DFI

EC300-CS

Edge AI Embedded System

User's Manual

Copyright

Trademarks

FCC and DOC Statement on Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

Table of Contents

About this Manual

This manual can be retrieved from the website.

The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

Warranty

1. Warranty does not cover damages or failures that arises from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

About this Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- 1 EC300-CS System Unit
- 1 Mounting Bracket
- 1 Power Connector

Note: The items are subject to change in the developing stage.
The product and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.

Important:
Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Precautions

- Use the correct DC / AC input voltage range.
- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging in the power cord.
- There is danger of explosion if battery incorrectly replaced.
- Replace only with the same or equivalent specifications of batteries recommend by the manufacturer.
- Dispose of used batteries according to local ordinance.
- Keep this system away from humid environments.
- Make sure the system is placed or mounted correctly and stably to prevent the chance of dropping or falling may cause damage.
- The openings on the system shall not be blocked and shall be kept in distance from other objects to make sure of proper air ventilation to protect the system from overheating.
- Dress the cables, especially the power cord, so they will not be stepped on, in contact with high temperature surfaces, or cause any tripping hazards.
- Do not place anything on top of the power cord. Use a power cord that has been approved for use with the system and is compliant with the voltage and current ranges required by the system's electrical specifications.
- If the system is to be unused or stored for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
- If one of the following occurs, consult a service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated the system.
  - The system has been exposed to moisture.
  - The system is not working properly.
  - The system is physically damaged.
- The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace the outlet.
- Disconnect the system from the electricity outlet before cleaning. Use a damp cloth for cleaning the surface. Do not use liquid or spray detergents for cleaning.
- Before connecting, make sure that the power supply voltage is correct. The device is connected to a power outlet which should be grounded connection.

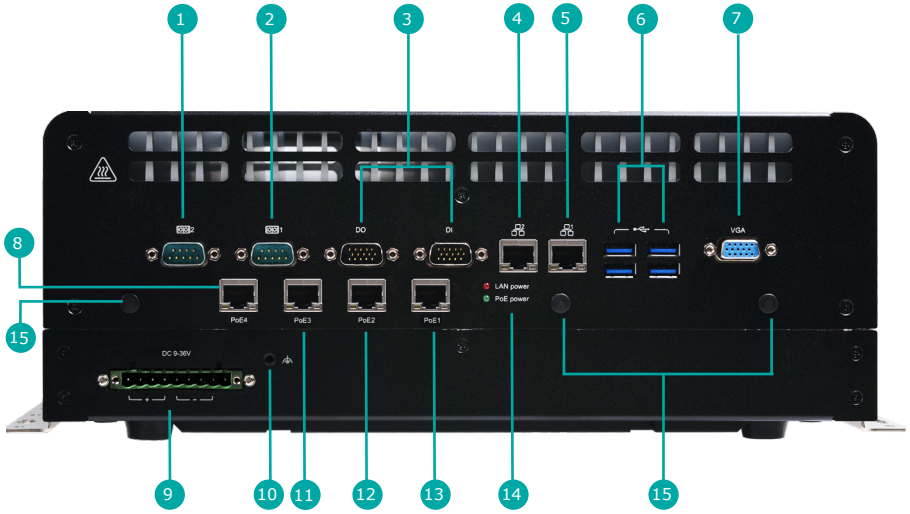
The system may burn fingers while running.

Wait for 30 minutes to handle electronic parts after power off.

Chapter 1 - Introduction

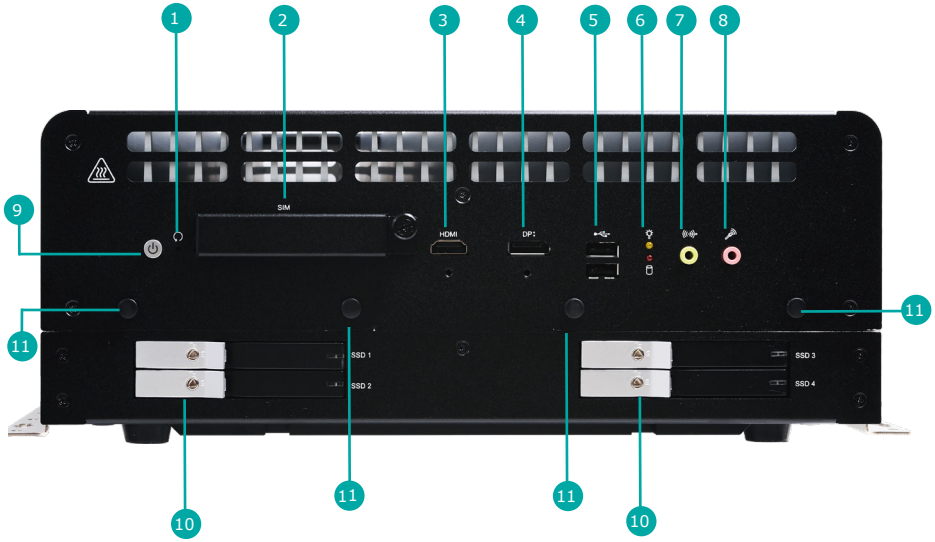
▶ Overview

Front View



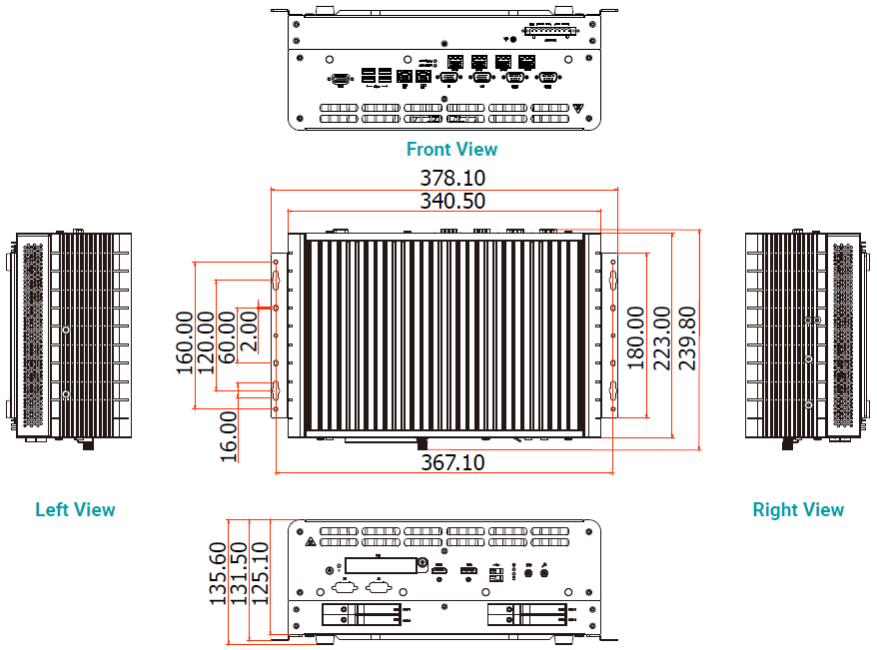
1	COM2
2	COM1
3	DIO
4	LAN2
5	LAN1
6	USB3.0
7	VGA
8	PoE4
9	DC-in 9~36V
10	Grounding
11	PoE3
12	PoE2
13	PoE1
14	LAN Power (Red) PoE Power (Green)
15	Antenna Hole

Rear View



1	Reset Button
2	SIM Sockets
3	HDMI
4	DP++
5	USB2.0
6	Status LED (Orange) HDD LED (Red)
7	Line-out
8	Mic-in
9	Power Button
10	2.5" SSD Storage Driver Bay
11	Antenna Hole

▶ Dimensions



▶ Key Features

High Performance CPU:
Intel® Coffee Lake Core i7 processor

802.3af PoE Ports
4 x RJ45 type PoE ports at 15W

AI Accelerated
Support up to 150W GPU GPU module

Scalability
3 x miniPCIe and 2 x M.2 slots

Support 5G Communication
Support M.2 B key 3042/3052 5G-NR module

Wide-Temperature
Up to -20°C~70°C operation without active fan

▶ Specifications

SYSTEM	Processor	8th/9th Generation Intel® CoreTM Processors, LGA 1151 Intel® Core™ i7-9700TE 8C/8T 1.8GHz 12MB cache, TDP 35W with Q370PCH Intel® Core™ i7-8700T 6C/12T 2.4GHz 12MB cache, TDP 35W with Q370PCH Intel® Core™ i7-9700E 8C/8T 2.6GHz 12MB cache, TDP 65W with Q370PCH Intel® Core™ i5-9500TE 6C/6T 2.2GHz 9MB cache, TDP 35W with Q370PCH (Other CPU support upon request)
	Chipset	Intel® Q370 Chipset
	Memory	Dual Channel DDR4 2666/2400 MHz by SODIMMs up to 64GB
	BIOS	AMI SPI 128Mbit
GRAPHICS	Controller	Intel® HD Graphics
	Display	1 x VGA (display out by DB-15 connector) VGA: resolution up to 1920x1200@60Hz 1 x HDMI (with screw lock) HDMI: resolution up to 4096x2160@24Hz 1 x DP++ (standard display port connector DIP type with screw lock) DP++: resolution up to 4096x2304@60Hz Support NIVIDIA Optimus technology
AI ACCELERATOR	Interface	MXM Type A, B, C on x16 PCIe 3.0
	Controller	Nvidia Quadro embedded
STORAGE	External	4 x Swappable 2.5” 7mm SSD storage bays with lock
	Internal	1 x M.2 2280 M key supports SATA SSD
EXPANSION	Interface	1 x Half-size Mini PCIe for WiFi/BT modules, with PCIe x1 & USB signal 2 x Full-size Mini PCIe support PCIe x1, USB 2.0 signal with SIM card socket of each 1 x M.2 B key supports 3042, 3052 devices or 5G module on PCIe x1, USB2.0, USB3.0 signal with SIM card slot bracket - SIM card can all be external accessible 1 x M.2 2280 M key supports 2242, 2260 & 2280 devices (PCIe x4 & SATA signal, support boot up function)
AUDIO	Audio Codec	Realtek ALC888
	Interface	1 x Mic-in and 1 x Line-out
ETHERNET	Controller	5 x Intel® I210IT NIC (10/100/1000Mbps) 1 x Intel® I219LM with iAMT11.0 PCIe (10/100/1000Mbps) (only Core i7/i5 supports iAMT)
	Interface	2 x RJ45 GbE 4 x RJ45 802.3af 15W PoE ports
LED	Indicators	1 x Power LED (green) 5 x Storage LED (red) 4 x PoE LED
FRONT I/O	PoE	4 x RJ45 802.3af (15.4w) PoE connectors. Supporting PSE side. NOT support Wake on Lan
	Ethernet	2 x GbE (RJ-45) support Wake on Lan
	Serial	2 x High speed full RS-232/422/485 (DB-9) 2 x RS-232/422/485 (pin headers)

	DIO	1 x 8bit isolated DI port by DB-9 connector 1 x 8bit isolated DO port by DB-9 connector 2KV isolation
	Display	1 x VGA display out by DB15 connector
	USB	4 x USB 3.0 (type A)
	Power-in	1 x 9 pins 5.0mm terminal block
REAR I/O	USB	2 x USB 2.0 (type A)
	Display	1 x HDMI 1 x DP++
	Audio	1 x Mic-in 1 x Line-out by 3.5mm 3P phone jack
	Buttons	1 x Power button 1 x Reset button
	SIM	3 x SIM sockets (external accessible with cover)
	Antenna Holes	7 x SMA type antenna hole for GNSS, WWAN/LTE MIMO, WLAN/ BT MIMO, 5G
WATCHDOG TIMER	Output & Interval	System reset, programmable via software from 1 to 255 seconds
SECURITY	TPM	TPM2.0
POWER	Type	+12VDC Reverse polarity protection
	Connector	9-pin 5.0mm terminal block
OS SUPPORT	Microsoft	Windows 10 IoT Enterprise 64 Bit
	Linux	Ubuntu 18.04
MECHANISM	Construction	Metal + Aluminum
	Mounting	Wall mount
	Dimensions (W x H x D)	340.5 x 132 x 223mm (3U height, excluding rubber foot)
	Weight	9.85 kg
ENVIRONMENT	Operating Temperature	-20°C to 70°C when CPU+GPU<100W without fan -20°C to 60°C when CPU+GPU<160W without fan -20°C to 70°C when CPU+GPU<160W with active fan CPU & GPU will be throttling at high temperature
	Storage Temperature	-40°C to 85°C
	Relative Humidity	10% to 90% (non-condensing)
STANDARDS AND CERTIFICATIONS	Shock (SSD/HDD)	IEC 60068-2-27 3 g, 11 ms, 18 Shock ±X, ±Y, ±Z (each axis 3 times) MIL-STD-810G Method 516.6, Procedure 1, OP:10G 11ms, Non-OP: 40G 11ms (Test by SSD, HDD is not support)
	Vibration	IEC 60068-2-64 Frequency : 5 Hz to 500 Hz Acceleration : 1 g rms Test Axis : X, Y, Z axis Test Time : 30 mins (Each axis), total 90 mins MIL-STD-810G Method 514.6C-3, Category 4 Composite wheeled vehicle Table 514.6C-VI
	IP Rating	IP40
	Certification	CE, FCC Class A, UKCA, RoHS

▶ Power Consumption

System Configuration

CPU	Intel Core i7-9700TE 8C/8T 1.8GHz 12MB cache, TDP 35W
Memory	DDR4-2666 SO-DIMM 260pin 8GB
Graphics card	MXM module NVIDIA GeForce RTX 3000 (80W)
Storage	4x SSD 2.5" SATAIII 128GB

Mode	DC Power Source (12V)	
Boot up	6.42A	77.04W
Idle	2.86A	34.32W
Max App Load (With PoE load)	12.75A	153.00W
Worse Case Load (With PoE load)	13.35A	160.20W
3D Mark Load (With PoE load)	12.92A	155.04W
S3	0.16A	1.92W
S5	0.11A	1.32W

Power Consumption Test Procedure

1. Examine basic function using Burn-In Test.
2. Install the external devices and loopback into System.
3. Use Device Manager to examine devices.
4. Use Chroma 62012P-80-60 DC to measure the power consumption modes : (please see below.)

Mode	Test Procedure
Boot up	Turn on the mainboard into operating mainboard desktop. (No external devices attached)
Idle	No run any applications, the mainboard use low CPU usage even when it is idle under operating mainboard. Exactly 15 minutes after the initial boot.
Max App Load	Burn in 100% maximum loading.
Worse Case Load	TAT(CPU,GPU load:100%)+Burn-In(I/O load:100%).
3D Mark Load	3Mark+Burn in(I/O load:100%)
S5	Select WOL enable & disable mode in BIOS menu, Power off the system. (No external devices attached)

5. Recode the power usage (in watts).

Chapter 2 - Hardware Installations

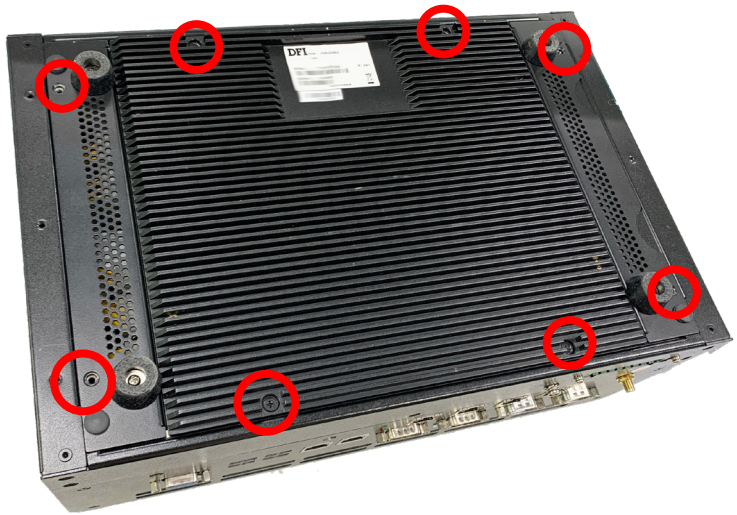
▶ Removing the Chassis Cover

Please observe the following guidelines and follow the instructions to open the system.

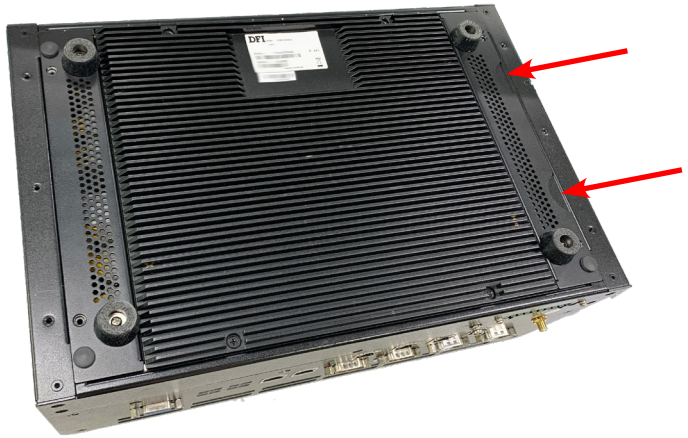
1. Make sure the system and all other peripheral devices connected to it have been powered off.

2. Disconnect all power cords and cables.

Step 1: Turn over the machine to let the bottom side become the top. Remove eight screws circled by red in each corner.

