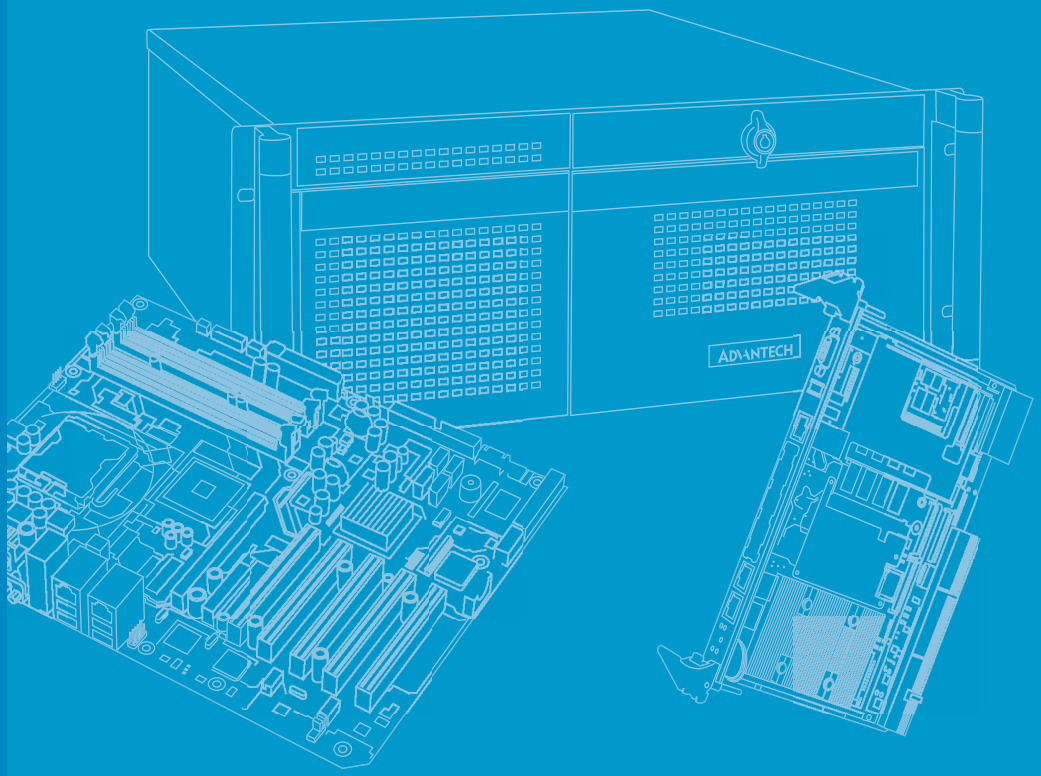

User Manual

MIC-330

3U CompactPCI® Serial with Intel® 9th Gen. Processor Blade

ADVANTECH

Enabling an Intelligent Planet

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Acknowledgments

Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandize authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

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Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this event, users are required to correct the interference at their own expense.

FM

This equipment has passed FM certification. According to the National Fire Protection Association, work sites are categorized into different classes, divisions, and groups based on hazard considerations. This equipment is compliant with the specifications for Class I, Division 2, Groups A, B, C, and D indoor hazards.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions that if not observed can cause personal injury!*

Caution! *Cautions are included to help prevent hardware damage and data losses. For example,*

"Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions."

Note! *Notes provide additional optional information.*

Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all feedback in writing to support@advantech.com.

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

- MIC-330 all-in-one single board computer (CPU heatsink included) x1

Ordering Information

System board	Front Panel					Onboard Features					Others	
	4HP			8HP								
	LAN (RJ45)	USB 3.0	DP(1)	LAN (M12)	COM(2)	CPU	Memory OnBoard	So-DIMM Socket	ECC(3)	SATA (M.2)	Width	GbE Signal To P6 Conn.
MIC-330-A1S1	2	2	2	-	-	i7-9850HL	16GB	-	No	2	4HP	2
MIC-330-A2D1	2	2	2	-	-	i7-9850HL	16GB	Yes	No	2	8HP	2
MIC-330-A3D1	2	2	2	2	1	i7-9850HL	16GB	Yes	No	1	8HP	max 5(4)
MIC-330-B1D1	2	2	2	2	1	E-2276ML	16GB	Yes	Yes	1	8HP	max 5(4)

Note: (1) Reserved 1x VGA function on M-1 board to replace the original 2x DP, Available per request.
(2) DB9 COM port by cable from on board pin head, RS232/422/485 support.
(3) Corei3 with ECC support are available per request.
(4) Among 5 GbE Signals to P6, 2 GbE switched with 2x GbE LAN to front 8HP.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -40° C (-40° F) or above 85 °C (185 °F) as this may damage the components. The equipment should be kept in a controlled environment.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precautions - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
- Disconnect the power before making any configuration changes. A sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.

We Appreciate Your Input

Please let us know of any aspect of this product, including the manual, which could use improvement or correction. We appreciate your valuable input in helping make our products better.

Contents

Chapter 1

Hardware Configuration

This chapter describes how to configure MIC-330 hardware.

1.1 Introduction

The Advantech MIC-330 series, powered by Intel® 9th Generation Mobile Xeon® or Core™ processors, delivers exceptional performance and power efficiency. This 3U CompactPCI® serial processor blade features a 6-core/12-thread Core™ i7 and Xeon® processor, supported by an Intel® CM246 PCH. It offers dual-channel 32GB DDR4-2666 memory, with 16GB onboard for rugged applications and an additional 16GB available through a SO-DIMM socket for expansion.

For onboard mass storage, the MIC-330 series includes a low-profile mezzanine expansion card that accommodates one or two 2280 M.2 style sockets with high-speed SATAIII. The front I/O of the host board is equipped with two Gigabit Ethernet ports, two USB 3.0 ports, and two DisplayPort connectors. An alternative option includes one VGA port, available on the configuration-one mezzanine card (M-1). The configuration-two mezzanine card (M-2) provides additional connectivity with two M12 X-code GbE, one DB9 non-isolated COM port, Fe-RAM function, and a reserved super capacitor per user request.

The MIC-330 series supports high-speed I/O resources, including up to 2 PCIe x8, 2 PCIe x4, 2 PCIe x1, 8 USB 2.0, 3 USB 3.0, 4 SATA, and 2 or 3 GbE, all accessible through the CompactPCI® Serial backplane for peripheral expansion such as storage, graphics, and Ethernet. The board features a 4HP height heatsink and supports up to 16GB onboard memory. There is also an 8HP height heatsink option with an 8HP height front panel for SO-DIMM extension, allowing up to 32GB of memory.

Designed with excellent thermal and EMC performance, the MIC-330 series is suitable for harsh environments, making it an ideal solution for railway rolling stock and high-performance computing applications.

1.2 Specifications

1.2.1 Key Features Summary

- PICMG® CompactPCI® Serial (CPCI-S.0) CPU card
- **Form factor:** single size Eurocard (board dimensions 100x160mm)
- **Mounting height:** 3U
- **Front panel width:** 4HP or 8HP (8HP assembly with optional mezzanine side card)
- **Front panel I/O (M-1):** 2 x USB3.0, 2 x DisplayPort, 2 x GbE (RJ45) on mezzanine side card 1 with 4HP or 8HP height panel depends on SO-DIMM support
- **Front panel I/O (M-2):** 2 x USB3.0, 2 x DisplayPort, 2 x GbE (RJ45), 2 x GbE (M12 X-code), 1 x DB9 COM port (Non-isolated) on mezzanine side card 2 (M-2)
- Backplane communication via PCI Express® Gen3, SATA Gen3, USB 2.0/3.0, Gigabit Ethernet
- Local Mezzanine expansion option

1.2.2 Processor

Intel® 9th Generation Mobile Xeon®/Core™ processor with CM246 PCH platform. Please find detailed info. for Xeon/Core i3/i7 processor configurations as below:

Table 1.1: Processor Type

Intel CPU Model Number	# Cores	# Threads	Base Freq.	Max Turbo Frequency	Cache	TDP	TDP Configure Down	Package Size	ECC Memory Supported
Core i7-9850HL	6	12	1.9GHz	4.1GHz	9MB	25W	NA	42*28mm	No
Core i7-9850HE	6	12	2.7GHz	4.4GHz	9MB	45W	35W	42*28mm	No
Core i3-9100HL	4	4	1.6GHz	2.9GHz	6MB	25W	NA	42*28mm	Yes
Xeon® E-2276ML	6	12	2GHz	4.2GHz	12MB	25W	NA	42*28mm	Yes
Xeon® E-2276ME	**6**	12	2.8GHz	4.5GHz	12MB	45W	35W	42*28mm	Yes

Note! *Because power consumption and thermal restrictions vary between different CompactPCI-Serial systems, please double check these items before installing a higher speed CPU not listed in the table above.*

1.2.3 Chipset

The mobile Intel® CM246 chipset provides excellent flexibility for developers of embedded applications by offering I/O bandwidth over previous Intel chipsets, which offers up to 8 GT/s for fast access to peripheral devices. It delivers outstanding system performance through high bandwidth interfaces such as PCI Express Gen III(8GT/s), Serial ATA Gen III(6GT/s) and Hi-Speed USB 3.0 and USB 2.0.

1.2.4 Memory

Integrated memory controller up to dual channel, 32GB/2666MHz frequency support.

- DDR4 soldered memory up to 16GB
- Another ECC SO-DIMM memory module socket up to 16GB, total 32GB on a single board

The following table lists the SO-DIMM modules that have been tested with MIC-330.

Table 1.2: So-DIMM Modules Type

Brand	Size	Speed	Vendor Part Number	ECC	Pin Count
Advantech	8GB	DDR4-2666	AQD-SD4U8GE26-SE	ECC	260 pin
Advantech	16GB	DDR4-2666	AQD-SD4U16E26-SE	ECC	260 pin
Kingston	4GB	DDR4-2400	4GB DDR4 2400 SO-DIMM_ KVR24S17S6/4	Non-ECC	260 pin
Micron	4GB	DDR4-2666	4GB DDR4 2666 SO-DIMM 1RX16 MTA4ATF51264HZ-2G6E1	Non-ECC	260 pin
Kingston	16GB	DDR4-2666	16GB DDR4 2666_ CBD26D4S9D8ME	Non-ECC	260 pin
Micron	8GB	DDR4-3200	8G DDR4 3200 MTA8ATF1G 64HZ-3G2J1 1RX8	Non-ECC	260 pin
Kingston	16GB	DDR4-3200	16G DDR4 3200 CBD32D4 S2S8HA-16	Non-ECC	260 pin

Note! *ECC support is optional on different processor spec. Please consult your local sales.*

1.2.5 Graphics

Integrated graphics engine with max 3 independent displays in processor

- **Front panel options:** Default 2 x DisplayPort (DP) connectors or 1 x VGA connector (reserved on M-1), per use request
- **Resolution:**
  - 4096 x 2304 @30Hz (DisplayPort) with E-2276ME/E-2276ML CPU
  - 4096 x 2304 @60Hz (DisplayPort) with Core i7-9850HL/i7-9850HE/i3-9100HL CPU
  - 1920 × 1080 @60Hz (VGA)

1.2.6 Ethernet

MIC-330 is equipped with several high-performance PCI-Express based network interface controllers which provide full IEEE802.3 compliant 10/100/1000Base-TX Ethernet interfaces.

- Up to 7 Ethernet networking interfaces in total.
- 2 x front RJ45 GbE, 2 x GbE interfaces to backplane P6 on M-1 side card (4HP front panel width).
- 2 x front RJ45 GbE, 2 x M12 X-code GbE, 3 x GbE interfaces to backplane P6 on M-2 side card (2x M12 X-code GbE on front 8HP can switch to 2 x GbE interfaces to backplane P6).

1.2.7 Storage Interface

MIC-330 provides up to 6 SATA III interfaces in total.

- 2 x on board 2280 SATA M.2 socket on M-1 side card.
- 1 x on board 2280 SATA M.2 socket on M-2 side card.
- 4 x SATA 3.0 interfaces to backplane.

The following tables list the 2280 SATA M.2 modules & 2.5" SATA devices that have been tested with MIC-330:

Table 1.3: 2280 SATA M.2 Modules

Vendor	Vendor PN	Advantech PN
ADVANTECH	SQF-SM8V2-128G-SBE	SQF-SM8V2-128G-SBE
ADVANTECH	SQF-SM8V1-64G-SBE	SQF-SM8V1-64G-SBE

Table 1.4: 2.5” SATA Device, Assembled in MIC-3820 SATA Carrier Board

Vendor	Vendor PN	Advantech PN
WD	WD5000LPZX	96ND500G-ST-WD5KG1
WD	WD7500BPVX-22JC3T0	96ND750G-ST-WD5K1
Seagate	ST500VT003	96ND500G-ST-SG5KA1
Seagate	ST2000LM007	96ND2TB-ST-SG5KG1
Seagate	ST1000LM014-1EJ164	96ND1TB-ST-SG5K
Toshiba	MQ01ABF032	XELO-MQ01ABF032
Toshiba	MK6476GSX SL01	96ND640G-ST-TO5K
ADVANTECH	SQF-S25M4-64G-S9C	SQF-S25M4-64G-S9C
ADVANTECH	SQF-S25M8-128G-SAC	SQF-S25M8-128G-SAC
ADVANTECH	SQF-S25S8-512G-S8C	SQF-S25S8-512G-S8C
ADVANTECH	SQF-S25M4-256G-SBC	SQF-S25M4-256G-SBC
Plextor	PX-256G5Se	96FD25-S256-PLG

1.2.8 Serial Port

MIC-330 provides 1xDB9 COM port on front panel of M-2 side card, by cable connecting with pin header on board, the COM port can support RS232/422/485 mode, here especial note that this COM port is without isolated protection.

1.2.9 USB Ports

MIC-330 provides up to 4 x USB 3.0 and 8 x USB 2.0 interfaces in total.

- 2 x USB 2.0/3.0 type A ports to front panel
- 2 x USB 3.0 and 8 x USB2.0 interfaces to backplane

1.2.10 Fe-RAM

Fe-RAM function with MB85RS1MT (128 Bit x 8, up to 30MHz maximum bus frequency) on M-2 card.

1.2.11 TPM

MIC-330 reserve TPM function, which follow TPM 2.0 SPEC.

1.2.12 RTC and Battery

MIC-330 use coin battery or on board super capacitor to keep CMOS data (date/time/password).

- Coin battery (3V/220 mAh with WIRE) on M-1 side card
- Coin battery (3V/220 mAh with WIRE) on M-2 side card, 1 super capacitor reserved for transportation application on user request

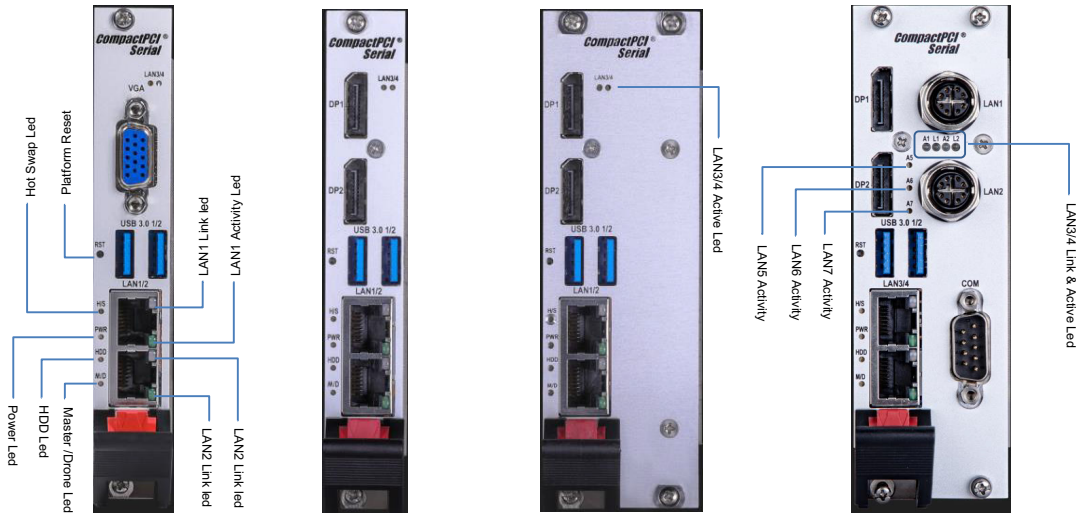
1.2.13 BIOS

256Mb SPI flash containing a specific AMI BIOS FW meets industrial and embedded system requirements.

