

Lanner

Vehicle Computing

Rugged Platforms for Vehicles and Railway Computing

ICS-R372 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.

The latest version of this document can be found on Lanner's official website, available either through the product page or through the [Lanner Download Center](#) page with a login account and password.

Conventions & Icons

This document utilizes icons in order to make selected text more transparent and explicable to users. Please note that this document contains the following conventions:

Icon Descriptions

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.

Online Resources

To obtain additional documentation resources and software updates for your system, please visit the [Lanner Download Center](#). As certain categories of documents are only available to users who are logged in, please be registered for a Lanner Account at <http://www.lannerinc.com/> to access published documents and downloadable resources.

For troubleshooting the issues with your system, please check the [Lanner Q&A](#) page for a diagnostic procedure and troubleshooting steps.

Technical Support

In addition to contacting your distributor or sales representative, you could submit a request to our [Lanner Technical Support](#) page to fill in a support ticket to our technical support department.

Documentation Feedback

Your feedback is valuable to us, as it will help us continue to provide you with more accurate and relevant documentation. To provide any feedback, comments or to report an error, please email to contact@lannerinc.com. Thank you for your time.

Contact Information

Taiwan Corporate Headquarters

Lanner Electronics Inc.

7F, No.173, Sec.2, Datong Rd.
Xizhi District, New Taipei City 22184,
Taiwan

立端科技股份有限公司

221 新北市汐止區
大同路二段 173 號 7 樓
T: +886-2-8692-6060
F: +886-2-8692-6101
E: contact@lannerinc.com

USA

Lanner Electronics Inc.

47790 Westinghouse Drive
Fremont, CA 94539
T: +1-855-852-6637
F: +1-510-979-0689
E: sales_us@lannerinc.com

Europe

Lanner Europe B.V.

Wilhelmina van Pruysenweg 104
2595 AN The Hague
The Netherlands
T: +31 70 701 3256
E: sales_eu@lannerinc.com

China

Beijing L&S Lancom Platform Tech. Co., Ltd.

Guodong LOFT 9 Layer No. 9 Huinan Road,
Huilongguan Town, Changping District, Beijing
102208 China

T: +86 010-82795600
F: +86 010-62963250
E: service@ls-china.com.cn

Canada

Lanner Electronics Canada Ltd

3160A Orlando Drive
Mississauga, ON
L4V 1R5 Canada
T: +1 877-813-2132
F: +1 905-362-2369
E: sales_ca@lannerinc.com

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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 in order to meet FCC emission limits and also 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.
- ▶ Do not wear loose clothing or jewelry that could get caught in the chassis. Fasten your tie or scarf and 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 by turning off the power and unplugging the power cord 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.
- ▶ A battery subjected to extremely low air pressure that may result in an explosion or the leakage of 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 Precautions

The following should be put into consideration for rack-mount or similar mounting installations:

- ▶ Do not install and/or operate this unit in any place that flammable objects are stored or used in.
- ▶ The installation of this product must be performed by trained specialists; otherwise, a non-specialist might create the risk of the system's falling to the ground or other damages.
- ▶ Lanner Electronics Inc. shall not be held liable for any losses resulting from insufficient strength for supporting the system or use of inappropriate installation components.
- ▶ Elevated Operating Ambient - 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.
- ▶ Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of airflow required for safe operation of the equipment is not compromised.
- ▶ Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- ▶ Circuit Overloading - 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 overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- ▶ Reliable Grounding - Reliable grounding of rack mounted equipment 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 EMBLEMES 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

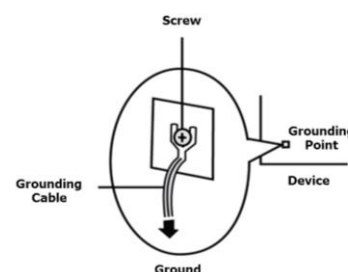
Before turning on the device, ground the grounding cable of the equipment. Proper grounding (grounding) is very important to protect the equipment against the harmful effects of external noise and to reduce the risk of electrocution in the event of a lightning strike. To uninstall the equipment, disconnect 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.

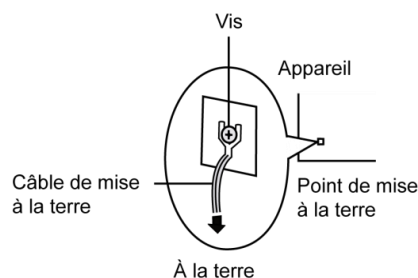
Grounding Procedure for Power Source

- ▶ 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



CAUTION: TO DISCONNECT POWER, REMOVE ALL POWER CORDS FROM UNIT.

注意：要断开电源，请将所有电源线从本机上拔下。

WARNUNG: Wenn Sie das Gerät zwecks Wartungsarbeiten vom Netz trennen müssen, müssen Sie beide Netzteile abnehmen.

ATTENTION: DÉBRANCHER TOUS LES CORDONS D'ALIMENTATION POUR DÉCONNECTER L'UNITÉ DU SECTEUR.

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CHAPTER 1: PRODUCT OVERVIEW

ICS-R372 Series is designed as a cost-effective embedded system, powered by Intel Apollo Lake CPU, providing quality performance with low power consumption for rolling stock cybersecurity application. ICS-R372 has passed extensive vibration and shock testing, earning compliance for EN50155 standard, making it exceptionally suitable for cybersecurity application in railway vehicles. This fanless system also boasts an abundance of I/O and internal expansion capabilities with IP67-rated M12 connectors, including 6x LAN ports, 1x internal 2.5" drive bays, 2x HDMI ports, USB and console ports, offering power-efficient performance for rail vehicle computing needs.

Package Content

Your package contains the following items:

- ▶ 1x ICS-R372 Vehicle and Railway Computer



Note: If you should find any components missing or damaged, please contact your dealer immediately for assistance.

Ordering Information

SKU No.	Description
ICS-R372A	Intel Atom™ x7-E3950 Processor, 6x M12X-coded GbE ports, 2x M.2 3042 B-Key sockets with dual SIM each, DC 24~36V power input.
ICS-R372B	Intel Atom™ x7-E3950 Processor, 6x M12X-coded GbE ports, 2x M.2 3042 B-Key sockets with dual SIM each, DC 72~110V power input.

Optional Accessories


Model	Description
080W000707000	Power Cable M12, 5P, 20cm, 180°-180° TIMYN TM-18L-CABLE-5F-20-N

System Specifications

Platform	CPU	Atom™ x7-E3950
	Frequency	1.6 GHz
	Core Number	Quad-core
	BIOS	AMI SPI Flash BIOS
	Chipset	SoC
	Processor Graphics	Intel® HD Graphics 505
Fanless		Yes
Memory	Technology	LPDDR4, Up to 2133MHz
	Max. Capacity	Up to 8GB (Default: 8GB)
Ethernet	Controller	6x Intel i210IT
	Speed	10/100/1000 Mbps
	Interface	6x M12 X-coded GbE
Storage	Type	1x Internal 2.5" drive bay (HDD/SSD not included) 1x mSATA Socket
I/O	Display	2x HDMI
	GPS	u-blox NEO-M8N; 3 GNSS (GPS, Galileo, GLONASS, BeiDou), default @ GPS + GLONASS dual band
	G-sensor	ADXL 345
	USB	4x USB 2.0 Type A
	Antenna	5x SMA antenna hole (includes GPS+GLONASS x1)
Expansion Interface	M.2	2x M.2 3042 B-Key
Cooling	Processor	Passive CPU heatsink
	System	Fanless design with corrugated aluminum
Power	Connector	M12 K-coded (Ground, DC_IN, Ground, IGN, Chassis Ground)
	Input	SKU A: Input Rated: 24~36Vdc SKU B: Input Rated: 72~110Vdc
Environment	Operating Temperature	-40~70°C / -40~158°F
	Storage Temperature	-40~85°C / -40~185°F
	Relative Humidity	5%~95% @ 40°C / 104°F (Storage Level)
Mechanical	Dimension (WxHxD)	272.4 x 88.3 x 228mm (10.72" x 3.48" x 8.97")
	Weight	5kg
	Mounting	Wall mount kit
Driver Support	Microsoft Windows	Win10 IoT
	Linux	Redhat Enterprise 5, Fedora 14. Linux Kernel 2.6.18 or later
Certification	EMC	E13, FCC/CE Class A, RoHS
	Certified	MIL-STD-810G, EN50155, EN50121-3-2, EN50121-4, EN50125, EN 45545
Miscellaneous	Hardware Monitoring	Yes
	Internal RTC with Li Battery	Yes

Front Panel

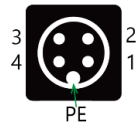
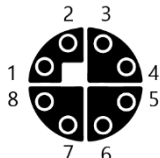


No.	Description				
F1	<div>Console Port</div> <div><div>19</div></div>	1x RS-232 (RJ45 connector)			
		Pin	Signals	Pin	Signals
		1	COM_RTS1#	2	COM_DTR1#
		3	COM_SOUT1	4	GND_COM
		5	GND_COM	6	COM_SIN1
		7	COM_DSR1#	8	COM_CTS1#
F2	USB 2.0 Port	4x USB 2.0, Type A			
F3	Antenna Port	5x SMA Antenna Holes			
F4	LED Indicators	Storage/Power/LNK/ACT/Speed, refer to Appendix A			
F5	SIM Card Cover	4x SIM card slots			

Rear Panel

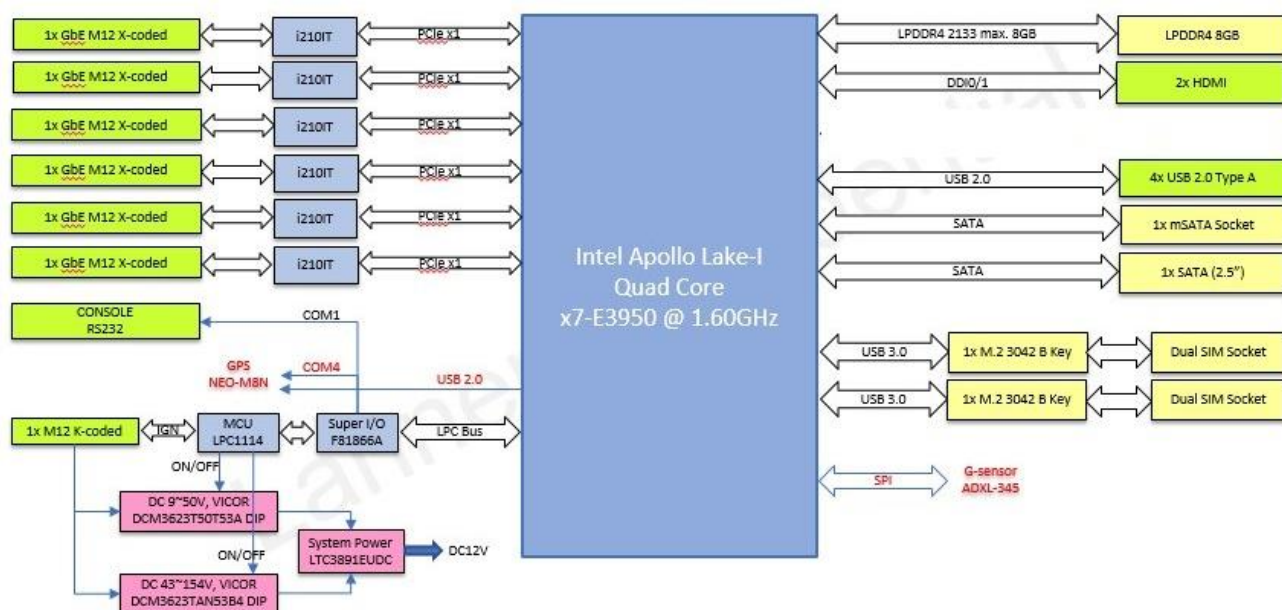

Grounding Point:

For safety measures to help prevent people from accidentally coming in contact with electrical hazards.

