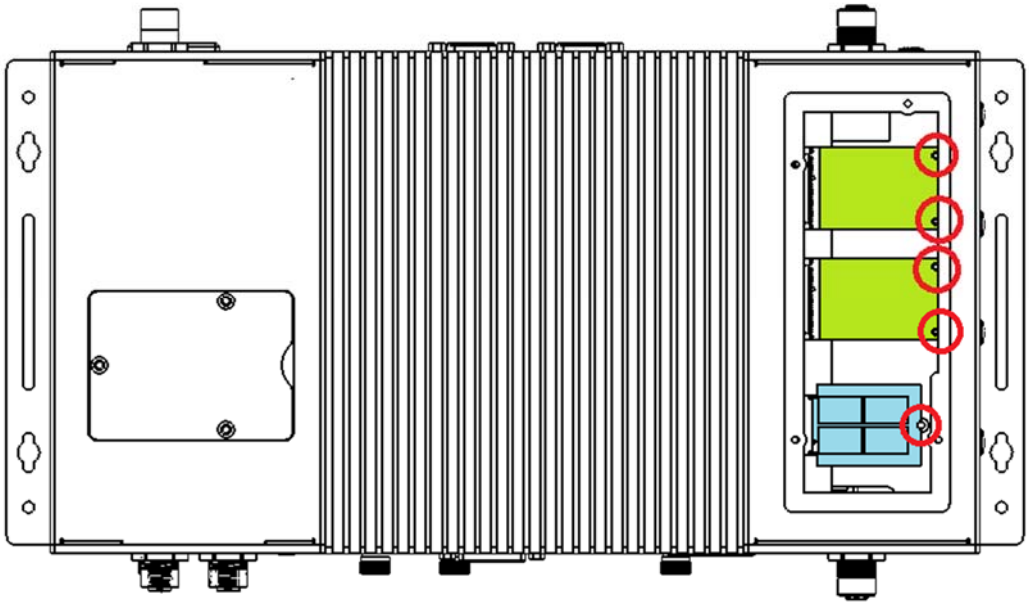
2.1.7 MiniPCIe, mSATA, and M.2 (B-key) Installation

1. Remove the four screws shown below to access the slots.
2. There are three (slots) underneath the cover. The first MiniPCIe (top) slot supports mSATA (Muxed with SSD 2 drive, if you use the mSATA, the second 2.5” SSD drive cannot be used). The second MiniPCIe slot supports the 2nd SIM card (switchable with M.2 slot). The third slot (bottom in the picture) is for M.2 B-key 30x42 with USB 2.0 and USB 3.0 signal, supporting 2x SIM cards.

   Remark: (MPT-1000R has 2 SIM card slots. Some LTE M.2 modules supoort 2 SIM cards, you can set the SIM card1 and SIM card 2 to the M.2 module(This is default setting), or you can set the SIM card2 to the second miniPCIe (By jumper on motherboard).

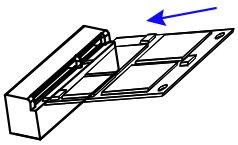


Remove the four (4) screws.

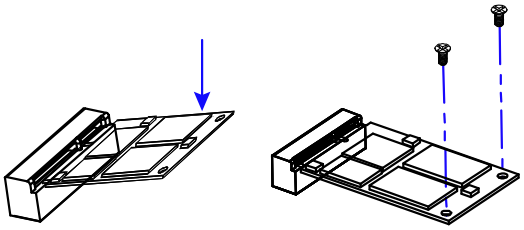


The above picture shows the 3 sockets after the cover has been removed.

3. Locate the mini-PCIe slot. Align the key of the mini-PCIe card to the interface, and insert the card slantwise.

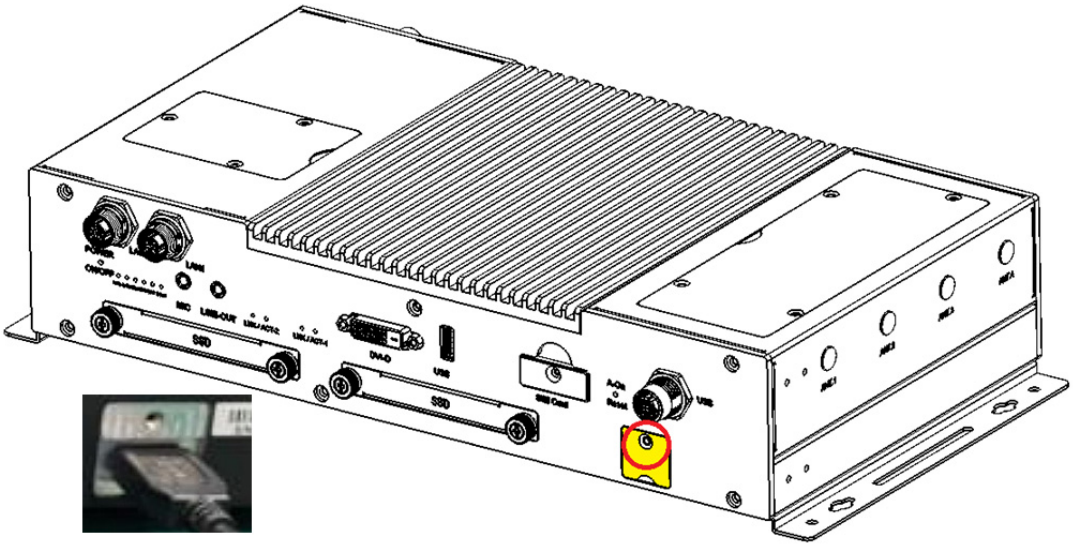


4. Push the mini-PCIe card down, fix it with the supplied 2 flat head screws for a full-size card and with one screw for a half-size card.



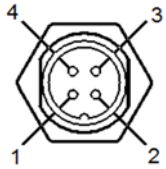
2.1.8 USB Socket Cover

1. There is a non- isolated USB socket with a cover. To use the USB socket (for devices such as USB mouse or USB keyboard), remove the single screw that is holding the cover.



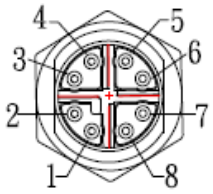
2.1.9 Pinout for M12 Connectors (Power Input, LAN, USB, CANbus)

- **Power Input (M12, 4 pins, male)**



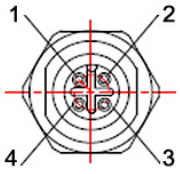
Pin	Assigment	Pin	Assigment
1	DC Input	3	Ground
2	Ground	4	DC Input

- **LAN Connector (M12, 8 pins, female, X-code)**



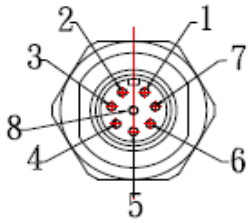
Pin	Assignment	Pin	Assignment
1	MX1+	5	MX2-
2	MX3-	6	MX4+
3	MX3+	7	MX1-
4	MX4-	8	MX2+

- **USB Connector (M12, 4 pins, female, A-code)**



Pin	Assignment	Pin	Assignment
1	VCC (+5V)	3	Data +
2	Data -	4	Ground

- **CANBus Connector(M12, 8 pins, male, A-code)**



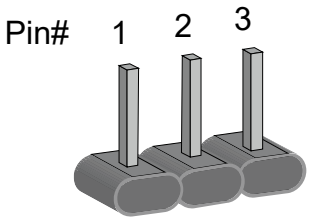
Pin	Assignment	Pin	Assignment
1	CAN-1H	5	CAN-2H
2	GND	6	GND
3	CAN-1L	7	CAN-2L
4	GND	8	GND

2.2 Setting the Jumpers

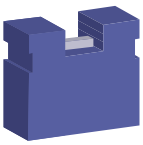
Set up and configure your MPT-1000R by using jumpers for various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your use.

2.2.1 How to Set Jumpers

Jumpers are short-length conductors consisting of several metal pins with a non-conductive base mounted on the circuit board. Jumper caps are used to have the functions and features enabled or disabled. If a jumper has 3 pins, you can connect either PIN1 to PIN2 or PIN2 to PIN3 by shorting.

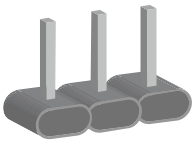
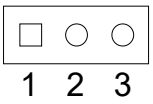
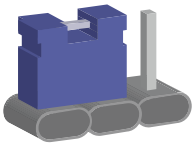
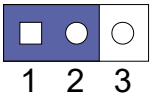
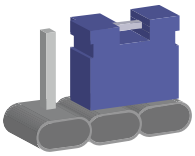
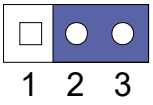


A 3-pin jumper



A jumper cap

Refer to the illustration below to set jumpers.

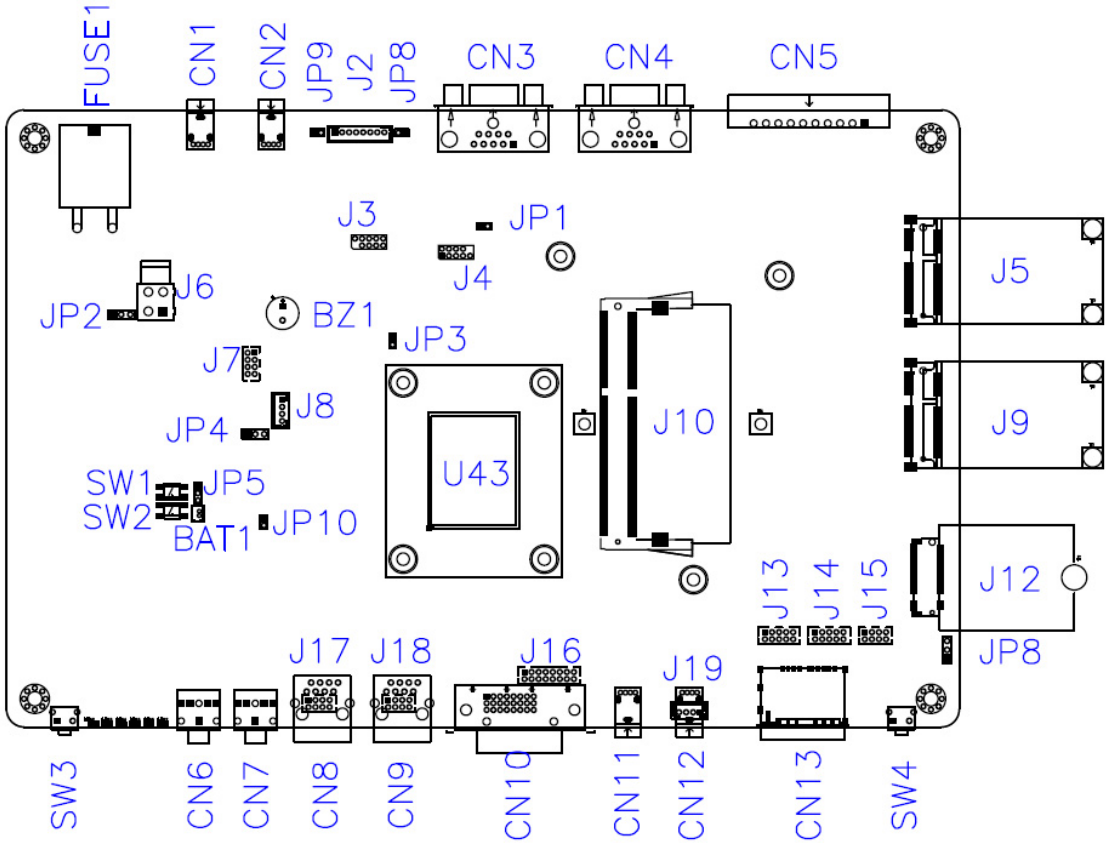
Pin closed	Oblique view	Schematic illustration in the manual
Open		
1-2		
2-3		

When two pins of a jumper are encased in a jumper cap, this jumper is **closed**, i.e. turned **On**.

When a jumper cap is removed from two jumper pins, this jumper is **open**, i.e. turned **Off**.

2.3 Jumper & Connector Locations

Motherboard: MBT-1001



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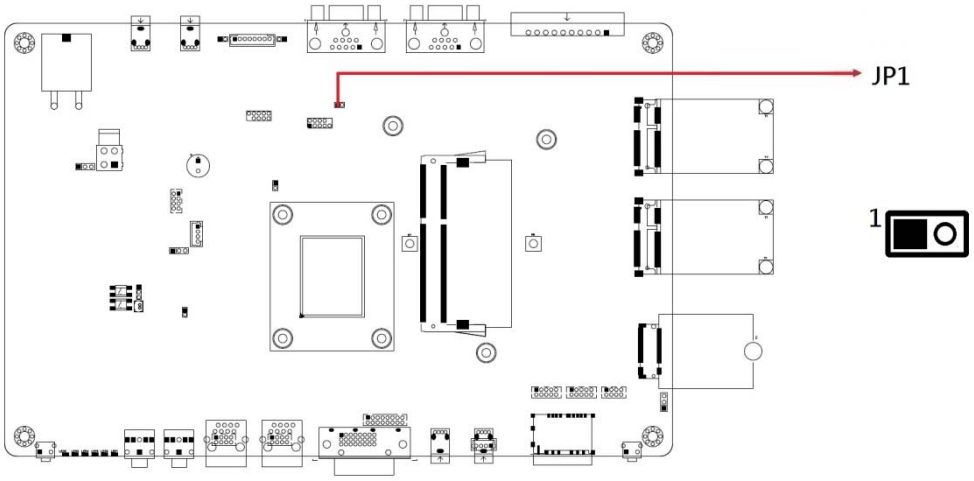
2.4 Jumpers and Connectors Quick Reference

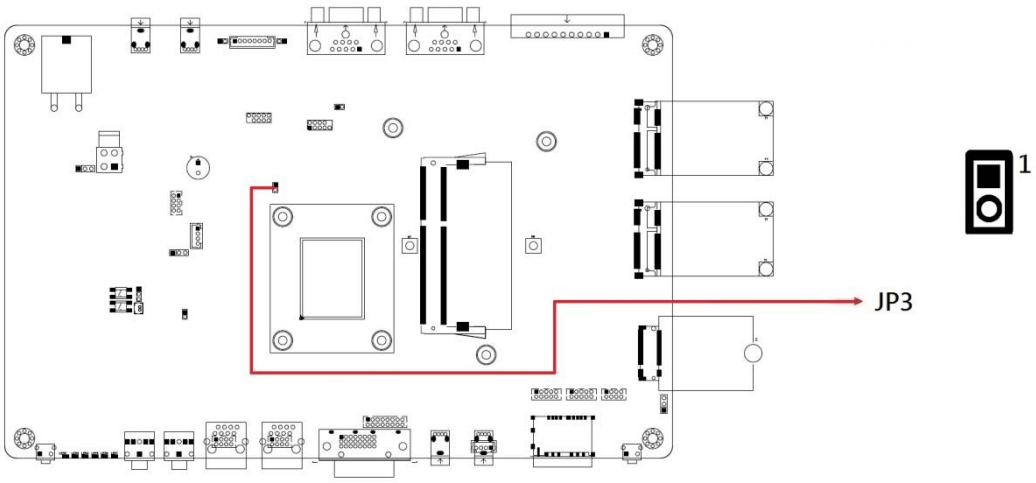
2.5 JP1: COM2 Terminator Enable
2.6 JP3: BIOS Flash
2.7 JP4: Car Battery Protect (Not used)
2.8 JP5: Clear ME Register
2.9 JP6: SIM Card Select
2.10 JP10: Reset Button Connector
2.11 SW1: MCU Reset
2.12 SW2: Clear CMOS
2.13 SW3: Power Button
2.14 SW4: Expansion Reset (Customer use only)
2.15 SW5: Digital Input simulation (Factory use only)
J2: CAN BUS Connector
J3: SPI Flash Connector (Factory use only)
J4: Port 80 connector (Factory use only)
J5: Mini PCI-e Connector (PCI-e, SATA, USB2)
J7, J15: Dual USB Connector (DF11-8S-PA66H)
J8: MCU firmware Connector (Factory use only)
J9: Mini PCI-e Connector (PCI-e, USB2)
J10: DDR3-L Connector
J12: M.2 B-Key 3042 Connector (USB3, USB2)
J16: VGA Connector (DF11-16DP-2DSA)
J17, J18: LAN Connector (DF11-8DP-2DSA)
J19: USB 2.0 Connector (USB 1.1 only)
CN1, CN2: USB 2.0 Connector (Supports USB 1.1 only)
CN11: USB 2.0 Connector (Supports USB 1.0 only)
CN3: COM Port Connector (RS-485 only)
CN4: COM Port Connector (RS-232,422,485)
CN5: Digital I/O Connector
CN6: MIC-IN Connector
CN7: Line Out Connector
CN10: DVI-D Connector
CN13: Dual Nano SIM Connector
CN14, CN15: SATA Connector