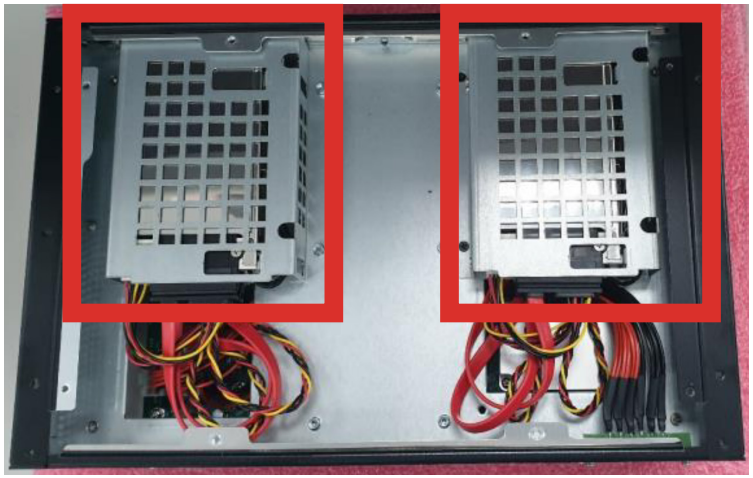


Step 2: Remove the bottom case



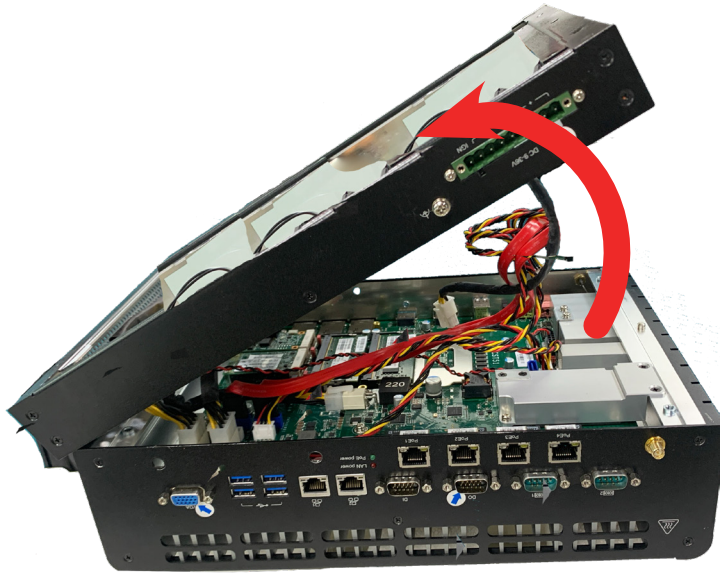
Step 3: The SSD part appears.

Step 4: There are two 2.5” HDD slots for harddisk/SSD installation.

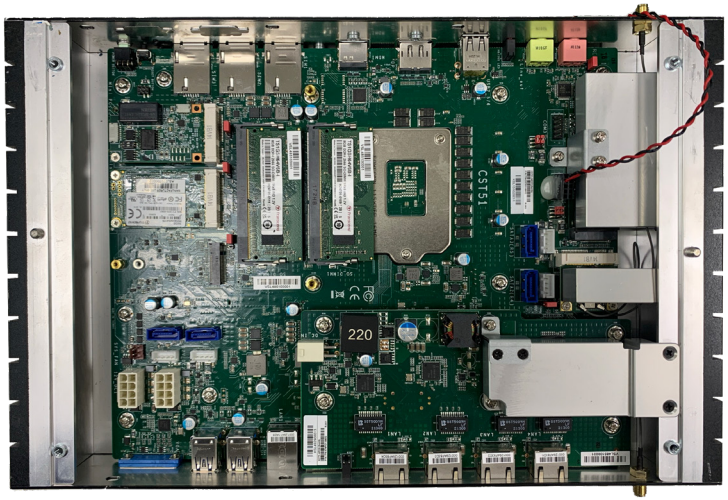


Step 5: If you want to change/remove/install other components, please remove the first layer first. Remove the 4 screws in each corner circled by red.

Step 6: Tilt up to remove the first layer carefully and slowly. Please unplug these cables first.



Step 7: The main body appears.



▶ Installing an MXM Card

Before installing an MXM card, please make sure that the following safety cautions are wellattended.

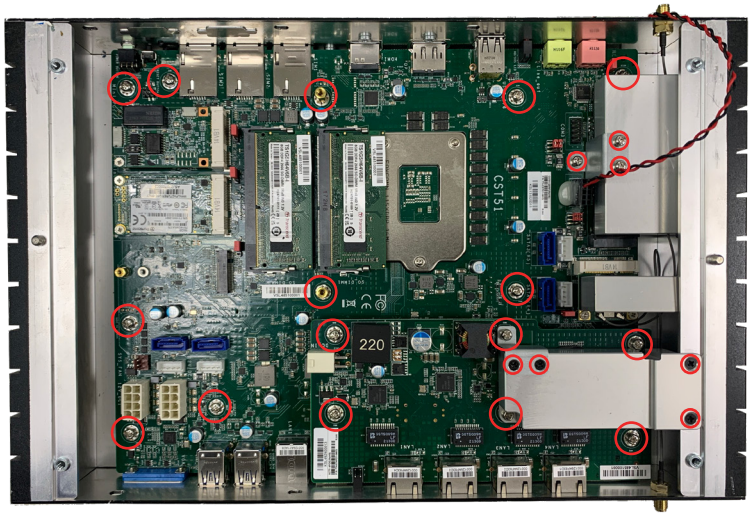
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.

Step 1:

To locate a MXM card socket, please follow the **Removing the Chassis Cover** section and lift the cover to open the system.

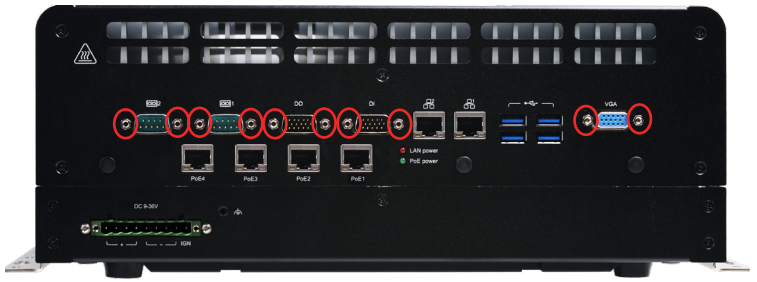
Step 2:

Remove the screws/standoffs marked in red circle on the main board.

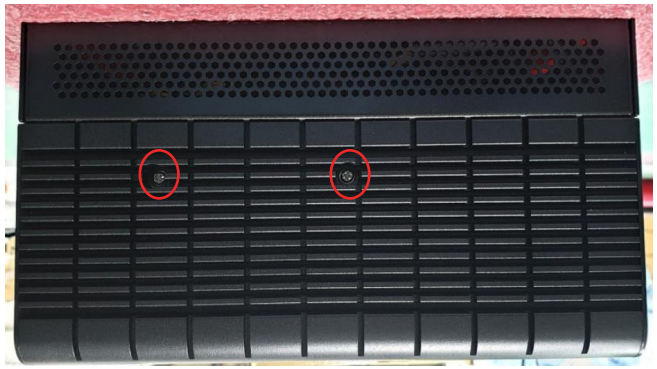


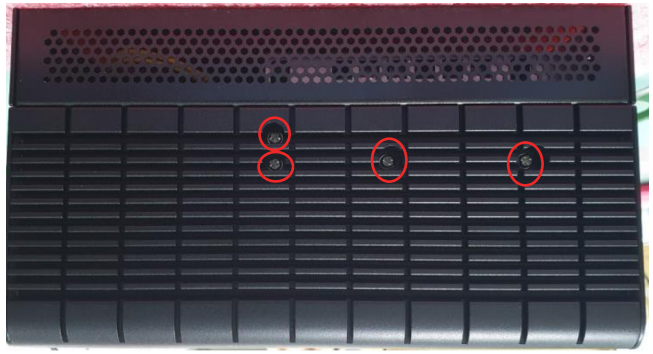
Step 3:

Remove the screws/standoffs marked in red circle on the left/right/front side of the chassis.

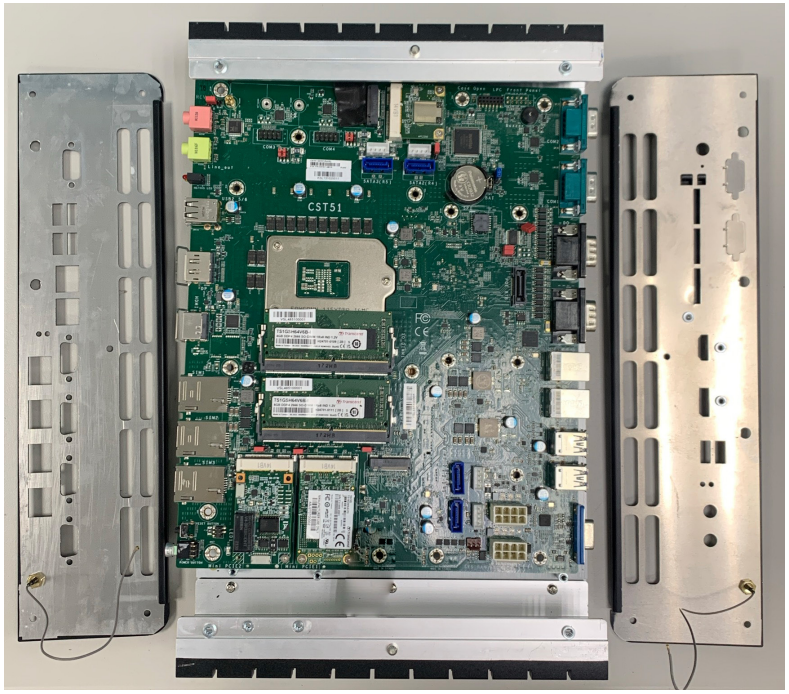


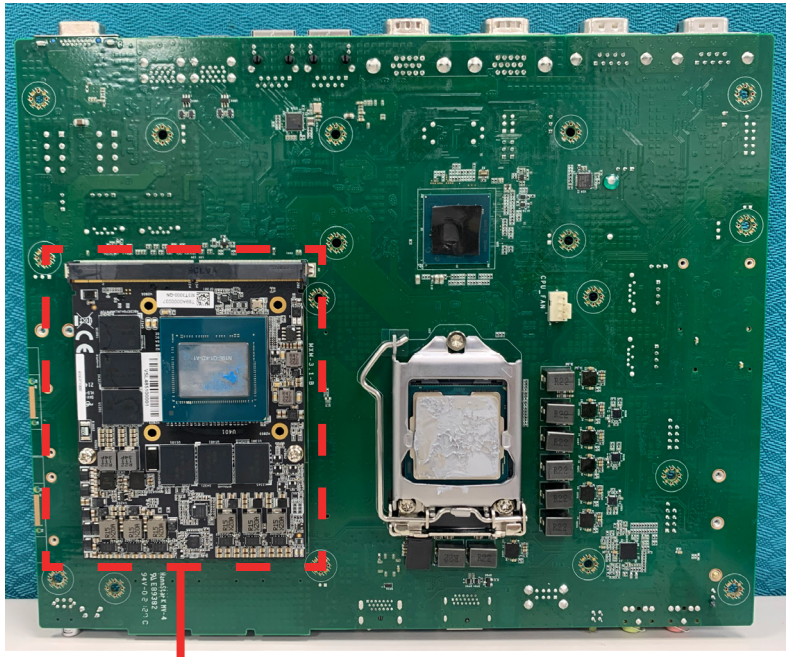
Remove all 10 standoffs



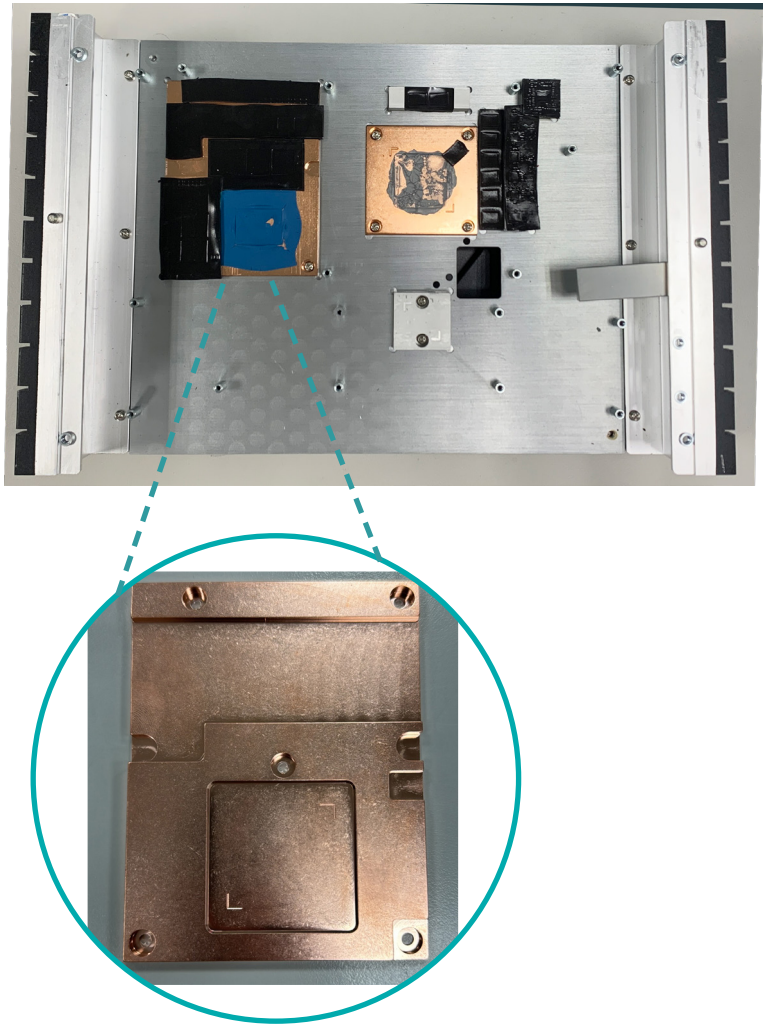


Step 4:
Gently lift the main board and turn it to the other side.
A MXM card socket is on the back side of the main board.





Step 5:
A heat sink will differ depending on the module of MXM card installed.



Compatible MXM Modules

Type	Model	CUDA Cores	Power	Support Operating Temperature
Quadro	P1000	512	47W	-20°C to +70°C
	P2000	768	58W	-20°C to +70°C
	T1000	896	50W	-20°C to +70°C
	RTX3000	1920	80W	-20°C to +55°C
	RTX5000	3072	150W	-20°C to +55°C (external air flow needed)

▶ Installing an Antenna

Before installing the antenna, please make sure that the following safety cautions are wellattended.

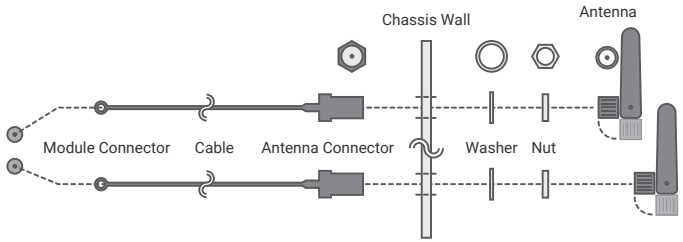
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.

Step 1:

There are antenna holes reserved on the front and the rear side of the system and covered by rubber plugs. Please remove the plug prior to installing an antenna.

Step 2:

Connect the internal cable to the board's antenna connector, screw the antenna connector through the antenna hole with washers and nuts, and screw on the antenna as illustrated below.



▶ Inserting a HDD/SDD

The drive bay can be easily accessed without opening the system.
Before inserting a HDD/SDD, please turn off the system first.
Use the following procedure to install a SATA HDD or SSD to the system:

Step 1:

Locate the drive bay on the front.

Step 2:

Pull the silver latch to unlock the door.

Step 3:

Slide the drive into the slot until the drive is fully seated.
Close the drive latch to lock the drive in place.

Important:

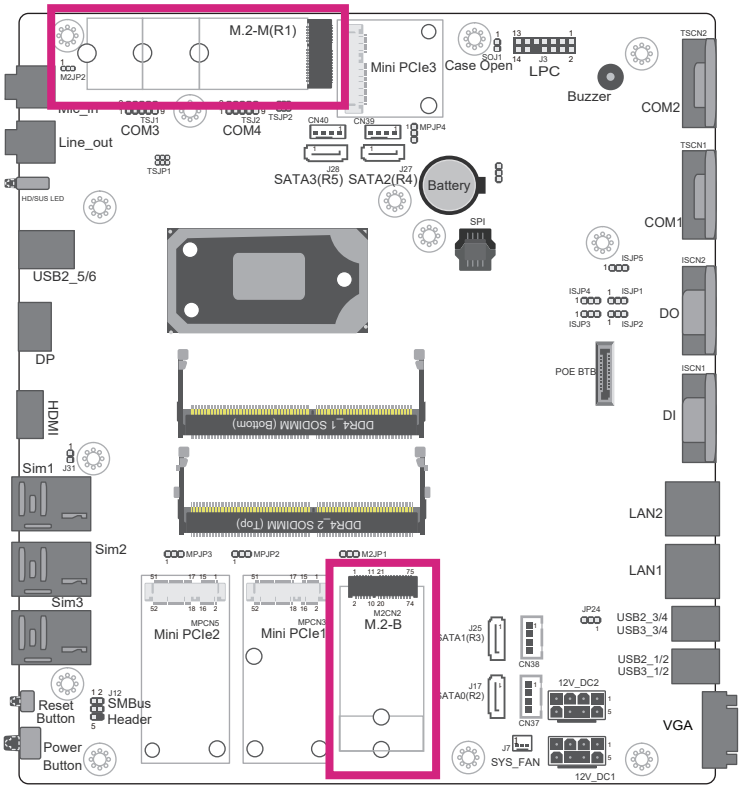
Excessive force may damage its mechanical parts.