No.	Description																							
R1	<div>DC Input</div> <div></div>	<div>1x M12 K-coded 5-pin for power source, (Ground, DC_IN, Ground, IGN, Chassis Ground) A SKU: Input Rated: 24~36Vdc, B SKU: Input Rated: 72~110Vdc</div> <table><tr><th>Pin</th><th>Signals</th><th>Pin</th><th>Signals</th></tr><tr><td>1</td><td>GND</td><td>2</td><td>DC-VIN</td></tr><tr><td>3</td><td>MCU_PG</td><td>4</td><td>IGN_IN</td></tr><tr><td>5(PE)</td><td>Chassis_GND</td><td></td><td></td></tr></table>			Pin	Signals	Pin	Signals	1	GND	2	DC-VIN	3	MCU_PG	4	IGN_IN	5(PE)	Chassis_GND						
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1	GND	2	DC-VIN																					
3	MCU_PG	4	IGN_IN																					
5(PE)	Chassis_GND																							
R2	Ground Hole	1x Grounding hole																						
R3	HDMI Port	2x HDMI Connector Ports																						
R4	Antenna Port	1x 3 GNSS (GPS, Galileo, GLONASS, BeiDou) antenna support																						
R5	<div>LAN Port</div> <div></div>	<div>6x M12 X-coded 8-pin LAN Ports</div> <table><tr><th>Pin</th><th>Signals</th><th>Pin</th><th>Signals</th></tr><tr><td>1</td><td>LANx*_MX0P</td><td>2</td><td>LANx*_MX0N</td></tr><tr><td>3</td><td>LANx*_MX1P</td><td>4</td><td>LANx*_MX1N</td></tr><tr><td>5</td><td>LANx*_MX3P</td><td>6</td><td>LANx*_MX3N</td></tr><tr><td>7</td><td>LANx*_MX2N</td><td>8</td><td>LANx*_MX2P</td></tr></table>			Pin	Signals	Pin	Signals	1	LANx*_MX0P	2	LANx*_MX0N	3	LANx*_MX1P	4	LANx*_MX1N	5	LANx*_MX3P	6	LANx*_MX3N	7	LANx*_MX2N	8	LANx*_MX2P
Pin	Signals	Pin	Signals																					
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3	LANx*_MX1P	4	LANx*_MX1N																					
5	LANx*_MX3P	6	LANx*_MX3N																					
7	LANx*_MX2N	8	LANx*_MX2P																					

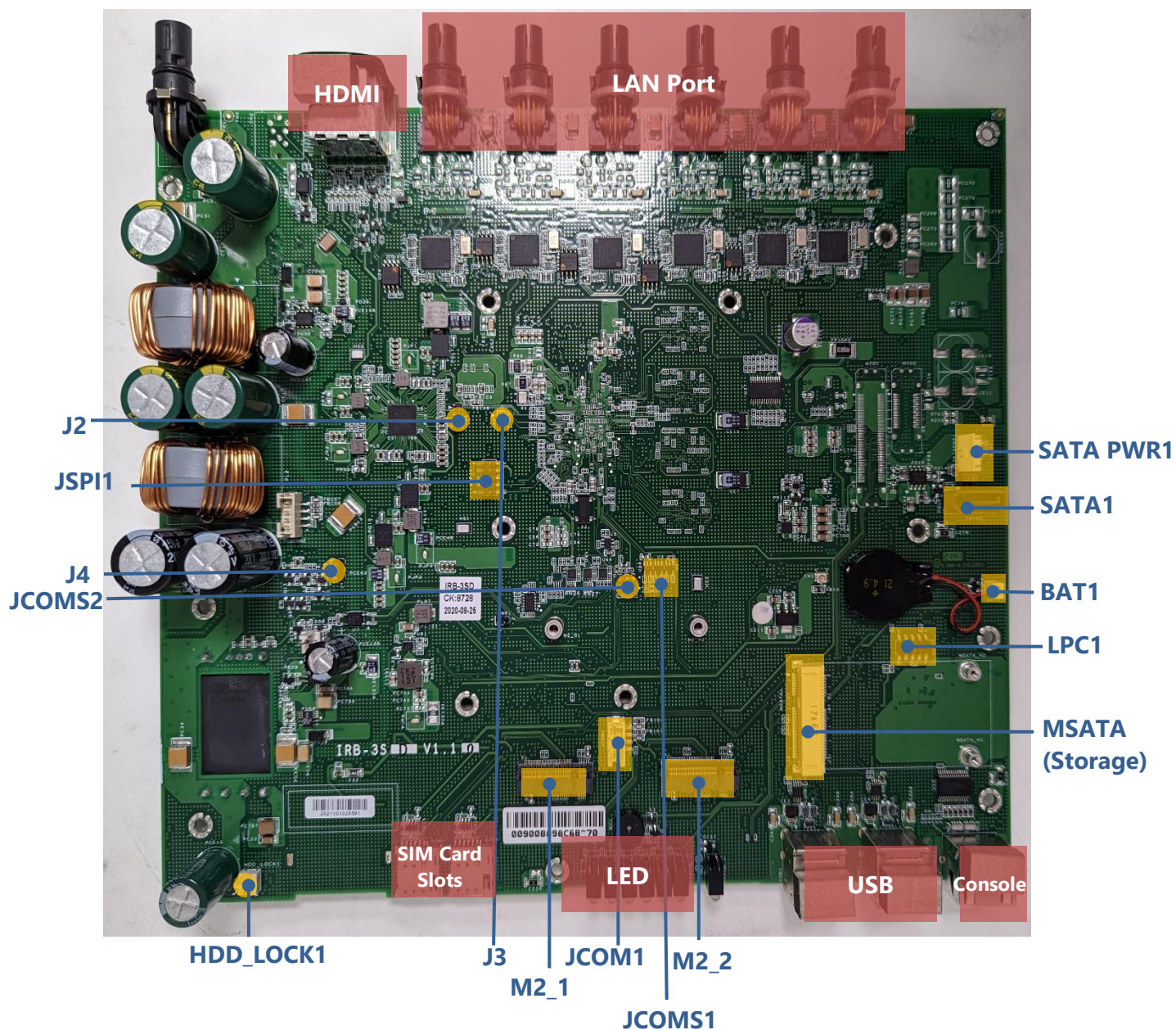
Motherboard Information

Block Diagram



Motherboard Layout

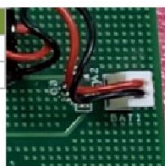
The motherboard layout shows the connectors and jumpers on the board. Refer to the following picture as a reference for the pin assignments and the internal connectors.



Jumper setting and Internal Connector

BAT1

Pin	Signals
1	VBAT
2	GND



BAT2

Pin	Signals
1	VBAT
2	GND



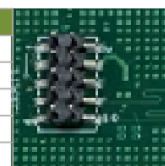
LPC1

Pin	Signals	Pin	Signals
1	L_CLKOUT1	6	P3V3
2	LPC_AD1	7	LPC_AD3
3	PLTRST_BUF2	8	NC
4	LPC_ADD	9	LPC_AD2
5	L_FRAME_N	10	GND



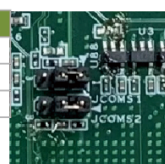
JSPI1

Pin	Signals	Pin	Signals
1	SPI0_HOLD_N	2	NC
3	SPI0_CS_N	4	V1P8_A_SPI
5	SPI0_MISO	6	NC
7	NC	8	SPIO_CLK
9	GND	10	SPIO_MOSI



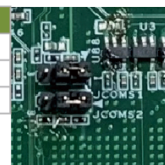
JCOMS1

Pin	Signals
1	NC
2	VCCRTC_3P3
3	GND



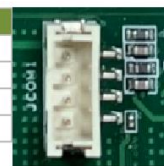
JCOMS2

Pin	Signals
1	NC
2	RTEST_N
3	GND



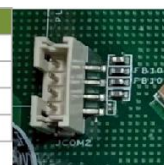
JCOM1(for MCU)

Pin	Signals
1	P3V3
2	SYS_RXD
3	SYS_TXD
4	GND



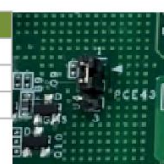
JCOM2(for power MCU)

Pin	Signals
1	IGN3V3 SB
2	MCU_RXD
3	MCU_TXD
4	GND



J4(for power MCU)

Pin	Signals
1	IGN3V3_SB
2	P_PID0_1
3	GND_PRI



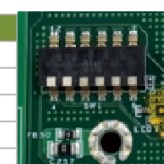
HDD_LOCK1

Pin	Signals
1	HDD LOCK#
2	GND



SW1(for MCU)

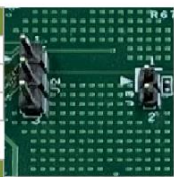
Pin	Signals	Pin	Signals
1	PIO1_6_RXD	12	SOUT6
2	PIO1_7_TXD	11	SIN6
3	PIO1_6_RXD	10	SYS_RXD
4	PIO1_7_TXD	9	SYS_TXD
5	NC	8	NC
6	PIO0_1	7	GND



- 1 ☐ 12
- 2 ☐ 11
- 3 ☐ 10
- 4 ☐ 9
- 5 ☐ 8
- 6 ☐ 7

J2(for PMIC debug)

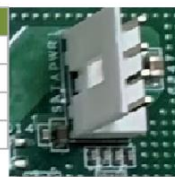
Pin	Signals
1	PMIC_SDA
2	PMIC_SCL
3	GND

**J3(for straps option)**

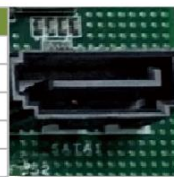
Pin	Signals
1	SOC_COM2_TXD
2	V1P8_A

**SATAPWR1**

Pin	Signals
1	12V
2	GND
3	GND
4	5V

**SATA1**

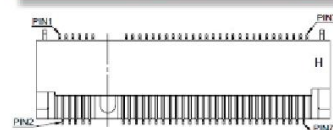
Pin	Signals
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND

**mSATA1**

Pin	Signals	Pin	Signals
1	WAKE#	2	+3.3Vaux1
3	RSV1	4	GND
5	RSV2	6	+1.5V1
7	CLKREQ#	8	UIM_PWR
9	GND	10	UIM_DATA
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_RESET
15	GND	16	UIM_VPP
KEY			
17	RSV3	18	GND
19	RSV4	20	W_DISABLE#
21	GND	22	PERST#
23	PERn0	24	+3.3Vaux2
25	PERp0	26	GND
27	GND	28	+1.5V2
29	GND	30	SMB_CLK
31	PETnO	32	SMB_DATA
33	PETpO	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	+3.3Vaux4	40	GND
41	+3.3Vaux5	42	LED_WWAN#
43	GND	44	LED_WLAN#
45	RSV	46	LED_WPAN#
47	RSV	48	+1.5V3
49	RSV	50	GND
51	RSV	52	+3.3Vaux3
53	PAD1	54	PAD2
V1.2 SPECW			
55	NPTH1	56	NPTH2

**M2_1 & M2_2 (B KEY)**

Pin	Signals	Pin	Signals
1	GND	2	3V3 AUX
3	GND	4	3V3 AUX
5	GND	6	F CARD PWROFF#
7	USB2_D-	8	W_DIS#
9	USB2_D+	10	LED#/1DAS/DSS#
11	GND	12	NOTCH5
13	NOTCH1	14	NOTCH6
15	NOTCH2	16	NOTCH7
17	NOTCH3	18	NOTCH8
19	NOTCH4	20	AUDIO 0
21	GND_WWAN/OC-SSD	22	AUDIO 1
23	NC	24	AUDIO 2
25	NC	26	AUDIO 3
27	GND	28	UIM_RFU
29	PERn1/USB3TX-	30	UIM_RESET
31	PERP1/USB3TX+	32	UIM_CLK
33	GND	34	UIM_DATA
35	PETn1/USB3TX-	36	UIM_PWR
37	PETp1/USB3TX+	38	DEVSLP
39	GND	40	GNSS0
41	PERNO/SATA-B+	42	GNSS1
43	PERpO/SATA-B-	44	GNSS2
45	GND	46	GNSS3
47	PETnO/SATA-A-	48	GNSS4
49	PETPO/SATA-A+	50	PERST#
51	GND	52	CLKREQ#
53	REFCLKN	54	WAKE#
55	REFCLKP	56	NC
57	GND	58	NC
59	ANTCTLO	60	COEX3
61	ANTCTL1	62	COEX2
63	ANTCTL2	64	COEX1
65	ANTCTL3	66	SIM_DET
67	RESET#	68	SUSCLK
69	PEDET	70	3V3_AUX
71	GND	72	3V3_AUX
73	GND	74	3V3_AUX
75	OC-USB3/GND-OTHER		



CHAPTER 2: HARDWARE SETUP

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

Open the Chassis

For installation of the M.2 LTE and mSATA storage, first open the chassis.