2.4.1 JP1: COM2 Terminator Enable



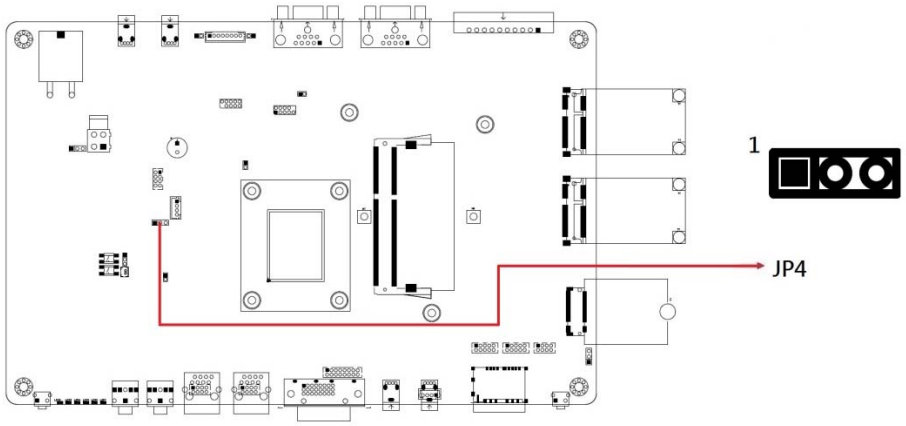
Pin	Function	Illustration
Open	Disabled (Default)	1
Pin 1-2 Closed	Enabled	1

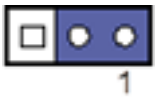
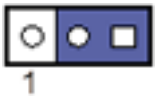
2.4.2 JP3: BIOS Flash



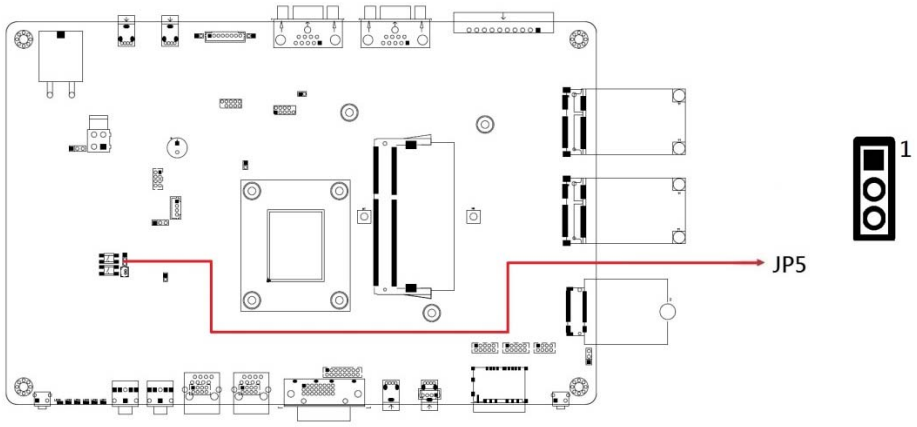
Pin	Function	Illustration
Open	Normal	1
Pin 1-2 Closed	Upgrade	1

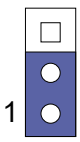
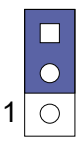
2.4.3 JP4: Car Battery Protect (Not used)



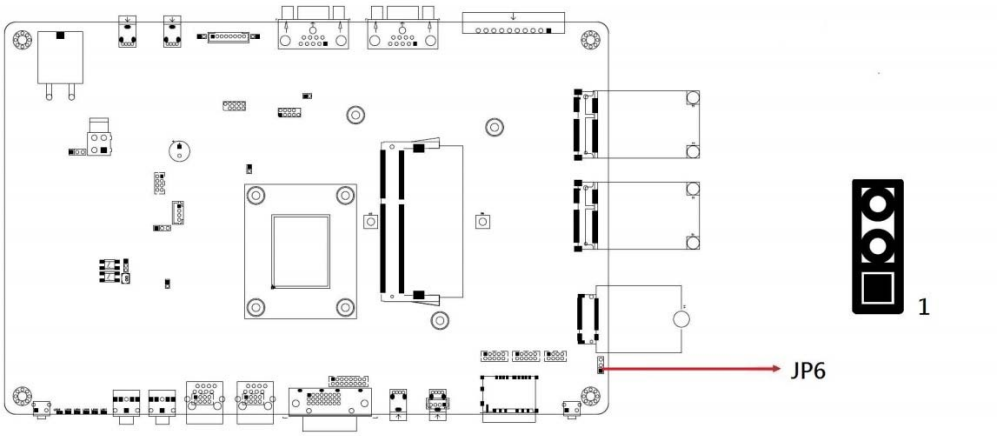
Function	Pin closed	Illustration
9~16V	1-2	
18~30V	2-3	

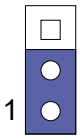
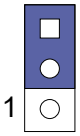
2.4.4 JP5: Clear ME Register



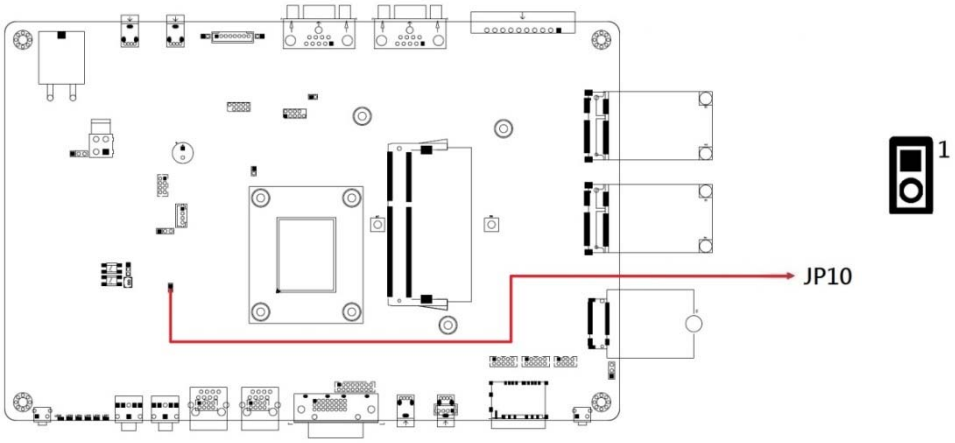
Function	Pin closed	Illustration
Normal (default)	1-2	
Clear ME Register	2-3	

2.4.5 JP6: Second SIM Card Select



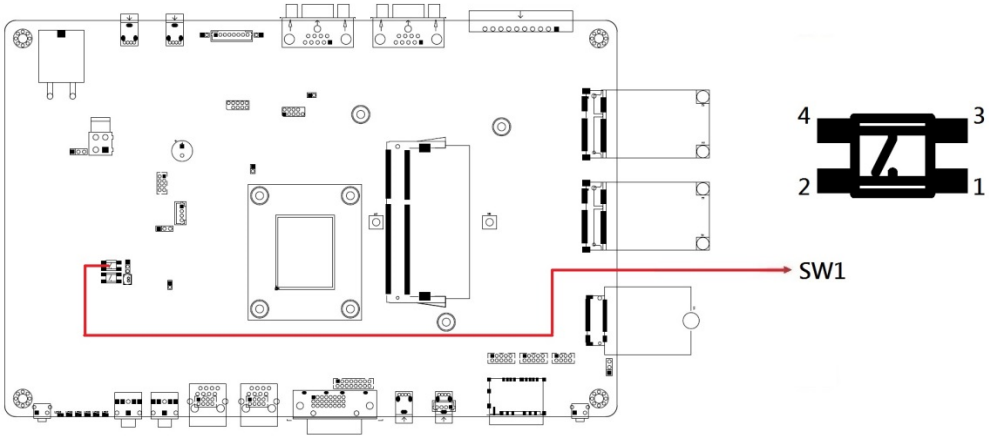
Function	Pin closed	Illustration
To M.2	1-2	
To Mini PCIe	2-3	

2.4.6 JP10: Reset Button Connector

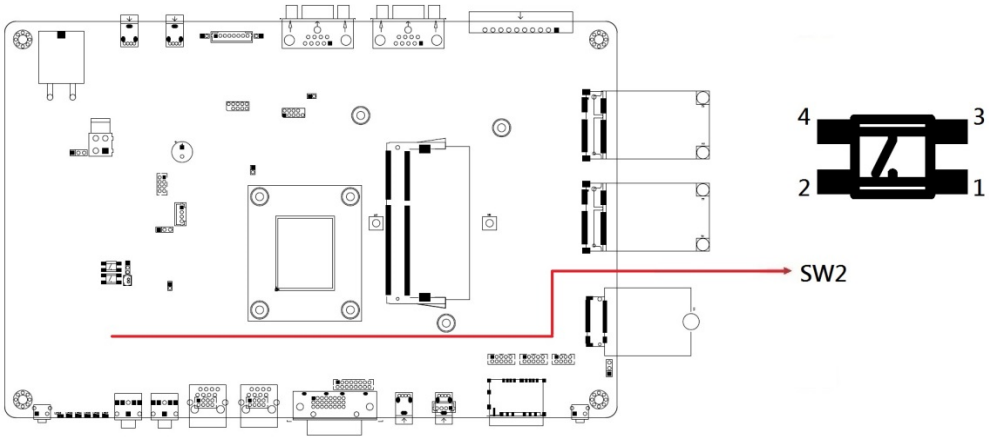


Pin#	Signal Name
1	Reset#
2	Ground

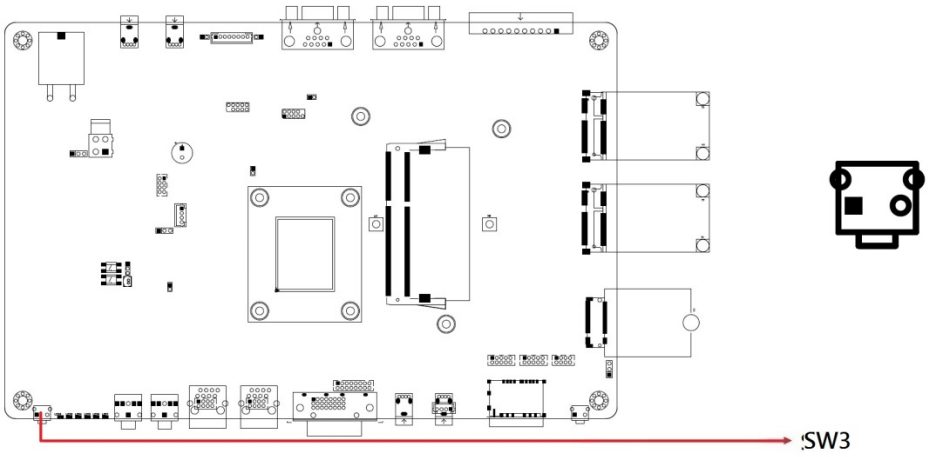
2.4.7 SW1: MCU Reset



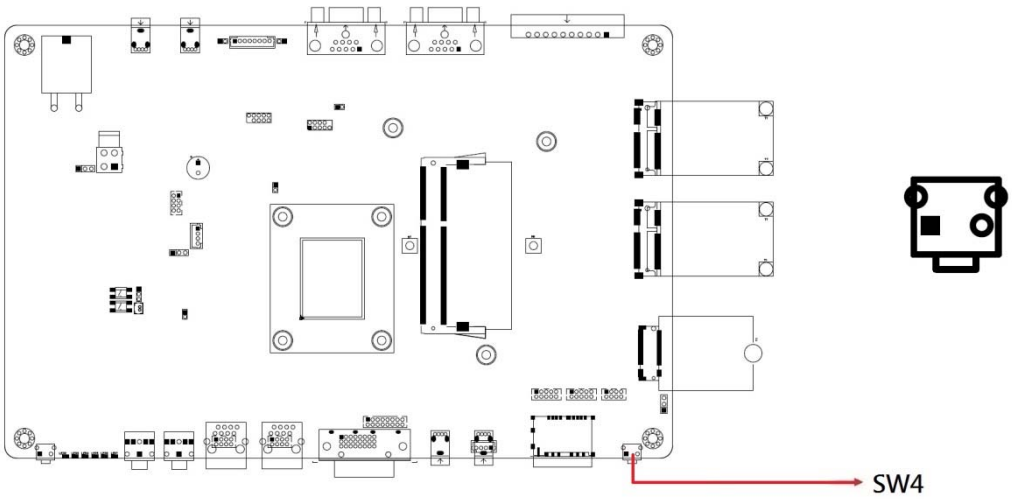
2.4.8 SW2: Clear CMOS



2.4.9 SW3: Power Button

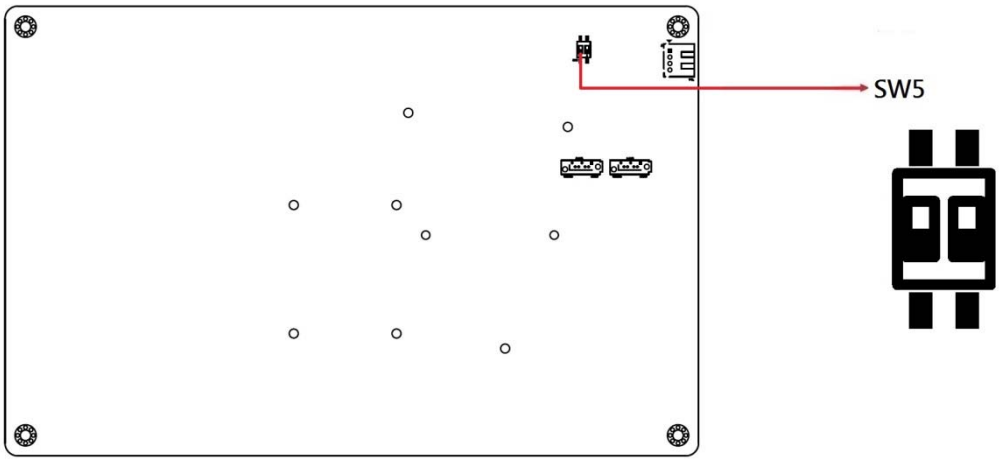


2.4.10 SW4: Add-on Reset (Customer use only)

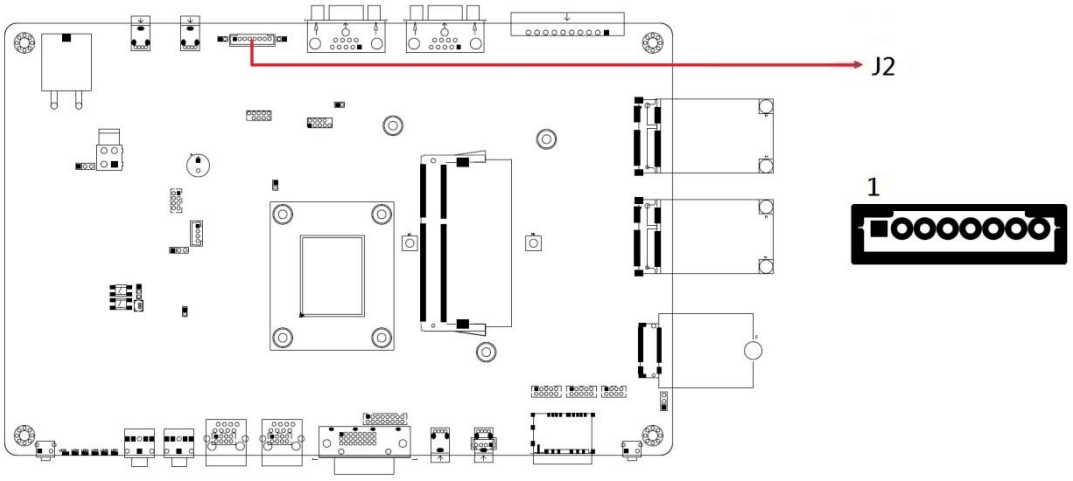


Add-on reset function works with customized software program.
If you would like to use this function, please contact IBASE to get the SDK.

