



Industrial Communication Platforms

Energy Management and Industrial Cyber Security Solutions

ICS-I331 User Manual

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About this Document

This manual describes the overview of the various functionalities of this product, and the information you need to get it ready for operation. It is intended for those who are:

- responsible for installing, administering and troubleshooting this system or Information Technology professionals.
- assumed to be qualified in the servicing of computer equipment, such as professional system integrators, or service personnel and technicians.

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Conventions & Icons

The icons are used in the manual to serve as an indication of interest topics or important messages.

Icon	Usage
 Note or Information	This mark indicates that there is something you should pay special attention to while using the product.
 Warning or Important	This mark indicates that there is a caution or warning and it is something that could damage your property or product.

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Documentation Feedback

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Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of 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 the instruction, 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 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.

FCC Caution

- ▶ Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- ▶ This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.



Note

1. An unshielded-type power cord is required to meet FCC emission limits and to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used.
2. Use only shielded cables to connect I/O devices to this equipment.
3. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



Important

1. Operations in the 5.15-5.25GHz band are restricted to indoor usage only.
2. This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

Safety Guidelines

Follow these guidelines to ensure general safety:

- ▶ Keep the chassis area clear and dust-free during and after installation.
- ▶ Keep loose clothing, jewelry, ties, and scarves away from the chassis. Roll up your sleeves.
- ▶ Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- ▶ Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- ▶ Disconnect all power before installing or removing a chassis or working near power supplies.
- ▶ Do not work alone if potentially hazardous conditions exist.
- ▶ Never assume that power is disconnected from a circuit; always check the circuit.

Consignes de sécurité

Suivez ces consignes pour assurer la sécurité générale :

- ▶ Laissez la zone du châssis propre et sans poussière pendant et après l'installation.
- ▶ Ne portez pas de vêtements amples ou de bijoux qui pourraient être pris dans le châssis. Attachez votre cravate ou écharpe et remontez vos manches.
- ▶ Portez des lunettes de sécurité pour protéger vos yeux.
- ▶ N'effectuez aucune action qui pourrait créer un danger pour d'autres ou rendre l'équipement dangereux.
- ▶ Coupez complètement l'alimentation en éteignant l'alimentation et en débranchant le cordon d'alimentation avant d'installer ou de retirer un châssis ou de travailler à proximité de sources d'alimentation.
- ▶ Ne travaillez pas seul si des conditions dangereuses sont présentes.
- ▶ Ne considérez jamais que l'alimentation est coupée d'un circuit, vérifiez toujours le circuit. Cet appareil génère, utilise et émet une énergie radiofréquence et, s'il n'est pas installé et utilisé conformément aux instructions des fournisseurs de composants sans fil, il risque de provoquer des interférences dans les communications radio.

Lithium Battery Caution

- ▶ There is risk of Explosion if Battery is replaced by an incorrect type.
- ▶ Dispose of used batteries according to the instructions.
- ▶ Installation only by a skilled person who knows all Installation and Device Specifications which are to be applied.
- ▶ Do not carry the handle of power supplies when moving to another place.
- ▶ Please conform to your local laws and regulations regarding safe disposal of lithium BATTERY.
- ▶ Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery can result in an explosion.
- ▶ Leaving a battery in an extremely high temperature surrounding environment can result in an explosion or the leakage of flammable liquid or gas.
- ▶ Batteries subjected to extremely low air pressure may explode or leak flammable liquid or gas.

Avertissement concernant la pile au lithium

- ▶ Risque d'explosion si la pile est remplacée par une autre d'un mauvais type.
- ▶ Jetez les piles usagées conformément aux instructions.
- ▶ L'installation doit être effectuée par un électricien formé ou une personne formée à l'électricité connaissant toutes les spécifications d'installation et d'appareil du produit.
- ▶ Ne transportez pas l'unité en la tenant par le câble d'alimentation lorsque vous déplacez l'appareil.

Operating Safety

- ▶ Electrical equipment generates heat. Ambient air temperature may not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Be sure that the room in which you choose to operate your system has adequate air circulation.
- ▶ Ensure that the chassis cover is secure. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
- ▶ Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. Be sure to follow ESD-prevention procedures when removing and replacing components to avoid these problems.
- ▶ Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. If no wrist strap is available, ground yourself by touching the metal part of the chassis.
- ▶ Periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

Sécurité de fonctionnement

- ▶ L'équipement électrique génère de la chaleur. La température ambiante peut ne pas être adéquate pour refroidir l'équipement à une température de fonctionnement acceptable sans circulation adaptée. Vérifiez que votre site propose une circulation d'air adéquate.
- ▶ Vérifiez que le couvercle du châssis est bien fixé. La conception du châssis permet à l'air de refroidissement de bien circuler. Un châssis ouvert laisse l'air s'échapper, ce qui peut interrompre et rediriger le flux d'air frais destiné aux composants internes.
- ▶ Les décharges électrostatiques (ESD) peuvent endommager l'équipement et gêner les circuits électriques. Des dégâts d'ESD surviennent lorsque des composants électroniques sont mal manipulés et peuvent causer des pannes totales ou intermittentes. Suivez les procédures de prévention d'ESD lors du retrait et du remplacement de composants.
- ▶ Portez un bracelet anti-ESD et veillez à ce qu'il soit bien au contact de la peau. Si aucun bracelet n'est disponible, reliez votre corps à la terre en touchant la partie métallique du châssis.
- ▶ Vérifiez régulièrement la valeur de résistance du bracelet antistatique, qui doit être comprise entre 1 et 10 mégohms (Mohms).

Mounting Installation Precaution

- ▶ Do not install and/or operate this unit in any place that flammable objects are stored or used in.
- ▶ If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
- ▶ Installation of the equipment (especially in a rack) should consider the ventilation of the system's intake (for taking chilled air) and exhaust (for emitting hot air) openings so that the amount of airflow required for safe operation of the equipment is not compromised.
- ▶ To avoid a hazardous load condition, be sure the mechanical loading is even when mounting.
- ▶ Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on over-current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- ▶ Reliable earthing should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).

Installation & Operation:

- ▶ This equipment must be grounded. The power cord for product should be connected to a socket-outlet with earthing connection.
Cet équipement doit être mis à la terre. La fiche d'alimentation doit être connectée à une prise de terre correctement câblée
- ▶ Suitable for installation in Information Technology Rooms in accordance with Article 645 of the National Electrical Code and NFPA 75.
Peut être installé dans des salles de matériel de traitement de l'information conformément à l'article 645 du National Electrical Code et à la NFPA 75.
- ▶ The machine can only be used in a restricted access location and must be installed by a skilled person.
Les matériels sont destinés à être installés dans des EMPLACEMENTS À ACCÈS RESTREINT.

Warning

- ▶ Class I Equipment. This equipment must be earthed. The power plug must be connected to a properly wired earth ground socket outlet. An improperly wired socket outlet could place hazardous voltages on accessible metal parts.
- ▶ Product shall be used with Class 1 laser device modules.

Avertissement

- ▶ Équipement de classe I. Ce matériel doit être relié à la terre. La fiche d'alimentation doit être raccordée à une prise de terre correctement câblée. Une prise de courant mal câblée pourrait induire des tensions dangereuses sur des parties métalliques accessibles.
- ▶ Le produit doit être utilisé avec des modules de dispositifs laser de classe 1.



Electrical Safety Instructions

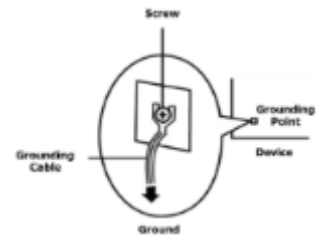
Before turning on the device, ground the grounding cable of the equipment. Proper grounding (grounding) is very important to protect the equipment against the harmful effects of external noise and to reduce the risk of electrocution in the event of a lightning strike. To uninstall the equipment, disconnect the ground wire after turning off the power. A ground wire is required and the part connecting the conductor must be greater than 4 mm² or 10 AWG.

Consignes de sécurité électrique

- ▶ Avant d'allumer l'appareil, reliez le câble de mise à la terre de l'équipement à la terre.
- ▶ Une bonne mise à la terre (connexion à la terre) est très importante pour protéger l'équipement contre les effets néfastes du bruit externe et réduire les risques d'électrocution en cas de foudre.
- ▶ Pour désinstaller l'équipement, débranchez le câble de mise à la terre après avoir éteint l'appareil.
- ▶ Un câble de mise à la terre est requis et la zone reliant les sections du conducteur doit faire plus de 4 mm² ou 10 AWG.

Grounding Procedure for Power Source

- ▶ Loosen the screw of the earthing point.
- ▶ Connect the grounding cable to the ground.
- ▶ The protection device for the power source must provide 30 A current.
- ▶ This protection device must be connected to the power source before power.
- ▶ The cable should be 16 AWG



Procédure de mise à la terre pour source d'alimentation

- ▶ Desserrez la vis du terminal de mise à la terre.
- ▶ Branchez le câble de mise à la terre à la terre.
- ▶ L'appareil de protection pour la source d'alimentation doit fournir 30 A de courant.
- ▶ Cet appareil de protection doit être branché à la source d'alimentation avant l'alimentation.
- ▶ Le câble doit être 16 AWG

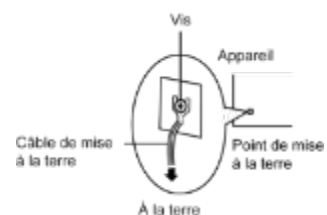


Table of Contents

Chapter 1: Product Overview 9

Package Content.....	9
Ordering Information	10
Optional Accessories	10
System Specifications	11
Physical Overview.....	12
Motherboard Information.....	14

Chapter 2: Hardware Installation..... 19

Opening the Bottom Chassis	19
Installing the System Memory.....	20
Installing the SATA Storage (Optional)	22
Installing the Wi-Fi Module (Optional).....	23
Installing the LTE/5G Module (Optional).....	25
Installing the SIM Cards (Optional)	28
DIN Rail Mounting (Optional)	29
Wall Mounting (Optional)	30

Chapter 3: Software Setup 32

Main Page.....	33
Advanced Page	34
Chipset.....	55
Security Page	61
Boot Menu.....	64
Save and Exit Menu	65

Appendix A: LED Indicator Explanations 67

Appendix B: Terms and Conditions 69

Warranty Policy	69
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CHAPTER 1: PRODUCT OVERVIEW

The ICS-I331 is a high-performance network security appliance powered by the Intel® Atom® X7000 Series CPU and supports up to 16GB of DDR5 SODIMM memory. It features versatile connectivity with multiple network options, including 4x 2.5GbE RJ45 ports (with Gen3 support for two ports), 1x GbE SFP, and 1x GbE/100M SFP. Rich I/O options include 1x RJ45 console, 2x Display Ports, 1x USB 3.0, 2x USB 2.0, an M.2 2230 E-Key slot for Wi-Fi 6/6E, and an M.2 3042/3050/3052 B-Key slot for LTE/5G. Designed for high-speed data processing, it is ideal for complex cybersecurity tasks.

Key Features

- ▶ Intel® Atom® X7000 Series Processors (Amston Lake)
- ▶ DDR5 SODIMM, Up to 16GB
- ▶ 4x 2.5GbE RJ45, 2x GbE SFP/RJ45 (By SKU)
- ▶ 1x USB3.0 & 2x USB2.0; 2x DP, 1x Console
- ▶ 1x M.2 2230 E-Key for Wi-Fi 6/6E (BT) (By SKU), 1x M.2 3042/3050/3052 B-Key for LTE/5G
- ▶ 2x Nano-SIM for LTE/5G Module
- ▶ Wide range of operating temperature -40~70°C

Package Content

Your package contains the following items:

- ▶ 1x ICS-I331 Industrial-Grade Cyber Security Appliance
- ▶ 1x Terminal Block

(Power Adapter Not Included)

Ordering Information

SKU	CPU	Memory	Storage	Ethernet	Wireless	I/O	Power
ICS-I331A	Intel® Atom® x7835RE 8C/8T	1x DDR5 SODIMM, up to 16GB	1x M.2 2280 B-Key for SATA	4x 2.5GbE RJ45 (w/1 pair Bypass); 2x GbE/100M RJ45	1x M.2 3042/3050/3052	1x RJ45 Console; 1x USB3.0; 2x USB2.0; 2x DP	Dual DC 12~48V
ICS-I331B				4x 2.5GbE RJ45 (w/1 pair Bypass); 1x GbE SFP; 1x GbE/100M SFP			
ICS-I331C	Intel® Atom® x7433RE 4C/4T			4x 2.5GbE RJ45 (w/1 pair Bypass); 2x GbE/100M RJ45	B-Key for LTE/5G Sub6		
ICS-I331D				4x 2.5GbE RJ45 (w/1 pair Bypass); 1x GbE SFP; 1x GbE/100M SFP			
ICS-I331E	Intel® Atom® x7211RE 2C			4x 2.5GbE RJ45; 1x GbE/100M RJ45	1x M.2 3042/3050/3052		
ICS-I331F				4x 2.5GbE RJ45; 1x GbE/100M SFP	B-Key for LTE/5G Sub6; 1x M.2 2230 E-Key for Wi-Fi 6/6E (BT)		

Optional Accessories

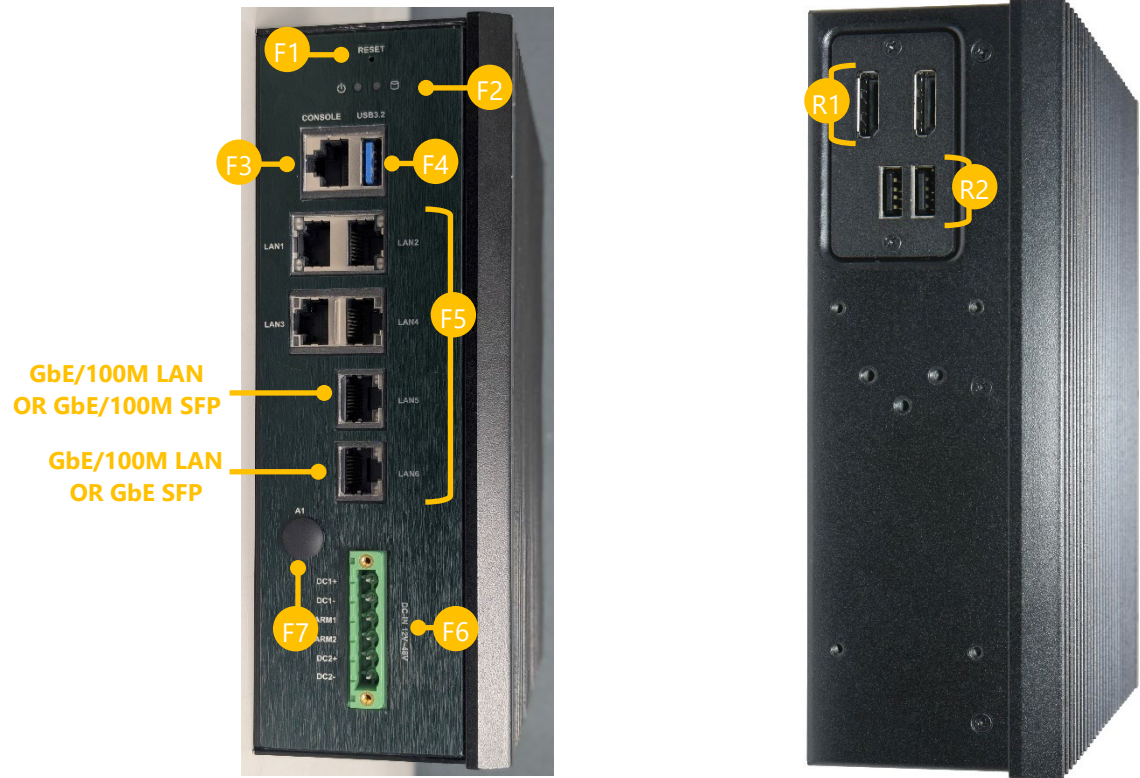
Model	Description
IP54 Kit	IP54 Cable Cover for ICS-I331
5G Antenna Kit	Antenna Kit with cables, antennas (without 5G Module)
LTE Antenna Kit	Antenna Kit with cables, antennas (without LTE Module)
Wi-Fi Antenna Kit	Antenna Kit with cables, antennas (without Wi-Fi Module)
Wall Mount Kit	Wallmount bracket with screw pack
VESA Mount Kit	VESA mount bracket with screw pack

System Specifications

Processor System	Processor Options	SKU A/B: Intel® Atom® x7835RE (8C); SKU C/D: Intel® Atom® x7433RE (4C); SKU E/F: Intel® Atom® x7211RE (2C)
	CPU TDP	12W/9W/6W
	Chipset	SoC
	BIOS	AMI SPI Flash BIOS
Memory	Technology	DDR5 SODIMM, up to 4800Mhz
	Max. Capacity	Up to 16GB
	Socket	1x 260-Pin SODIMM
Ethernet	Controller	Intel® i210-IT/IS, GPY215;
	Speed	10/100/1000 Mbps; 10/100/1000/2500 Mbps
Storage	Interface	SKU A/C: 4x 2.5GbE RJ45 w/ 1x Pair Bypass; 2x 1G/100M RJ45; SKU B/D: 4x 2.5GbE RJ45 w/1x Pair Bypass; 1x 1G SFP; 1x 1G/100M SFP; SKU E: 4x 2.5GbE RJ45; 1x 1G/100M RJ45; SKU F: 4x 2.5GbE RJ45; 1x 1G/100M SFP;
	eMMC	Up to 256GB (Reserved by request for OEM)
	M.2	1x M.2 2280 B-Key for SATA Storage
I/O Interface	Serial Port	1x RJ45 Console Port
	Reset Button	1x Reset Button
	USB Port	1x USB 3.0 Type A Port; 2x USB 2.0 Type A Ports
	Display Port	2x DP Ports
	Antenna	4x Antenna for 5G Sub6; 2x Antenna for Wi-Fi 6/6E
Expansion Interface	M.2	1x M.2 3042/3050/3052 B-Key for LTE/5G Sub6; 1x M.2 2230 E-Key for Wi-Fi 6/6E (By SKU)
	SIM Card Slot	2x Nano-SIM (for LTE/5G Sub6)
Miscellaneous	Watchdog Timer	Yes
	Internal RTC w/ Li-Battery	Yes
	TPM	Onboard TPM 2.0
Cooling	Processor	Passive CPU Heatsink
	System	IP50 (Optional IP54 Cable Shroud)
Mechanical	Dimension (WxDxH)	67 x 193 x 200 mm
	Packaging Dimensions	195 x 324 x 450 mm
	Mounting	DIN-Rail (Default); Wall-mount/VESA mount (Optional)
Environmental	Operating Temperature	-40°C ~70°C
	Humidity (RH)	Operating: 5% ~ 90%, Non-condensing; Non-Operating: 5%~95%, Non-condensing
Power	Connector	1x 6-pin Terminal Block
	Input	Input Rated 12-48V; Design Specification at 9~54Vdc
Driver Support	Microsoft Windows	Windows 10 IoT
	Linux	Linux
Certification	EMC	CE/UKCA, FCC Class A, RoHS
	Safety	UL+CB 62368-1, C1D2 (SKU B ONLY)

Physical Overview

Front & Rear Panel



No. Description		
F1	Reset Button	1x Reset Button
F2	LED Indicators	System Power / Storage Activity LED Indicators
F3	Console Port	1x RJ45 Console Port
F4	USB Port	1x USB 3.0 Port
F5	LAN/SFP Port	SKU A/C: 4x 2.5GbE RJ45 w/ 1x Pair Bypass; 2x 1G/100M RJ45; SKU B/D: 4x 2.5GbE RJ45 w/1x Pair Bypass; 1x 1G SFP; 1x 1G/100M SFP; SKU E: 4x 2.5GbE RJ45; 1x 1G/100M RJ45; SKU F: 4x 2.5GbE RJ45; 1x 1G/100M SFP;
F6	Power Input	1x 6-pin Terminal Block for Dual DC Input 12~48V
F7	Antenna	1x Antenna Holes