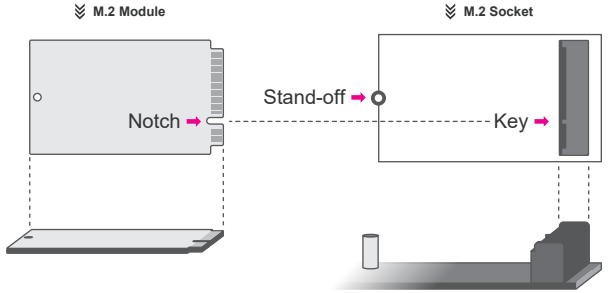
If the HDD/SSD is inserted backward into the slot, forcing the device may damage the slot.

Installing the M.2 Module

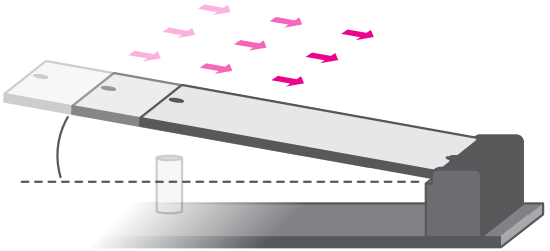
Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.

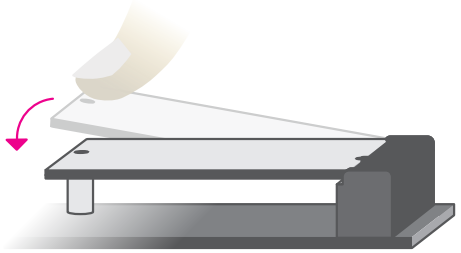




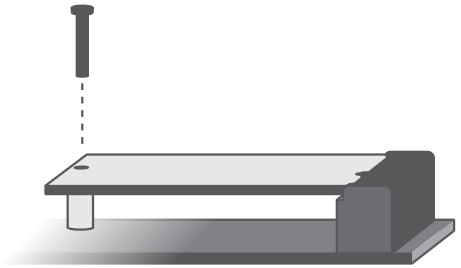
Please follow the steps below to install the card into the socket.



Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



Step 2:
Press the end of the card far from the socket down until against the stand-off.

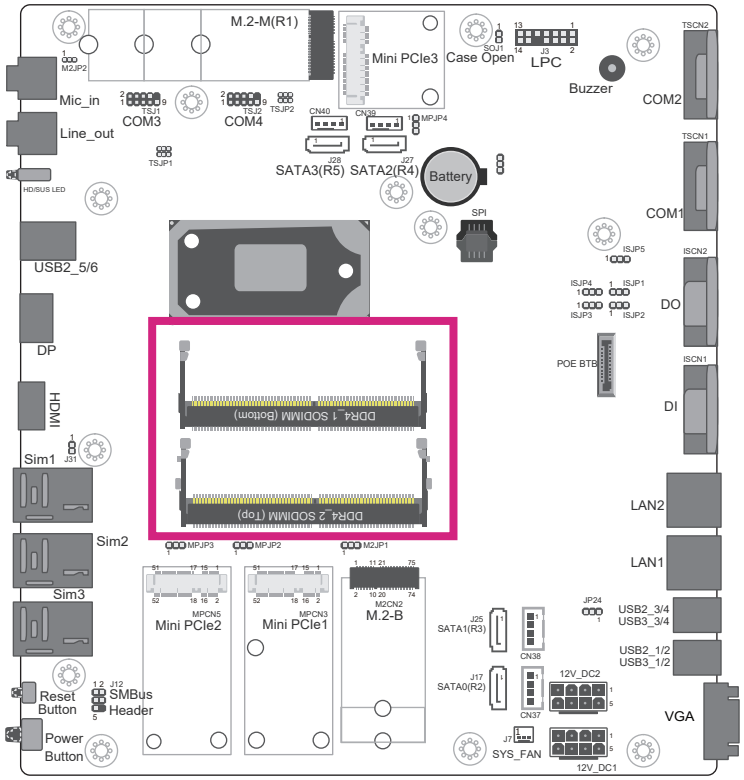


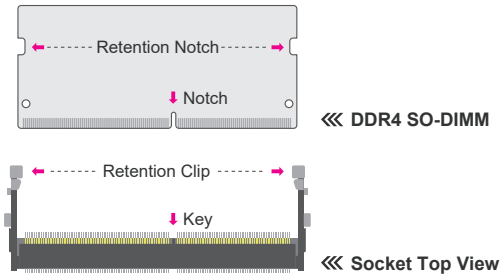
Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

Installing the SO-DIMM Module

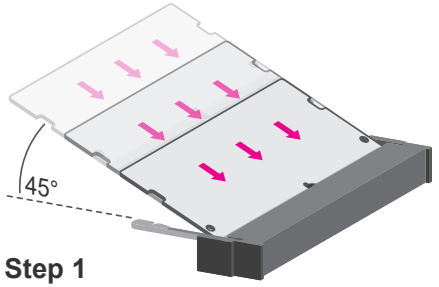
Before installing the memory module, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the SO-DIMM socket on the system board
4. Make sure the notch on memory card is aligned to the key on the socket.

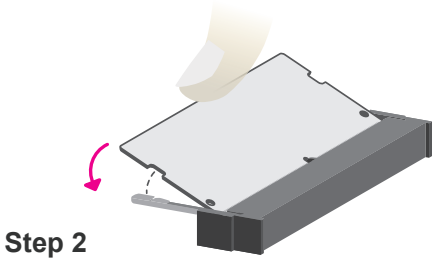




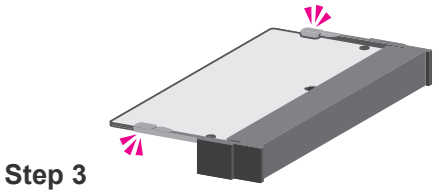
Please follow the steps below to install the memory card into the socket.



Step 1:
Insert the memory card into the slot while making sure 1) the notch and the key are aligned, and 2) the non-connector end rises approximately 45 degrees horizontally. Press the card firmly into the socket while applying and maintaining even pressure on both ends.



Step 2:
Press the end of the card far from the socket down while making sure the retention notch and the clip align as indicated by the dotted line in the illustration. If the retention notch and the clip do not align, please remove the card and re-insert it. Press the card all the way down.

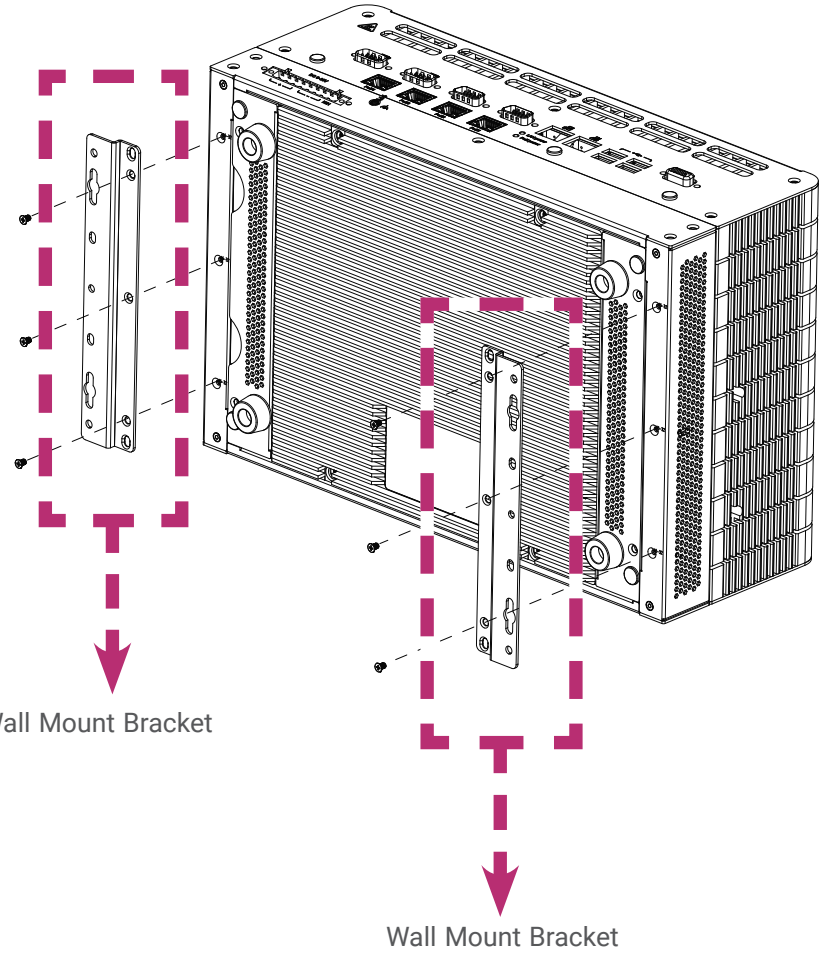


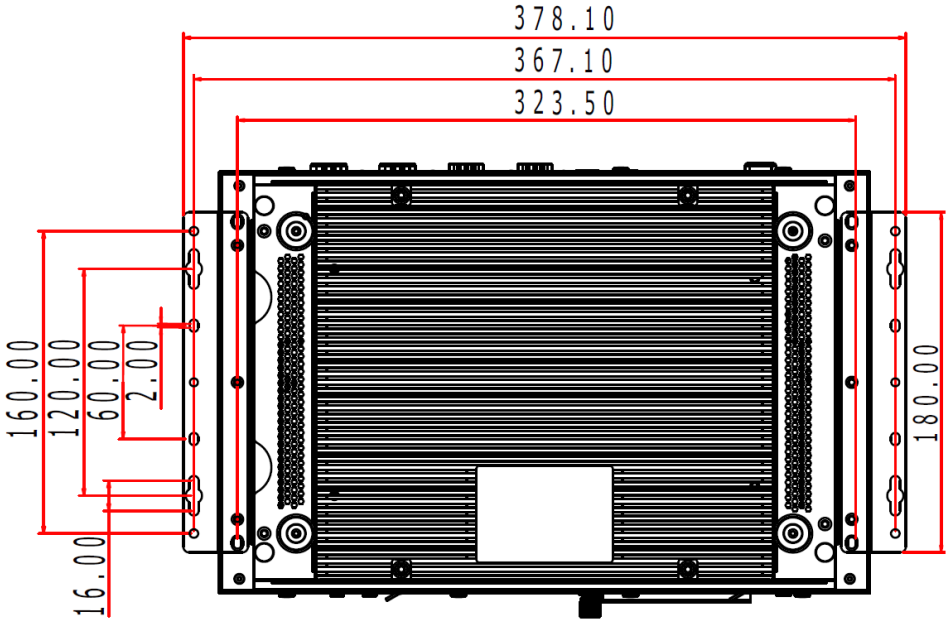
Step 3:
The clips snap automatically and abruptly to the retention notches of the card sounding a distinctive click, and lock the card in place. Inspect that the clip sits in the notch. If not, please pull the clips outward, release and remove the card, and mount it again.

▶ Mounting Options

Wall Mount

The wall mount kit containing two mounting brackets can be attached to the bottom of the system for mounting onto desired locations, such as walls, stands, or shelves. Locate the mounting holes on the bottom of the system as shown in the photo. Screw on the two brackets onto the system with six screws as illustrated below.

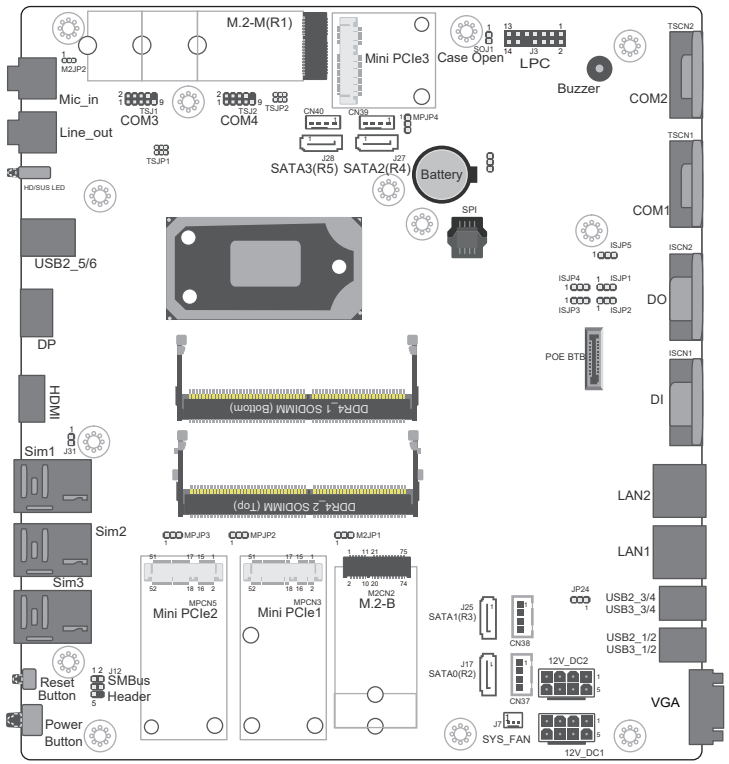




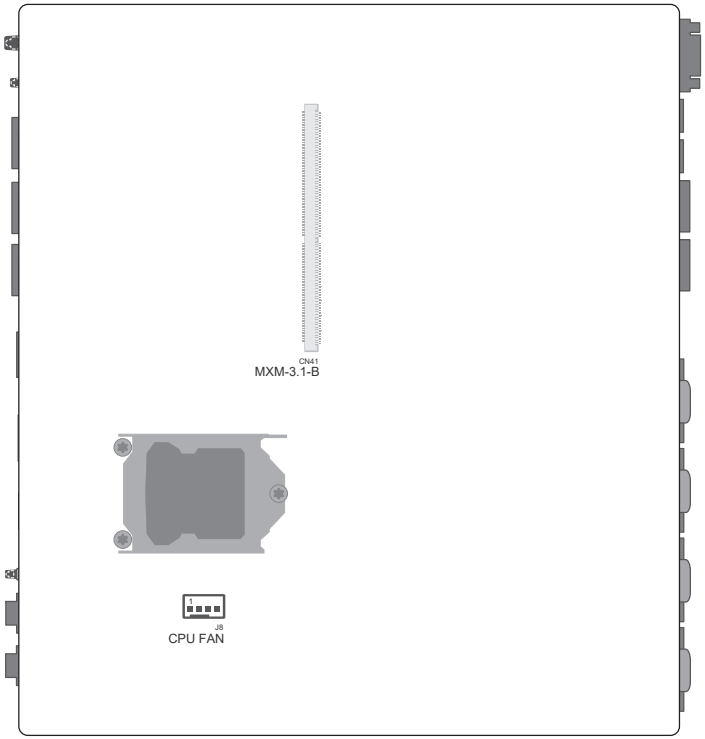
Chapter 3 - System Settings

▶ Board Layout

Top View



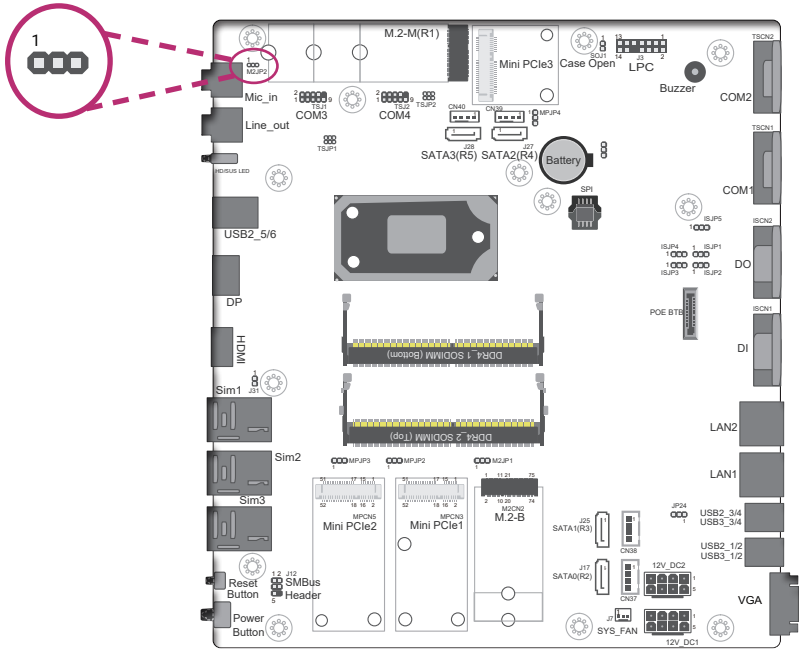
Bottom View



Important:
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

▶ Jumper Settings

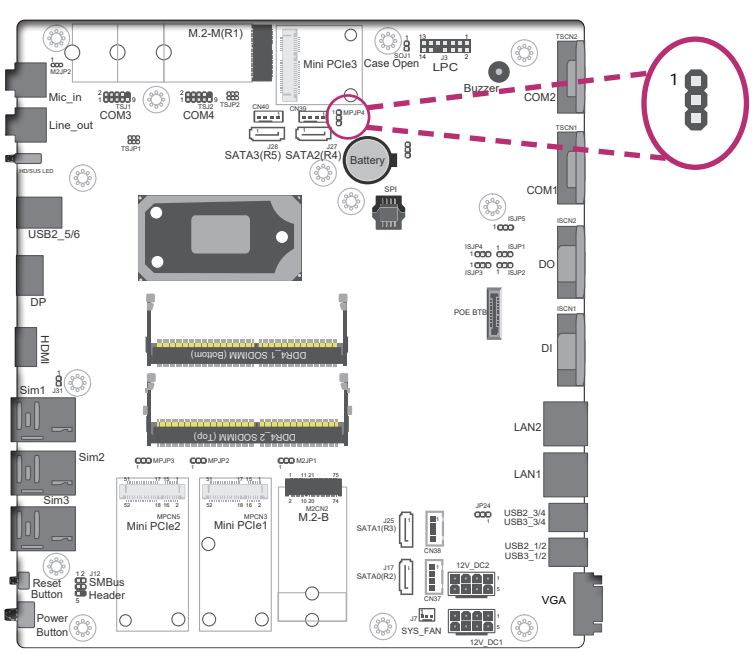
M2JP2 M.2 Socket (M2JP2)