2.4.11 SW5: Digital Input simulation (Factory use only)

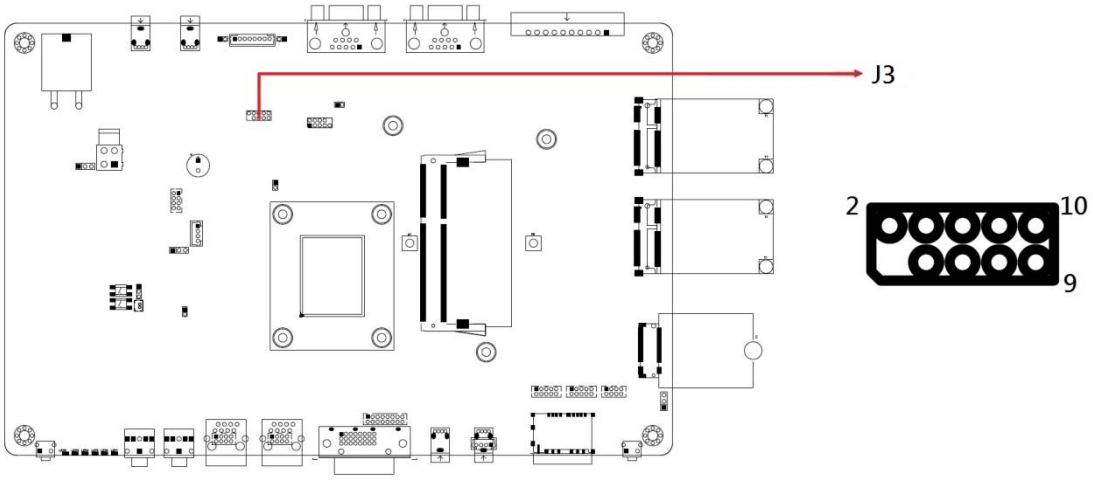


2.4.12 J2: CAN BUS Connector



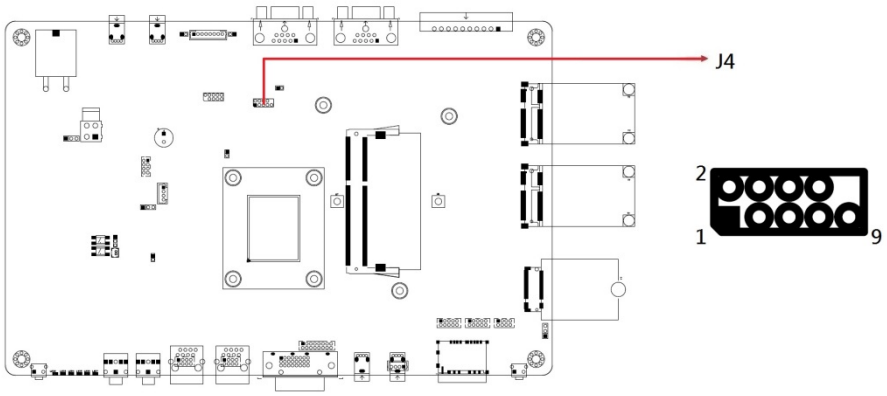
Signal Name	Pin #	Pin#	Signal Name
CAN_DH1	1	5	CAN_DH2
GND_CAN1	2	6	GND_CAN2
CAN_DL1	3	7	CAN_DL2
GND_CAN1	4	8	GND_CAN2

2.4.13 J3: SPI Flash Connector (Factory use only)

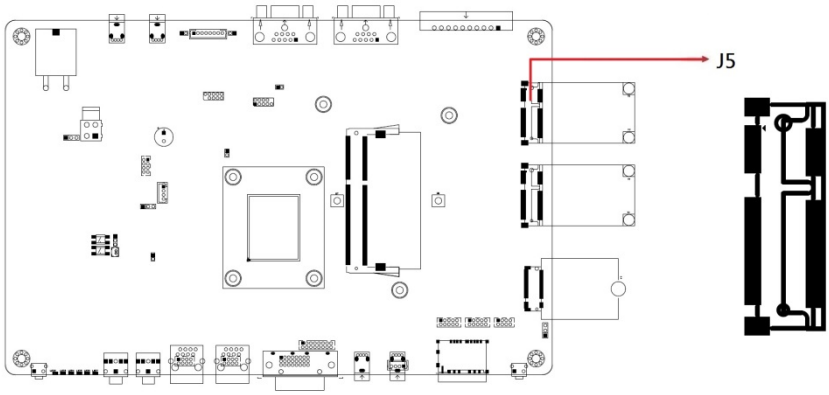


Signal Name	Pin #	Pin#	Signal Name
	X	2	NC
SPI_CS	3	4	+3.3V
SPI_SO	5	6	SPI_HOLD
SPI_WP	7	8	SPI_CLK
GND	9	10	SPI_SI

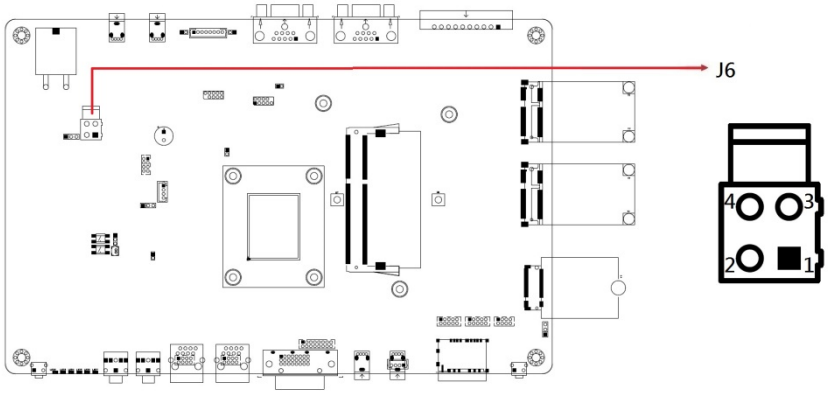
2.4.14 J4: Port 80 connector (Factory use only)



2.4.15 J5: Mini PCI-e Connector (PCI-e, SATA, USB2)

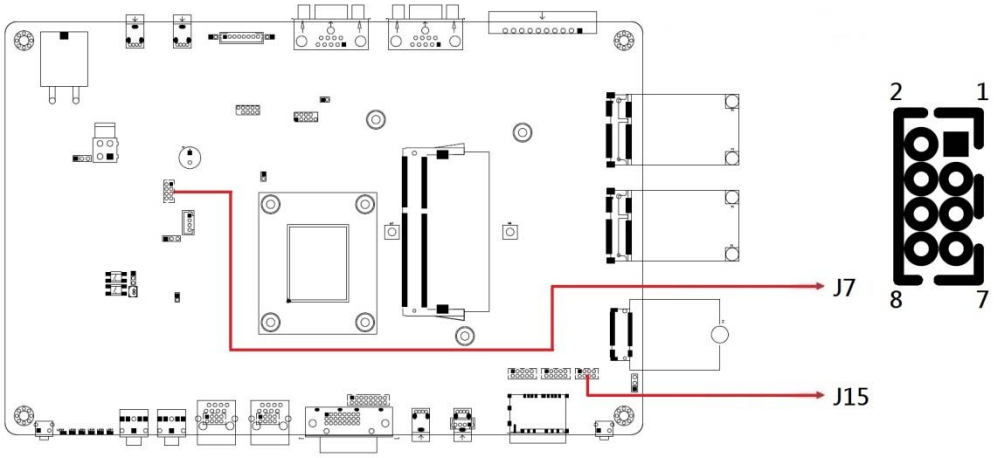


2.4.16 J6: DC-IN Connector



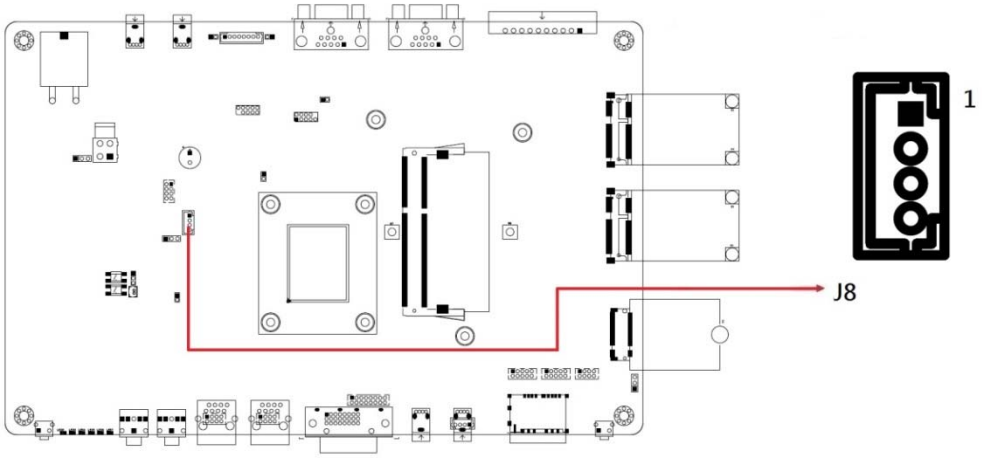
Pin#	Signal Name
1	GND
2	GND
3	9~32V
4	9~32V

2.4.17 J7, J15: Dual USB Connector (DF11-8S-PA66H)



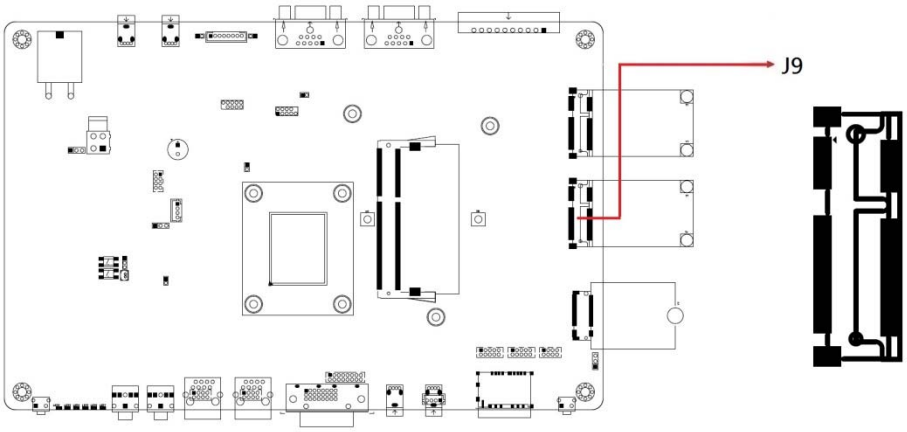
Signal Name	Pin #	Pin#	Signal Name
VBUS0	1	2	GND
D0-	3	4	D1+
D0+	5	6	D1-
GND	7	8	VBUS1

2.4.18 J8: MCU firmware Connector (Factory use only)



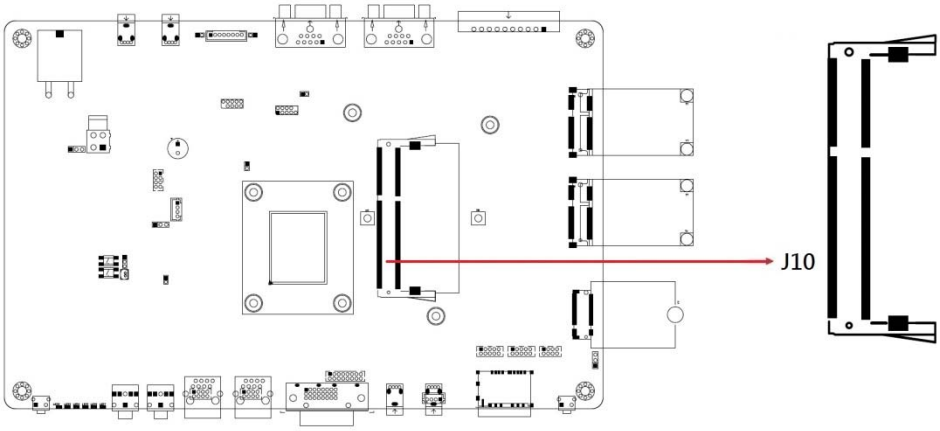
Pin#	Signal Name
1	MCU_VCC
2	CLK
3	DAT
4	GND