No. Description		
R1	Display Port	2x Display Ports
R2	USB Port	2x USB 2.0 Ports

Top Panel



No.	Description	
T1	Antenna	2x Antenna Holes

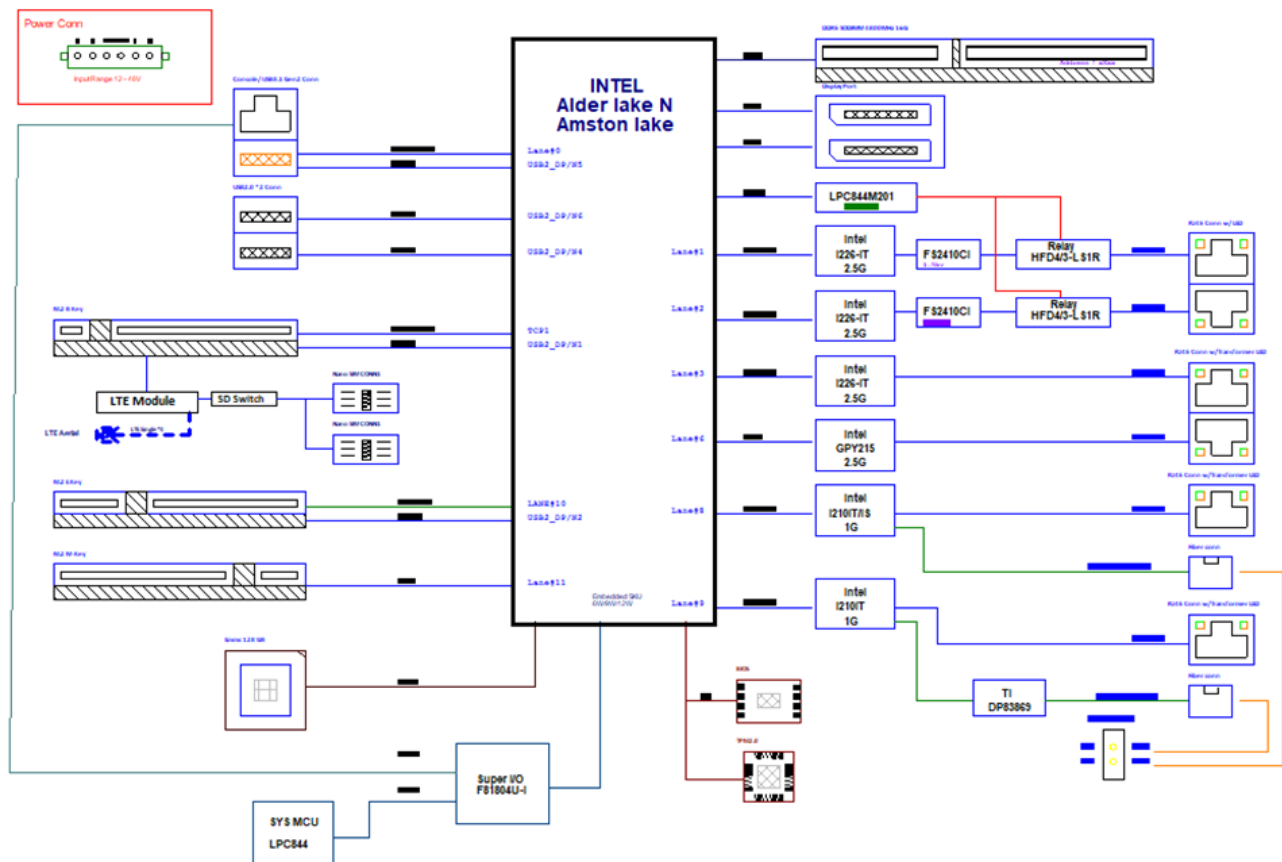
Bottom Panel



No.	Description	
B1	Antenna	3x Antenna Holes
B2	SIM Card Cover	2x Nano-SIM Card Slot Cover

Motherboard Information

Block Diagram



Internal Jumpers and Connector

The pin headers on the motherboard are often associated with important functions. With the shunt (Jumper) pushed down on the designated pins (the pin numbers are printed on the circuit board, surrounding the pin header), certain feature can be enabled or disabled. When changing the jumpers, make sure your system is completely powered off.

Internal Connectors

J1: RTC Reset

Default: 1-2 NC

3-4: Clear CMOS for SRTC

5-6: Clear CMOS for RTC

Pin	Signal	Pin	Signal
1	NC	2	NC
3	SOC_RTCRST#	4	GND
5	SOC_SRTCST#	6	GND

J3: LAN PHY 100 & 1G Mode

Default: NO Jumper (SW Control 2-3)

1-2: 100 Base

2-3: 1G Base

Pin	Signal
1	+PHY_VDDIO
2	JTAG_TDO
3	GND

J2: 5G Module Mode

Default: NO Jumper (SW Control 2-3)

1-2: EM9x9x module

2-3: Other module

Pin	Signal
1	+P3V3_5G
2	5G_Module SW
3	GND

Reset1

Default: 1-2

1-2: Hardware Reset

2-3: Software Reset

Pin	Signal
1	RST_CONN_SEL_HW
2	RST_CONN
3	SIO_SW_RST_CN

BTN1: Debug PWRBTN

Pin	Signal
1	PM_PWRBTN_N
2	GND

JTAG1: For Program SMCU (Debug/Burn-in code) ISP Programming Selection

1-2: Program Mode (Default)

2-3: ISP Mode

Pin	Signal
1	MCU_ISP_MODE_H
2	LPC844_MODE
3	GND

JTAG2: Program SMCU Connector

Pin	Signal
1	+P3V3_MCU
2	MCU_UART_RX_ISP
3	GND
4	MCU_UART_TX_ISP

CON1: For SMCU FW Debug

Pin	Signal
1	+P3V3_ISMCU
2	IGN_SWDCLK
3	IGN_SWDIO
4	GND

SW4 (1-2 ON): SMCU Program & Normal Status

SW4 1-2 ON: Normal Status

SW4 2-3 ON: Program Status (Default)

Pin	Signal	Pin	Signal
1	IMCU_RX	8	UART6_TXD
2	IMCU_TX	7	UART6_RXD
3	IMCU_RX	6	MCU_UART_RX_ISP
4	IMCU_TX	5	MCU_UART_TX_ISP

JTAG3: For Program Bypass MCU (Debug / Burn-in code) ISP Programming Selection

1-2: Program Mode (Default)

2-3: ISP Mode

Pin	Signal
1	MCU_ISP_MODE_PU
2	MCU_PROG
3	GND

JTAG4: Program Bypass MCU Connector

Pin	Signal
1	+P3V3_MCU
2	MCU_UART_RX
3	GND
4	MCU_UART_TX

CON2: For SMCU FW Debug

Pin	Signal
1	+P3V3_MCU
2	MCU_CLK
3	MCU_DIO
4	GND

JSPI1

Pin	Signal	Pin	Signal
1	SPI0_IO3_HOLD#	2	NC
3	SPI0_CS0_R#	4	VFLASH_SPI
5	SPI0_IO1_MISO_R	6	NC
7	NC	8	SPI0_CLK_R
9	GND	10	SPI0_IO0_MOSI_R

J80PORT1

Pin	Signal	Pin	Signal
1	LPC_CLKOUT0	2	LPC_LAD1
3	80PORT_RST#	4	LPC_LAD0
5	LPC_FRAME#	6	+P3V3
7	LPC_LAD3	8	NA
9	LPC_LAD2	10	GND

PWR1 (24-110V)

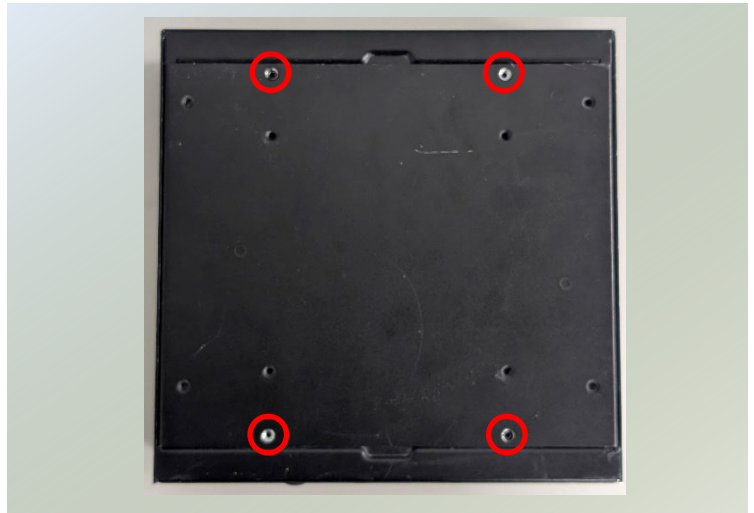
Pin	Signal
1	DC_GND
2	+PDC_PWR1
3	ALARM1
4	ALARM2
5	+PDC_PWR2
6	DC_GND

CHAPTER 2: HARDWARE INSTALLATION

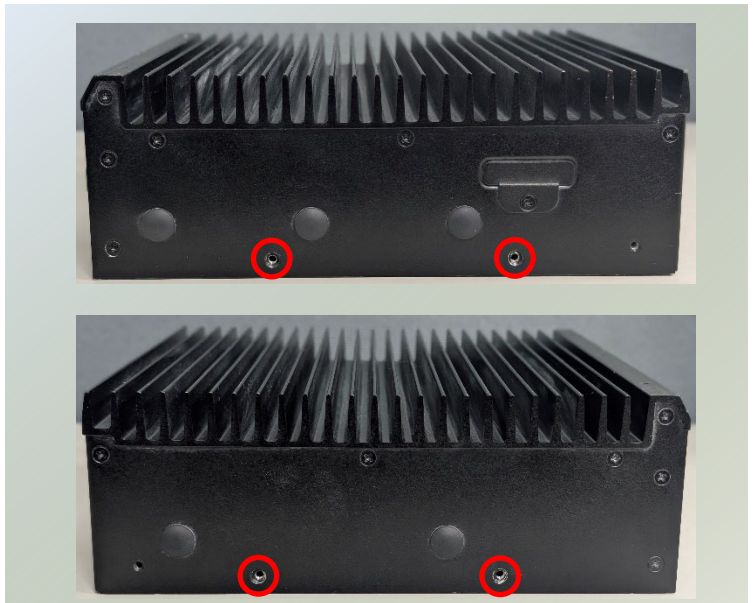
To reduce the risk of personal injury, electric shock, or damage to the system, please remove all power connections to shut down the device completely. Also, please wear ESD protection gloves when conducting the steps in this chapter.

Opening the Bottom Chassis

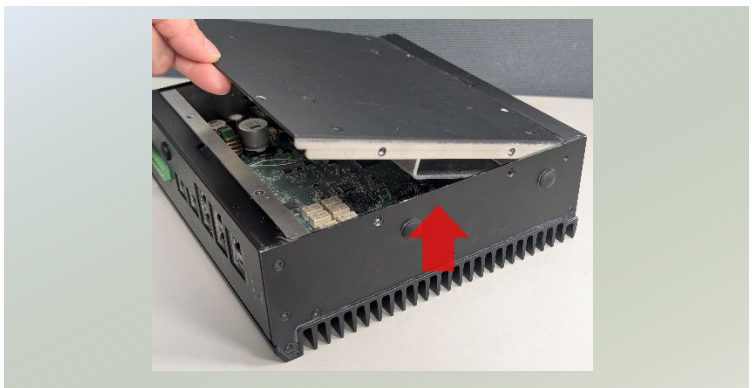
1. Power off the system and unplug the power cord. Turn the system upside down.
2. Unscrew the four (4) screws on the system's bottom panel and remove the metal cover.



4. Unscrew the two (2) screws (each) on the system's right and left side.



4. Lift the bottom cover chassis to remove.



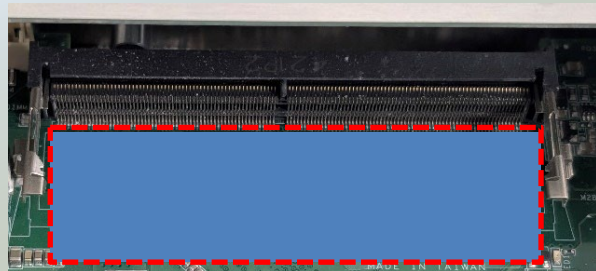
Installing the System Memory

The system supports one system memory slot, please follow the steps for installation.

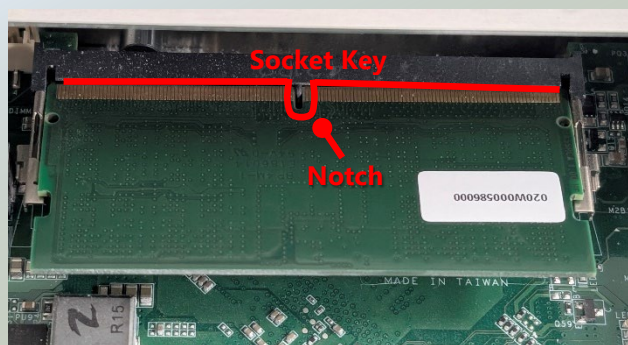
1. Power off the system, and open the bottom chassis cover. Locate the DIMM Socket on the motherboard.



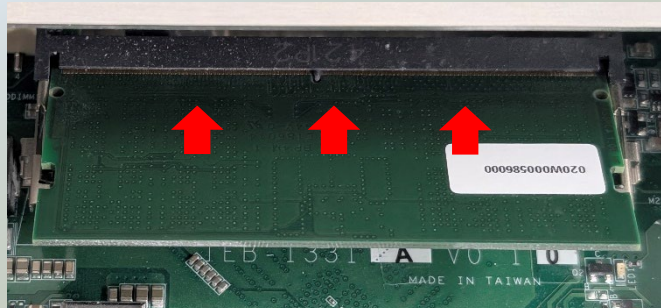
2. Next, thermal pad placement. Position the thermal pad (included in the accessory pack) gently on the motherboard.



3. Pick up the DIMM module and turn it around. Align the notches of the DIMM module with the socket key in the pin slot.

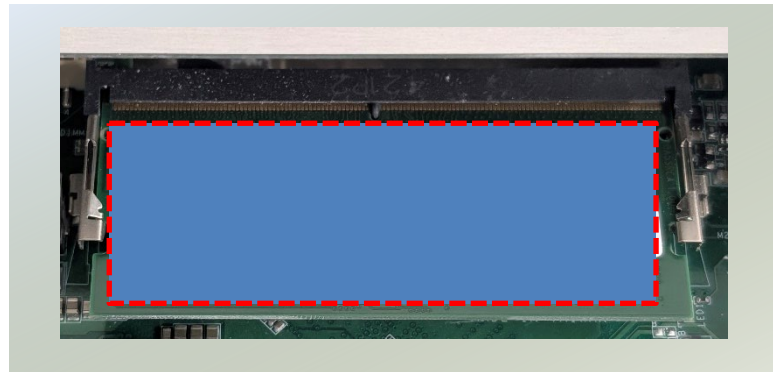


4. Insert the module into the slot at a diagonal angle and gently press down until it is firmly seated by the clips on both sides.





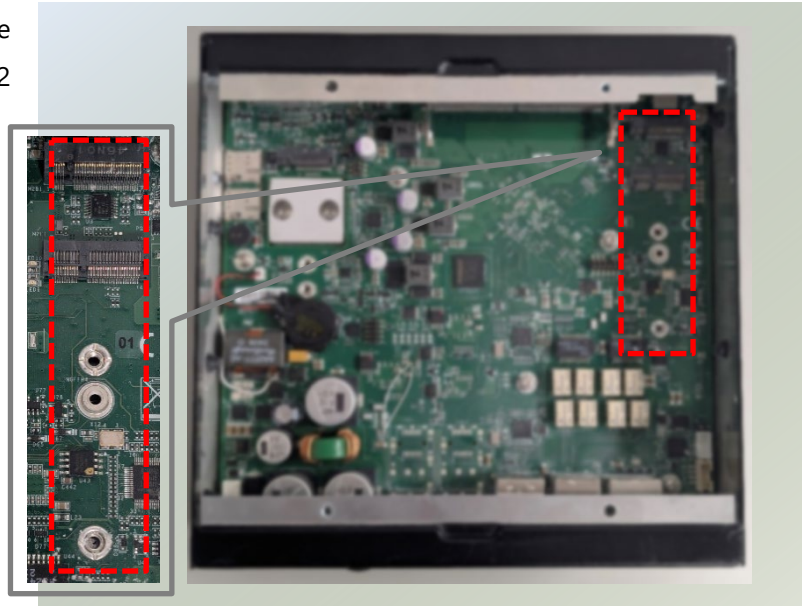
5. Lastly, thermal pad placement.
Position a second thermal pad gently
on the top side of the memory
module.



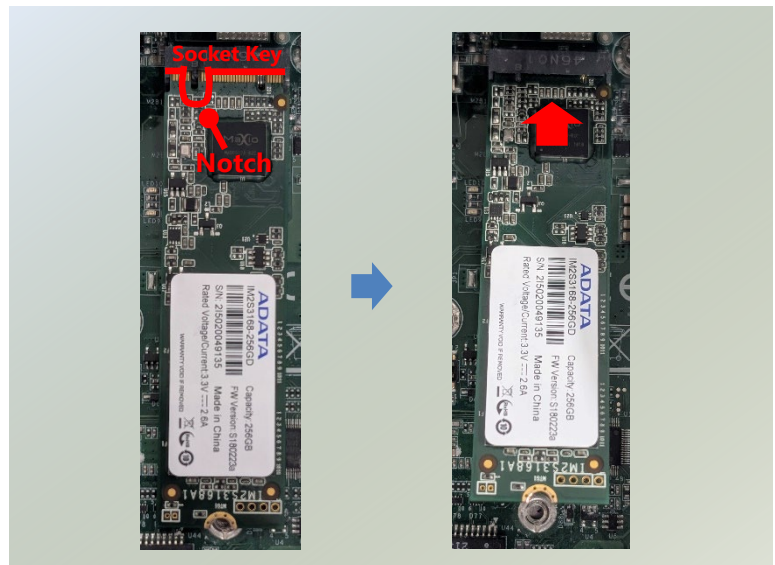
Installing the SATA Storage (Optional)

The system supports one M.2 2280 B-Key for SATA SSD expansion slot. Follow the procedures below for installing a SATA storage module card.

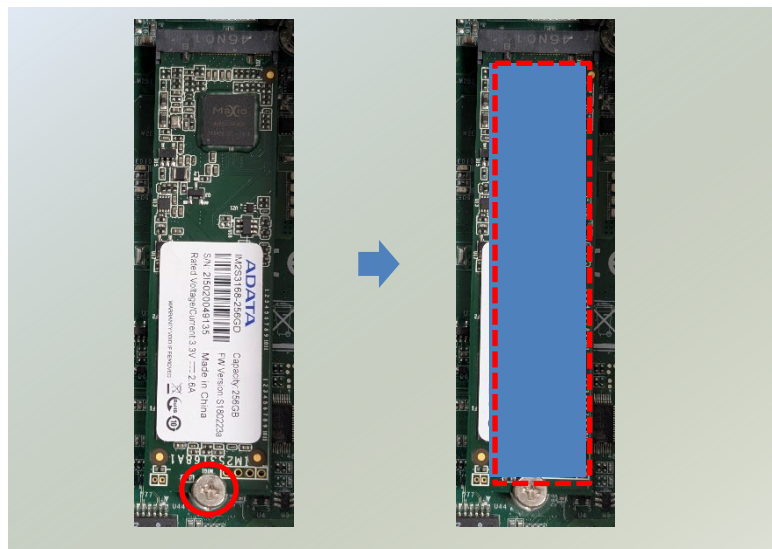
1. Power off the system, and open the bottom chassis cover. Locate the M.2 slot on the motherboard.