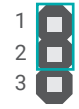
■ 1-2 On: 3V3 (default)

■ 2-3 On: 3V3SB

Mini PCIe Power (MPJP4)

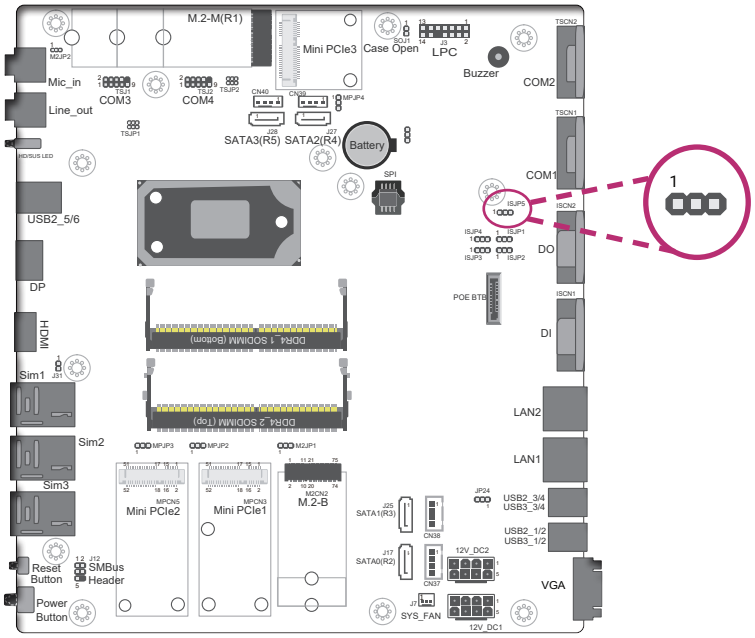


■ 1-2 On: 3V3SB (default)



■ 2-3 On: 3V3

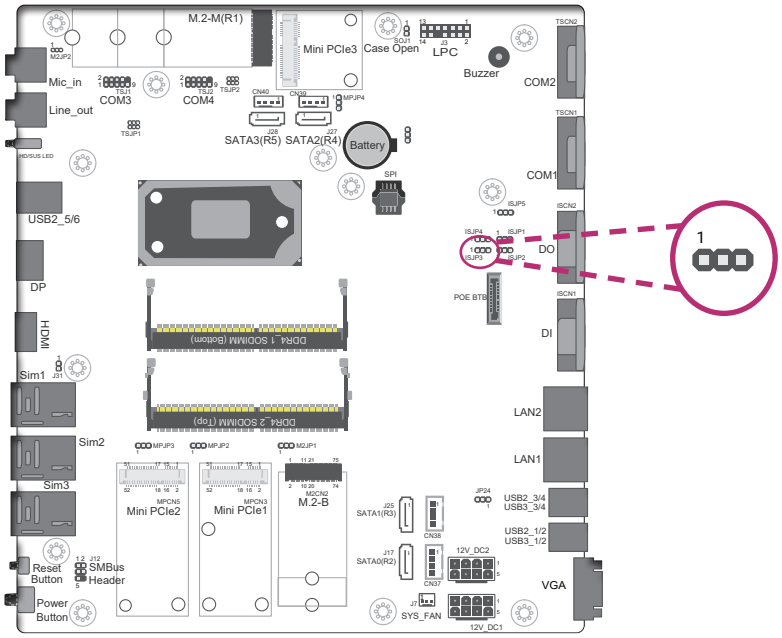
DIO Power (ISJP5)



■ 1-2 On: 5VSB (default)

■ 2-3 On: 5V

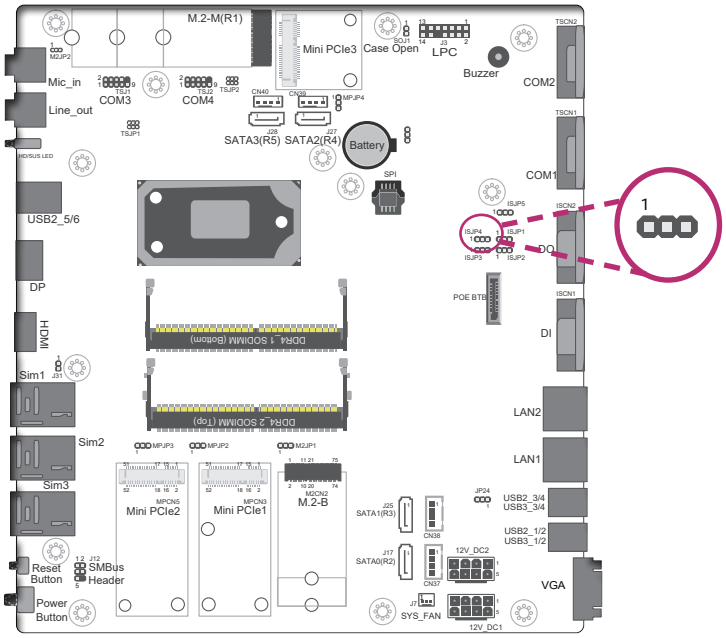
DI 4~7 Power (ISJP3)



■ 1-2 On: DIO PWR (default)

■ 2-3 On: GND

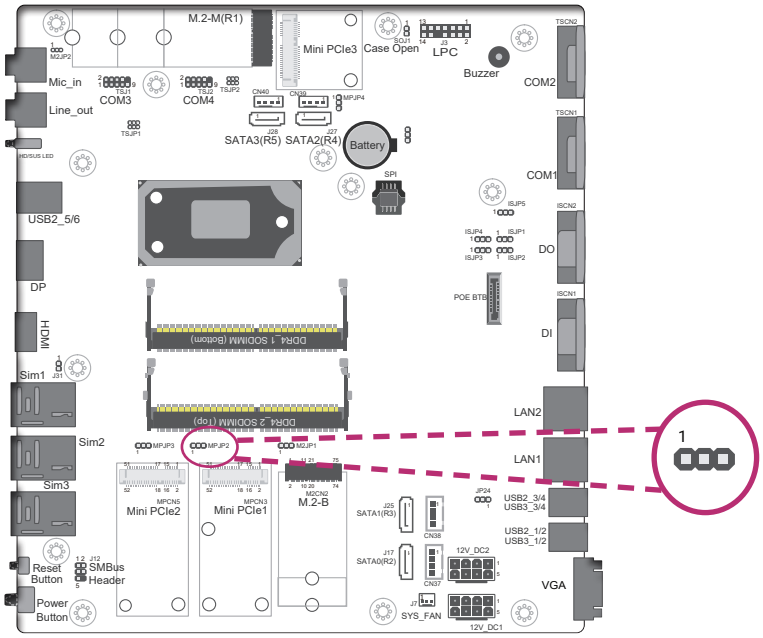
DI 0~3 Power (ISJP4)



■ 1-2 On: DIO PWR (default)

■ 2-3 On: GND

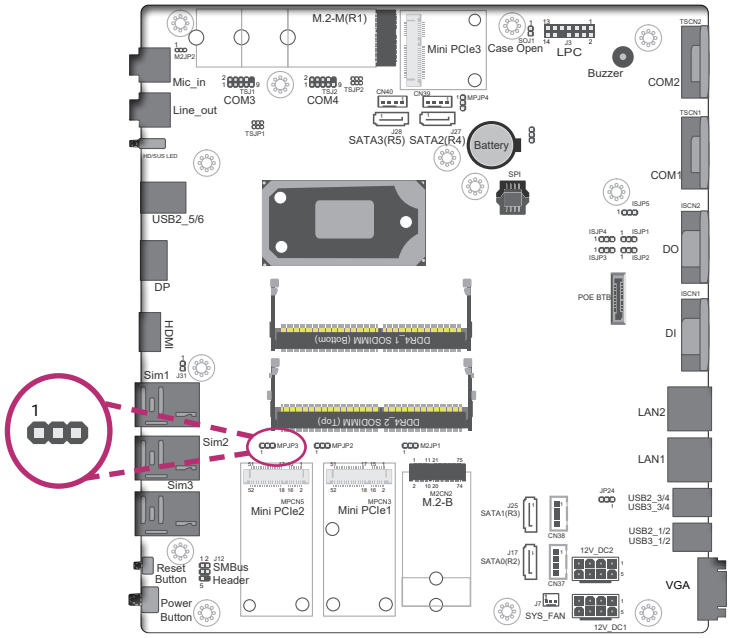
Mini PCIe1 Power (MPJP2)



■ 1-2 On: 3V3SB (default)

■ 2-3 On: 3V3

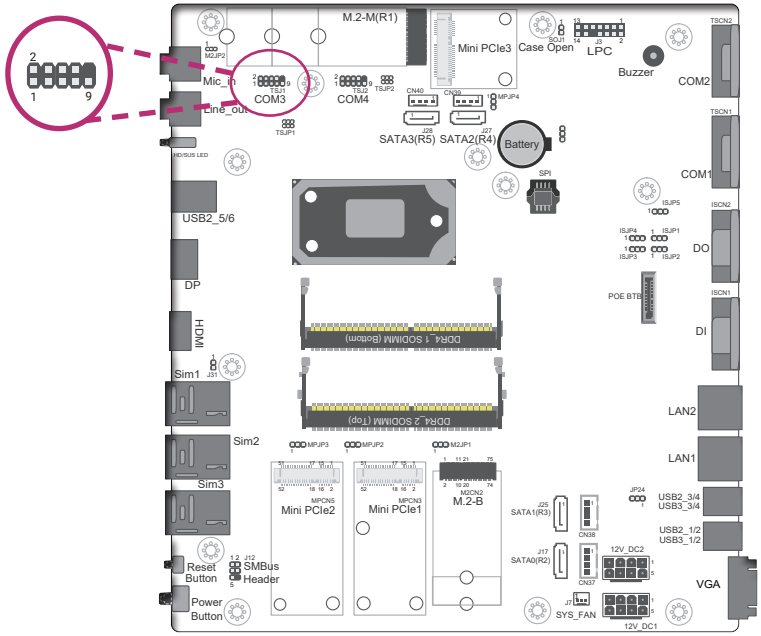
Mini PCIe2 Power (MPJP3)

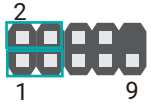


■ 1-2 On: 3V3SB (default)

■ 2-3 On: 3V3

COM3 (TSJ1)



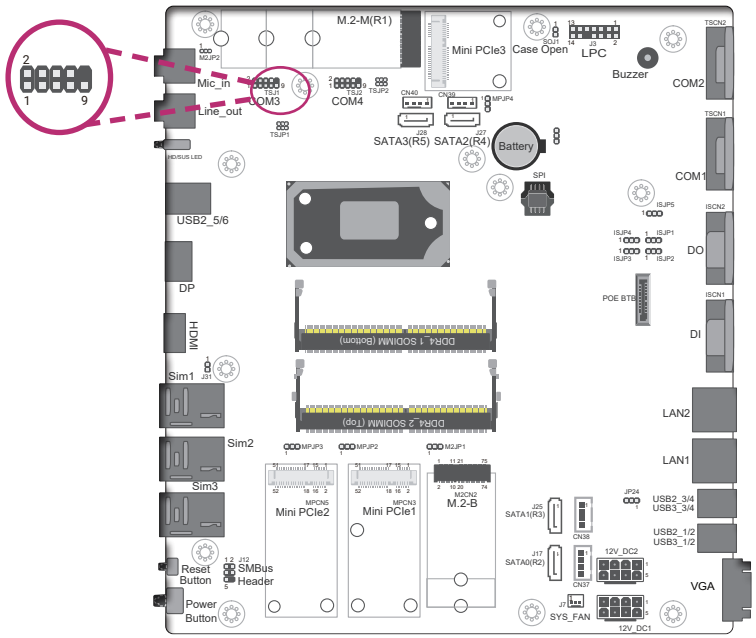


■ 1-3, 2-4 On: RS232 Standard (default)

■ 3-5, 4-6 On: RS232 with Power

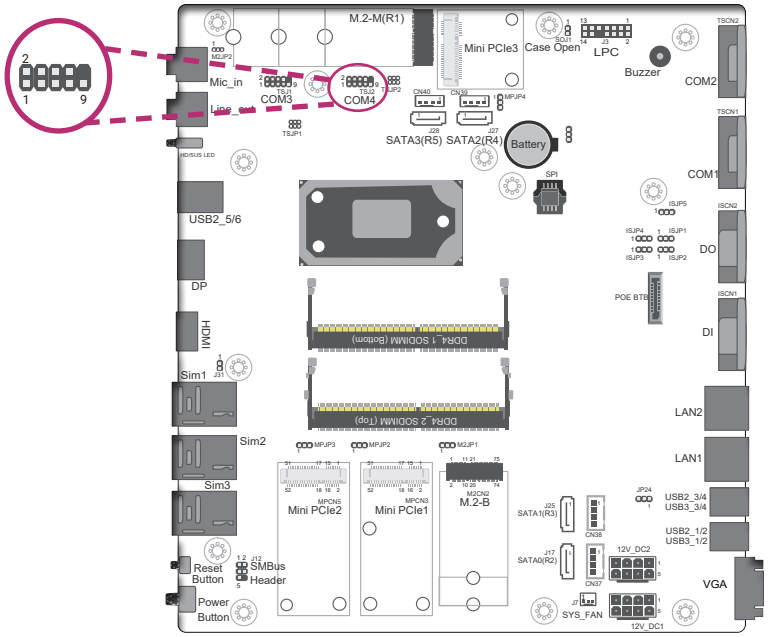
▶ Pin Assignment

COM3 (TSJ1)



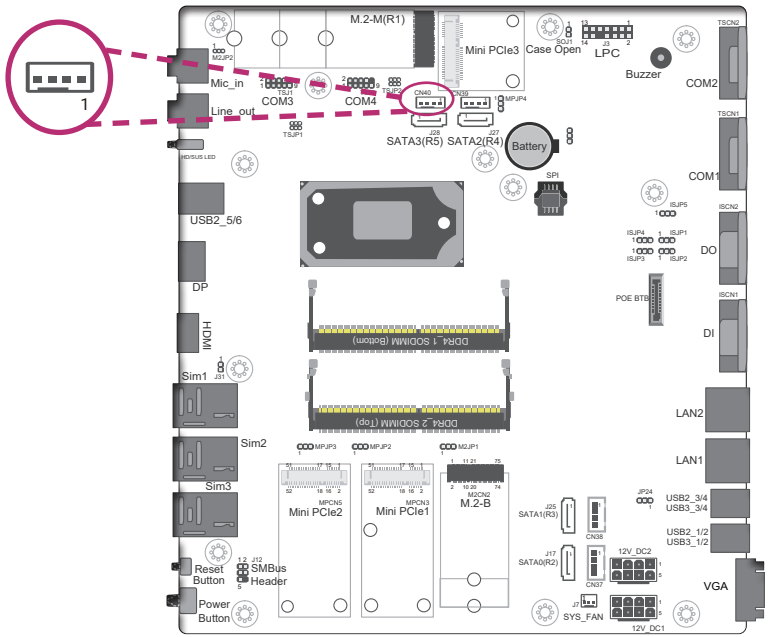
Pin	Standard RS232	RS232 with Power	RS422 Full Duplex	RS485
1	DCD-	12V	TXD-	Data-
2	RD	RD	TXD+	Data+
3	TD	TD	RXD+	N.C
4	DTR-	DTR-	RXD-	N.C
5	GND	GND	GND	GND
6	DSR-	DSR-	N.C	N.C
7	RTS-	RTS-	N.C	N.C
8	CTS-	CTS-	N.C	N.C
9	RI-	5V	N.C	N.C
10	N.C	N.C	N.C	N.C

COM4 (TSJ2)