2.4.19 J9: Mini PCI-e Connector (PCI-e, USB2)

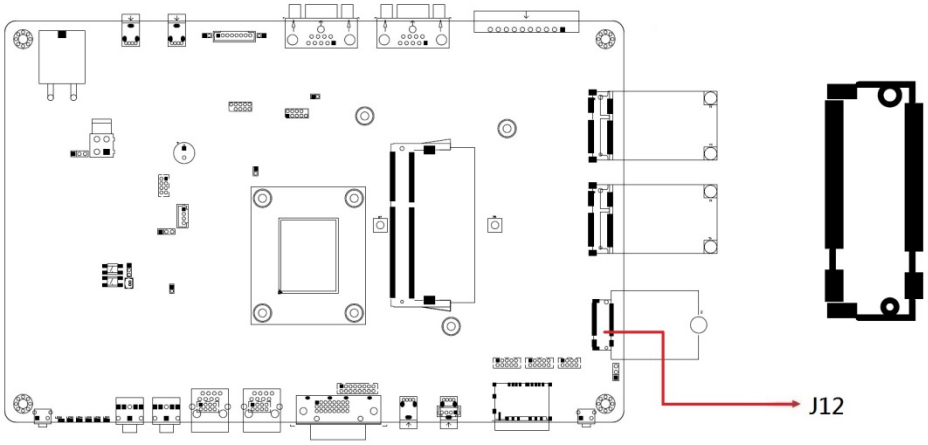


2.4.20 J10: DDR3-L Connector

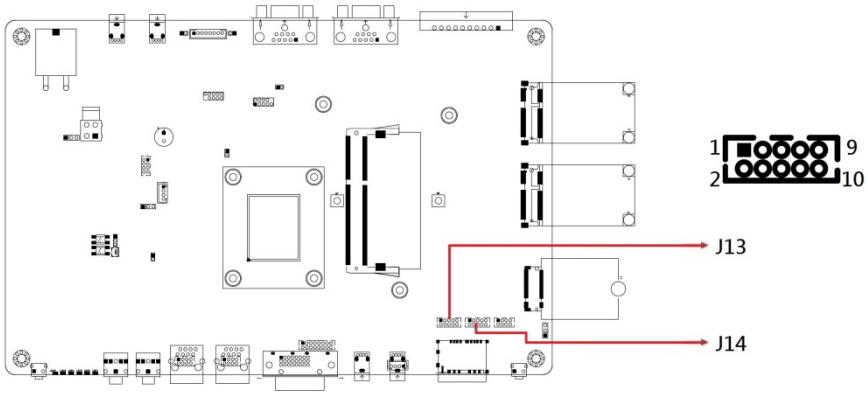
* Supports ECC only



2.4.21 J12: M.2 B-Key 3042 Connector (USB3, USB2)

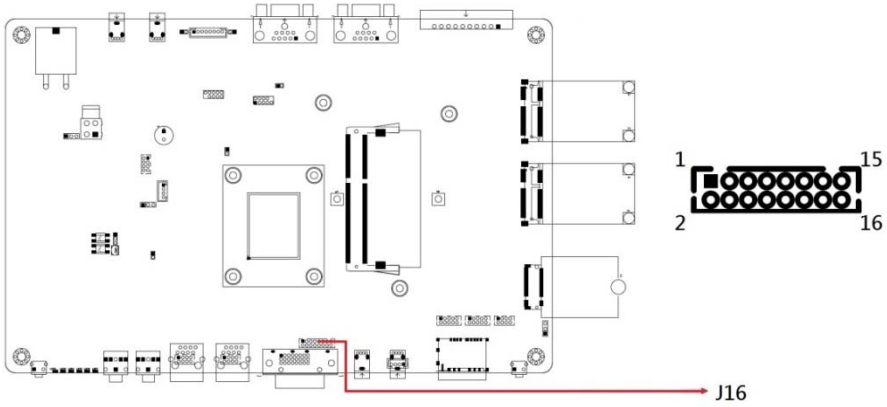


2.4.22 J13, J14：COM3/4 RS-232 Ports (DF11-10S-PA66H)



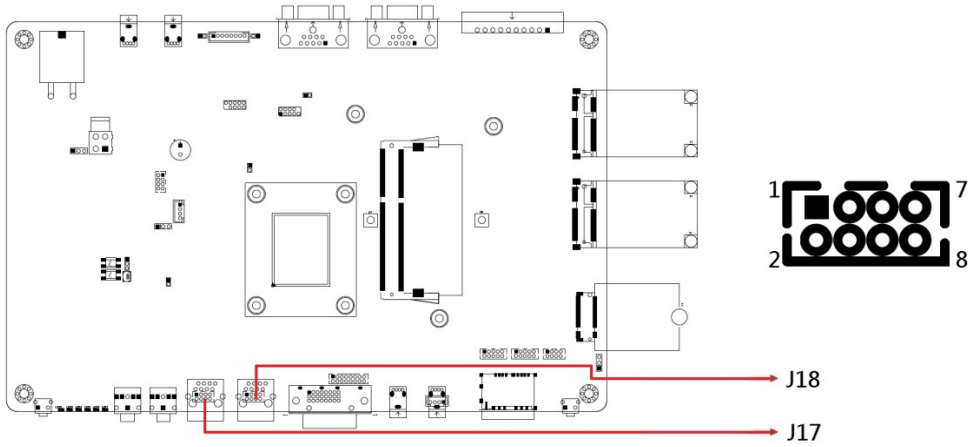
Pin	Signal Name	Pin	Signal Name
1	DCD, Data carrier detect	2	RXD, Receive data
3	TXD, Transmit data	4	DTR, Data terminal ready
5	Ground	6	DSR, Data set ready
7	RTS, Request to send	8	CTS, Clear to send
9	RI, Ring indicator	10	Not Used

2.4.23 J16: VGA Connector (DF11-16DP-2DSA)



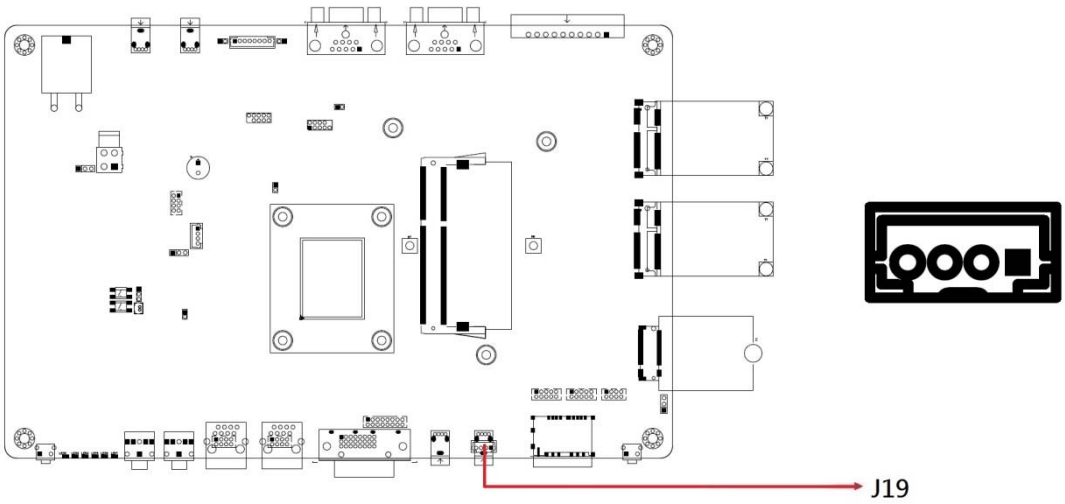
Signal Name	Pin #	Pin#	Signal Name
CRT_R	1	2	CRT_VCC
CRT_G	3	4	GND
CRT_B	5	6	X
X	7	8	DDC_DATA
GND	9	10	HSYNC
GND	11	12	VSYNC
GND	13	14	DDC_CLK
GND	15	16	X

2.4.24 J17, J18: LAN Connector (DF11-8DP-2DSA)



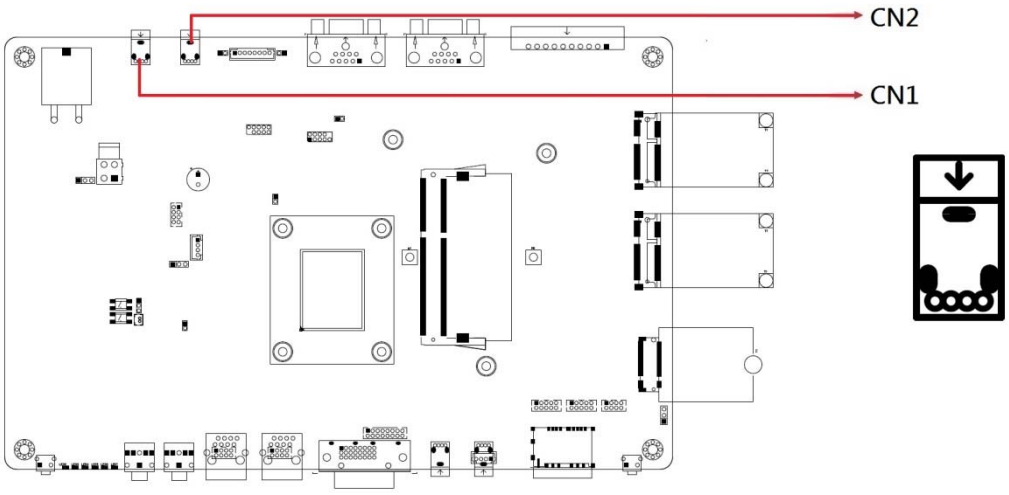
Signal Name	Pin #	Pin#	Signal Name
MDI0+	1	2	MDI0-
MDI1+	3	4	MDI1-
MDI2-	5	6	MDI2+
MDI3+	7	8	MDI3-

2.4.25 J19: USB 2.0 Connector (USB 1.1 only)

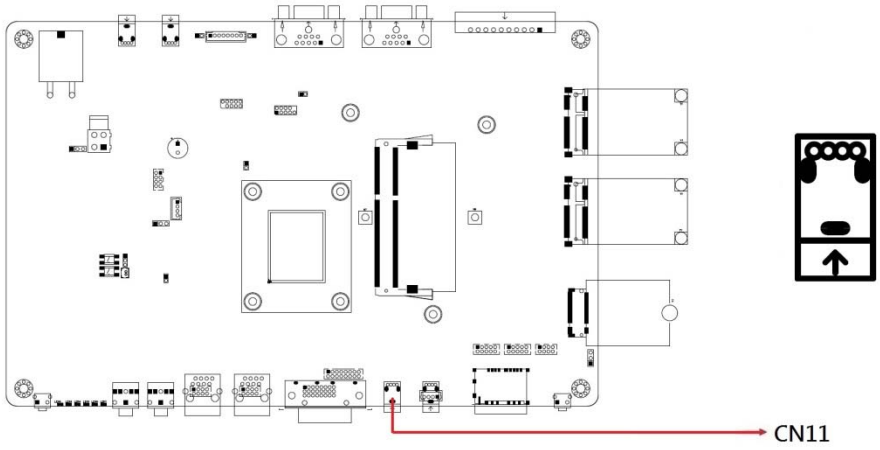


Pin#	Signal Name
1	VBUS
2	D-
3	D+
4	GND

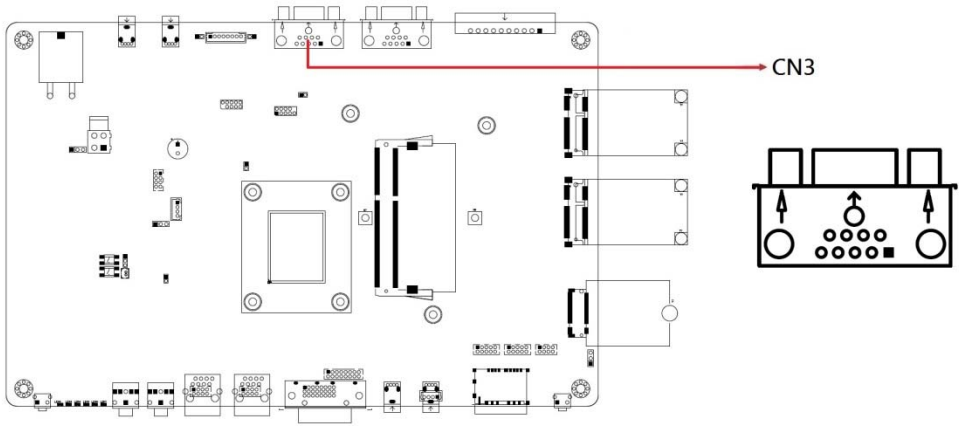
2.4.26 CN1, CN2: USB 2.0 Connector (Supports USB 1.1 only)



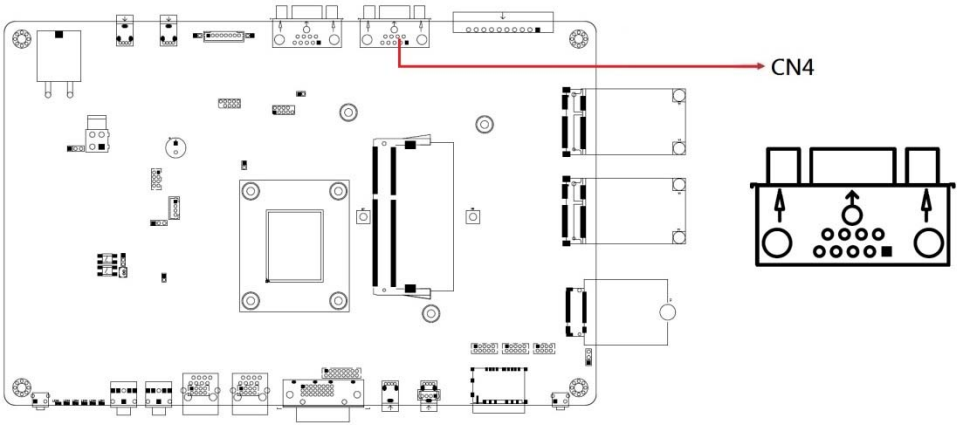
2.4.27 CN11: USB 2.0 Connector (Supports USB 1.0 only)



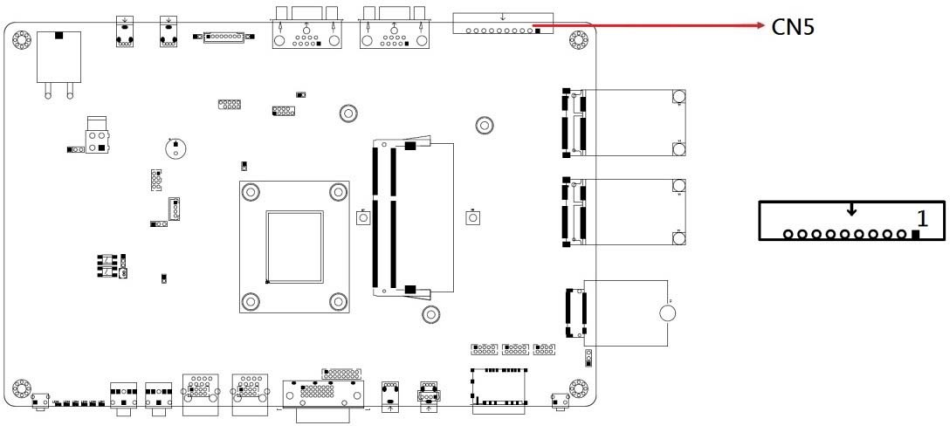
2.4.28 CN3: COM Port Connector (RS-485 only)



2.4.29 CN4: COM Port Connector (RS-232,422,485)

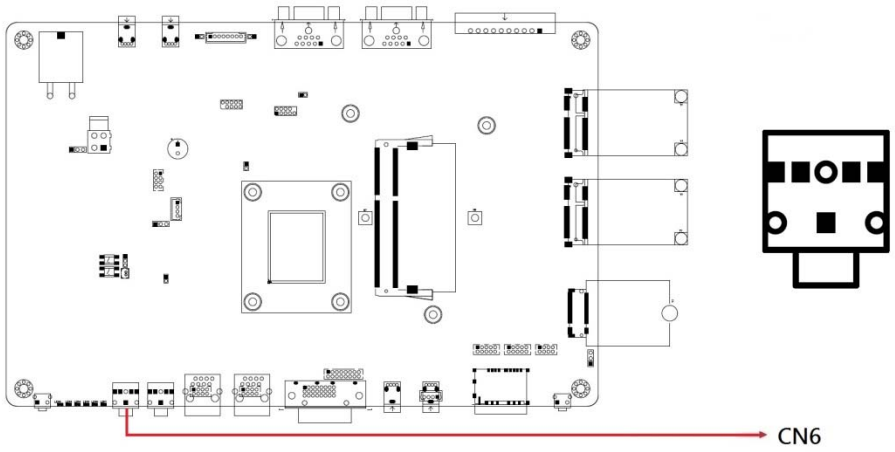


2.4.30 CN5: Digital I/O Connector

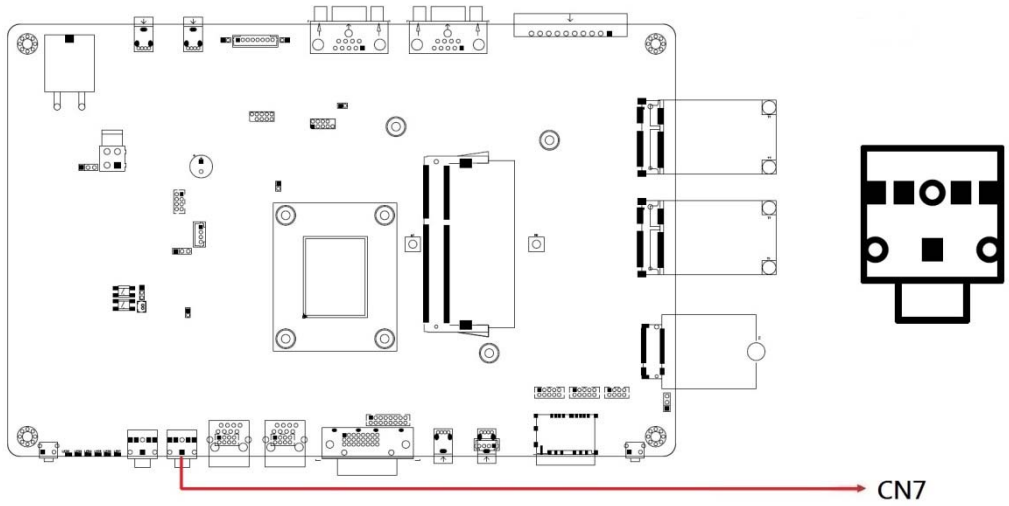


Pin#	Signal Name
1	GND
2	OD-OUT0
3	OD OUT1
4	IN0
5	IN1
6	IN2
7	IN3
8	IN4
9	IN5
10	GND