2. Align the notch of the storage card with the socket key in the pin slot.
3. Insert the storage card pins at 30 degrees into the socket until it is fully seated.



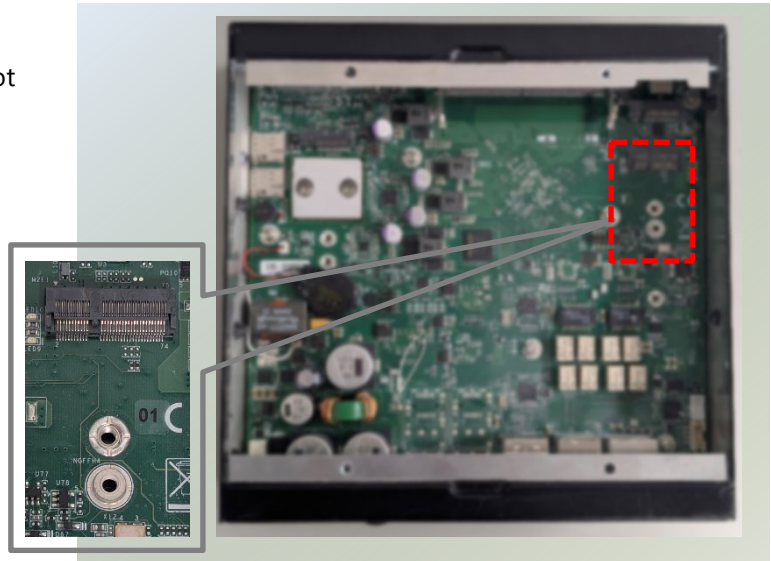
4. Push down on the storage card and secure it with one (1) screw.
5. Lastly, thermal pad placement.
Position the thermal pad (included in the accessory pack) gently on top side of the storage module.



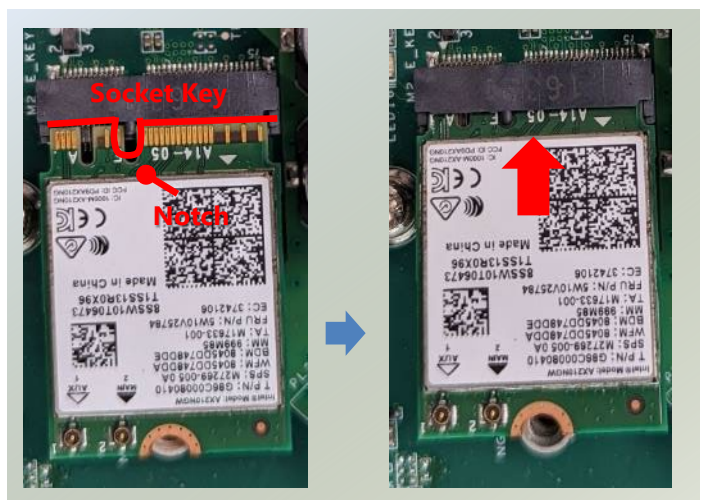
Installing the Wi-Fi Module (Optional)

The motherboard provides one M.2 E-Key slot for a Wi-Fi module card. Wi-Fi module requires two antennas. Please follow the procedures for installation.

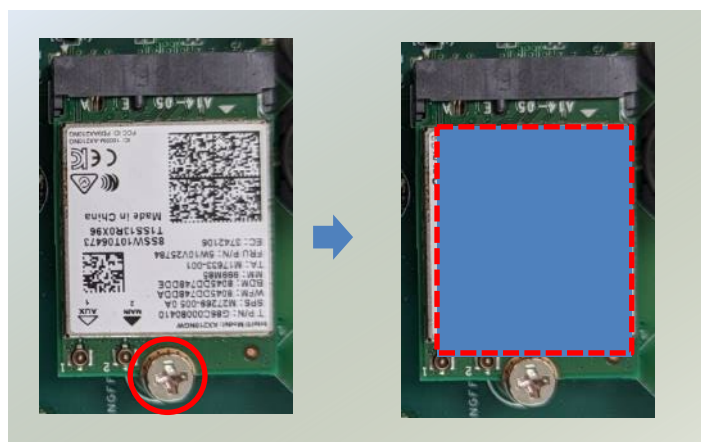
1. Power off the system and remove the bottom chassis cover. Locate the M.2 slot on the motherboard.



2. Align the notch of the module card with the socket key in the pin slot.
3. Insert the module card at 30 degrees into the socket until it is fully seated.



4. Push down on the module card and secure it with a screw.
5. Lastly, thermal pad placement. Position two thermal pads (included in the accessory pack) gently on the top side of the Wi-Fi module.



Installing Wi-Fi Antenna

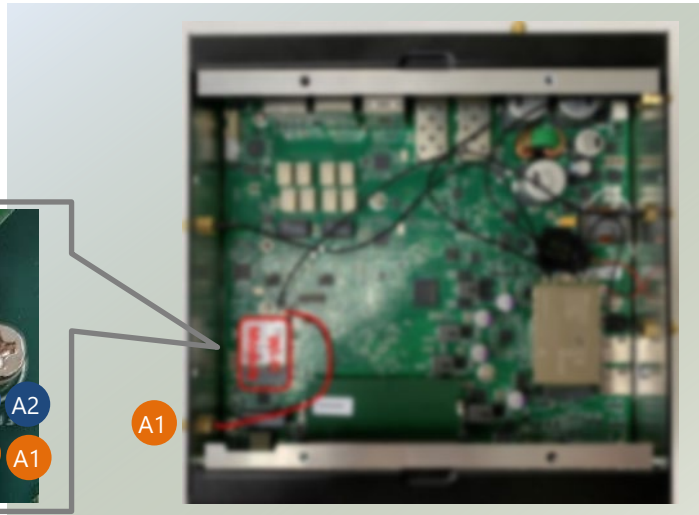
Bottom Side



Top Side



1. Locate the two (2) antenna hole placements (A1, A2) on the system panel and the two (2) IPEX connectors on the Wi-Fi module card.



2. Connect the RF cables to the IPEX connectors on the Wi-Fi module card and secure the other ends of the cables to the antenna hole placements.



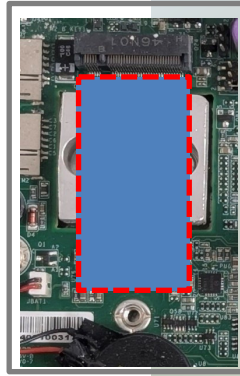
3. Replace the chassis cover and secure it with screws. Then, attach the two antennas to the system panel.



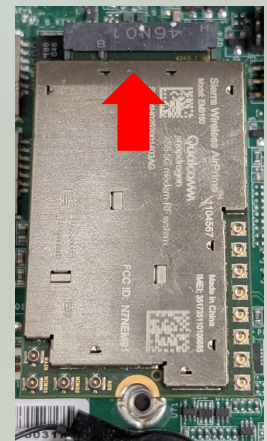
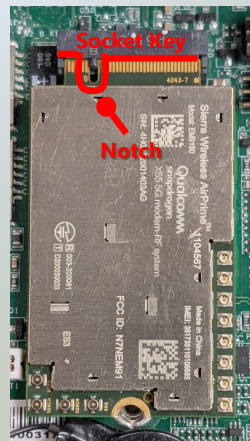
Installing the LTE/5G Module (Optional)

The system supports one M.2 B-Key for LTE/5G module card expansion. LTE module requires two antennas. 5G module requires four antennas. Please follow the procedures for installation.

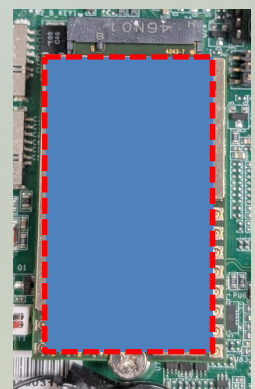
1. Power off the system and remove the bottom chassis cover. Locate the M.2 slot on the motherboard.
2. Next, thermal pad placement. Position a thermal pad (included in the accessory pack) gently on the motherboard.



2. Align the notch of the module card with the socket key in the pin slot.
3. Insert the module card at 30 degrees into the socket until it is fully seated.



4. Push down on the module card and secure it with a screw.
5. Lastly, thermal pad placement. Position a second thermal pad (included in the accessory pack) gently on the top side of the LTE/5G module.



Installing LTE Antenna

Bottom Side



1. Locate the two (2) antenna hole placements (A1, A2) on the system panel and the two (2) IPEX connectors on the LTE module card.



2. Connect the RF cables to the IPEX connectors on the LTE module card and secure the other ends of the cables to the antenna hole placements.



3. Replace the chassis cover and secure it with screws. Then, attach the two antennas to the system bottom side.



Installing 5G Antenna

Front Panel



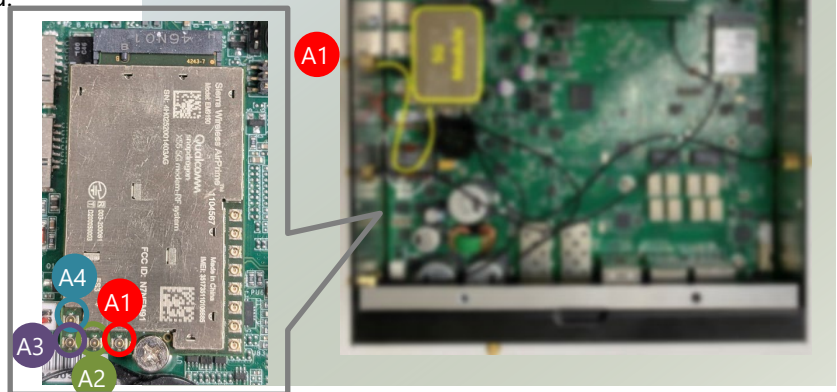
Bottom



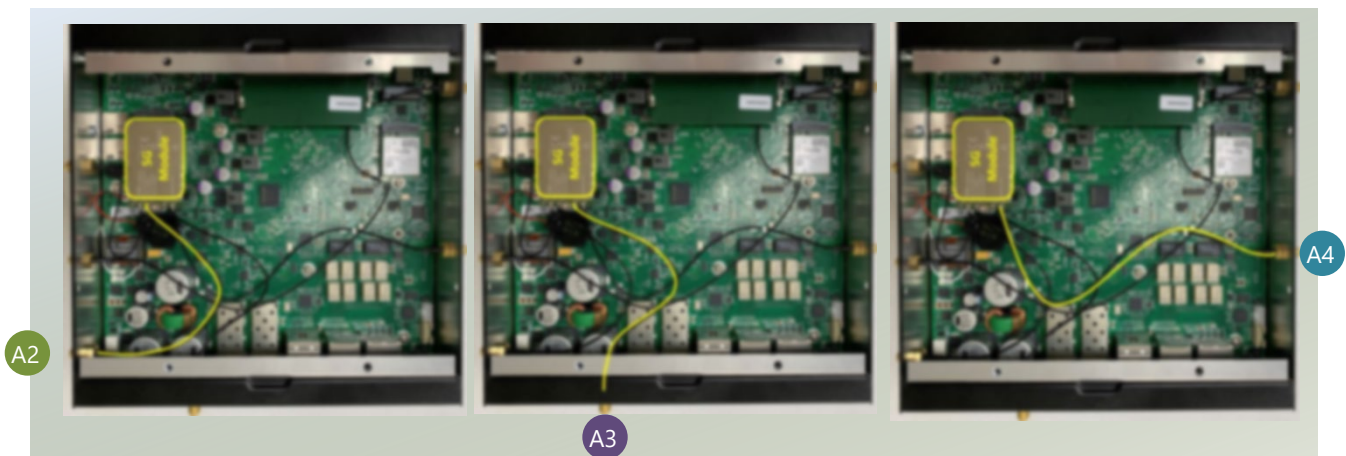
Top Side



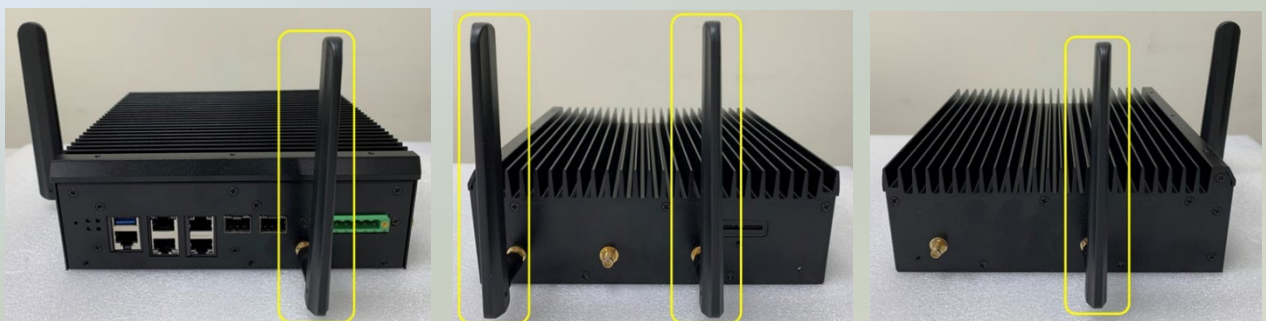
1. Locate the four (4) antenna hole placement (A1, A2, A3, A4). Locate the four (4) IPEX connectors on the 5G module card.



2. Connect the RF cables to the IPEX connectors on the 5G module card and screw the other end of the cables in the antenna holes.



3. Replace the chassis cover and secure it with screws. Then, attach the four antennas to the system front, top, and bottom side panels.



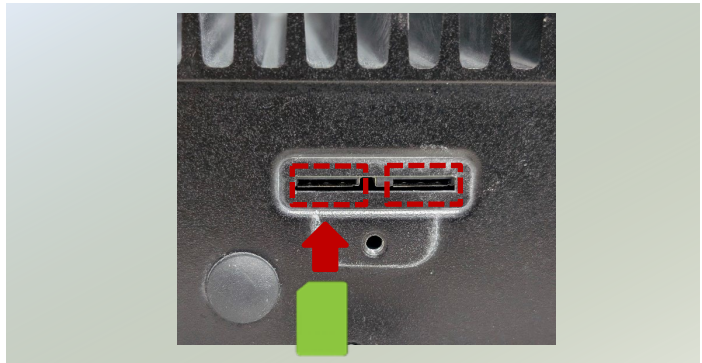
Installing the SIM Cards (Optional)

The system supports dual-Nano SIM card expansion for enhanced connectivity options. The SIM card socket features a push-push mechanism, enabling easy insertion and ejection of SIM cards with a simple push.

1. The SIM card slot is located on the bottom side of the system. Locate the SIM card cover, and remove the screw.



2. Insert and push the Nano-SIM card all the way in until it clicks into place. The gold contacts should be facing downwards. Repeat steps if another SIM card will be placed.

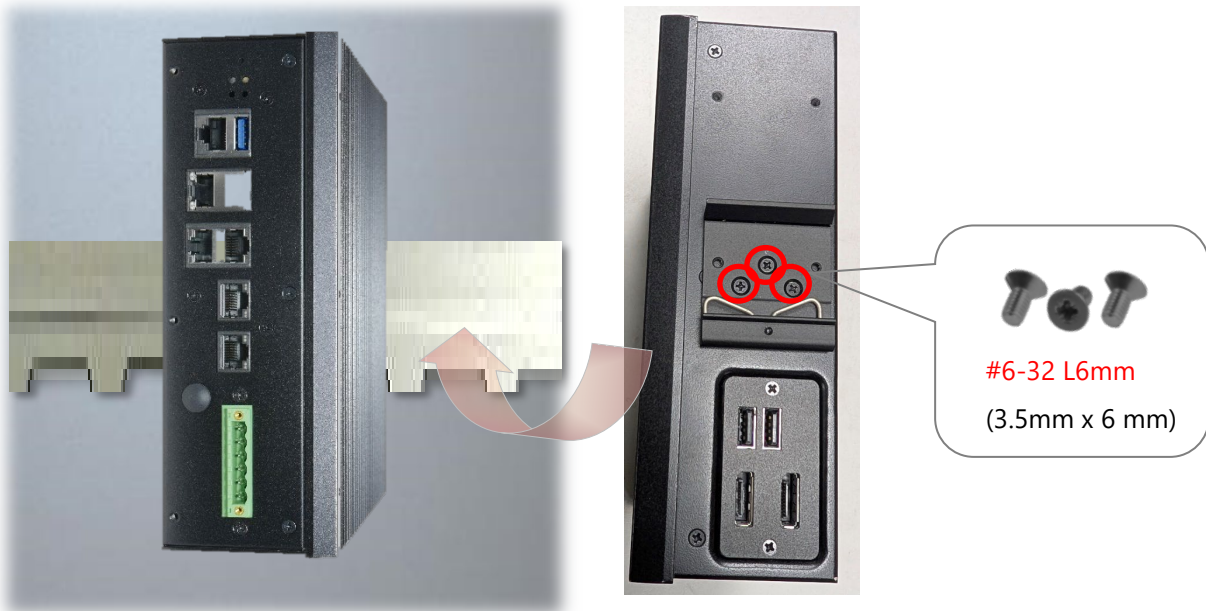


3. To remove the SIM card, push it again to eject, then pull it out carefully. Then replace the SIM card cover and secure with a screw.

DIN Rail Mounting (Optional)

The system can be mounted to a DIN Rail with an optional DIN Rail Kit.

1. Attach the DIN rail bracket to the rear panel of the system using three (3) screws.
2. Align the bracket's hook with the DIN Rail and gently hang the system onto the rail.



 **Note:** After the unit is mounted, make sure to check that the installation provides strong and appropriate support and that each part is assembled correctly.

Wall Mounting (Optional)

The system can be mounted on a flat surfaced wall. Please take the following into consideration when mounting the system onto the wall.

1. Check the kit contents for the following items:

- ▶ 1x pair of Wall Brackets



2. Unscrew four (4) screws on the right and left side of the system. Attach the wall mount brackets onto the system with the two (2) screws on each side.



3. On the wall, measure the exact place where you want to hang the system, and drill four holes that match the four mounting holes on the brackets.

NOTE: the demonstrated screw type can fit in general drywall or shelves. Please identify the wall type and select a suitable fixing approach to fix this system to the wall and consult qualified trained person if you are uncertain.

4. Insert the expansion anchor bolts into the holes, and then insert the long screws into the wall screws.

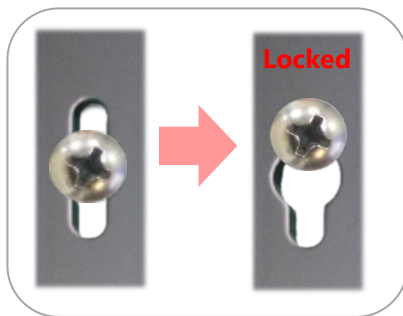


M4 x 2mm



M3 x 19.5mm

5. Align the system's wall bracket holes, and engage the four screws in the bracket holes and push the system downwards to lock the screws into position.



CHAPTER 3: SOFTWARE SETUP

BIOS Setup

BIOS (Basic Input / Output System) is the program that controls the computer boot process. The purpose of the BIOS is to identify and initialize processor, memory, hard drives, optical drives, and other hardware. The system has AMI BIOS built-in, with a setup utility that allows users to configure required settings or to activate certain system features.