1. Turn the system over so the bottom is facing up. Then, remove the screws on the sides, front, and rear panels as below:

Front Panel



Rear Panel



Right Side

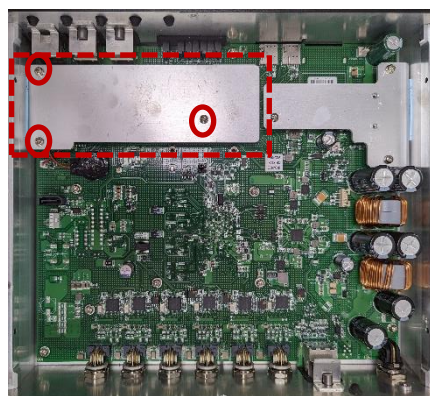


Left Side

2. Lift up the chassis.



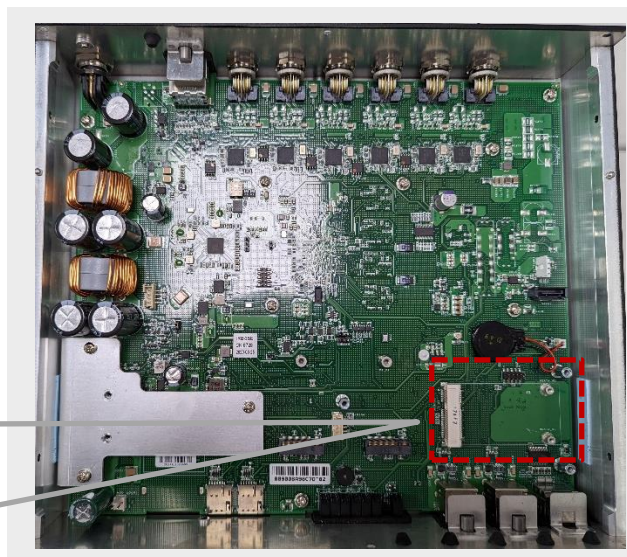
3. Remove the screws securing the partition board on the motherboard.



Installing the mSATA Storage Module (Optional)

The system supports one mSATA slot. Follow the procedures below for installing a mSATA storage module card.

1. Power off the system, and open the bottom chassis cover, then remove the partition board.
2. Locate the mSATA socket on the motherboard.



3. Align the notch of the mSATA storage card with the socket key in the slot.
4. Insert at 30 degrees into the socket until it is fully seated in the connector.



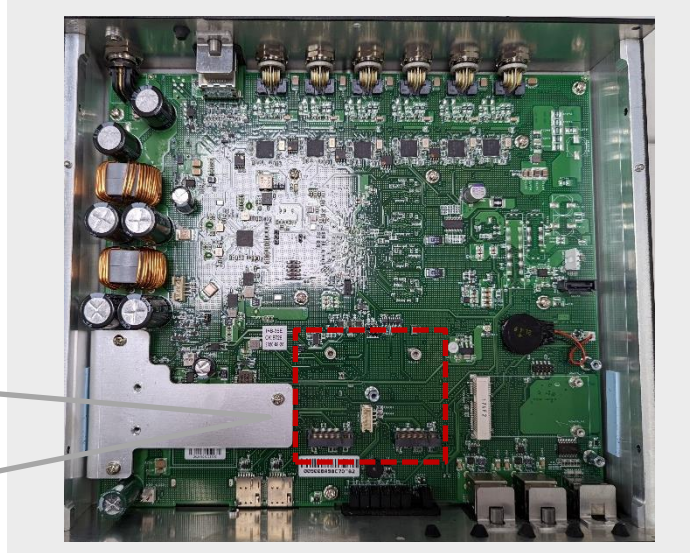
5. Push down on the storage card and secure it with two (2) screws.



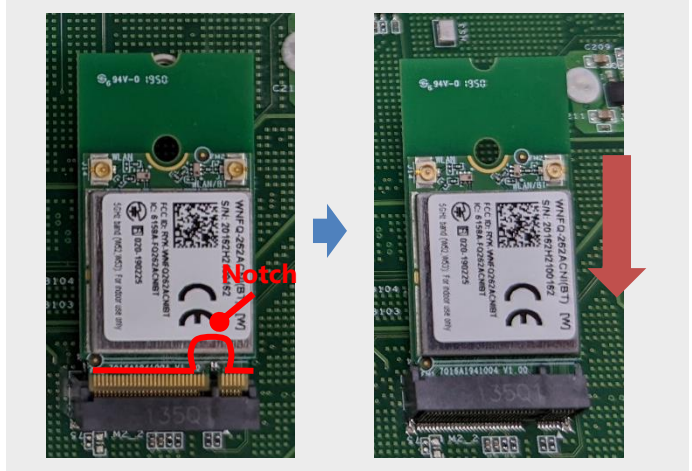
Installing the M.2 LTE Module (Optional)

The motherboard provides two M.2 slots. The M.2 slots can support two LTE 3G/4G module cards or one LTE 3G/4G module card and one Wi-Fi module card. Each LTE 3G/4G and Wi-Fi module card requires two (2) antennas. The M.2 slot can also accommodate one LTE 5G module card, which will require four (4) antennas. Follow the steps for installation.

1. Power off the system, and open the bottom chassis cover, then remove the partition board.
2. Locate the M.2 slots on the motherboard.



3. Align the notch of the LTE/Wi-Fi module card with the socket key in the slot.
4. Insert at 30 degrees into the socket until it is fully seated in the connector.



5. Push down on the LTE/Wi-Fi module card and secure it with one (1) screw.
6. Repeat for 2nd LTE 3G/4G or Wi-Fi module card.



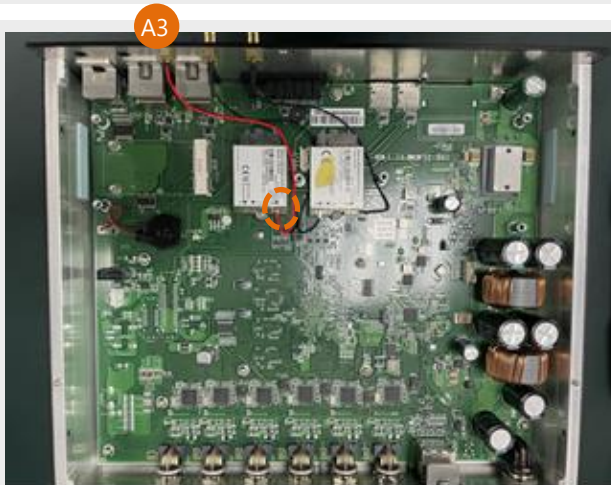
Installing LTE Antennas



1. Locate the two antenna RF cables and IPEX connectors on the LTE or Wi-Fi module card.
2. Connect RF cables to the LTE or Wi-Fi module card IPEX connector.



3. Repeat for the second LTE 3G/4G module card or continue connecting to the IPEX connectors of the LTE 5G module card.





4. Screw on the four (4) antennas to the system.



Installing SIM Card

1. Remove the screw on the SIM card cover and lift the cover.



2. Insert and push the SIM card all the way in until it clicks into place



3. To remove the card, push it once, to have the card automatically eject.
4. Place the cover back and tighten the one (1) screw.

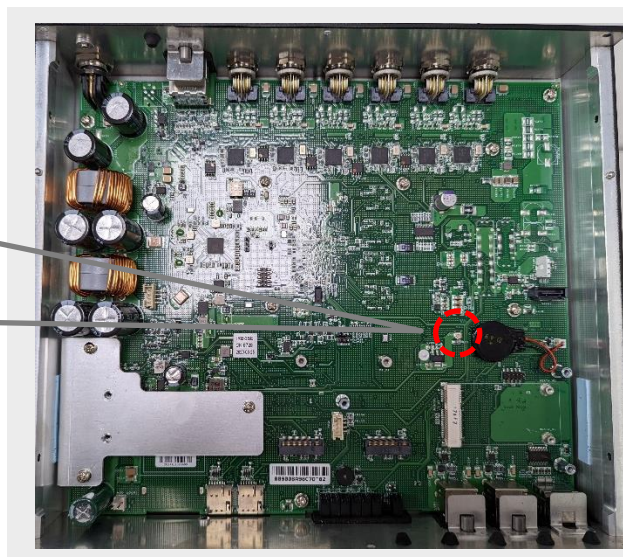
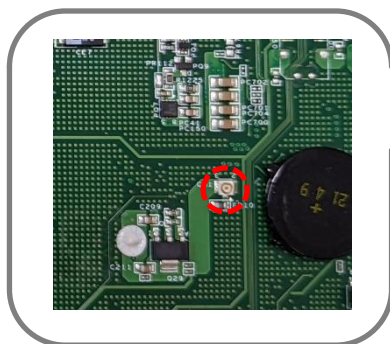


Installing GPS Antenna

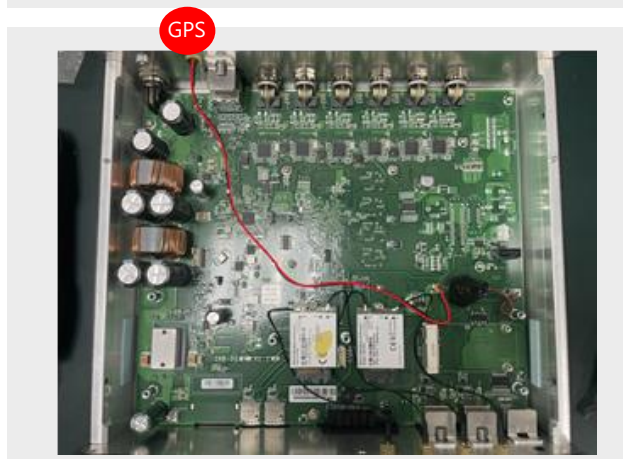
On the rear panel, there is an antenna hole for GPS GNSS (GPS, Galileo, GLONASS, BeiDou) support.



1. Locate the antenna hole on the rear panel, and locate the IPEX connector on the motherboard.



2. Connect antenna RF cables to the IPEX connector.



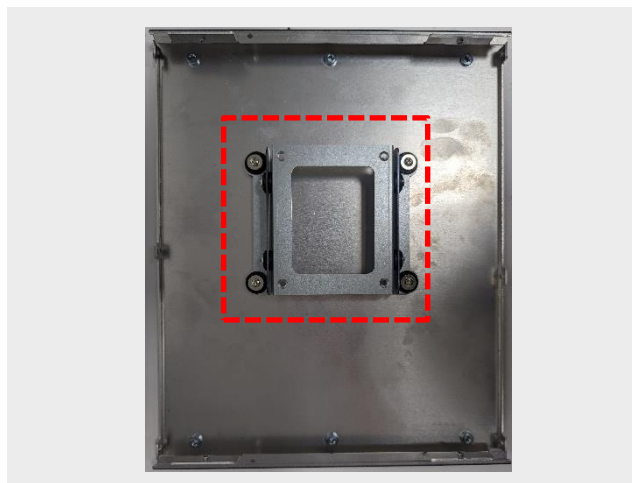
3. Screw on the antenna to the system.



Installing the SSD/HDD Drive (Optional)

The system supports one 2.5" SATA HDD/SSD drive bay for additional data storage. Please follow the steps for installation.

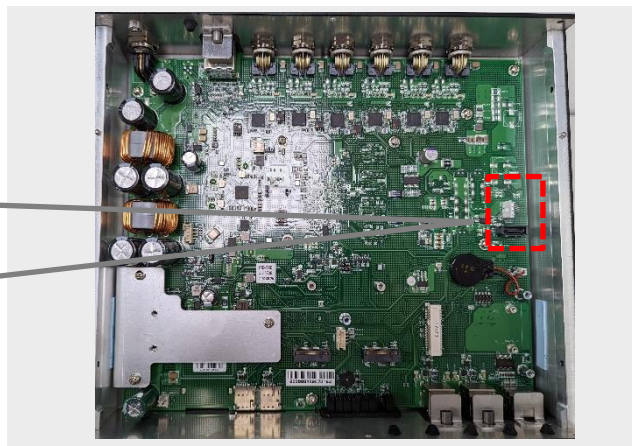
1. Power off the system, and open the bottom chassis cover. Locate the 2.5" SATA SSD/HDD drive bay on the underside of the bottom chassis cover.



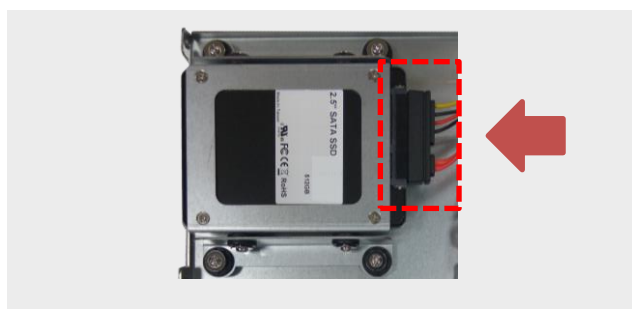
2. Place the disk drive into the drive bay and apply four (4) screws on the top of the disk tray. Make sure the disk SATA connector contacts faces outwards.



3. Locate the SATA connectors on the motherboard. Connect one end of the data cable and power cable to the connectors on the motherboard.