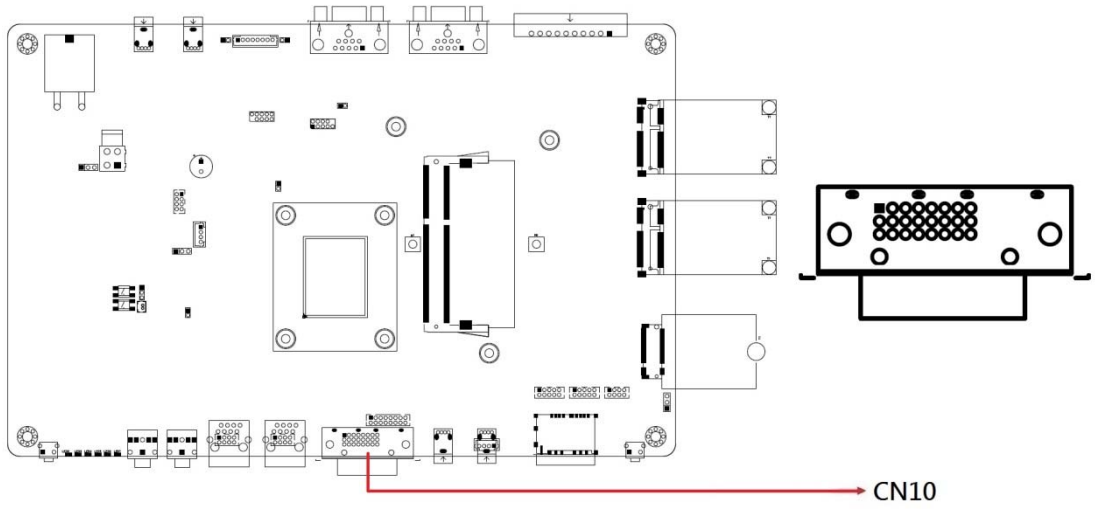
2.4.31 CN6: Mic-In Connector



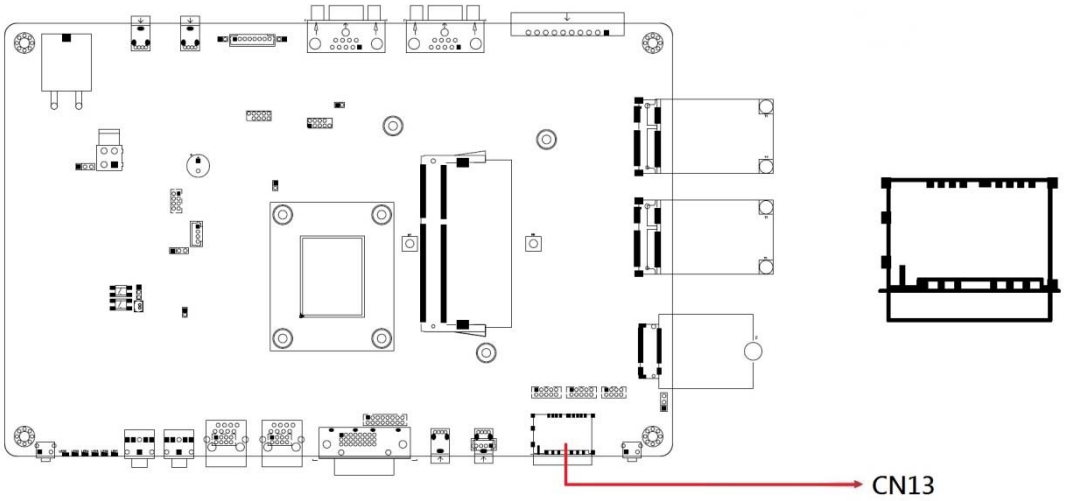
2.4.32 CN7: Line Out Connector



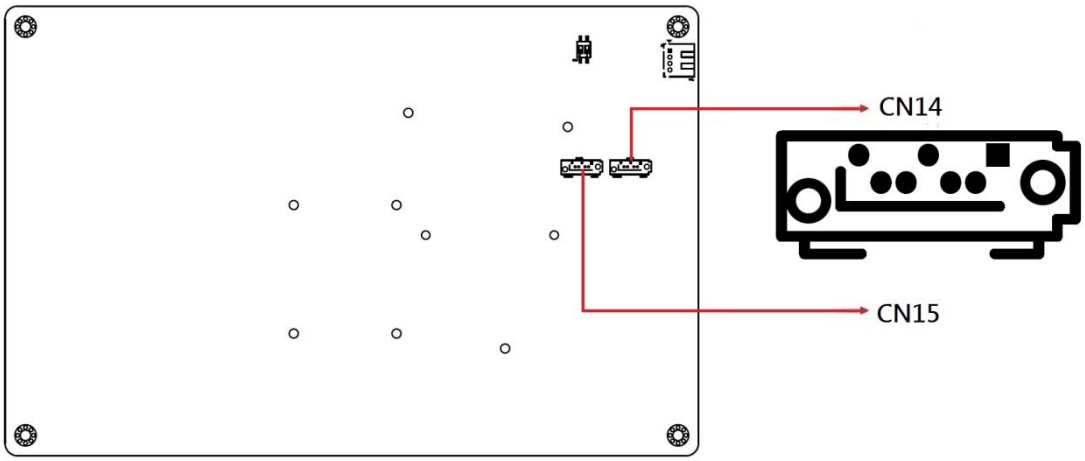
2.4.33 CN10: DVI-D Connector



2.4.34 CN13: Dual Nano SIM Connector



2.4.35 CN14, CN15: SATA Connector



Chapter 3
Driver Installation

The information provided in this chapter includes:

- Intel® Chipset Software Installation Utility
- VGA Driver Installation
- HD Audio Driver Installation
- LAN Driver Installation
- Intel® Trusted Execution Engine Installation
- Intel® Serial I/O Driver Installation

3.1 Introduction

This section describes the installation procedures for software drivers. The software drivers are in a disk enclosed with the product package. If you find anything missing, please contact the distributor where you made the purchase.

Note: After installing your Windows operating system, you must install the Intel® Chipset Software Installation Utility first before proceeding with the drivers installation.

3.2 Intel® Chipset Software Installation Utility

The Intel® Chipset drivers should be installed first before the software drivers to install INF files for Plug & Play function for the chipset components. Follow the instructions below to complete the installation.

1. Insert the DVD enclosed in the package. Click **Intel** and then **Intel(R) Apollolake Chipset Drivers**.

2. Click **Intel(R) Chipset Software Installation Utility**.

3. When the *Welcome* screen to the Intel® Chipset Device Software appears, click **Next** to continue.
4. Click **Yes** to accept the software license agreement and proceed with the installation process.
5. When the driver has been completely installed, click **Finish** to complete the setup process.

3.3 VGA Driver Installation

1. Click **Intel** and then **Intel(R) Apollolake Chipset Drivers**.

2. Click **Intel(R) Apollolake Graphics Driver**.

3. When the *Welcome* screen appears, click **Next** to continue.
4. Click **Yes** to agree with the license agreement and continue the installation.
5. Click **Next** after reading th Readme File Information. Click **Next** in the *Setup Progress* screen.
6. When Setup is Complete, restart the computer for changes to take effect.

3.4 Realtek HD Audio Driver Installation

1. Click **Intel** and then **Intel(R) Apollolake Chipset Drivers**.

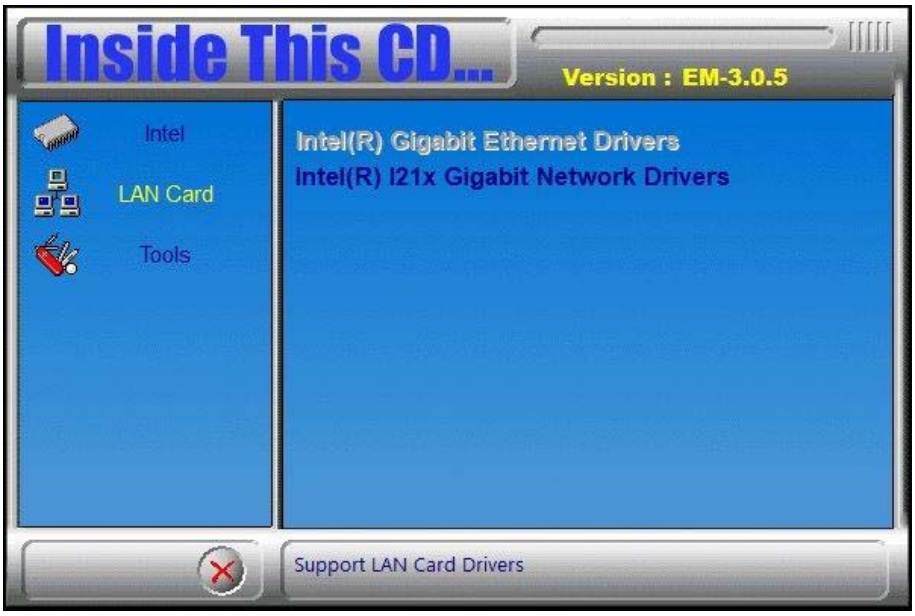
2. Click **Realtek High Definition Audio Driver**.

3. On the *Welcome* screen of the InstallShield Wizard, click **Next** to continue.
4. When the InstallShield Wizard has successfully installed the Realtek High Definition Audio Driver, restart the computer.

3.5 LAN Driver Installation

1. Click **LAN Card** and then **Intel LAN Controller Drivers**.

2. Click **Intel(R) Gigabit Ethernet Drivers**.



3. On the welcome screen of *Intel® Network Connections Install Wizard*, click **Next**.
4. Accept the license agreement and click **Next** to continue.
5. On the *Setup Options* screen, click the checkbox to select the desired driver(s) to install. Then click **Next** to continue.
6. The wizard is ready to make the installation. Click **Install**.

   Install wizard has completed the installation, click **Finish**.

3.6 Intel® Trusted Execution Engine Installation

1. Click **Intel** and then **Intel(R) Apollolake Chipset Drivers**.

2. Click **Intel** and then **Intel(R) TXE Drivers**.

3. When the *Weocome* screen appears, click **Next** to continue.
4. Accept the license agreement and click **Next** to continue.
5. In the *Confirmation* screen, click **Next** to continue.
6. When the Intel® Trusted Execution Engine has been successfully installed, click **Finish**..

3.7 Intel® Serial I/O Driver Installation

1. Click **Intel** and then **Intel(R) Apollolake Chipset Drivers**.

2. Click **Intel** and then **Support Intel(R) Serial IO Driver**.

3. When the *Weocome* screen appears, click **Next** to continue.
4. Accept the license agreement and click **Next** to continue.
5. In the *Readme File Information* screen, click **Next** to continue
6. In the *Confirmation* screen, click **Next** to continue
7. When the Intel® Serial I/O has been successfully installed, click **Finish**.

Chapter 4
BIOS Setup

This chapter describes the different settings available in the AMI BIOS that comes with the board. The topics covered in this chapter are as follows:

- Main Settings
- Advanced Settings
- Chipset Settings
- Security Settings
- Boot Settings
- Save & Exit

4.1 Introduction

The BIOS (Basic Input/Output System) installed in the ROM of your computer system supports Intel® processors. The BIOS provides critical low-level support for standard devices such as disk drives, serial ports and parallel ports. It also provides password protection as well as special support for detailed fine-tuning of the chipset controlling the entire system.

4.2 BIOS Setup

The BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS ROM of the system stores the Setup utility. When you turn on the computer, the BIOS is immediately activated. Press the <Del> key immediately allows you to enter the Setup utility. If you are a little bit late pressing the <Del> key, POST (Power On Self Test) will continue with its test routines, thus preventing you from invoking the Setup.

If you still need to enter Setup, restart the system by pressing the ”Reset” button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys. You can also restart by turning the system Off and back On again.

The following message will appear on the screen:

```
Press <DEL> to Enter Setup
```

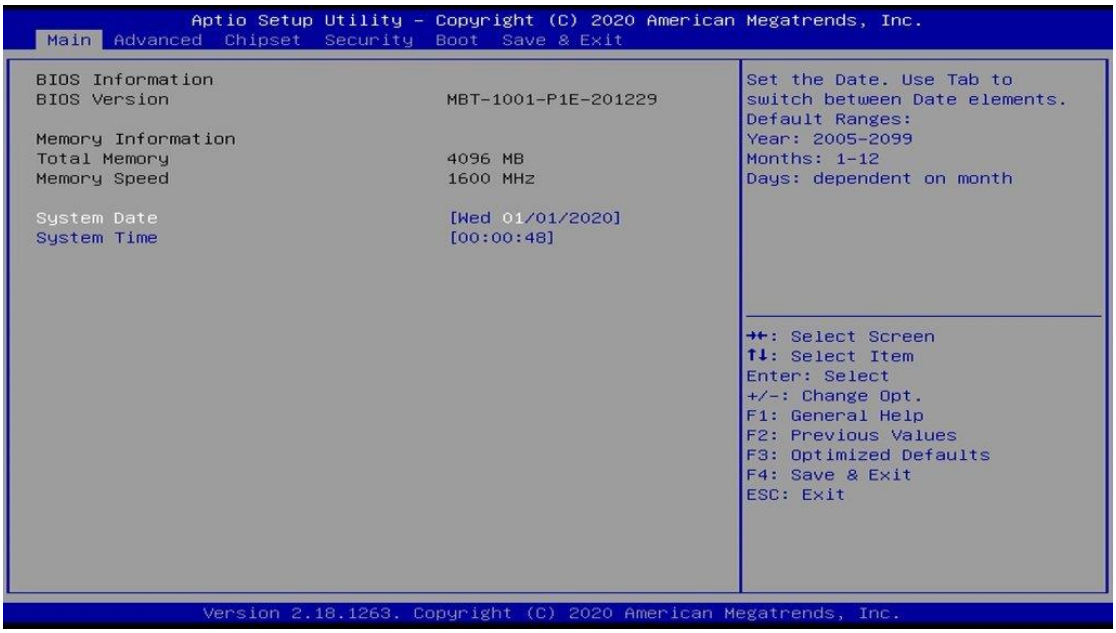
In general, press the arrow keys to highlight items, <Enter> to select, the <PgUp> and <PgDn> keys to change entries, <F1> for help, and <Esc> to quit.

When you enter the BIOS Setup utility, the *Main Menu* screen will appear on the screen. The Main Menu allows you to select from various setup functions and exit choices.

Warning: It is strongly recommended that you avoid making any changes to the chipset defaults.

These defaults have been carefully chosen by both AMI and your system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could make the system unstable and crash in some cases.