To enter the BIOS setup utility, follow the steps below:

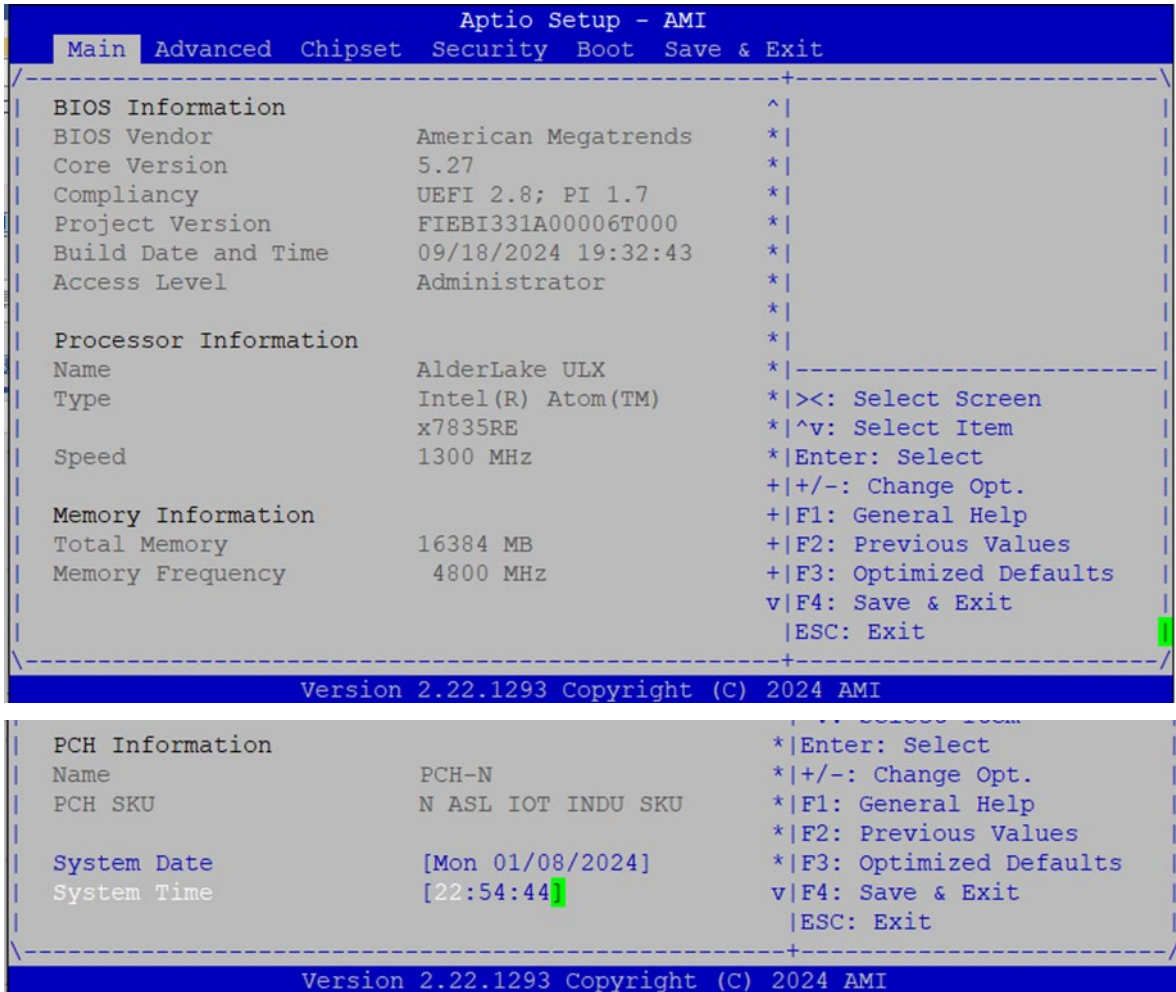
1. Boot up the system.
2. Pressing the **<Tab>** or **** key immediately allows you to enter the Setup utility, then you will be directed to the BIOS main screen. The instructions for BIOS navigations are as below:

Control Keys	Description
→←	select a setup screen
↑↓	select an item/option on a setup screen
<Enter>	select an item/option or enter a sub-menu
+/-	adjust values for the selected setup item/option
F1	display General Help screen
F2	retrieve previous values, such as the last configured parameters during the last time you entered BIOS
F3	load optimized default values
F4	save configurations and exit BIOS
<Esc>	exit the current screen

NOTE: The screenshots presented in this section are for reference only.

Main Page

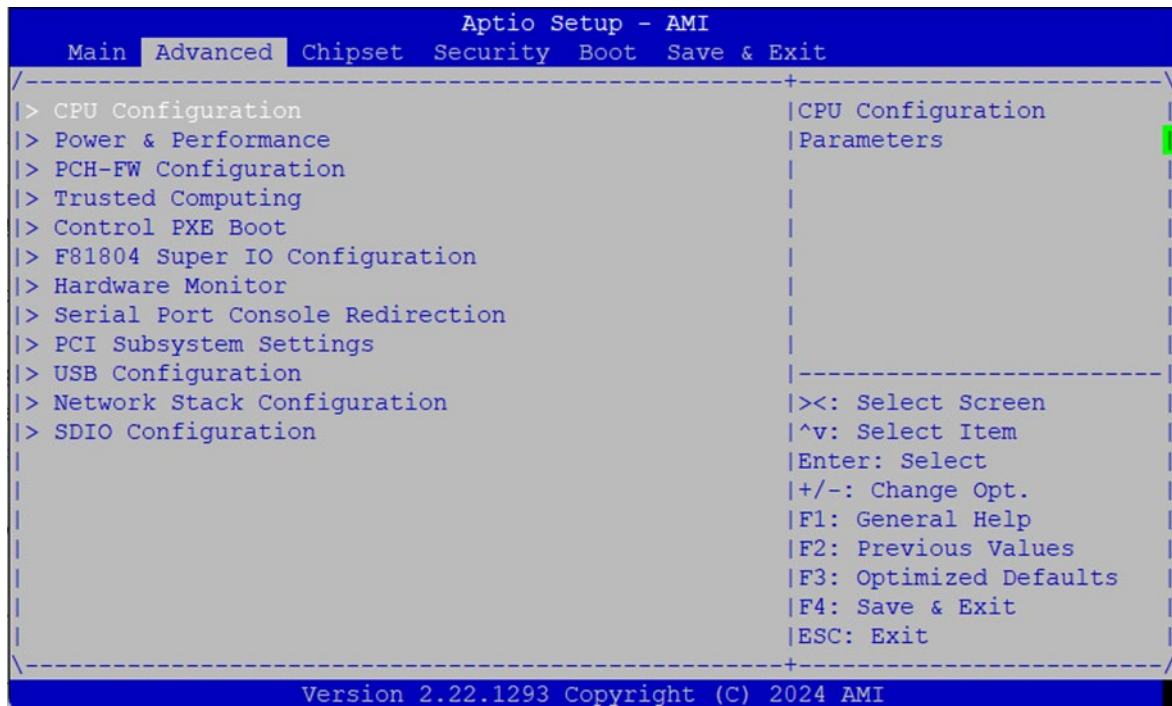
Setup main page contains BIOS information and project version information.



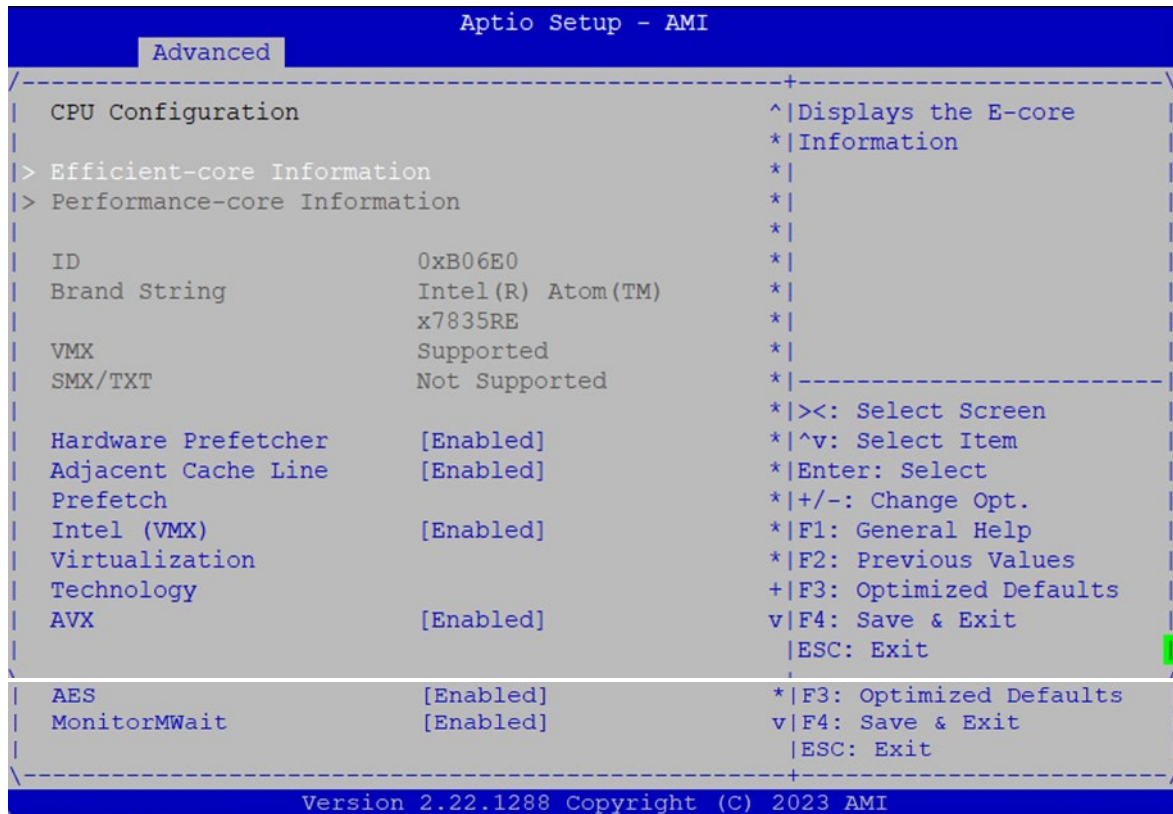
Feature	Description
BIOS Information	BIOS Vendor: American Megatrends Core Version: AMI Kernel version, CRB code base, X64 Compliance: UEFI version, PI version Project Version: BIOS release version Build Date and Time: MM/DD/YYYY Access Level: Administrator / User
Processor Information	Information of platform processor
Memory Information	Information of memory
System Date	To set the Date, use <Tab> to switch between Date elements. Default Range of Year: 1998-9999 Default Range of Month: 1-12 Days: dependent on Month.
System Time	To set the Date, use <Tab> to switch between Date elements.

Advanced Page

Select the **Advanced** menu item from the BIOS setup screen to enter the “Advanced” setup screen. Users can select any of the items in the left frame of the screen.

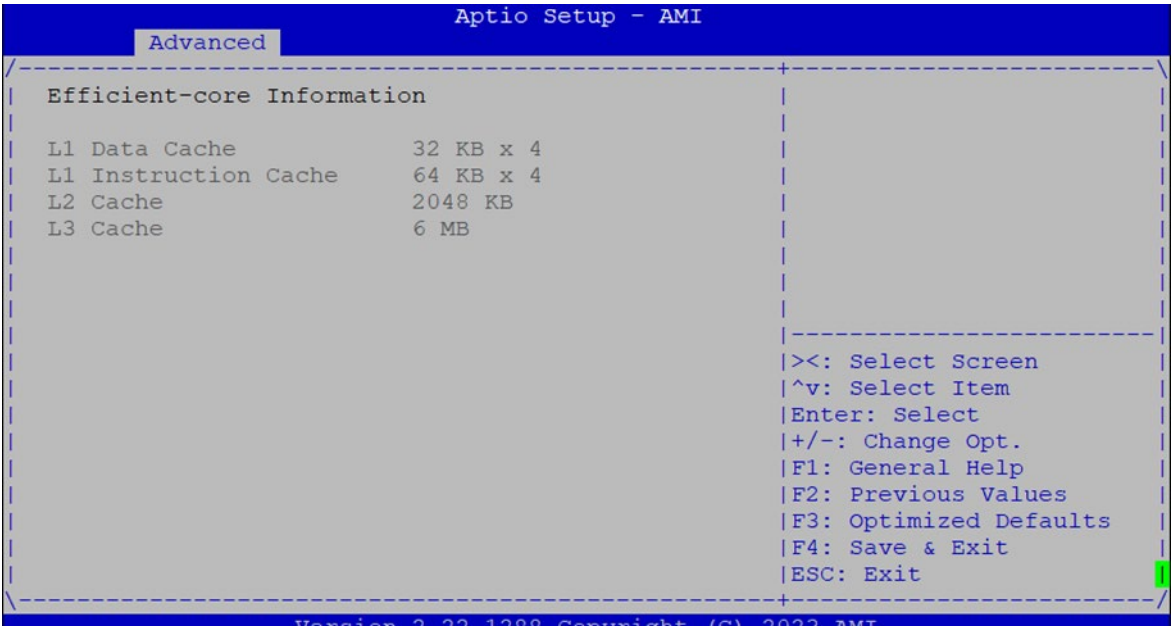


CPU Configuration



Feature	Options	Description
Hardware Prefetcher	Disabled Enabled	To turn on/off the MLC streamer prefetcher.
Adjacent Cache Line Prefetch	Disabled Enabled	To turn on/off prefetching of adjacent cache lines.
Intel (VMX) Virtualization Technology	Disabled Enabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
AES	Disabled Enabled	Enable/Disable AES (Advanced Encryption Standard)
MonitorMWait	Disabled Enabled	Enable/Disable MonitorMWait, if Disable MonitorMwait, the AP threads Idle Manner should not set in MWAIT Loop

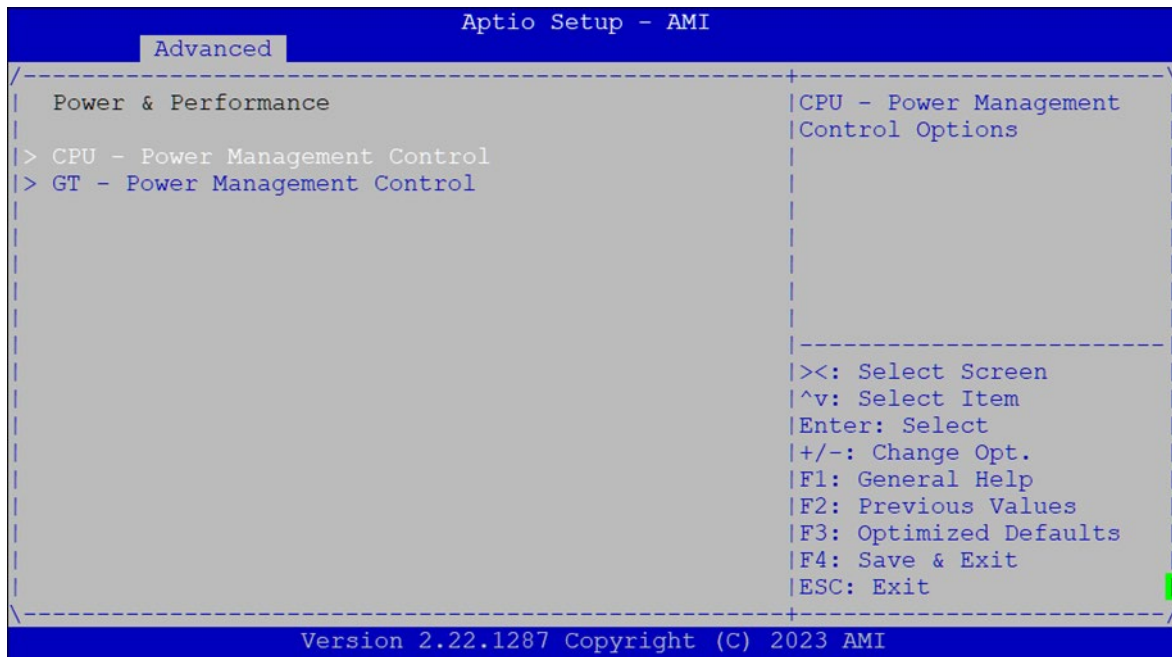
Efficient-Core Information



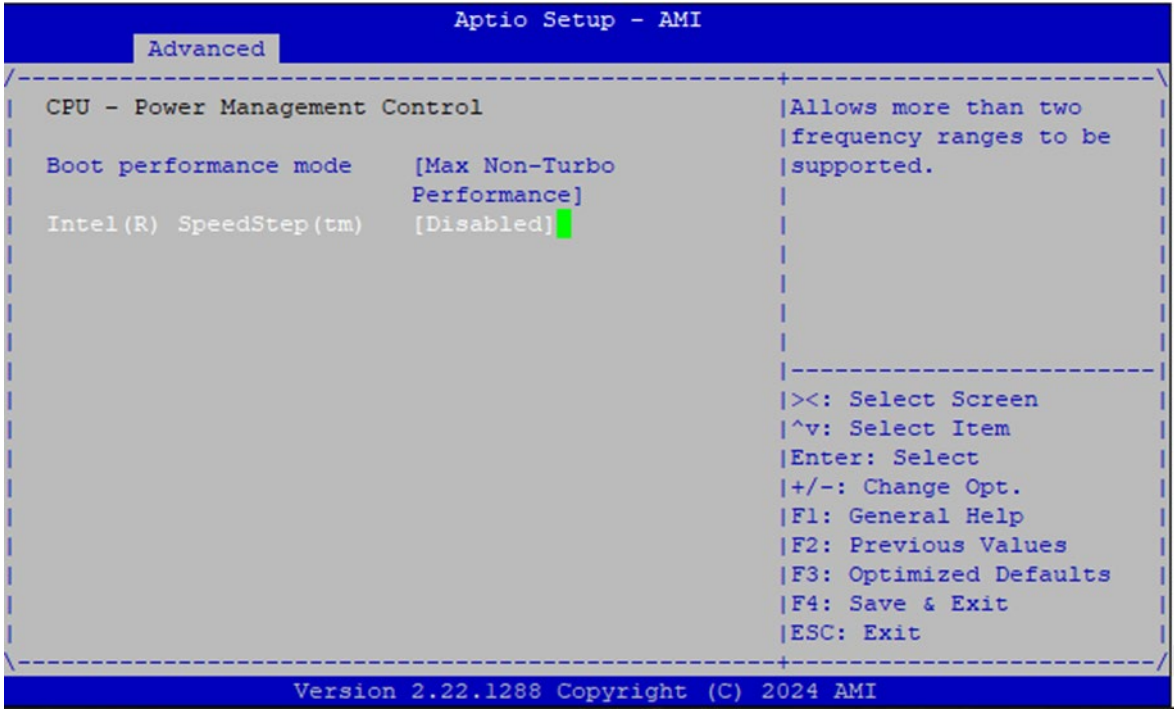
Performance-Core Information

N/A

Power & Performance

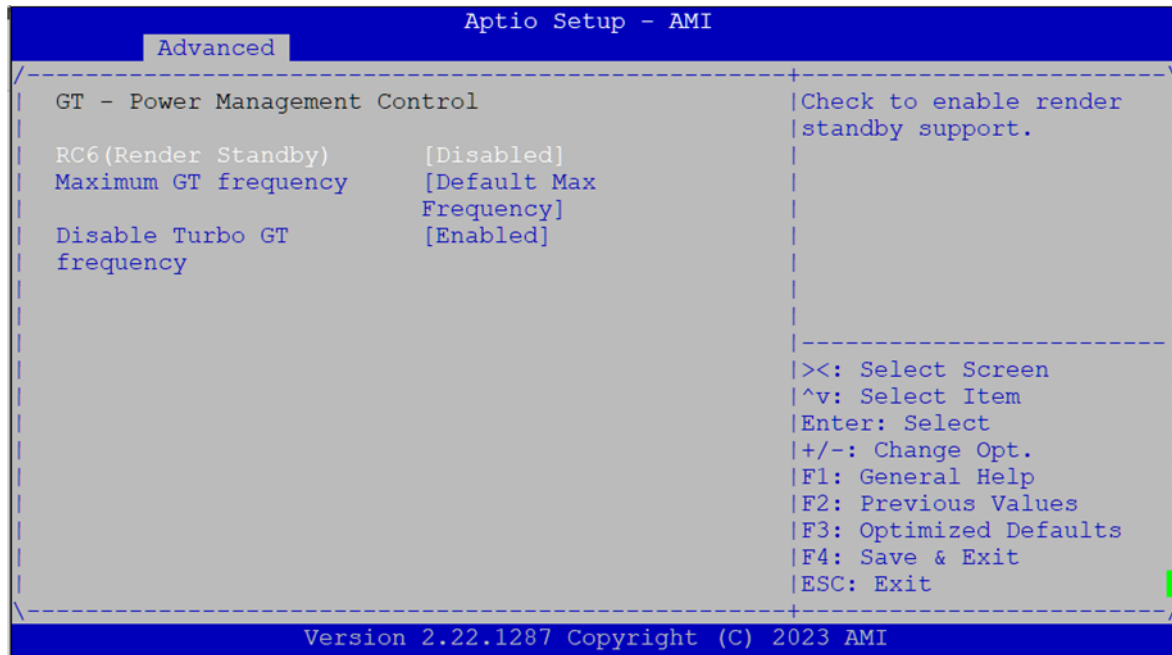


CPU – Power Management Control



Feature	Options	Description
Boot performance mode	Max Battery Max Non-Turbo Performance Turbo Performance	Select the performance state that the BIOS will set starting from reset vector.
Intel (R) SpeedStep (tm)	Disabled Enabled	Allows more than two frequency ranges to be supported.