4. Plug the other end of the SATA data cable and power cable to the SSD/HDD.



Wall Mounting

With the wall-mount kit, you can fix this system onto a flat wall surface.

Check the kit contents for the following items:

- ▶ 1x pair of Wall Brackets
- ▶ 6x Screws (for the wall brackets)

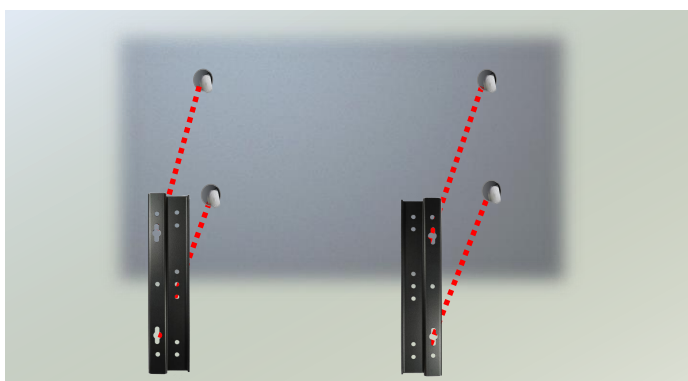


1. Turn the system over so the bottom is facing up; fix both wall brackets onto the system bottom with six (6) screws.

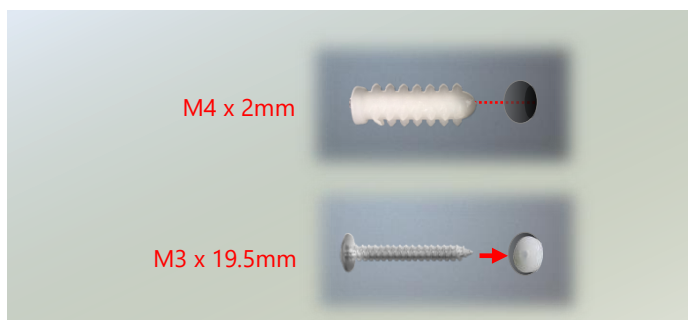


2. On the wall, measure the exact place where you want to hang the system and drill four holes.

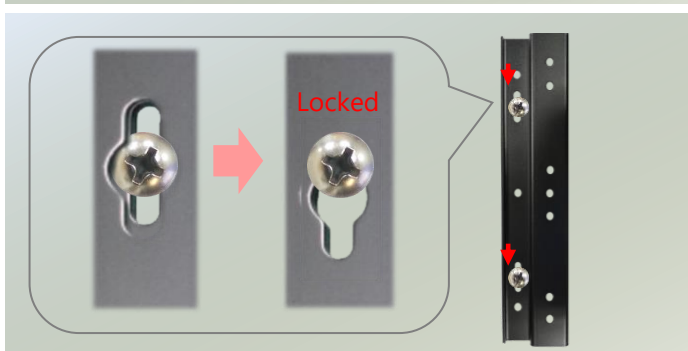
NOTE: *The demonstrated screw type can fit in general drywall or shelves. Please identify the wall type and select the suitable fixing approach to secure this system to the wall, and consult a qualified trained person if you are unsure.*



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



4. Align the four screw holes on the system's wall brackets with the four long screws you just installed on the wall.
5. 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 is a firmware embedded on an exclusive chip on the system's motherboard. Lanner's BIOS firmware offering including market-proven technologies such as Secure Boot and Intel Boot Guard technology deliver solid commitments for the shield protection against malware, uncertified sequences, and other named cyber threats.

Main Page Setup

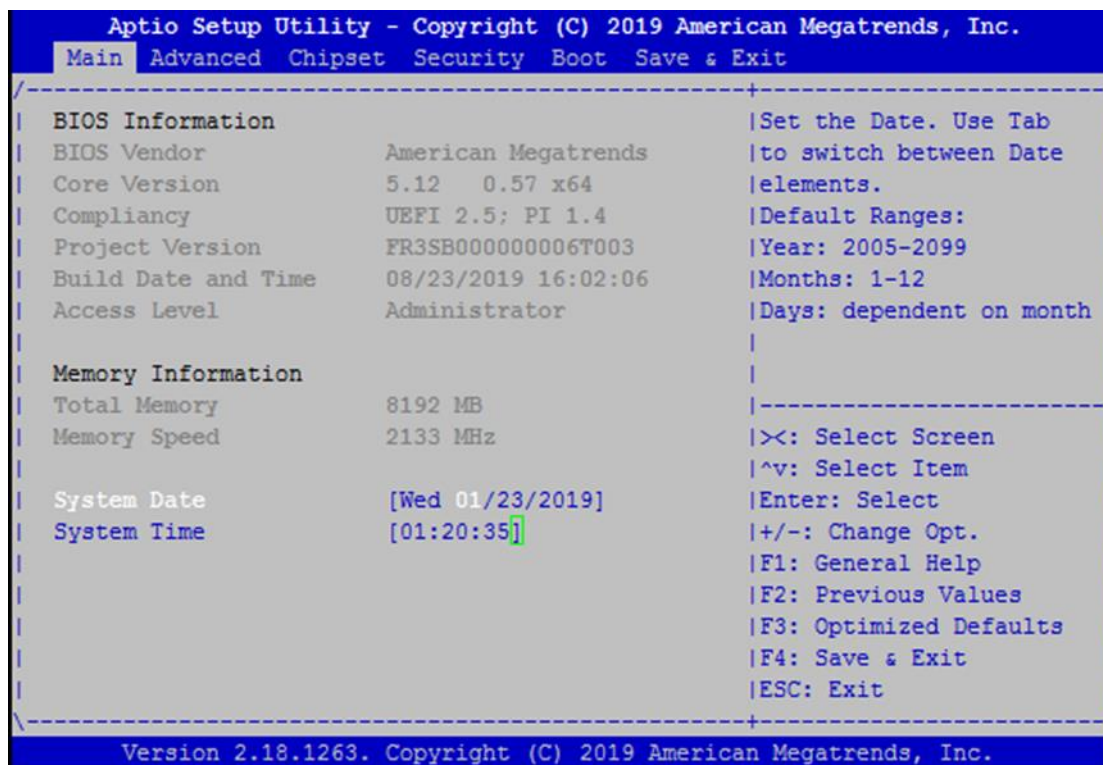
To enter the BIOS setup utility, simply follow the steps below:

1. Boot up the system.
2. Pressing the **<Esc>** or **** key immediately allows you to enter the Setup utility, and 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

Main Page

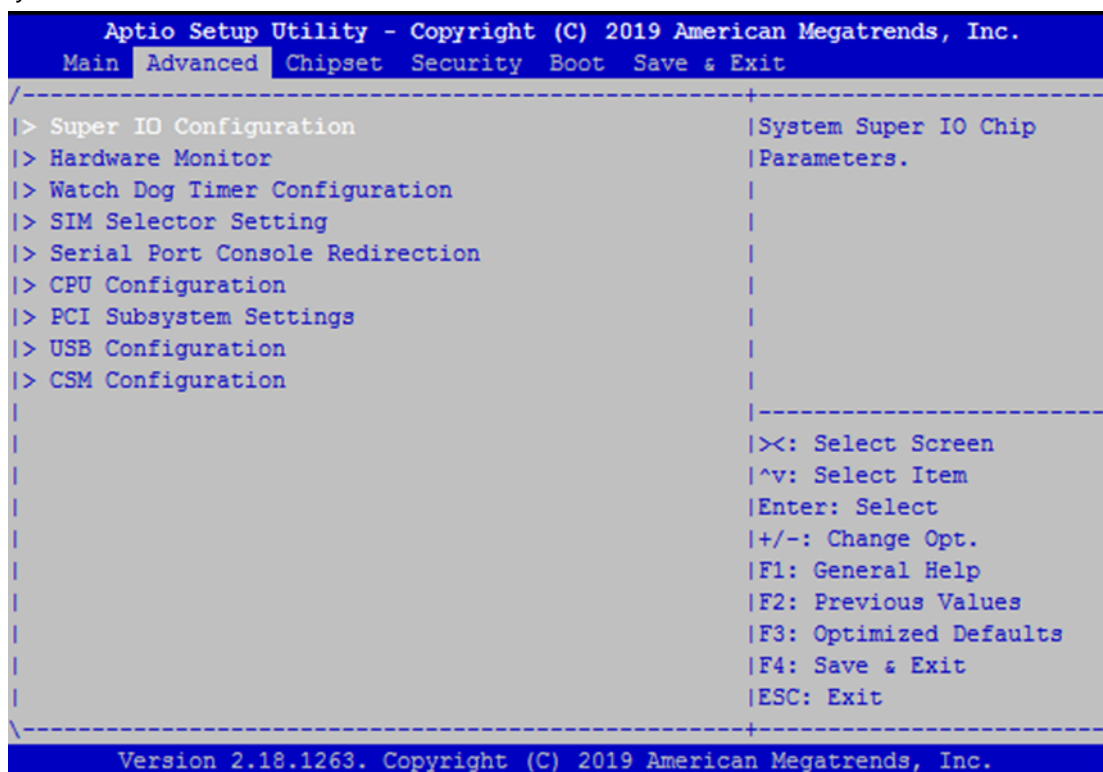
Setup main page contains BIOS information and project version information.



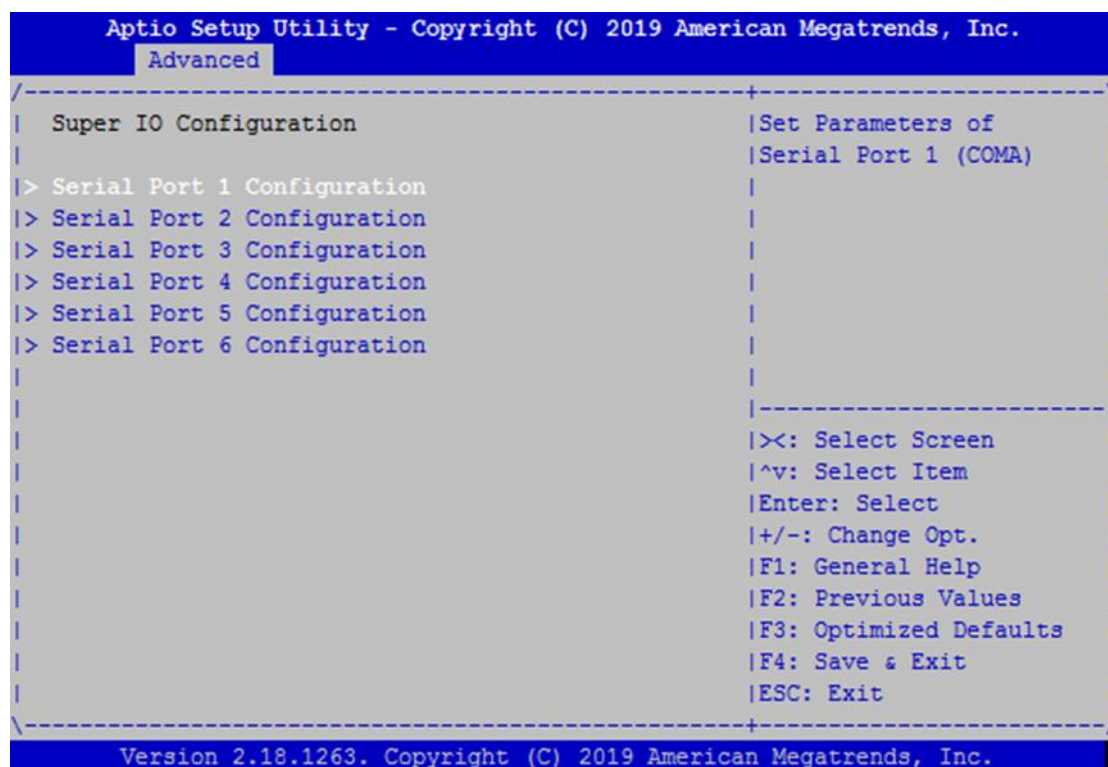
Feature	Description
BIOS Information	BIOS Vendor: American Megatrends Core Version: AMI Kernel version, CRB code base, X64 Compliance: UEFI version, PI version Project Version: BIOS release version Build Date and Time: MM/DD/YYYY Access Level: Administrator / User
System Date	To set the Date, use <Tab> to switch between Date elements. Default Range of Year: 2005-2099 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