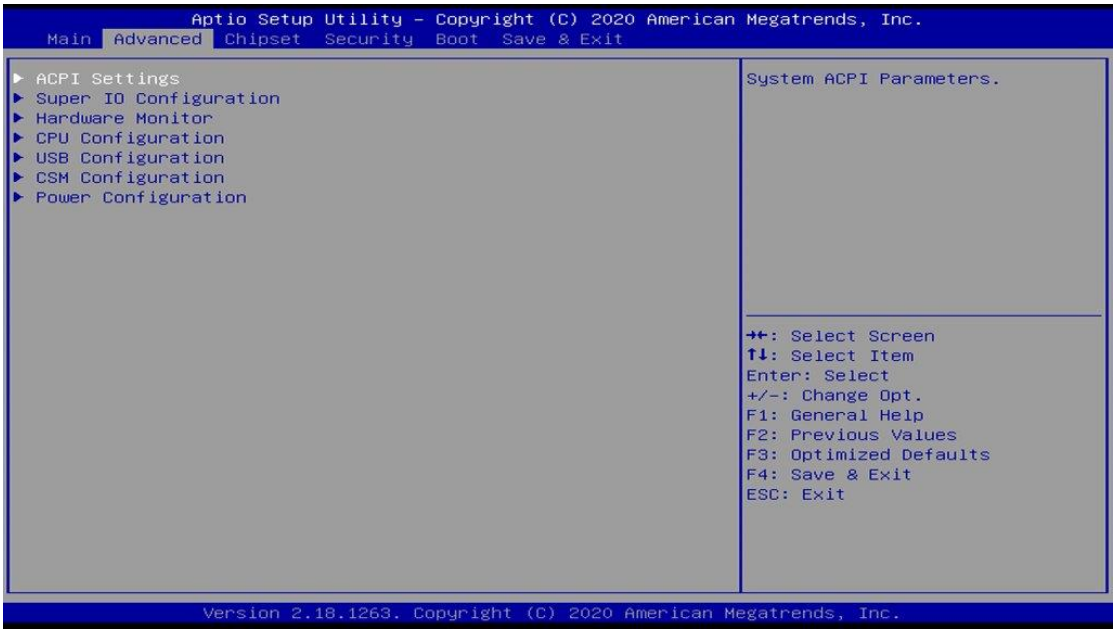
4.3 Main Settings



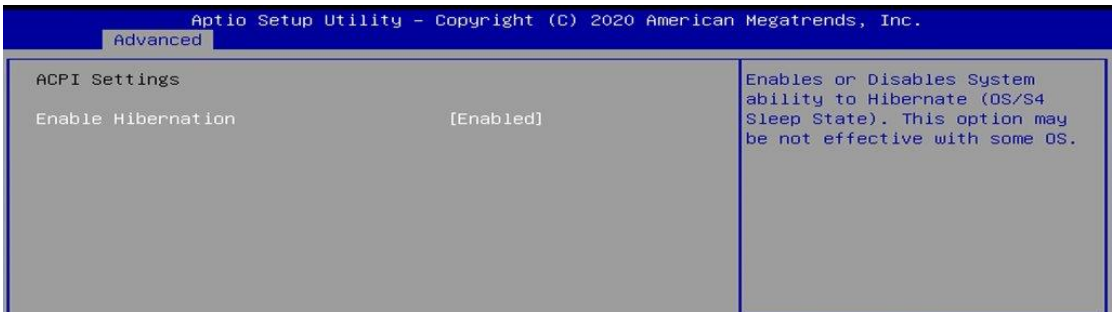
BIOS Setting	Description
System Date	Sets the date. Use the <Tab> key to switch between the data elements.
System Time	Set the time. Use the <Tab> key to switch between the data elements.

4.4 Advanced Settings

This section allows you to configure, improve your system and allows you to set up some system features according to your preference.

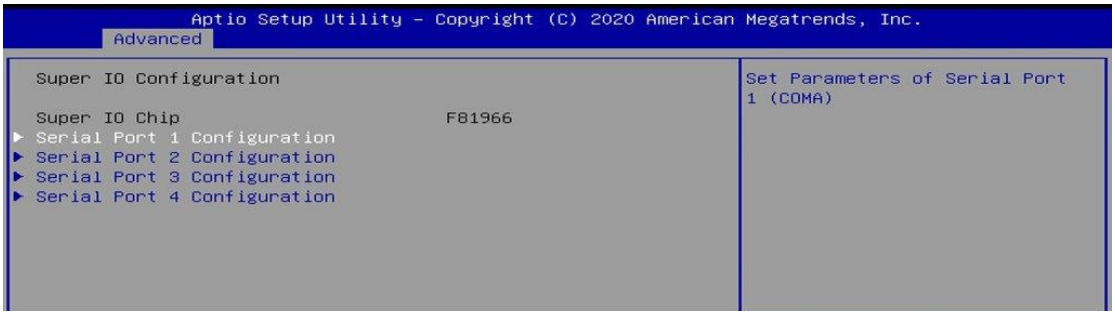


4.4.1 ACPI Settings



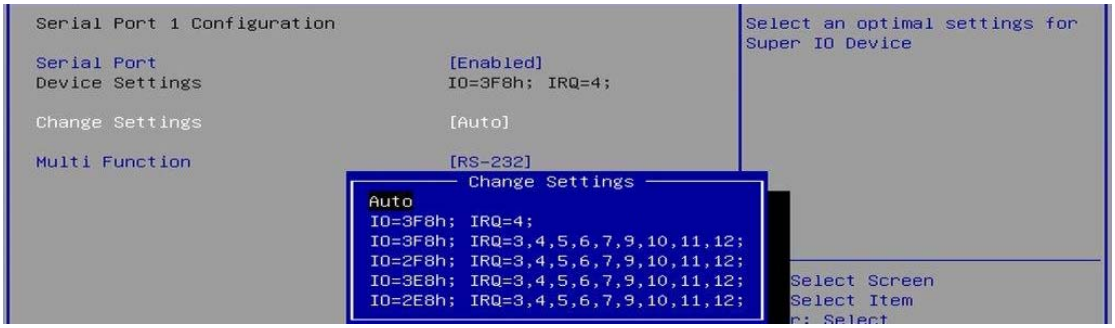
BIOS Setting	Description
Enable Hibernation	Enables or disables the System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some OS.
ACPI Sleep State	Selects ACPI sleep state that the system will enter when the SUSPEND button is pressed.

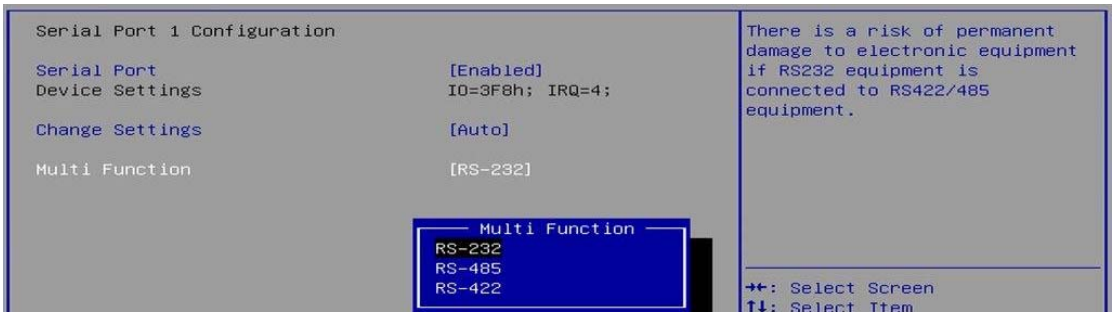
4.4.2 Super IO Configuration



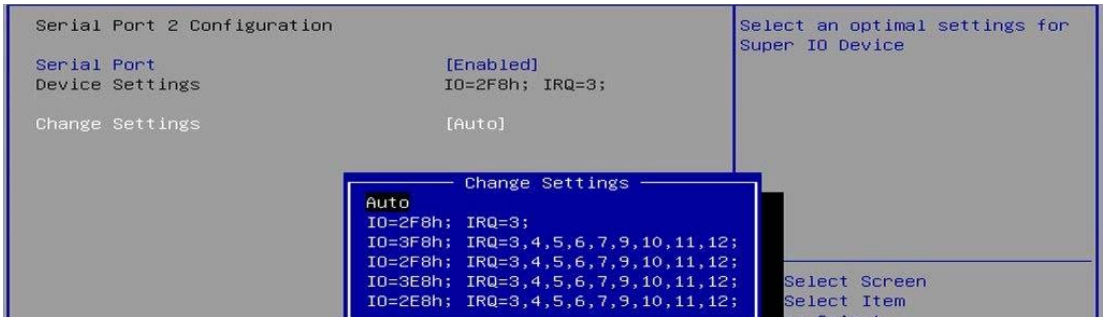
BIOS Setting	Description
Serial Port Configuration	Sets Parameters of Serial Ports. You can enable / disable the serial port and select an optimal settings for the Super IO device.

Serial Port 1 Configuration

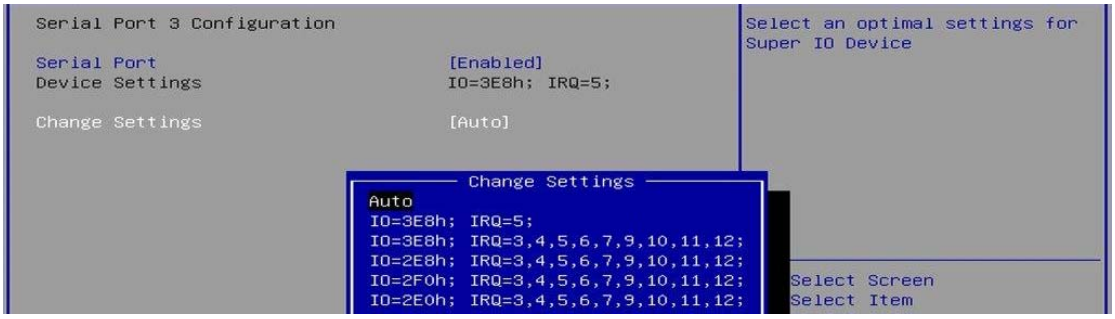




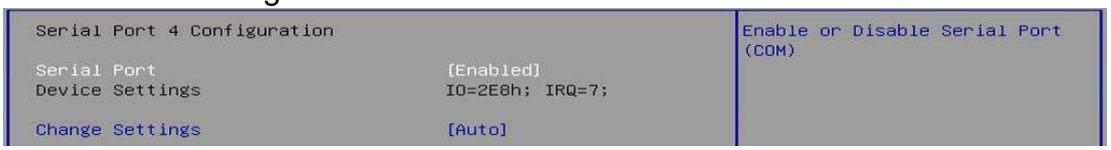
Serial Port 2 Configuration

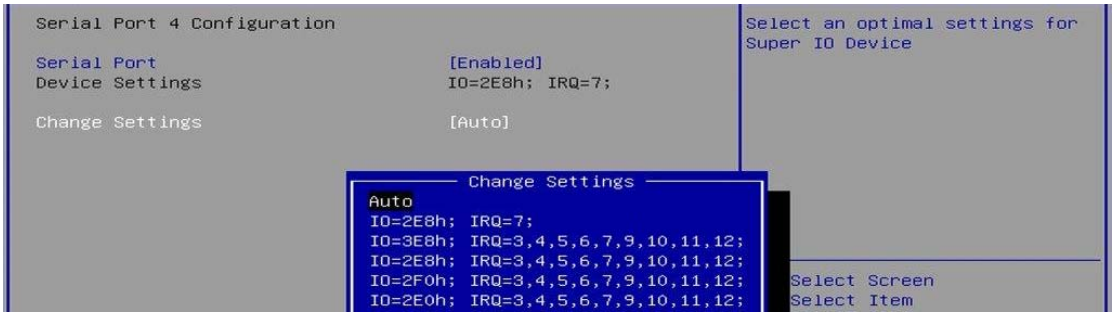


Serial Port 3 Configuration

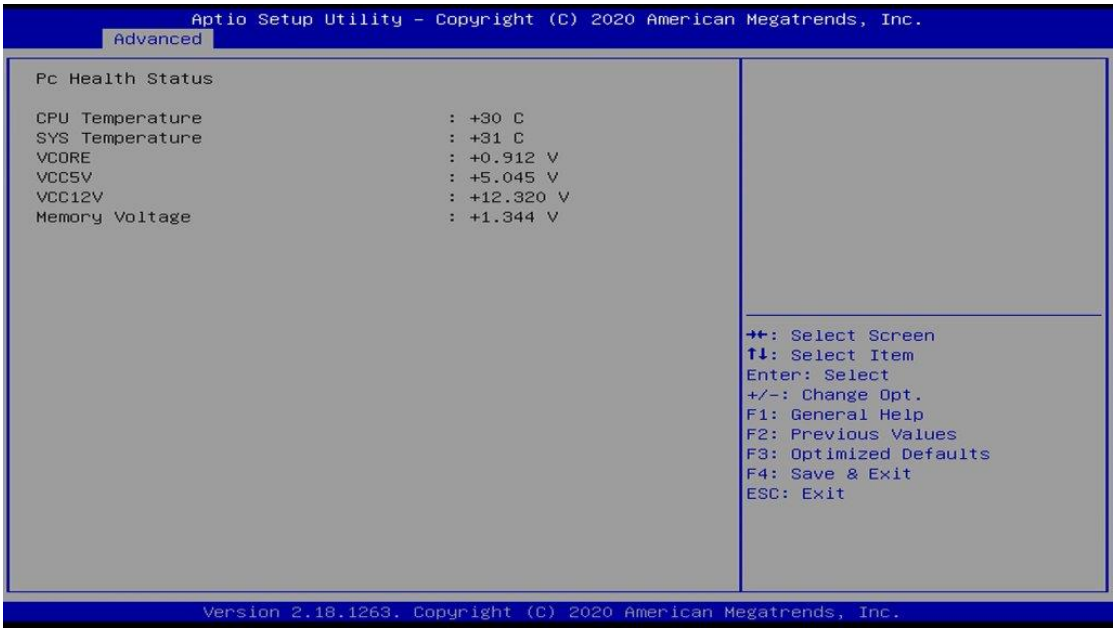


Serial Port 4 Configuration





4.4.3 Hardware Monitor

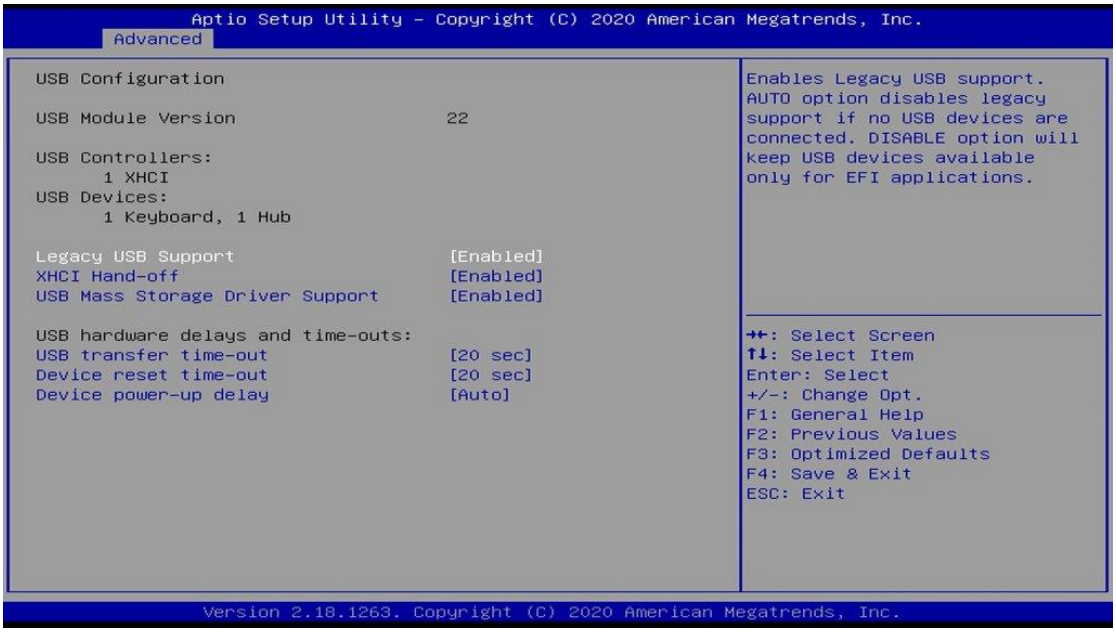


BIOS Setting	Description
Temperatures / Voltages	These fields are the parameters of the hardware monitoring function feature of the motherboard. The values are read-only values as monitored by the system and show the PC health status