GT – Power Management Control



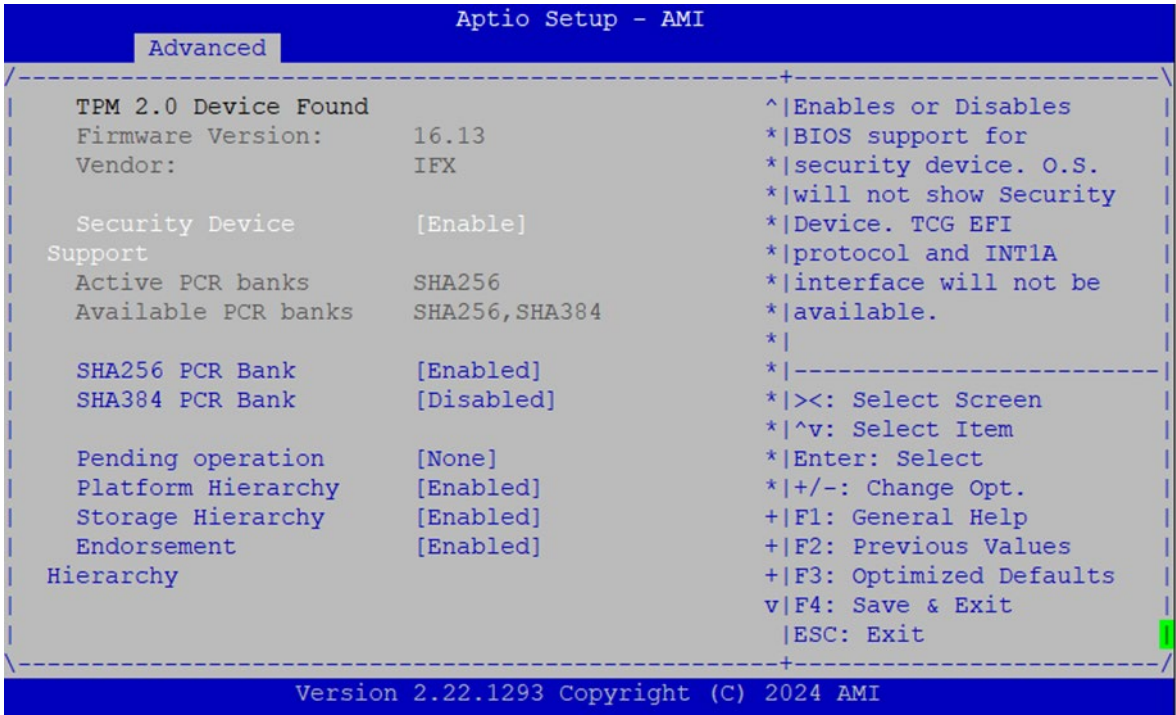
Feature	Options	Description
RC6 (Render Standby)	Disabled Enabled	Check to enable render standby support.
Maximum GT frequency	Default Max Frequency	Maximum GT frequency limited by the user. Choose between 300MHz (RPN) and 1550MHz (RP0). Value beyond the range will be clipped to min/max supported by SKU
Disable Turbo GT frequency	Enabled Disabled	Enabled: Disables Turbo GT frequency. Disabled: GT frequency is not limited

Firmware Update Configuration

Aptio Setup - AMI		
Advanced		
Me FW Image Re-Flash	[Disabled]	Enable/Disable Me FW Image Re-Flash function.
		><: Select Screen ^v: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.22.1287 Copyright (C) 2023 AMI		

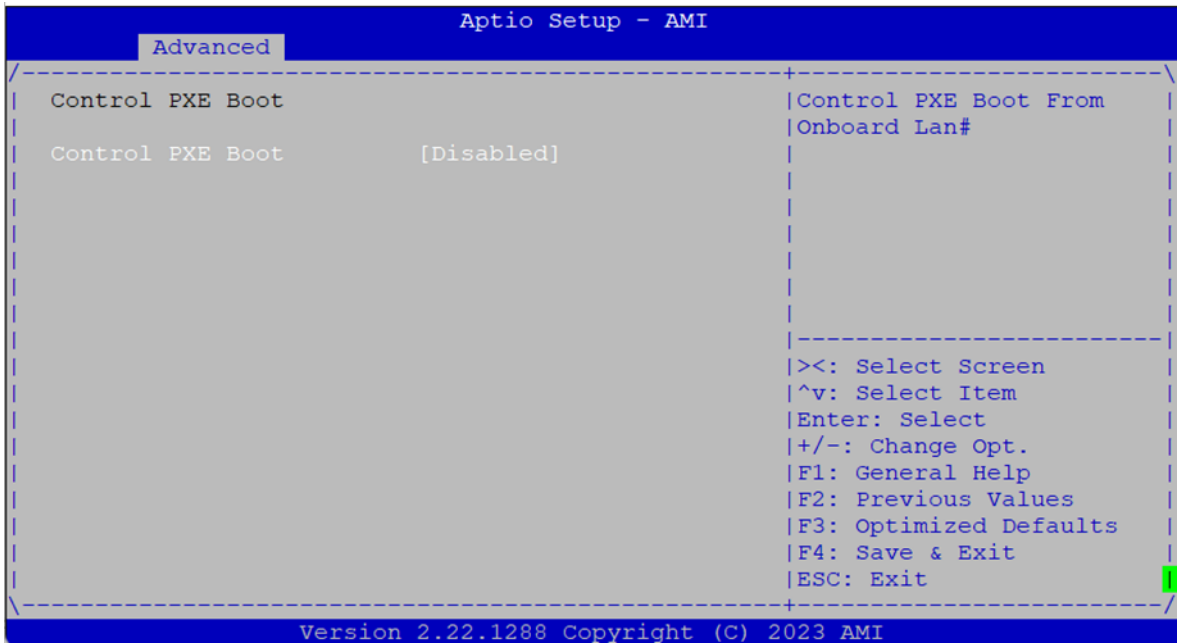
Feature	Options	Description
Me Fw Image Re-Flash	Disabled Enabled	Enable/Disable Me FW Image Re-Flash function.

Trusted Computing



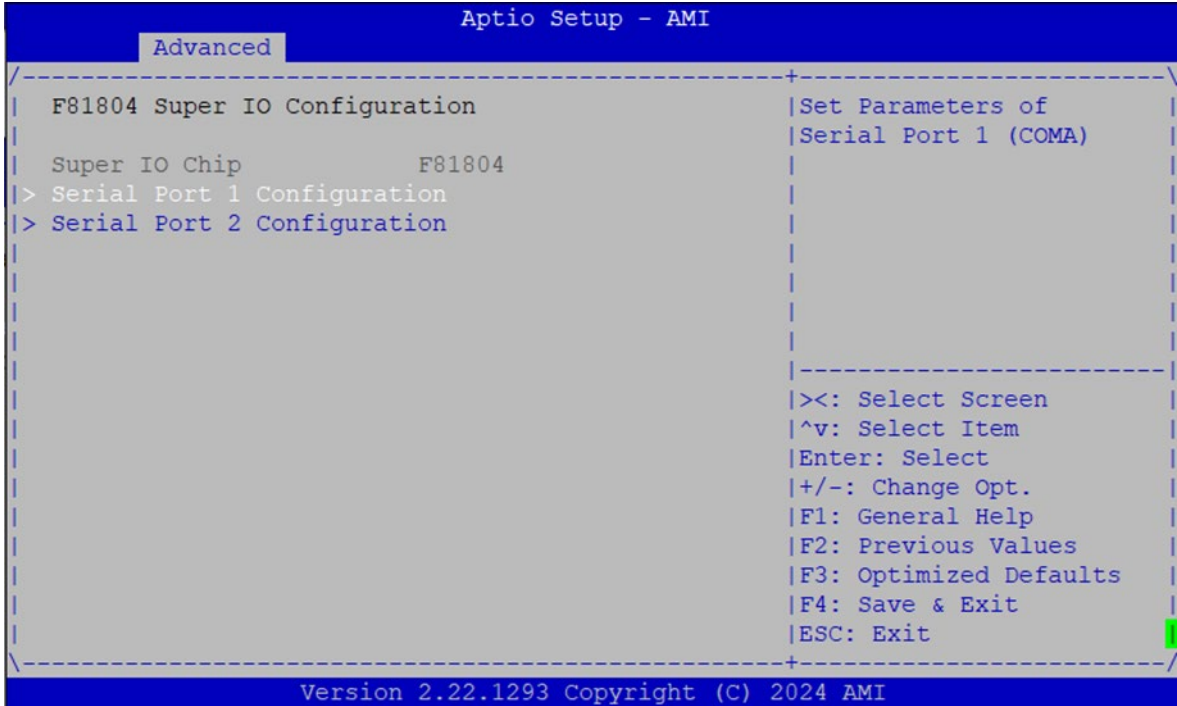
Feature	Options	Description
Security Device Support	Disable Enable	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

Control PXE Boot

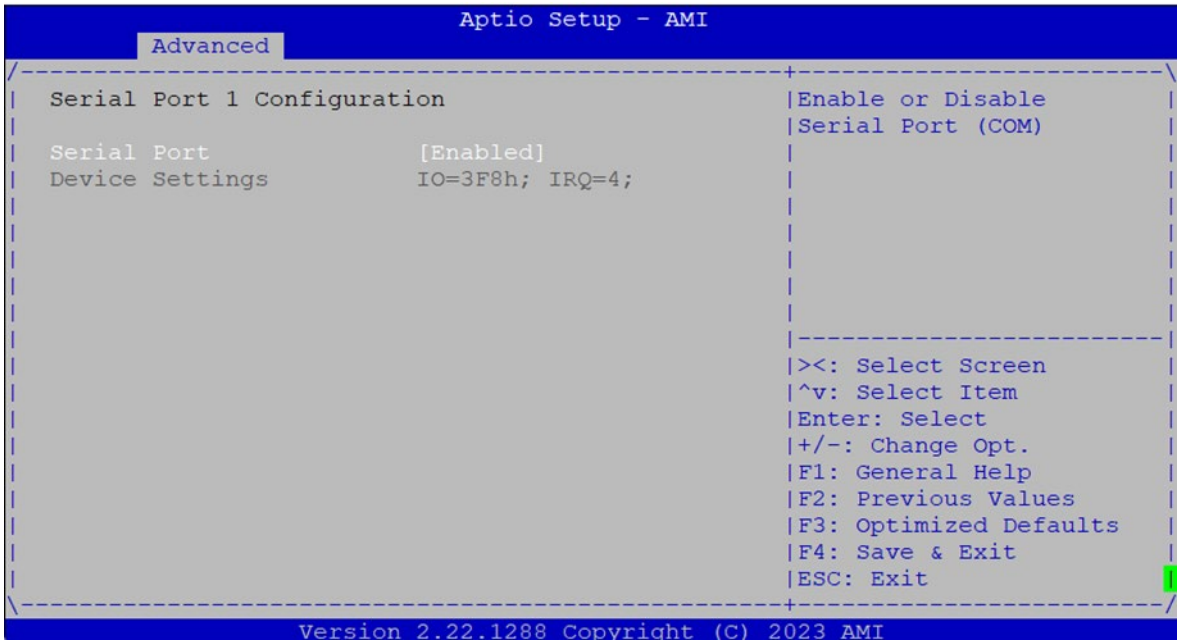


Feature	Options	Description
Control PXE Boot	Disabled LAN1 LAN2 LAN3	Control PXE Boot from I226 Lan#

F81804 Super IO Configuration

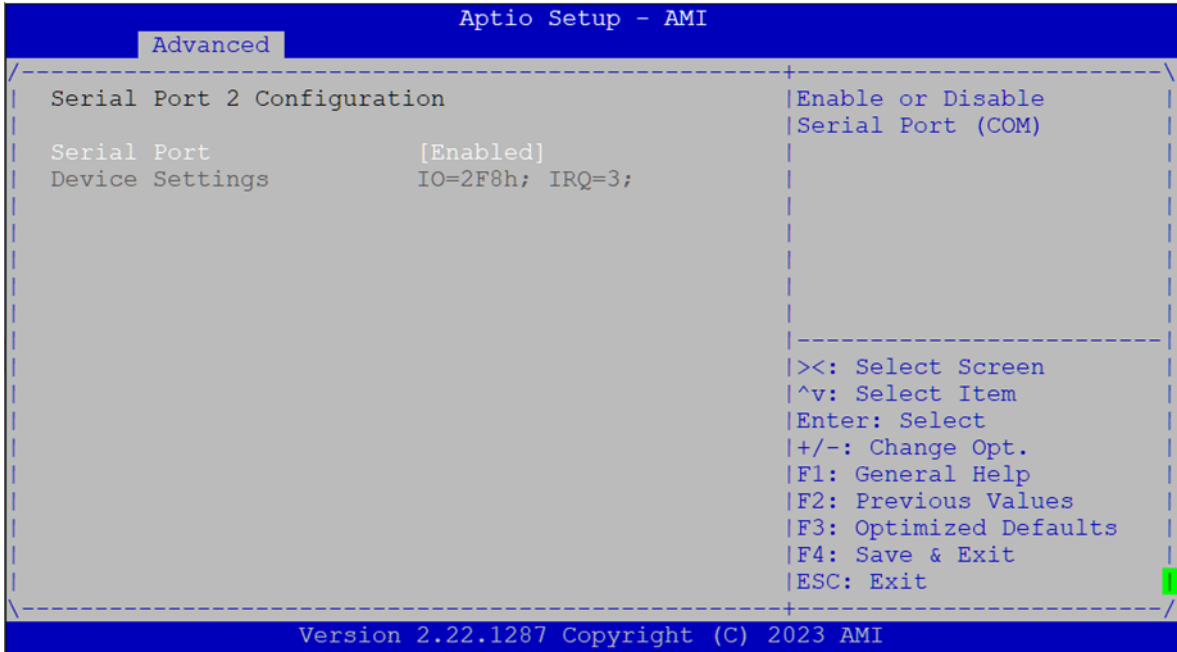


Serial Port 1 Configuration



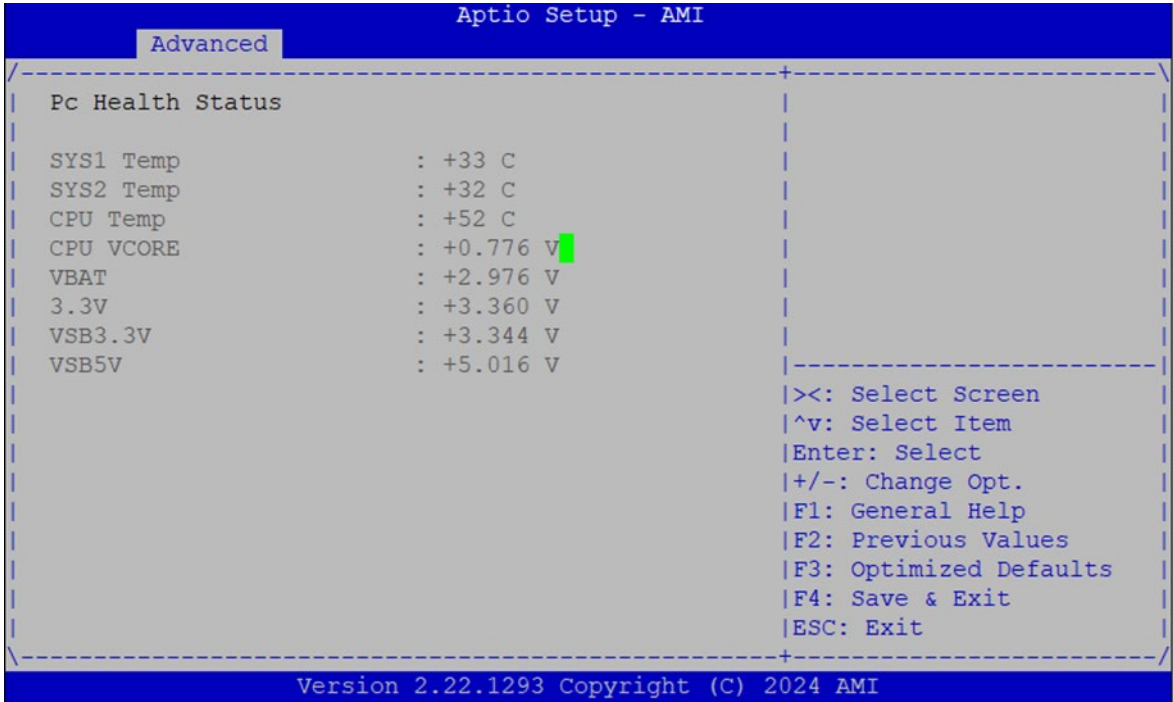
Feature	Options	Description
Serial Port	Disabled Enabled	Enable or Disable Serial Port (COM)
Device Settings	N/A	IO=3F8h; IRQ=4;