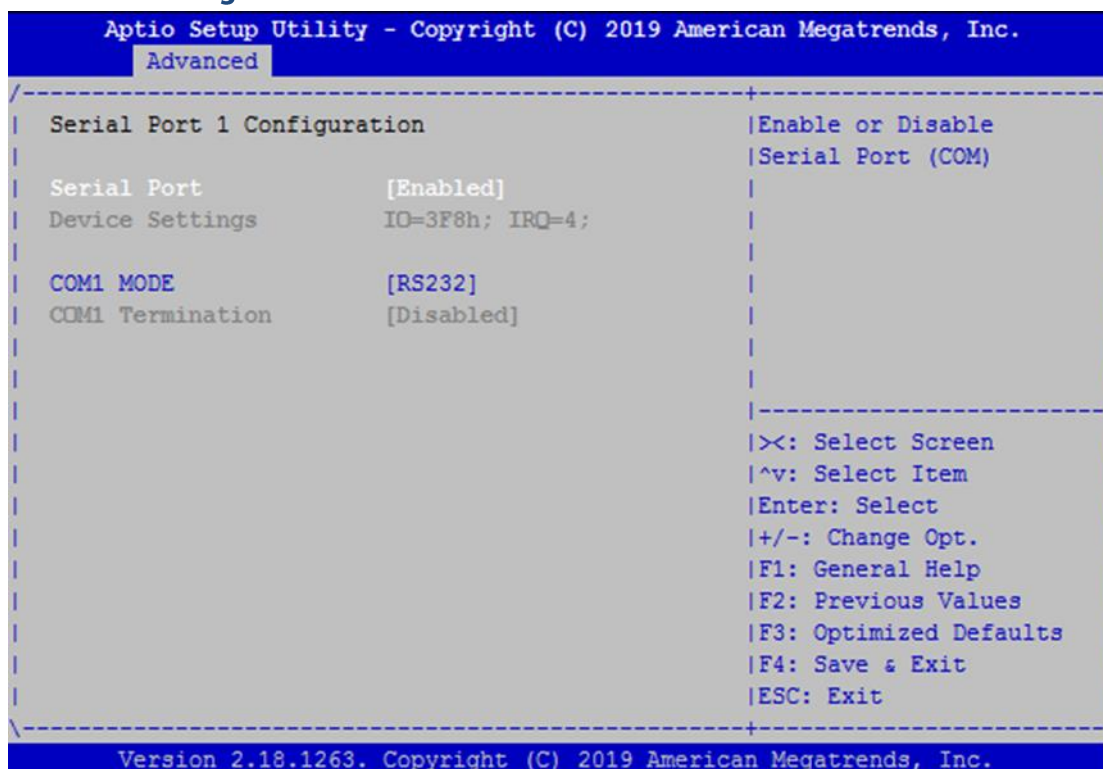
Select the **Advanced** menu item from the BIOS setup screen to enter the "Advanced" setup screen. Users can select any of the items in the left frame of the screen.



Super IO Configuration

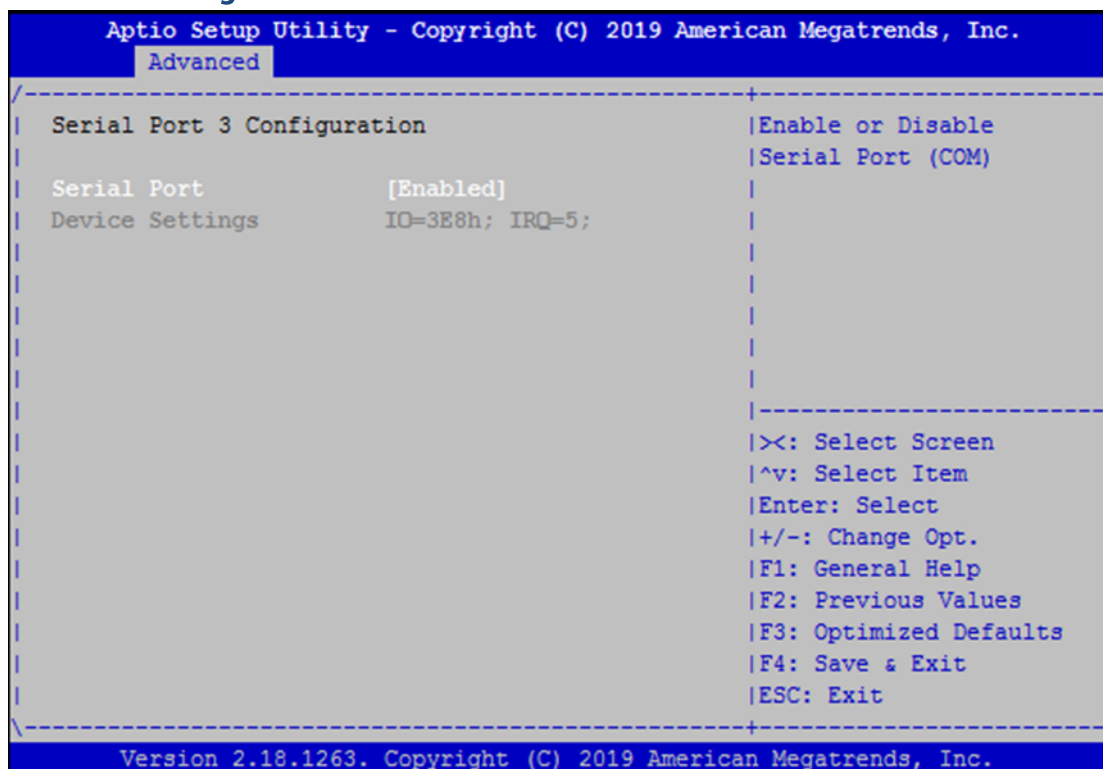


Serial Port 1 ~ 2 Configuration



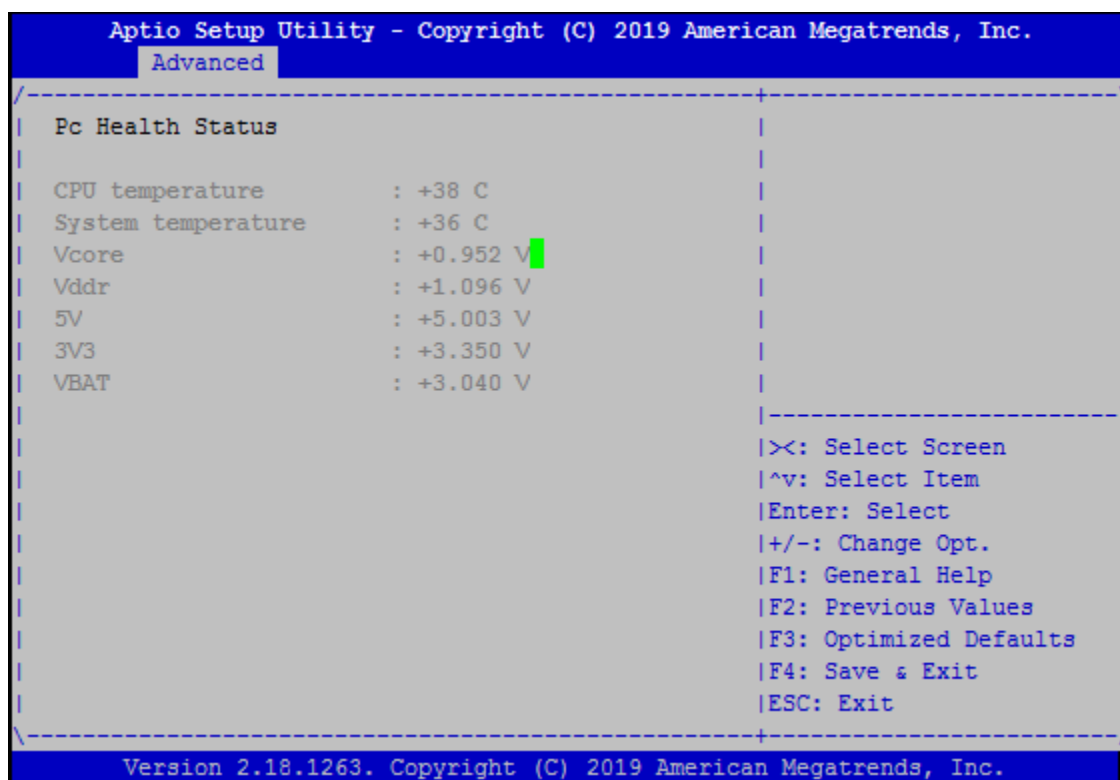
Feature	Options	Description
Serial Port	Enabled Disabled	Enables or disables Serial Port 1.
Device Settings	NA	IO=3F8h; IRQ = 4 → Serial Port 1 IO=2F8h; IRQ = 11 → Serial Port 2
COM mode	RS232 RS485 RS422	Configure COM port mode.

Serial Port 3 ~ 6 Configuration



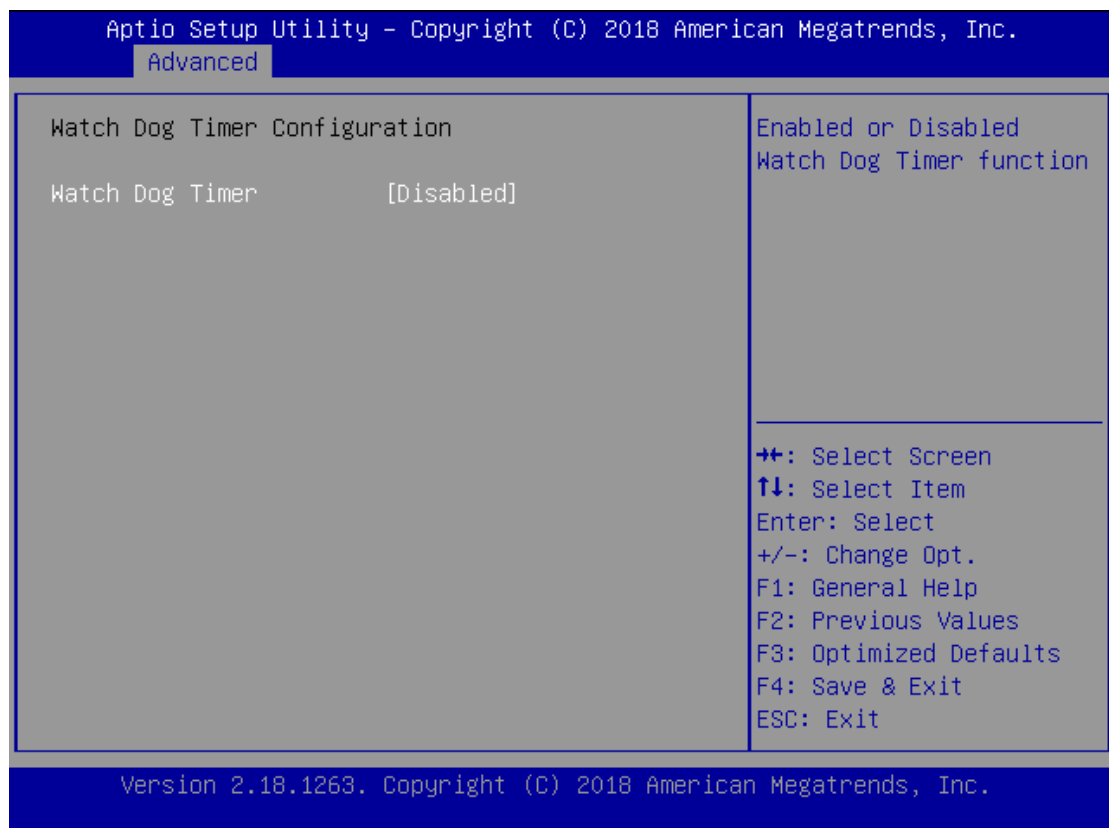
Feature	Options	Description
Serial Port	Enabled Disabled	Enables or disables Serial Port 3 ~ 6.
Device Settings	NA	Assigned to IO=3E8h; IRQ = 5