1.2.14 Front Panel I/O

For MIC-330, it can provide the I/O ports on front panel as below:

- 2 x USB3.0 on front 4HP
- 2 x DisplayPort on front 4HP(1 x VGA reserved on M-1 card, by customer request)
- 2 x GbE (RJ45) on front 4HP
- Additional 2 x GbE (M12 X-code) on mezzanine side card 2(M-2), 8HP height panel only
- Additional 1 x DB9 COM port (non-isolated) on mezzanine side card 2 (M-2), 8HP height panel only



1.2.15 M/D, PWR, HDD, Hot-swap & LAN LEDs

Front panel provide Many LEDs for indication, please check details as below table:

Table 1.5: Front Panel LEDs Indication

Layer	Name	Description
4HP	PWR (Green)	Indicates power status
	HDD (Yellow)	Indicates HDD Read/Write
	H/S (Blue)	Indicates the board is ready to be hot-swapped
	M/D (Blue)	Indicates Master or Drone mode status Blue blink Indicates the board is inserted into peripheral slots
	LAN1/LAN2(Link)	1000Mb/s:Orange;100Mb/s: Green;10Mb/s: LED off
	LAN1/LAN2 (Activity)	Green Blink
Mezzanine-1 Card	LAN3/4(Activity)	Green Blink
Mezzanine-2 Card	L3/L4(Link)	1000Mb/s: Orange; 100Mb/s: Green;10Mb/s: LED off
	A3/A4/A5/A6/A7(Activity)	Green Blink

1.2.16 CompactPCI® Serial Backplane Resources

MIC-330 is a CPU card that followed PICMG® CPCI-S.0 standard, and provides high speed Interfaces for peripheral card extension, as shown below:

Table 1.6: Interfaces to Backplane

CPCI-S connector	Interfaces
P1	1 x PEG x 4; 1 x USB 3.0; 1 x USB 2.0
P2	1 x PEG x 4; 1 x PEG x 8; 3 x USB 2.0
P3	4 x SATA 3.0; 1 x USB 3.0; 4 x USB 2.0
P4	2 x PCIe x 4; 2 x PCIe x 1
P5	System Clock
P6	■ 2 x GbE on M-1 side card ■ Max 5 x GbE on M-2 side card (2x GbE switch with 2x M12 LAN on front 8HP)

1.2.17 Environmental & Regulatory Specifications

MIC-330 can meet environmental & regulatory specifications as below:

- **Operating temperature:** -25 ~ 70 °C (-13 ~ 158 °F)

Note! *The operating temperature range of the MIC-330 depends on the installed processor and the airflow through the chassis.*

- **Storage Temperature:** -40 ~ 85° C (-40 ~ 185° F)
- **Humidity:** 95% @ 40° C (non-condensing)
- **Humidity (Non-operating):** 95% @ 60 °C (non-condensing)
- **Random Vibration:** 5~500Hz, 2Grms, 3 axes (operation test With M.2 SSD, Without so-dimm slot memory):
- **Shock (Operation):** 10G, 11ms
- **Board size:** 100mm x 160mm (3U)
- **Width:** 4HP/8HP
- **Weight:**
  - MIC-330-A1S1(0.51Kg)
  - MIC-330-A2D1(0.80Kg)
  - MIC-330-A3D1(0.82Kg)
  - MIC-330-B1D1(0.82Kg)
- **Long term availability**
- **Coating on request**
- **RoHS compliant**
- **EMC & Safety:** design to meet EN50155/EN50121-4

1.2.18 Compact Mechanical Design

The MIC-330 is equipped with a set of high-speed local expansion interface connectors, which can be optionally used to attach either a low profile mezzanine module (fits into the 4HP front panel envelope) or a side card for an 8HP assembly.

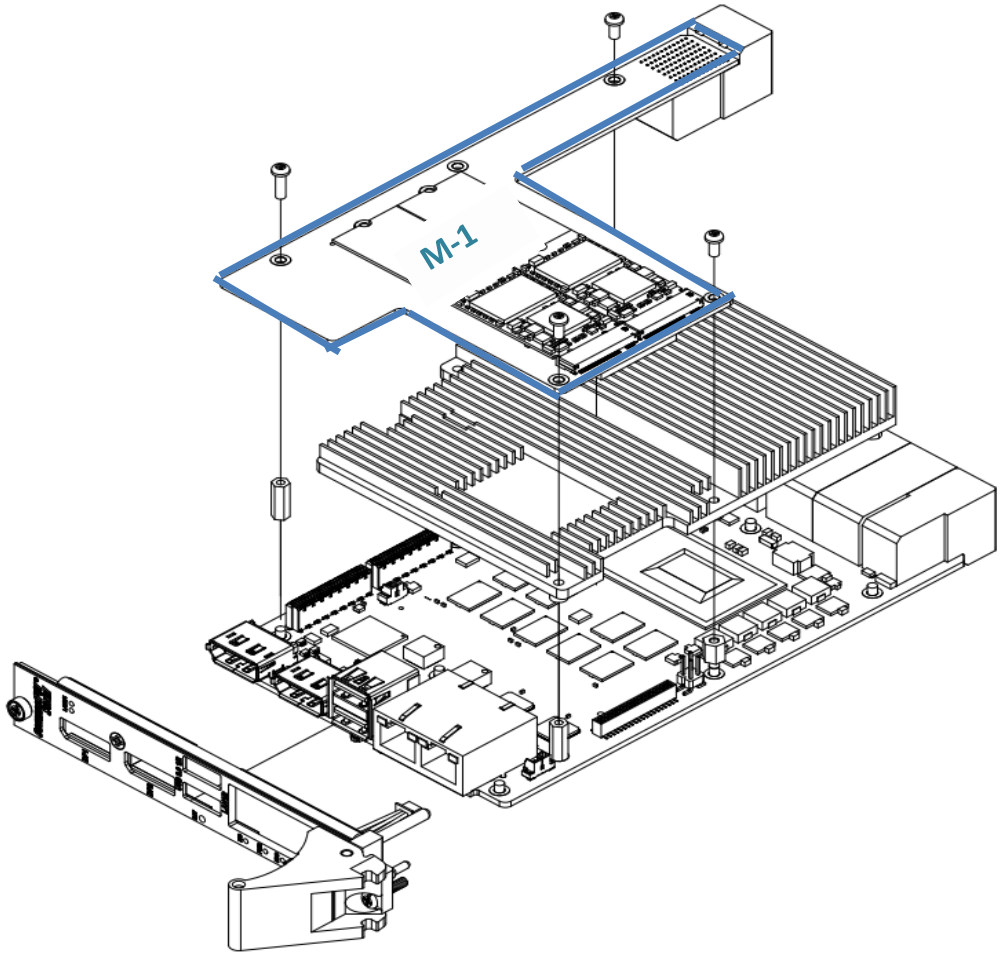


Figure 1.1 MIC-330 with M-1: 4HP front panel envelope, without SO-DIMM socket expansion

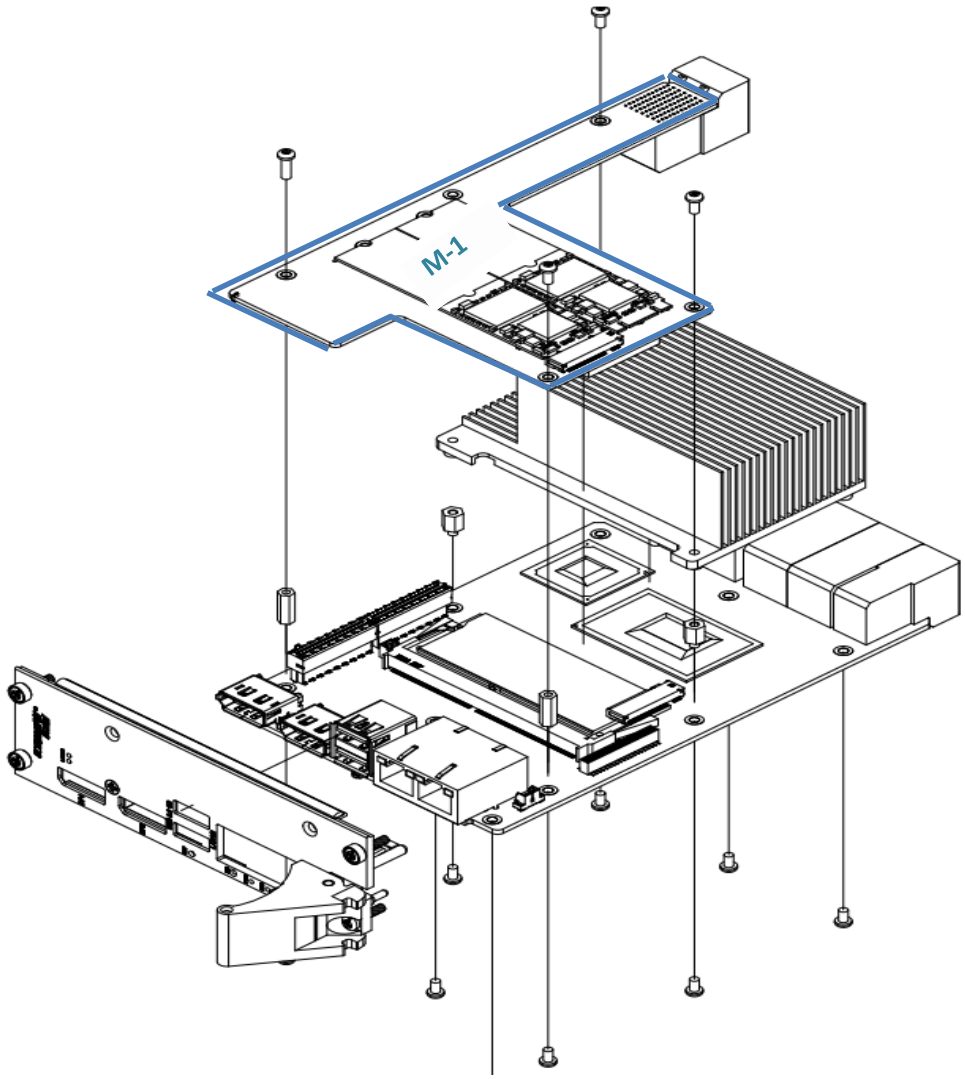


Figure 1.2 MIC-330 with M-1: 8HP front panel with SO-DIMM socket expansion

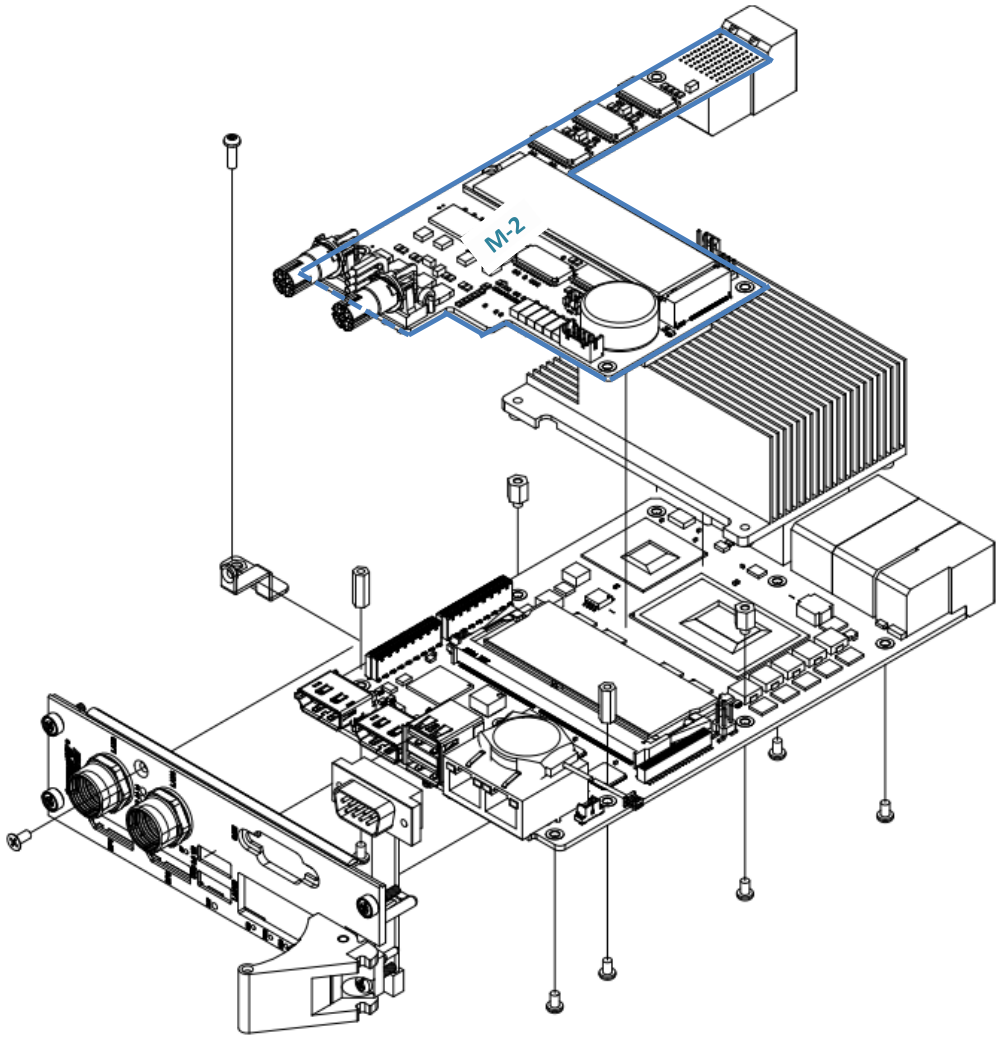


Figure 1.3 MIC-330 with M-2: 8HP front panel with I/O ports & SO-DIMM socket expansion

Forced-air cooling in the chassis is recommended for the MIC-330 board to enhance system stability and reliability. Although the unit is already equipped with a specially designed copper heatsink, additional cooling is beneficial. To achieve optimal cooling, use a 3U CPCI-Serial chassis from the MIC-300 series, available through sales or the Advantech website. These chassis come with mini-fans installed on the top and bottom sides of the enclosure, ensuring sufficient airflow to cool the CPU blade. This configuration has been validated against EN50155 test items.

1.2.19 Hardware Monitor

The MIC-330 series features a hardware management (HWM) system that monitors processor temperatures and core voltage information. Additionally, it includes an optional NCT5523D component, which can provide fan health status upon customer request.

1.2.20 Super I/O

MIC-330 Super I/O device can enable or disable serial ports, and you can select the serial port mode RS232/RS422/RS485 by jumper setting. For the details, please check Figure 1.5: MIC-330 COM mode setting.