Serial Port 2 Configuration



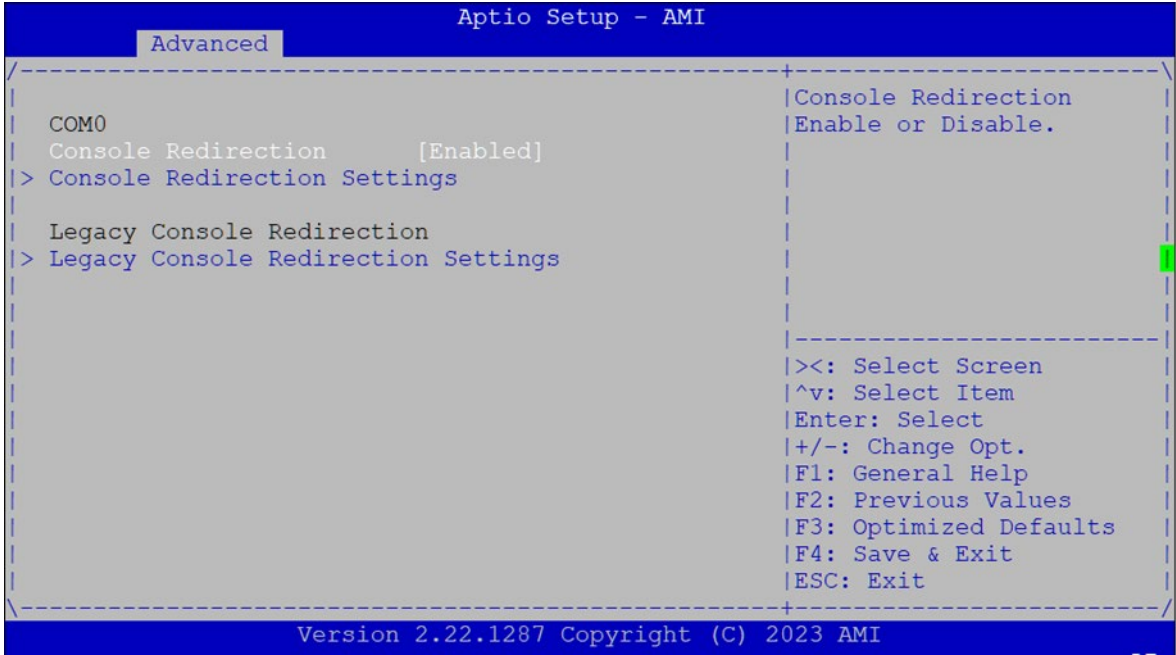
Feature	Options	Description
Serial Port	Disabled Enabled	Enable or Disable Serial Port (COM)
Device Settings	N/A	IO=2F8h; IRQ=3;

Hardware Monitor



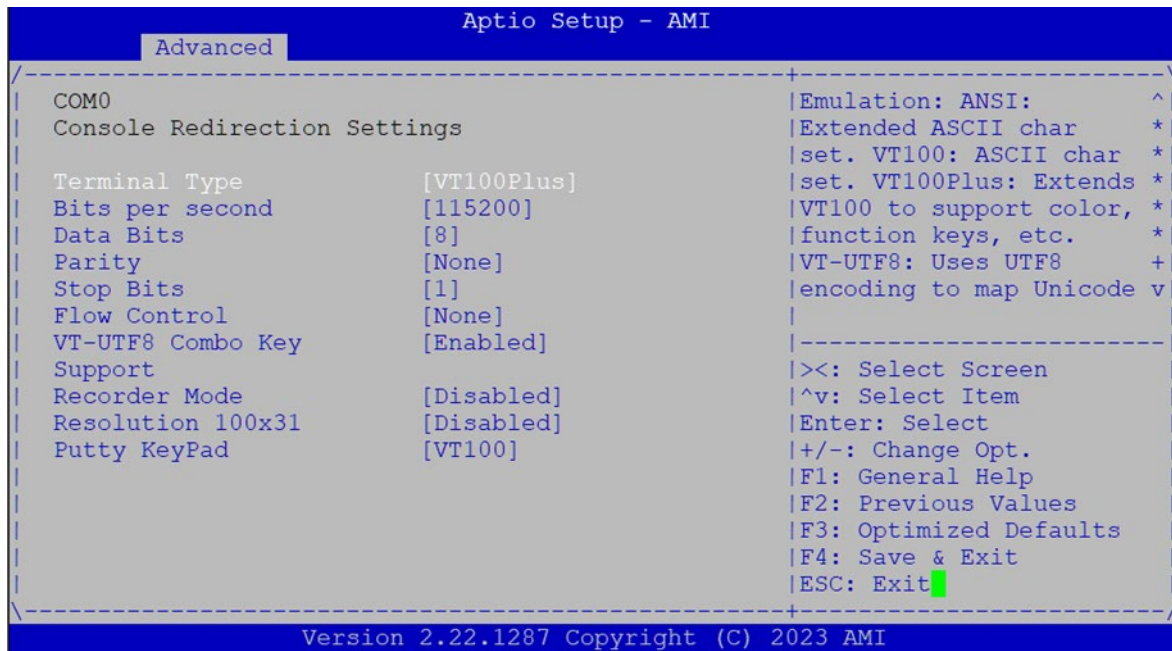
Feature	Description
SYS1 Temp	This value reports the System temperature
SYS2 Temp	This value reports the System temperature (Close to CPU)
CPU Temp	This value reports the CPU temperature
CPU VCORE	This value reports the CPU VCORE Input voltage
VBAT	This value reports the VBAT Input voltage
3.3V	This value reports the 3.3V Input voltage
VSB3.3V	This value reports the VSB3.3V Input voltage
VSB5V	This value reports the VSB5V Input voltage

Serial Port Console Redirection



Feature	Options	Description
Console Redirection	Disabled Enabled	Console Redirection Enable or Disable.

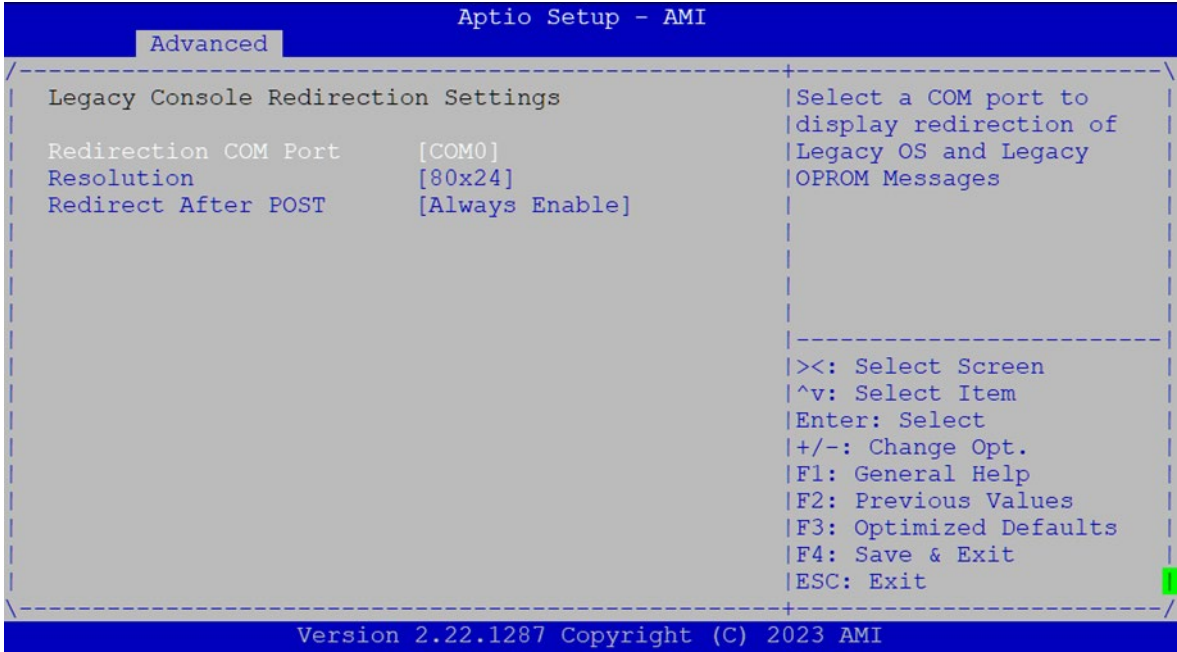
Console Redirection Settings



Feature	Options	Description
Terminal Type	VT100 VT100Plus VT-UTF8 ANSI	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per second	9600 19200 38400 57600 115200	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Data Bits	7 8	Data Bits
Parity	None Even Odd Mark Space	A parity bit can be sent with the data bits to detect some transmission errors.
Stop Bits	1 2	Stop bits indicate the end of a serial data packet.
Flow Control	None Hardware RTS/CTS	Flow control can prevent data loss from buffer overflow.

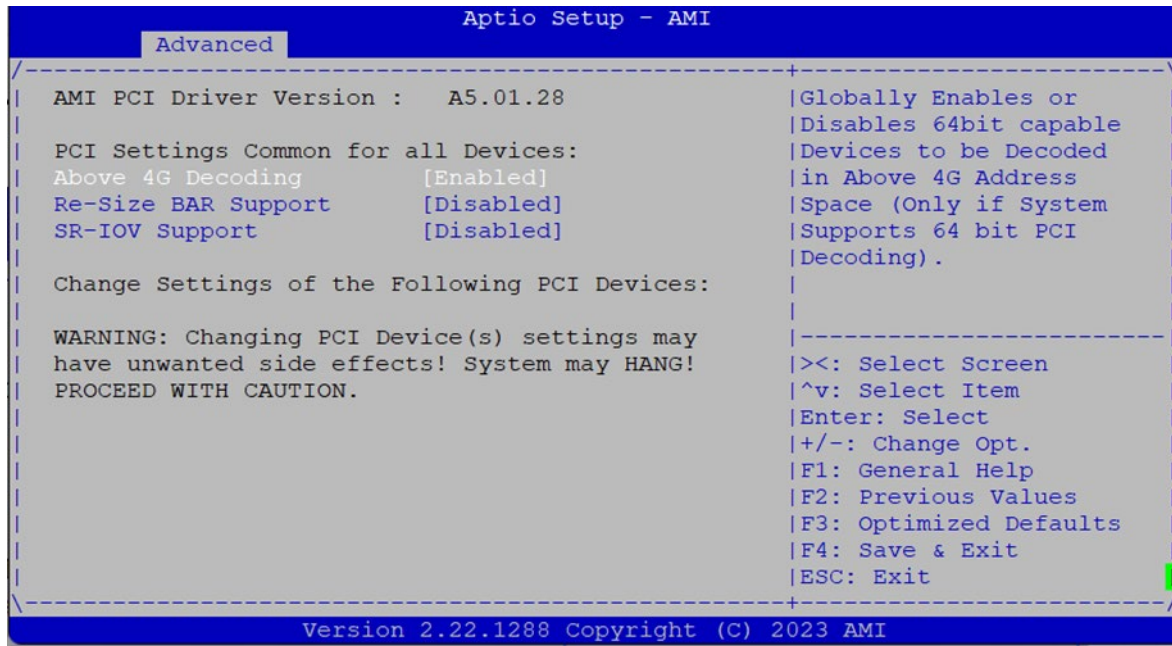
VT-UTF8 Combo Key Support	Disabled Enabled	Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals
Recorder Mode	Disabled Enabled	With this mode enabled only text will be sent. This is to capture Terminal data.
Resolution 100x31	Disabled Enabled	Enables or disables extended terminal resolution.
Putty KeyPad	VT100 LINUX XTERMR6 SCO ESCN VT400	Select FunctionKey and KeyPad on Putty.

Legacy Console Redirection Settings



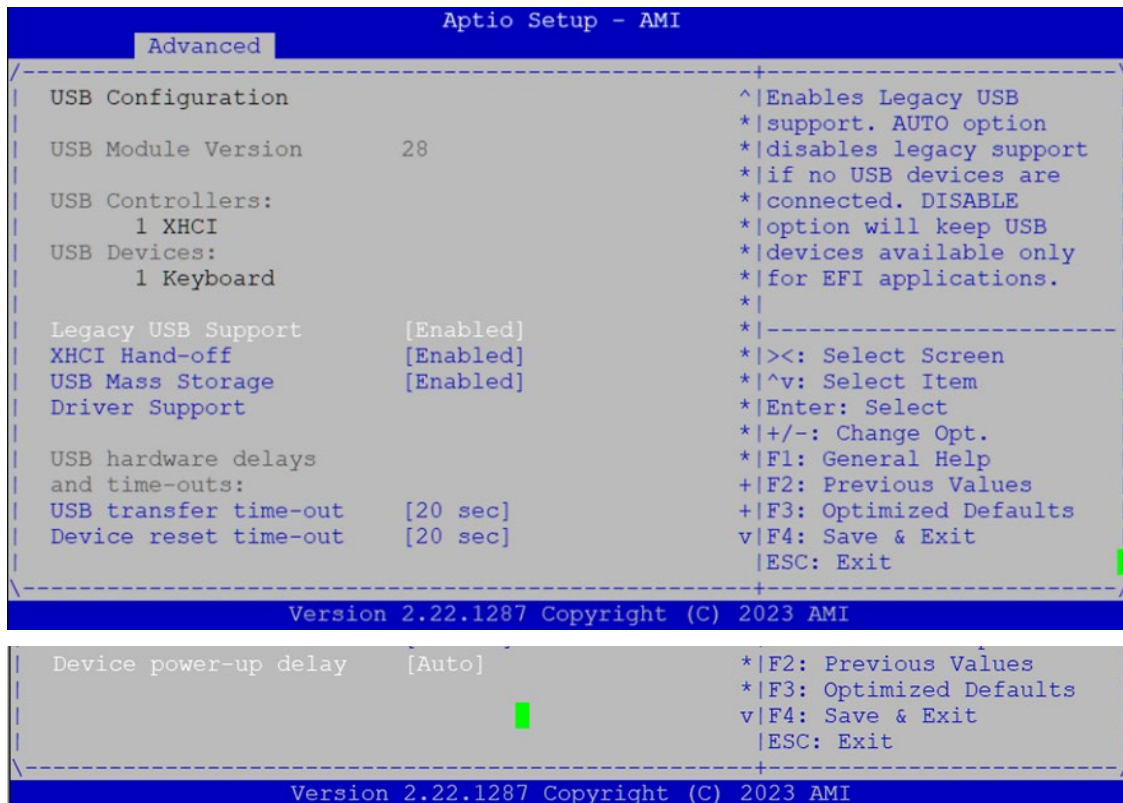
Feature	Options	Description
Redirection COM Port	COM0	Select a COM port to display redirection of Legacy OS and Legacy OPRM Messages
Resolution	80x24 80x25	On Legacy OS, the Number of Rows and Columns supported redirection
Redirect After POST	Always Enable BootLoader	When Bootloader is selected, then Legacy Console Redirection is disabled before booting to legacy OS. When Always Enable is selected, then Legacy Console Redirection is enabled for legacy OS. Default setting for this option is set to Always Enable.

PCI Subsystem Settings



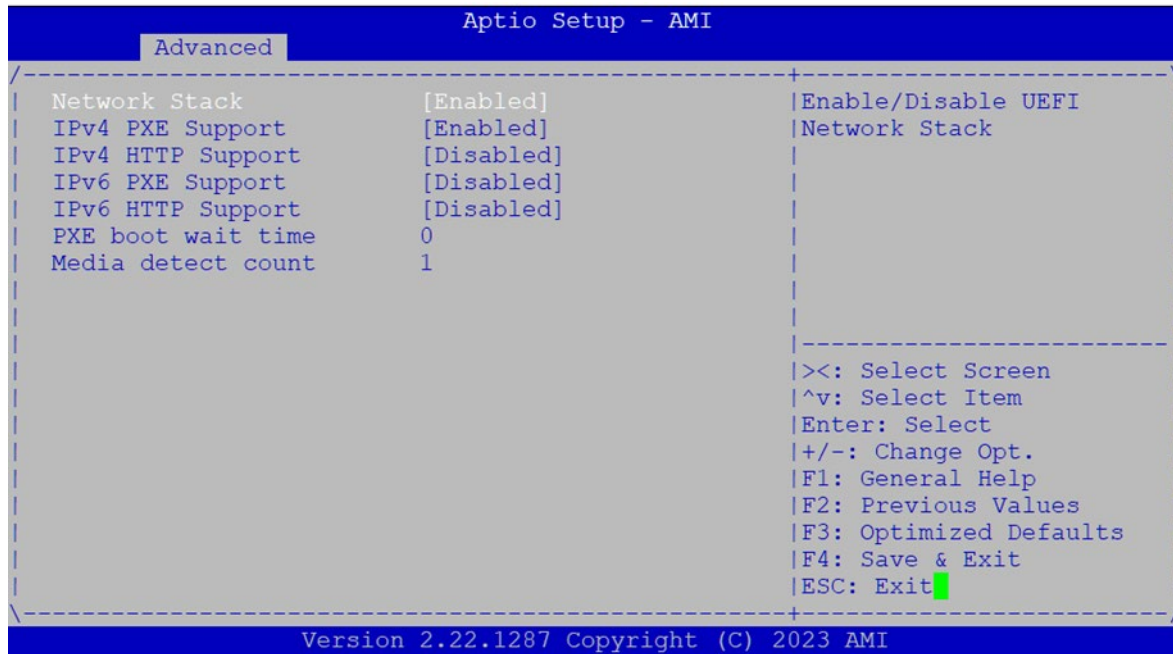
Feature	Options	Description
Above 4G Decoding	Disabled Enabled	Disables 64bit capable Device Resources to be Allocated in Above 4G Address Space.
SR-IOV Support	Disabled Enabled	If system has SR-IOV capable PCIe Devices, this option Enables or Disables Single Root IO Virtualization Support.
Re-Size BAR Support	Disabled Enabled	If system has Resizable BAR capable PCIe Devices, this option Enables or Disables Resizable BAR Support.

USB Configuration



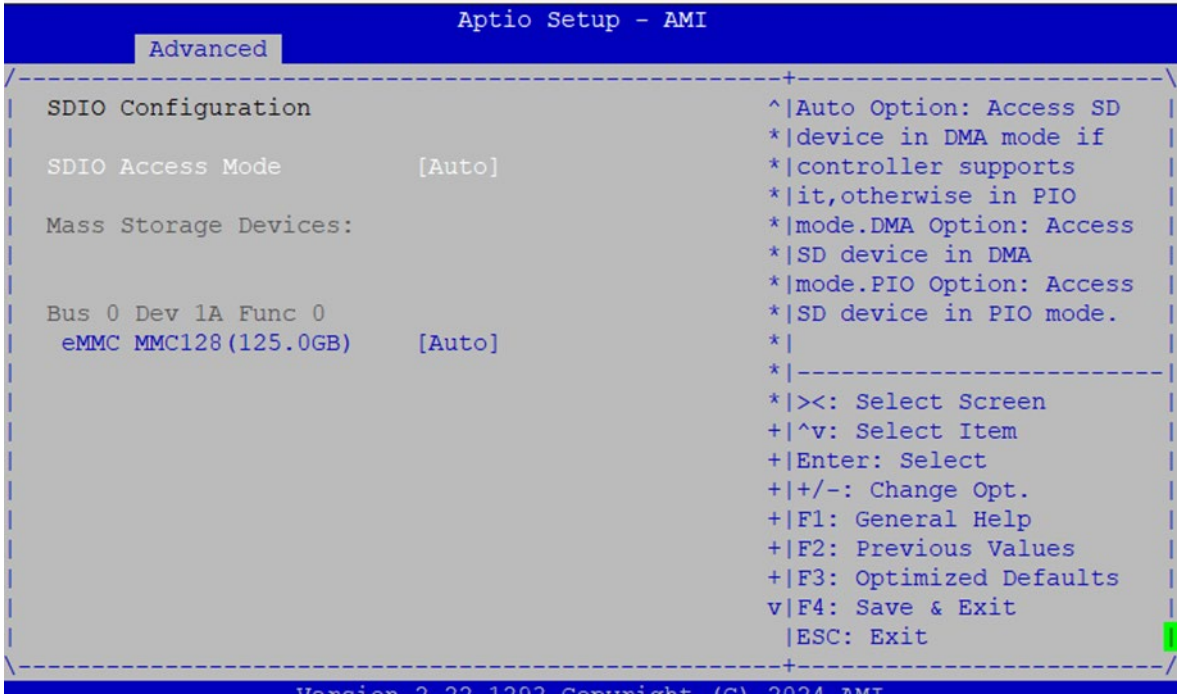
Feature	Options	Description
Legacy USB Support	Enabled Disabled Auto	Enables Legacy USB support. Auto option disables legacy support if no USB devices are connected. Disabled option will keep USB devices available only for EFI applications.
XHCI Hand-off	Enabled Disabled	This is a workaround for OSeS without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Disabled Enabled	Enable/Disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec 5 sec 10 sec 20 sec	The time-out value for Control, Bulk, and Interrupt transfers
Device reset time-out	10 sec 20 sec 30 sec 40 sec	USB mass storage device Start Unit command time-out
Device power-up delay	Auto Manual	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 100 ms, for a Hub port the delay is taken from Hub descriptor.