■ Hardware Monitor



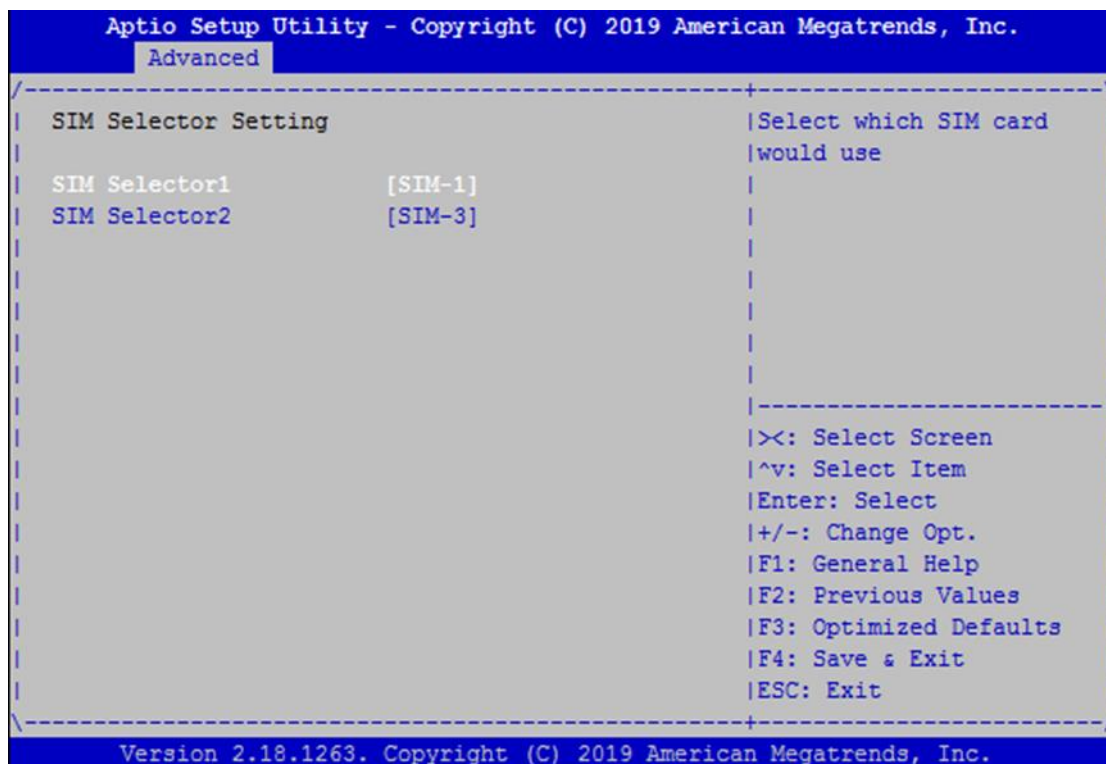
Feature	Description
CPU Temp	This value reports the CPU temperature.
SYS Temp	This value reports the System temperature.
VCORE	This value reports the CPU VCORE.
Vddr	This value reports the Vddr.
VBAT	This value reports the VBAT Input voltage.
5V	This value reports the 5V Input voltage.
3V3	This value reports the 3.3V Input voltage.

■ Watch Dog Timer Configuration



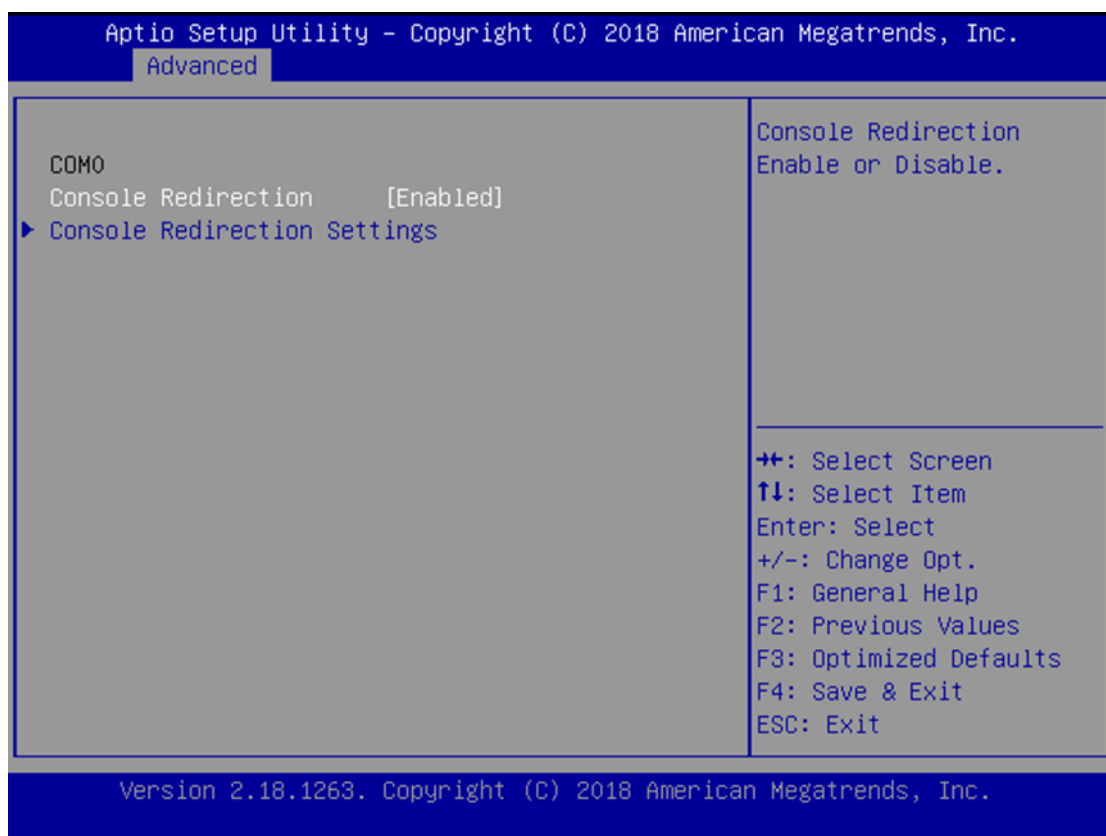
Feature	Options	Description
Watch Dog Timer	Enabled Disabled	Enable or Disable Watch Dog function
Timer Count Mode	Second Mode Minute Mode	Select Second Mode or Minute Mode
Timer out Value	60	Watch Dog Timer out Value 0-255

■ SIM Selector Setting



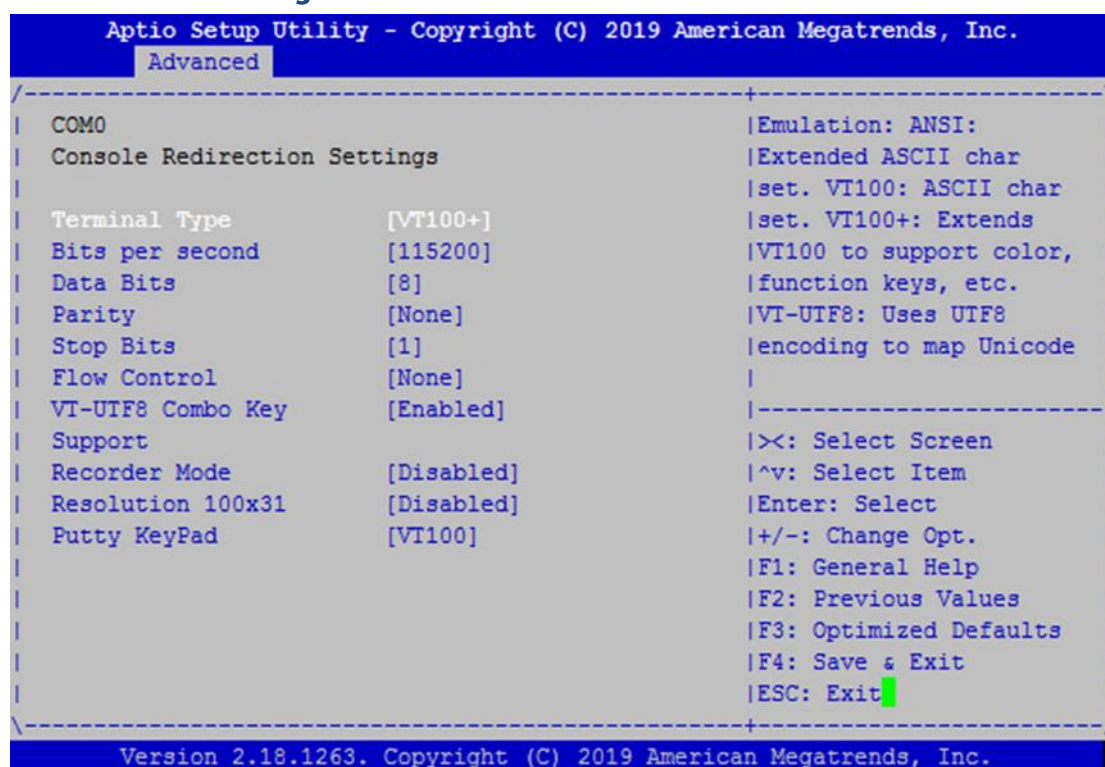
Feature	Options	Description
SIM Selector1	SIM-1 SIM-2	Select which SIM card would use
SIM Selector2	SIM-3 SIM-4	Select which SIM card would use

■ Serial Port Console Redirection



Feature	Options	Description
COM0 Console Redirection	Enabled Disabled	Console Redirection Enable or Disable.

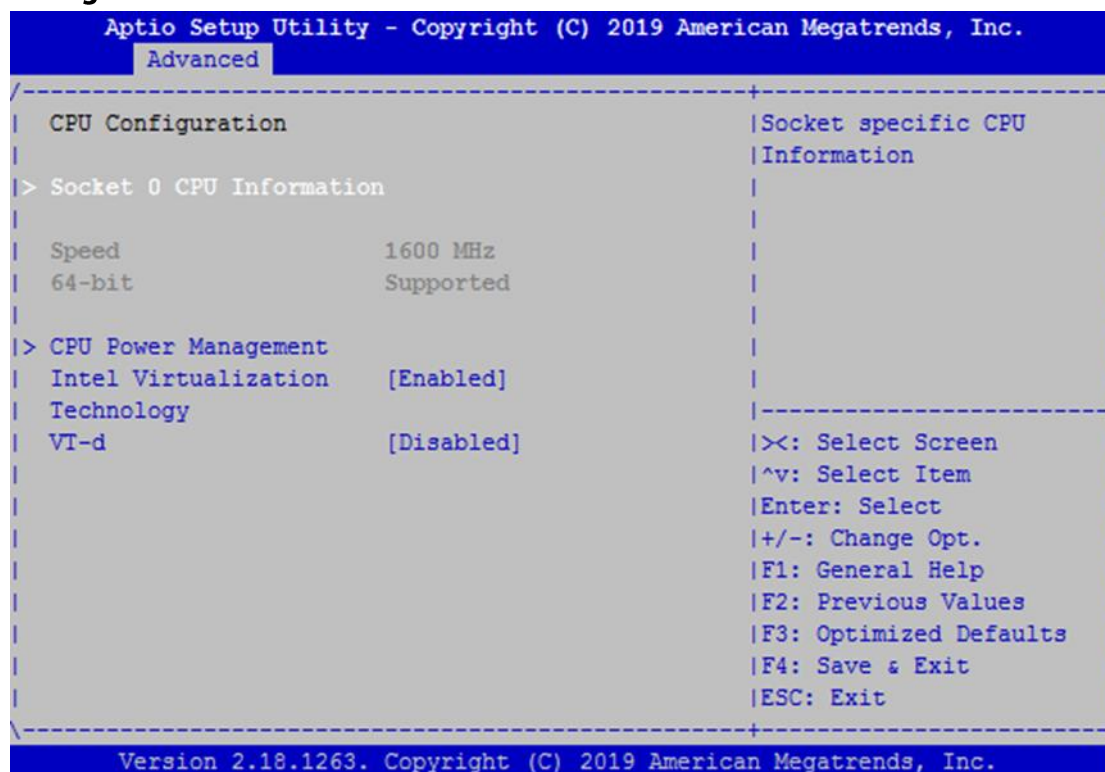
Console Redirection Setting



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

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 XTERM86 SCO ESCN VT400	Select FunctionKey and KeyPad on Putty.