1.3 Functional Block Diagram

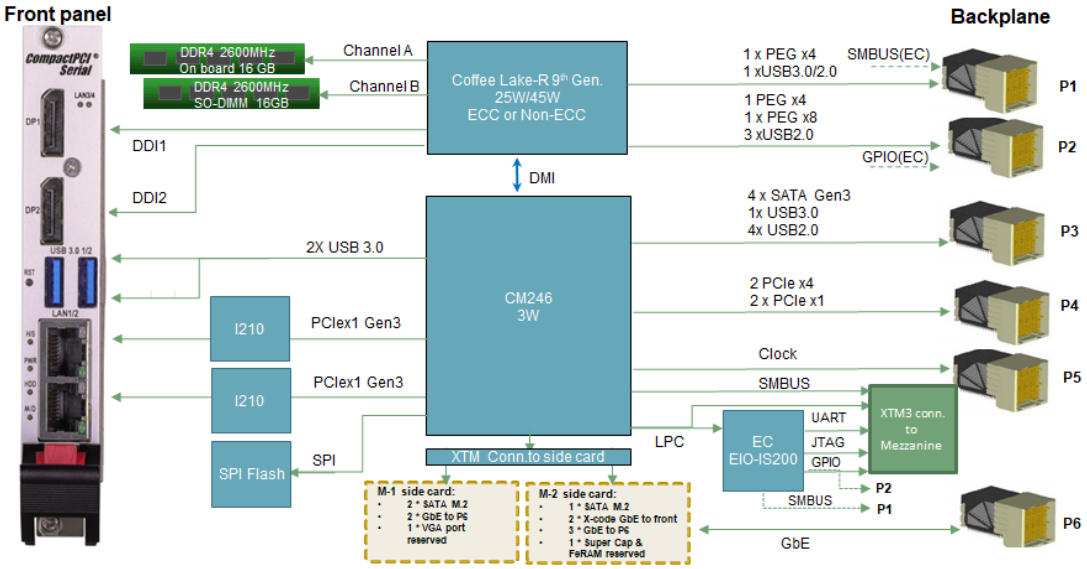


Figure 1.4 MIC-330 block diagram

1.4 Switches and Jumpers

1.4.1 Switches

MIC-330 can switch 2x GbE between 2 x M12 to 8HP front and 2 x GbE signals to P6, please find details in below table 1.4:

Table 1.7: SW1 Setting Definitions

Status	Function	Note
On/On	1*GbE function to LAN1/LAN2 M12	[default]
Off/Off	1*GbE function to P6 (Peripheral Slot 5/Slot6)	

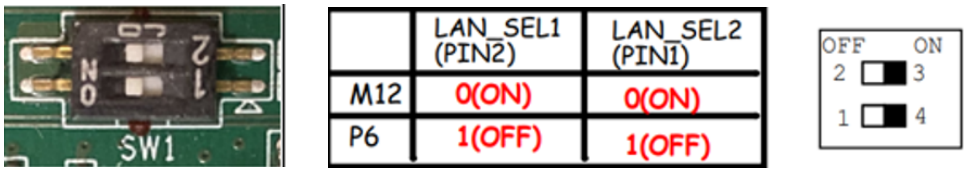


Figure 1.5 SW1 functions definition

1.4.2 Jumpers

For J_COM1, You can select COM mode by setting jumper as below table:

Table 1.8: J_COM1 Setting Definitions

Status	Function	Note
Close 1-2	RS-232	
Close 3-4		[default]
Close 3-4	RS-422 with Term-R and Bias-R	
Close 5-6		
Close 1-2	RS-485	
Close 5-6		
Close 1-3	RS-485 with Term-R and Bias-R	
Close 5-6		

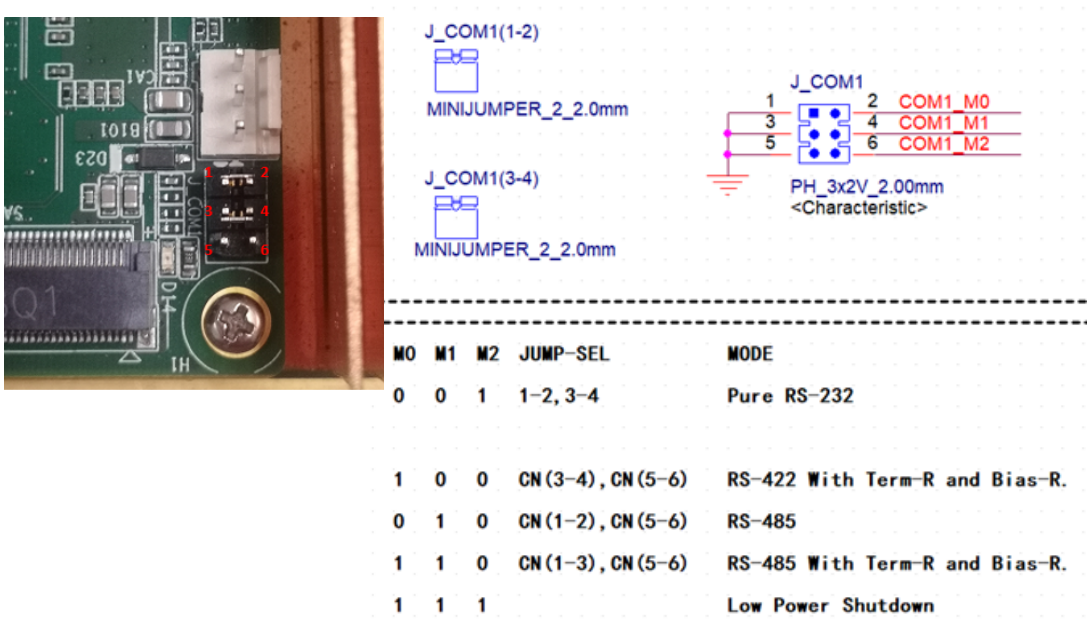


Figure 1.6 MIC-330 COM mode setting

1.5 Connectors Definitions

1.5.1 MIC-330 Series with M-1 IO Functions

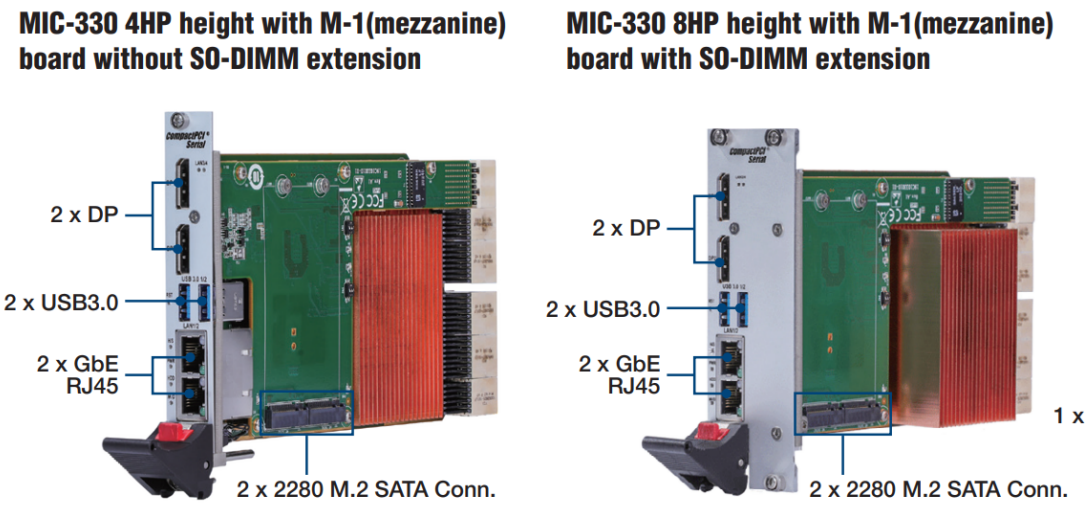


Figure 1.7 MIC-330 series with M-1 IO functions

1.5.2 MIC-330 Series with M-2 IO Functions

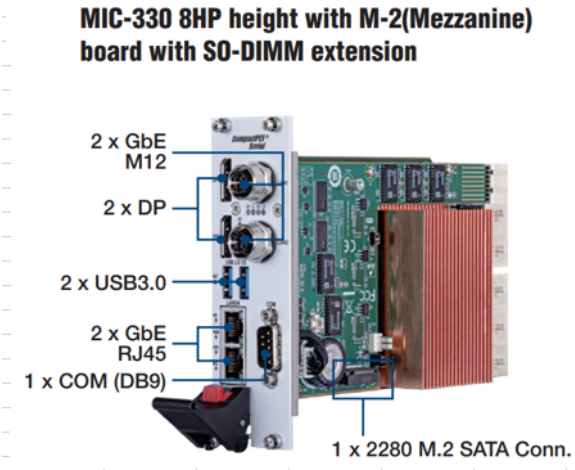


Figure 1.8 MIC-330 series with M-2 IO functions

1.6 Safety Precautions

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electric shock, always disconnect the power from your CompactPCI chassis before you work on it. Don't touch any components on the CPU board or other boards while the CompactPCI chassis is powered.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a board may damage sensitive electronic components.
- Always ground yourself to remove any static charge before you touch your CPU board. Be particularly careful not to touch the chip connectors.
- Modern integrated electronic devices, especially CPUs and memory chips, are extremely sensitive to static electric discharges and fields. Keep the board in its antistatic packaging when it is not installed in the chassis, and place it on a static dissipative mat when you are working with it. Wear a grounding wrist strap for continuous protection.

1.7 Installation Steps

The MIC-330 contains electro-statically sensitive devices. Please discharge your clothing before touching the assembly. Do not touch components or connector pins. We recommend that you perform assembly at an anti-static workbench.

1.8 Battery Replacement

The battery model number is CR2032, 3V, 210 mAh battery with wire. Replacement batteries may be purchased from Advantech. When ordering the battery, please contact your local sales office to check availability.

1750129010-3V/210 mAh with WIRE CR2032M1S8-LF

1.9 Software Support

Windows 10, Linux, Ubuntu 18.04, CentOS 7.6, VxWorks 7.0 have been fully tested on the MIC-330. Please contact representative for details on support for other operating systems.

Chapter 2

AMI BIOS Setup

This chapter describes how to configure the AMI BIOS.

2.1 Introduction

The AMI BIOS has been customized and integrated into many industrial and embedded motherboards for decades. This section describes the BIOS which has been specifically adapted for the MIC-330. With the AMI UEFI BIOS Setup Utility, you can modify BIOS settings and control the special features of the MIC-330. The Setup program uses a number of menus for making changes and turning the special features on or off. This chapter describes the basic navigation of the MIC-330 setup screens.

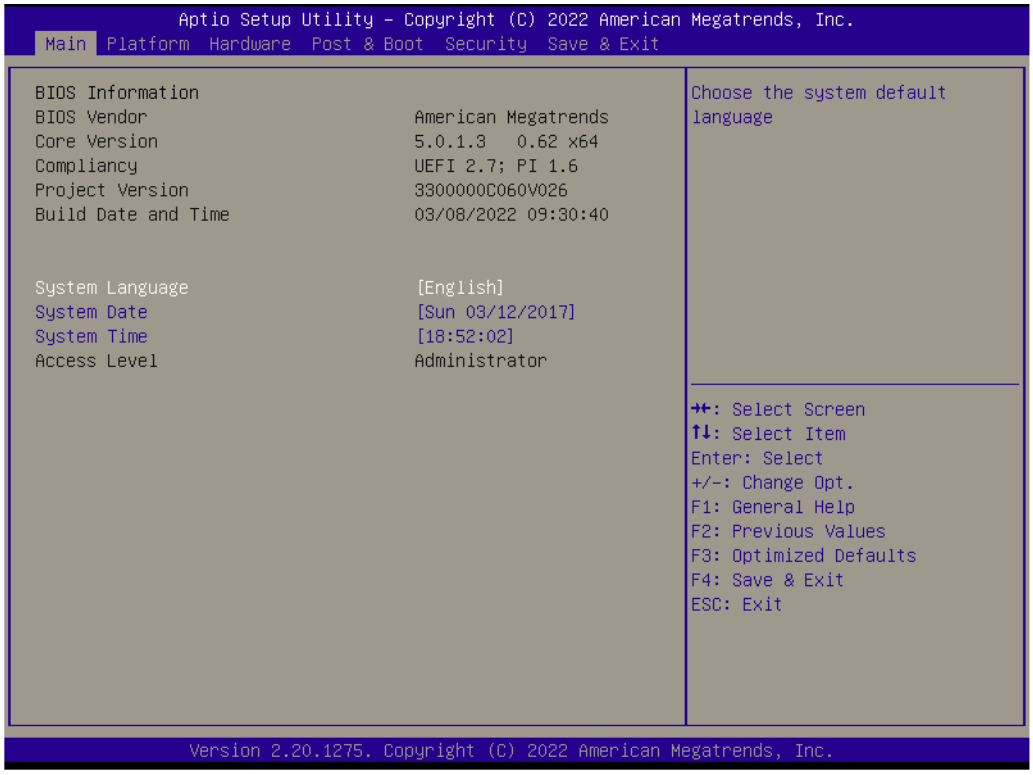


Figure 2.1 Setup program initial screen

2.2 BIOS Setup

The MIC-330 Series system has AMI BIOS built in, with a BIOS SETUP utility that allows users to configure required settings or to activate certain system features.

The BIOS SETUP saves the configuration in the NVRAM of the motherboard. When the power is turned off, the battery on the board supplies the necessary power. when CMOS battery is removed or the clear jumper is set, all user's settings will be restored the BIOS default settings.

When the power is turned on, press the <Del> or <F2> button during the BIOS POST (Power- On Self Test) to access the CMOS SETUP screen.

Table 2.1: Control Keys

< → > < ← >	Select Screen
< ↑ > < ↓ >	Select item
<Enter>	Select
<+/->	Change Option
<F1>	General help, for Setup Sub Menu
<F2>	Previous values
<F3>	Optimized defaults
<F4>	Save & exit
<Esc>	Exit

2.3 Entering Setup

Turn on the computer, and there should be a POST (Power-On Self Test) screen that shows the CPU information. When pressing <DEL> or <F2>, you will immediately be allowed to enter Setup.

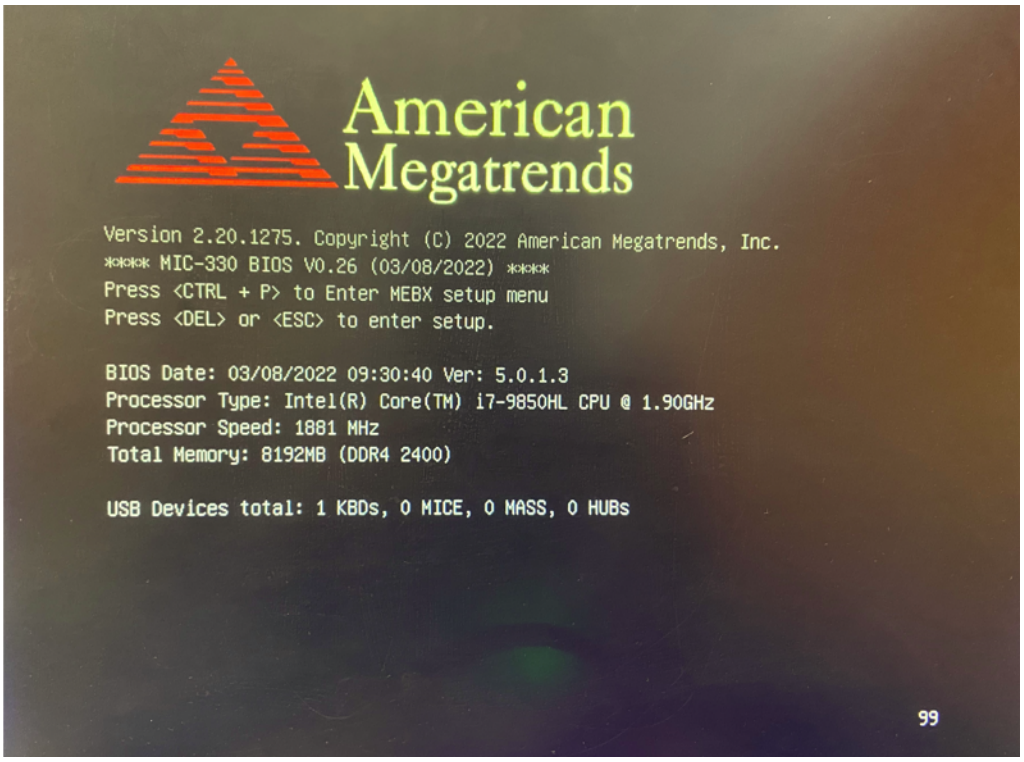


Figure 2.2 Setup screen

2.3.1 Main Setup

When you first enter the BIOS Setup Utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. Two main setup options are described in this section. The main BIOS setup screen is shown below.

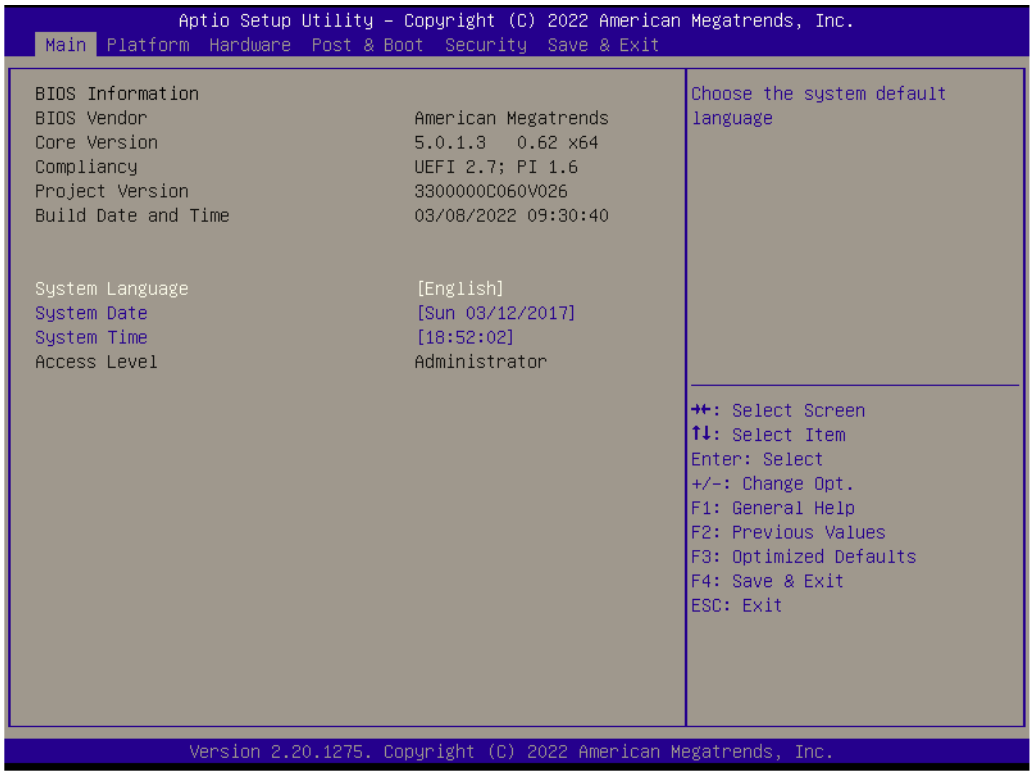


Figure 2.3 Main setup screen

The main BIOS setup menu screen has two main frames. The left frame displays all the options that can be configured. The right frame displays the keyboard shortcuts. Above the keyboard shortcuts, there is an area reserved for a text message. When one option in the left frame is selected, it is highlighted in white. At the same time, the text message in the right frame always shows the further annotation.