Network Stack Configuration



Feature	Options	Description
Network Stack	Disabled Enabled	Enable/Disable UEFI Network Stack
IPv4 PXE Support	Disabled Enabled	Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.
IPv4 HTTP Support	Disabled Enabled	Enable/Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.
IPv6 PXE Support	Disabled Enabled	Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.
IPv6 HTTP Support	Disabled Enabled	Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.
PXE boot wait time	0	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	1	Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

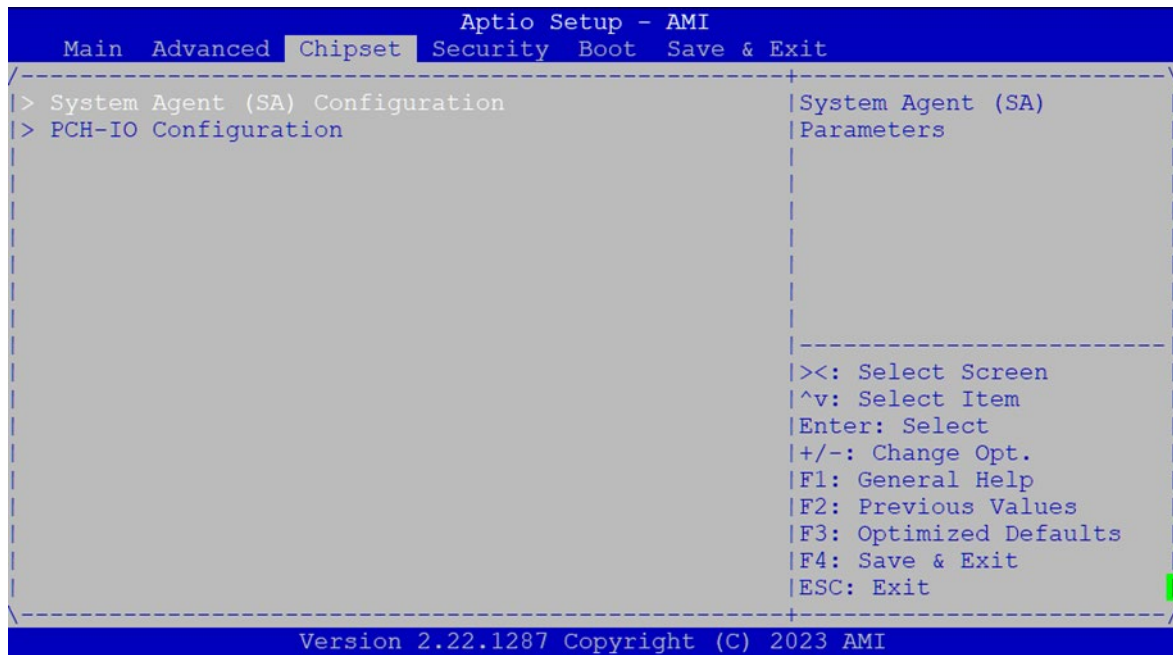
SDIO Configuration



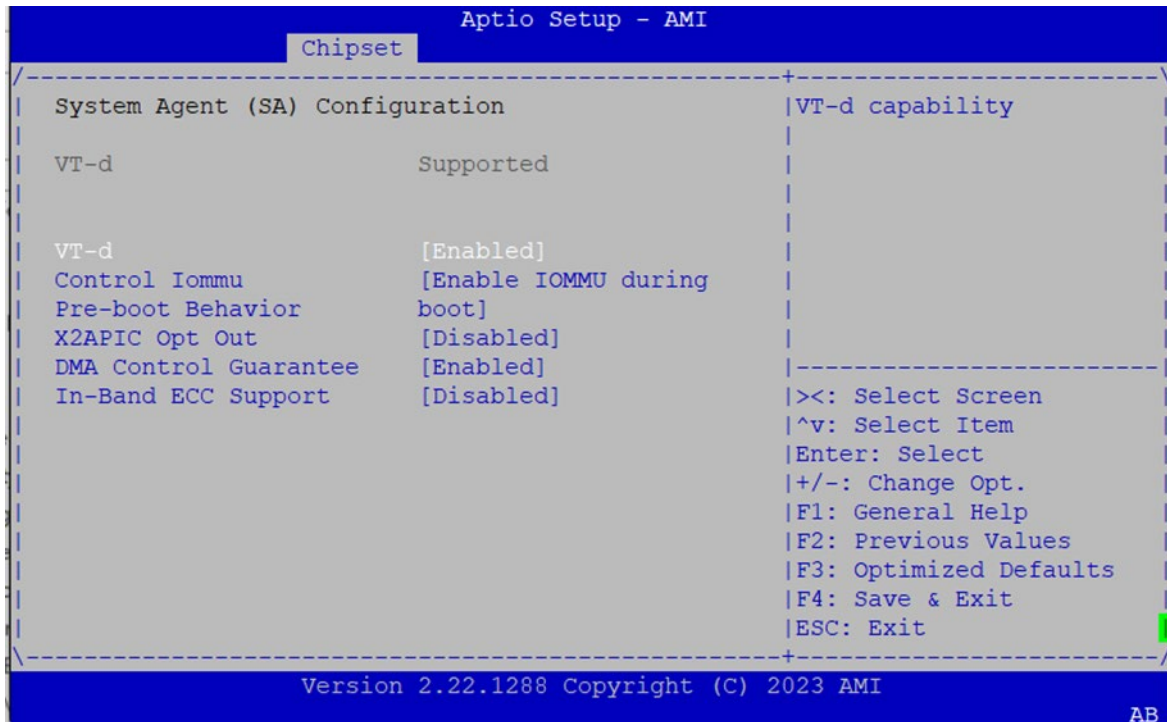
Feature	Options	Description
SDIO Access Mode	Auto	Auto Option: Access SD device in DMA mode if controller supports it, otherwise in PIO mode.
	ADMA	
	SDMA	DMA Option: Access SD device in DMA mode. PIO Option:
	PIO	Access SD device in PIO mode.

Chipset

Select the **Chipset** menu item from the BIOS setup screen to enter the “Chipset” setup screen. Users can select any of the items in the left frame of the screen.

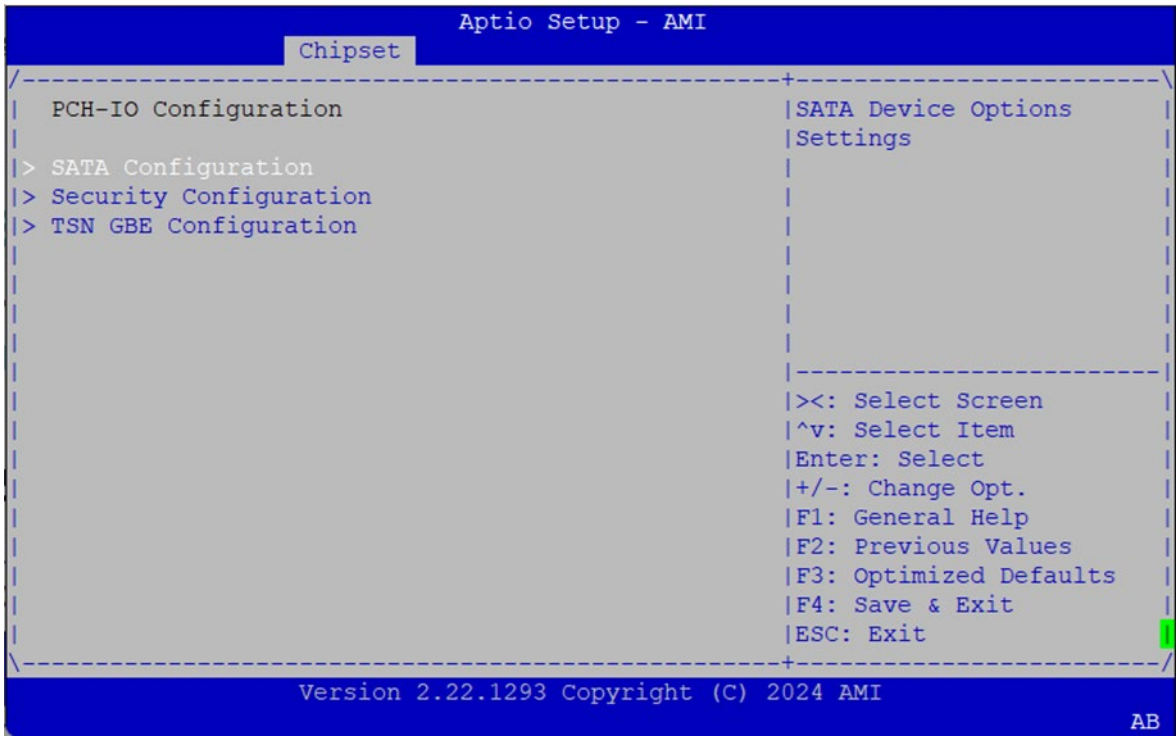


System Agent (SA) Configuration

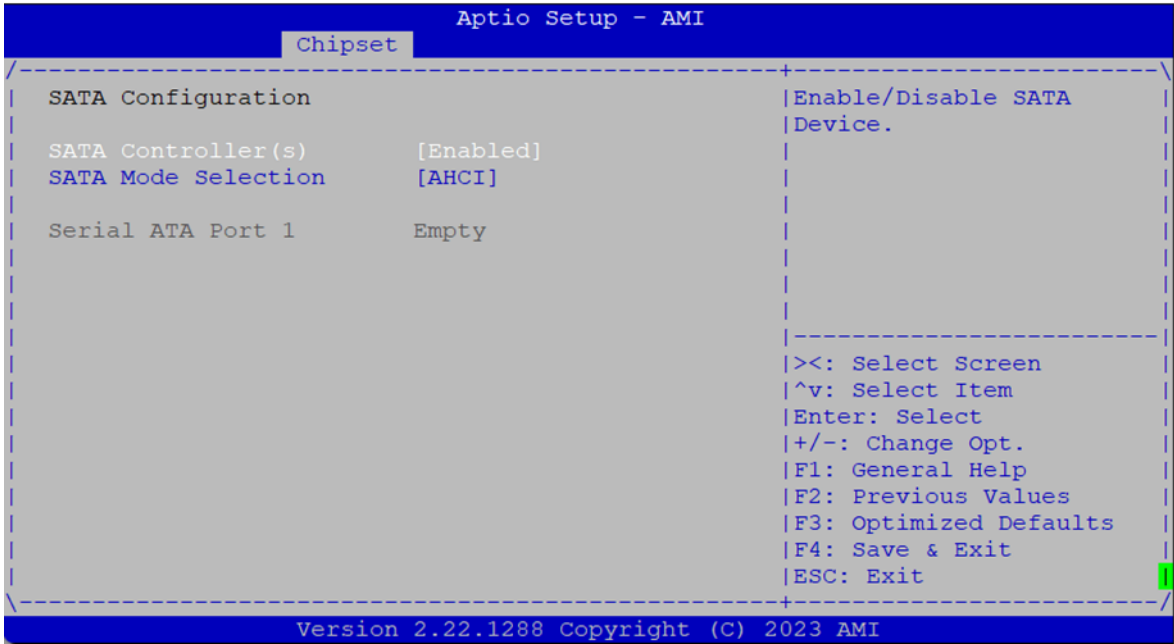


Feature	Options	Description
VT-d	Disabled Enable	VT-d capability
Control Iommu	Disable IOMMU Enable IOMMU during boot	Enable IOMMU in Pre-boot environment (If DMAR table is installed in DXE and If VTD_INFO_PPI is installed in PEI.)
X2APIC Opt Out	Enabled Disabled	Enable/Disable X2APIC_OPT_OUT bit
DMA Control Guarantee	Enabled Disabled	Enable/Disable DMA_CONTROL_GUARANTEE bit
In-Band ECC Support	Enabled Disabled	Enable/Disable In-Band ECC. Will be enabled if memory has symmetric configuration

PCH-IO Configuration

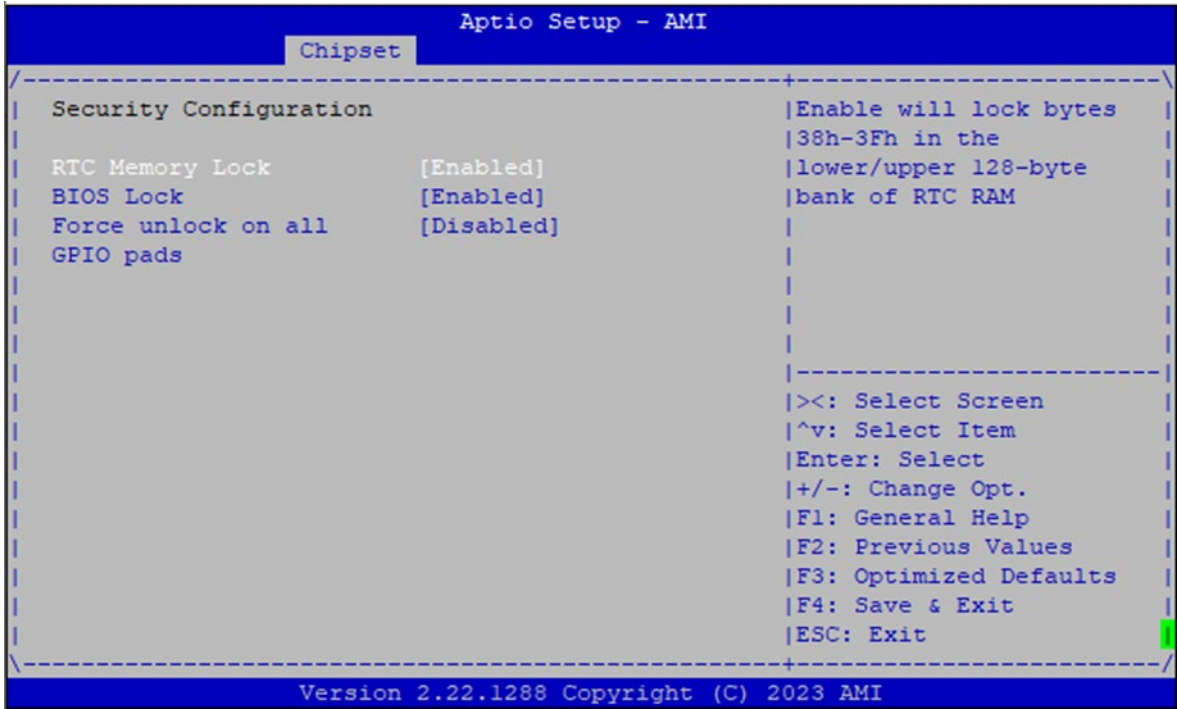


SATA Configuration



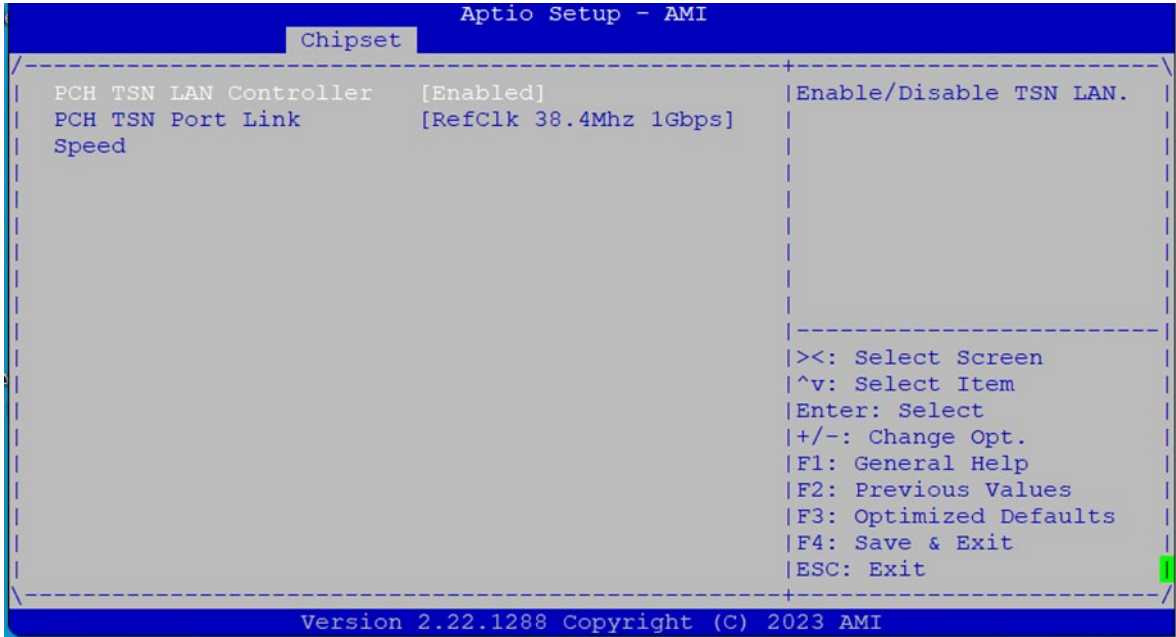
Feature	Options	Description
SATA Controller(s)	Enabled Disabled	Enable/Disable SATA Device.
SATA Mode Selection	AHCI	Determines how SATA controller(s) operate.