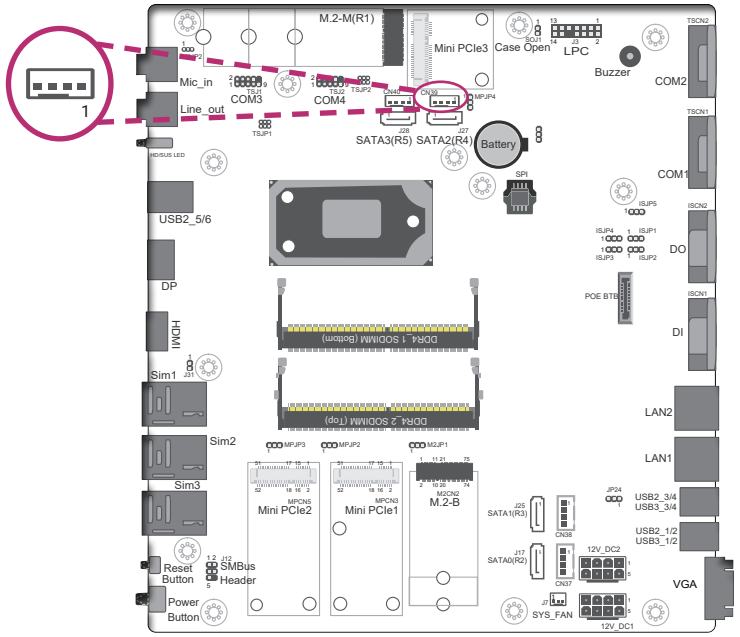
Pin	Standard RS232	RS232 with Power	RS422 Full Duplex	RS485
1	DCD-	12V	TXD-	Data-
2	RD	RD	TXD+	Data+
3	TD	TD	RXD+	N.C
4	DTR-	DTR-	RXD-	N.C
5	GND	GND	GND	GND
6	DSR-	DSR-	N.C	N.C
7	RTS-	RTS-	N.C	N.C
8	CTS-	CTS-	N.C	N.C
9	RI-	5V	N.C	N.C
10	N.C	N.C	N.C	N.C

SATA3 Power (CN40)



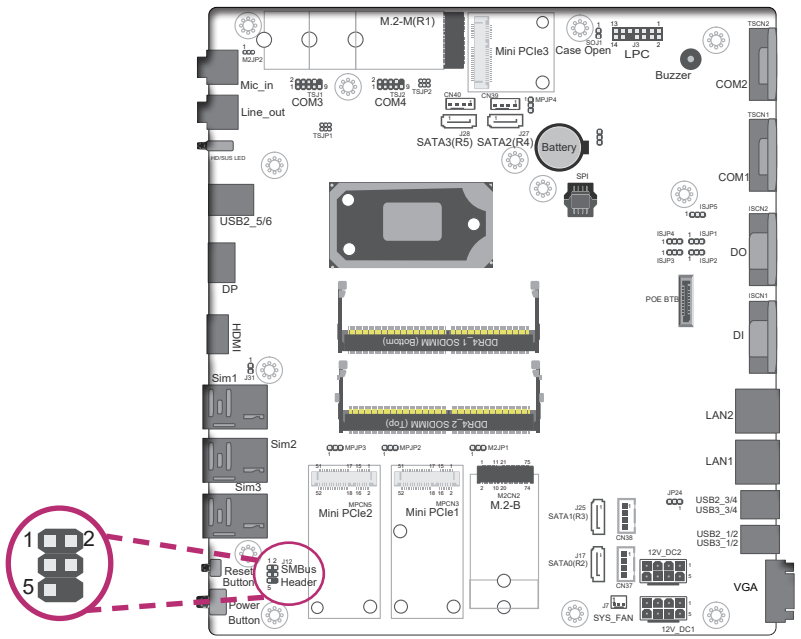
Pin	Assignment
1	+12V_SATA2
2	GND
3	GND
4	5V_SATA2

SATA2 Power (CN39)



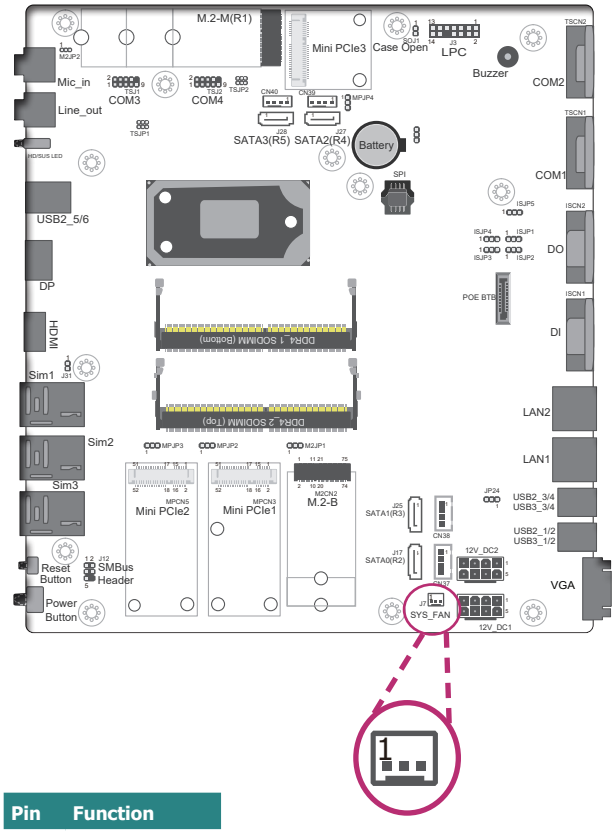
Pin	Assignment
1	+12V_SATA2
2	GND
3	GND
4	5V_SATA2

SMBus Header (J12)



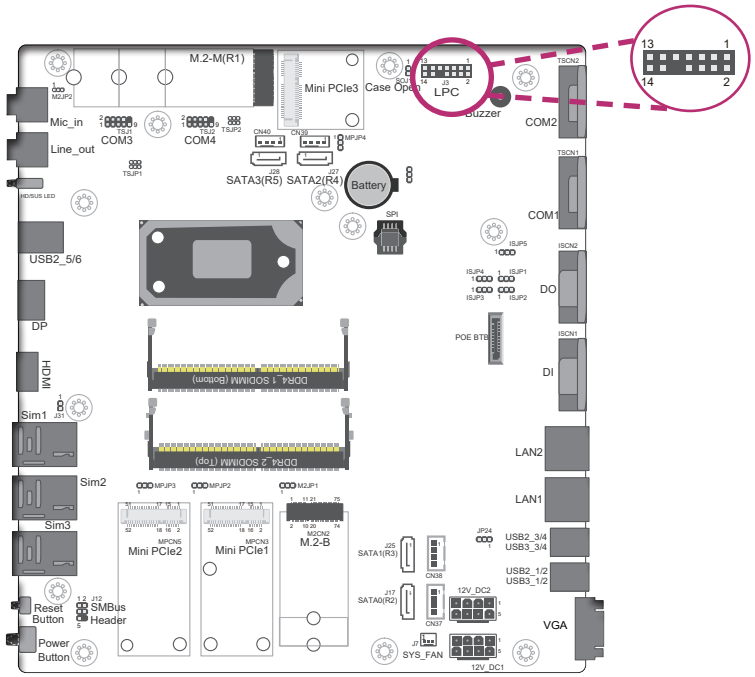
Pin	Function	Pin	Function
1	3V3SB	2	GND
3	SMB_CLK_RESUME	4	SMB_DATA_RESUME
5	SMBALERT_PCH-	6	---

System FAN (J7)



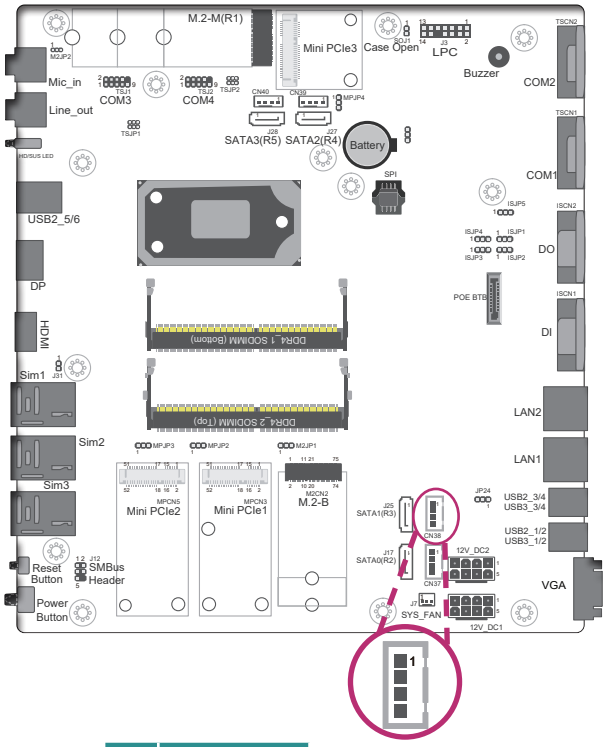
Pin	Function
1	GND
2	PWM
3	TACH

LPC (J3)



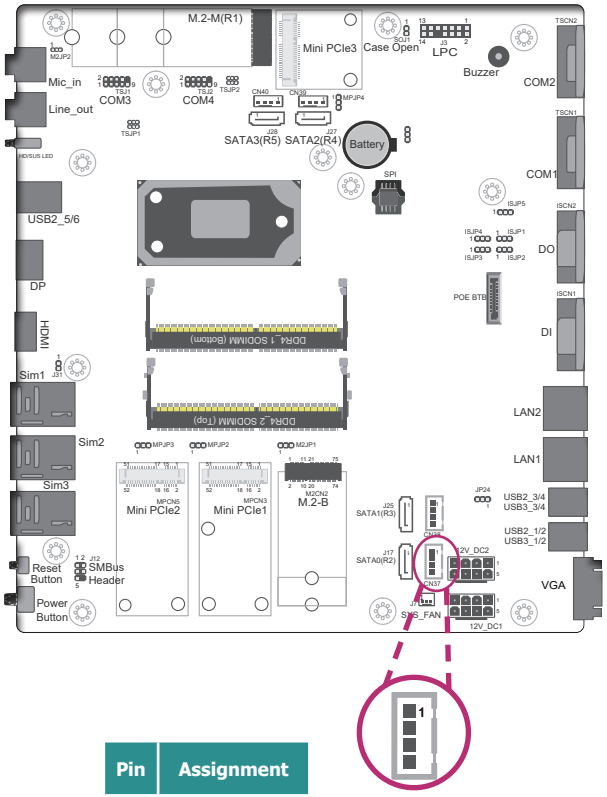
Pin	Assignment	Pin	Assignment
1	CLK	2	LAD1
3	RST#	4	LAD0
5	FRAME#	6	VCC3
7	LAD3	8	GND
9	LAD2	10	N.C.
11	SERIRQ	12	GND
13	5VSB	14	5V

SATA1 Power (CN38)



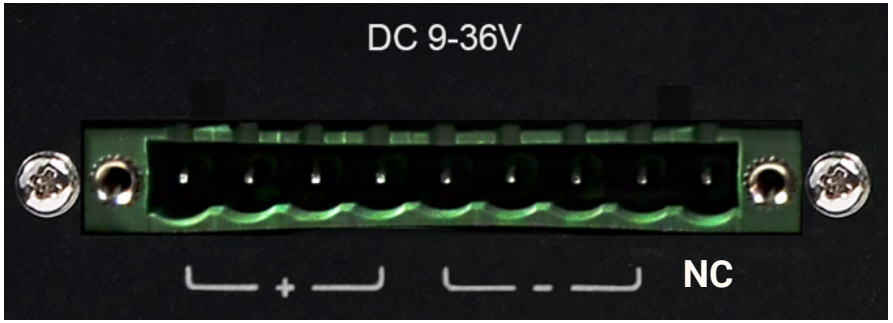
Pin	Assignment
1	+12V_SATA1
2	GND
3	GND
4	5V_SATA1

SATA0 Power (CN37)

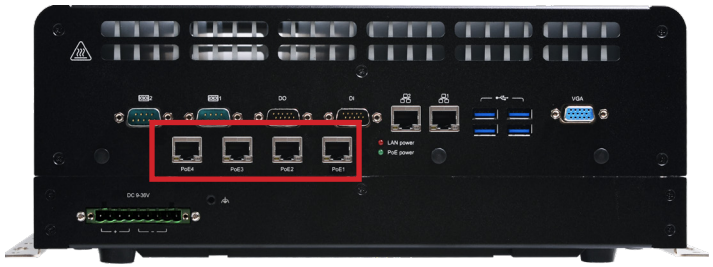


Pin	Assignment
1	+12V_SATA1
2	GND
3	GND
4	5V_SATA1

Power Pin Define of DC 9-36V



Pin Define of RJ45



Pin	1000 Mbps Assignment	POE
1	MDI 0+	POE V+/ P
2	MDI 0-	POE V+/ P
3	MDI 1+	POE V-/ N
4	MDI 2+	POE V-/ N
5	MDI 2-	
6	MDI 1-	
7	MDI 3+	
8	MDI 3-	

Chapter 4 - BIOS Settings

▶ Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added.
It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.

Note:
The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

Default Configuration
Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

Entering the BIOS Setup Utility
The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.
The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message “Press DEL to run setup” will appear on the screen. If the message disappears before you respond, restart the system or press the “Reset” button. You may also restart the system by pressing the <Ctrl> <Alt> and <Del> keys simultaneously.

Legends

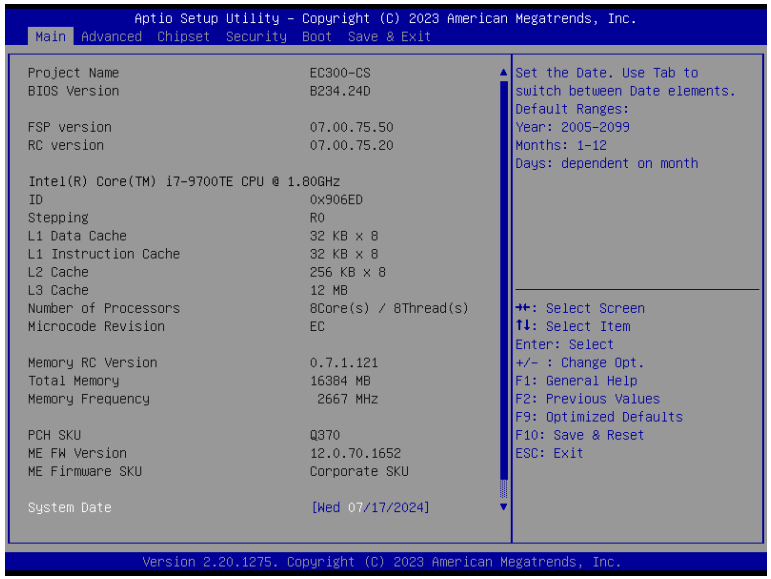
Keys	Function
Right / Left arrow	Move the highlight left or right to select a menu
Up / Down arrow	Move the highlight up or down between submenus or fields
<Enter>	Enter the highlighted submenu
+ (plus key)/F6	Scroll forward through the values or options of the highlighted field
- (minus key)/F5	Scroll backward through the values or options of the highlighted field
<F1>	Display general help
<F2>	Display previous values
<F7>	Popup Boot Device List
<F9>	Optimized defaults
<F10>	Save and Exit
<Esc>	Return to previous menu

Scroll Bar
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

Submenu
When “▶” appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

▶ Main

The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.



System Date

The date format is <month>, <date>, <year>. Press "Tab" to switch to the next field and press "-" or "+" to modify the value.

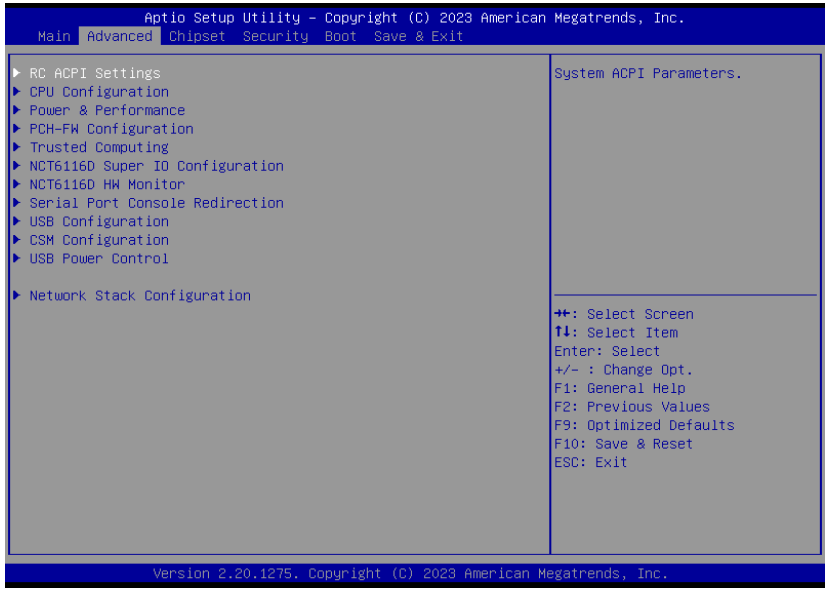
System Time

The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

▶ Advanced

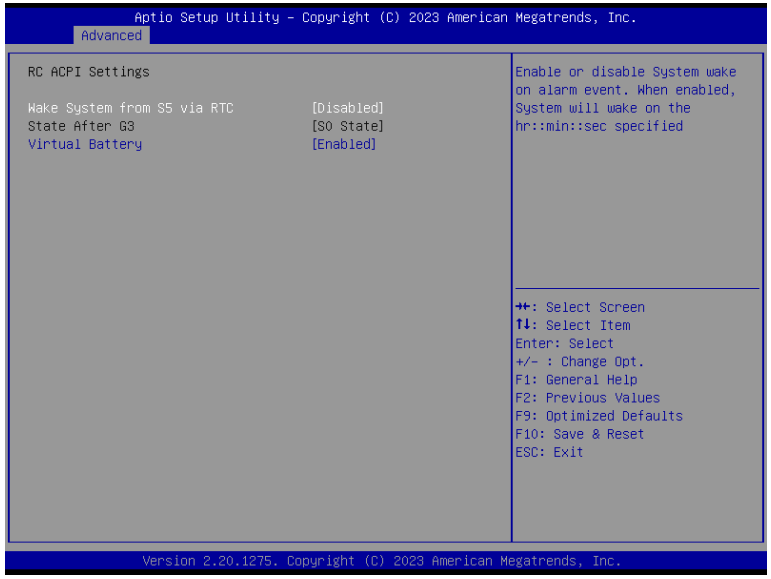
The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.