- **System Time/System Date**
  Use this option to change the system time and date. Highlight System Time or System Date using the <↑><↓> keys. Input new values through the keyboard. Press the <↑><↓> keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

2.3.2 Platform BIOS Features Setup

Select the Advanced tab from the MIC-330 setup screen to enter the Advanced BIOS Setup screen. You can click one of the items in the left frame of the screen, such as serial console, to go to the sub menu of the selected item. You can display an platform option by highlighting it using the <↑><↓> keys. All the platform BIOS Setup options are described in this section. The platform BIOS Setup screen is shown below. The sub menus are described on the following pages.

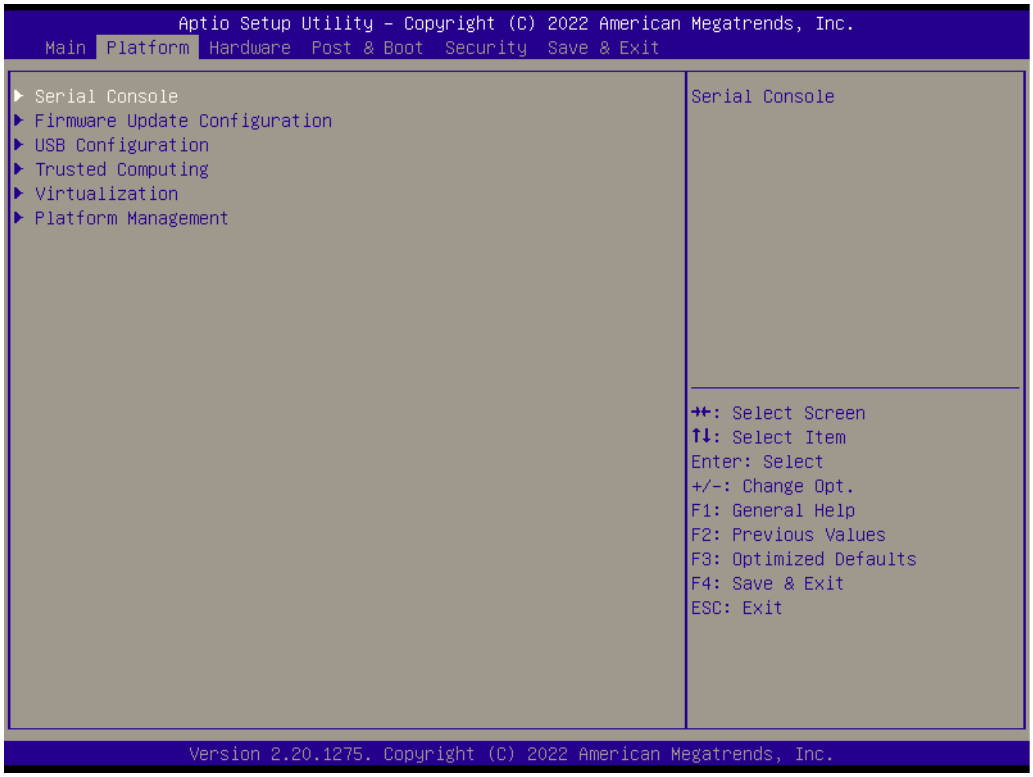


Figure 2.4 Platform BIOS features setup screen

2.3.2.1 Serial Console Setting

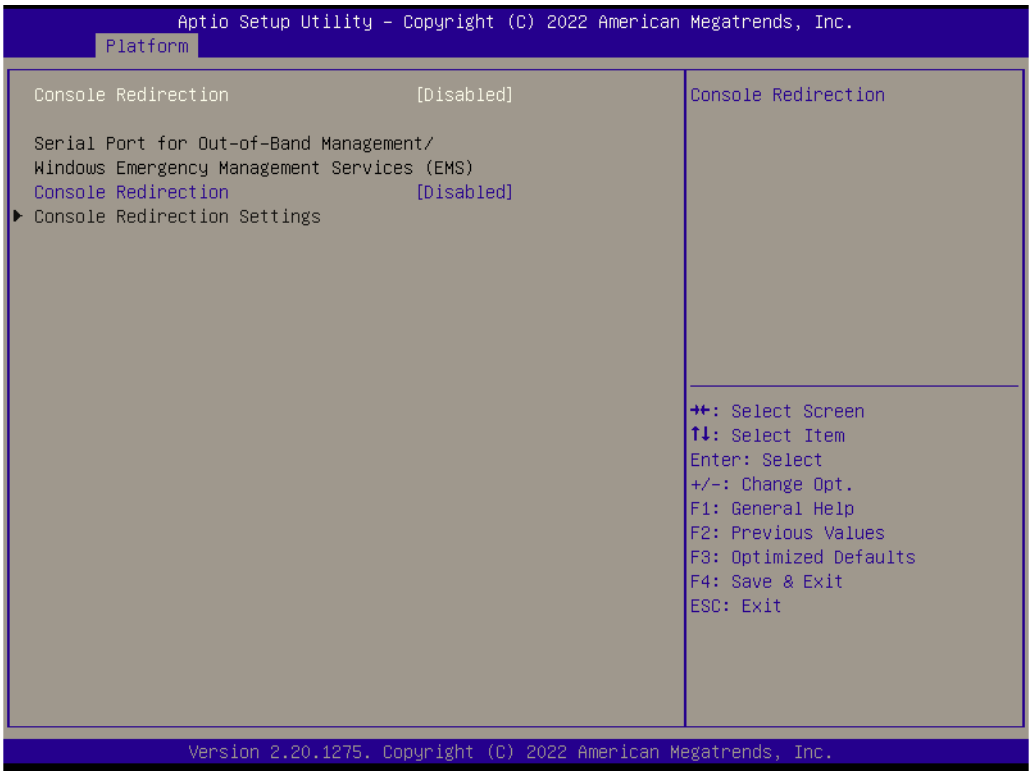


Figure 2.5 Serial console setting

- **Console Redirection**
  This item allows users to enable or disable console redirection or Microsoft Windows Emergency Management Services (EMS).

2.3.2.2 ME FW Image

This item allows users to enable or disable ME FW image Re-Flash function.

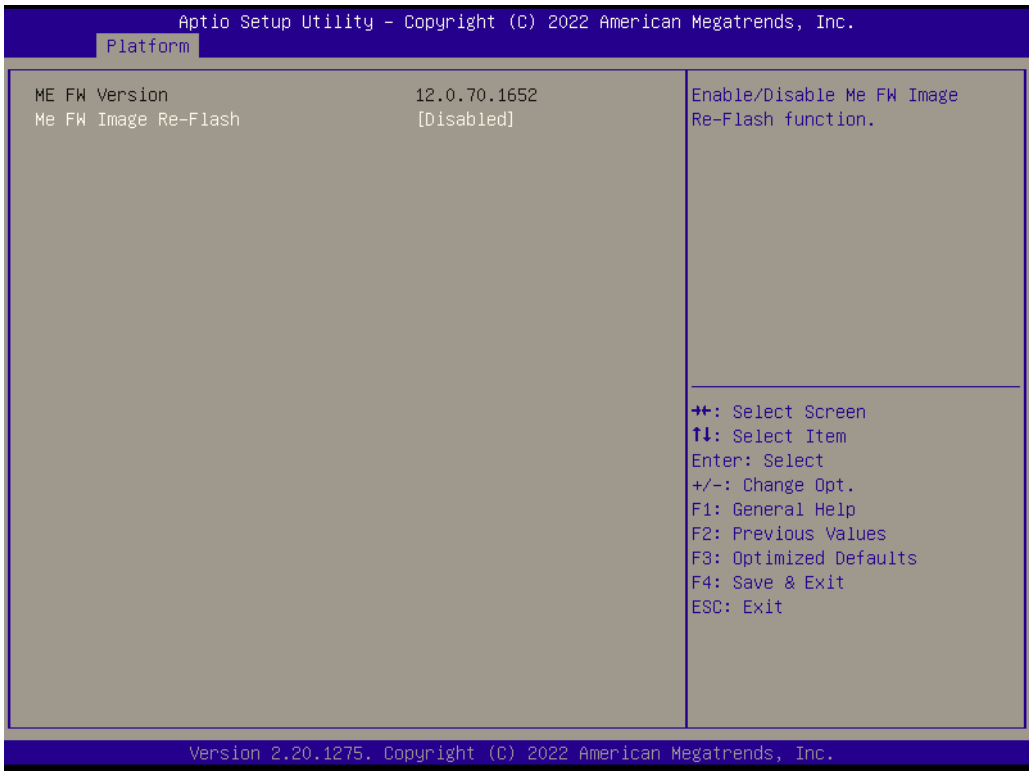


Figure 2.6 ME FW image

2.3.2.3 USB Configuration

Figure 2.7 USB configuration

- **USB Support**
  USB support Parameters.
- **Legacy USB support**
  Enables Legacy USB Support, AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
- **EHCI Hand-off**
  This is a workaround for OS without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver.

2.3.2.4 Trusted Computing

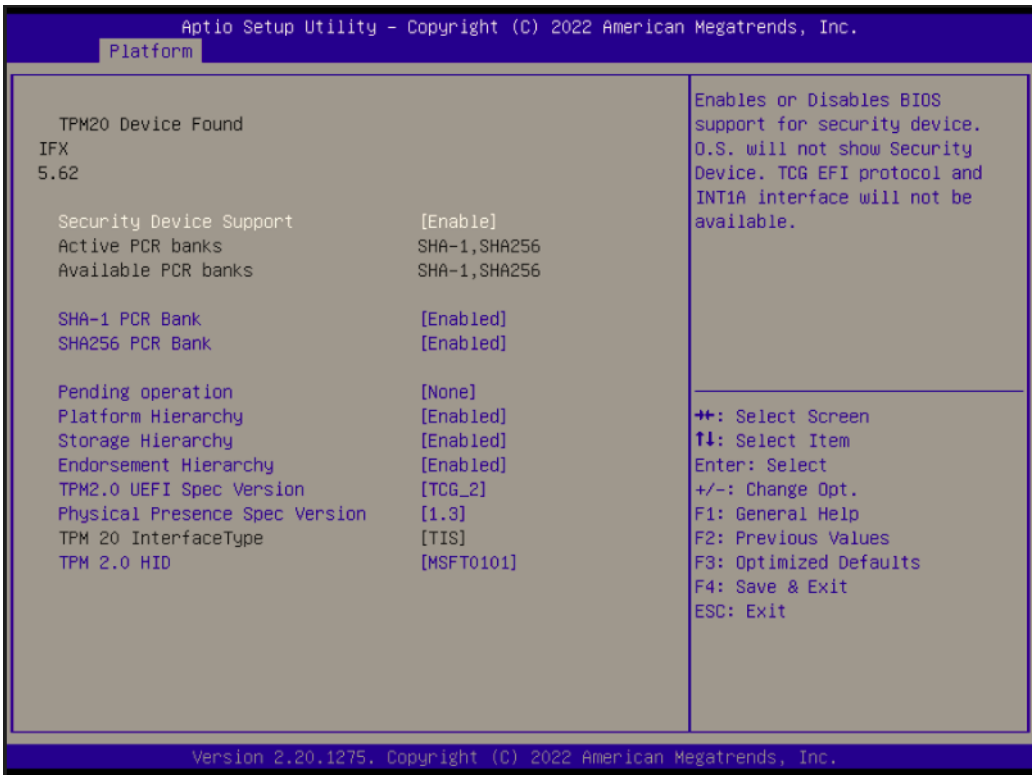


Figure 2.8 Trusted computing

- **Enable or Disable BIOS support for security device. OS will not show security Device. TCG EFI protocol and INTIA interface will not be available.**
  - MIC-330 reserved TPM function by customer request.

2.3.2.5 Virtualization

Figure 2.9 Virtualization

Virtualization Settings

- **Intel (VMX) Virtualization Technology**
  When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
- **Intel®VT-d**
  VT-d capability.

2.3.2.6 Platform Management

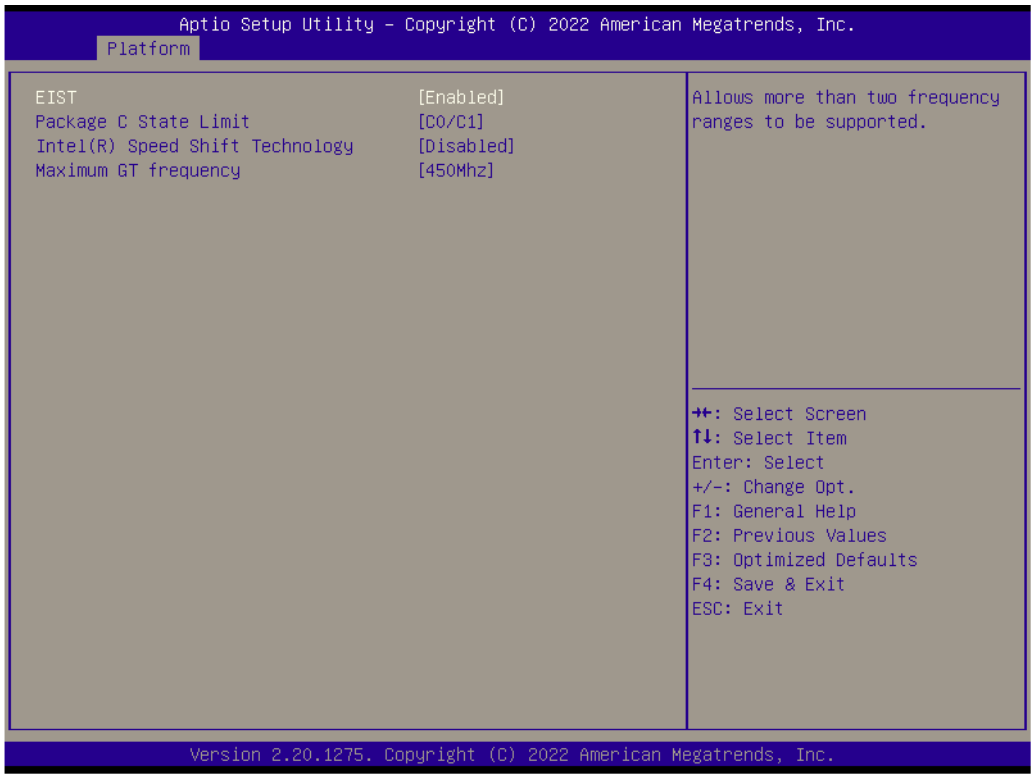


Figure 2.10 Platform management

Platform management settings

- **EIST**
  Allows more than two frequency ranges to be supported.
- **Package C State Limit**
  Maximum Package C State Limit Setting.
  CPU Default: Leaves to Factory default value.
  Auto: Initializes to deepest available package C state Limit.
- **Intel Speed Shift Technology**
  Enable/Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.
- **Maximum GT frequency**
  The option shows current graphic frequency, and the graphic frequency can be set by customer request.

2.3.3 Hardware Settings

Select the hardware tab from the BIOS setup screen to enter the Hardware Setup screen. Users can select any item in the left frame of the screen to go to the sub menu for that item. Users can display a Chipset Setup option by highlighting it using the <Arrow> keys. All hardware Setup options are described in this section. The hardware Setup screens are shown below. The sub menus are described on the following pages.