4.4.4 CPU Configuration

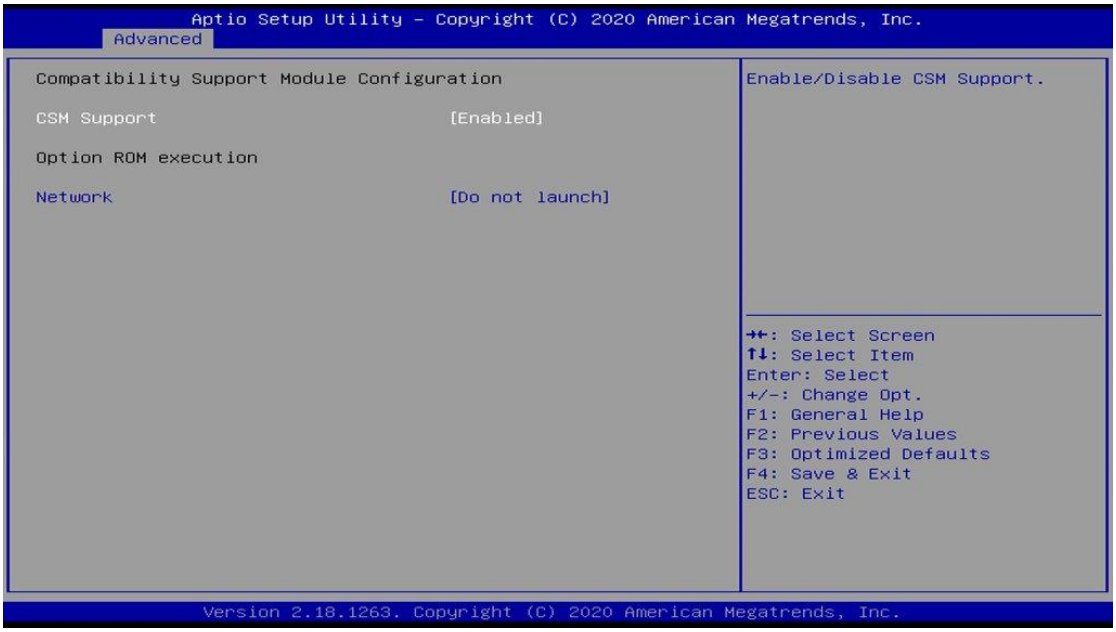
BIOS Setting	Description
Socket 0 CPU Information	Displays the specific socket CPU Information.

4.4.5 USB Configuration



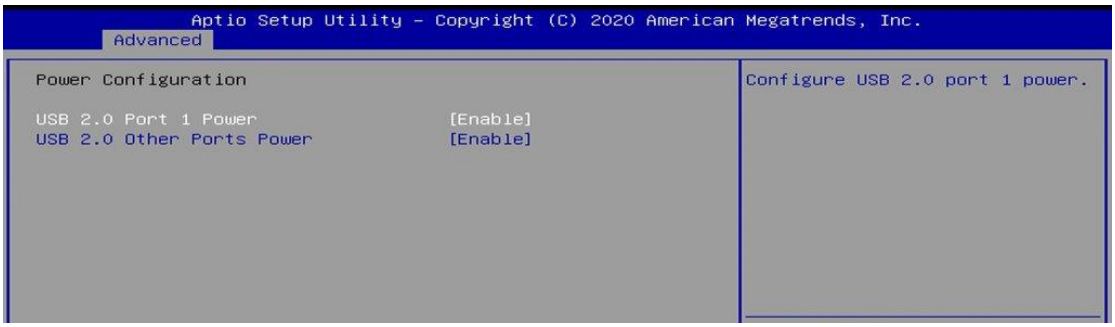
BIOS Setting	Description
Legacy USB Support	• **Enable:** Enables Ledacy USB Support. • **Auto:** Disables legacy support if no USB devices are connected. • **Disable:** Keeps USB devices available only for EFI applications.
XHCI Hand-off	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Enables / Disables the support for USB mass storage driver.
USB transfer time-out	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	USB mass storage device Start Unit command time-out. Options: 10/20/30/40 sec
Device power-up delay	The maximum time the device will take before it properly reports itself to the Host Controller. “Auto” uses default value for a Root port it is 100ms. But for a Hub port, the delay is taken from Hub descriptor.

4.4.6 CSM Configuration



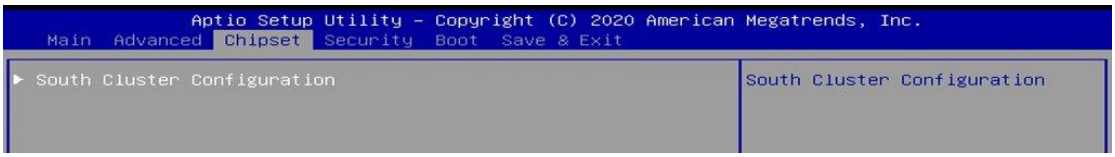
BIOS Setting	Description
CSM Support	Enables/Disables CSM Support.
Network	Controls the execution of UEFI and Legacy PXE OpROM.

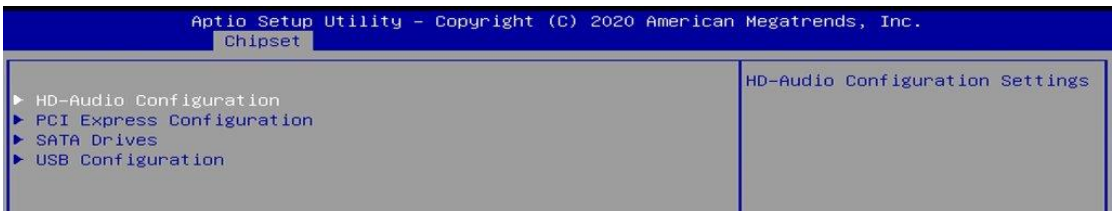
4.4.7 Power Configuration



BIOS Setting	Description
USB 2.0 Port 1 Power	Configure USB 2.0 port 1 power
USB 2.0 Other Ports Power	Configure USB 2.0 other ports power

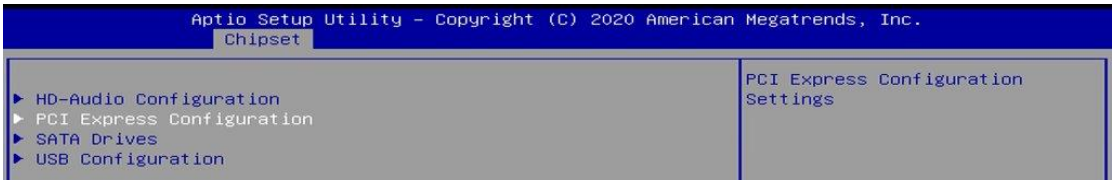
4.5 Chipset Settings



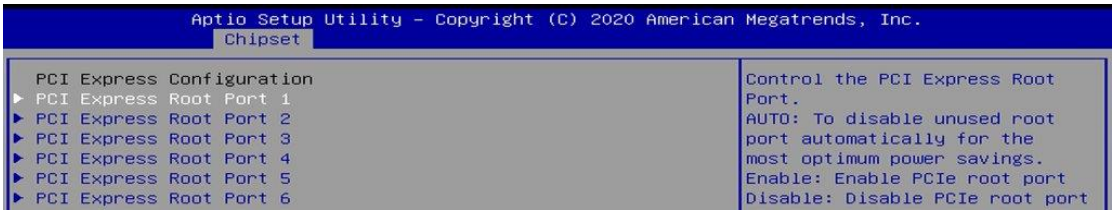


BIOS Setting	Description
HD-Audio Configuration	HD-Audio Configuration Settings
PCI Express Configuration	PCI Express Configuration Settings
SATA Drivers	Selects the SATA Device Configuration Setup options
USB Configuration	USB Configuration Settings

HD-Audio Configuration



PCI Express Configuration



BIOS Setting	Description
PCI Express Root Port	Control the PCI Express Root Port. AUTO: To disable unused root port automatically for the most optimum power savings. Enable: Enable PCIe root port Disable: Disable PCIe root port
ASPM	PCI Express Active State Power Management settings
L1 Substates	PCI Express L1 Substates settings.
PME SCI	PCI Express PME SCI Enable/Disable
PCIe Speed	Configure PCIe Speed

SATA Drives

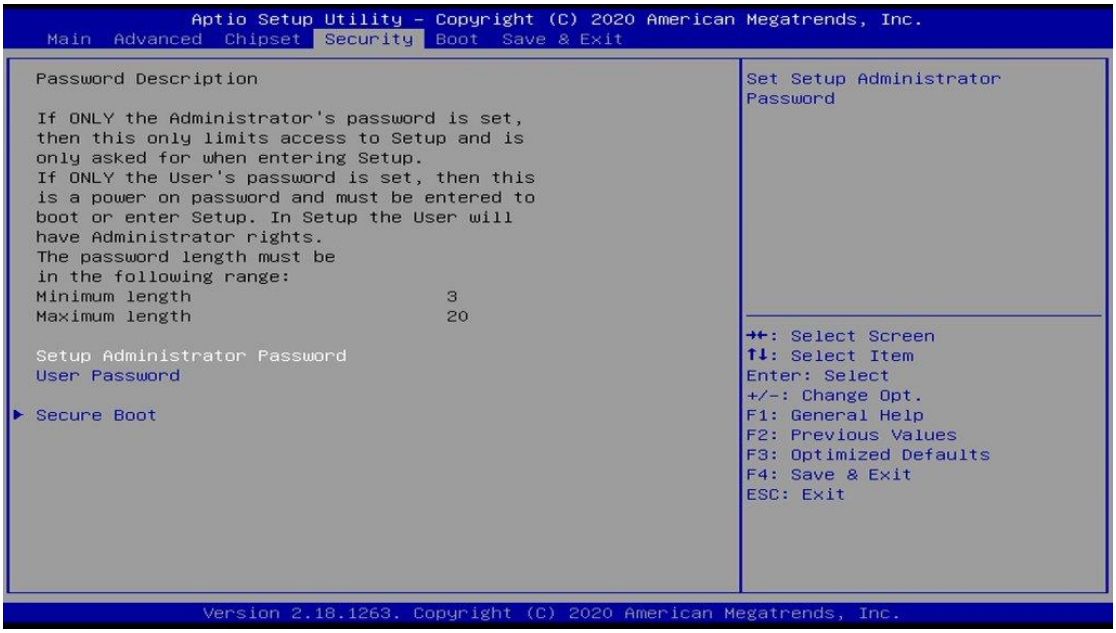
BIOS Setting	Description
Chipset SATA	Enables or Disables the Chipset SATA controller. The Chipset SATA controller supports the 2 black internal SATA ports (up to 3Gb/s supported /port).
SATA Mode Selection	Determines hos SATA controller(s) operate.
L1 Substates	PCI Express L1 Substates settings.

USB Configuration

BIOS Setting	Description
XHCI Pre-Boot Driver	Enable/Disable XHCI Pre-Boot Driver support
XHCI Mode	Once disabled, XHCI controller would be function disable, none of the USB devices are detectable and usable during boot and in OS. Do not disable it unless for debug purpose.
USB VBUS	VBUS should be ON in HOST mode. It should be OFF in OTG device mode.
USB HSIC1 Support	Enable/Disable USB HSIC
USB SSIC1 Support	Enable/Disable USB SSIC1
USB Port Disable Override	Selectively Enable/Disable the corresponding USB port from reporting a Device Connection to the controller.
XDCI Support	Enable/Disable XDCI
XHCI Disable Compliance Mode	Options to disable XHCI Link Compliance Mode. Default is FALSE to not disable Compliance Mode. Set TRUE to disable Compliance Mode.

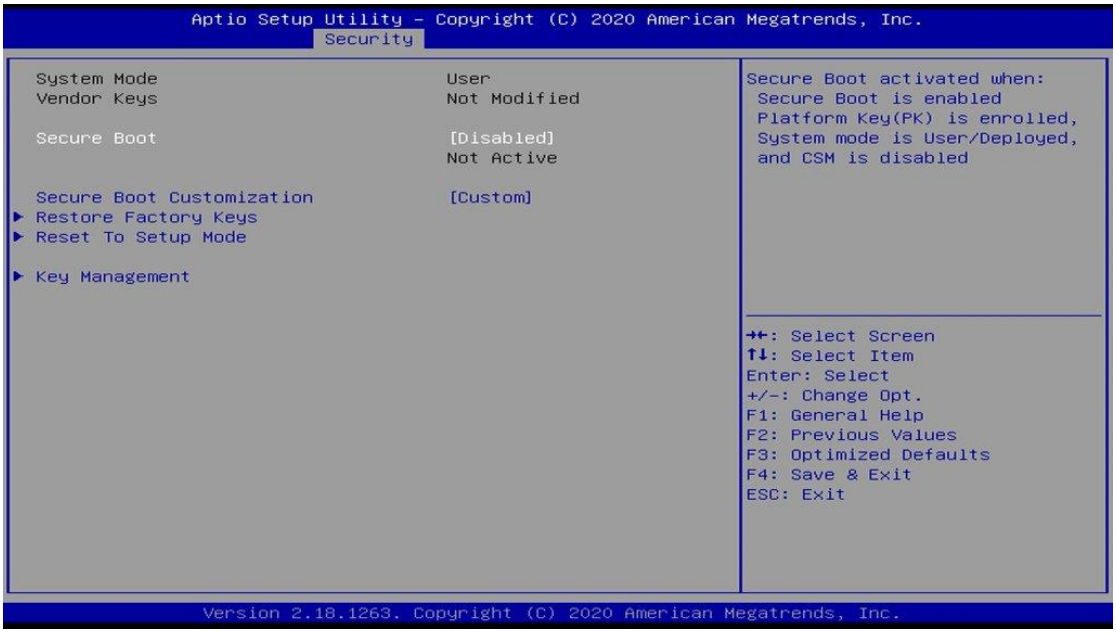
4.6 Security Settings

This section allows you to configure, improve your system, and set up some system features according to your preference.



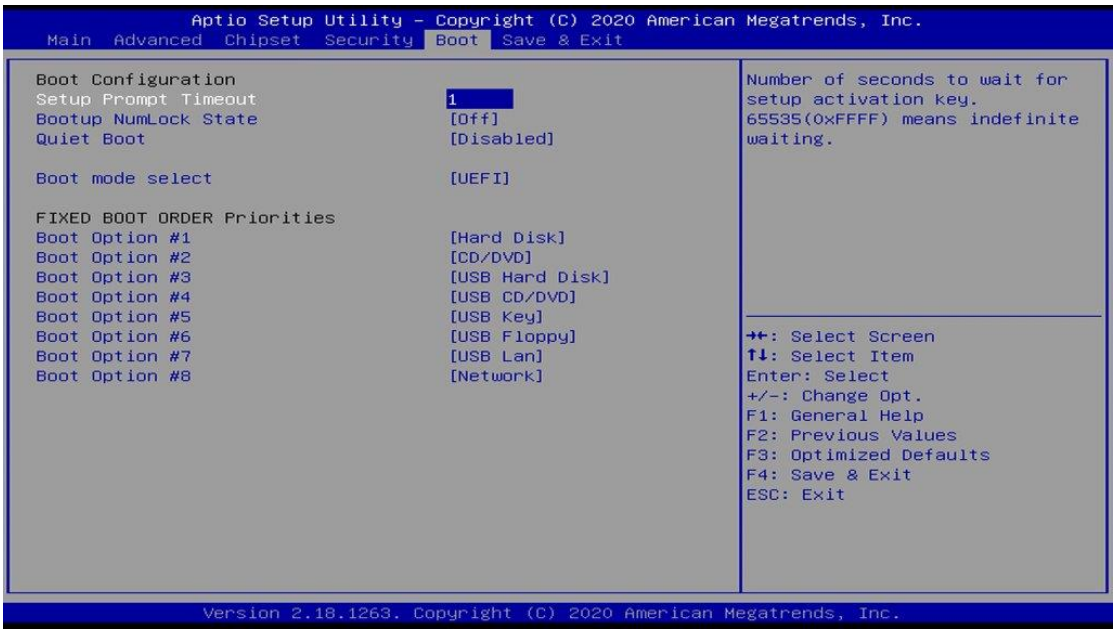
BIOS Setting	Description
Administrator Password	Sets an administrator password for the setup utility.
User Password	Sets a user password.
Secure Boot	Configures Secure Boot.