Important:
Setting incorrect field values may cause the system to malfunction.



▶ Advanced

RC ACPI Settings



Wake system from S5 via RTC

When Enabled, the system will automatically power up at a designated time every day. Once it's switched to [Enabled], please set up the time of day — hour, minute, and second — for the system to wake up.

State After G3

Select between S0 State, and S5 State. This field is used to specify what state the system is set to return to when power is re-applied after a power failure (G3 state).

S0 State The system automatically powers on after power failure.

S5 State The system enter soft-off state after power failure. Power-on signal input is required to power up the system.

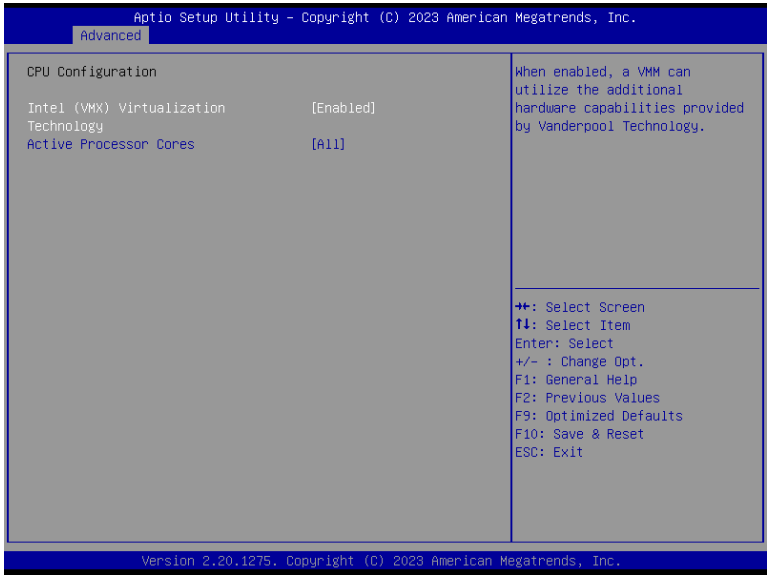
Last State The system returns to the last state right before power failure.

Virtual Battery

Enable or disable virtual battery.

▶ Advanced

CPU Configuration



Intel (VMX) Virtualization Technology

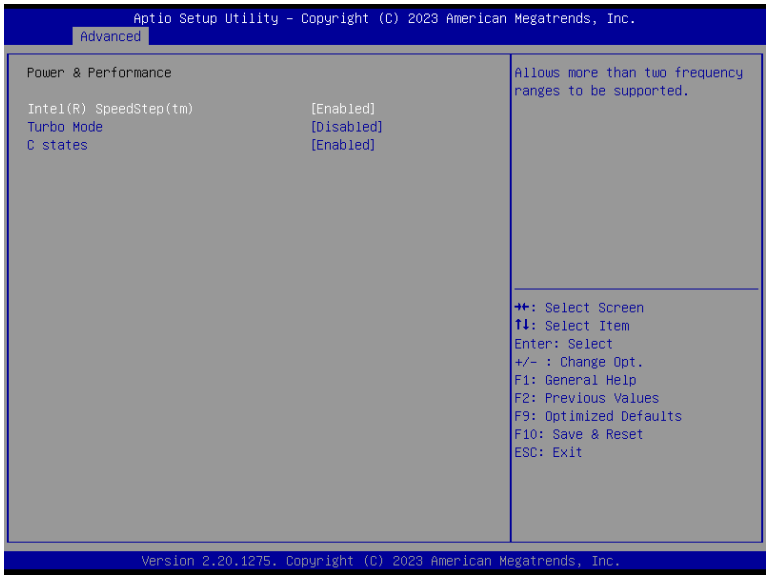
When this field is set to Enabled, the VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Active Processor Cores

Select number of cores to enable in each processor package: all or 1.

▶ Advanced

Power & Performance



Intel (R) SpeedStep(tm)

This field is used to enable or disable the Intel SpeedStep® Technology, which helps optimize the balance between system's power consumption and performance. After it is enabled in the BIOS, EIST features can then be enabled via the operating system's power management.

Turbo Mode

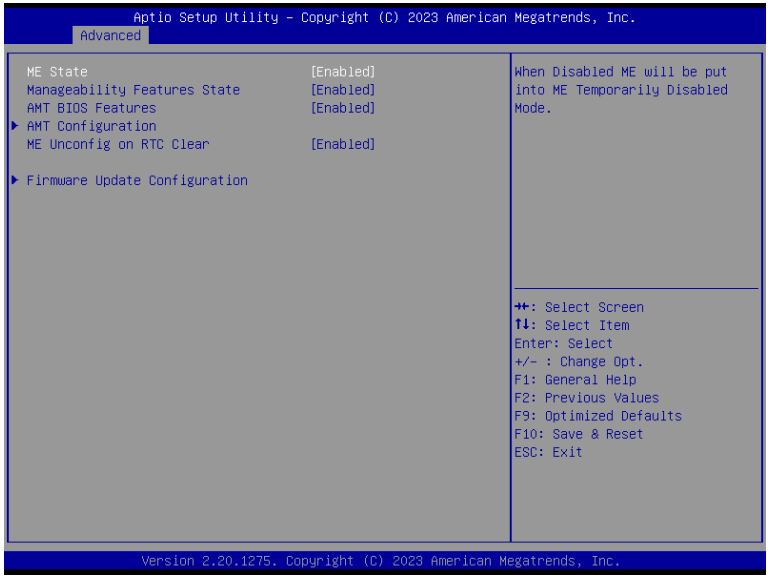
Enable or disable turbo mode of the processor. This field will only be displayed when EIST is enabled.

C states

Enable or disable CPU Power Management. It allows CPU to enter "C states" when it's idle and nothing is executing.

▶ Advanced

PCH-FW Configuration



ME State

When this field is set to Disabled, ME will be put into ME Temporarily Disabled Mode.

Manageability Features State

Enable or disable Intel(R) Manageability features. This option disables/enables Manageability Features support in FW. To disable, support platform must be in an unprovisioned state first.

AMT BIOS Features

When disabled, AMT BIOS features are no longer supported and user is no longer able to access MEBx Setup. This option does not disable manageability features in FW.

ME Unconfig on RTC Clear

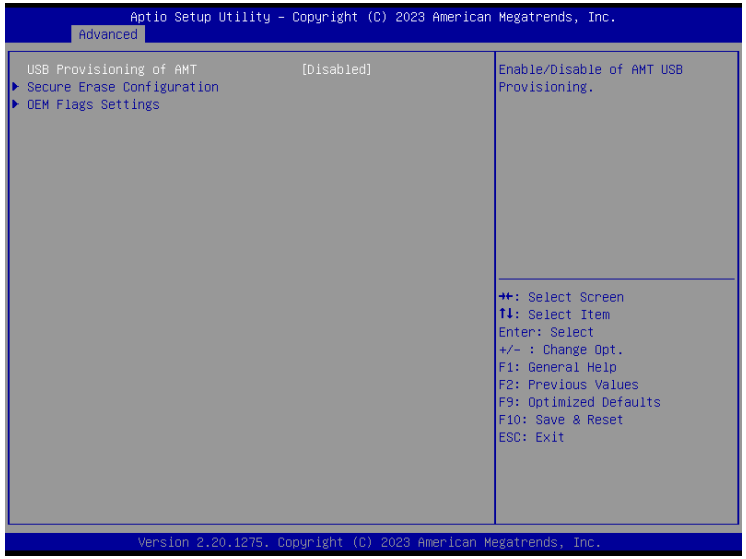
When disabled, ME will not be unconfigured on RTC Clear.

Firmware Update Configuration

Configure Management Engine Technology Parameters.

▶ Advanced

PCH-FW Configuration ▶ AMT Configuration



USB Provisioning of AMT

Enable or disable of AMT USB Provisioning.

Secure Erase Configuration

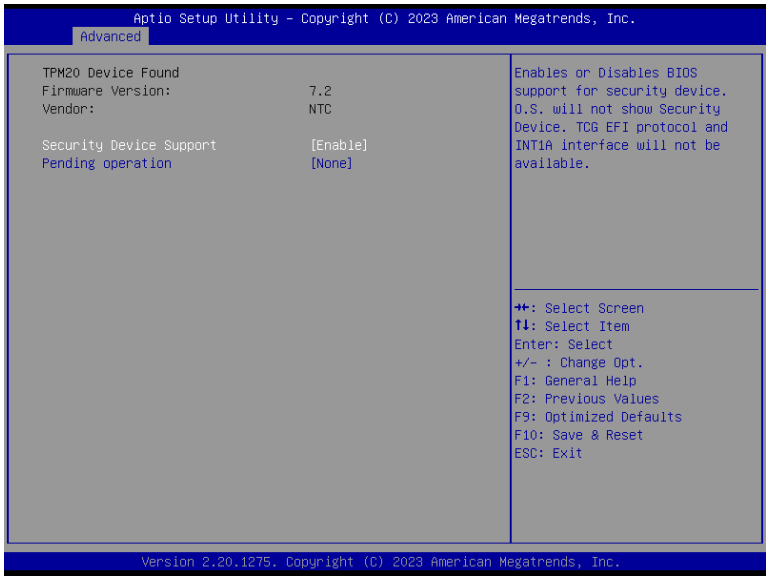
Secure Erase Configuration Menu

OEM Flags Settings

Configure OEM Flags.

▶ Advanced

Trusted Computing



Security Device Support

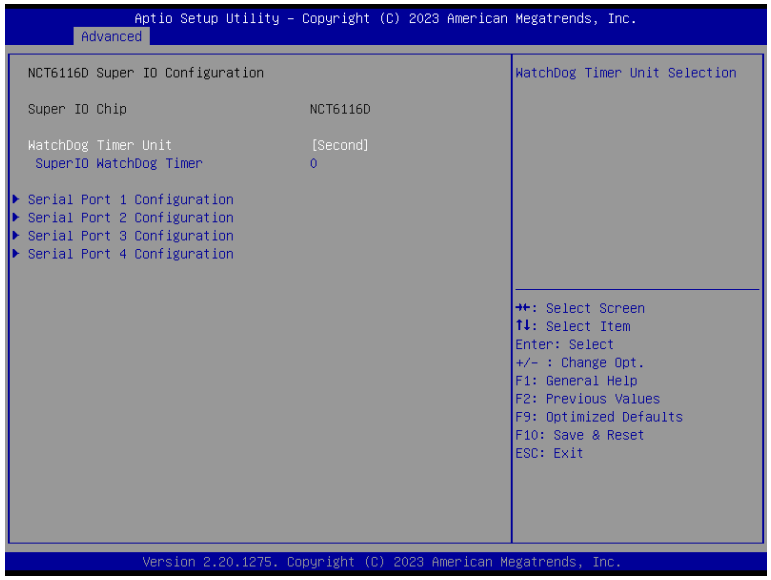
This field is used to enable or disable BIOS support for the security device such as an TPM 2.0 to achieve hardware-level security via cryptographic keys.

Pending operation

To clear the existing TPM encryption, select "TPM Clear" and restart the system. This field is not available when "Security Device Support" is disabled.

▶ Advanced

NCT6116D Super IO Configuration



WatchDog Timer Unit

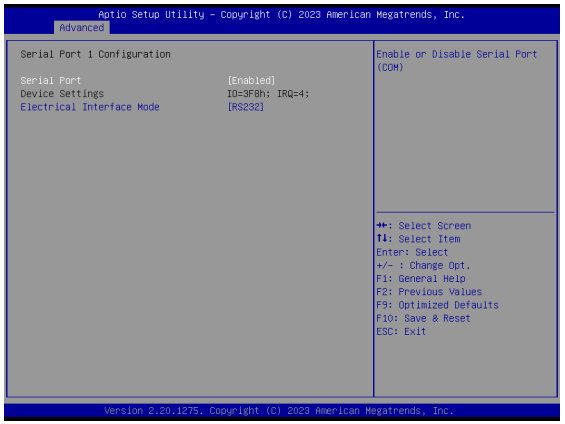
Select WatchDog Timer Unit — Second or Minute.

SuperIO WatchDog Timer

Set SuperIO WatchDog Timer Timeout value. The range is from 0 (disabled) to 255.

▶ Advanced

NCT6116D Super IO Configuration ▶ Serial Port 1,2 Configuration



Serial Port

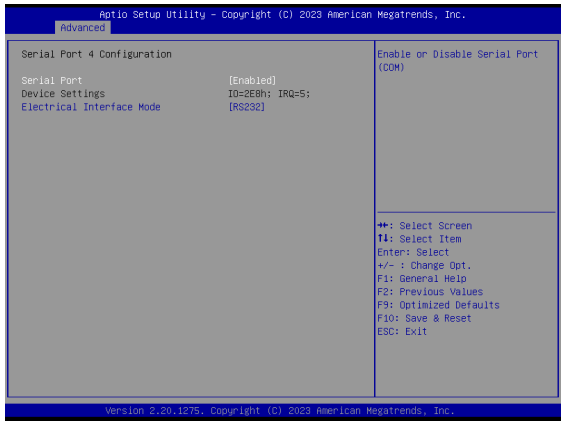
Enable or disable serial port.

Electrical Interface Mode

Choose mode between RS232 / RS485 / RS422

▶ Advanced

NCT6116D Super IO Configuration ▶ Serial Port 3,4 Configuration

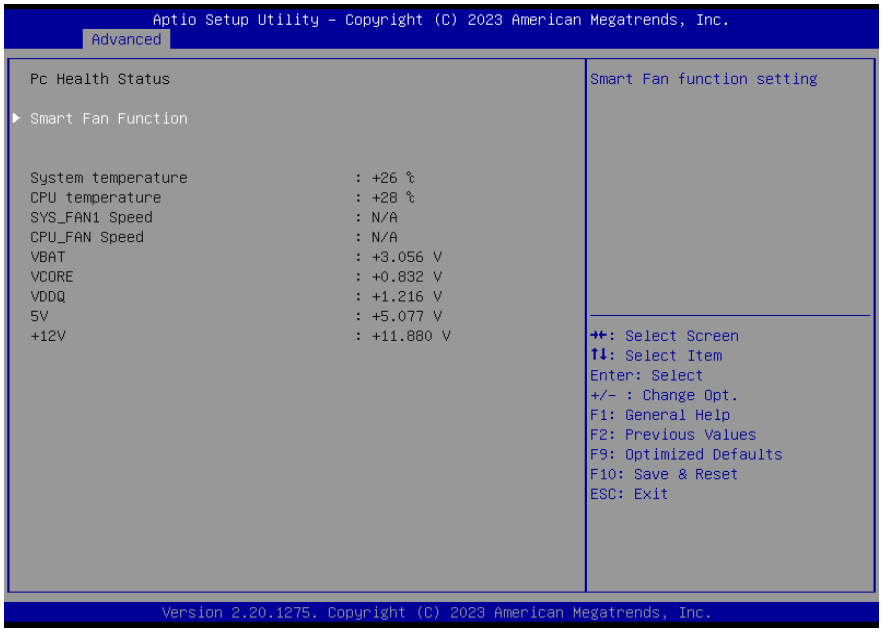


Serial Port
Enable or disable serial port.

Electrical Interface Mode
Choose mode between RS232 / RS485 / RS422

▶ Advanced

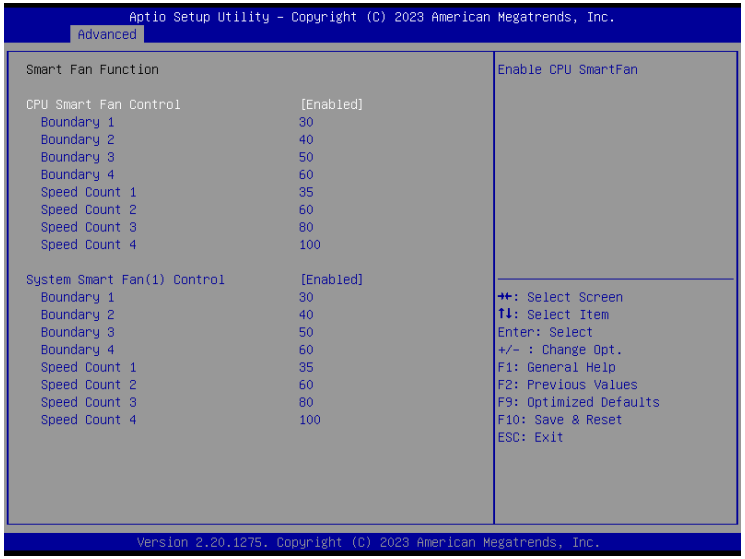
NCT6116D HW Monitor



This section displays the system's health information, i.e. voltage readings, CPU and system temperatures, and fan speed readings

▶ Advanced

NCT6126D HW Monitor ▶ Smart FAN Function



Smart Fan is a fan speed moderation strategy dependent on the current system temperature. When the system temperature goes higher than the Boundary setting, the fan speed will be turned up to the setting of the Fan Speed Count that bears the same index as the Boundary field.