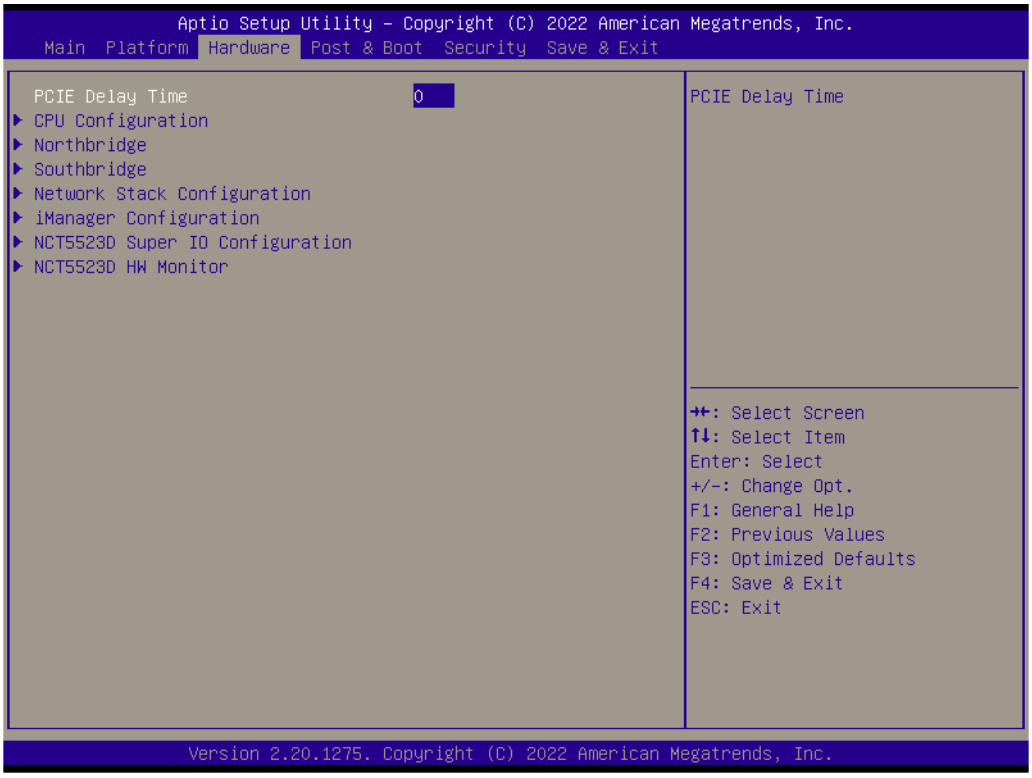


Figure 2.11 Hardware BIOS setup screen

2.3.3.1 CPU Configuration

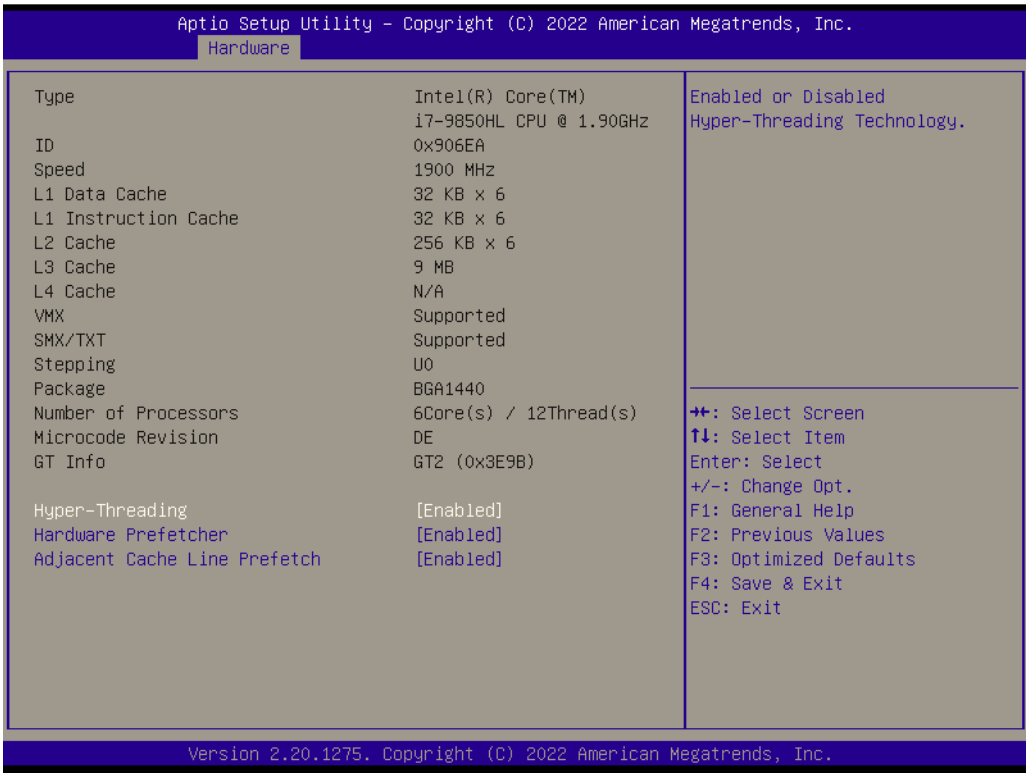


Figure 2.12 CPU configuration

CPU configuration Settings

- **Hyper-Threading**
  Enabled or Disabled Hyper-Threading Technology.
- **Hardware Prefetcher**
  To turn on/off the MLC streamer prefetcher.
- **Adjacent Cache Line Prefetch**
  To turn on/off prefetching of adjacent cache lines.

2.3.3.2 Northbridge

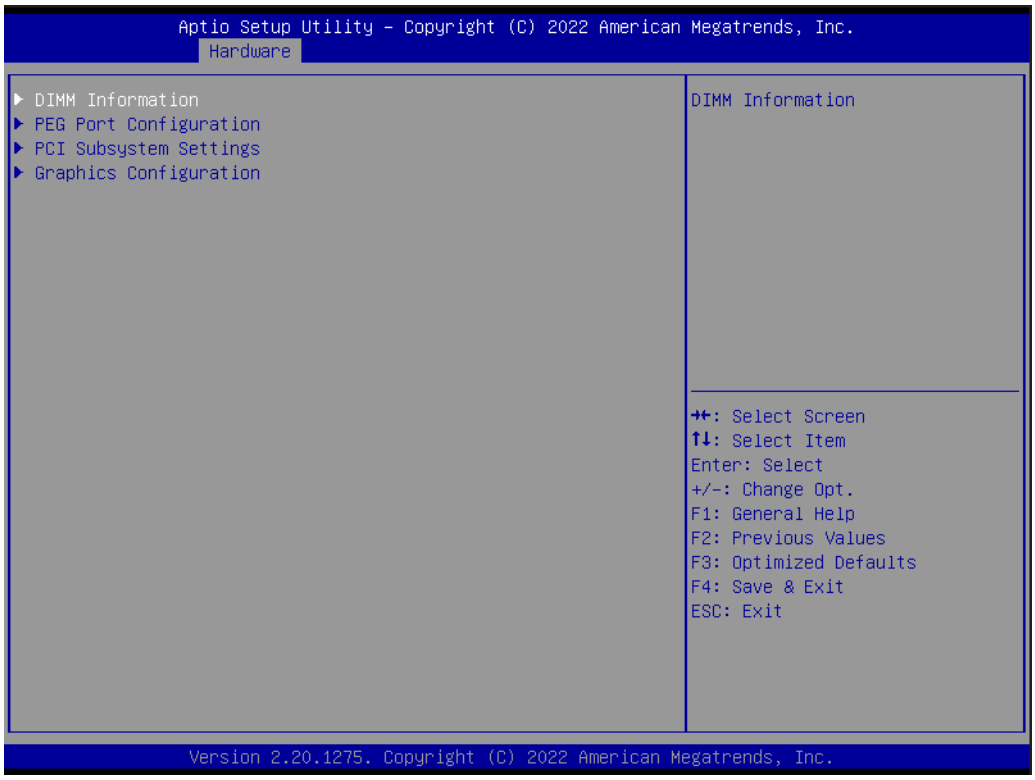


Figure 2.13 Northbridge

- **DIMM Information**

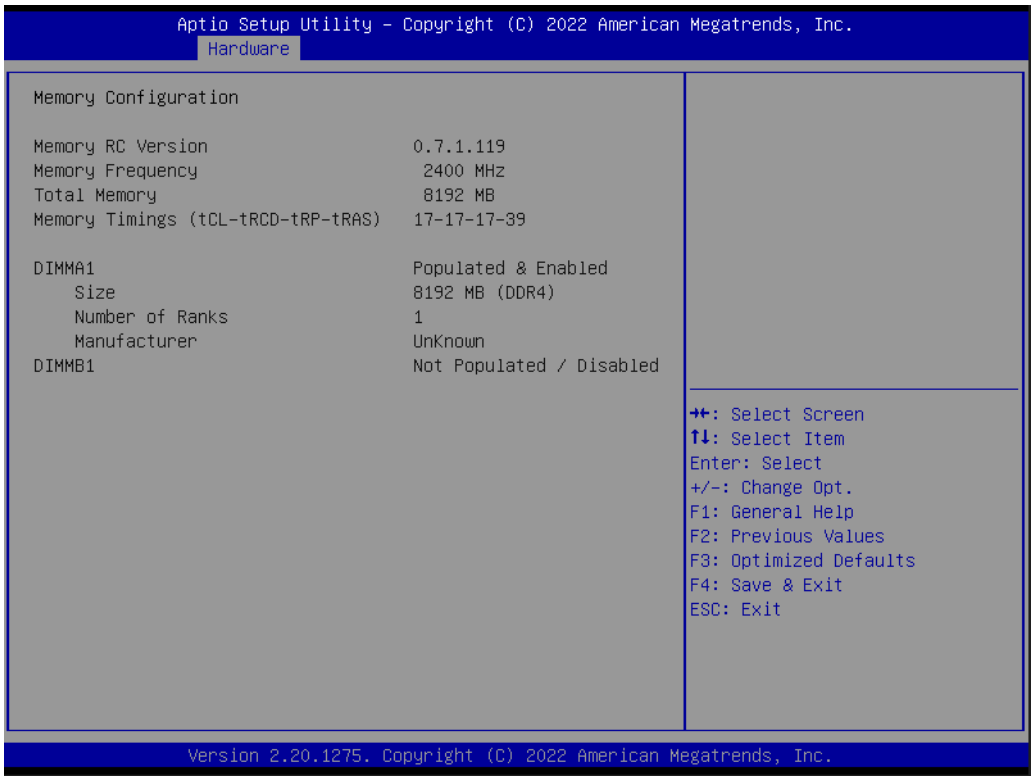


Figure 2.14 Memory configuration

The option shows the memory information.

PEG Port Configuration

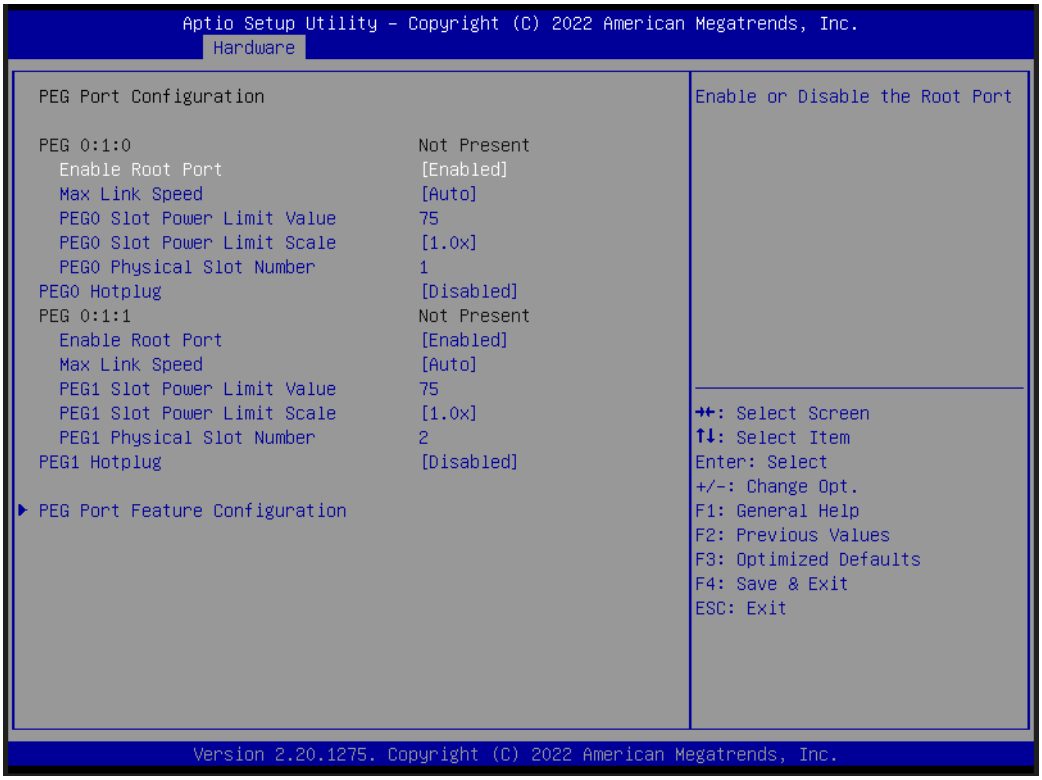


Figure 2.15 PEG port configuration

You can enable or disable the root port here.

PCI Subsystem Settings

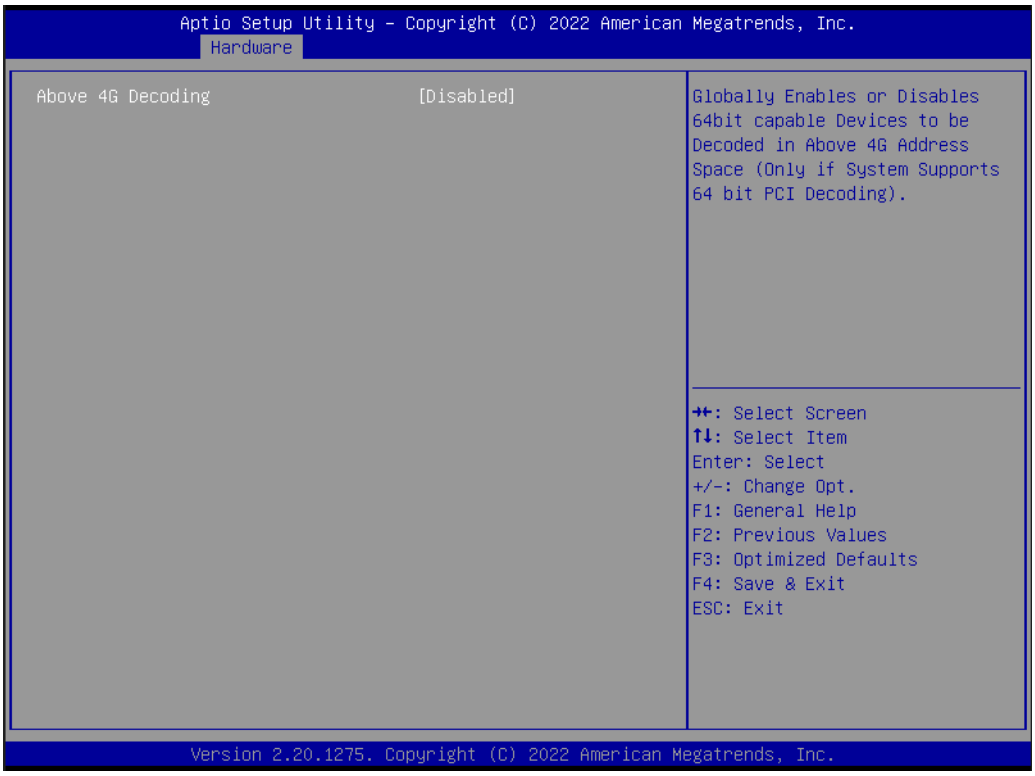


Figure 2.16 PCI subsystem

– **Above 4G Decoding**
Enables or Disables 64-bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).

Graphics Configuration

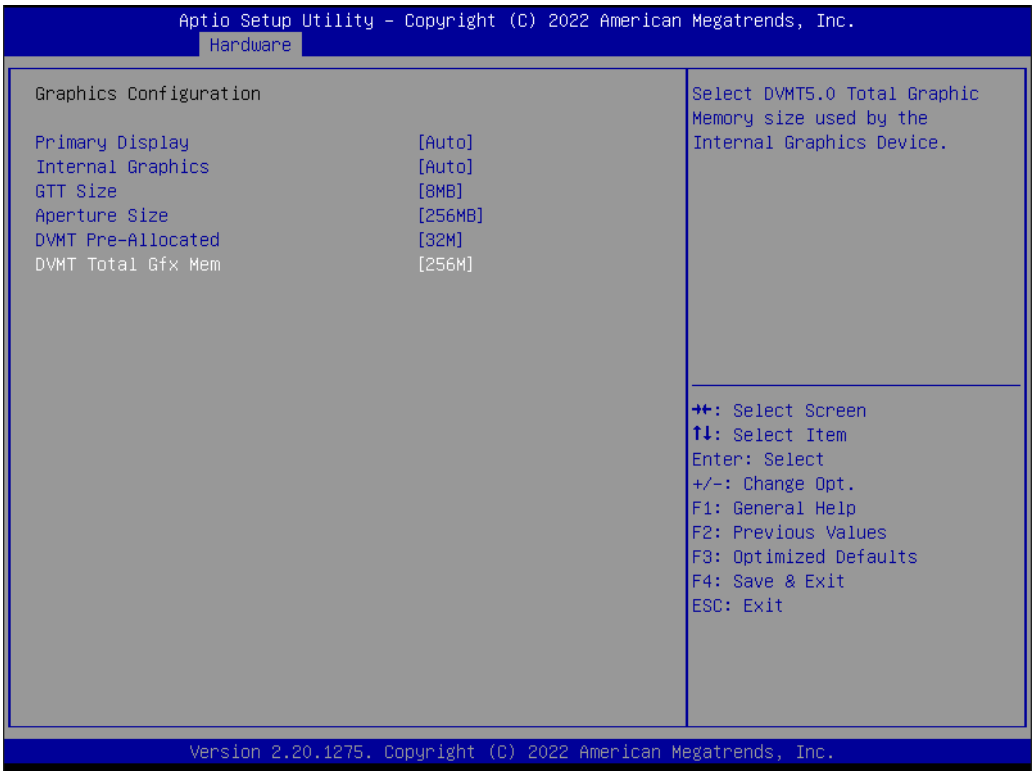


Figure 2.17 Graphics configuration

This page shows Graphics configuration, You can select the parameter by the internal Graphics Device.