4.6.1 Secure Boot



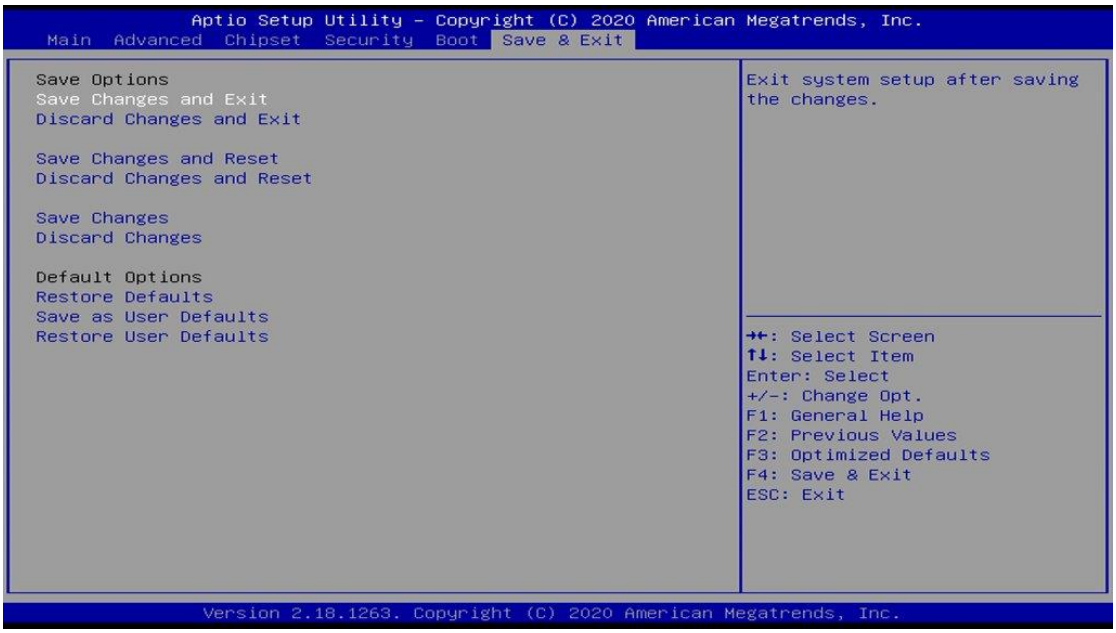
BIOS Setting	Description
Secure Boot	Secure Boot feature is Active if Secure Boot is enabled. Platform Key (PK) Is enrolled and the system is in User mode and CSM is disabled.
Secure Boot Customization	Secure Boot Mode – Custom and Standard. Set UEFI Secure Boot Mode to STANDARD mode or CUSTOM mode,. This change takes effect after save. After reset, th emode will return to STANDARD mode.
Restore Factory Keys	Forces system to user mode. Configure NVRAM to contain OEM-defined factory default Secure Boot keys.
Reset to Setup Mode	Delete NVRAM content of all UEFI Secure Boot key databases
Key Management	Enables expert users to modify Secure Boot Policy variables without full authentication.

4.7 Boot Settings



BIOS Setting	Description
Setup Prompt Timeout	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	Selects the keyboard NumLock state.
Quiet Boot	Enables / Disables Quiet Boot option.
Boot mode select	Select boot mode LEGACY/UEFI
Boot Option Priorities	Sets the system boot order.

4.8 Save & Exit Settings



BIOS Setting	Description
Save Changes and Exit	Exits system setup after saving the changes.
Discard Changes and Exit	Exits system setup without saving any changes.
Save Changes and Reset	Resets the system after saving the changes.
Discard Changes and Reset	Resets system setup without saving any changes.
Save Changes	Saves changes done so far to any of the setup options.
Discard Changes	Discards changes done so far to any of the setup options.
Restore Defaults	Restores / Loads defaults values for all the setup options.
Save as User Defaults	Saves the changes done so far as user defaults.
Restore User Defaults	Restores the user defaults to all the setup options.

Appendix

This section provides the mapping addresses of peripheral devices and the sample code of watchdog timer configuration.

- I/O Port Address Map
- Interrupt Request Lines (IRQ)
- Watchdog Timer Configuration

A. I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device. The following table lists the I/O port addresses used.

Address	Device Description
0x00000A00-0x00000A0F	Motherboard resources
0x00000A10-0x00000A1F	Motherboard resources
0x00000A20-0x00000A2F	Motherboard resources
0x0000002E-0x0000002F	Motherboard resources
0x0000004E-0x0000004F	Motherboard resources
0x00000061-0x00000061	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x00000067	Motherboard resources
0x00000070-0x00000070	Motherboard resources
0x00000070-0x00000070	System CMOS/real time clock
0x00000080-0x0000008F	Motherboard resources
0x00000092-0x00000092	Motherboard resources
0x000000B2-0x000000B3	Motherboard resources
0x00000680-0x0000069F	Motherboard resources
0x00000400-0x0000047F	Motherboard resources
0x00000500-0x000005FE	Motherboard resources
0x00000600-0x0000061F	Motherboard resources
0x0000164E-0x0000164F	Motherboard resources
0x0000E000-0x0000EFFF	PCI-to-PCI Bridge
0x000003F8-0x000003FF	Communications Port (COM1)
0x000002F8-0x000002FF	Communications Port (COM2)
0x000003E8-0x000003EF	Communications Port (COM3)
0x000002E8-0x000002EF	Communications Port (COM4)
0x000002E0-0x000002E7	Communications Port (COM5)
0x0000F000-0x0000F03F	Intel(R) HD Graphics 505
0x0000C000-0x0000CFFF	PCI-to-PCI Bridge

0x00000020-0x00000021	Programmable interrupt controller
0x00000024-0x00000025	Programmable interrupt controller
0x00000028-0x00000029	Programmable interrupt controller
0x0000002C-0x0000002D	Programmable interrupt controller
0x00000030-0x00000031	Programmable interrupt controller
0x00000034-0x00000035	Programmable interrupt controller
0x00000038-0x00000039	Programmable interrupt controller
0x0000003C-0x0000003D	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x000000A4-0x000000A5	Programmable interrupt controller
0x000000A8-0x000000A9	Programmable interrupt controller
0x000000AC-0x000000AD	Programmable interrupt controller
0x000000B0-0x000000B1	Programmable interrupt controller
0x000000B4-0x000000B5	Programmable interrupt controller
0x000000B8-0x000000B9	Programmable interrupt controller
0x000000BC-0x000000BD	Programmable interrupt controller
0x000004D0-0x000004D1	Programmable interrupt controller
0x0000F090-0x0000F097	Standard SATA AHCI Controller
0x0000F080-0x0000F083	Standard SATA AHCI Controller
0x0000F060-0x0000F07F	Standard SATA AHCI Controller
0x00000000-0x0000006F	PCI Express Root Complex
0x00000078-0x00000CF7	PCI Express Root Complex
0x00000D00-0x0000FFFF	PCI Express Root Complex
0x0000F040-0x0000F05F	SM Bus Controller
0x0000D000-0x0000DFFF	PCI-to-PCI Bridge
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer

B. Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function
IRQ 8	High precision event timer
IRQ 4	Communications Port (COM1)
IRQ 3	Communications Port (COM2)
IRQ 5	Communications Port (COM3)
IRQ 7	Communications Port (COM4)
IRQ 7	PCI Simple Communications Controller
IRQ 7	SM Bus Controller
IRQ 11	Communications Port (COM5)
IRQ 4294967292	Intel(R) HD Graphics 505
IRQ 4294967291	Intel(R) I210 Gigabit Network Connection
IRQ 4294967290	Intel(R) I210 Gigabit Network Connection
IRQ 4294967289	Intel(R) I210 Gigabit Network Connection
IRQ 4294967288	Intel(R) I210 Gigabit Network Connection
IRQ 4294967287	Intel(R) I210 Gigabit Network Connection
IRQ 4294967286	Intel(R) I210 Gigabit Network Connection
IRQ 4294967294	Standard SATA AHCI Controller
IRQ 4294967285	Intel(R) I210 Gigabit Network Connection #2
IRQ 4294967284	Intel(R) I210 Gigabit Network Connection #2
IRQ 4294967283	Intel(R) I210 Gigabit Network Connection #2
IRQ 4294967282	Intel(R) I210 Gigabit Network Connection #2
IRQ 4294967281	Intel(R) I210 Gigabit Network Connection #2
IRQ 4294967280	Intel(R) I210 Gigabit Network Connection #2
IRQ 54 ~ IRQ 204	Microsoft ACPI-Compliant System
IRQ 264 ~ IRQ 511	Microsoft ACPI-Compliant System
IRQ 25	High Definition Audio Controller
IRQ 14	Intel(R) Serial IO GPIO Host Controller - INT3452
IRQ 14	Intel(R) Serial IO GPIO Host Controller - INT3452
IRQ 14	Intel(R) Serial IO GPIO Host Controller - INT3452
IRQ 14	Intel(R) Serial IO GPIO Host Controller - INT3452
IRQ 27	Intel(R) Serial IO I2C Host Controller - 5AAC
IRQ 4294967293	Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 0	System timer

C. Watchdog Timer Configuration

The Watchdog Timer (WDT) is used to generate a variety of output signals after a user programmable count. The WDT is suitable for the use in the prevention of system lock-up, such as when software becomes trapped in a deadlock. Under these sorts of circumstances, the timer will count to zero and the selected outputs will be driven.

Under normal circumstance, you will need to restart the WDT at regular intervals before the timer counts to zero.

Sample Code:

```
//---------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//---------------------------------------------------------------------------
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "F81966.H"
//---------------------------------------------------------------------------
int main (int argc, char *argv[]); void EnableWDT(int);
void DisableWDT(void);
//---------------------------------------------------------------------------
int main (int argc, char *argv[])
{
unsigned char bBuf; unsigned char bTime; char **endptr;

char SIO;
printf("Fintek 81966 watch dog program\n"); SIO = Init_F81966();
if (SIO == 0)
{
printf("Can not detect Fintek 81966, program abort.\n"); return(1);
}//if (SIO == 0)

if (argc != 2)
{
printf(" Parameter incorrect!!\n"); return (1);
}

bTime = strtol (argv[1], endptr, 10);
printf("System will reset after %d seconds\n", bTime);

if (bTime)
{       EnableWDT(bTime);    } else
```

```
{       DisableWDT();   } return 0;
}
//-------------------------------------------------------------------------
void EnableWDT(int interval)
{
unsigned char bBuf;

bBuf = Get_F81966_Reg(0x2C); bBuf &= (~0x20);
Set_F81966_Reg(0x2C, bBuf);   //Enable WDTO

Set_F81966_LD(0x07);      //switch to logic device 7
Set_F81966_Reg(0x30, 0x01);   //enable timer

bBuf = Get_F81966_Reg(0xF5); bBuf &= (~0x0F);
bBuf |= 0x52;
Set_F81966_Reg(0xF5, bBuf);           //count mode is second  Set_F81966_Reg(0xF6,
interval);    //set timer
bBuf = Get_F81966_Reg(0xF0); bBuf |= 0x80;
Set_F81966_Reg(0xF0, bBuf);    //enable WDTO output

bBuf = Get_F81966_Reg(0xF5); bBuf |= 0x20;
Set_F81966_Reg(0xF5, bBuf);    //start counting
}
//-------------------------------------------------------------------------
void DisableWDT(void)
{
unsigned char bBuf;
Set_F81966_LD(0x07);      //switch to logic device 7
bBuf = Get_F81966_Reg(0xF0);
bBuf &= ~0x80;
Set_F81966_Reg(0xF0, bBuf);    //disable WDTO output

bBuf = Get_F81966_Reg(0xF5); bBuf &= ~0x20;
bBuf |= 0x40;
Set_F81966_Reg(0xF5, bBuf);    //disable WDT
}
//-------------------------------------------------------------------------
```

```
//---------------------------------------------------------------------------
//
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// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//---------------------------------------------------------------------------
#include "F81966.H"
#include <dos.h>
//---------------------------------------------------------------------------
unsigned int F81966_BASE; void Unlock_F81966 (void); void Lock_F81966 (void);
//---------------------------------------------------------------------------
unsigned int Init_F81966(void)
{
unsigned int result; unsigned char ucDid;

F81966_BASE = 0x4E;
result = F81966_BASE;

ucDid = Get_F81966_Reg(0x20);
if (ucDid == 0x15)      //Fintek 81966
{       goto Init_Finish; }

F81966_BASE = 0x2E;
result = F81966_BASE;

ucDid = Get_F81966_Reg(0x20);
if (ucDid == 0x15)      //Fintek 81966
{       goto Init_Finish; }

F81966_BASE = 0x00;
result = F81966_BASE;

Init_Finish:
return (result);
}
//---------------------------------------------------------------------------
void Unlock_F81966 (void)
{
outportb(F81966_INDEX_PORT, F81966_UNLOCK); outportb(F81966_INDEX_PORT,
F81966_UNLOCK);
}
//---------------------------------------------------------------------------
void Lock_F81966 (void)
{
outportb(F81966_INDEX_PORT, F81966_LOCK);
}
//---------------------------------------------------------------------------
void Set_F81966_LD( unsigned char LD)
{
Unlock_F81966();
outportb(F81966_INDEX_PORT, F81966_REG_LD);
outportb(F81966_DATA_PORT, LD);  Lock_F81966();
```

```
}
//---------------------------------------------------------------------------
void Set_F81966_Reg( unsigned char REG, unsigned char DATA)
{
Unlock_F81966(); outportb(F81966_INDEX_PORT, REG); outportb(F81966_DATA_PORT,
DATA); Lock_F81966();
}
//---------------------------------------------------------------------------
unsigned char Get_F81966_Reg(unsigned char REG)
{
unsigned char Result; Unlock_F81966();
outportb(F81966_INDEX_PORT, REG); Result = inportb(F81966_DATA_PORT);
Lock_F81966();
return Result;
}
//---------------------------------------------------------------------------
```

```
//---------------------------------------------------------------------------
//
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// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//---------------------------------------------------------------------------
#ifndef       F81966_H
#define        F81966_H     1
//---------------------------------------------------------------------------
#defineF81966_INDEX_PORT   (F81966_BASE)
#defineF81966_DATA_PORT    (F81966_BASE+1)
//---------------------------------------------------------------------------
#defineF81966_REG_LD   0x07
//---------------------------------------------------------------------------
#define F81966_UNLOCK  0x87
#defineF81966_LOCK       0xAA
//---------------------------------------------------------------------------
unsigned int Init_F81966(void);
void Set_F81966_LD( unsigned char);
void Set_F81966_Reg( unsigned char, unsigned char); unsigned char
Get_F81966_Reg( unsigned char);
//---------------------------------------------------------------------------
#endif //      F81966_H
```