SYS Smart Fan/CPU Smart Fan Control = [Enabled]

- **Boundary 1 to Boundary 4**

  Set the boundary temperatures that determine the fan speeds accordingly, the value ranging from 0-127°C. For example, when the system temperature reaches Boundary 1 setting, the fan speed will be turned up to the designated speed of the Fan Speed Count 1 field.

- **Fan Speed Count 1 to Fan Speed Count 4**

  Set the fan speed, the value ranging from 1-100%, 100% being full speed. The fans will operate according to the specified boundary temperatures above-mentioned.

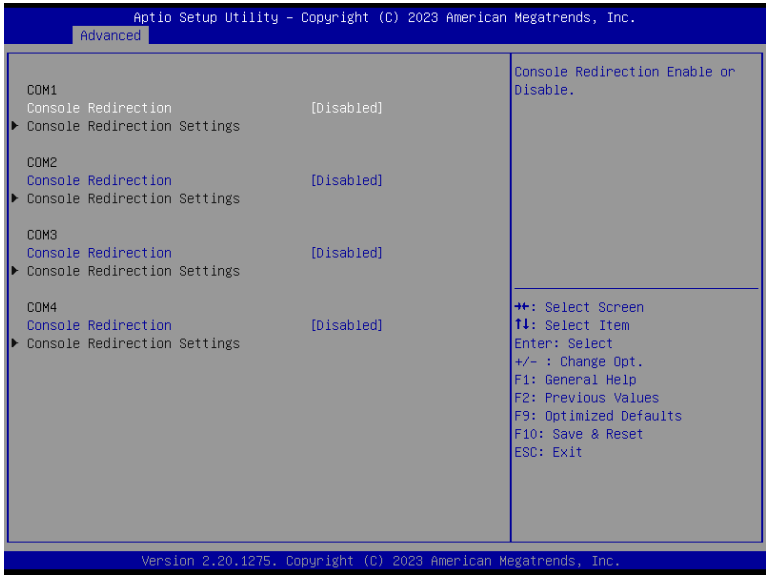
SYS Smart Fan/CPU Smart Fan Control = [Disabled]

- **Fix Fan Speed Count**

  Set the fan speed, the value ranging from 1-100%, 100% being full speed. The fans will always operate at the specified speed regardless of gauged temperatures.

▶ Advanced

Serial Port Console Redirection

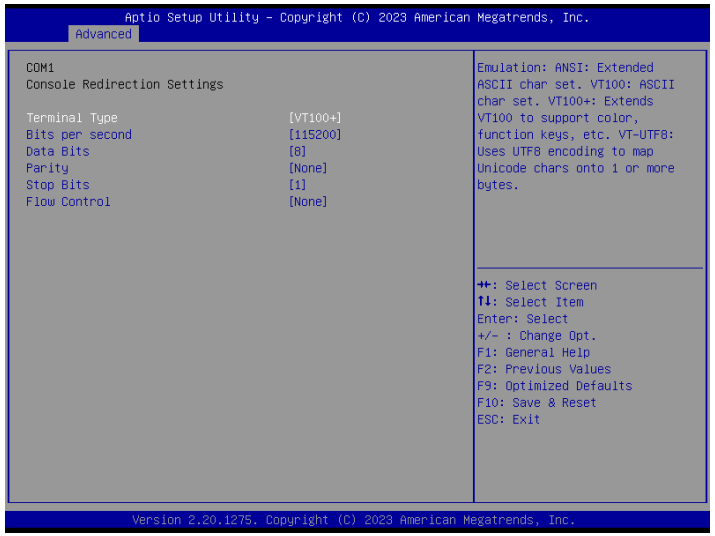


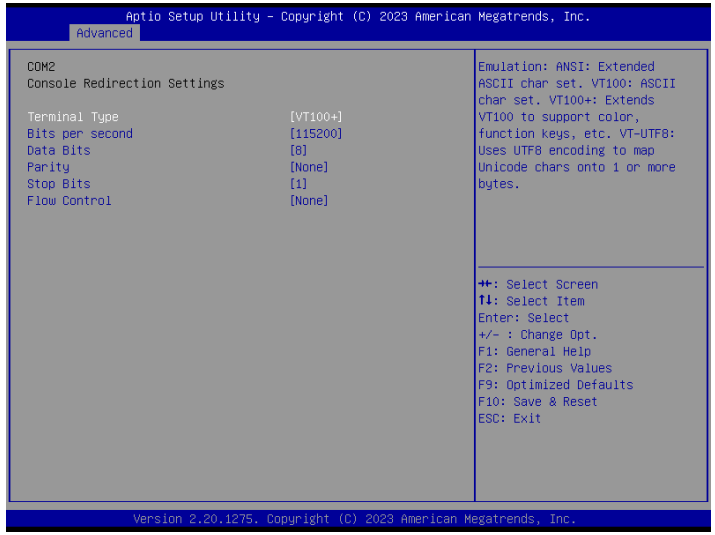
Console Redirection
Console Redirection Enable or Disable.

Console Redirection Settings
See following pages.

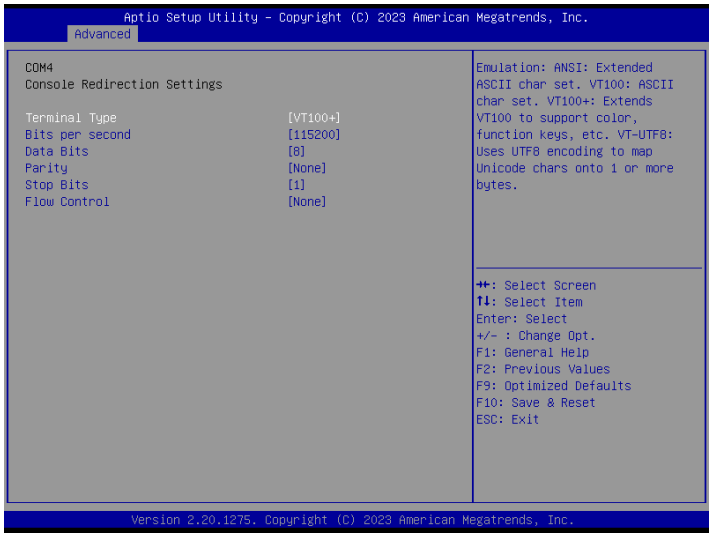
▶ Advanced

Serial Port Console Redirection ▶ Console Redirection Settings





Serial Port Console Redirection ▶ Console Redirection Settings



Configure the serial settings of the current COM port.

Terminal Type
Select terminal type: VT100, VT100+, VT-UTF8 or ANSI.

Bits per second
Select serial port transmission speed: 9600, 19200, 38400, 57600 or 115200.

Data Bits
Select data bits: 7 bits or 8 bits.

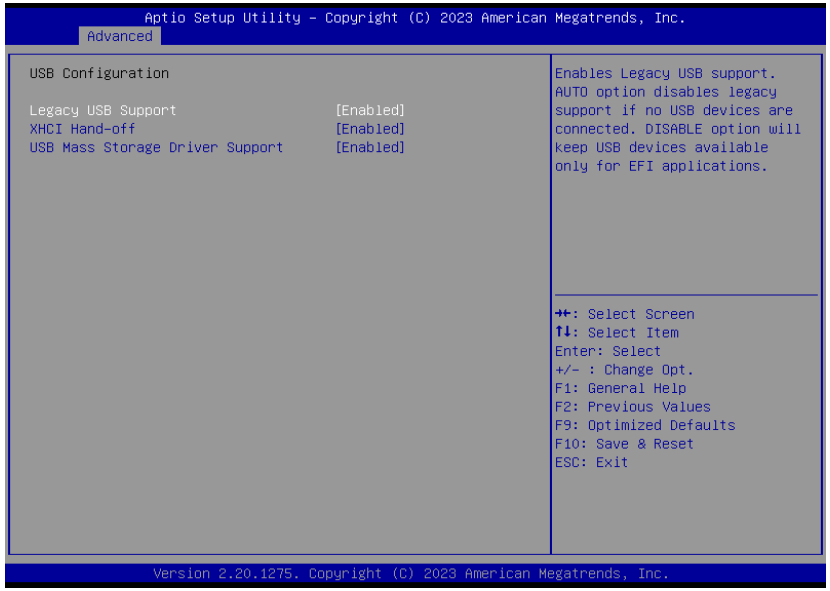
Parity
Select parity bits: None, Even, Odd, Mark or Space.

Stop Bits
Select stop bits: 1 bit or 2 bits.

Flow Control
Select flow control type: None or RTS/CTS.

▶ Advanced

USB Configuration



Legacy USB Support

Enabled	Enable Legacy USB support.
Disabled	Keep USB devices available only for EFI applications.
Auto	Disable Legacy support if no USB devices are connected.

XHCI Hand-off

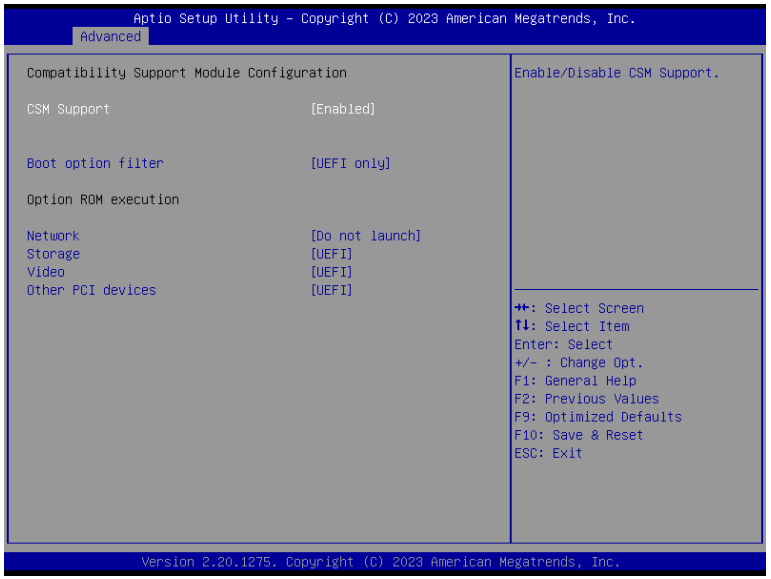
Enable or disable XHCI Hand-off.

USB Mass Storage Driver Support

Enable or disable USB Mass Storage Driver Support.

▶ Advanced

CSM Configuration



CSM (Compatibility Support Module) Support

Enable or disable CSM Support.

Boot option filter

This option controls Legacy/UEFI ROMs priority.

Network

Controls the execution of UEFI and Legacy Network OpROM

Storage

Controls the execution of UEFI and Legacy Storage OpROM

Video

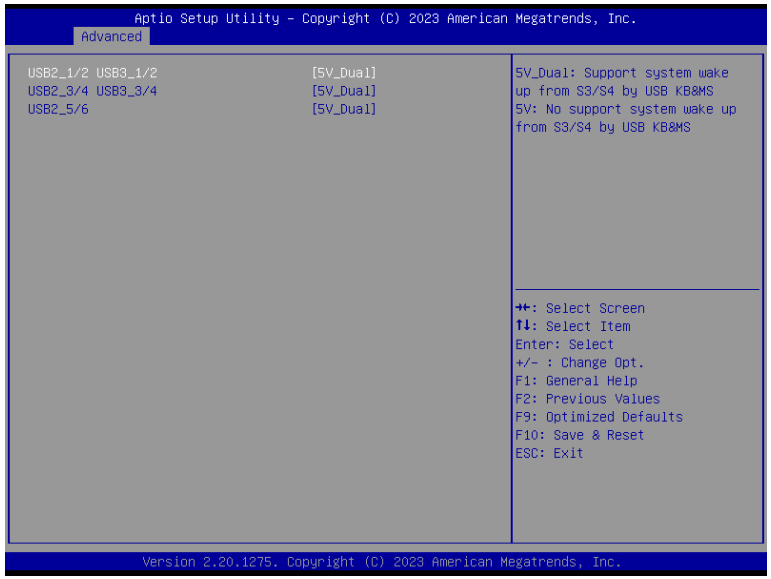
Controls the execution of UEFI and Legacy Video OpROM

Other PCI devices

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

▶ Advanced

USB Power Control



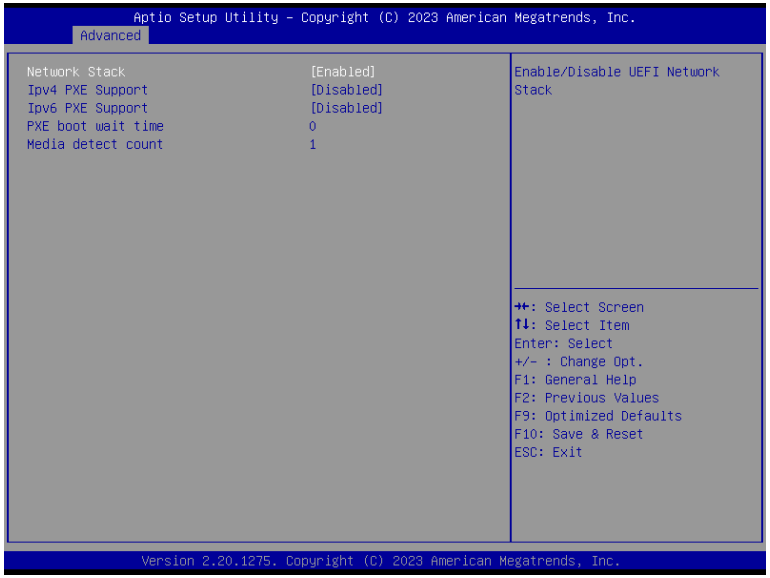
USB Power

5V_Dual: Support system wake from S3/S4 by USB KB&MS

5V: No Support system wake from S3/S4 by USB KB&MS

▶ Advanced

Network Stack Configuration



Network Stack

Enable or disable (Default) UEFI network stack. The following fields will appear when this field is enabled.

Ipv4 PXE Support Enable or disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

Ipv6 PXE Support

Enable or disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.

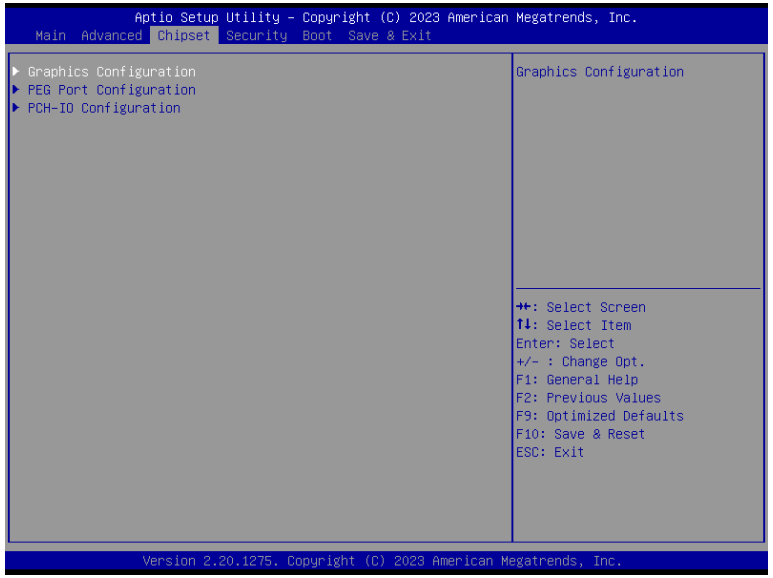
PXE boot wait time

Set the wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

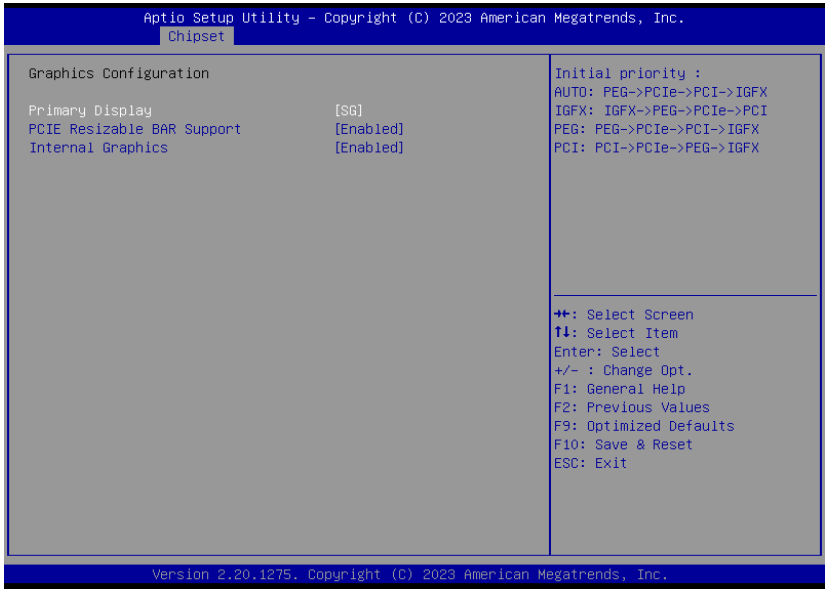
Media detect count

Set the number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

▶ Chipset



Graphics Configuration



Primary Display

Select which of IGFX/PEG/PCI Graphics device to be the primary display.