Security Configuration



Feature	Options	Description
RTC Memory Lock	Enabled Disabled	Enable will lock bytes 38h-3Fh in the lower/upper 128-byte bank of RTC RAM.
Bios Lock	Enabled Disabled	Enable/Disable the PCH BIOS Lock Enable feature. Required to be enabled to ensure SMM protection of flash.
Force unlock on all GPIO pads	Enabled Disabled	If Enabled BIOS will force all GPIO pads to be in unlocked state

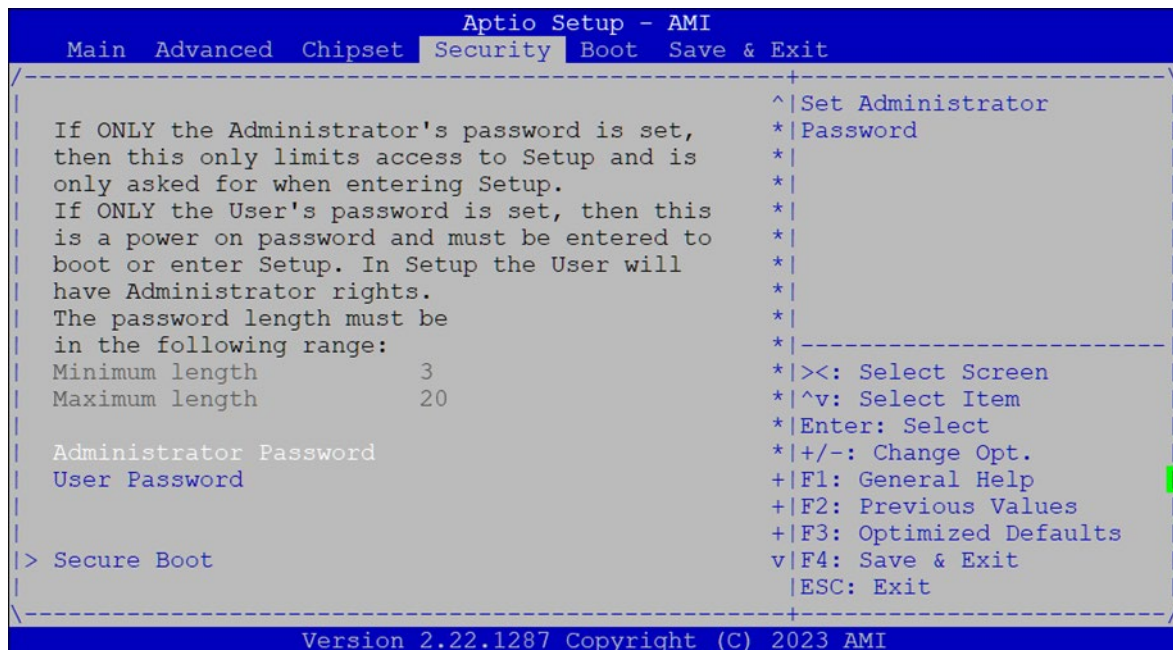
TSN GBE Configuration



Feature	Options	Description
PCH TSN LAN Controller	Enabled Disabled	Enable/Disable TSN LAN Device.
PCH TSN Port Link Speed	RefClk 38.4Mhz 1Gbps RefClk 38.4Mhz 2.5Gbps	Select TSN LANLink Speed

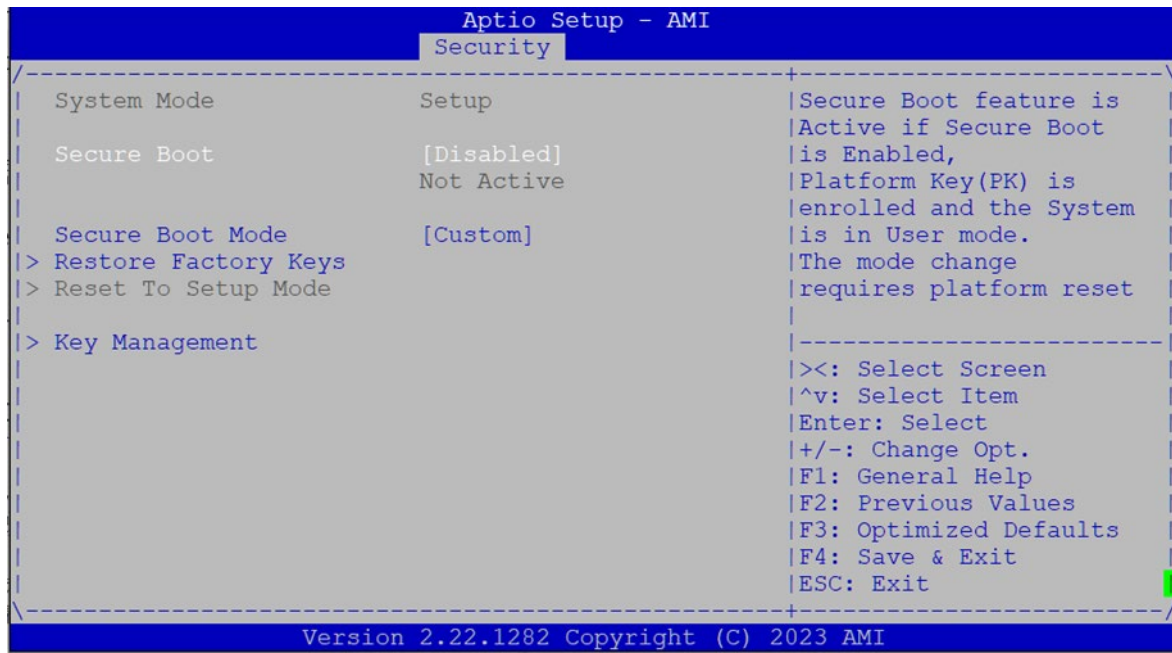
Security Page

Select the **Security** menu item from the BIOS setup screen to enter the Security Setup screen. Users can select any of the items in the left frame of the screen.



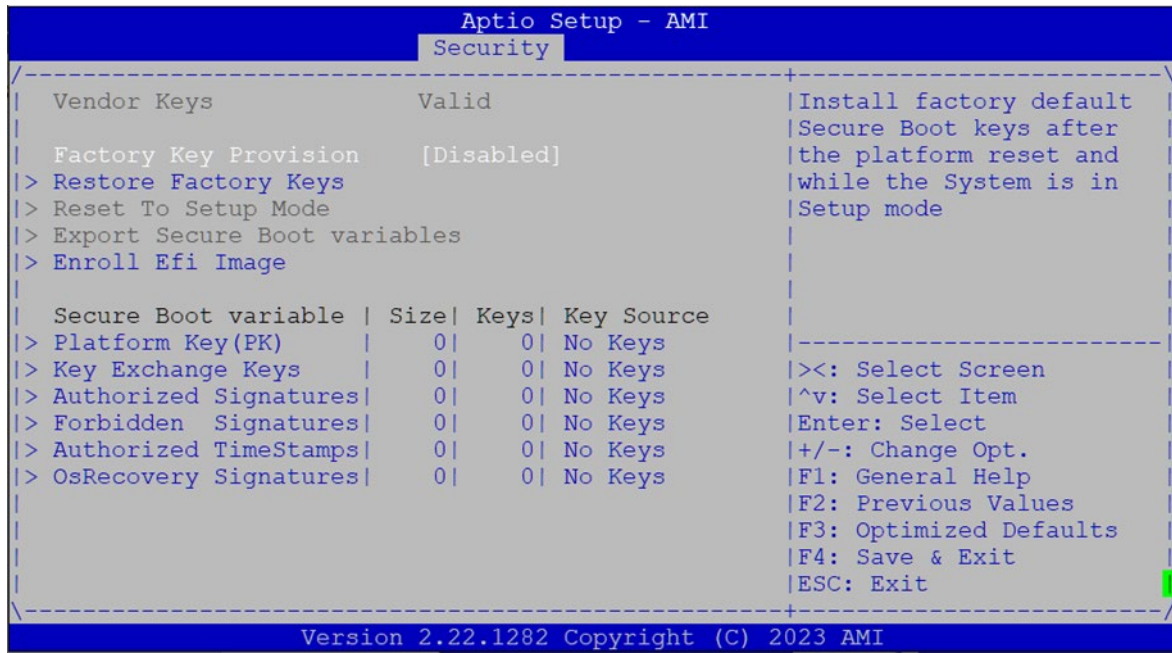
Feature	Description
Setup Administrator Password	If ONLY the Administrator's password is set, it only limits access to Setup and is only asked for when entering Setup.
User Password	If ONLY the User's password is set, it serves as a power-on password and must be entered to boot or enter Setup. In Setup, the User will have Administrator rights.

Secure Boot



Feature	Options	Description
Secure Boot	Disabled Enabled	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	Standard Custom	Secure Boot mode options: Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication

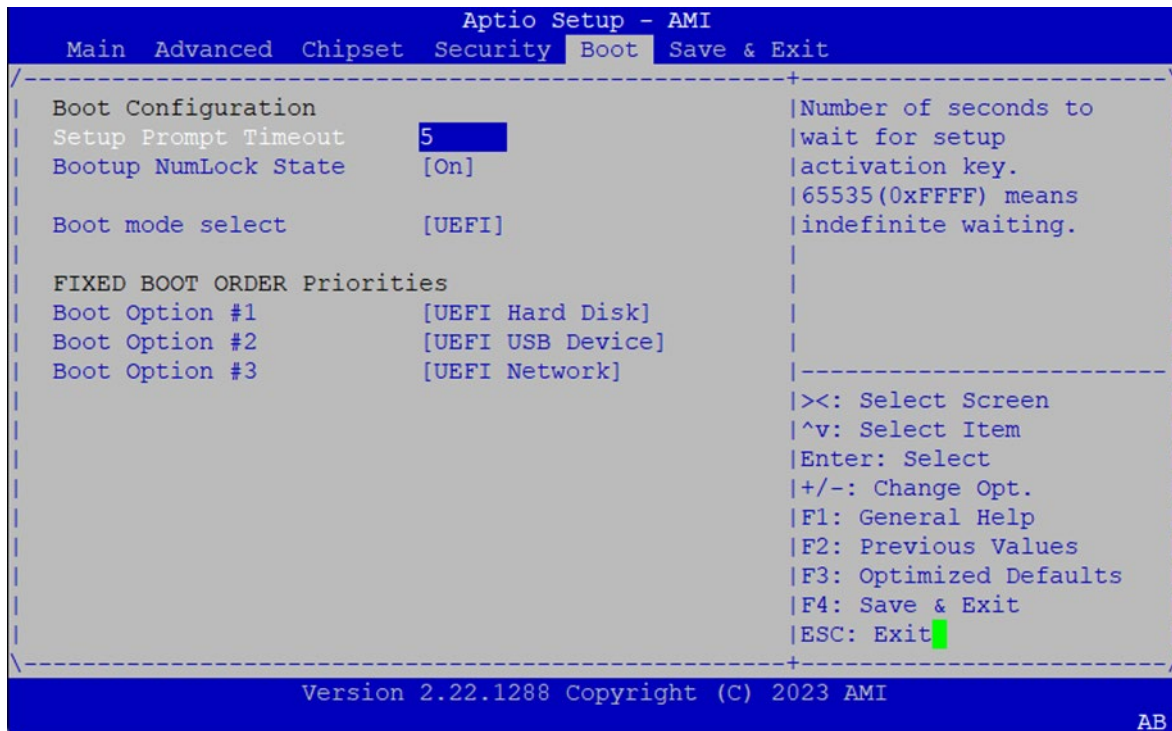
Key Management



Feature	Options	Description
Factory Key Provision	Disabled Enabled	Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode
Restore Factory Keys	None	Force System to User Mode. Install factory default Secure Boot key databases
Reset To Setup Mode	None	Delete all Secure Boot key databases from NVRAM
Export Secure Boot variables	None	Copy NVRAM content of Secure Boot variables to files in a root folder on a file system device
Enroll Efi Image	None	Allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db)

Boot Menu

Select the Boot menu item from the BIOS setup screen to enter the Boot Setup screen. Users can select any of the items in the left frame of the screen.

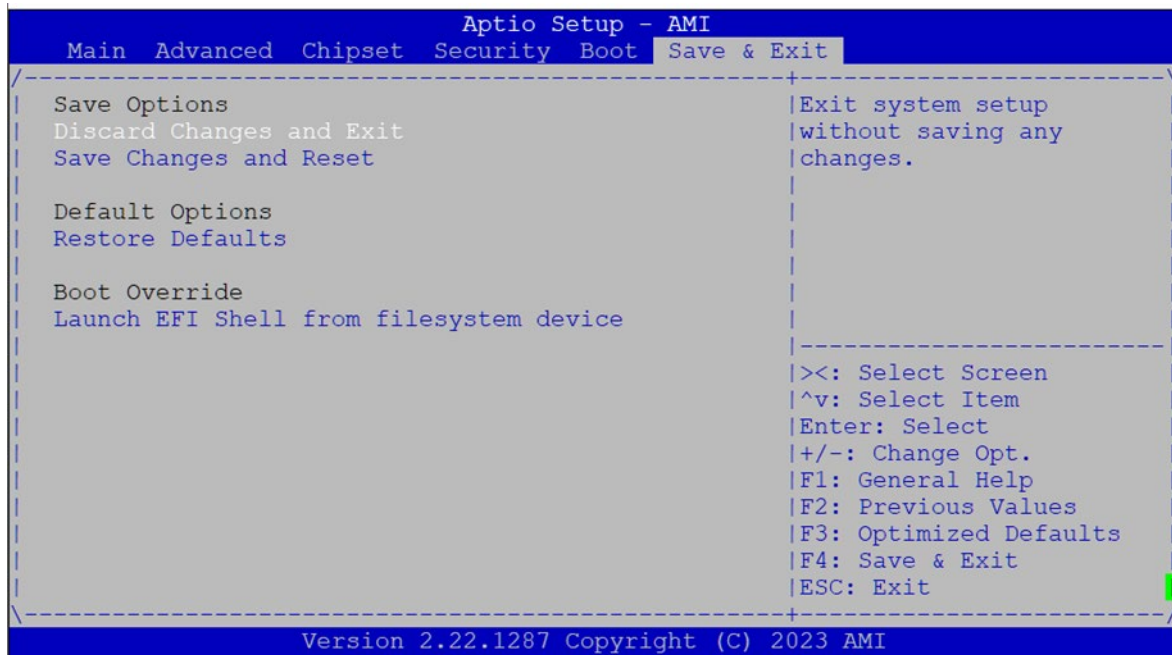


Feature	Options	Description
Setup Prompt Timeout	5	The number of seconds to wait for setup activation key. 65535 means indefinite waiting.
Bootup NumLock State	On Off	Select the keyboard NumLock state
Boot mode select	UEFI	Support boot UEFI mode only

- Default boot priority: **Hard Disk -> USB -> Network**
- Choose specifies boot device priority sequence from available Group device.
- Choose boot priority from boot option group.

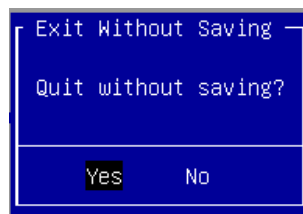
Save and Exit Menu

Select the **Save and Exit** menu item from the BIOS setup screen to enter the Save and Exit Setup screen. Users can select any of the items in the left frame of the screen.



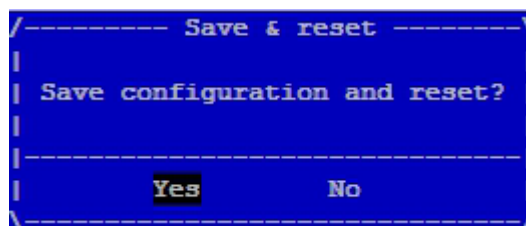
■ Discard Changes and Exit

Select this option to quit Setup without saving any modifications to the system configuration. The following window will appear after the **"Discard Changes and Exit"** option is selected. Select **"Yes"** to Discard changes and Exit Setup.



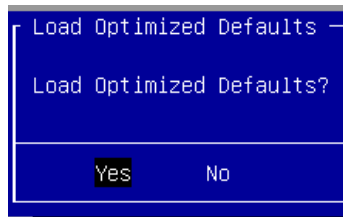
■ Save Changes and Reset

When Users have completed the system configuration changes, select this option to save the changes and reset from BIOS Setup in order for the new system configuration parameters to take effect. The following window will appear after selecting the **"Save Changes and Reset"** option is selected. Select **"Yes"** to Save Changes and reset.



■ Restore Defaults

Restore default values for all setup options. Select “**Yes**” to load Optimized defaults.



Note

The items listed under Boot Override will depend on the actual devices connected to this system.

APPENDIX A: LED INDICATOR EXPLANATIONS

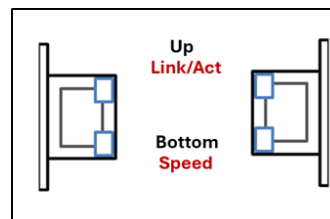
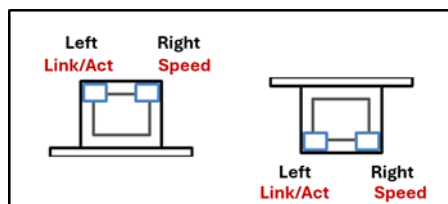
► System Power / Status / Storage Activity / Cellular



The status explanations of LED indicators on front panel are as follows:

LED	COLOR	LED ACTION	DESCRIPTION
Power	Green	Steady	System is powered ON
	OFF	N/A	System is powered OFF
Status	Green	Steady	Control by GPIO
	Red	Steady	Control by GPIO
	OFF	N/A	Control by GPIO (Default) OR Power OFF
Storage	Amber	Blinking	Storage (HDD/SSD) Activity Active (Includes SATA / NVMe Storage)
	OFF	N/A	No Data Access OR Power OFF
Cellular	Yellow	Blinking	4G LTE/5G Transmission Activity Active
	OFF	N/A	No Data Access OR Power OFF

► RJ45 LAN LED



1Gb RJ45 Define:

Speed	Amber (Link/Active)	Green/Amber (Speed)
10M	ON / Blinking (Data access)	OFF
100M	ON / Blinking (Data access)	ON (Green)
1G	ON / Blinking (Data access)	ON (Amber)

- When cable is plug-in and network is linked. Both LED lights will be bright. The behavior is as defined.
- Without the Cable plug-in, the LED should be off
- If LAN Driver controls the LED, the behavior will follow the driver.

2.5Gb RJ45 Define:

Speed	Green (Link/Active)	Green/Amber (Speed)
100M	ON / Blinking (Data access)	OFF
1G	ON / Blinking (Data access)	ON (Amber)
2.5G	ON / Blinking (Data access)	ON (Green)

1. When cable is plug-in and network is linked. Both LED lights will be bright. The behavior is as defined.
 2. Without the Cable plug-in, the LED should be off
 3. If LAN Driver controls the LED, the behavior will follow the driver

Bypass Default Configuration:

Item	Power ON	Run Time	Power OFF
Bypass (Default)	Disable	Disable	Enable
Reconnecting Power Adapter	Change back to default status		
System Rebut	Stay the current status		

1Gb SFP Define:

Speed	Amber (Link/Active)	Amber (Speed)
1G	ON / Blinking (Data access) (Amber)	ON (Amber)
Non-Link	OFF	OFF

1. When cable is plug-in and network is linked. Both LED lights will be bright. The behavior is as defined.
 2. Without the Cable plug-in, the LED should be off
 3. If LAN Driver controls the LED, the behavior will follow the driver

APPENDIX B: TERMS AND CONDITIONS

Warranty Policy

1. All products are under warranty against defects in materials and workmanship for one year from the date of purchase.
2. The buyer will bear the return freight charges for goods returned for repair within the warranty period; whereas the manufacturer will bear the after service freight charges for goods returned to the user.
3. The buyer will pay for the repair (for replaced components plus service time) and transportation charges (both ways) for items after the expiration of the warranty period.
4. If the RMA Service Request Form does not meet the stated requirement as listed on "RMA Service," RMA goods will be returned at customer's expense.
5. The following conditions are excluded from this warranty:
 - ▶ Improper or inadequate maintenance by the customer
 - ▶ Unauthorized modification, misuse, or reversed engineering of the product
 - ▶ Operation outside of the environmental specifications for the product.

RMA Service

Requesting an RMA#

1. To obtain an RMA number, fill out and fax the "RMA Request Form" to your supplier.
2. The customer is required to fill out the problem code as listed. If your problem is not among the codes listed, please write the symptom description in the remarks box.
3. Ship the defective unit(s) on freight prepaid terms. Use the original packing materials when possible.
4. Mark the RMA# clearly on the box.



Note

Customer is responsible for shipping damage(s) resulting from inadequate/loose packing of the defective unit(s). All RMA# are valid for 30 days only; RMA goods received after the effective RMA# period will be rejected.

RMA Service Request Form

When requesting RMA service, please fill out the following form. Without this form enclosed, your RMA cannot be processed.

RMA No:		Reasons to Return: ☐ Repair(Please include failure details)	
		☐ Testing Purpose	
Company:		Contact Person:	
Phone No.		Purchased Date:	
Fax No.:		Applied Date:	
Return Shipping Address: _____			
Shipping by: ☐ Air Freight ☐ Sea ☐ Express _____			
☐ Others: _____			
Item	Model Name	Serial Number	Configuration

Item	Problem Code	Failure Status

***Problem Code:**

01: D.O.A.	07: BIOS Problem	13: SCSI	19: DIO
02: Second Time R.M.A.	08: Keyboard Controller Fail	14: LPT Port	20: Buzzer
03: CMOS Data Lost	09: Cache RMA Problem	15: PS2	21: Shut Down
04: FDC Fail	10: Memory Socket Bad	16: LAN	22: Panel Fail
05: HDC Fail	11: Hang Up Software	17: COM Port	23: CRT Fail
06: Bad Slot	12: Out Look Damage	18: Watchdog Timer	24: Others (Pls specify)

Request Party

Confirmed By Supplier

Authorized Signature / Date

Authorized Signature / Date