2.3.3.3 Southbridge

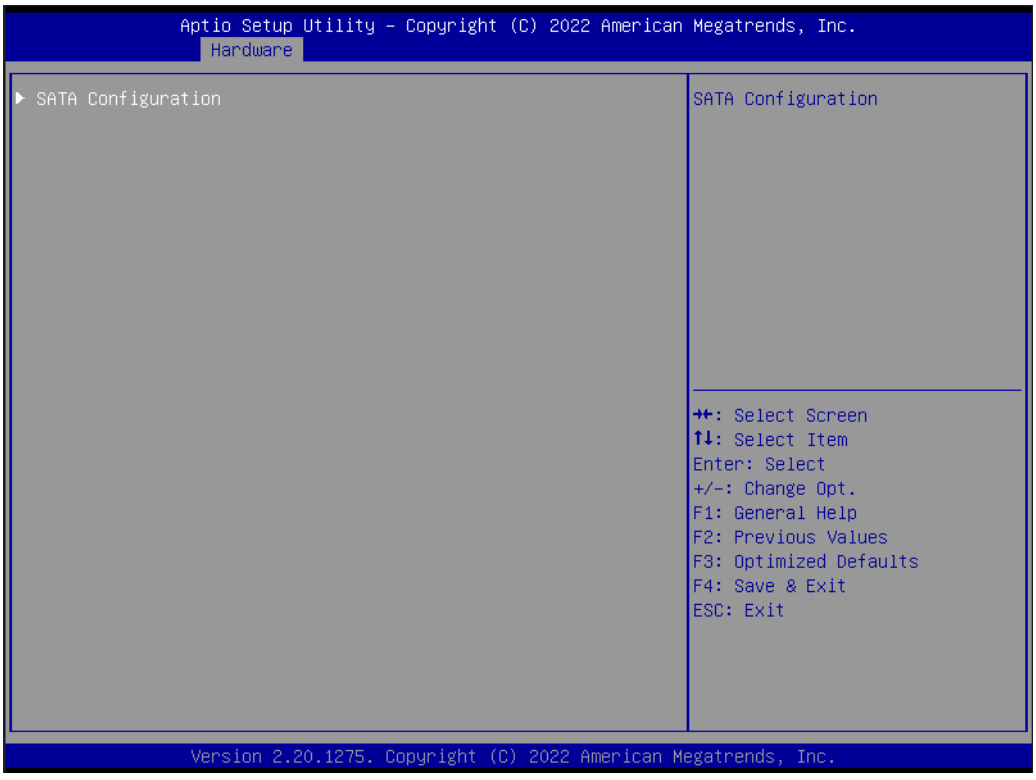


Figure 2.18 Southbridge

SATA Configuration

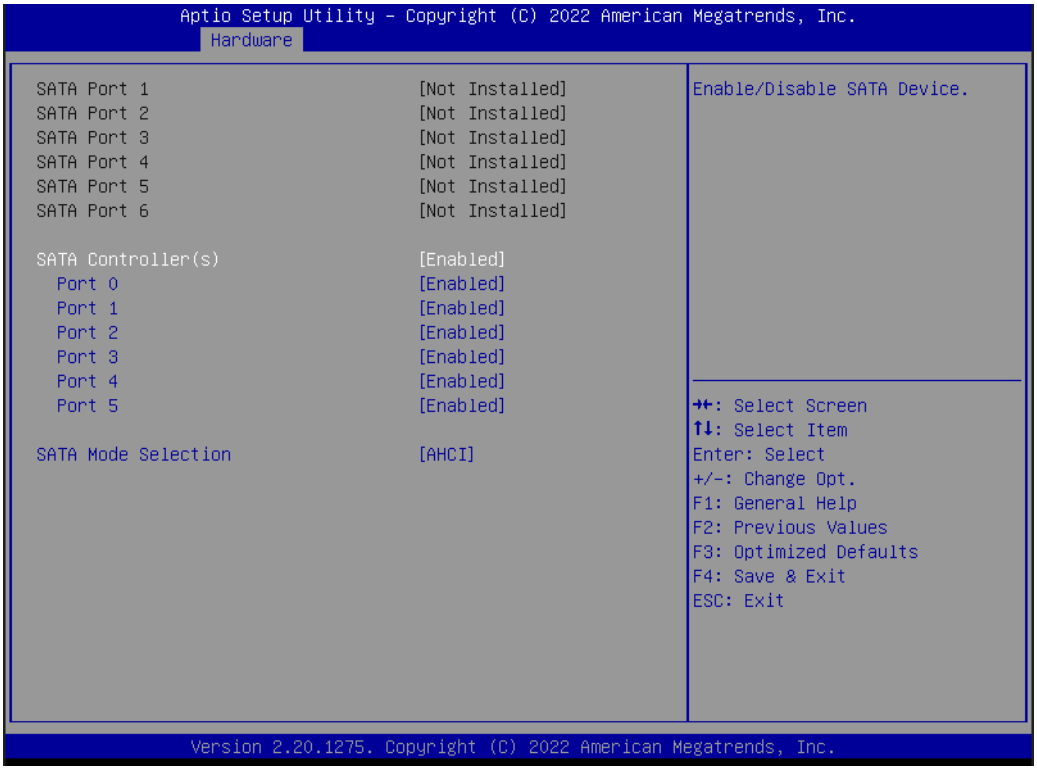


Figure 2.19 SATA configuration

- **SATA Controller(s)**
  Enable/Disable SATA Device.
- **SATA Mode Selection**
  Determines how SATA controller(s) operate.

2.3.3.4 Network Stack Configuration

Figure 2.20 Network stack configuration

This option can Enable/Disable UEFI Network stack.

2.3.3.5 iManager Configuration

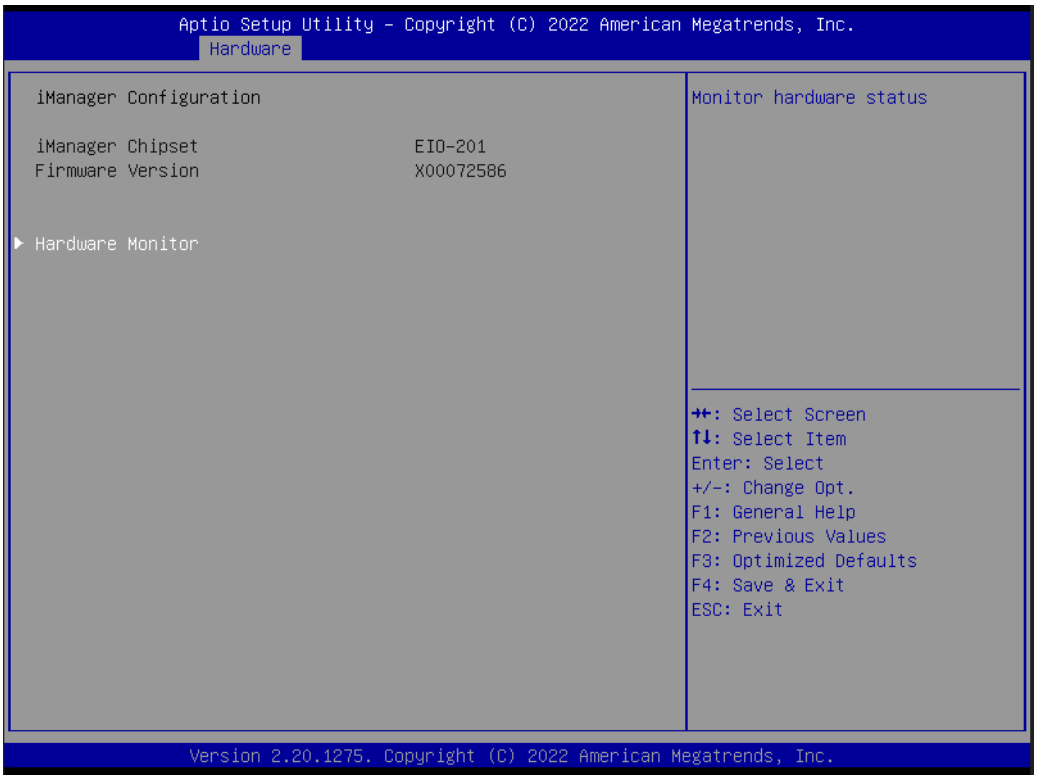


Figure 2.21 iManager configuration

The option shows EC information, which includes EC module, firmware and hardware monitor.

2.3.3.6 Hardware Monitor Configuration

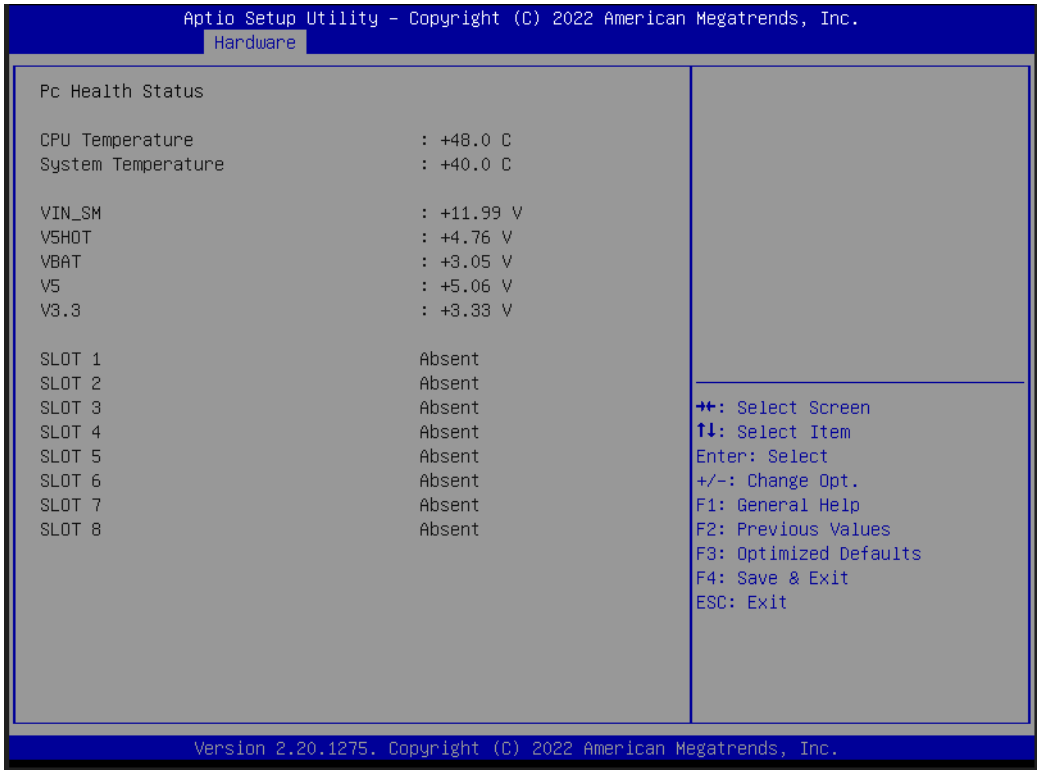


Figure 2.22 Hardware monitor configuration

2.3.3.7 NCT5523D Super IO Configuration

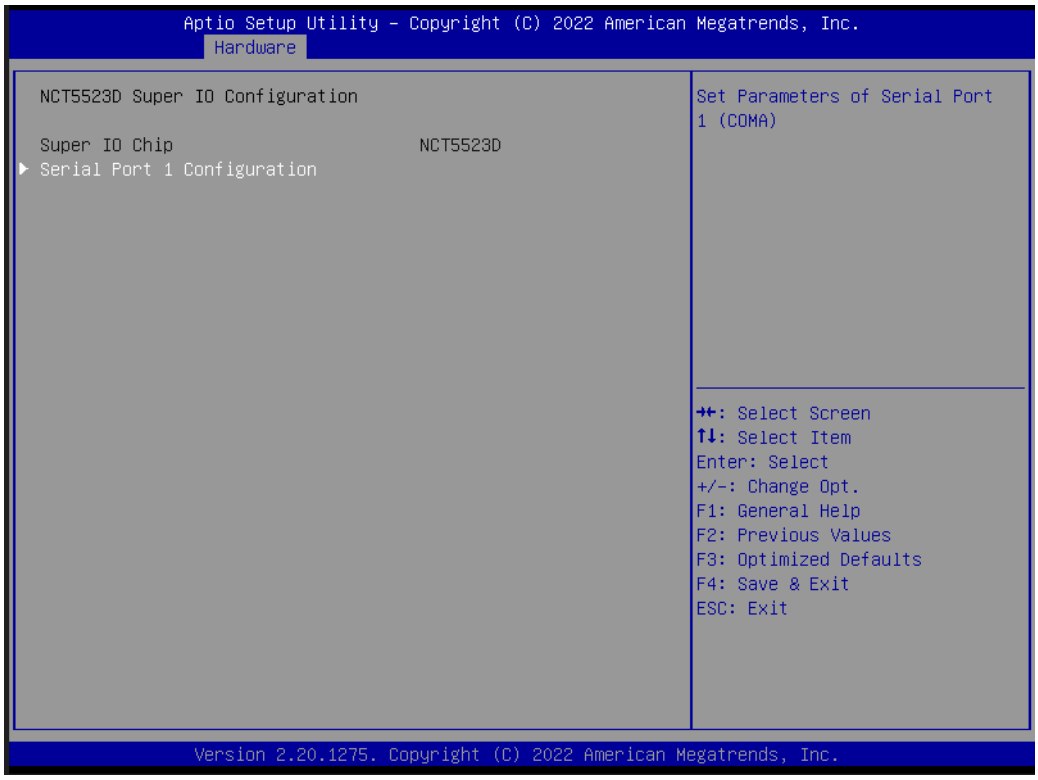


Figure 2.23 NCT5523D super IO configuration

Serial Port 1 configuration on Mezzanine-2 board

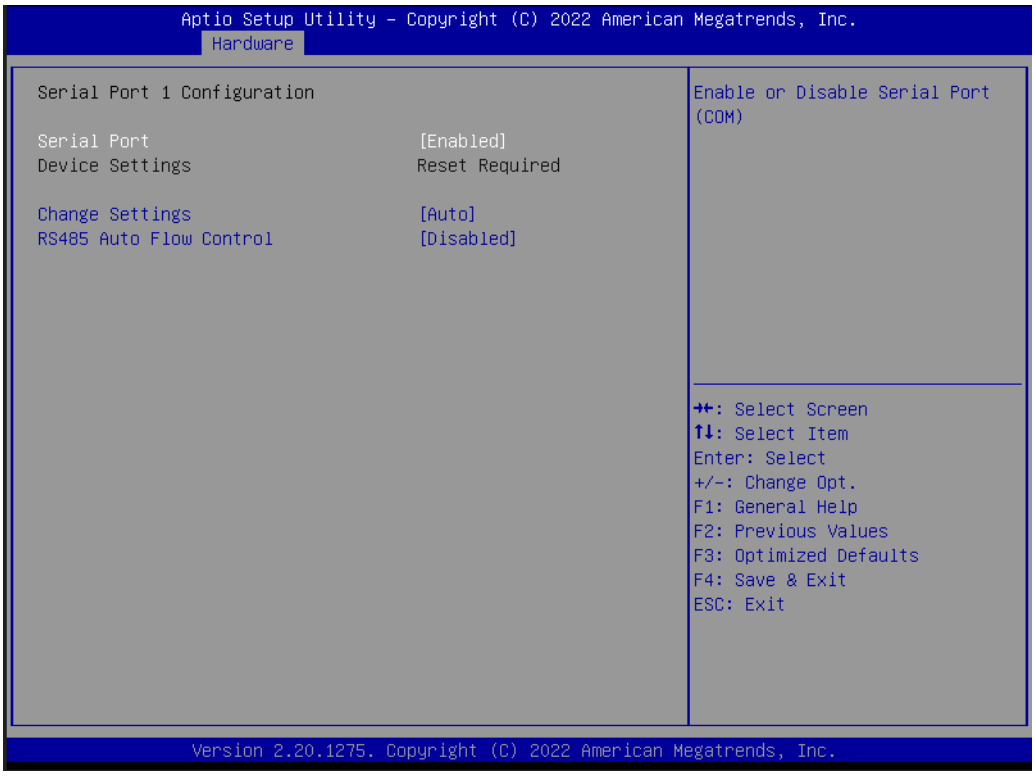


Figure 2.24 Serial Port1 configuration

- **Serial Port**
  Enable or Disable Serial Port (COM).
- **Serial Port1 Mode**
  You can select the Serial Port1 Mode RS232/RS422/RS485.