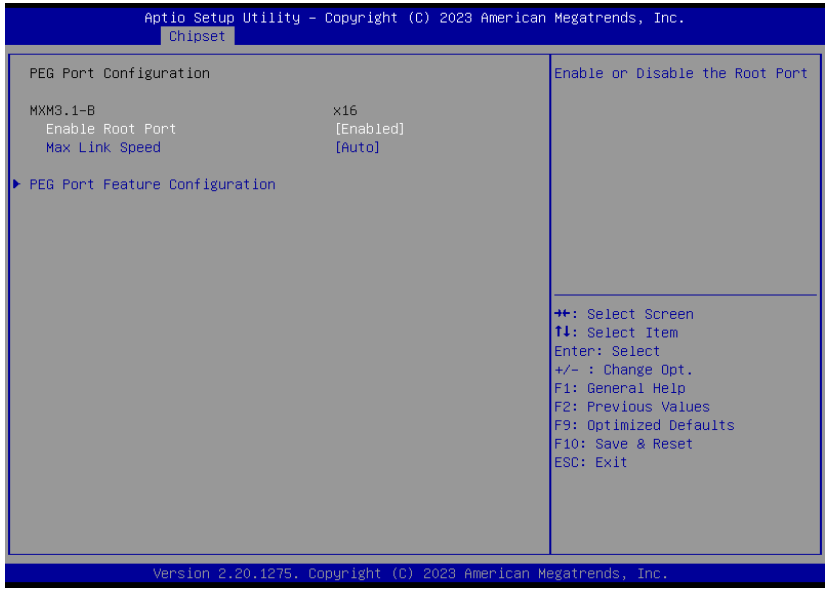
Internal Graphics

Enable/Disable PCIE Resizable BAR Support
If disable adjust EnableAbove4GBMmio option accordingly

Internal Graphics

Keep IGFX "Enabled" or "Disabled" based on the setup options, or select "Auto" for auto-detection.

PEG Port Configuration



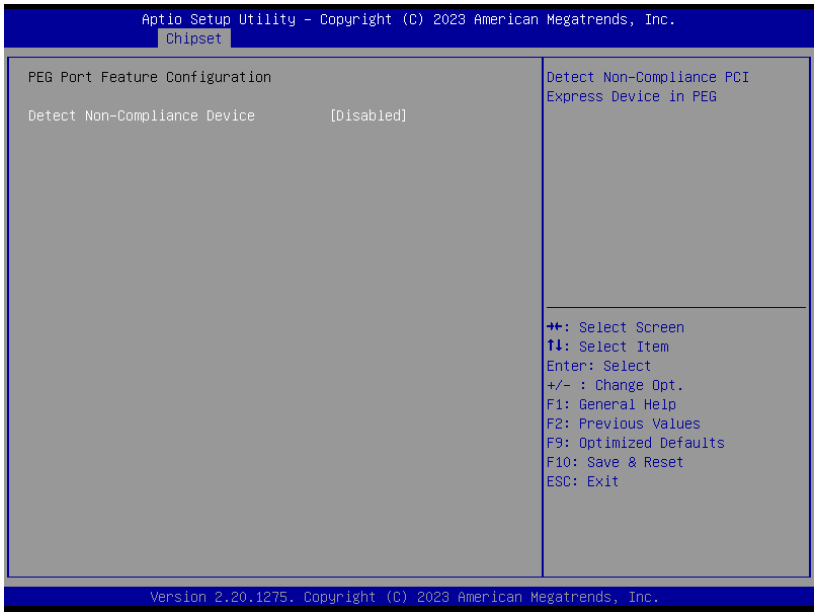
Enable Root Port

Enable/Disable the Root Port

Max Link Speed

Configure PEG 0:1:0 Max Speed

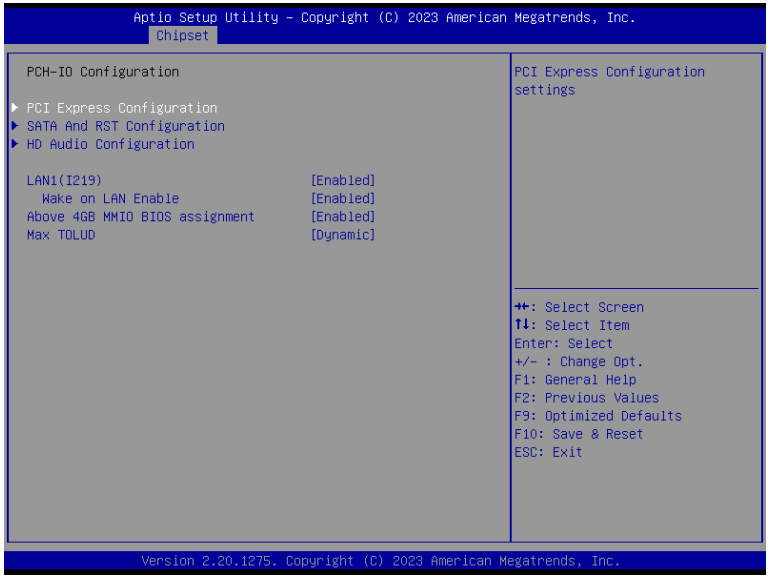
PEG Port Configuration ▶ PEG Port Feature Configuration



Detect Non-Compliance Device

Detect Non-Compliance PCI Express Device in PEG

PCH-IO Configuration



PCI Express Configuration

PCI Express Configuration Settings

SATA And RST Configuration

SATA Device Otpions Settings

HD Audio Configuration

HD Audio Subsystem Configuration Settings

LAN1(I219)

Enable or disable onboard NIC.

Wake on LAN Enable

Enable or disable integrated LAN to wake the system.

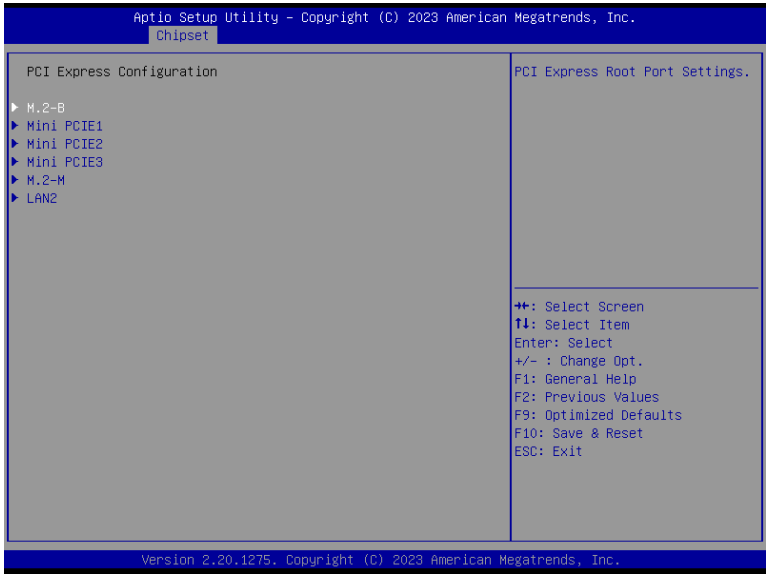
Above 4GB MMIO BIOS assignment

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

Max TOLUD

Assign the maximum value of Top Of Lower Usable DRAM (TOLUD). Select to specify a fixed value, or select "Dynamic" so that the assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller.

PCH-IO Configuration ▶ PCI Express Configuration

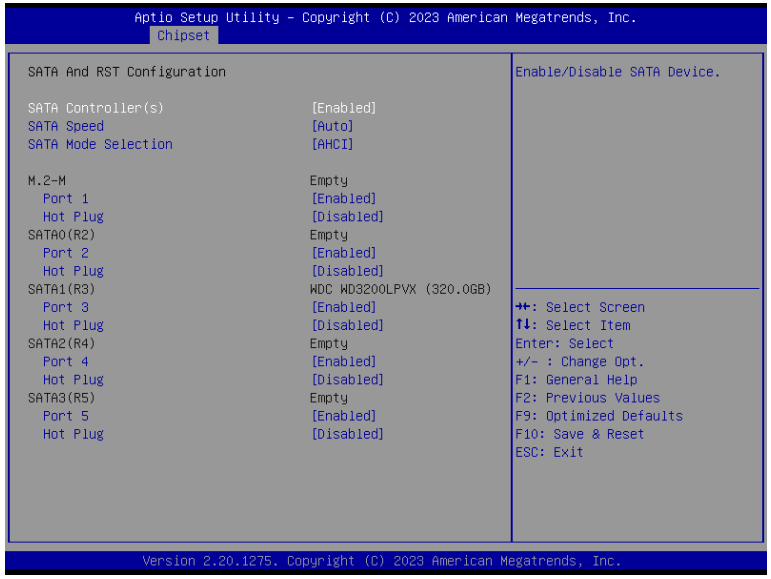


Select one of the PCI Express channels and press enter to configure the following settings.

LAN 2, Mini PCIE1, 2,&3, M.2-M, M.2-B

Control the PCI Express Root Port.

PCH-IO Configuration ▶ SATA And RST Configuration



SATA Controller(s)

This field is used to enable or disable the Serial ATA controller.

SATA Speed

This field is used to select SATA speed generation limit: Auto, Gen1, Gen2 or Gen3.

SATA Mode Selection

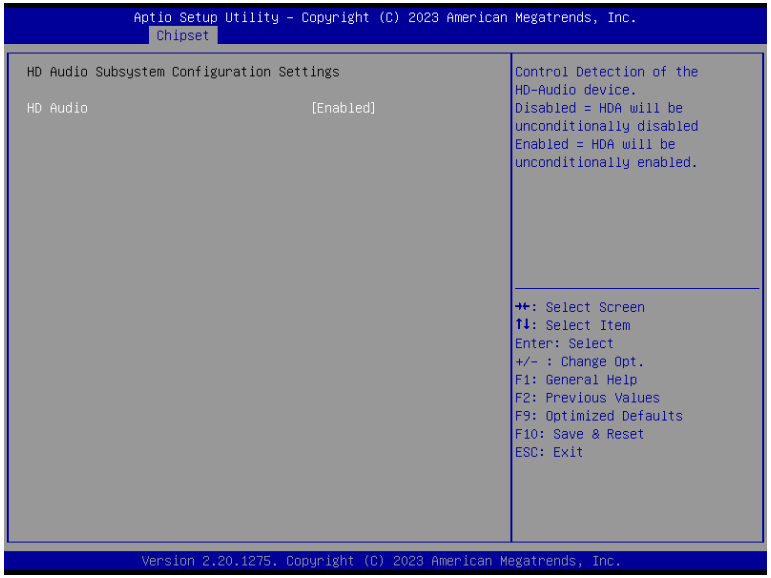
The mode selection determines how the SATA controller(s) operates.

- **AHCI** This option allows the Serial ATA controller(s) to use AHCI (Advanced Host Controller Interface).
- **Intel RST Premium With Intel Optane System Acceleration** This option allows you to create RAID or Intel Rapid Storage configuration along with Intel® Optane™ system acceleration on Serial ATA devices.

Ports and Hot Plug

Enable or disable the Serial ATA port and its hot plug function.

PCH-IO Configuration ▶ HD Audio Configuration

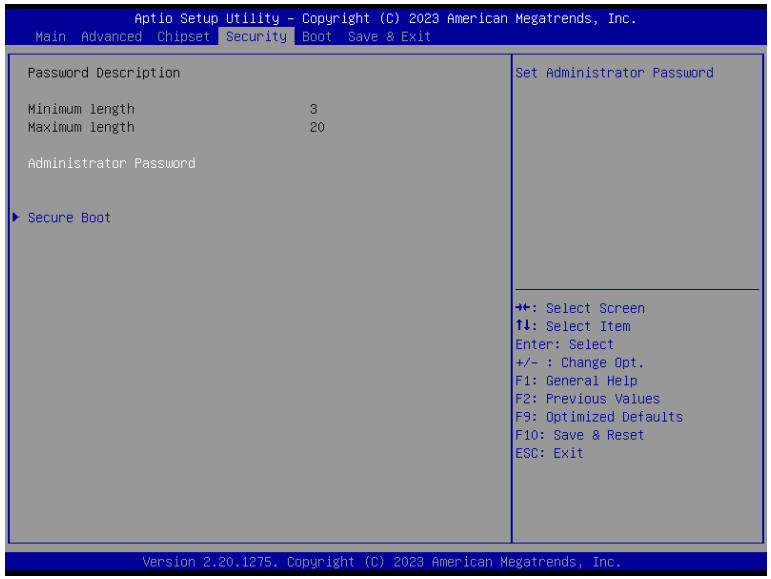


HD Audio

Control the detection of the HD Audio device.

Disabled	HDA will be unconditionally disabled.
Enabled	HDA will be unconditionally enabled.

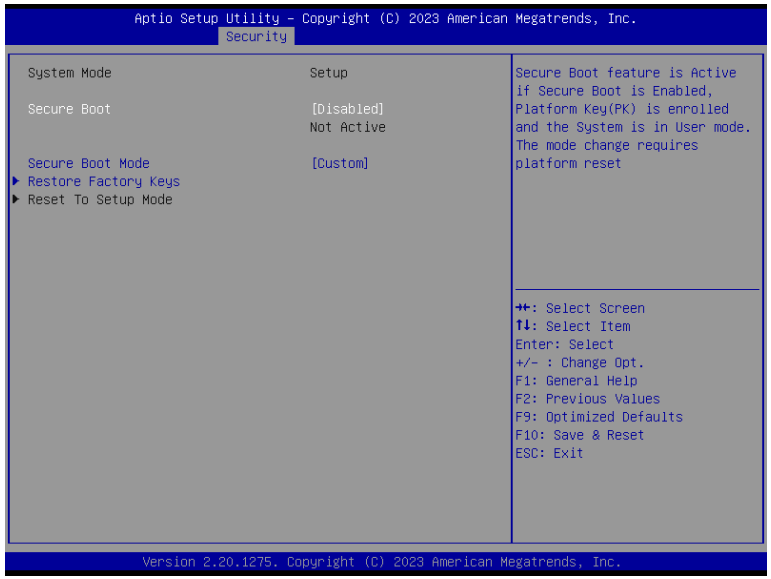
▶ Security



Administrator Password

Set the administrator password. To clear the password, input nothing and press enter when a new password is asked. Administrator Password will be required when entering the BIOS.

Secure Boot



Secure Boot

Secure Boot feature is Active if secure Boot is Enabled, Platform Key (PK) is enrolled and the system is in user mode. The mode change requires platform reset.

Secure Boot Mode

Select the secure boot mode — Standard or Custom. When set to Custom, the following fields will be configurable for the user to manually modify the key database.

Restore Factory Keys

Force system to User Mode. Load OEM-defined factory defaults of keys and databases onto the Secure Boot. Press Enter and a prompt will show up for you to confirm.

Reset To Setup Mode

Clear the database from the NVRAM, including all the keys and signatures installed in the Key Management menu. Press Enter and a prompt will show up for you to confirm.

▶ Boot

Setup Prompt Timeout

Set the number of seconds to wait for the setup activation key. 65535 (0xFFFF) denotes indefinite waiting.

Bootup NumLock State

Select the keyboard NumLock state: On or Off.

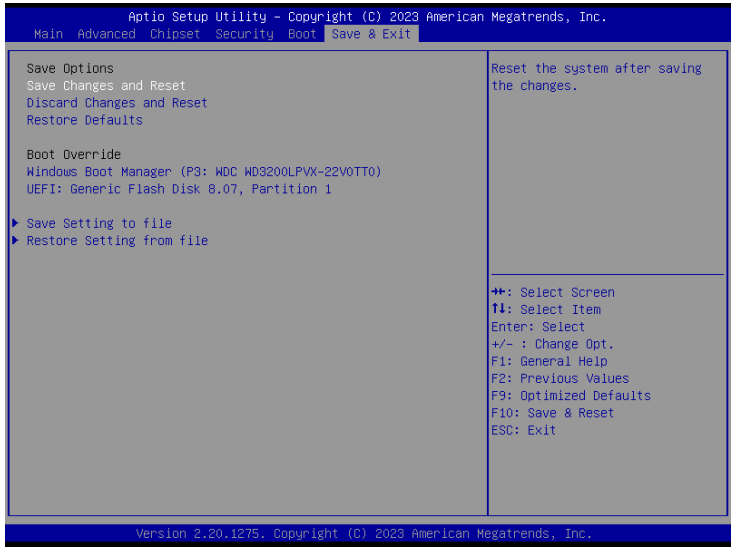
Quiet Boot

This section is used to enable or disable quiet boot option.

Boot Option Priorities

Rearrange the system boot order of available boot devices.

▶ Save & Exit



Save Changes and Reset

To save the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system after saving all changes made.

Discard Changes and Reset

To discard the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system setup without saving any changes.

Restore Defaults

To restore and load the optimized default values, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore the default values of all the setup options.

Boot Override

Move the cursor to an available boot device and press Enter, and then the system will immediately boot from the selected boot device. The Boot Override function will only be effective for the current boot. The “Boot Option Priorities” configured in the Boot menu will not be changed.

► Save Setting to file

Select this option to save BIOS configuration settings to a USB flash device.

► Restore Setting from file

This field will appear only when a USB flash device is detected. Select this field to restore setting from the USB flash device.

▶ Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files and specific instructions about how to update BIOS with the flash utility.

▶ Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.
2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.
3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.

Note:

a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.

b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

c. After updating unique MAC Address from manufacturing, NVM will be protected immediately after power cycle.
Users cannot update NVM or MAC address.