■ CPU Configuration

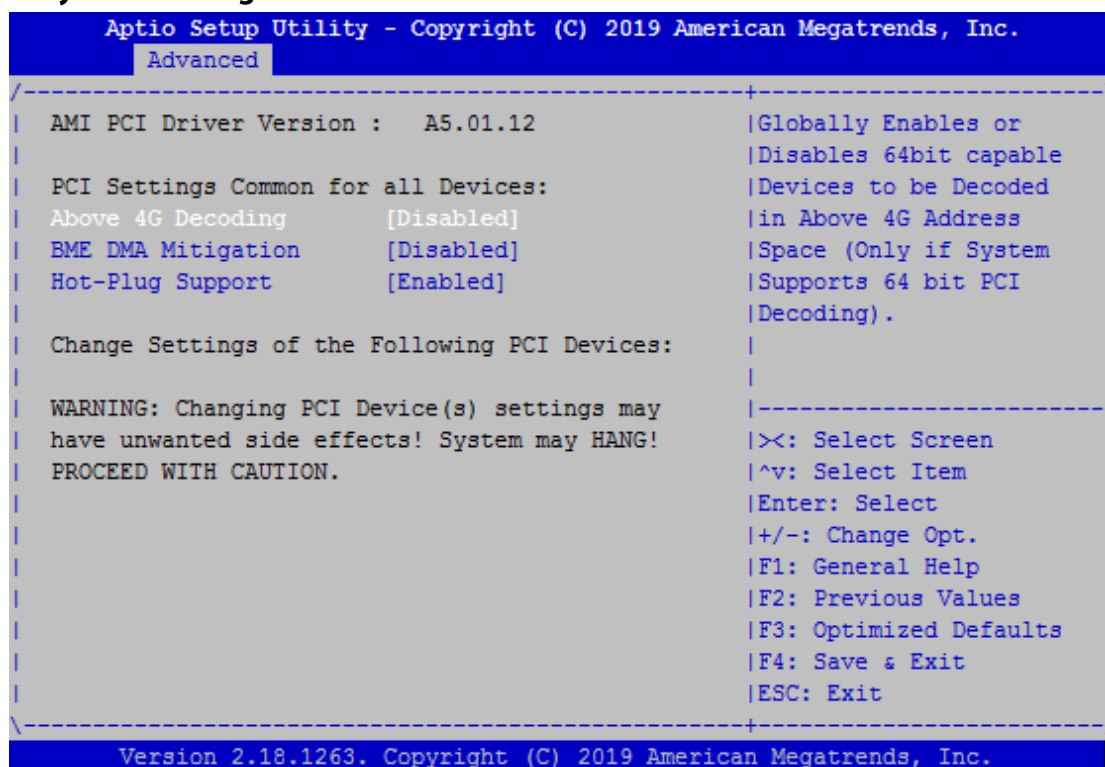


Feature	Options	Description
Intel Virtualization Technology	Disabled Enabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology
VT-d	Disabled Enabled	Enable/Disable CPU VT-d

Socket 0 CPU Information

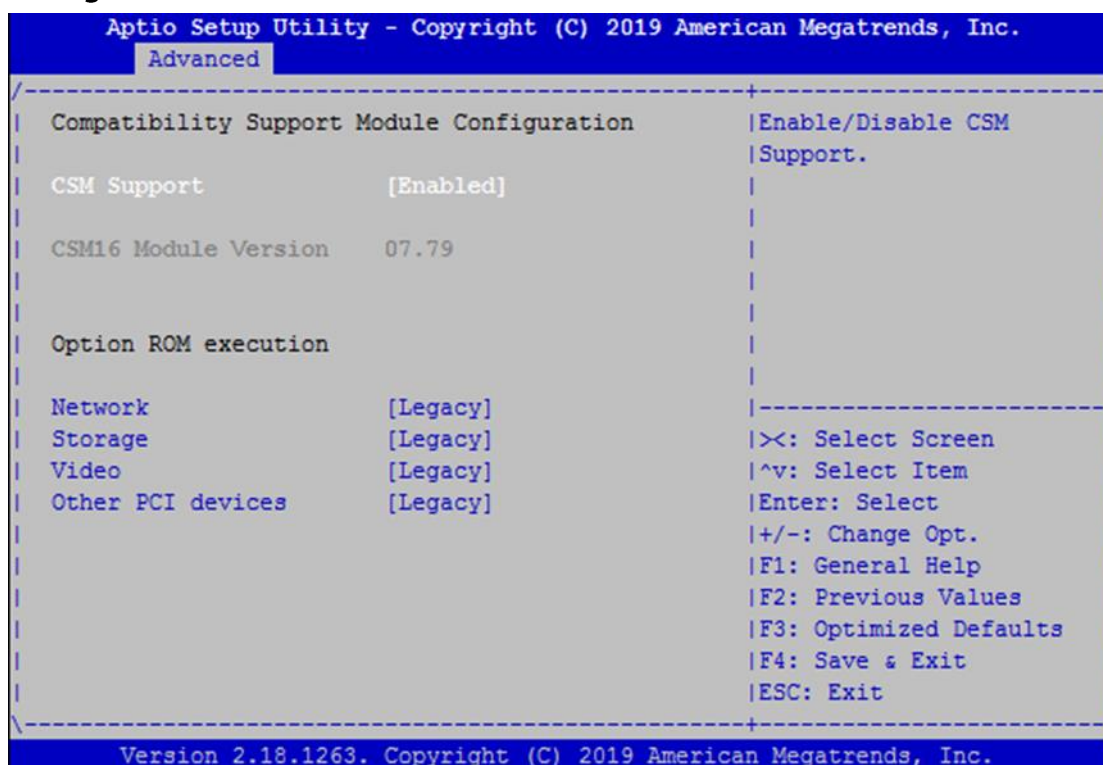
Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.		
Advanced		
-----+-----		
Socket 0 CPU Information		
Intel(R) Atom(TM) Processor E3950 @ 1.60GHz		
CPU Signature	506CA	
Microcode Patch	16	
Max CPU Speed	1600 MHz	
Min CPU Speed	800 MHz	
Processor Cores	4	
Intel HT Technology	Not Supported	
Intel VT-x Technology	Supported	
		-----+-----
L1 Data Cache	24 kB x 4	>: Select Screen
L1 Code Cache	32 kB x 4	^v: Select Item
L2 Cache	1024 kB x 2	Enter: Select
L3 Cache	Not Present	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit
-----+-----		
Version 2.18.1263. Copyright (C) 2019 American Megatrends, Inc.		

■ PCI Subsystem Settings



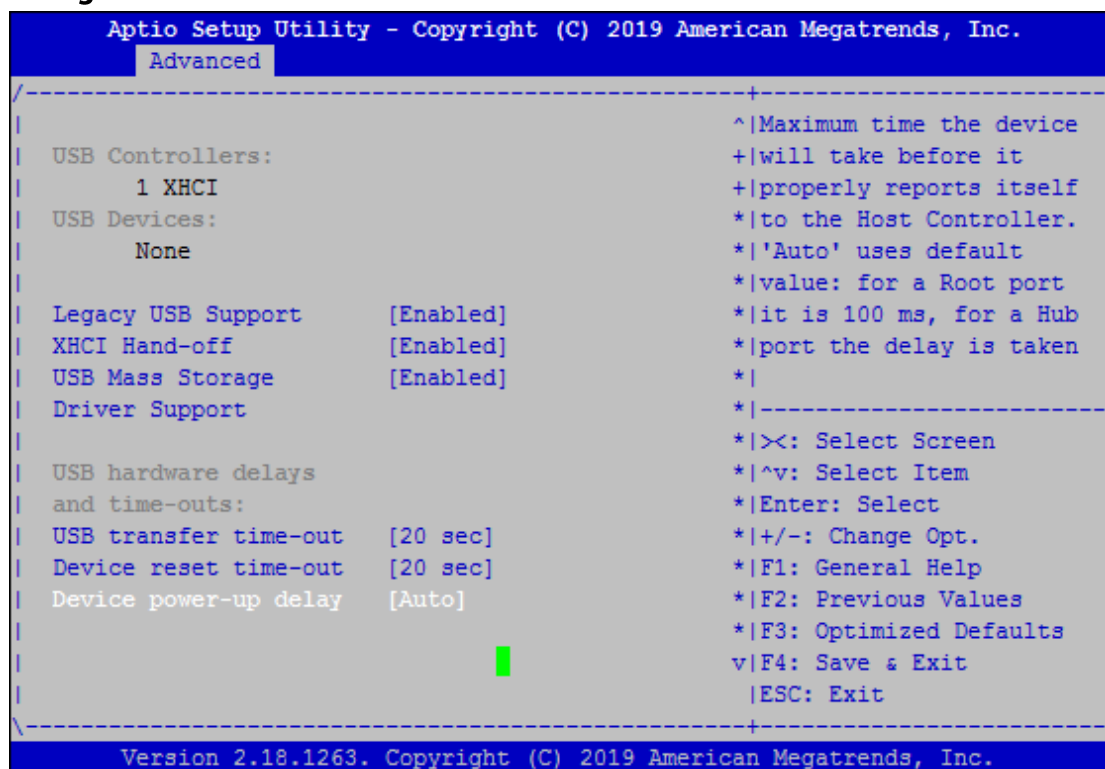
Feature	Options	Description
Above 4G Decoding	Disabled Enabled	Globally Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).
BME DMA Mitigation	Disabled Enabled	Re-enable Bus Master Attribute disabled during PCI enumeration for PCI bridge after SMM Locked.
Hot-Plug Support	Enabled Disabled	Globally Enables or Disables Hot-Plug support for the entire System. If System has Hot-Plug capable Slots and this option set to Enabled, it provides a Setup screen for selecting PCI resource padding for Hot-Plug.

■ CSM Configuration



Feature	Options	Description
CSM Support	Disabled Enabled	Enables or disables CSM Support
Network	Do Not Launch UEFI Legacy	Controls the execution of UEFI and Legacy PXE OpROM
Storage	Do Not Launch UEFI Legacy	Controls the execution of UEFI and Legacy Storage OpROM
Video	Do Not Launch UEFI Legacy	Controls the execution of UEFI and Legacy Video OpROM
Other PCI device	Do Not Launch UEFI Legacy	Determines OpROM execution policy for devices other than Network, Storage, or Video

■ 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	Enabled Disabled	Enables or disables 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	1 sec 5 sec 10 sec 20 sec	USB mass storage device Start Unit command time-out

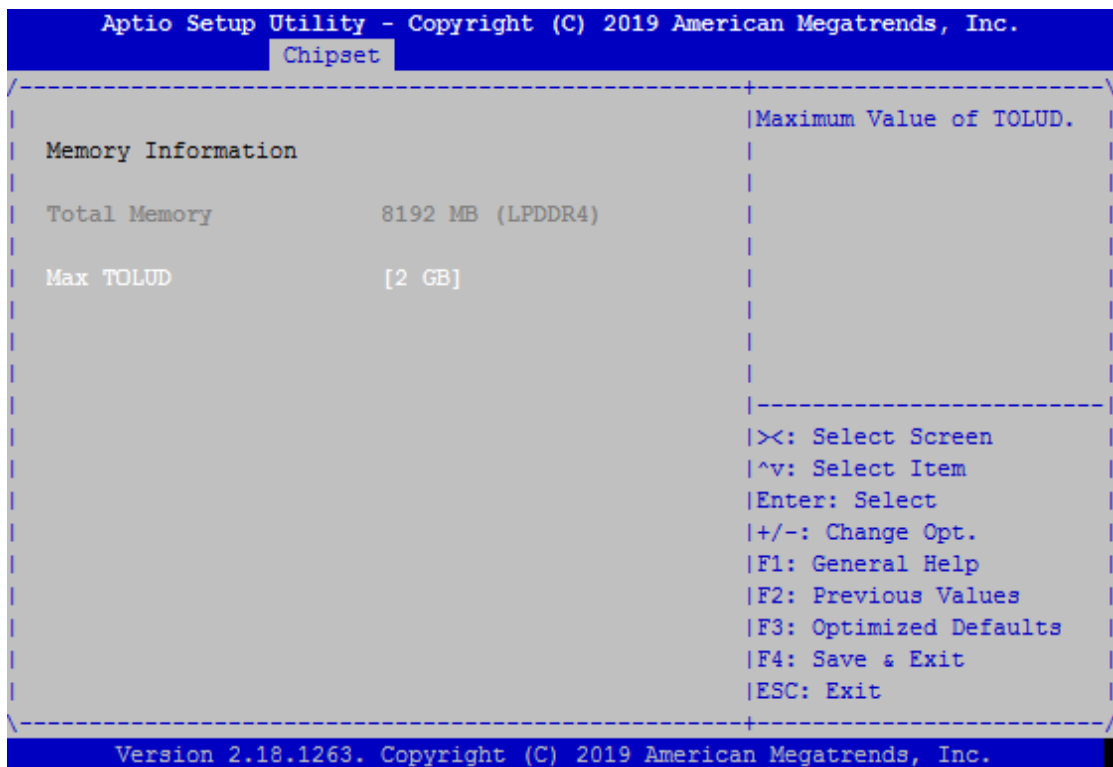
Device power-up delay	Auto Manual	Maximum time the device will take before it properly reports itself to the Host Controller. Auto uses default value: for a Root port, it is 100 ms, for a Hub port the delay is taken from Hub descriptor.
--------------------------	-----------------------	---

IntelRCSetup

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



■ North Bridge



Feature	Options	Description
Max TOLUD	2 GB 2.25 GB 2.5 GB 2.75 GB 3 GB	Maximum Value of TOLUD.