2.3.3.8 NCT5523D H/W Monitor Configuration

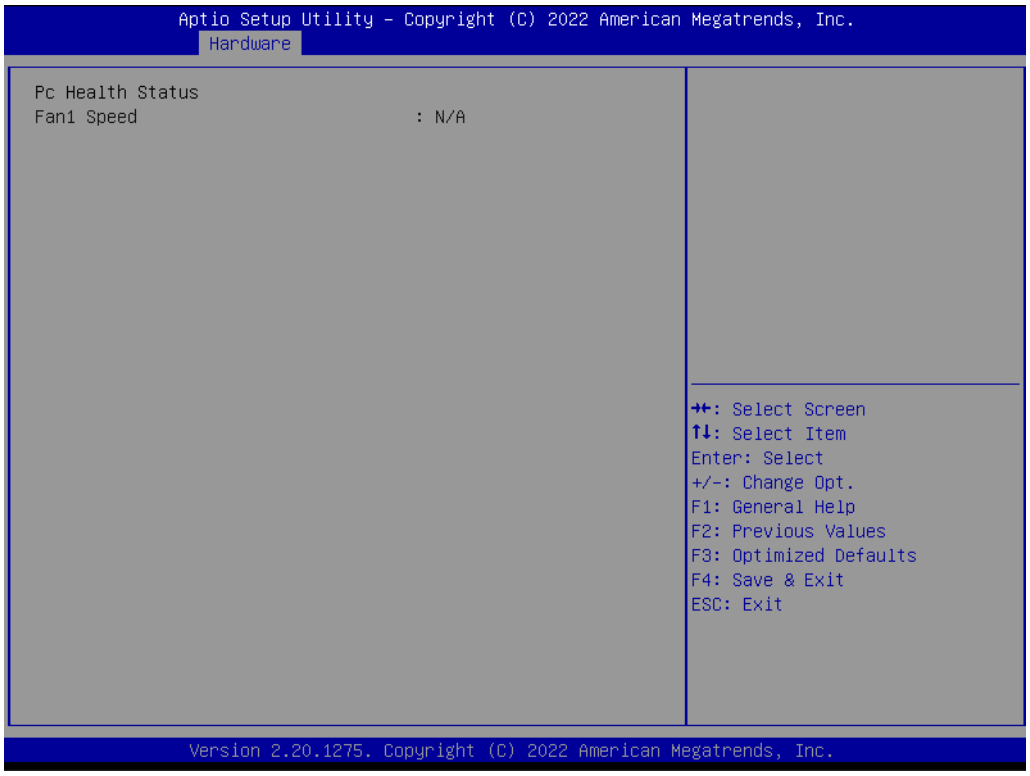


Figure 2.25 NCT5523D H/W monitor configuration

This option shows FANs heath status.

2.3.4 Post&Boot

Select the Post & Boot tab from the BIOS setup screen to enter the Post & Boot setup screen. Users can select any item in the left frame of the screen to go to the sub menu for that item. Users can display a Post & Boot Setup option by highlighting it using the <Arrow> keys. All Post & Boot Setup options are described in this section. The Setup screens are shown below. The sub menus are described on the following pages.

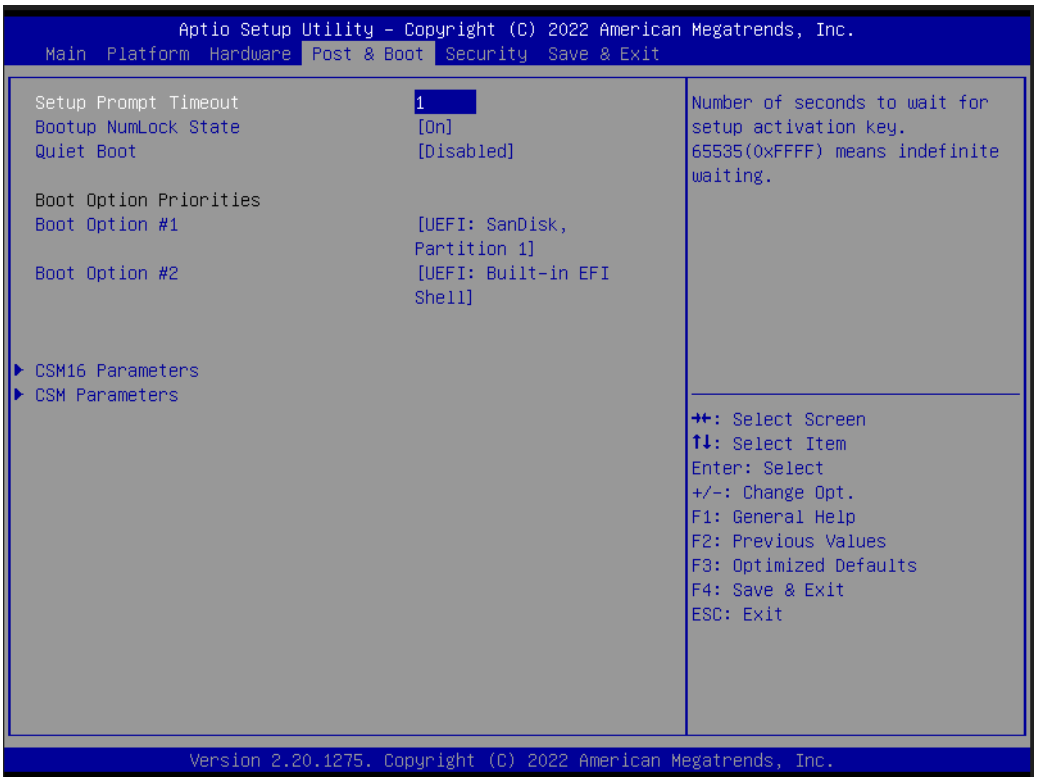


Figure 2.26 Post&Boot setup screen

Post&Boot Settings

- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key.
  65535(oxFFFF) means indefinite waiting.
- **Boot up NumLock State**
  Select the keyboard NumLock state. By "ON", the keyboard NumLock state will stay "ON" after booting. By "OFF", the keyboard NumLock state will stay "OFF" after booting.
- **Quiet Boot**
  Enable or disable Quiet Boot option. If this option is set to Disabled, the BIOS displays normal POST messages. If enabled, an OEM Logo is shown instead of POST messages.
- **Boot Option**
  Boot Option #1
  Boot Option #2
  The option shows the boot priority of devices.

CSM16 Parameters

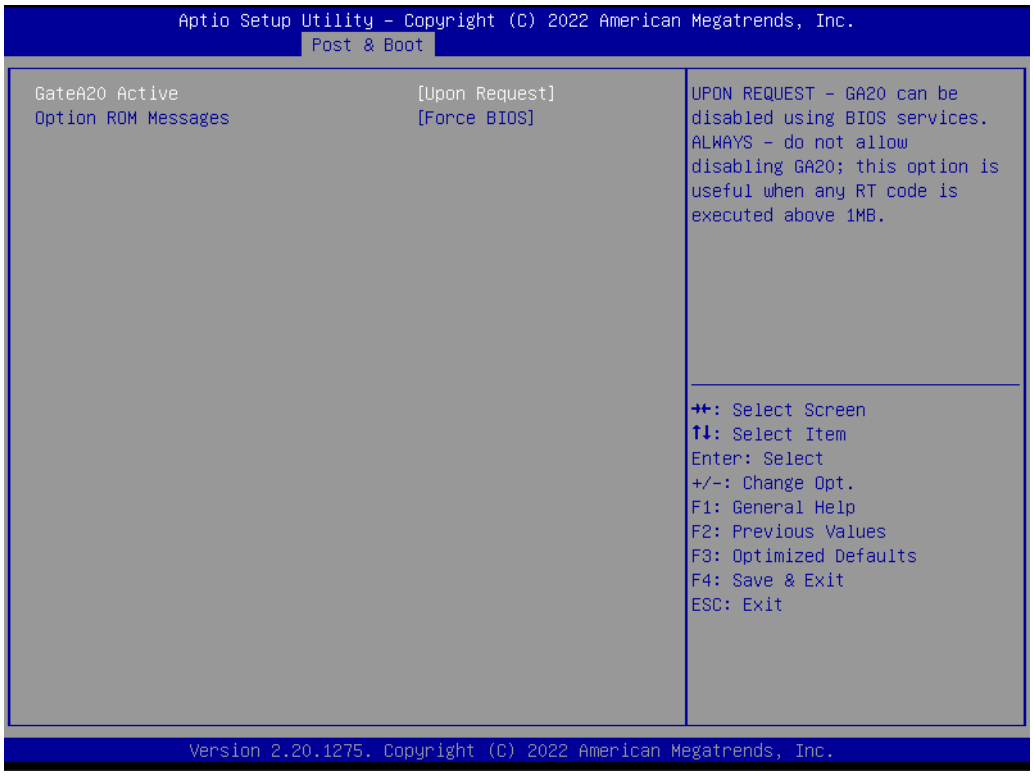


Figure 2.27 CSM16 parameters

This item allows users to set display mode for Option ROM.

– **GateA20 Active**
  UPON REQUEST: GA20 can be disabled using BIOS services.
  ALWAYS: do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

CSM Parameters

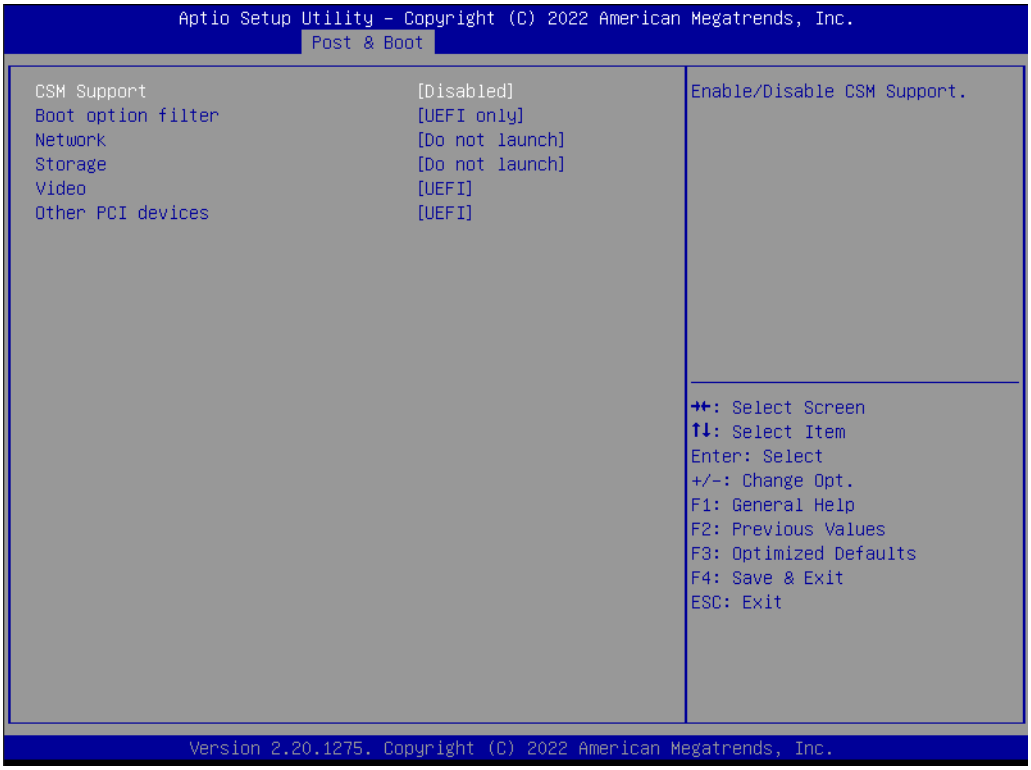


Figure 2.28 CSM parameters

This option controls if CSM will be launched.

- **CSM Support**
  Enable/Disable CSM support.
- **Boot option filter**
  This option controls Legacy/UEFI ROMs priority.
- **Network**
  Controls the execution of UEFI and Legacy PXE option.
- **Storage**
  Controls the execution of UEFI and Legacy Storage OpROM.
- **Video**
  Controls the execution of UEFI and Legacy Video OpROM.
- **Other PCI devices**
  Determines OpROM execution policy for devices other than network storage or video.

2.3.5 Security

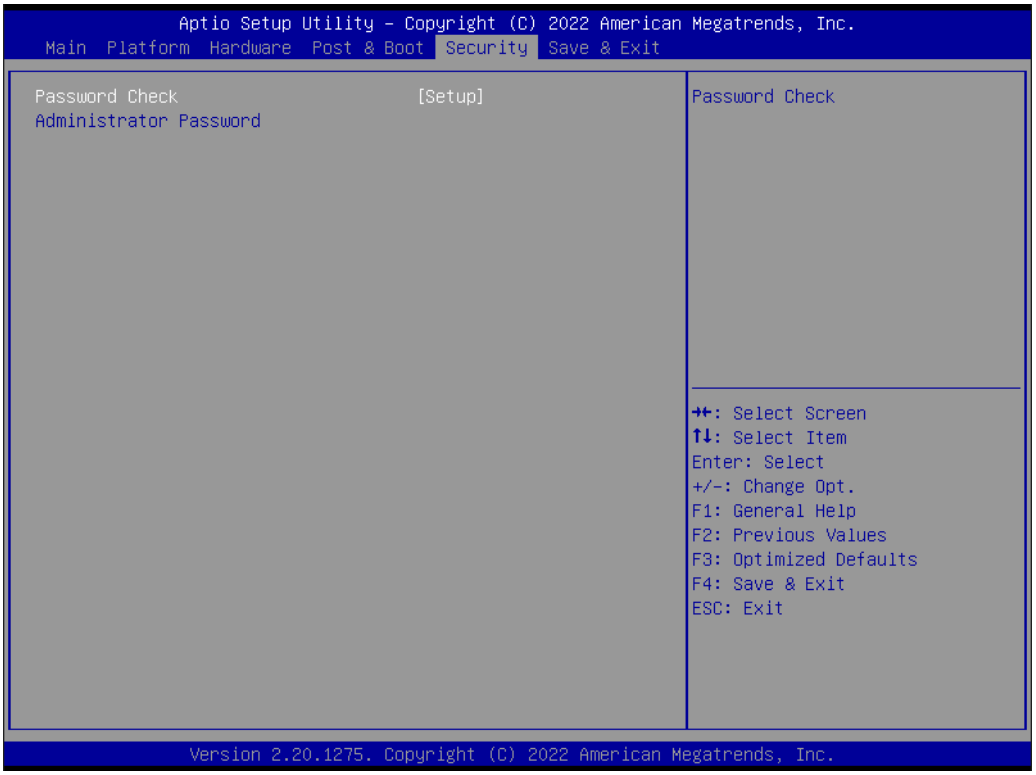


Figure 2.29 Security settings

Select Security Setup from the MIC-330 setup Main BIOS setup menu. All Security setup options, such as password protection is described in this section. To access the sub-menu for the following items, select the item and press Enter.

Note! *If only one user password is set, the user will have Administrator rights. Setting an administrator password is strongly recommended if you have security concerns.*

2.3.6 Save & Exit

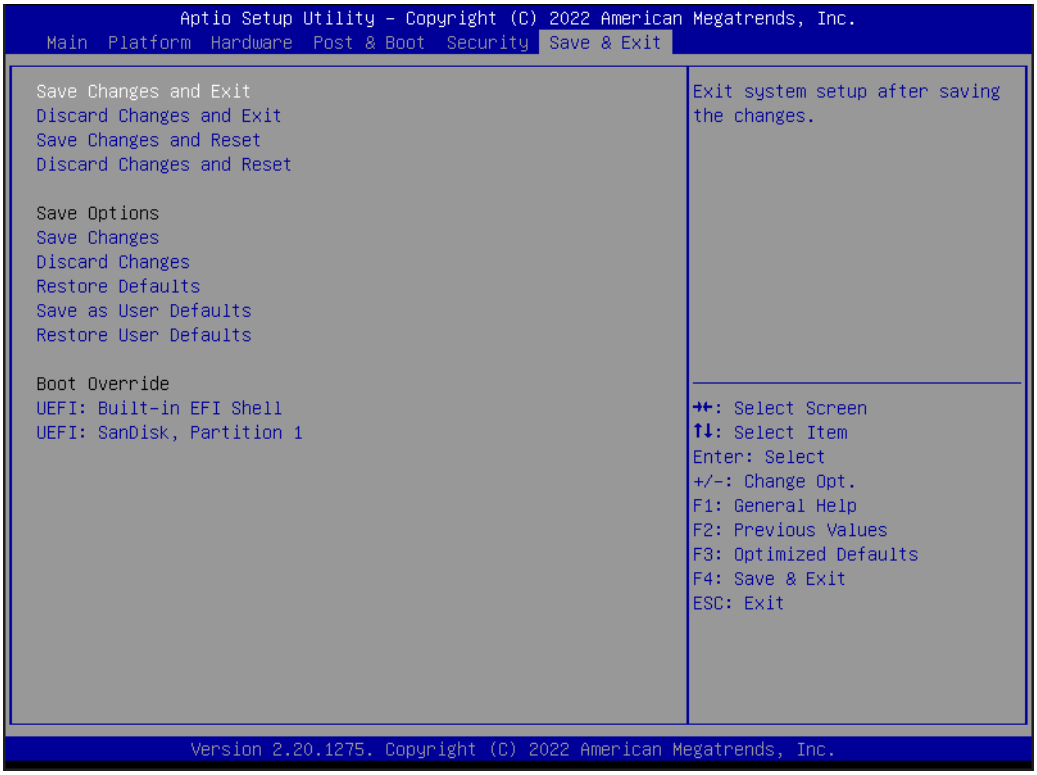


Figure 2.30 Save & Exit

- **Save Changes and Exit**
  When users have completed system configuration, select this option to save changes, exit BIOS setup menu and reboot the computer to take effect all system configuration parameters.
  – Select Exit Saving Changes from the Exit menu and press Enter. The following message appears: Save Configuration Changes and Exit Now? Choose Ok or Cancel.
  – Select Ok or cancel.
- **Discard Changes and Exit**
  Select this option to quit Setup without making any permanent changes to the system configuration.
  – Select Exit Discarding Changes from the Exit menu and press Enter. The following message appears: Discard Changes and Exit Setup Now? Choose Ok or Cancel.
  – Select Ok to discard changes and exit. Discard Changes: Select Discard Changes from the Exit menu and press Enter.
- **Save changes and reset**
  Reset the system after saving the changes.
- **Discard changes and reset**
  Reset system setup without saving any changes.
- **Save changes**
  Save Changes done so far to any of the setup options.
- **Discard changes**
  Discard Changes done so far to any of the setup options.
- **Restore Default**
  The BIOS automatically configures all setup items to optimal settings when

users select this option. Defaults are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Defaults if the user's computer is experiencing system configuration problems. Select Restore Defaults from the Exit menu and press Enter.

- **Save as User Default**
  Save the all current settings as a user default.
- **Restore User Default**
  Restore all settings to user default values.
- **Boot Override**
  This option shows the boot device for you to choose.

Appendix A

Pin Assignments

This appendix describes pin assignments.

A.1 P1~P5 Connector Pin Definitions

Table A.1: P1~P5 Connector Pin Definitions

Pin	A	B	C	D	E	F
5-06	5_PE_CLKE#	5_PE_CLK+	5_PE_CLK-	6_PE_CLKE#	6_PE_CLK+	6_PE_CLK-
5-05	1_PE_CLK+	1_PE_CLK-	1_PE_CLKE#	2_PE_CLK+	2_PE_CLK-	2_PE_CLKE#
5-04	GND	NC	NC	GND	NC	NC
5-03	NC	NC	GND	NC	NC	GND
5-02	GND	NC	NC	GND	NC	NC
5-01	NC	NC	GND	NC	NC	GND
4-08	GND	NC	NC	GND	NC	NC
4-07	6_PE_Tx00+	6_PE_Tx00-	GND	6_PE_Rx00+	6_PE_Rx00-	GND
4-06	GND	NC	NC	GND	NC	NC
4-05	5_PE_Tx00+	5_PE_Tx00-	GND	5_PE_Rx00+	5_PE_Rx00-	GND
4-04	GND	4_PE_Tx02+	4_PE_Tx02-	GND	4_PE_Rx02+	4_PE_Rx02-
4-03	4_PE_Tx00+	4_PE_Tx00-	GND	4_PE_Rx00+	4_PE_Rx00-	GND
4-02	GND	3_PE_Tx02+	3_PE_Tx02-	GND	3_PE_Rx02+	3_PE_Rx02-
4-01	3_PE_Tx00+	3_PE_Tx00-	GND	3_PE_Rx00+	3_PE_Rx00-	GND
3-08	GND_1	7_SATA_Tx+	7_SATA_Tx-	GND_9	7_SATA_Rx+	7_SATA_Rx-
3-07	5_SATA_Tx+	5_SATA_Tx-	GND_5	5_SATA_Rx+	5_SATA_Rx-	GND_13
3-06	GND_2	NC	NC	GND_10	NC	NC
3-05	NC	NC	GND_6	NC	NC	GND_14
3-04	GND_3	NC	NC	GND_11	NC	NC
3-03	NC	NC	GND_7	NC	NC	GND_15
3-02	GND_4	2_USB3_Tx+	2_USB3_Tx-	GND_12	2_USB3_Rx+	2_USB3_Rx-
3-01	5_USB2+	5_USB2-	GND_8	6_USB2+	6_USB2-	GND_16
2-08	GND	GPIO (rsvd)	GPIO (rsvd)	GND	2_USB2+	2_USB2-
2-07	GPIO (rsvd)	GPIO (rsvd)	GND	GPIO (rsvd)	NC	GND
2-06	GND	2_PE_Tx06+	2_PE_Tx06-	GND	2_PE_Rx06+	2_PE_Rx06-
2-05	2_PE_Tx04+	2_PE_Tx04-	GND	2_PE_Rx04+	2_PE_Rx04-	GND
2-04	GND	2_PE_Tx02+	2_PE_Tx02-	GND	2_PE_Rx02+	2_PE_Rx02-
2-03	2_PE_Tx00+	2_PE_Tx00-	GND	2_PE_Rx00+	2_PE_Rx00-	GND
2-02	GND	1_PE_Tx06+	1_PE_Tx06-	GND	1_PE_Rx06+	1_PE_Rx06-
2-01	1_PE_Tx04+	1_PE_Tx04-	GND	1_PE_Rx04+	1_PE_Rx04-	GND
1-06	GND	1_PE_TX02+	1_PE_TX02-	GND	1_PE_RX02+	1_PE_RX02-
1-05	1_PE_TX00+	1_PE_TX00-	GND	1_PE_RX00+	1_PE_RX00-	GND
1-04	GND	1_USB2+	1_USB2-	GND	NC	NC
1-03	1_USB3_TX+	1_USB3_TX-	PWRBTN#	1_USB3_RX+	1_USB3_RX-	PWR_-FAIL#(rsvd)
1-02	GND	I2C_SCL	I2C_SDA	GND	PS_ON#	RST#
1-01	+12V	STANDBY	GND	+12V	+12V	GND
Pin	**A**	**B**	**C**	**D**	**E**	**F**

Table A.2: P1~P5 Connector Pin Definitions (Cont.)

G	H	I	J	K	L	Pin
7_PE_CLKE#	7_PE_CLK+	7_PE_CLK-	8_PE_CLKE#	8_PE_CLK+	8_PE_CLK-	5-06
3_PE_CLK+	3_PE_CLK-	3_PE_CLKE#	4_PE_CLK+	4_PE_CLK-	4_PE_CLKE#	5-05
GND	NC	NC	GND	NC	NC	5-04
NC	NC	GND	NC	NC	GND	5-03
GND	NC	NC	GND	NC	NC	5-02
NC	NC	GND	NC	NC	GND	5-01
GND	NC	NC	GND	NC	NC	4-08
NC	NC	GND	NC	NC	GND	4-07
GND	NC	NC	GND	NC	NC	4-06
NC	NC	GND	NC	NC	GND	4-05
GND	4_PE_Tx03+	4_PE_Tx03-	GND	4_PE_Rx03+	4_PE_Rx03-	4-04
4_PE_Tx01+	4_PE_Tx01-	GND	4_PE_Rx01+	4_PE_Rx01-	GND	4-03
GND	3_PE_Tx03+	3_PE_Tx03-	GND	3_PE_Rx03+	3_PE_Rx03-	4-02
3_PE_Tx01+	3_PE_Tx01-	GND	3_PE_Rx01+	3_PE_Rx01-	GND	4-01
GND_17	8_SATA_Tx+	8_SATA_Tx-	GND_25	8_SATA_Rx+	8_SATA_Rx-	3-08
6_SATA_Tx+	6_SATA_Tx-	GND_21	6_SATA_Rx+	6_SATA_Rx-	GND_29	3-07
GND_18	NC	NC	GND_26	NC	NC	3-06
NC	NC	GND_22	NC	NC	GND_30	3-05
GND_19	NC	NC	GND_27	NC	NC	3-04
NC	NC	GND_23	NC	NC	GND_31	3-03
GND_20	NC	NC	GND_28	NC	NC	3-02
7_USB2+	7_USB2-	GND_24	8_USB2+	8_USB2-	GND_32	3-01
GND	3_USB2+	3_USB2-	NC	4_USB2+	4_USB2-	2-08
FAN_TACH (rsvd)	FAN_TACH (rsvd)	GND	FAN_PWM (rsvd)	FAN_PWM (rsvd)	GND	2-07
GND	2_PE_Tx07+	2_PE_Tx07-	GND	2_PE_Rx07+	2_PE_Rx07-	2-06
2_PE_Tx05+	2_PE_Tx05-	GND	2_PE_Rx05+	2_PE_Rx05-	GND	2-05
GND	2_PE_Tx03+	2_PE_Tx03-	GND	2_PE_Rx03+	2_PE_Rx03-	2-04
2_PE_Tx01+	2_PE_Tx01-	GND	2_PE_Rx01+	2_PE_Rx01-	GND	2-03
GND	1_PE_Tx07+	1_PE_Tx07-	GND	1_PE_Rx07+	1_PE_Rx07-	2-02
1_PE_Tx05+	1_PE_Tx05-	GND	1_PE_Rx05+	1_PE_Rx05-	GND	2-01
GND	1_PE_TX03+	1_PE_TX03-	GND	1_PE_RX03+	1_PE_RX03-	1-06
1_PE_TX01+	1_PE_TX01-	GND	1_PE_RX01+	1_PE_RX01-	GND	1-05
GND	NC	NC	GND	NC	NC	1-04
SATA_SD3 (rsvd)	SATA_SDO (rsvd)	GND/GA2	SATA_SCL (rsvd)	SATA_SL (rsvd)	GND/GA3	1-03
GND	PRST# (rsvd)	n.a.	GND	NC	SYSEN#	1-02
+12V	+12V	GND	+12V	+12V	GND	1-01
G	**H**	**I**	**J**	**K**	**L**	**Pin**

Note!

1. NC: No Connection;
2. #: Active Low;
3. n.a.: not available;
4. Rsvd: reserved function, not ready now

A.2 P6 Connector Pin Definitions

P6 connector Pin definitions on mezzanine side card-1/2 board:

Table A.3: P6 Connector Pin Definitions

Pin		A	B	C	D	E	F
P6 Mezzanine side card-2	6-08	GND	NC	NC	GND	NC	NC
	6-07	NC	NC	GND	NC	NC	GND
	6-06	GND	NC	NC	GND	NC	NC
	6-05	5_ETH_A+	5_ETH_A-	GND	5_ETH_B+	5_ETH_B-	GND
	6-04	GND	4_ETH_A+	4_ETH_A-	GND	4_ETH_B+	4_ETH_B-
	6-03	3_ETH_A+	3_ETH_A-	GND	3_ETH_B+	3_ETH_B-	GND
	6-02	GND	2_ETH_A+	2_ETH_A-	GND	2_ETH_B+	2_ETH_B-
	6-01	1_ETH_A+	1_ETH_A-	GND	1_ETH_B+	1_ETH_B-	GND
P6 Mezzanine side card-1	6-08	GND	NC	NC	GND	NC	NC
	6-07	NC	NC	GND	NC	NC	GND
	6-06	GND	NC	NC	GND	NC	NC
	6-05	NC	NC	GND	NC	NC	GND
	6-04	GND	NC	NC	GND	NC	NC
	6-03	NC	NC	GND	NC	NC	GND
	6-02	GND	2_ETH_A+	2_ETH_A-	GND	2_ETH_B+	2_ETH_B-
	6-01	1_ETH_A+	1_ETH_A-	GND	1_ETH_B+	1_ETH_B-	GND

Pin		G	H	I	J	K	L
P6 Mezzanine side card-2	6-08	GND	NC	NC	GND	NC	NC
	6-07	NC	NC	GND	NC	NC	GND
	6-06	GND	NC	NC	GND	NC	NC
	6-05	5_ETH_C+	5_ETH_C-	GND	5_ETH_D+	5_ETH_D-	GND
	6-04	GND	4_ETH_C+	4_ETH_C-	GND	4_ETH_D+	4_ETH_D-
	6-03	3_ETH_C+	3_ETH_C-	GND	3_ETH_D+	3_ETH_D-	GND
	6-02	GND	2_ETH_C+	2_ETH_C-	GND	2_ETH_D+	2_ETH_D-
	6-01	1_ETH_C+	1_ETH_C-	GND	1_ETH_D+	1_ETH_D-	GND
P6 Mezzanine side card-1	6-08	GND	NC	NC	GND	NC	NC
	6-07	NC	NC	GND	NC	NC	GND
	6-06	GND	NC	NC	GND	NC	NC
	6-05	NA	NC	GND	NC	NC	GND
	6-04	GND	NC	NC	GND	NC	NC
	6-03	NA	NC	GND	NC	NC	GND
	6-02	GND	2_ETH_C+	2_ETH_C-	GND	2_ETH_D+	2_ETH_D-
	6-01	1_ETH_C+	1_ETH_C-	GND	1_ETH_D+	1_ETH_D-	GND

Note! *1. NC: No Connection.*

2. Ethernet port 1/2 on Mezzanine side card-2 are switchable between front I/O and P6, and default are Switched to front I/O.

Appendix B

Embedded Controller

This appendix describe EC configuration.

B.1 Features

- **Power Sequence**
- **Hardware Monitor:**
  - **Voltage:** Including Vin_SM, +5V_HOT, +V5, +V3.3, Coin battery voltage status, will show in BIOS setup menu;
  - **Thermal:** CPU temperature, System temperature, will show in BIOS setup menu;
  - **FAN Speed:** reserved, will customize by customer request.
- **Slot 1~8:** Detect Plug in/out status, it will show in BIOS setup menu.
- **LED:**
  - 80 port LED
  - Power LED (PWROK_LED)
    On: Handle Switch on and power good
    Flash: Handle Switch off and power good
    Off: Power not ready
  - Handle LED(BULE_LED)
    On: System boot on
    Off: System shutdown
  - Drone Mode LED (Drone Mode)
    On: Peripheral slot
    Off: motherboard slot
- **Button/Switch:**
  - **Handle Switch:** System boot on/system boot off by OS power button behavior
  - **RST_BT1:** reset system
- **Watchdog:**
  - Reset
  - Power Cycle
  - IRQ
- Fan/SMBus/Thermal protect/UART/GPIO reserved, will customized by customer request.

Appendix C

Glossary

Table C.1: Glossary	
ACPI	Advanced Configuration and Power Interface
API	Application Programming Interface
BIOS	Basic Input/Output System
CPU	Central Processing Unit
CPCI	CompactPCI
DDR4	Double Data Rate 4
ECC	Error Checking and Correction
FCBGA	Flip Chip BGA
Flash	Flash memory
FPGA	Field Programmable Gate Array
FRU	Field Replaceable Unit
GbE	Gigabit Ethernet
GPIO	General Purpose Input/Output
HDD	Hard Disk Drive
HW	Hardware
I/O	Input/Output
IC	Integrated Circuit
I^2C	Inter Integrated Circuit
LPC	Low Pin Count
MAC	Medium Access Control
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
RIO	Rear Input/Output
RS-232	Recommended Standard 232
RTC	Real Time Clock
RTM	Rear Transition Module
SATA	Serial Advanced Technology Attachment
SEL	System Event Log
SPD	Serial Presence Detect
SPI	Serial Peripheral Interface
SW	Software
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

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