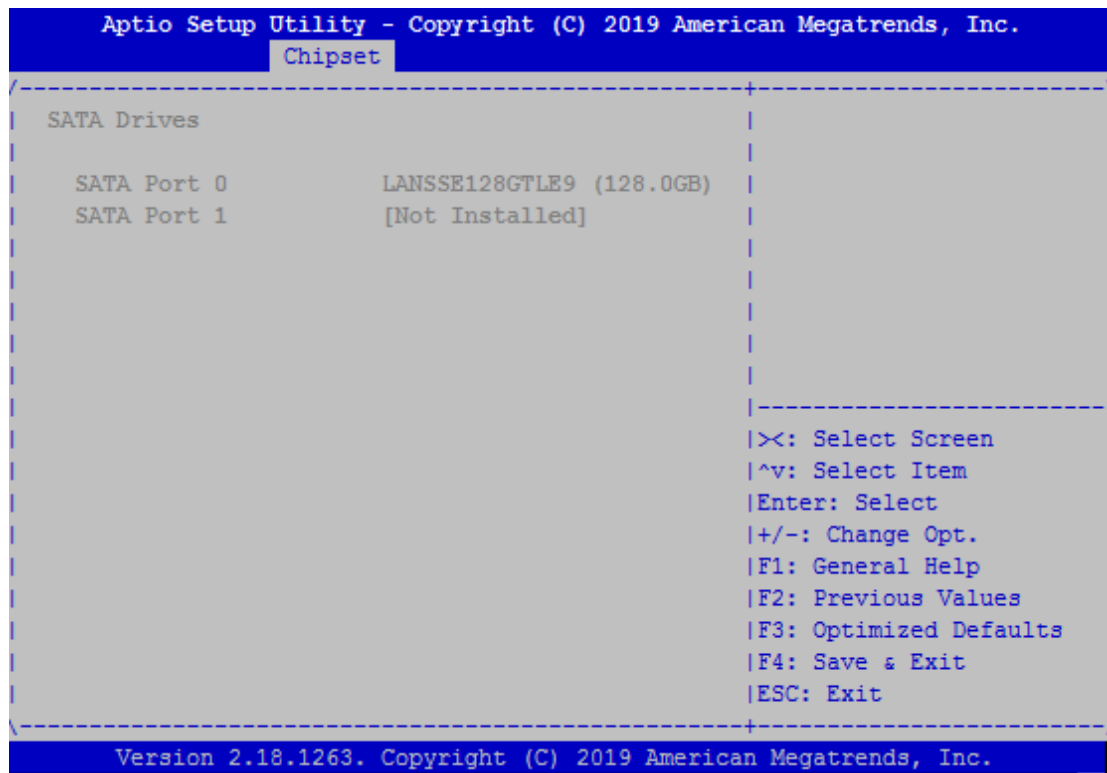
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■ South Bridge



Feature	Options	Description
OS Selection	Windows Android Win7 Intel Linux	Select the target OS

■ South Cluster Configuration



Security

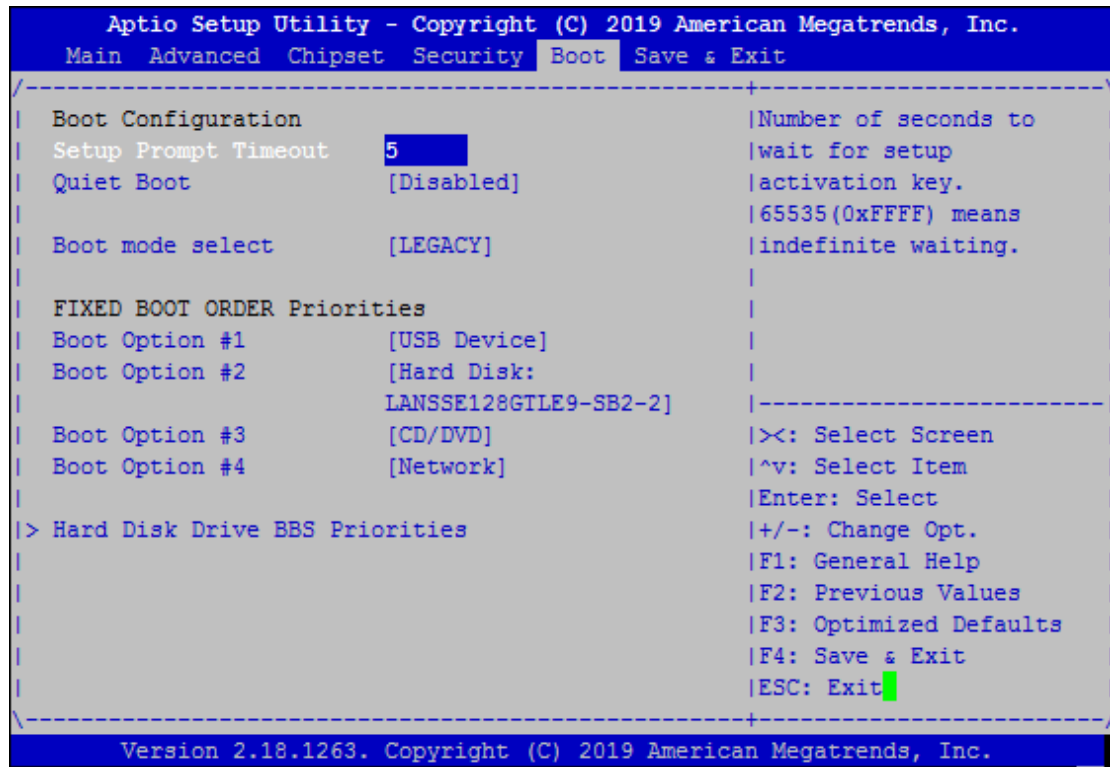
Select the Security menu item from the BIOS setup screen to enter the Security Setup screen. Users can select any of the items in the left frame of the screen.



Feature	Description
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.

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.

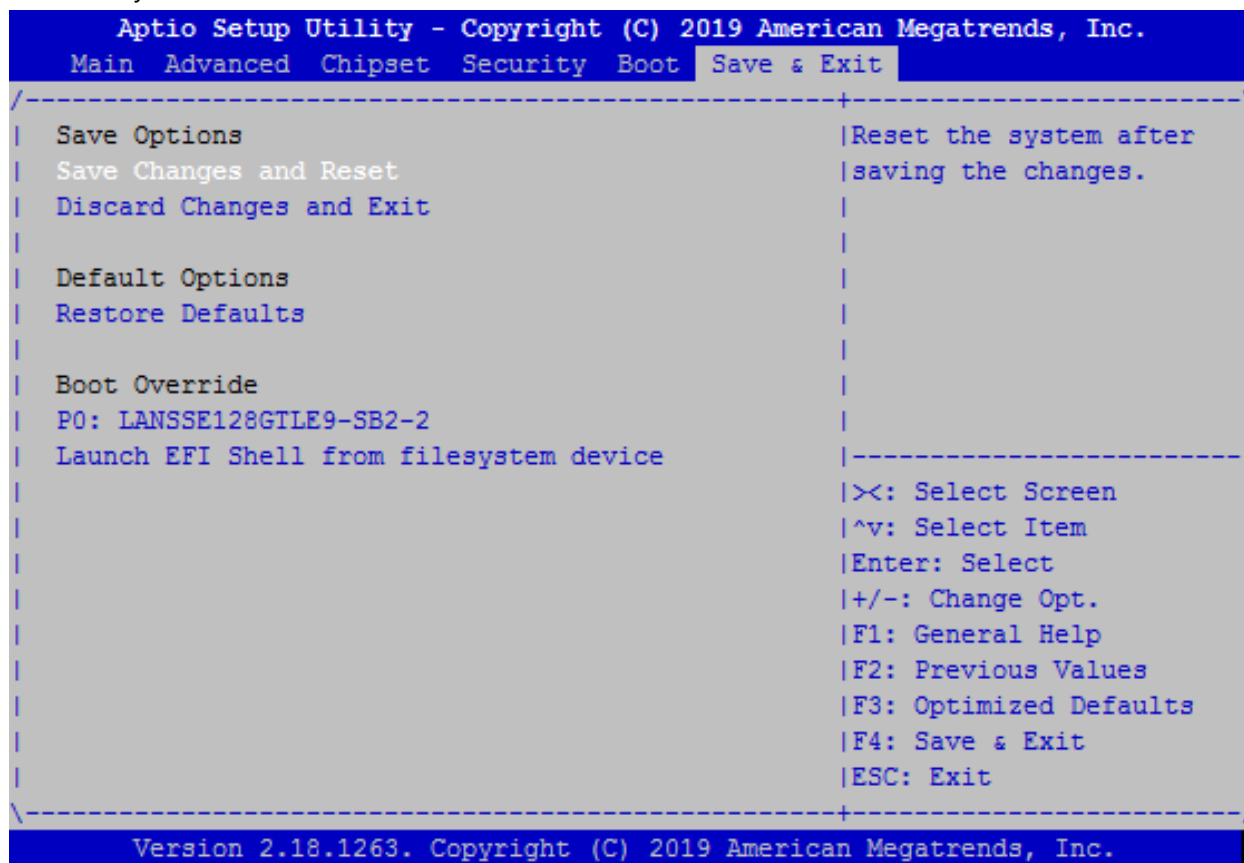


Feature	Options	Description
Setup Prompt Timeout	5	The number of seconds to wait for setup activation key. 65535 means indefinite waiting.
Bootup NumLock State	On Off	Select the keyboard NumLock state
Quiet Boot	Disabled Enabled	Enables or disables Quiet Boot option.
Boot mode select	LEGACY UEFI DUAL	Select boot mode for LEGACY or UEFI.

- Choose boot priority from boot option group.
- Choose specifies boot device priority sequence from available Group device.

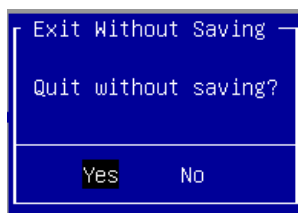
Save and Exit Menu

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.



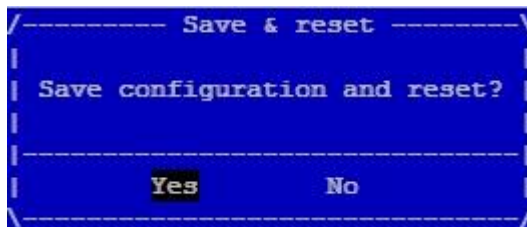
■ Discard Changes and Exit

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.



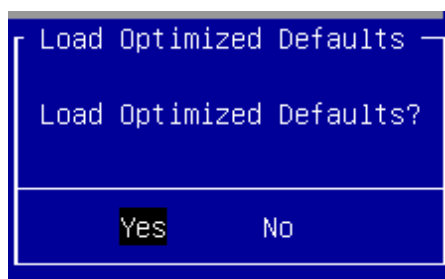
■ Save Changes and Reset

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.



PS: The items under Boot Override may not be the same image. The image will depend on the devices connected to the system.

APPENDIX A: LED INDICATOR EXPLANATIONS



LED	COLOR	LED ACTION	DESCRIPTION
Storage	Amber	Blinking	Data Access Successful
	OFF	N/A	No Activity
Power	Green	Steady	System On
	OFF	N/A	System Off
LNK / ACT (LED1~ LED6)	Green	Steady	100M Link Successful
	Amber	Steady	1G Link Successful
	OFF	N/A	10M/No Connection
Speed (LED1~ LED6)	Amber	Steady	Link Successful
	Amber	Blinking	Active
	OFF	N/A	No Activity

APPENDIX B: TERMS AND CONDITIONS

Warranty Policy

1. All products are under warranty against defects in materials and workmanship for a period of 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 reverse engineering of the product
 - ▶ Operation outside of the environmental specifications for the product.

RMA Service

Requesting an RMA#

1. To obtain an RMA number, simply 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: <input type="checkbox"/> Repair (Please describe failure details) <input type="checkbox"/> Testing Purpose
Company:	Contact Person:
Phone No.	Purchased Date:
Fax No.:	Apply Date:
Return Shipping Address: _____	
Shipping by: <input type="checkbox"/> Air Freight <input type="checkbox"/> Sea <input type="checkbox"/> Express: _____ <input type="checkbox"/> Others: _____	

Item	GP	Model Name	Serial Number	Configuration

Item	Problem Code	Failure Status

*Problem Code:

01:D.O.A.
 02: Second Time R.M.A.
 03: CMOS Data Lost
 04: FDC Fail
 05: HDC Fail
 06: Bad Slot

07: BIOS Problem
 08: Keyboard Controller Fail
 09: Cache RMA Problem
 10: Memory Socket Bad
 11: Hang Up Software
 12: Appearance Damage

13: SCSI
 14: LPT Port
 15: PS2
 16: LAN
 17: COM Port
 18: Watchdog Timer

19: DIO
 20: Buzzer
 21: Shut Down
 22: Panel Fail
 23: CRT Fail
 24: Others (Pls specify)

Requested by

Confirmed by supplier

Authorized Signature / Date

Authorized Signature / Date